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Power

Ref.: APL/UPCL/P-I/ENV/EC/MoEFCC/289/05/24
Date: 24.05.2024

To,
Additional Principal Chief Conservator of Forest
Ministry of Environment, Forest and Climate Change
Integrated Regional Office (Southern Zone)
Kendriya Sadan, Koramangala,
Bangalore – 560 034

Sub: Submission of Six-Monthly EC compliance report & CRZ Compliance report for 2x600 MW Udupi Thermal Power Plant at Udupi, Karnataka.

Ref: Environmental Clearance No: **J-13011/23/1996-IA.II (T) Dated: 01.09.2011.**
CRZ Clearance No: **11-14/2010-IA-III dated 18.05.2010.** EC Transfer from Udupi Power Corporation Ltd. to Adani Power Ltd. dated 23.05.2023.

Dear Sir,

With reference to above subject, please find enclosed herewith Half yearly Environment Clearances (EC) compliance report and CRZ Compliance report (for Sea Water Pipe-Line intake system) for the period of **October'2023 to March'2024** for **Udupi Thermal Power Plant,** through **e-mail.**

This is for your kind information and record please.

Thanking you,
Yours sincerely,
for **Adani Power Limited, Udupi**

(Santosh Kumar Singh)
Head AESG

Encl: As above

CC:

The Member Secretary,
Central Pollution Control Board,
Parivesh Bhavan, East Arjun Nagar,
Kendriya Paryavaran Bhawan, New Delhi – 110 032

Zonal Office,
Central Pollution Control Board,
1st and 2nd Floor, Nisarga Bhavan, A-Block, Thimmaiah Main Road, 7th Cross, Shivanagar, Bengaluru – 560 010

The Member Secretary
Karnataka State Pollution Control Board
"Parisara Bhavan", #49, 4th & 5th Floor,
Church Street, Bangalore – 560 001

Regional Office,
Karnataka State Pollution Control Board.
Plot no-36-C, Shivalli Industrial Area,
Manipal, Udupi – 576 104

Adani Power Ltd
Adani Corporate House
Shantigram, S G Highway
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CIN: L40100GJ1996PLC030533

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SIX MONTHLY COMPLIANCE REPORT OF ENVIRONMENT CLEARANCE (EC) AND CRZ CLEARANCE OF SEA WATER PIPELINE

FOR

1200 (2x600) MW
Udupi Thermal Power Plant

At

Village Yelluru, Pilar Post,
Padubidri, Udupi District, Karnataka

Submitted to:

Integrated Regional Office, Bengaluru
Ministry of Environment, Forest & Climate Change
Zonal Office, Central Pollution Control Board
Karnataka State Pollution Control Board

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Submitted by:

Environment Management Department

Adani Power Limited

Village Yelluru, Pilar Post,
Padubidri, Udupi District, Karnataka

Period: October'2023 to March'2024

CONTENTS

Introduction

Udupi Thermal Power Plant of Adani Power Limited with capacity of 2X600 MW imported Coal based Power Plant in the Udupi District of Karnataka. Situated in the western coastal region of India, the plant is situated in the village of Yellur, between Mangalore and Udupi.

Udupi TPP is the first independent power project (IPP) using 100% imported coal as fuel in the country. The Udupi Power Project supplies 90% of the power it generates to the State of Karnataka.

Location of the Project

State	Karnataka
District	Udupi
Village	Yelluru (in Padubidri Industrial Area)
Geographical Coordinates	$13^0 9' 00''$ N $74^0 47' 00''$ E $13^0 10' 30''$ N $74^0 48' 40''$ E

Both units of 600 MW have been installed as Super critical coal fired steam generator each connected to a reheat type condensing steam turbine and generator with water cooled condenser and all other required auxiliaries. Each steam generator of 600MW is rated to generate about 2028 tons/hour of superheated steam at a pressure of about 175 kg/cm^2 and superheat temperature of 540^{0}C. The steam generators are equipped with facilities for HFO/LDO firing for startup and flame stabilization at low loads. Each steam turbine is 3000 rpm rated speed, tandem compound, single re-heat, condensing type machine with extractions for regenerative feed water heating. The turbine is designed for mainstream pressure of 170 kg/cm^2 (a) and inlet temperature of 537^{0}C.

Being coastal area with perennial availability of seawater, usage of seawater is envisaged for condenser cooling and freshwater requirement. Re-circulating type of circulating water (CW) system with natural draft cooling towers is installed. Due to availability of Fresh water in this area is seasonal and limited; desalination of seawater is installed for meeting the freshwater requirement for the plant. About 10000 m^3/hr of makeup sea water is required for both the Unit-1 & Unit-2.

The plant has all latest Pollution Control Equipment like, High Efficiency ESP's, Flue gas desulphurization plant, Low NO_X burners and 275 m height chimney.

Environmental Clearances from Ministry of Environment & Forest (MoEFCC), Consent to Establish and Consent for Operation (CFO) from Karnataka State Pollution Control Board (KSPCB). Udupi TPP has also obtained all necessary statutory/mandatory clearances.

Ambient Air quality Monitoring Stations were established in 4 locations inside the plant area for continuous monitoring of Ambient Air Quality. One meteorological station has also been installed for monitoring of meteorological data. Udupi TPP is monitoring the environmental parameters in and around the plant area through NABL accredited Laboratory.

Environmental clearance was accorded to the project for 2x500 MW with imported Coal based units on 20 March 1997. This EC was amended on 25 Jan 1999 and 09 Sept 2009 permitting enhancement of capacity to 2x507.5 MW and subsequently to 2x600 MW. These amendments in EC were consolidated on 01 Sept 2011 by MoEFCC.

The Hon'ble NCLT vide its order dated 08.02.2023 sanctioning the scheme of amalgamation/merger of Udupi Power Corporation Ltd. with **Adani Power Limited.**

Subsequently, transfer of Environment Clearance from Udupi Power Corporation Ltd. To Adani Power Limited is granted from MoEFCC, New Delhi vide file no. J-13012/12/2015-IA.I (T) dated 26th June 2023.

Detailed compliance status of Consolidated Environment Clearance from MoEFCC for **2X600 MW Coal based Subcritical Thermal Power plant and CRZ Clearance** from State Coastal Zone Management Authority for Sea Water Pipeline is being furnished herewith.

Compliance Status on Environnemental Clearance
1200 (2×600) MW Coal Based Thermal Power Plant
Environment Clearance vide no. J-13011/23/1996-IA.II (T)
EC Transfer from UPCL to APL dated 26.06.2023.

Sl.No.	Conditions	Compliance Status
A	**Specific Conditions**	
(I)	All the conditions stipulated by the Karnataka State Pollution Control Board issued from time to time should be strictly implemented including the installation of Flue Gas Desulphurization (FGD) Plant. The status of implementation of FGD shall be submitted to the Regional Office of the Ministry at Bangalore.	Complied. All the conditions stipulated by KSPCB are implemented. FGD units are commissioned and are in operation from the inception of Unit-1 & Unit-2 boilers. Unit-I: 11th November 2010 Unit-II: 19th August 2012 As per the MoEFCC notification no. G.S.R.682 (E) dated: 05.09.2022 timeline for compliance for SO_2 emissions for Category C TPPs is 31st December 2026. In line with the notification, existing FGD (25% flue gas capacity) has been completely dismantled. As on today, installation of FGD (100% flue gas capacity) has been commenced to comply with the SO_2 emission standard within the notified timelines.
(II)	Sulphur and ash contents in the coal to be used in the project shall not exceed 0.8% and 12 % (average) respectively at any given time. In case of variation of coal quality at any point of time, fresh reference shall be made to the Ministry	Complied for both Sulphur and Ash contents. Average Sulphur and Ash content in coal used for the period of Oct'2023 to March'2024 is as below: 1. Sulphur Content: **0.57 %** 2. Ash Content: **5.46 %**
(III)	A single bi-flue stack of 275 m height shall be provided with continuous online monitoring equipment of SO_x, NO_x and Particulate Matter ($PM_{2.5}$ & PM_{10}). Exit velocity of flue gases shall not be less than 22 m/sec. Mercury emissions from stack shall also be monitored on periodic basis.	Compiled A Single bi-flue stack of 275 m height is provided with continuous online monitoring for SO_2, NO_x, Particulate Matter and Mercury. Exit velocity of the flue gases from the stack for the period of Oct'2023 to Mar'2024 was 24.10 to 27.00 m/s.
(IV)	An instrumented meteorological tower shall be set up for collecting on-site meteorological data.	Complied An instrumented meteorological tower is established for online meteorological data. Meteorological data for the period of Oct'2023 to Mar'2024 is enclosed as **Annexure-I** for reference.

(V)	High Efficiency Electrostatic Precipitators (ESPs) shall be installed to ensure that particulate emission from the proposed plant does not exceed 50 mg / NM^3. Low NO_x Burners shall be installed.	Complied High Efficiency Electrostatic Precipitators and low NOx Burners are installed. Particulate emissions from the plant are well within the limits. Monitoring reports for the period of Oct'2023 to Mar'2024 is enclosed as **Annexure-I**
(VI)	Adequate dust extraction system such as cyclones / bag filters and water spray system in dusty areas such as in coal handling and ash handling points, transfer areas and other vulnerable dusty areas shall be provided.	Complied Water Sprinklers are provided in coal yard, coal unloading and coal conveyor systems. Dust Extraction system has been provided at Junction towers. Dry Fog dust suppression system is provided in track hopper and bunkers. Wind Shield has been provided; photograph enclosed in **Annexure-II.**
(VII)	Transportation of coal from Mangalore Port to the project site shall be undertaken by rail with adequate provisions to prevent fugitive emissions	Complied Coal is transported from Mangalore port to plant site is only through rail by BOBRN wagons. Wagons are covered with tarpaulin sheets to avoid fugitive emission during transportation.
(VIII)	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. 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. To prevent ground water contamination, the ash pond area should be lined with impervious layer.	Complied Fly ash is collected in dry form and stored in ash Silos. All the generated fly ash is being supplied to the end users like Cement, RMC, Brick manufactures etc. Fly Ash Utilization details enclosed as **Annexure-III**. Ash pond is lined with LDPE film as impervious layer to avoid ground water contamination. Mercury and other heavy metals are monitored in the bottom ash through NABL accredited laboratory. No effluent is emanated from ash pond. No ash is disposed in the low-lying areas. Test wells are constructed around the ash pond area for water monitoring and monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I** for reference.
(IX)	The transportation of dry fly ash to the ash disposal area through closed bulkers shall be allowed till 30.03.2012 till the Cement	Complied.

	Grinding unit of M/s ACC Ltd. is set up. Monitoring of particulate emissions along the route of transportation shall be carried out	Cement blending unit has installed within the plant near to Ash silos and ash is transferred from silos to blending unit through closed conduit only. Monitoring is carried out in transportation route. Four numbers of online ambient air quality monitoring stations are established for continuous ambient air quality (CAAQ) monitoring. AAQ monitoring is also done in transportation route and buffer zone through MoEFCC and NABL accredited laboratory. Air monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I**.
(X)	Extensive monitoring of air quality in and around the power plant and extending up to Western Ghat should be carried out and records should be scientifically maintained. The monitoring Programme should cover the key stone species for any potential acid deposition effects.	Complied Air quality monitoring is carried through MoEFCC and NABL accredited laboratory at 8 locations (extending up to Western Ghats) which is finalized in consultation with KSPCB and the monitoring reports are submitted to the KSPCB as per CFO condition. The Monitoring program covers till western Ghats and measure Sulphur dioxide and Nitrogen dioxide, as main precursors for acid rain. Key Stone Species Monitoring is carried once in six months. There is no change noticed. Air quality monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I**.
(XI)	No leachate shall take place at any point of time from the Coal storage area and Ash Pond and adequate safety measures such as lining with impermeable membrane / liner shall be adopted. Precautionary measure shall be taken to protect the ash dyke from getting breached and in-built monitoring mechanism shall be formulated.	Complied LDPE film is used as impervious layer to avoid ground water contamination from Coal storage and Ash Pond area. Test wells are constructed around the ash pond area for water monitoring and monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I.**
(XII)	Fugitive emission of fly ash (dry or wet) shall be controlled so that no agricultural or non-agricultural land is affected. Damage to any land shall be mitigated and suitable	Complied Disposal of fly ash is handled through closed conduit within plant. No damage has happened to any land.

	compensation provided in consultation with the local Panchayat.	
(XIII)	COC of at least 1.25 shall be adopted	Complied
(XIV)	Closed Circuit Cooling Tower shall be installed and sea water shall be used for cooling purpose. The sweet water requirement shall be met from the desalination plant.	Complied Closed circuit cooling tower is provided, and sea water is used for cooling purpose. Desalination plant is provided for sweet water requirement.
(XV)	No effluent will be discharged into the Mulki River. The treated effluents shall be discharged through a pipeline in the Arabian Sea ensuring that the differential temperature is maintained at 5^0 C. The area and location of the intake and discharge point shall be finalized in consultation with the National Institute of Oceanography (NIO), Goa/Central Water and Power Research Station, Pune.	Complied No effluent is discharged into the Mulki River and there is no connection of Udupi Thermal Power Plant with Mulki River. All the cooling towers blow down and water outlets are discharged back to the sea from Guard Pond through Coro-coated MS-Pipe line at designated place which is finalized in consultation with NIO. The differential temperature is maintained within 5^0 C. All the intake and outfall sea water points are finalized as per recommendations of NIO, Goa.
(XVI)	Brine management from desalination plant, its disposal mechanism and status of implementation shall be submitted to the Regional Office of the Ministry from time to time.	Complied Guard pond has been established to collect all the water outlets. Brine from desalination plant is sent to Guard Pond and discharged to Sea. Continuous online monitoring system implemented in Guard Pond, in addition to that water sample is being collected and analyzed once a week by MoEFCC and NABL accredited laboratory. Guard pond effluent monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I**.
(XVII)	Possibility for setting up transit storage within plant site for temperature control of effluent before discharging to the sea shall be examined and details submitted to the Ministry within six months.	Complied Guard pond has been established to collect all the water outlets. Treated effluents, including blow down from the cooling towers are sent back to sea via Guard Pond. Effluent temperature maintained within 5^0 C before discharge.
(XVIII)	Monitoring of ground and surface water quality nearby shall be regularly conducted and records maintained. The monitored data	Complied

	shall be submitted to the Ministry regularly. Further, monitoring points shall be located between the plant and drainage in the direction of flow of ground water and or advised by the State Pollution Control Board and records maintained. Monitoring for heavy metals in ground water shall be undertaken.	Ground water and Surface water monitoring is carried regularly in the locations finalized in consultation with KSPCB and records are maintained. Monitoring reports are submitted to KSPCB as per CFO condition. Monitoring of heavy metals in ground water is carried out monthly. Water monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I.**
(XIX)	A well designed rainwater harvesting system shall be put in place which shall comprise of rain water collection from the built up and open area in the plant premises. Action plan and road map for implementation shall be submitted to the Regional Office of Ministry.	Three Numbers of Rainwater Harvesting ponds are constructed to harvest rainwater. Photos enclosed as **Annexure-IV.**
(XX)	The project proponent shall not hamper the vocation of the fishing community in the area (if any) and it shall be ensured that local fishing community shall be allowed to carry out their vocation. Clearance from the Department of Fisheries in the State Govt. shall be obtained.	Complied Fishing activity is not hampered. Monitoring of sea water around the intake and outfall points is carried regularly through College of Fisheries, Mangalore. NOC obtained from department of Fisheries, State government of Karnataka. Copy of NOC already submitted.
(XXI)	Acquisition of land should be restricted to 550 ha as per the following breakup:	Complied Current status as below:

Plant area	180 Ha	Plant area	167 Ha
Ash Disposal Area	150 Ha	Ash Disposal Area	46 Ha
Colony Area	45 Ha	Colony Area	03 Ha
In take pipe route	25 Ha	In take pipe route	15 Ha
Other requirements	50 Ha	Other requirements	8 Ha
Rehabilitation, Green belts, Ash utilizations etc.	100 Ha	Rehabilitation, Green belts, Ash utilizations etc.,	82 Ha

<table>
<tr><td>(XXII)</td><td>Green belt of adequate width and density with suitably selected native species should be developed all around the plant area and the ash disposal site. Density of trees shall not be less than 2000 per ha and survival rate not less than 80%. It shall be ensured that at least 1/3rd of the total area is utilized for creation of green belt. Adequate financial provision should be made for this purpose.</td><td>Complied
Green belt/plantation of about 4,12,505 saplings in 195 acres have been planted.
Survival rate of the plantation is ensured more than 80% by taking appropriate after care methods like Watering, apply manure etc. Snapshots of Plantation are enclosed as Annexure-V for reference.
Adequate financial provision for the plantation under Environment budget is made separately. The amount spent for various activities under Environment for the period of Oct'2023 to March'2024.
<table>
<tr><th>Description</th><th>Amount (Rs.)</th></tr>
<tr><td>Afforestation</td><td>1,15,47,488</td></tr>
<tr><td>Environment Monitoring</td><td>41,39,718</td></tr>
<tr><td>General Environment Management</td><td>2,62,05,377</td></tr>
<tr><td>Total</td><td>4,18,92,583</td></tr>
</table></td></tr>
<tr><td>(XXIII)</td><td>Local employable youth from Project Affected Family shall be trained in skills relevant to the project for eventual employment in the project itself. The action taken report and details thereof to this effect shall be submitted to the Regional Office of the Ministry and the State Govt. Dept. concerned from time to time.</td><td>Complied
As per the recommendations from KIADB, project affected families are taken on employment and provided required trainings and skill developments.</td></tr>
<tr><td>(XXIV)</td><td>The project affected people should be rehabilitated and resettled in consultation with the State Govt. of Karnataka. A Rehabilitation Committee should be constituted with representatives from the state of Govt. of Karnataka, affected people, local recognized NGOs, technical institutions, experts etc.</td><td>Complied
Rehabilitation and Resettlement is already provided to the project affected people as per R&R policy of Government of Karnataka.</td></tr>
<tr><td>(XXV)</td><td>Status of implementation of R&R including its financial component spent and action pending shall be submitted to the regional Office of the Ministry from time to time.</td><td>Complied</td></tr>
<tr><td>(XXVI)</td><td>Financial requirements for implementations of the environmental mitigative measures should be earmarked and shall not be diverted for the other purposes. Adequate provision should be ensured for</td><td>Complied
Financial requirement for Environmental mitigative measures was earmarked at the time of project as per EIA report and measures have been implemented. Operating expenses</td></tr>
</table>

	enhancement of funds required, if any, in future.	are earmarked in operation budget on yearly basis. In case of any future requirement funds will be provided as when required.
(XXVII)	The project proponent shall also adequately contribute in the development of the neighboring villages. Special package with implementation schedule for free potable drinking water supply in the nearby villages and schools shall be undertaken in a time bound manner.	Complied Potable drinking water supply through RO plant is done. The company is also providing assistance in Medical, Education and Infrastructural facilities etc., to the neighboring villages. Scholarships, green nurturing and school grants are also providing to nearby villages.
(XXVIII)	The project proponent shall formulate sustainable livelihood scheme for landless and marginalized section of society (such as landless farmers) in the area who are directly or indirectly affected due to power project.	Complied The Company has engaged local people for various activities like green belt Development, Area development and other service works like catering etc.,
(XXIX)	At least three nearest village shall be examined for possible adoption and basic amenities like development of roads; drinking water supply, primary health centre, primary school etc shall be developed in co-ordination with the district administration	Complied Udupi TPP along with the District Administration has identified various schools in the neighboring villages for adoption and for providing basic amenities like toilet facilities, drinking water, green nurturing, etc.
(XXX)	An amount of Rs. 5.0 Crores shall be earmarked as one time capital cost for CSR programme. Subsequently a recurring expenditure of Rs. 1.0 Crores per annum till the life the plant 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 Rs.5 crore was earmarked onetime cost for CSR during the project phase stage of 2x600 MW plant. Over Rs.1 crore is earmarked and used for all CSR activities every year.
(XXXI)	CSR scheme shall be identified based on need based assessment in and around the villages within 5.0 km of the site and in constant consultation with the village Panchayat and the District Administration. As part of CSR prior identification of local employable youth and eventual employment in the project as required after imparting relevant training shall be also undertaken as necessary.	Complied CSR schemes are identified based on need assessment and constant consultation with village Panchayat and the District Administration. CSR team is engaged for assessment and consultation with local villages for CSR activities on a continuous basis. For local youth, scholarships and various other schemes including trainings are provided to get them proper education and getting eventual employment opportunities.

		Snapshots of CSR activities are enclosed as **Annexure-VI** for reference.
(XXXII)	It 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.	Complied Socio Economic study was carried at the project time as a part of EIA study. Impact assessment of CSR interventions is periodically done internally.
(XXXIII)	A Monitoring Committee should be constituted for reviewing the compliance to various safeguard measures by involving recognized local NGOs. Pollution Control Board, Institutions, Experts etc.	Monitoring Committee is framed comprises of NGO, College Experts and Institution Experts to review Safeguard measures implemented by Udupi Thermal Power Plant.
B	**General Conditions:**	
(I)	A Corporate Environmental Policy shall be formulated and after due approval of the Board of Directors of the Company shall be submitted to the Ministry **with six months.** The policy shall specifically address issues of adherence to environmental policy so formulated and environmental clearance conditions stipulated for the power project and also others including matters related to violations of stipulated conditions (if any) to the Board.	Complied
(II)	The treated effluents confirming to the prescribed standards only shall be re-circulated and reused within the plant. Arrangements shall be made that effluents and storm water do not get mixed.	Complied All the Effluents are treated through ETP (Effluent Treatment Plant) to meet the effluent standards and the treated water is used for Greenbelt development/dust suppression.
(III)	A sewage treatment plant shall be provided (as applicable) and the treated sewage shall be used for raising greenbelt / plantation.	Complied. Modular STP has been installed treating sewage water and discharging for green belt development.
(IV)	A well-designed rainwater harvesting shall be constructed. Central Groundwater Authority / Board shall be consulted for finalization of appropriate rainwater harvesting technology within a period of three months from the date of issue of clearance and details shall be furnished to the Regional Office of the Ministry.	Three Numbers of Rainwater harvesting ponds are constructed to harvest rainwater. Photos enclosed as **Annexure-IV.**

(V)	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.	Complied Adequate safety measures like fire hydrant, fire extinguishers, smoke detectors, hose reel, hose house, water monitor, D.V system, Fire water pump house, fire tenders are available to prevent from spontaneous fires.
(VI)	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.	Storage facilities in the plant for auxiliary liquid fuel are provided and the facilities are approved by Department of Explosives, Nagpur. Liquid fuel is procured from Oil Companies (GOI Undertakings) and Sulphur content condition is complied with. Environment and disaster preparedness plan is in place and approved by Inspector of Factories and Boilers.
(VII)	Regular monitoring of ground water level shall be carried out by establishing a network of existing wells and constructing new piezometers. Monitoring around the ash pond area shall be carried out particularly for heavy metals (Hg, Cr, As, Pb) and records maintained and submitted to the Regional Office of this Ministry. The data so obtained should be compared with the baseline data so as to ensure that the ground water quality is not adversely affected due to the project.	Complied Regular monitoring is being carried in existing wells and test wells constructed around ash pond area and reports are submitted to KSPCB office and the same is submitted to RO-MoEFCC once in six months. Monitoring reports are enclosed as **Annexure-I** for reference. The compared baseline data for the period of March'2024 for water quality and ambient air quality is enclosed as **Annexure-VII**
(VIII)	Monitoring surface water quantity and quality shall also be regularly conducted and records maintained. The monitored data shall be submitted to the Ministry regularly. Further, monitoring points shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring for heavy metals in ground water shall be undertaken.	Complied Surface water monitoring is carried regularly in the monitoring points finalized in consultation with KSPCB. Monitoring reports are submitted regularly to RO-KSPCB and same is submitted to RO-MoEFCC once in six months. Monitoring reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I** for reference. However, surface water Quantity measurement is not applicable.
(IX)	First Aid and sanitation arrangements shall be made for the drivers and other contract workers during construction phase	Complied All the arrangements are made during the construction phase.
(X)	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 /	Complied Enclosures are provided for turbines to control the noise. The persons working in the high

	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 / noise less areas.	noise area are provided with ear plugs/earmuffs. All the employees working in the area are examined periodically for audiometric and records are maintained.
(XI)	Regular monitoring of ground level concentration of SO_2, NO_x, $PM_{2.5}$ & PM_{10} and Hg shall be carried out in the impact zone and records maintained. If at any stage these levels are found to exceed the prescribed limits, necessary control measures shall be provided immediately. The location of the monitoring stations and frequency of monitoring shall be decided in consultation with SPCB. Periodic reports shall be submitted to the Regional Office of this Ministry. The data shall also be put on the website of the company.	Complied Regular monitoring is carried as per NAAQ standards in all the locations finalized by KSPCB. Ambient Air Quality Monitoring stations are established in the plant for continuous monitoring of pollution levels. Monitoring reports are regularly submitted to KSPCB and RO-MoEFCC and copy of the report along with the data is being kept on company website in six monthly compliance reports. http://www.adanipower.com/downloads
(XII)	Provision shall be made for the housing of construction labor (as applicable) 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	Complied All the arrangements are made during the construction phase
(XIII)	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	Complied
(XIV)	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 project proponent.	Complied Clearance letter is uploaded in company website as part of the Six-monthly compliance report of EC conditions. http://www.adanipower.com/downloads
(XV)	An Environmental Cell shall be created at the project site itself and shall be headed by an officer of appropriate seniority and qualification. It shall be ensured that the head of the Cell shall directly report to the	Complied A well-qualified Environment cell is established. Head of the Environment

	Head of the Organization. The status report on the functioning of the Cell shall be submitted to the regional office of the Ministry periodically. The Cell shall comprise of an expert in Marine Biology, Fishery and Mangroves preservation.	department is directly reporting to station head. Director & Research Karnataka Veterinary, Animal & Fisheries Sciences University Bidar, is a member of Environmental Monitoring committee is providing necessary technical assistance in Marine Biology, Fishery and Mangroves preservation issues.
(XVI)	The proponent shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MOEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels 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.	Complied Status of compliance of the stipulated environmental clearance conditions including results of monitored data is kept website and shall update on Six monthly bases. http://www.adanipower.com/downloads Monitoring parameters are displayed near main gate. Online Continuous emission monitoring (CEMS) data is supplied to CPCB and displayed in the public domain through the below said website. URL: http://cpcbrtdms.nic.in/ Regularly monitoring data is submitted to Regional Office of MoEFCC, Regional Office of KSPCB and Zonal Office of CPCB.
(XVII)	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 environmental clearance conditions and shall also be sent to the respective Regional Offices of the Ministry by e-mail.	Complied Copy of Environmental statement for the Financial Year 2022-23 is submitted to RO-MoEFCC and RO-KSPCB. Copy is enclosed as **Annexure-VIII** for reference. The copy of Environmental statement is kept in six monthly EC compliance report to MoEFCC. Six monthly report is displayed through company website. http://www.adanipower.com/downloads
(XVIII)	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	Complied Six monthly compliance reports are regularly submitted to Regional Office of MoEFCC, Regional Office of KSPCB and Zonal Office of CPCB. Last Compliance report for the period of April'2023 to Sep'2023 submitted vide letter no. APL/Udupi/P-I/ENV/EC/MoEFCC/225/11/23 dated 23.11.2023. The same is displayed in the company website. http://www.adanipower.com/downloads

<table>
<tr><td>(XIX)</td><td>Regional Office of the Ministry of Environment & Forests will monitor the implementation of the stipulated conditions.
A complete set of documents including Environmental Impact Assessment Report and Environment Management Plan along with the additional 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 up-date 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.</td><td>Complied.
Complete set of documents including EIA/EMP report was submitted to MoEFCC and KSPCB for project approval.
Status of compliance of the stipulated environmental clearance conditions including results of monitored data is kept on website and shall be updated on Six monthly basis.
http://www.adanipower.com/downloads
Environmental Monitoring parameters are being displayed near the main gate.</td></tr>
<tr><td>(XX)</td><td>Separate funds shall be allocated for implantation 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 should be reported to the Ministry.</td><td>Complied.
Funds for Environmental protection measures were earmarked at the time of project as per EIA report and measures have been implemented.
Yearly environmental budget is part of the yearly operating cost of the project.
The total Environment Expenditure for the period of October'2023 to March'2024 included the following:
<table>
<tr><th>S.No</th><th>Detail Description</th><th>Amount (Rs.)</th></tr>
<tr><td>1</td><td>Afforestation</td><td>1,15,47,488</td></tr>
<tr><td>2</td><td>Environment Monitoring</td><td>41,39,718</td></tr>
<tr><td>3</td><td>Environment Management</td><td>2,62,05,377</td></tr>
<tr><td></td><td>Total</td><td>4,18,92,583</td></tr>
</table></td></tr>
<tr><td>(XXI)</td><td>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</td><td>Complied</td></tr>
<tr><td>(XXII)</td><td>Full cooperation shall be extended to the Scientists/ Officers from the Ministry/ Regional Office of the Ministry at Bangalore/ CPCB/ SPCB who would be monitoring the compliance of environmental status</td><td>Noted & Compliance assured</td></tr>
</table>

(5)	The Ministry of Environment and Forests reserves the right to revoke the clearance if conditions stipulated are not implemented to the satisfaction of the Ministry. The Ministry may also impose additional environmental conditions or modify the existing ones, if necessary.	Noted
(6)	Concealing factual data or submission of false / fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986	Noted
(7)	In case of any deviation or alteration in the project a fresh reference should be made to the Ministry to assess the adequacy of the condition(s) imposed and to add additional environmental protection measures required.	Noted.
(8)	The above stipulations would be enforced among others under the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986 and rules there under, Hazardous Wastes (Management and Handling) Rules, 2008 and its amendments, the Public Liability Insurance Act, 1991 and its amendments.	Noted

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Compliance Status on CRZ Clearance of Sea Water Pipeline
1200 (2×600) MW Coal Based Thermal Power Plant
CRZ CLEARANCE NO. 11-14/2010-IA-III dated 18.05.2010

Sl. No.	Conditions	Compliance Status
5	**Specific Conditions**	
I	**Construction phase:**	
(I)	All the conditions stipulated by the Karnataka State Coastal Zone Management Authority vide letter No. FEE 25 CRZ 2009, dated 16.02.2010 and the commitments/ details submitted to KSCZMA shall be strictly complied with.	Noted & complied.
(II)	Regular monitoring shall be carried out before discharging into sea.	Complied. All the used water is directed to Guard Pond and regular monitoring is done and reports are submitted on monthly basis to KSPCB also.
(III)	A joint meeting of both the monitoring groups every year shall be carried out and send the report to MoEFCC.	Complied. Regular joint meeting of monitoring team and third party MoEFCC and NABL approved lab is conducted and monitoring reports are submitted to MoEFCC on six monthly.
(IV)	It should be ensured that there shall not be any disturbance to fishing activity.	Noted & complied.
(V)	All safety precautionary measures viz. stability of the pipeline, signal for fishing boats etc. shall be installed.	Complied. Sea water Pipeline is in fenced area and Emergency contact number is displayed in critical areas like Road Crossing, Village areas. 3 No's of Safety buoys are provided in the underwater pipeline area for safety of fishing boats.
(VI)	There shall be display boards at critical locations along the pipeline giving emergency instructions. Emergency information board shall contain emergency instructions in additions to contact details	Complied. Sea water Pipeline is in fenced area and caution boards provided with emergency contact number is displayed in critical areas like Road Crossing, Village areas. Photos of display boards are enclosed as **Annexure-IX**
(VII)	The project shall be implemented in such a manner that there is no damage to the mangroves/other sensitive coastal ecosystems	The pipeline area does not include any mangroves/other sensitive coastal eco systems.
(VIII)	A continuous and comprehensive post-project marine quality monitoring programme shall be taken up. This shall include monitoring of water quality, sediment quality and biological characteristics and the report shall be submitted every six month to Ministry's Regional Office at Bangalore.	Complied. Monitoring is carried for sea water quality at intake and outfall points by College of Fisheries, Mangalore. Monitoring Reports for the period of Oct'2023 to March'2024 is enclosed as **Annexure-I**.

(IX)	It shall be ensured that there is no displacement of people and the houses as a result of the project.	Noted & complied.
(X)	There shall be no withdrawal of ground water in CRZ area, for the project.	Noted & complied.
(XI)	Provision shall be made for the housing of construction labor 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.	All the arrangements were made during the construction phase.
(XII)	A First Aid Room will be provided in the project both during construction and operation of the project	Complied. All the arrangements are made during the construction phase.
(XIII)	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality	Complied All the construction activities are completed.
(XIV)	Any hazardous waste generated during construction phase, should be disposed off as per applicable rules and norms with necessary approvals of the KSPCB.	Complied. No hazardous waste was generated during construction phase.
(XV)	The diesel generator sets to be used during construction phase should be low Sulphur diesel type and should confirm to Environment (Protection) Rules prescribed for air and noise emission standards.	Construction work involves only excavation and pipe laying work, so DG sets were not used.
(XVI)	The diesel required for operating DG sets shall be stored in underground tanks and if required, clearance from Chief Controller of Explosives shall be taken.	Construction work involves only excavation and pipe laying work, so DG sets were not used.
(XVII)	Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should confirm to applicable air and noise emission standards and should be operated only during non-peak hours.	Complied
(XVIII)	Ambient noise levels should confirm to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to confirm to the stipulated standards by CPCB/KSPCB	Complied.
(XIX)	Storm water control and its re-use as per CGWB and BIS standards for various applications.	Work involved only in lying of pipeline underground and back filling.
(XX)	Regular supervision of the above and other measures for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings	Complied.

<table>
<tr><td>(II)</td><td colspan="2">OPERATION PHASE</td></tr>
<tr><td>(I)</td><td>Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured shall be restricted to the permissible levels to comply with the prevalent regulations.</td><td>Not applicable in the area because no structure is available in the area.</td></tr>
<tr><td>(II)</td><td>The green belt of the adequate width and density preferably with local species along the periphery of the power plant shall be raised so as to provide protection against particulates and noise as suggested by KSCZMA.</td><td>Complied.
Green belt is developed in the power plant area in accordance with environmental clearance.</td></tr>
<tr><td>(III)</td><td>Project proponent shall support afforestation activities by way of raising and supply of required seedling by the locals within 5KM radius of the plant as suggested by KSCZMA.</td><td>Complied.</td></tr>
<tr><td>(IV)</td><td>The ground water level and its quality should be monitored regularly</td><td>The work involves only laying of pipeline and no other industrial activities are involved. However regular water monitoring is being carried in the test wells constructed in the pipeline area.
Monitoring reports for the period of Oct'2023 to March'2024 is enclosed as Annexure-I for reference</td></tr>
<tr><td>(V)</td><td>The mangroves, if any, on the site should not be disturbed in anyway</td><td>Complied with at the time of pipeline construction.</td></tr>
<tr><td>(VI)</td><td>The environmental safeguards contained in the application should be implemented in letter and spirit</td><td>Complied with.</td></tr>
<tr><td>(VII)</td><td>A separate Environment management Cell with suitably qualified staff to carry out various environment related functions shall be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.</td><td>Complied.
Well qualified environment cell is established which is headed by HOD-Environment who is directly reporting to station head.</td></tr>
<tr><td>(VIII)</td><td>The funds earmarked for environment protection measures shall be maintained in a separate account and there shall be no diversion of these funds for any purpose. A year wise expenditure on environmental safeguards shall be reported to this Ministry's Regional Office at Bangalore.</td><td>Complied.
Funds for Environmental protection measures were earmarked at the time of project as per EIA report and measures have been implemented.
Yearly environmental budget is part of the yearly operating cost of the project.

The Environment Expenditure for the period of Oct'2023 to March'2024 included the following:
<table>
<tr><th>S.No</th><th>Detail Description</th><th>Amount (Rs.)</th></tr>
<tr><td>1</td><td>Afforestation</td><td>1,15,47,488</td></tr>
<tr><td>2</td><td>Environment Monitoring</td><td>41,39,718</td></tr>
</table></td></tr>
</table>

		3	General Environment Management	2,62,05,377
		4	Total	**4,18,92,583**
(IX)	In case of deviation or alteration in the project including the implementing agency, a fresh reference shall be made to this Ministry for modification in the clearance conditions or imposition of new one for ensuring environmental protection. The project proponents shall be responsible for implementing the suggested safeguard measures.	Condition is noted & compliance.		
(X)	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry	Condition is noted & compliance.		
(6)	**GENERAL CONDITIONS**			
(I)	Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment.	Complied. All the arrangements are made during the construction phase.		
(II)	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	Condition is noted & complied.		
(III)	Borrow sites for each quarry sites for road construction material and dump sites must be identified keeping in view the following	Not Applicable since no road construction work involved in the CRZ area.		
(a)	No excavation or dumping on private property is carried out without written consent of the owner	Condition is noted & complied.		
(b)	No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations.	Condition is noted & complied.		
(c)	Excavation work shall be done in close consultation with the Soil Conservation and Watershed Development Agencies working in the area, and	Condition is noted & complied.		
(d)	Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such materials and the dump sites for such materials must be secured so that they shall not leach into the ground water	Condition is noted & complied.		
(IV)	Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely	Complied with. All the precautionary measures are taken during construction time.		
(V)	Borrow pits and other scars created during the laying of cable shall be properly leveled and treated	It was proper complied during the said activities.		

(VI)	Adequate financial provision must be made in the project to implement the aforesaid safeguards.	Complied with.
(VII)	The project proponent will set up separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.	Complied. Well qualified Environment cell is established which is headed by HOD-Environment who is directly reporting to Station Head.
(VIII)	Full support shall be extended to the officers of this Ministry/Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	Noted for compliance.
(IX)	MoEF or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	Noted for compliance.
(X)	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry	Noted for compliance.
(XI)	In the event of a change in the project profile or change in the implementation agency, a fresh reference shall be made to the MoEFCC.	Noted for compliance.
(XII)	The project proponents shall inform the Regional office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work	The pipeline activity is a part of the total power project. The date of financial closure for the total project was 13.06.2007. The MoEFCC clearance was originally received on 20.03.1997 and the clearance for augmented capacity (from 2 x 507.5 to 2 x 600 MW) was received on 09.09.2009. Consolidated Environmental clearance received on 01.09.2011. The land development work for the pipeline activity was commenced in March 2009.
(XIII)	KSPCB shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's office/Tahsildar's office for 30 days.	Noted as related to KSPCB.
7	These stipulations would be enforced among others under the provisions of Water Act, 1974, Air Act, 1981, Environment Act, 1986, Public Liability Act, 1991 and EIA Notification 2006, including the amendments and rules made thereafter.	Noted for compliance.
8	All other statutory clearances such as the approvals for storage of diesel from CCE, Fire Department, Civil Aviation Dept, Forest Conservation Act, 1980 and Wild life Act, 1972,	Noted. These clearances were not applicable for sea water pipeline work.

	etc shall be obtained, as applicable by project proponents from the respective competent authorities.	
9	The project proponent shall advertise in at least two local newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded EC and copies of clearance letters are available with the KSPCB and may also be seen on the website of MoEF at http://www.envfor.nic.in. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	Complied. A copy of advertisement in local newspaper is submitted to RO-MoEFCC vide ref letter No: UPCL/B04/2010/1990 dated: 29.05.2010.
10	EC is subject to final order of the Honorable Supreme Court of India in the matter of Goa Foundation Vs Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	Noted for compliance.
11	Any appeal against this EC shall lie with National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.	Noted for compliance.
12	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad/Municipal Corporation, Urban Local Body and the local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	This is to clarify that the pipeline activity is a part of the main plant for which there was no need for public hearing as mentioned in MoEFCC letter.113011/23/96-IA-II (T) Part dated 31.01.2005. Hence no representations were received and therefore this clause is not applicable.
13	The proponent shall upload the status of compliance of 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 at Bangalore, the respective Zonal Office of CPCB and the KSPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Compliance status of the stipulated conditions uploaded on the website. However, results of monitoring data is not applicable since the activity involved is only laying of the water pipeline and no industrial activity involved in the area under discussion (CRZ). The monitoring data of the main plant is uploaded on the website and displayed near the main gate of the project. Reports are displayed in company website. http://www.adanipower.com/downloads
14	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and SPCB	Complied Six monthly compliance reports are regularly submitted to Regional Office of MoEFCC, Regional Office of KSPCB and Zonal Office of CPCB.

		Compliance report for the period of April'2023 to Sep'2023 submitted vide letter no. APL/Udupi/P-I/ENV/EC/MoEFCC/225/11/23 dated 23.11.2023.
15	The Environmental Statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned KSPCB 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 Office of MoEF at Bangalore by email.	Complied. Copy of Environmental statement for the Financial Year 2022-23 is submitted to RO-MoEFCC and RO-KSPCB is enclosed as **Annexure-VIII.** The copy of the same is being displayed in company website. http://www.adanipower.com/downloads

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METEOROLOGICAL DATA **Annexure-I**

Udupi Thermal Power Plant is having own Continuous Meteorological Observatory Station at site to observe parameters such as temperature, relative humidity, wind speed, wind direction and rainfall.

TABLE-1: AVERAGE DAILY METEOROLOGICAL DATA OF OCTOBER-2023

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01/10/2023	24.65	29.81	81.80	100	10.7
02/10/2023	25.00	30.11	81.50	100	0.0
03/10/2023	24.55	31.56	71.51	100	0.0
04/10/2023	24.19	31.92	62.87	100	0.0
05/10/2023	24.17	31.75	64.86	100	0.0
06/10/2023	23.42	31.31	58.53	100	0.0
07/10/2023	24.27	31.35	72.98	100	0.0
08/10/2023	25.50	32.04	72.30	100	0.0
09/10/2023	26.00	32.75	67.05	100	0.0
10/10/2023	25.65	31.20	76.11	100	0.4
11/10/2023	25.80	31.26	82.40	100	3.5
12/10/2023	25.26	30.97	80.00	100	0.7
13/10/2023	25.33	32.40	73.94	100	0.0
14/10/2023	25.01	34.25	62.65	100	0.0
15/10/2023	25.43	32.87	72.31	100	0.0
16/10/2023	25.36	33.03	68.13	100	12.7
17/10/2023	23.65	32.14	75.57	100	0.0
18/10/2023	24.38	31.31	71.00	100	0.0
19/10/2023	25.56	33.40	62.89	100	0.0
20/10/2023	25.39	32.44	73.24	100	0.0
21/10/2023	25.10	33.60	60.33	100	0.0
22/10/2023	24.90	32.62	69.57	100	0.0
23/10/2023	24.73	31.72	77.87	100	0.0
24/10/2023	24.73	33.25	66.11	100	0.0
25/10/2023	25.30	32.43	68.55	100	0.0
26/10/2023	25.34	33.36	61.97	100	0.0
27/10/2023	24.51	33.98	51.59	100	0.0
28/10/2023	23.95	34.71	45.35	100	0.0
29/10/2023	25.24	34.52	54.52	100	0.0
30/10/2023	22.59	34.22	61.81	100	0.0
31/10/2023	23.00	32.89	67.23	100	0.0
					27.99

TABLE-2: AVERAGE DAILY METEOROLOGICAL DATA OF NOVEMBER-2023

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01/11/2023	24.37	32.11	73.14	100	0.0
02/11/2023	26.27	33.22	74.52	100	0.0
03/11/2023	24.55	34.35	64.69	100	0.0
04/11/2023	24.84	31.29	74.64	100	17.5
05/11/2023	24.43	30.15	79.35	100	50.4
06/11/2023	23.58	31.37	72.35	100	0.0
07/11/2023	24.48	33.93	54.00	100	16.6
08/11/2023	24.08	31.12	78.12	100	18.4
09/11/2023	23.69	31.33	70.77	100	0.0
10/11/2023	24.28	34.17	55.91	100	16.8
11/11/2023	24.46	34.45	59.29	100	0.0
12/11/2023	24.92	33.56	51.43	100	0.0
13/11/2023	23.40	33.24	49.57	100	0.0
14/11/2023	23.47	34.70	42.20	100	0.0
15/11/2023	23.06	32.78	50.44	100	0.0
16/11/2023	23.92	34.38	53.51	100	0.0
17/11/2023	24.87	34.75	56.67	100	1.6
18/11/2023	25.31	32.80	70.20	100	0.0
19/11/2023	25.81	35.04	53.42	100	0.0
20/11/2023	25.43	34.56	52.41	100	0.0
21/11/2023	23.84	33.63	46.76	100	0.0
22/11/2023	25.22	32.59	65.02	100	0.0
23/11/2023	25.39	32.73	66.54	100	0.0
24/11/2023	25.63	30.72	78.66	100	0.0
25/11/2023	24.71	34.40	55.81	100	0.0
26/11/2023	25.03	33.84	47.51	100	0.0
27/11/2023	24.65	34.22	53.03	100	0.0
28/11/2023	25.24	34.46	52.39	100	0.0
29/11/2023	25.28	33.21	61.13	100	0.0
30/11/2023	25.57	34.57	48.89	100	0.0
					121.36

TABLE-3: AVERAGE DAILY METEOROLOGICAL DATA OF DECEMBER-2023

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
01/12/2023	24.84	33.46	64.65	100	0.5
02/12/2023	24.46	35.30	51.34	100	0.0
03/12/2023	24.84	35.30	54.25	100	0.0
04/12/2023	23.81	32.65	60.09	100	0.0
05/12/2023	24.12	33.78	52.92	100	0.0
06/12/2023	23.73	33.22	60.53	100	0.0
07/12/2023	23.69	32.92	55.14	100	0.0
08/12/2023	23.12	33.54	50.59	100	0.0
09/12/2023	26.05	33.44	64.27	100	122.4
10/12/2023	23.34	32.96	66.87	100	0.0
11/12/2023	25.12	33.01	67.69	100	0.0
12/12/2023	25.78	33.80	56.91	100	0.0
13/12/2023	25.20	33.27	55.86	100	0.0
14/12/2023	23.12	34.74	46.68	100	0.0
15/12/2023	23.00	33.81	35.85	100	0.0
16/12/2023	23.85	34.41	57.81	100	0.0
17/12/2023	24.37	34.19	55.71	100	0.0
18/12/2023	25.26	34.59	54.11	100	0.0
19/12/2023	24.95	32.85	55.30	100	0.0
20/12/2023	22.52	35.27	41.66	100	0.0
21/12/2023	23.43	35.08	47.21	100	0.0
22/12/2023	24.60	34.48	53.99	100	0.0
23/12/2023	24.39	33.95	47.29	100	0.0
24/12/2023	22.21	32.63	51.12	100	0.0
25/12/2023	22.74	34.25	52.99	100	0.0
26/12/2023	23.42	35.57	36.38	100	0.0
27/12/2023	20.37	34.02	32.93	100	0.0
28/12/2023	20.42	35.27	37.37	100	0.0
29/12/2023	22.49	34.82	46.49	100	0.0
30/12/2023	21.99	35.45	36.21	100	0.0
31/12/2023	23.57	34.86	42.23	100	0.0
					122.83

TABLE-4: AVERAGE DAILY METEOROLOGICAL DATA OF JANUARY- 2024

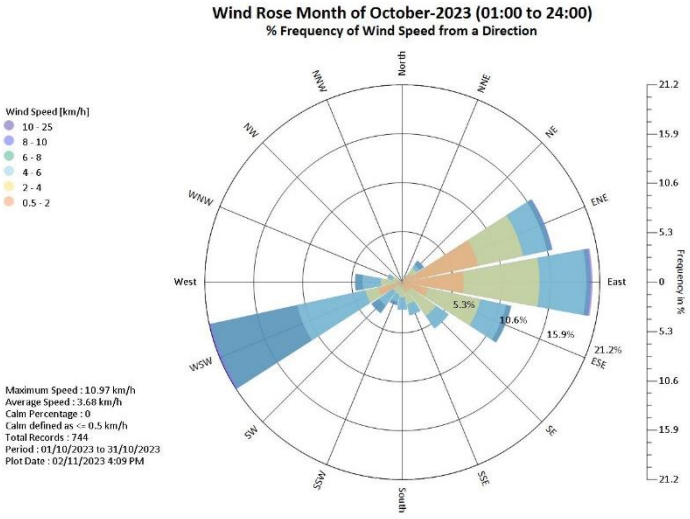
Date	Temperature (°C)		Relative Humidity (%)		Rain Fall (mm)
	Min	Max	Min	Max	
01/01/2024	23.97	34.74	41.54	100	0.0
02/01/2024	24.19	31.34	65.47	100	1.6
03/01/2024	25.06	30.91	70.71	100	26.7
04/01/2024	23.50	28.36	77.56	100	7.9
05/01/2024	23.15	32.07	64.03	100	0.0
06/01/2024	24.29	32.42	61.70	100	0.0
07/01/2024	23.94	33.65	59.54	100	1.4
08/01/2024	24.73	33.66	56.11	100	49.8
09/01/2024	22.92	31.89	71.95	100	2.6
10/01/2024	22.13	33.73	42.86	100	0.0
11/01/2024	21.63	32.30	50.76	100	0.0
12/01/2024	22.30	34.48	34.97	100	0.0
13/01/2024	22.91	32.84	51.86	100	0.0
14/01/2024	22.86	31.84	58.06	100	0.0
15/01/2024	23.47	34.89	39.96	100	0.0
16/01/2024	23.03	32.06	65.03	100	0.0
17/01/2024	21.91	31.84	56.88	100	0.0
18/01/2024	23.39	32.31	61.83	100	0.0
19/01/2024	22.52	32.85	55.66	100	0.0
20/01/2024	23.44	32.22	62.81	100	0.0
21/01/2024	22.24	33.78	59.33	100	0.0
22/01/2024	21.75	32.52	61.21	100	0.0
23/01/2024	22.55	34.07	40.06	100	0.0
24/01/2024	21.01	31.46	54.12	100	0.0
25/01/2024	20.67	30.65	59.51	100	0.0
26/01/2024	20.96	32.97	50.23	100	0.0
27/01/2024	21.11	34.47	36.70	100	0.0
28/01/2024	22.23	34.96	34.84	100	0.0
29/01/2024	22.21	33.97	39.74	100	0.0
30/01/2024	22.14	33.42	41.71	100	0.0
31/01/2024	21.39	31.86	50.80	100	0.0
					90.01

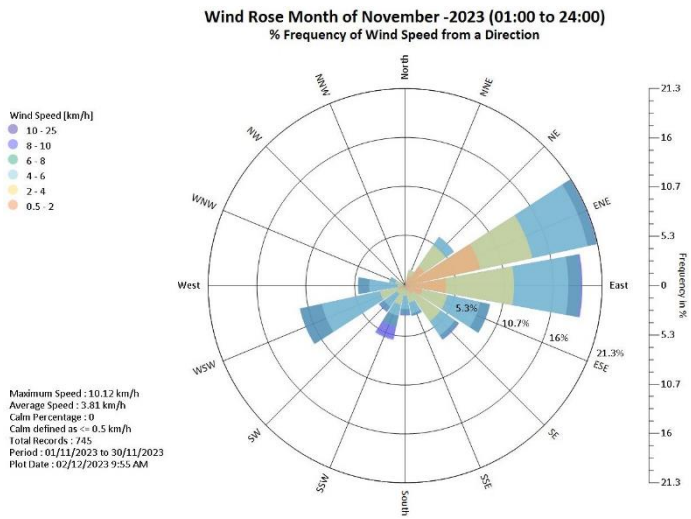
TABLE-5: AVERAGE DAILY METEOROLOGICAL DATA OF FEBRUARY-2024

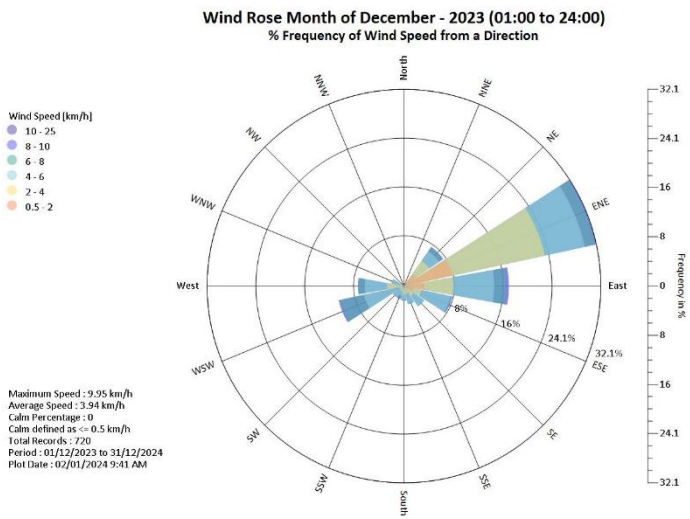
Date	Temperature (°C)		Relative Humidity (%)		Rain Fall (mm)
	Min	Max	Min	Max	
01/02/2024	26.17	32.61	82.30	100	0.0
02/02/2024	25.75	31.20	81.30	100	0.0
03/02/2024	26.09	32.68	80.20	100	0.0
04/02/2024	27.40	33.04	82.80	98.90	0.0
05/02/2024	27.80	33.71	84.90	100	0.0
06/02/2024	27.81	33.48	86.10	100	0.0
07/02/2024	27.74	33.50	89.90	100	0.0
08/02/2024	27.71	32.57	89.90	100	0.0
09/02/2024	27.83	32.68	91.40	100	0.0
10/02/2024	28.34	33.64	89.10	100	0.0
11/02/2024	28.82	35.81	82.60	100	0.0
12/02/2024	28.31	35.09	82.10	100	0.0
13/02/2024	27.54	34.26	82.20	100	0.0
14/02/2024	27.90	34.16	87.10	100	0.0
15/02/2024	28.40	34.42	86.50	100	0.0
16/02/2024	28.44	35.87	75.53	100	0.0
17/02/2024	28.11	35.42	83.10	100	0.0
18/02/2024	28.16	33.71	87.00	100	0.0
19/02/2024	28.14	33.61	84.80	100	0.0
20/02/2024	27.75	32.52	88.20	100	0.0
21/02/2024	27.85	32.98	79.56	100	0.0
22/02/2024	27.02	32.59	82.20	99.80	0.0
23/02/2024	26.61	31.76	79.92	100	0.0
24/02/2024	26.41	31.45	83.80	100	0.0
25/02/2024	27.46	34.32	76.83	100	0.0
26/02/2024	28.17	34.67	79.05	99.70	0.0
27/02/2024	28.57	34.74	79.91	100	0.0
28/02/2024	28.85	34.15	85.60	100	0.0
29/02/2024	28.66	34.12	86.50	100	0.0
					0.0

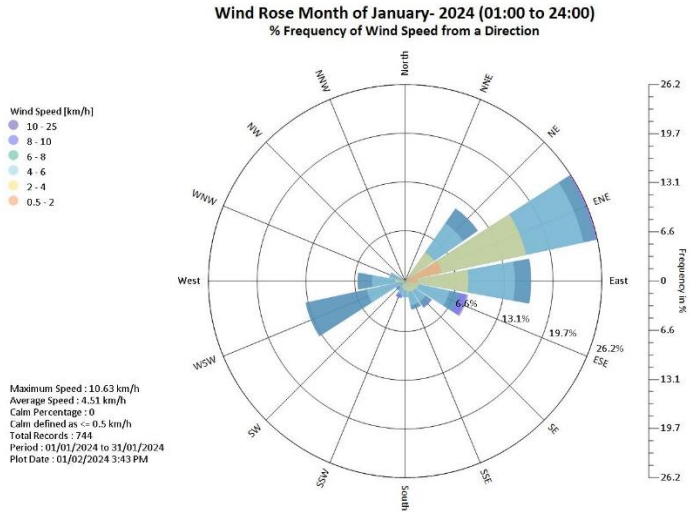
TABLE-6: AVERAGE DAILY METEOROLOGICAL DATA OF MARCH-2024

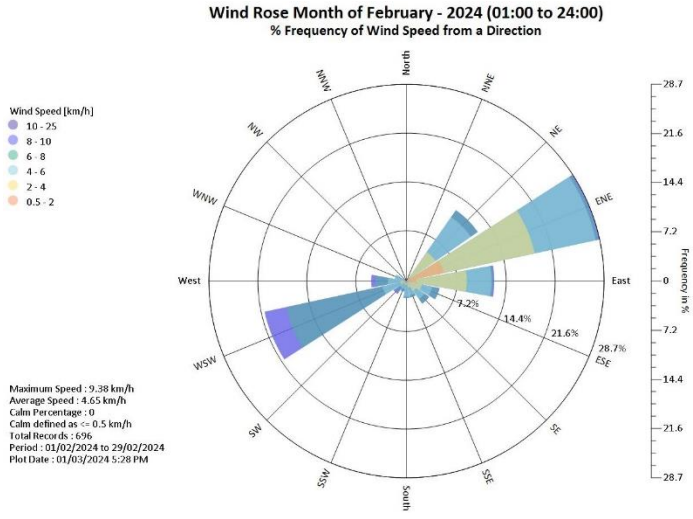
Date	Temperature (°C)		Relative Humidity (%)		Rain Fall (mm)
	Min	Max	Min	Max	
01/03/2024	25.23	34.76	50.40	100	0.0
02/03/2024	25.16	33.27	60.77	100	0.0
03/03/2024	25.77	33.06	56.67	100	0.0
04/03/2024	24.90	32.13	58.65	100	0.0
05/03/2024	23.38	32.11	61.12	100	0.0
06/03/2024	24.24	32.85	53.45	99.70	0.0
07/03/2024	22.51	33.33	43.40	100	0.0
08/03/2024	22.79	33.06	45.30	100	0.0
09/03/2024	23.90	33.12	60.75	100	0.0
10/03/2024	24.65	32.57	66.86	100	0.0
11/03/2024	25.64	33.07	70.75	100	0.0
12/03/2024	25.08	33.27	64.06	100	0.0
13/03/2024	25.19	33.47	66.85	100	0.0
14/03/2024	25.28	32.87	60.41	100	0.0
15/03/2024	23.77	32.51	56.17	100	0.0
16/03/2024	23.31	32.55	57.24	100	0.0
17/03/2024	23.39	32.83	58.66	100	0.0
18/03/2024	24.43	32.69	51.32	100	0.0
19/03/2024	24.20	33.19	47.00	100	0.0
20/03/2024	23.99	32.99	63.50	100	0.0
21/03/2024	24.88	34.03	61.29	100	0.94
22/03/2024	26.75	33.27	68.42	100	0.0
23/03/2024	25.53	34.58	52.01	100	0.0
24/03/2024	25.42	34.21	48.31	100	0.0
25/03/2024	25.05	33.71	57.05	99.60	0.0
26/03/2024	25.54	33.42	67.87	100	0.0
27/03/2024	25.73	33.31	66.74	100	0.0
28/03/2024	26.52	34.65	64.35	100	0.0
29/03/2024	25.82	34.49	60.21	100	0.0
30/03/2024	25.73	34.05	60.63	100	0.0
31/03/2024	25.92	33.14	62.92	100	0.0
					0.94

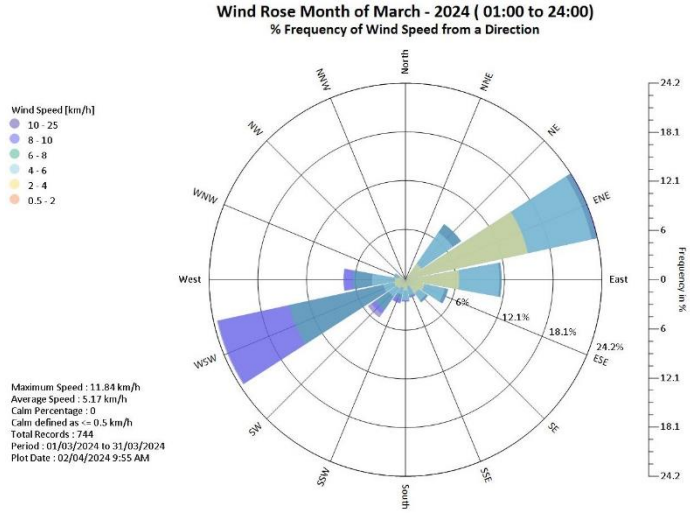

Wind Rose Month of October-2023 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
5.3%
10.6%
15.9%
21.2%
Frequency in %
Maximum Speed : 10.97 km/h
Average Speed : 3.68 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/10/2023 to 31/10/2023
Plot Date : 02/11/2023 4:09 PM


Wind Rose Month of November -2023 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
5.3%
10.7%
16%
21.3%
Frequency in %
Maximum Speed : 10.12 km/h
Average Speed : 3.81 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 745
Period : 01/11/2023 to 30/11/2023
Plot Date : 02/12/2023 9:55 AM


Wind Rose Month of December - 2023 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
8%
16%
24.1%
32.1%
Frequency in %
Maximum Speed : 9.95 km/h
Average Speed : 3.94 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 720
Period : 01/12/2023 to 31/12/2024
Plot Date : 02/01/2024 9:41 AM


Wind Rose Month of January- 2024 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
6.6%
13.1%
19.7%
26.2%
Frequency in %
Maximum Speed : 10.63 km/h
Average Speed : 4.51 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/01/2024 to 31/01/2024
Plot Date : 01/02/2024 3:43 PM


Wind Rose Month of February - 2024 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
7.2%
14.4%
21.6%
28.7%
Frequency in %
Maximum Speed : 9.38 km/h
Average Speed : 4.65 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 696
Period : 01/02/2024 to 29/02/2024
Plot Date : 01/03/2024 5:28 PM


Wind Rose Month of March - 2024 (01:00 to 24:00)
% Frequency of Wind Speed from a Direction
Wind Speed [km/h]
10 - 25
8 - 10
6 - 8
4 - 6
2 - 4
0.5 - 2
North
NNE
NE
ENE
East
ESE
SE
SSE
South
SSW
SW
WSW
West
WNW
NW
NNW
6%
12.1%
18.1%
24.2%
Frequency in %
Maximum Speed : 11.84 km/h
Average Speed : 5.17 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/03/2024 to 31/03/2024
Plot Date : 02/04/2024 9:55 AM

AMBIENT AIR QUALITY MONITORING

Annexure-I

The Ambient Air Quality samples were collected by representative from NABL accredited laboratory.

Method of Analysis

Pollutants	Method of Measurement
Particulate Matter (PM_{10}) , µg/m^3	Gravimetric
Particulate Matter ($PM_{2.5}$), µg/m^3	Gravimetric
Sulphur dioxide (SO_2), µg/m^3	Improved west and Geake method
Nitrogen Dioxide (NO_2), µg/m^3	Modified Jacob & Hochheiser
Carbon Monoxide (CO), mg/m^3	Non Dispersive Infra-Red

AMBIENT AIR QUALITY MONITORING LOCATIONS

Ambient Air Quality Monitoring (PM_{10}, $PM_{2.5}$, SO_2, NO_X & CO) was done twice a week at following locations:

1. Near DM Plant (Inside Plant)
2. Near Admar Village
3. Near Inna Village
4. Near Hejmady Village
5. Near Baikampady Village
6. Near Paradka Village
7. Near Mudarangadi Village
8. Near Adani Pump House
9. Near Ash Pond

The Monitoring values for the period from Oct 2023 to Mar 2024 in the above said locations are presented in Table-1 to Table-9 as below.

Table-1: Ambient Air Quality Monitoring in Plant Site (Near DM Plant) for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m^3)			$PM_{2.5}$ (60 µg/m^3)			SO_2 (80 µg/m^3)			NO_x (80 µg/m^3)			CO (2.0 mg/m^3)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near DM Plant (A1)	Oct 2023	48.2	50.4	49.0	27.4	29.3	28.5	12.3	13.9	13.0	14.2	15.5	14.7	BLQ	BLQ	BLQ
	Nov 2023	51.6	52.8	52.4	30.3	32.2	30.9	12.6	14.1	13.2	14.5	15.9	15.1	BLQ	BLQ	BLQ
	Dec 2023	53.6	55.2	54.7	32.5	33.3	32.8	12.9	14.5	13.7	14.7	16.2	15.3	BLQ	BLQ	BLQ
	Jan 2024	55.7	57.4	56.6	34.4	35.7	35.0	13.3	14.8	14.0	15.1	16.3	15.7	BLQ	BLQ	BLQ
	Feb 2024	58.2	59.4	58.9	36.3	37.5	36.9	13.6	15.1	14.3	15.4	16.6	16.0	BLQ	BLQ	BLQ
	Mar 2024	59.4	61.8	60.7	38.4	39.6	38.8	13.3	15.4	14.6	15.2	16.6	16.1	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

Table-2: Ambient Air Quality Monitoring at Admar village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Admar Village (A2)	Oct 2023	45.1	46.1	45.6	26.3	28.4	27.1	12.2	12.9	12.5	13.2	14.9	14.0	BLQ	BLQ	BLQ
	Nov 2023	48.2	49.2	48.7	29.2	31.1	30.1	12.5	13.2	12.8	13.5	15.2	14.3	BLQ	BLQ	BLQ
	Dec 2023	50.7	51.8	51.2	31.1	32.8	32.2	12.8	13.4	13.1	13.8	15.6	14.6	BLQ	BLQ	BLQ
	Jan 2024	52.6	56.2	54.2	33.7	35.6	34.6	13.2	13.8	13.4	14.1	15.8	15.0	BLQ	BLQ	BLQ
	Feb 2024	55.2	57.6	56.3	35.8	37.6	36.6	13.5	14.1	13.7	14.4	16.0	15.3	BLQ	BLQ	BLQ
	Mar 2024	57.2	58.6	57.9	37.2	39.5	38.3	13.8	14.4	14.1	14.8	16.4	15.6	BLQ	BLQ	BLQ

Table-3: Ambient Air Quality Monitoring at Inna village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Inna Village (A3)	Oct 2023	43.6	46.2	44.8	25.1	26.7	26.0	13.1	14.2	13.7	14.9	16.1	15.5	BLQ	BLQ	BLQ
	Nov 2023	47.2	49.9	48.3	28.5	29.7	29.0	13.5	14.6	14.0	15.3	16.7	15.8	BLQ	BLQ	BLQ
	Dec 2023	50.1	52.7	50.8	31.1	32.4	31.7	13.8	14.8	14.3	15.6	16.9	16.2	BLQ	BLQ	BLQ
	Jan 2024	52.7	55.6	53.7	33.4	35.2	34.0	14.1	15.2	14.6	15.9	17.1	16.6	BLQ	BLQ	BLQ
	Feb 2024	55.2	57.1	56.0	35.2	37.4	36.0	14.4	15.5	14.9	16.3	17.4	16.9	BLQ	BLQ	BLQ
	Mar 2024	57.4	59.6	58.3	37.2	38.6	37.8	14.7	15.7	15.1	16.6	17.7	17.2	BLQ	BLQ	BLQ

Table-4: Ambient Air Quality Monitoring at Hejmady Village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Hejamady Village (A4)	Oct 2023	39.5	42.7	41.2	30.2	31.9	31.1	12.3	13.2	12.8	15.4	16.1	15.8	BLQ	BLQ	BLQ
	Nov 2023	44.2	46.2	45.2	33.2	34.2	33.7	12.6	13.5	13.2	15.7	16.5	16.1	BLQ	BLQ	BLQ
	Dec 2023	46.7	48.6	47.3	35.4	36.6	35.8	12.9	13.7	13.4	15.9	16.8	16.4	BLQ	BLQ	BLQ
	Jan 2024	49.2	50.6	49.9	36.9	38.9	37.9	13.2	14.1	13.7	16.2	17.1	16.7	BLQ	BLQ	BLQ
	Feb 2024	52.2	52.7	52.5	38.5	40.8	40.0	13.5	14.4	14.0	16.5	17.4	17.0	BLQ	BLQ	BLQ
	Mar 2024	54.1	54.8	54.6	40.5	42.8	41.8	13.8	14.7	14.3	17.0	17.8	17.4	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

Table-5: Ambient Air Quality Monitoring at Baikampady Village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Baikampady Village (A5)	Oct 2023	46.1	46.9	46.5	25.2	26.7	26.1	17.1	17.9	17.6	23.5	24.1	23.8	BLQ	BLQ	BLQ
	Nov 2023	49.0	50.3	49.6	28.3	29.8	29.0	17.5	18.3	17.9	23.4	24.6	24.1	BLQ	BLQ	BLQ
	Dec 2023	52.3	52.7	52.5	31.6	32.5	32.1	17.8	18.5	18.2	24.1	24.9	24.5	BLQ	BLQ	BLQ
	Jan 2024	54.2	55.8	54.9	33.9	36.1	35.2	18.2	19.2	18.7	24.4	25.2	24.7	BLQ	BLQ	BLQ
	Feb 2024	56.2	57.8	56.8	35.9	37.5	36.8	18.5	19.5	19.0	24.7	25.5	25.0	BLQ	BLQ	BLQ
	Mar 2024	58.2	59.2	58.6	37.2	39.5	38.7	18.8	19.5	19.2	25.1	25.6	25.3	BLQ	BLQ	BLQ

Table-6: Ambient Air Quality Monitoring at Paradka Village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Paradka Village (A6)	Oct 2023	39.6	40.7	40.2	19.3	20.1	19.6	12.2	12.9	12.5	14.2	14.9	14.6	BLQ	BLQ	BLQ
	Nov 2023	43.2	44.5	44.0	22.3	23.1	22.6	12.5	13.2	12.7	14.2	15.3	14.8	BLQ	BLQ	BLQ
	Dec 2023	45.4	46.6	46.0	24.1	25.6	24.6	12.8	13.5	13.1	14.8	15.6	15.3	BLQ	BLQ	BLQ
	Jan 2024	47.3	48.9	48.2	26.3	27.1	26.6	13.2	13.8	13.5	15.1	15.9	15.5	BLQ	BLQ	BLQ
	Feb 2024	49.9	50.7	50.4	28.4	29.3	28.6	13.5	14.2	13.8	15.5	16.2	15.9	BLQ	BLQ	BLQ
	Mar 2024	52.3	52.7	52.5	30.4	31.2	30.7	13.8	14.4	14.1	15.9	16.6	16.3	BLQ	BLQ	BLQ

Table-7: Ambient Air Quality Monitoring at Mudarangadi Village for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Mudarangadi Village (A7)	Oct 2023	41.5	42.7	42.1	19.8	21.7	21.0	11.5	11.9	11.7	14.4	15.1	14.7	BLQ	BLQ	BLQ
	Nov 2023	44.8	45.7	45.3	22.8	24.1	23.5	11.9	12.6	12.2	14.8	15.6	15.2	BLQ	BLQ	BLQ
	Dec 2023	46.6	48.7	47.4	24.9	26.6	25.5	12.2	12.7	12.5	15.1	15.9	15.5	BLQ	BLQ	BLQ
	Jan 2024	49.6	51.3	50.3	27.1	28.1	27.6	12.5	13.2	12.9	15.2	16.3	15.8	BLQ	BLQ	BLQ
	Feb 2024	52.1	53.6	52.7	29.3	30.4	29.7	12.8	13.5	13.2	15.5	16.6	16.2	BLQ	BLQ	BLQ
	Mar 2024	54.3	55.9	55.1	31.4	32.9	32.4	13.2	13.7	13.5	16.2	16.9	16.6	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

Table-8: Ambient Air Quality Monitoring at Adani Pump House for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Adani Pump House (A8)	Oct 2023	36.6	38.9	37.6	23.5	24.8	24.1	12.3	13.3	12.7	14.3	14.8	14.6	BLQ	BLQ	BLQ
	Nov 2023	39.6	42.3	40.9	26.1	27.8	26.9	12.6	13.7	13.2	14.6	15.4	15.0	BLQ	BLQ	BLQ
	Dec 2023	42.3	44.6	43.1	28.4	29.9	29.1	12.9	13.9	13.4	14.9	15.5	15.2	BLQ	BLQ	BLQ
	Jan 2024	45.2	46.9	45.9	30.3	32.6	31.3	13.4	14.3	13.8	15.3	16.1	15.6	BLQ	BLQ	BLQ
	Feb 2024	48.2	48.9	48.5	32.3	33.8	33.1	13.7	14.6	14.1	15.6	16.5	16.0	BLQ	BLQ	BLQ
	Mar 2024	50.2	51.7	50.9	34.2	35.9	35.3	14.0	14.8	14.4	16.1	16.5	16.3	BLQ	BLQ	BLQ

Table-9: Ambient Air Quality Monitoring at Near Ash Pond for the period of Oct 2023 to Mar 2024

Location	Month	PM_{10} (100 µg/m³)			$PM_{2.5}$ (60 µg/m³)			SO_2 (80 µg/m³)			NO_x (80 µg/m³)			CO (2.0 mg/m³)		
		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Near Ash Pond (A9)	Oct 2023	38.5	42.2	40.5	27.9	31.2	29.7	12.1	13.1	12.5	14.1	15.2	14.6	BLQ	BLQ	BLQ
	Nov 2023	42.3	45.8	44.0	31.7	34.8	33.2	12.5	13.5	12.9	14.5	15.5	15.0	BLQ	BLQ	BLQ
	Dec 2023	44.1	47.4	46.0	33.8	36.9	35.3	12.8	13.8	13.2	14.6	15.8	15.3	BLQ	BLQ	BLQ
	Jan 2024	47.1	49.8	48.7	35.7	38.8	37.3	13.1	14.1	13.5	14.9	16.2	15.6	BLQ	BLQ	BLQ
	Feb 2024	50.3	51.9	51.2	38.7	41.6	40.2	13.4	14.5	13.8	15.2	16.5	15.9	BLQ	BLQ	BLQ
	Mar 2024	52.1	53.7	53.1	40.7	43.2	42.3	13.8	14.8	14.2	15.5	16.9	16.2	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

STACK MONITORING REPORT

Annexure-I

Stack Monitoring has been carried out by NABL accredited laboratory in the frequency of once in fifteen days per month. The monitoring reports for both the units during the period of Oct 2023 to Mar 2024 are as Table-1 below.

Table-1: Stack monitoring report for the period of Oct 2023 to Mar 2024

Stack	Parameters	Oct-2023		Nov-2023		Dec-2023		Jan-2024		Feb-2024		Mar-2024	
		07.10.23	28.10.23	07.11.23	28.11.23	06.12.23	20.12.23	04.01.24	23.01.24	08.02.24	22.02.24	06.03.24	25.03.24
Boiler-I	Particulate Matter (mg/Nm³)	38.4	37.6	39.2	40.2	40.1	39.7	42.6	44.4	43.5	46.3	SD	45.7
	SO_2 (mg/Nm³)	472.1	461.5	467.6	471.2	469.5	464.0	473.1	477.3	482.8	489.4		481.9
	NO_x (mg/Nm³)	156.9	155.1	156.9	156.3	158.6	154.2	165.4	168.1	173.1	184.7		172.9
	Mercury mg/Nm³)	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ		BLQ
Boiler-II	Particulate Matter (mg/Nm³)	36.2	36.9	40.8	39.5	41.2	41.7	41.9	45.5	42.1	44.5	42.9	47.9
	SO_2 (mg/Nm³)	461.9	468.6	472.1	463.6	477.9	477.5	466.8	485.2	478.0	478.5	457.6	495.8
	NO_x (mg/Nm³)	154.8	156.7	159.7	155.2	160.8	166.5	158.6	172.1	169.5	172.9	168.3	187.4
	Mercury (mg/Nm³)	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

Note:

- SD - Shut down and BLQ - Below Limit of Quantification
- PM - Particulate matter, SO_2 - Sulphur dioxide, NO_x - Nitrogen dioxide & Mercury are in mg/Nm³

TEST WELLS MONITORING AROUND ASH POND

ANNEXURE-I

Ash pond is lined with LDPE film of 500 µ thickness as an impervious layer to avoid ground water leachate contamination.

Water samples from Test wells (4 No's) around the ash pond area are analyzed for Ground water monitoring.

Monitoring reports for the period of Oct'2023 to Mar'2024 is presented in the Table-1 to Table-4 as below.

The nomenclature for test wells is as below:

1. Test well constructed on North Side of the Ash Pond (13°10'2.46"N 74°49'38.72"E)
2. Test well constructed on South side of the Ash Pond (13°9'48.68"N 74°49'44.85"E)
3. Test well constructed on East Side of the Ash Pond (13°10'5.13"N 74°49'46.98"E)
4. Test well constructed on West Side of the Ash Pond (13°9'51.84"N 74°49'38.56"E)

Table-1: Results of Water Sample from Test Well constructed in North side of Ash Pond sampling period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.71	6.75	6.77	6.90	6.86	6.82
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.40	1.30	BLQ	BLQ	1.40	0.50
6	TDS	mg/l	500	2000	55.00	64.00	18.20	83.00	63.00	148.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	36.00	36.00	8.50	4.00	36.00	10.00
8	Total Hardness	mg/l	200	600	14.00	16.00	6.20	60.00	16.00	50.00
9	Calcium as Ca	mg/l	75	200	3.20	3.21	2.40	8.81	3.21	4.08
10	Magnesium as Mg	mg/l	30	100	1.46	1.94	BLQ	8.26	1.94	12.15
11	Iron as Fe	mg/l	0.3	No relaxation	0.22	0.26	BLQ	BLQ	0.26	0.03
12	Sulphate as SO_4	mg/l	200	400	3.11	3.85	3.85	4.14	2.48	6.17
13	Chloride as Cl	mg/l	250	1000	9.89	10.88	8.41	7.40	11.87	15.96
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	BLQ	BLQ	1.78	BLQ	1.52	3.64
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Limit of Quantification

Table-2: Results of Water Sample from Test Well constructed in South side of Ash Pond sampling period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.76	6.86	6.83	6.78	6.95	6.85
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.20	1.30	BLQ	BLQ	1.50	BLQ
6	TDS	mg/l	500	2000	66.00	81.00	22.00	87.00	82.00	89.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	48.00	54.00	9.00	52.00	58.00	64.00
8	Total Hardness	mg/l	200	600	46.00	60.00	4.70	52.00	62.00	58.00
9	Calcium as Ca	mg/l	75	200	13.62	16.03	1.60	17.63	18.43	16.03
10	Magnesium as Mg	mg/l	30	100	2.91	4.86	BLQ	1.45	3.89	4.37
11	Iron as Fe	mg/l	0.3	No relaxation	0.14	0.18	BLQ	0.10	0.25	BLQ
12	Sulphate as SO_4	mg/l	200	400	4.51	5.29	1.07	3.94	2.59	4.50
13	Chloride as Cl	mg/l	250	1000	5.94	10.88	9.40	6.92	6.93	9.89
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.07	1.97	1.38	BLQ	2.32	1.04
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Limit of Quantification

Table-3: Results of Water Sample from Test Well constructed in East side of Ash Pond sampling period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.83	6.75	6.78	6.93	6.97	6.82
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.10	1.60	BLQ	1.20	1.20	1.50
6	TDS	mg/l	500	2000	105.00	114.00	19.00	85.00	84.00	71.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	25.00	20.00	6.00	62.00	15.00	32.00
8	Total Hardness	mg/l	200	600	50.10	57.50	5.00	20.00	38.00	16.00
9	Calcium as Ca	mg/l	75	200	14.80	18.07	2.20	13.63	5.65	3.21
10	Magnesium as Mg	mg/l	30	100	5.12	13.36	BLQ	6.32	9.72	1.94
11	Iron as Fe	mg/l	0.3	No relaxation	0.28	0.27	BLQ	0.07	0.26	0.25
12	Sulphate as SO_4	mg/l	200	400	5.54	12.15	BLQ	4.56	5.60	4.56
13	Chloride as Cl	mg/l	250	1000	7.04	49.48	8.91	6.92	12.60	11.87
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	0.29	BLQ	BLQ	0.25	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.32	1.87	1.24	BLQ	4.25	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Limit of Quantification

Table-4: Results of Water Sample from Test Well constructed in West side of Ash Pond sampling period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.81	6.74	6.84	6.95	6.92	6.96
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.70	1.30	BLQ	1.00	1.80	1.00
6	TDS	mg/l	500	2000	49.00	55.00	20.00	76.00	119.00	110.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	20.00	20.00	7.00	52.00	55.00	35.00
8	Total Hardness	mg/l	200	600	16.00	16.00	7.30	20.00	30.00	50.00
9	Calcium as Ca	mg/l	75	200	3.20	3.61	1.20	4.80	6.01	10.02
10	Magnesium as Mg	mg/l	30	100	1.94	1.70	BLQ	1.94	3.64	6.07
11	Iron as Fe	mg/l	0.3	No relaxation	0.27	0.26	BLQ	0.25	0.25	0.23
12	Sulphate as SO_4	mg/l	200	400	7.52	9.81	BLQ	3.75	3.56	5.02
13	Chloride as Cl	mg/l	250	1000	10.89	11.38	8.20	9.89	9.89	17.11
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	0.23	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.63	1.98	1.31	BLQ	3.45	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Limit of Quantification

WATER QUALITY MONITORING REPORT

ANNEXURE-I

Water quality monitoring is carried in the eleven locations which are finalized in consultation with KSPCB and monitoring carried for the period of Oct'2023 to Mar'2024 is presented in the Table-1 to Table-11 as below:

Water Quality Sampling Location- Ground/Surface:

S.No	Name of the Location	Code	Source
1	Karnire River near Palimar village	SW-1	River
2	Pangala River Water	SW-2	River
3	Santhoor village	GW-1	Open well
4	Nandikur Village	GW-2	Open well
5	Palimar Village	GW-3	Open well
6	Simanthoor Village	GW-4	Open well
7	Admar Village	GW-5	Open well
8	Bappanadu Village	GW-6	Open well
9	Hejamady Village	GW-7	Open well
10	North Side of the Plant	GW-8	Open well
11	South Side of the plant	GW-9	Open well

Water Sample Analysis Parameters:

S.No	Parameters	S.No	Parameters
1	Color	16	Fluoride
2	pH	17	Phenolic Compounds
3	Odour	18	manganese
4	Taste	19	zinc
5	Turbidity	20	Arsenic
6	TDs	21	cyanide
7	Alkalinity	22	cadmium
8	Total Hardness as $CaCO_3$	23	chromium
9	Calcium as Ca	24	Aluminium
10	Magnesium	25	Selenium
11	Iron	26	Lead
12	Sulphate as SO_4	27	Mercury
13	Chloride	28	Nitrate nitrogen
14	Boron	29	Ecoli
15	Residual Free Chlorine		

The Water Quality test results for the period of Oct'2023 to Mar'2024 is presented in the Table-1 to Table-11 as below.

Table-1: Water Quality Monitoring carried out in Karnire River (Back Water) (SW-1) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.79	6.57	6.93	6.98	7.15	6.92
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.20	2.90	0.50	1.60	1.40	1.60
6	TDS	mg/l	500	2000	62.00	211.00	94.00	184.00	66.00	174.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	20.00	20.00	30.00	50.00	18.00	30.00
8	Total Hardness	mg/l	200	600	15.00	35.00	46.00	45.60	20.00	54.00
9	Calcium as Ca	mg/l	75	200	4.00	8.02	3.80	14.28	4.80	4.48
10	Magnesium as Mg	mg/l	30	100	1.20	3.64	9.50	7.45	2.70	2.93
11	Iron as Fe	mg/l	0.3	No relaxation	0.24	0.18	0.03	0.24	0.26	0.23
12	Sulphate as SO_4	mg/l	200	400	6.92	12.98	8.73	6.23	3.25	1.45
13	Chloride as Cl	mg/l	250	1000	24.74	98.87	35.70	43.05	15.39	26.20
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.75	0.97	1.06	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	1.06	BLQ	2.39	1.87	2.13	2.23
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-2: Water Quality Monitoring carried out in Pangala River (SW-2) for the period Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.85	6.65	6.98	6.96	6.95	6.97
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.40	1.50	0.60	1.40	1.20	BLQ
6	TDS	mg/l	500	2000	26.00	127.00	96.40	196.20	37.00	42.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	9.00	12.00	30.00	30.00	19.00	19.00
8	Total Hardness	mg/l	200	600	9.00	50.00	42.00	50.75	17.00	16.00
9	Calcium as Ca	mg/l	75	200	1.60	8.02	4.12	12.80	3.61	3.61
10	Magnesium as Mg	mg/l	30	100	1.20	7.29	8.30	8.10	1.94	1.70
11	Iron as Fe	mg/l	0.3	No relaxation	0.22	0.15	0.05	0.27	0.27	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.13	2.58	7.62	5.90	1.25	1.56
13	Chloride as Cl	mg/l	250	1000	8.90	54.43	38.50	45.20	8.41	10.39
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.74	0.78	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	BLQ	BLQ	2.35	1.84	1.48	0.02
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-3: Water Quality Monitoring Carried out at Open well in Santhoor Village (GW-1) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.85	6.82	6.74	6.88	6.85	6.89
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	BLQ	0.90	0.90	BLQ	BLQ	BLQ
6	TDS	mg/l	500	2000	29.00	37.00	32.00	45.00	43.00	51.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	12.00	13.00	12.00	10.00	12.00	15.00
8	Total Hardness	mg/l	200	600	9.00	12.00	9.00	10.00	14.00	13.00
9	Calcium as Ca	mg/l	75	200	1.60	2.80	1.60	2.00	3.21	2.80
10	Magnesium as Mg	mg/l	30	100	1.20	1.22	1.20	1.22	1.45	1.46
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	0.04	BLQ	BLQ	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.13	1.21	1.94	1.03	7.13	1.62
13	Chloride as Cl	mg/l	250	1000	7.91	10.39	7.91	11.38	9.89	10.88
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	BLQ	6.40	1.29	5.37	1.25	7.87
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-4: Water Quality Monitoring Carried out at Open well in Nandikur Village (GW-2) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.83	6.85	6.88	7.26	7.19	6.97
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	BLQ	BLQ	BLQ	BLQ	BLQ	1.40
6	TDS	mg/l	500	2000	26.00	19.00	95.00	139.00	70.00	64.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	9.00	6.00	50.00	90.00	40.00	24.00
8	Total Hardness	mg/l	200	600	9.00	5.00	48.00	90.00	42.00	20.00
9	Calcium as Ca	mg/l	75	200	1.60	1.20	8.81	24.04	11.22	4.01
10	Magnesium as Mg	mg/l	30	100	1.20	BLQ	6.31	7.29	3.40	2.43
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	BLQ	BLQ	BLQ	0.03	0.11
12	Sulphate as SO_4	mg/l	200	400	1.09	BLQ	3.31	4.05	2.13	2.48
13	Chloride as Cl	mg/l	250	1000	9.40	8.41	17.81	12.37	11.87	13.85
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	BLQ	BLQ	2.41	1.39	3.10	8.16
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-5: Water Quality Monitoring carried out at Open well in Palimar Village (GW-3) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.84	6.85	6.81	6.85	6.72	6.81
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	BLQ	BLQ	1.20	1.30	1.60	1.30
6	TDS	mg/l	500	2000	113.00	112.00	124.00	78.00	71.00	75.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	48.00	48.00	60.00	30.00	38.00	42.00
8	Total Hardness	mg/l	200	600	68.00	64.00	68.00	36.00	36.00	38.00
9	Calcium as Ca	mg/l	75	200	20.04	20.84	19.23	8.00	8.02	8.82
10	Magnesium as Mg	mg/l	30	100	4.37	2.92	4.86	3.89	3.88	3.88
11	Iron as Fe	mg/l	0.3	No relaxation	0.06	BLQ	0.17	0.04	0.24	0.21
12	Sulphate as SO_4	mg/l	200	400	6.71	8.28	5.79	3.14	3.87	4.39
13	Chloride as Cl	mg/l	250	1000	26.72	26.70	29.69	13.85	15.83	12.86
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	2.78	2.88	1.74	2.98	1.65	1.24
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-6: Water Quality Monitoring carried out at Open well in Simanthoor Village (GW-4) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.06	6.83	7.01	7.06	7.78	6.87
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	BLQ	BLQ	BLQ	BLQ	1.20	BLQ
6	TDS	mg/l	500	2000	112.00	109.00	21.00	167.00	62.00	81.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	46.00	46.00	8.00	100.00	32.00	42.00
8	Total Hardness	mg/l	200	600	66.00	64.00	5.00	100.00	36.00	34.00
9	Calcium as Ca	mg/l	75	200	20.84	20.84	1.20	32.06	8.82	8.02
10	Magnesium as Mg	mg/l	30	100	3.40	2.92	BLQ	4.86	3.40	3.40
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	BLQ	BLQ	0.10	0.25	BLQ
12	Sulphate as SO_4	mg/l	200	400	6.81	7.81	1.16	13.12	3.12	5.62
13	Chloride as Cl	mg/l	250	1000	27.71	25.73	10.39	22.26	14.86	16.82
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	0.23	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	2.11	2.71	1.69	5.81	2.32	1.37
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-7: Water Quality Monitoring carried out at Open well in Admar Village (GW-5) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.85	6.63	7.04	7.41	7.33	7.08
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.70	1.60	3.80	BLQ	1.50	1.30
6	TDS	mg/l	500	2000	52.00	61.00	71.00	103.00	76.00	82.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	32.00	40.00	50.00	52.00	52.00	54.00
8	Total Hardness	mg/l	200	600	32.00	44.00	48.00	58.00	56.00	52.00
9	Calcium as Ca	mg/l	75	200	6.80	10.42	16.03	20.84	16.03	11.22
10	Magnesium as Mg	mg/l	30	100	3.64	4.37	1.94	1.45	3.89	5.83
11	Iron as Fe	mg/l	0.3	No relaxation	0.06	0.11	BLQ	0.06	0.12	0.08
12	Sulphate as SO_4	mg/l	200	400	3.57	3.73	2.41	4.60	2.14	6.12
13	Chloride as Cl	mg/l	250	1000	8.41	8.91	9.89	14.84	7.91	7.92
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.73	BLQ	1.56	BLQ	1.45	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-8: Water Quality Monitoring carried out at Open well in Bappanadu Village (GW-6) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.70	6.81	8.17	7.71	7.58	6.83
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	0.80	BLQ	BLQ	1.20	BLQ	BLQ
6	TDS	mg/l	500	2000	30.00	24.00	249.00	168.00	179.00	192.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	12.00	5.00	135.00	95.00	80.00	70.00
8	Total Hardness	mg/l	200	600	10.00	8.00	165.00	95.00	95.00	100.00
9	Calcium as Ca	mg/l	75	200	2.00	1.20	54.10	32.00	32.06	22.04
10	Magnesium as Mg	mg/l	30	100	1.20	1.22	7.29	3.40	3.64	10.93
11	Iron as Fe	mg/l	0.3	No relaxation	0.05	BLQ	0.03	0.15	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.41	BLQ	26.43	15.22	24.17	28.69
13	Chloride as Cl	mg/l	250	1000	11.38	9.89	32.16	19.79	32.16	37.11
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.27	0.24	0.23	0.26
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	BLQ	BLQ	19.70	6.18	3.88	10.73
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-9: Water Quality Monitoring carried out at Open well in Hejamady Village (GW-7) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.86	6.78	7.16	7.11	7.61	7.12
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	BLQ	BLQ	BLQ	1.30	BLQ	BLQ
6	TDS	mg/l	500	2000	28.00	22.00	247.00	174.00	177.00	184.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	9.00	5.00	130.00	100.00	95.00	35.00
8	Total Hardness	mg/l	200	600	10.00	6.00	160.00	100.00	85.00	70.00
9	Calcium as Ca	mg/l	75	200	2.00	1.20	56.11	34.06	28.05	26.11
10	Magnesium as Mg	mg/l	30	100	1.20	BLQ	4.86	3.64	3.64	7.29
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	BLQ	BLQ	0.08	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.28	BLQ	26.36	13.66	1.89	16.76
13	Chloride as Cl	mg/l	250	1000	8.91	8.91	32.16	22.26	27.21	27.01
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.24	0.23	0.24	0.24
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	BLQ	BLQ	33.15	5.83	3.92	17.98
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-10: Water Quality Monitoring carried out at North Side of UPCL Plant site (GW-8) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.79	6.82	6.81	6.84	6.82	6.84
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.80	BLQ	BLQ	BLQ	BLQ	BLQ
6	TDS	mg/l	500	2000	53.00	24.00	25.00	27.00	25.00	41.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	34.00	5.00	6.00	6.30	10.00	3.00
8	Total Hardness	mg/l	200	600	33.00	9.00	5.00	8.00	5.00	8.00
9	Calcium as Ca	mg/l	75	200	7.21	1.60	1.20	1.60	1.20	1.60
10	Magnesium as Mg	mg/l	30	100	3.64	1.20	BLQ	1.00	BLQ	1.00
11	Iron as Fe	mg/l	0.3	No relaxation	0.07	BLQ	BLQ	BLQ	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	3.23	BLQ	26.35	1.61	BLQ	1.78
13	Chloride as Cl	mg/l	250	1000	9.40	10.39	10.39	10.39	8.91	14.35
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3.N	mg/l	45	No relaxation	1.09	BLQ	33.07	1.23	1.06	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

Table-11: Water Quality Monitoring carried out at South Side of UPCL plant site (GW-9) for the period of Oct'2023 to Mar'2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.84	6.85	6.86	7.51	6.80	6.88
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	0.50	BLQ	BLQ	BLQ	BLQ	BLQ
6	TDS	mg/l	500	2000	25.00	21.00	87.00	92.00	59.00	138.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	10.00	4.00	50.00	48.00	30.00	10.00
8	Total Hardness	mg/l	200	600	9.00	5.00	44.00	42.00	27.00	70.00
9	Calcium as Ca	mg/l	75	200	1.60	1.20	9.61	8.81	6.01	12.80
10	Magnesium as Mg	mg/l	30	100	1.20	BLQ	4.86	5.34	2.91	9.44
11	Iron as Fe	mg/l	0.3	No relaxation	0.04	BLQ	BLQ	BLQ	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.35	BLQ	3.35	5.33	2.14	10.32
13	Chloride as Cl	mg/l	250	1000	9.40	10.39	11.87	18.80	10.89	37.50
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	BLQ	BLQ	2.14	1.51	3.13	2.45
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

Note: BLQ- Below Level of Quantification

TREATED EFFLUENT WATER MONITORING

ANNEXURE-I

All the effluents like condenser cooling water, cooling tower blow down and brine discharge from desalination plant is directly discharged to Guard Pond, from where the water is going back to the Sea through Coro-coated MS Pipeline. Final discharge point is through guard pond.

Boiler Blowdown, Coal Settling Pond water and Floor washings are treated in ETP and reused in the areas including greenbelt development/ dust suppression.

Continuous Online Monitoring setup is installed in the Guard Pond & ETP discharge line to monitor Temp, pH, DO and TSS.

Ash Pond is covered with green belt and the runoff due to rain is collected in the adjacent pond and used for dust suppression within ash pond area. There is no provision of any outlet from Ash Pond, hence there is no effluent generated from the Ash Pond.

Samples are collected and the monitoring values for the period of Oct'2023 to Mar'2024 are presented in Table-1 to Table-4 as below:

Table-1: Cooling Tower Blowdown Effluent monitoring for the period of Oct'2023 to Mar'2024

S.No	Parameters	Limits	Units	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	pH	6.5 - 8.5	-	7.08	7.25	7.29	8.18	7.39	8.09
2	Temperature	-	°C	30.7	29.8	29.0	30.6	27.9	29.2
3	Available Free Chlorine	0.5	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
4	Zinc	1.0	mg/l	0.21	0.23	0.24	0.23	0.22	0.22
5	Chromium	0.2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
6	Phosphate	5.0	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ

Note: BLQ- Below Level of Quantification

Table-2: Boiler Blow down Effluent sample monitoring for the period of Oct'2023 to Mar'2024

S.No	Parameters	Limits	Units	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Oil & Grease	20	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	Copper	1.0	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
3	Suspended Solids	100	mg/l	3.30	2.90	2.60	2.76	2.55	2.50
4	Iron	1.0	mg/l	0.21	0.20	0.25	0.23	0.22	0.23

Note: BLQ- Below Level of Quantification

Table-3: ETP Effluent sample monitoring for the period of Oct'2023 to Mar'2024

S.N	Parameters	Limits	Units	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Temperature	Not more than 5°C higher than intake sea water	°C	30.2	29.8	29.8	30.0	27.6	29.6
2	pH (at 25 °C)	5.5 – 9.0	-	6.95	7.24	6.92	7.76	7.20	7.50
3	Colour	-	-	1	1	1	1	1	1
4	Odour	-	-	A	A	A	A	A	A
5	Total Suspended Solids	Not more than 10% higher than intake sea water	mg/l	3.6	3.4	2.9	2.8	9.1	2.4
6	Oil and Grease	20	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
7	Total Residual Chlorine	1	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
8	BOD	100	mg/l	BLQ	2.6	1.5	BLQ	BLQ	BLQ
9	COD	250	mg/l	8.06	12.14	12.19	8.16	12.14	12.04
10	Total Chromium	2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
11	Hexavalent Chromium	1	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
12	Phenolic Compounds	5	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
13	Mercury as Hg	0.01	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
14	Lead as Pb	2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Arsenic as As	0.2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Iron	3	mg/l	0.20	0.23	0.23	0.21	0.26	0.19

Note: BLQ - Below Level of Quantification and A - Agreeable

Table-4: Guard Pond Effluent sample monitoring for the period of Oct'2023 to Mar'2024

S.N	Parameter	Limit	Unit	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Temperature	Not more than 5°C higher than intake sea water	°C	30.1	29.9	29.7	30.1	28.9	29.2
2	pH (at 25 °C)	5.5 – 9.0	-	7.49	7.69	7.34	7.98	7.79	7.57
3	Colour	-	-	1	1	1	1	1	BLQ
4	Odour	-	-	A	A	A	A	A	A
5	Total Suspended Solids	Not more than 10% higher than intake sea water	mg/l	3.4	3.2	3.2	2.9	3.5	2.3
6	Oil and Grease	20	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
7	Total Residual Chlorine	1	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
8	BOD	100	mg/l	BLQ	1.2	1.4	BLQ	BLQ	BLQ
9	COD	250	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
10	Total Chromium	2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
11	Hexavalent Chromium	1	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
12	Phenolic Compounds	5	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
13	Mercury as Hg	0.01	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
14	Lead as Pb	2	mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Arsenic as As	0.2	mg/l	BLQ	BLQ	BLQ	0.23	0.25	0.22
16	Iron	3	mg/l	0.20	0.25	0.24	BLQ	BLQ	BLQ

Note: BLQ - Below Level of Quantification and A - Agreeable

Sea Water Pipeline Test Well Monitoring: Annexure-I

Test Wells are installed in the Sea Water Pipeline fenced area and the monitoring is carried for the period from October 2023 to March 2024 is presented in the Table-1 to Table-6 as below:

The locations of test wells are:

S.NO	Name of the Location	Code	Source
1	Pipeline Corridor test well	PC-1	Test Well
2	Pipeline Corridor test well	PC-2	Test Well
3	Pipeline Corridor test well	PC-3	Test Well
4	Pipeline Corridor test well	PC-4	Test Well
5	Pipeline Corridor test well	PC-5	Test Well
6	Pipeline Corridor test well	PC-6	Test Well

Water Sample Analysis Parameters:

S.No	Parameters	S.No	Parameters
1	Color	16	Fluoride
2	pH	17	Phenolic Compounds
3	Odor	18	manganese
4	Taste	19	zinc
5	Turbidity	20	Arsenic
6	TDs	21	cyanide
7	Alkalinity	22	cadmium
8	Total Hardness as $CaCO_3$	23	chromium
9	Calcium as Ca	24	Aluminium
10	Magnesium	25	Selenium
11	Iron	26	Lead
12	Sulphate as SO_4	27	Mercury
13	Chloride	28	Nitrate nitrogen
14	Boron	29	E.coli
15	Residual Free Chlorine		

Table-1: Pipeline Corridor Test Well (PC-1) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.75	6.85	6.77	6.94	7.13	6.81
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.20	1.20	1.80	1.00	BLQ	BLQ
6	TDS	mg/l	500	2000	86.00	29.00	92.00	95.00	102.00	92.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	6.00	13.00	10.00	4.00	20.00	4.00
8	Total Hardness	mg/l	200	600	24.00	12.00	28.00	28.00	44.00	28.00
9	Calcium as Ca	mg/l	75	200	4.80	2.00	6.41	5.61	10.42	4.80
10	Magnesium as Mg	mg/l	30	100	2.91	1.70	2.91	3.40	4.37	3.88
11	Iron as Fe	mg/l	0.3	No relaxation	0.12	0.27	0.09	0.17	BLQ	BLQ
12	Sulphate as SO_4	mg/l	200	400	6.55	1.63	6.79	6.58	4.69	7.68
13	Chloride as Cl	mg/l	250	1000	32.66	9.89	27.71	32.66	32.66	31.67
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	3.11	1.03	26.44	10.67	10.82	10.59
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

BLQ - Below Limit of Quantification

Table-2: Pipeline Corridor Test Well (PC-2) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.83	6.86	6.84	6.86	6.96	6.78
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.70	1.30	BLQ	BLQ	1.40	1.20
6	TDS	mg/l	500	2000	89.00	141.00	89.00	102.00	135.00	162.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	8.00	25.00	6.00	4.00	30.00	20.00
8	Total Hardness	mg/l	200	600	22.00	57.00	34.00	32.00	40.00	75.00
9	Calcium as Ca	mg/l	75	200	4.00	6.05	7.21	5.61	8.05	4.05
10	Magnesium as Mg	mg/l	30	100	2.91	14.58	3.89	3.40	7.01	8.27
11	Iron as Fe	mg/l	0.3	No relaxation	0.17	0.18	BLQ	BLQ	0.14	0.23
12	Sulphate as SO_4	mg/l	200	400	5.63	11.48	4.17	9.05	3.59	7.90
13	Chloride as Cl	mg/l	250	1000	31.67	45.62	14.85	31.67	38.10	38.60
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	0.39	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	3.11	8.22	26.86	10.63	9.39	8.99
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

BLQ - Below Limit of Quantification

Table-3: Pipeline Corridor Test Well (PC-3) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.74	6.88	6.94	6.82	6.87	6.84
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.40	1.30	1.40	BLQ	BLQ	1.60
6	TDS	mg/l	500	2000	178.00	198.00	91.00	108.00	198.00	115.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	BLQ	BLQ	BLQ	6.00	BLQ	10.00
8	Total Hardness	mg/l	200	600	50.00	50.00	24.00	6.00	65.00	70.00
9	Calcium as Ca	mg/l	75	200	8.01	10.02	4.81	4.80	14.02	14.03
10	Magnesium as Mg	mg/l	30	100	7.29	6.07	2.91	4.86	7.29	8.50
11	Iron as Fe	mg/l	0.3	No relaxation	0.12	0.09	0.10	0.10	BLQ	0.25
12	Sulphate as SO_4	mg/l	200	400	17.30	11.48	5.61	9.75	9.98	8.15
13	Chloride as Cl	mg/l	250	1000	74.23	56.61	32.66	32.66	33.82	36.29
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	0.31	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	2.07	4.46	26.83	10.66	6.02	6.70
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

BLQ - Below Limit of Quantification

Table-4: Pipeline Corridor Test Well (PC-4) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.84	6.75	6.71	6.94	7.46	6.92
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.70	1.20	1.20	1.20	BLQ	1.20
6	TDS	mg/l	500	2000	171.00	78.00	89.00	102.00	85.00	107.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	BLQ	44.00	8.00	4.00	56.00	64.00
8	Total Hardness	mg/l	200	600	40.00	52.00	30.00	44.00	62.00	70.00
9	Calcium as Ca	mg/l	75	200	8.01	12.02	6.41	9.61	21.64	16.83
10	Magnesium as Mg	mg/l	30	100	4.86	5.35	3.40	4.86	1.94	6.80
11	Iron as Fe	mg/l	0.3	No relaxation	0.14	0.24	0.04	0.14	BLQ	0.09
12	Sulphate as SO_4	mg/l	200	400	15.71	6.95	4.93	9.05	2.18	6.40
13	Chloride as Cl	mg/l	250	1000	71.15	9.89	29.69	31.67	9.89	9.89
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.31	5.02	27.39	10.78	2.01	5.29
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

A – Agreeable; BLQ – Below Limit of Quantification

Table-5: Pipeline Corridor Test Well (PC-5) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.85	6.92	6.88	6.95	6.89	7.65
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.30	1.40	45.60	1.10	1.30	1.20
6	TDS	mg/l	500	2000	120.00	89.00	97.50	82.60	83.00	125.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	10.00	60.00	10.00	10.00	54.00	84.00
8	Total Hardness	mg/l	200	600	50.00	44.00	28.60	75.00	40.00	64.00
9	Calcium as Ca	mg/l	75	200	9.61	12.05	20.04	16.03	10.42	16.03
10	Magnesium as Mg	mg/l	30	100	6.31	3.40	12.15	8.50	3.40	5.83
11	Iron as Fe	mg/l	0.3	No relaxation	0.16	0.21	0.05	0.14	0.26	0.21
12	Sulphate as SO_4	mg/l	200	400	1.42	7.81	3.91	1.66	2.87	19.63
13	Chloride as Cl	mg/l	250	1000	58.39	11.87	58.87	36.60	10.89	12.86
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.26	0.33	BLQ	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.05	2.93	1.26	1.25	2.13	1.45
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

BLQ - Below Limit of Quantification

Table-6: Pipeline Corridor Test Well (PC-6) for the period of Oct'2023 to Mar'2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.72	6.76	6.94	6.98	6.84	6.78
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Turbidity	NTU	1	5	1.20	1.20	1.00	1.30	1.50	BLQ
6	TDS	mg/l	500	2000	118.00	185.00	104.00	97.20	150.60	198.00
7	Alkalinity as $CaCO_3$	mg/l	200	600	10.00	10.00	15.00	15.00	10.00	10.00
8	Total Hardness	mg/l	200	600	48.00	90.00	36.20	55.00	50.00	40.00
9	Calcium as Ca	mg/l	75	200	8.01	14.03	22.04	12.04	5.60	6.23
10	Magnesium as Mg	mg/l	30	100	6.80	13.36	13.36	6.42	14.10	4.02
11	Iron as Fe	mg/l	0.3	No relaxation	0.11	0.05	0.05	0.16	0.25	BLQ
12	Sulphate as SO_4	mg/l	200	400	1.94	1.13	4.07	1.03	3.81	10.28
13	Chloride as Cl	mg/l	250	1000	57.40	49.70	46.73	38.40	16.30	38.87
14	Boron as B	mg/l	0.5	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
15	Residual Free Chlorine	mg/l	0.2	1	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
16	Fluoride as F	mg/l	1	1.5	BLQ	BLQ	0.25	0.34	0.28	BLQ
17	Phenolic Compounds	mg/l	0.001	0.002	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
18	Manganese as Mn	mg/l	0.1	0.3	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
19	Zinc as Zn	mg/l	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
20	Arsenic as As	mg/l	0.01	0.05	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
21	Cyanide as CN	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
22	Cadmium as Cd	mg/l	0.003	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
23	Chromium as Cr	mg/l	0.05	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
24	Aluminium	mg/l	0.03	0.2	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
25	Selenium as Se	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
26	Lead as Pb	mg/l	0.01	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
27	Mercury as Hg	mg/l	0.001	No relaxation	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
28	Nitrate as NO_3-N	mg/l	45	No relaxation	1.06	1.58	1.56	1.35	1.77	3.60
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	Absent	Absent

BLQ - Below Limit of Quantification

Introduction:

The M/s Udupi Power Corporation Limited. (UPCL) is a 2 X 600 MW imported coal based power project in the Udupi District of Karnataka. Situated in the western coastal region of India, the plant is situated in the village of Yellur, between Mangalore and Udupi.

The base line data on environmental parameters are pre-requisites for understanding the impact of developmental activity and to assess the environmental quality before, during and after implementation of project in order to assess the quality of water. Therefore, it is essential to study the spatial and temporal variations of physical, chemical and biological parameters in the potential impact zone.

Objectives:

1. Assessment of physical and chemical parameters of seawater near the vicinity of effluent discharge point.
2. Seasonal and temporal variation of phytoplankton, zooplankton and benthic organisms.
3. Bioassay studies on the receiving water.

Work plan:

Altogether, eight station were selected and the sampling was carried out at surface and subsurface depths of discharge points. The water and sediment samples collected were analysed for physical, chemical and biological characteristics. Standard procedure was followed for the analyses. The details of results obtained for the month of October, 2023 is provided in this report.

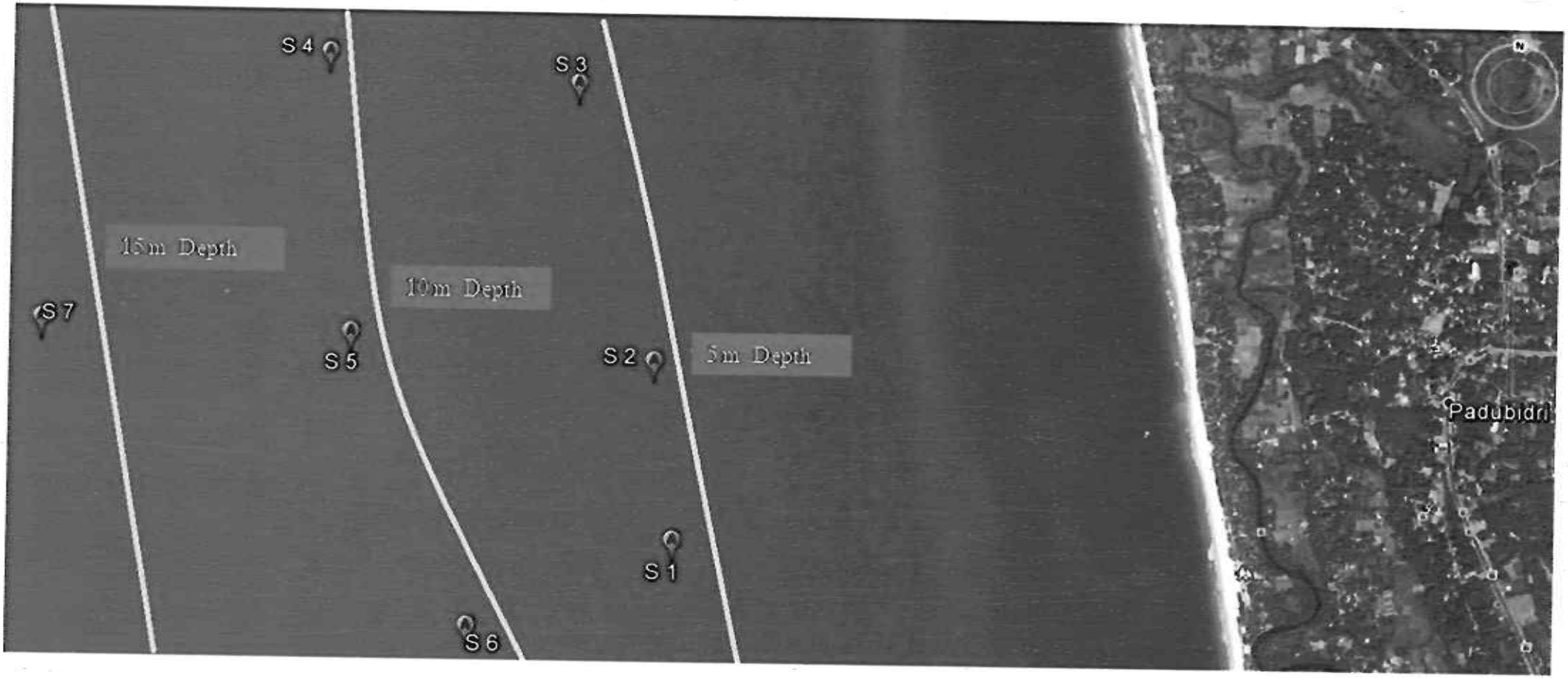


Fig 1. Location of sampling stations off Padubidri

Table. 1 Sampling GPS coordinates coastal waters off Padubidri

S. No.	Sampling locations	Latitude	Longitude
1	Pipeline north side Point 1	N 13° 09'55.99"	E074° 45'13.56"
2	Pipeline north side Point 2	N 13° 09'59.74"	E074° 45'12.63"
3	Pipeline north side Point 3	N 13° 09'51.84"	E074° 45'14.27"
4	Sea Pipe Point	N 13° 09'50.57"	E074° 45'14.36"
5	Pipeline south side Point 1	N 13° 09'47.31"	E074° 45'15.60"
6	Pipeline south side Point 2	N 13° 09'42.91"	E074° 45'16.71"

Table 1. Data on water quality parameters off Padubidri during October, 2023

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	30.90	30.10	29.10	31.00	31.10	31.10	31.40
		SS	31.20	30.70	29.30	30.80	30.80	31.60	31.50
2	pH	S	7.80	7.75	7.56	7.92	7.76	8.12	7.93
		SS	7.7	7.63	7.48	7.42	7.81	8.05	7.94
3	Salinity (psu)	S	29.30	28.41	30.00	29.48	30.55	30.26	30.54
		SS	29.56	30.10	30.52	30.46	30.21	30.30	30.23
4	Dissolved Oxygen (mg/l)	S	6.23	5.20	6.00	6.40	6.80	6.40	5.85
		SS	5.00	4.80	5.80	5.80	6.40	6.40	5.25
5	BOD_3 at 27^{0}C	S	-	1.99	-	-	1.71	-	1.91
		SS		1.78			1.15		1.31
6	COD (mg/l)	S	-	13	-	-	12	-	13
		SS		11			10		12
7	Transparency (m)		3.42	3.52	3.36	3.50	3.34	3.58	3.45
8	Total Suspended Solids (mg/l)		-	78	-	-	120	-	110
9	Total Dissolved Solids (mg/l)		-	30240	-	-	28200	-	31500
10	Ammonia (µg-at/l)	S	1.38	0.86	3.54	3.80	7.52	3.80	6.14
		SS	1.82	20.40	1.04	0.17	2.68	8.99	6.40
11	Nitrite (µg-at/l)	S	0.85	0.71	0.89	0.84	1.11	0.68	0.85
		SS	0.81	0.49	0.54	0.61	0.860	0.54	0.49
12	Nitrate (µg-at/l)	S	1.62	1.45	1.78	1.59	1.35	1.45	1.11
		SS	1.12	1.32	1.44	1.56	1.19	1.47	1.10
13	Phosphate (µg-at/l)	S	2.17	2.07	2.63	1.11	1.01	2.22	2.02
		SS	1.36	1.52	0.61	2.07	1.36	0.91	2.22
14	Silicate (µg-at/l)	S	11.23	12.11	11.42	11.32	13.11	11.89	12.32
		SS	11.10	12.00	13.15	12.45	15.12	12.30	11.65
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during October, 2023

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1200	1000	2000
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	1500	-	-
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1100	1000	1000
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	1350	1300	1200
	d. Others	1100	-	-
4	*Cerataulina*			
	a. *C. perlagica*	-	800	2100
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1700	2300	1900
	b. *C. decipiens*	1300	1150	120
	c. *C. compressus*	-	-	-
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	9400	13200	11300
	b. *C. lineatus*	-	-	-
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	5200	2600	3200
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	1400	1000	2000
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	-	-	-
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	1100	4800	1600
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	11200	16500	23500
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	-	2300	7000
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	4500	1100	2100
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	1300	-	-
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	-	-	-
	b. Others	1200	1000	1000
17	*Nitzschia*			
	a. *N. closterium*	1200	-	1300
	b. *N. striata*	2400	1500	1200
	c. *N. longissima*	-	-	-
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1450	-	1200
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	1300	1000	1200
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	1900	1500	1200
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	-	-	-
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	-	-	-
	b. Others	1500	-	1000
22	*Staurastrum* sp.	1800	2600	3200
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	2600	-	2100
	b. *T. longissima*	-	1200	1500
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	2300	3600	3000
	b. *T. favus*	-	-	-
	c. Others	-	-	-
26	*Diatoma*			

	a. Diatoma vulgare	11700	12300	13600
	b. Other diatoms	-	-	-

II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	11300	16300	14600
	b. *C. fusus*	1500	-	2700
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	-	-	-
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	-	-	-
	b. *G. rhombodes*	-	2300	1400
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	2600	1700	2900
	b. *P. divergens*	-	-	-
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	2100	1800	-
6	*Preperidinium*	4700	2300	-
7	*Noctiluca*			
	a. *N. Scintillans*	-	2000	2400
	b. Others	-	-	-
III	**Blue green algae**	1200	1100	1700
1	Blue Green Algae	-	-	-
Biomass [wet weight - mg/m^3]		**283.22**	**294.11**	**278.41**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during October, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	11600	14300	11700
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	1300	1100	1700
2	**Radiolarians**	2900	1400	4300
3	**Medusae**			
	a. *Obelia* sp.	11700	27400	2300
	b. *Octocostatum* sp.	1600	1300	4100
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	2600	1900	2400
5	**Ctenophores**			
	a. *Plurobranchia* sp.	3100	3600	1300
6	**Chaetognaths**			
	a.*Sagitta enflata*	2200	1400	2800
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	-	-	-
7	**Polychaetes**	-	-	-
8	**Cladocerans**			
	a. *Penilia avirostris*	-	2400	-
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	-	2000	2600
	b. *Tamora longicornis*	1700	-	2400
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	2600	-	2300
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	1000	-	-
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	1150	1400	2900
	b. *Oikopleura* sp.	-	-	-
	c. *Doliolom* sp.	2500	-	3800
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	2300	6500	1700
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	1000	500	800
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	-	-	-
20	**Chaetognath Larvae**	-	-	-
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**278.23**	**268.21**	**269.56**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during October, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	28	36	26
2	*Anadora* sp.	-	-	-
3	Bivalve Spats	30	23	28
4	*Cardium* sp.	23	16	16
5	*Donax* sp.	-	-	-
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	43	38	-
8	*Perna* sp	-	-	29
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	10	-	-
B	**Gastropods**			
1	*Babylonia* sp.	32	39	26
2	*Cavolinia* sp.	15	21	23
3	*Cerithedia* sp.	15	-	69
4	*Conus* sp.	-	-	-
5	*Oliva* sp.	-	-	-
6	*Patella* sp.	24	20	41
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	39	23	-
9	*Trochus* sp.	-	14	38
10	*Turitella* sp.	24	-	-
11	*Umbonium* sp.	23	37	28
C	**Scaphopods**			

1	*Dentalium* sp.	89	65	97
D	**Other Molluscs**	59	-	49
II	**Echinodermata**			
1	*Astropecten* sp.	-	-	-
2	*Ophiocoma* sp.	05	17	18
3	*Holothuria* sp.	-	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	18	26	18
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	-	-	-
2	Shrimps	-	23	17
3	Fishes	-	-	-
4	Mud tubes	49	67	89
5	Sand tubes	-	-	-
6	Egg Cases	48	16	29
Density (Individuals/m^2)		**574.00**	**481.00**	**641.00**

- : Absent

Table 5. Results of Bioassay experiment for the coastal waters off Padubidri during October, 2023

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 3.50 cms (Average)
3.	Weight of the Test Organism	: 2.1 gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluent fallout from UPCL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	**HOUR / MORTALITY (%)**			
	24	**48**	**72**	**96**
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of October, 2023 are given below.

The water temperature varied from 29.10 to 31.40 ^{0}C. The pH values ranged between 7.42 and 8.12. The salinity varied from 28.41 to 30.54 psu. The dissolved oxygen (DO) varied between 4.80 and 6.80 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.15 to 1.99 mg/l in the study region. The COD values ranged between 10.00 and 13.00 mg/l. The total suspended solids (TSS) ranged between 78.0 and 120.0 mg/l and the total dissolved solids (TDS) ranged between 28200 and 31500 mg/l. The transparency values varied from 3.34 to 3.58 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.49 to 1.11 µg-at/l, while nitrate (NO_3-N) varied between 1.10 and 1.78 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 0.17 and 20.40 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.61 and 2.22 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 11.10 and 13.15 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in respective Table. Phytoplanktons were dominant in the study area with 36 different genera with the abundance of *Gyrosigma balticum, Ceratium macroceros, Diatoma vulgare* and *Coscinodiscus iridis.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 278.41 to 294.11 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 17 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp., *Obelia* sp., Copepod eggs and Radiolarians were dominant. The biomass ranged from 268.21 to 278.23 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 21 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Meritrix* sp. and *Telescopium* sp. The density ranged from 481.00 to 641.00 no/m^2.

Bioassay:

The bioassay studies indicated no mortality of mussels in the seawater samples collected from effluent discharge location in the Padubidri region.

Lakshmipathi

(Lakshmipathi M. T.)

Table 1. Data on water quality parameters off Padubidri during November, 2023

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	31.50	31.10	31.50	32.00	32.20	31.50	31.10
		SS	30.80	31.00	31.20	31.80	31.80	30.80	31.00
2	pH	S	7.76	7.10	7.30	7.15	7.89	7.62	7.30
		SS	7.56	7.20	7.10	7.30	7.68	7.49	7.10
3	Salinity (psu)	S	33.13	34.06	36.81	35.25	32.69	34.94	36.13
		SS	33.25	33.88	34.25	34.44	32.50	34.06	34.31
4	Dissolved Oxygen (mg/l)	S	6.00	4.80	5.20	5.60	4.80	4.80	5.20
		SS	4.40	4.40	4.40	4.80	4.00	4.40	4.00
5	BOD_3 at 27^{0}C	S	-	1.6	-	-	2.0	-	2.4
		SS		1.2			1.6		1.6
6	COD (mg/l)	S	-	12	-	-	11	-	14
		SS		10			13		12
7	Transparency (m)		4.90	5.20	5.40	4.79	5.37	4.73	5.02
8	Total Suspended Solids (mg/l)		-	80	-	-	80	-	120
9	Total Dissolved Solids (mg/l)		-	37800	-	-	29200	-	38800
10	Ammonia (µg-at/l)	S	8.213	5.965	6.052	2.421	5.101	5.792	3.285
		SS	6.311	3.544	4.668	4.236	4.236	4.063	3.199
11	Nitrite (µg-at/l)	S	0.286	0.286	0.286	0.881	0.595	0.333	0.762
		SS	0.762	0.428	0.666	0.833	0.643	0.904	0.595
12	Nitrate (µg-at/l)	S	0.357	0.357	0.500	0.833	0.666	0.690	0.952
		SS	1.095	0.547	0.809	0.976	0.738	1.000	0.666
13	Phosphate (µg-at/l)	S	1.263	2.273	1.869	2.475	2.424	2.222	3.232
		SS	2.727	2.929	2.273	2.778	2.727	2.879	2.778
14	Silicate (µg-at/l)	S	10.56	11.23	12.33	12.14	12.32	12.55	11.48
		SS	11.45	12.32	11.78	13.23	11.25	12.32	13.26
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during November, 2023

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1000	1000	2000
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	1000	1200	-
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1100	1700	-
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	2000	-	1300
	d. Others	1500	-	-
4	*Cerataulina*			
	a. *C. perlagica*	-	1800	-
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1400	-	1400
	b. *C. decipiens*	-	1000	1200
	c. *C. compressus*	-	-	-
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	8400	10500	9800
	b. *C. lineatus*	-	-	-
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	2300	-	1600
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	1600	800	1400
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	1300	-	-
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	2100	4100	1200
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	10000	12300	18700
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	-	1300	1600
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	2300	1800	1400
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	1100	-	1300
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	-	-	-
	b. Others	1500	1200	1000
17	*Nitzschia*			
	a. *N. closterium*	-	-	1300
	b. *N. striata*	2900	1100	1200
	c. *N. longissima*	-	-	-
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1200	1000	-
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	1500	1100	1000
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	2000	1100	1200
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	-	-	-
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	-	-	-
	b. Others	-	-	1000
22	*Staurastrum* sp.	1400	1600	1200
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	2000	-	2100
	b. *T. longissima*	-	1100	1500
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	1300	1900	2100
	b. *T. favus*	-	-	-
	c. Others	-	-	-
26	*Diatoma*			

	a. *Diatoma vulgare*	10400	11600	10000
	b. Other diatoms	-	-	-

II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	9400	11200	13100
	b. *C. fusus*	4700	-	3700
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	1200	-	-
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	-	-	-
	b. *G. rhombodes*	1500	-	1400
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	1300	1200	1500
	b. *P. divergens*	-	-	-
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	1300	-
6	*Preperidinium*	3100	2300	-
7	*Noctiluca*			
	a. *N. Scintillans*	-	1000	1200
	b. Others	-	-	-
III	**Blue green algae**	1100	1600	1300
1	Blue Green Algae	-	-	-
Biomass [wet weight - mg/m^3]		**271.11**	**269.23**	**269.23**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during November, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	9800	4600	7900
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	1800	-	2300
2	**Radiolarians**	1900	1000	1600
3	**Medusae**			
	a. *Obelia* sp.	-	18400	17800
	b. *Octocostatum* sp.	1100	2300	-
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	1200	1400	1300
5	**Ctenophores**			
	a. *Plurobranchia* sp.	2100	1500	1900
6	**Chaetognaths**			
	a. Sagitta enflata	2300	1600	1700
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	-	-	-
7	**Polychaetes**	-	-	-
8	**Cladocerans**			
	a. *Penilia avirostris*	1200	1600	-
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	-	1400	1800
	b. *Tamora longicornis*	1100	-	1700
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	1400	-	1500
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	1100	-	800
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	1300	1500	1800
	b. *Oikopleura* sp.	-	-	-
	c. *Doliolom* sp.	1500	-	2600
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	1700	4100	1500
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	1200	1400	1300
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	-	-	-
20	**Chaetognath Larvae**	-	-	-
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**264.11**	**274.32**	**284.45**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during November, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	25	30	27
2	*Anadora* sp.	-	-	-
3	Bivalve Spats	56	39	21
4	*Cardium* sp.	49	34	23
5	*Donax* sp.	-	-	-
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	33	57	23
8	*Perna* sp	-	-	18
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	13	12	-
B	**Gastropods**			
1	*Babylonia* sp.	12	16	14
2	*Cavolinia* sp.	11	15	12
3	*Cerithedia* sp.	16	20	45
4	*Conus* sp.	-	-	-
5	*Oliva* sp.	-	-	-
6	*Patella* sp.	19	16	23
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	27	20	-
9	*Trochus* sp.	-	10	19
10	*Turitella* sp.	16	-	-
11	*Umbonium* sp.	20	16	19

C	**Scaphopods**			
1	*Dentalium* sp.	78	45	64
D	**Other Molluscs**	23	-	41
II	**Echinodermata**			
1	*Astropecten* sp.	-	-	-
2	*Ophiocoma* sp.	-	-	-
3	*Holothuria* sp.	-	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	21	13	26
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	10	-	-
2	Shrimps	-	41	23
3	Fishes	-	-	-
4	Mud tubes	16	31	48
5	Sand tubes	13	42	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**458.00**	**457.00**	**446.00**

- : Absent

Table 5. Results of Bioassay experiment for the coastal waters off Padubidri during November, 2023

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 3.70 cms (Average)
3.	Weight of the Test Organism	: 2.2 gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluent fallout from UPCL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	HOUR / MORTALITY (%)			
	24	48	72	96
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of November, 2023 are given below.

The water temperature varied from 30.80 to 32.20 ^{0}C. The pH values ranged between 7.10 and 7.89. The salinity varied from 32.50 to 36.81 PSU. The dissolved oxygen (DO) varied between 4.00 and 6.00 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.2 to 1.4 mg/l in the study region. The COD values ranged between 10.00 and 14.00 mg/l. The total suspended solids (TSS) ranged between 80.00 and 120.00 mg/l and the total dissolved solids (TDS) ranged between 29200 and 38800 mg/l. The transparency values varied from 4.73 to 5.4 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.286 to 0.904 µg-at/l, while nitrate (NO_3-N) varied between 0.357 and 1.095 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 2.421 and 8.213 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 1.263 and 3.232 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 10.56 and 13.26 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of vrious forms of phytoplankton is depicted in respective Table. Phytoplanktons were dominant in the study area with 38 different genera with the abundance of *Ceratium macroceros, Gyrosigma balticum, Diatoma vulgare* and *Coscinodiscus iridis.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 269.23 to 271.11 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 17 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp., *Obelia* sp., *Sagitta enflata,* Copepod eggs and Bivalve larvae were dominant. The biomass ranged from 264.11 to 284.45 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 21 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Meritrix* sp., *Cardium* sp., Mud tubes and *Umbonium* sp. The density ranged from 446.00 to 458.00 no/m^2.

Bioassay:

The bioassay studies indicated no mortality of mussels in sthe seawater samples collected from effluent discharge location in the Padubidri region.

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Table 1. Data on water quality parameters off Padubidri during December, 2023

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	31.5	30.8	31.7	30.6	30.6	30.0	30.7
		SS	31.6	30.9	31.7	30.8	30.6	30.2	31.0
2	pH	S	7.61	7.35	7.45	7.22	7.56	7.26	7.49
		SS	7.42	7.89	7.63	7.48	7.67	7.43	7.49
3	Salinity (psu)	S	41.63	36.75	38.94	40.50	40.06	39.13	34.00
		SS	38.94	34.00	38.31	39.69	39.25	38.19	32.69
4	Dissolved Oxygen (mg/l)	S	4.80	6.40	6.40	5.60	6.40	6.00	6.00
		SS	7.20	7.20	5.60	6.80	6.40	7.20	6.80
5	BOD_3 at 27^{0}C	S	-	1.2	-	-	2.4	-	1.6
		SS		1.2			1.2		1.6
6	COD (mg/l)	S	-	11	-	-	14	-	15
		SS		10			11		12
7	Transparency (m)		2.78	2.44	2.76	2.76	2.85	2.80	2.65
8	Total Suspended Solids (mg/l)		-	420	-	-	340	-	360
9	Total Dissolved Solids (mg/l)		-	48120	-	-	44860	-	68600
10	Ammonia (µg-at/l)	S	1.902	2.680	1.556	1.383	1.297	1.988	1.643
		SS	1.815	1.643	0.865	0.951	2.248	3.631	2.161
11	Nitrite (µg-at/l)	S	1.690	2.547	2.547	2.237	2.428	4.165	2.499
		SS	2.237	3.903	4.355	2.380	2.285	2.309	2.547
12	Nitrate (µg-at/l)	S	9.687	3.475	2.713	2.689	2.808	3.237	3.975
		SS	3.475	2.547	2.808	2.618	2.737	3.665	3.261
13	Phosphate (µg-at/l)	S	2.475	1.919	2.020	2.525	2.980	2.879	2.121
		SS	2.172	2.222	2.727	2.424	2.626	2.576	4.293
14	Silicate (µg-at/l)	S	32.55	47.55	142.5	31.82	59.53	35.70	38.12
		SS	20.33	72.84	49.73	103.94	78.05	49.85	68.00
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during December, 2023

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1300	-	1800
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	1000	1400	1100
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1000	-	1800
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	2100	1500	-
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. perlagica*	1100	1300	-
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1200	-	2600
	b. *C. decipiens*	-	1200	2300
	c. *C. compressus*	1200	-	-
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	7100	13200	8400
	b. *C. lineatus*	-	-	-
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	3200	1000	1400
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	7800	1700	2600
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	1300	-	1800
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	2100	7100	2300
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	9800	13100	-
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	-	1400	1100
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	3100	2100	2600
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	1500	1600	-
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	-	2000	-
	b. Others	1700	3100	1200
17	*Nitzschia*			
	a. *N. closterium*	1100	-	2300
	b. *N. striata*	-	3900	2200
	c. *N. longissima*	-	-	-
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1000	3000	-
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	800	1300	2100
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	1200	2300	2200
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	-	-	-
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	1200	-	1300
	b. Others	-	-	1000
22	*Staurastrum* sp.	1000	2400	2300
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	1900	-	1300
	b. *T. longissima*	-	3100	2000
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	-	1100	1600
	b. *T. favus*	1200	-	-
	c. Others	-	-	-
26	*Diatoma*			

	a. *Diatoma vulgare*	8900	7800	8900
	b. Other diatoms	-	-	-

II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	10000	8500	12100
	b. *C. fusus*	-	-	2100
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	1000	-	1500
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	-	-	-
	b. *G. rhombodes*	2300	-	1100
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	1400	1800	1600
	b. *P. divergens*	-	-	-
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	-	-
6	*Preperidinium*	1200	3900	-
7	*Noctiluca*			
	a. *N. Scintillans*	1400	800	3100
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	1700	1300	3500
Biomass [wet weight - mg/m^3]		**240.23**	**315.12**	**295.13**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during December, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	7400	5400	9100
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	2100	-	1400
2	**Radiolarians**	1400	1200	-
3	**Medusae**			
	a. *Obelia* sp.	-	-	11200
	b. *Octocostatum* sp.	1100	-	1400
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	-	1100	3000
5	**Ctenophores**			
	a. *Plurobranchia* sp.	1400	1300	2100
6	**Chaetognaths**			
	a. Sagitta enflata	-	4500	2300
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	-	-	-
7	**Polychaetes**	-	-	-
8	**Cladocerans**			
	a. *Penilia avirostris*	1000	2000	1200
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	-	900	2100
	b. *Tamora longicornis*	3100	-	2400
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	2300	1200	1000
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	2000	800	1400
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	1400	800	2300
	b. *Oikopleura* sp.	-	-	-
	c. *Doliolom* sp.	1600	-	1200
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	2100	-	2300
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	800	-	-
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	-	-	-
20	**Chaetognath Larvae**	-	-	-
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**251.32**	**241.11**	**256.13**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during December, 2023

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	30	-	24
2	*Anadora* sp.	-	29	-
3	Bivalve Spats	30	15	14
4	*Cardium* sp.	37	20	23
5	*Donax* sp.	45	23	10
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	23	24	-
8	*Perna* sp	26	-	24
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	23	20	-
B	**Gastropods**			
1	*Babylonia* sp.	18	13	15
2	*Cavolinia* sp.	18	20	20
3	*Cerithedia* sp.	-	-	21
4	*Conus* sp.	-	-	-
5	*Oliva* sp.	-	-	-
6	*Patella* sp.	-	13	12
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	27	12	26
9	*Trochus* sp.	-	12	19
10	*Turitella* sp.	16	-	23
11	*Umbonium* sp.	23	16	19

C	**Scaphopods**			
1	*Dentalium* sp.	112	45	59
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	-	-	-
2	*Ophiocoma* sp.	12	-	-
3	*Holothuria* sp.	-	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	45	20	19
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	-	-	-
2	Shrimps	-	12	32
3	Fishes	-	-	-
4	Mud tubes	16	13	62
5	Sand tubes	13	31	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**504.00**	**338.00**	**422.00**

- : Absent

Table 5. Results of Bioassay experiment for the coastal waters off Padubidri during December, 2023

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 3.50 cms (Average)
3.	Weight of the Test Organism	: 2.10 gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluent fallout from UPCL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	HOUR / MORTALITY (%)			
	24	48	72	96
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of December, 2023 are given below.

The water temperature varied from 30.00 to 31.70 ^{0}C. The pH values ranged between 7.22 and 7.89. The salinity varied from 32.69 to 41.63 PSU. The dissolved oxygen (DO) varied between 4.80 and 7.20 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.2 to 2.4 mg/l in the study region. The COD values ranged between 10.00 and 15.00 mg/l. The total suspended solids (TSS) ranged between 340.00 and 420.00 mg/l and the total dissolved solids (TDS) ranged between 44860 and 68600 mg/l. The transparency values varied from 2.44 to 2.85 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 1.690 to 4.355 µg-at/l, while nitrate (NO_3-N) varied between 2.547 and 9.687 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 0.865 and 3.631 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 1.919 and 4.293 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 20.33 and 142.5 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of vrious forms of phytoplankton is depicted in respective Table. Phytoplanktons were dominant in the study area with 40 different genera with the abundance of *Ceratium macroceros* and *Diatoma vulgare*. The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 240.23 to 315.12 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 17 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp., *Obelia* sp., and *Tamora longicornis* were dominant. The biomass ranged from 241.11 to 256.13 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 22 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Donax* sp., and Polychaetes. The density ranged from 338.00 to 504.00 no/m^2.

Bioassay:

The bioassay studies indicated no mortality of mussels in sthe seawater samples collected from effluent discharge location in the Padubidri region.

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Table 1. Data on water quality parameters off Padubidri during January, 2024

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	28.00	28.10	28.30	28.20	28.20	28.00	29.20
		SS	28.20	28.30	28.30	28.30	28.40	28.50	29.40
2	pH	S	7.81	7.85	7.89	7.46	7.85	7.90	7.86
		SS	7.75	7.89	7.92	7.90	7.85	7.84	7.90
3	Salinity (psu)	S	35.63	37.50	36.25	36.25	38.13	35.44	35.94
		SS	36.88	34.75	35.44	35.19	35.69	34.63	35.13
4	Dissolved Oxygen (mg/l)	S	6.00	6.00	6.40	6.80	7.20	7.20	6.80
		SS	6.40	6.00	6.80	6.40	6.40	8.00	6.40
5	BOD_3 at 27^{0}C	S	-	1.60	-	-	2.00	-	1.20
		SS		2.00			1.20		1.60
6	COD (mg/l)	S	-	14	-	-	10	-	13
		SS		13			13		12
7	Transparency (m)		4.10	4.12	5.13	5.10	5.10	4.34	4.31
8	Total Suspended Solids (mg/l)		-	440	-	-	460	-	434
9	Total Dissolved Solids (mg/l)		-	39600	-	-	39600	-	39134
10	Ammonia (µg-at/l)	S	2.421	1.815	1.643	1.815	2.939	2.507	3.026
		SS	1.037	1.815	1.902	1.210	1.902	2.507	2.939
11	Nitrite (µg-at/l)	S	0.309	0.785	0.428	0.714	0.309	0.476	0.643
		SS	0.238	0.357	0.714	0.547	0.738	0.762	0.809
12	Nitrate (µg-at/l)	S	0.333	0.452	1.047	1.190	0.452	0.904	0.952
		SS	0.666	0.500	0.952	0.928	1.023	1.618	1.095
13	Phosphate (µg-at/l)	S	2.273	2.576	1.717	1.566	2.323	2.475	2.121
		SS	2.172	2.222	2.121	1.212	1.717	2.576	2.980
14	Silicate (µg-at/l)	S	43.68	71.87	115.19	54.69	57.11	39.44	58.32
		SS	29.76	53.36	75.38	31.82	74.05	52.15	64.49
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during January, 2024

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	2100	-	3200
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	1600	2200	1600
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1100	800	2300
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	2500	1800	-
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. perlagica*	1100	1300	1900
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1300	2200	3100
	b. *C. decipiens*	1100	1600	1700
	c. *C. compressus*	1300	-	-
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	8900	12800	9600
	b. *C. lineatus*	2600	1200	2300
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	2800	1600	2100
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	8900	1800	2400
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	1500	3000	2600
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	5300	8200	3200
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	1000	5600	7600
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	1400	5600	3200
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	-	2000	-
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	900	3000	2600
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	1900	3500	1500
	b. Others	1100	-	-
17	*Nitzschia*			
	a. *N. closterium*	2300	1900	1500
	b. *N. striata*	1600	5400	2100
	c. *N. longissima*	1200	-	-
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	-	2600	4100
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	1700	-	2000
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	2600	1100	1800
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	2200	-	1600
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	1500	-	1600
	b. Others	-	-	1200
22	*Staurastrum* sp.	-	1500	-
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	3100	-	2800
	b. *T. longissima*	1900	2400	3100
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	1700	1800	1500
	b. *T. favus*	4100	1500	-
	c. Others	-	-	-
26	*Diatoma*			
	a. *Diatoma vulgare*	7900	6400	6700
	b. Other diatoms	-	-	-

II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	11400	9100	13500
	b. *C. fusus*	1300	1700	3500
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	1100	-	1600
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	1800	-	1500
	b. *G. rhombodes*	2900	-	1900
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	2100	1100	2300
	b. *P. divergens*	-	-	1500
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	-	-
6	*Preperidinium*	1800	2600	4500
7	*Noctiluca*			
	a. *N. Scintillans*	1600	2400	3600
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	1900	2600	3900
Biomass [wet weight - mg/m^3]		**283.15**	**348.22**	**376.11**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during January, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	6800	4800	7200
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	4200	1500	2600
2	**Radiolarians**	1800	1100	800
3	**Medusae**			
	a. *Obelia* sp.	4800	-	9800
	b. *Octocostatum* sp.	2600	-	-
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	-	1500	1600
5	**Ctenophores**			
	a. *Plurobranchia* sp.	3400	2100	1100
6	**Chaetognaths**			
	a. Sagitta enflata	1900	6100	3600
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	2100	-	-
7	**Polychaetes**	1300	-	-
8	**Cladocerans**			
	a. *Penilia avirostris*	1500	-	-
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	-	2000	2800
	b. *Tamora longicornis*	2000	-	1300
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	-	-	1500
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	1600	1400	2300
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	900	2000	1400
	b. *Oikopleura* sp.	900	-	1400
	c. *Doliolom* sp.	2100	-	1000
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	2100	-	2300
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	1400	1200	1000
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	2100	1100	1300
20	**Chaetognath Larvae**	1200	-	-
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**326.12**	**311.11**	**289.18**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during January, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	41	23	18
2	*Anadora* sp.	-	21	15
3	Bivalve Spats	34	11	26
4	*Cardium* sp.	21	36	10
5	*Donax* sp.	23	11	35
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	20	27	34
8	*Perna* sp.	15	23	18
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	17	14	22
B	**Gastropods**			
1	*Babylonia* sp.	21	17	11
2	*Cavolinia* sp.	16	17	12
3	*Cerithedia* sp.	18	14	20
4	*Conus* sp.	16	11	25
5	*Oliva* sp.	10	-	08
6	*Patella* sp.	-	13	12
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	16	-	-
9	*Trochus* sp.	-	13	11
10	*Turitella* sp.	09	-	05
11	*Umbonium* sp.	-	-	-

C	**Scaphopods**			
1	*Dentalium* sp.	156	132	178
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	-	17	12
2	*Ophiocoma* sp.	15	-	16
3	*Holothuria* sp.	-	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	56	45	36
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	-	26	34
2	Shrimps	-	25	34
3	Fishes	-	-	-
4	Mud tubes	24	36	24
5	Sand tubes	28	36	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**541.00**	**568.00**	**616.00**

- : Absent

Table 5. Results of Bioassay experiment for the coastal waters off Padubidri during January, 2024

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 7.90 cms (Average)
3.	Weight of the Test Organism	: 10.26 gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluent fallout from UPCL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	HOUR / MORTALITY (%)			
	24	48	72	96
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of January, 2024 are given below.

The water temperature varied from 28.00 to 29.40 ^{0}C. The pH values ranged between 7.46 and 7.92. The salinity varied from 34.63 to 38.13 PSU. The dissolved oxygen (DO) varied between 6.00 and 8.00 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.2 to 2.0 mg/l in the study region. The COD values ranged between 10.00 and 14.00 mg/l. The total suspended solids (TSS) ranged between 434.00 and 460.00 mg/l and the total dissolved solids (TDS) ranged between 39134 and 39600 mg/l. The transparency values varied from 4.10 to 5.13 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.238 to 0.809 µg-at/l, while nitrate (NO_3-N) varied between 0.333 and 1.618 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 1.037 and 3.026 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 1.566 and 2.980 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 29.76 and 115.19 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of vrious forms of phytoplankton is depicted in respective Table. Phytoplanktons were dominant in the study area with 45 different genera with the abundance of *Ceratium macroceros* and *Diatoma vulgare*. The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 283.15 to 376.11 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 22 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp., *Obelia* sp., and *Favella* sp. were dominant. The biomass ranged from 289.18 to 326.12 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 25 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Arca* sp., and Polychaetes. The density ranged from 541.00 to 616.00 no/m^2.

Bioassay:

The bioassay studies indicated no mortality of mussels in sthe seawater samples collected from effluent discharge location in the Padubidri region.

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Table 1. Data on water quality parameters off Padubidri during February, 2024

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	33.40	33.20	32.20	33.50	32.80	32.40	34.80
		SS	33.20	33.10	32.10	33.20	32.50	32.10	34.50
2	pH	S	8.15	8.22	8.33	7.98	8.56	7.88	8.65
		SS	8.11	8.32	8.21	8.11	8.32	7.69	8.24
3	Salinity (psu)	S	37.50	38.13	36.88	37.81	39.38	37.19	38.44
		SS	36.56	36.88	36.56	36.88	38.44	37.50	38.13
4	Dissolved Oxygen (mg/l)	S	6.00	6.80	6.80	5.20	6.80	6.80	6.80
		SS	5.20	5.60	7.20	6.00	5.60	5.20	7.20
5	BOD_3 at 27^{0}C	S	-	1.20	-	-	1.20	-	1.20
		SS		2.00			1.60		1.20
6	COD (mg/l)	S	-	13.00	-	-	13.00	-	15.00
		SS		11.00			10.00		11.00
7	Transparency (m)		2.11	2.34	2.48	1.56	2.56	2.82	2.71
8	Total Suspended Solids (mg/l)		-	360	-	-	460	-	340
9	Total Dissolved Solids (mg/l)		-	39800	-	-	43600	-	39800
10	Ammonia (µg-at/l)	S	4.668	1.037	1.383	4.409	3.890	6.138	15.820
		SS	3.631	7.002	2.421	1.902	4.755	9.855	7.002
11	Nitrite (µg-at/l)	S	2.142	1.690	3.570	1.952	1.904	1.666	3.570
		SS	1.952	2.380	2.071	1.690	2.023	2.499	1.904
12	Nitrate (µg-at/l)	S	2.190	1.761	4.094	2.094	1.975	2.309	2.261
		SS	2.071	2.618	2.166	1.714	2.071	2.023	2.428
13	Phosphate (µg-at/l)	S	3.737	4.596	4.495	4.646	4.091	4.444	4.141
		SS	6.212	3.636	4.444	4.242	3.788	4.394	3.990
14	Silicate (µg-at/l)	S	78.892	94.985	134.915	91.234	78.045	71.148	87.846
		SS	55.176	79.618	121.605	69.938	72.358	57.112	66.308
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during February, 2024

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. Japonica*	2800	-	2200
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. Varians*	3100	2500	2700
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1800	1000	2100
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	1800	2000	-
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. Perlagica*	1700	1500	2000
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. Lorenzianus*	1700	2400	2500
	b. *C. Decipiens*	1800	2100	1200
	c. *C. Compressus*	1200	-	-
	d. *C. Curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	11800	7800	8700
	b. *C. Lineatus*	3500	2200	1400
	c. *C. Excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. Stelligera*	1900	2600	2800
	b. Others	-	-	-
8	*Dynobryonsetularia*	-	-	-
9	*Ditylum*			
	a. *D. Brightwelli*	7500	2200	1600
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. Zoodiacus*	2100	3800	2500
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. Oceanic*	4200	6800	7100
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. Balticum*	1800	4800	6600
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. Borealis*	4500	3200	2800
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. Danicus*	-	2900	-
	b. Others	-	-	-
15	*Melosira*			
	a. *M. Monilifornas*	2500	3600	1500
	b. Others	-	-	-
16	*Navicula*			
	a. *N. Longa*	2000	2800	3700
	b. Others	1400	2500	1700
17	*Nitzschia*			
	a. *N. Closterium*	2800	2000	1400
	b. *N. Striata*	1700	4200	2100
	c. *N. Longissima*	1800	900	500
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. Sol*	2300	2100	3600
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. Normanii*	-	1900	2800
	b. *P. Elongatum*	1800	-	1200
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. Stolterfothii*	2800	2300	3100
	b. *R. Shrubsolei*	-	200	-
	c. *R. Stliformis*	2700	1500	600
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. Costatum*	1800	800	2100
	b. Others	-	-	1200
22	*Staurastrum*sp.	1200	1400	-
23	*Streptotheca*			
	a. *S. Thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. Decipiens*	3400	-	1800
	b. *T. Longissima*	2100	2100	2800
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. Reticulate*	2300	1500	2100
	b. *T. Favus*	2400	1900	800
	c. Others	-	-	-
26	*Diatoma*			

	a. *Diatoma vulgare*	8400	7600	6300
	b. Other diatoms	-	-	-
II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. Macroceros*	8500	13200	12600
	b. *C. Fusus*	1600	2100	1500
	c. *C. Longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. Acuta*	1200	900	1900
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. Splendens*	1400	-	1900
	b. *G. Rhombodes*	2500	500	2300
	c. Others	-	-	-
4	*Ornithocerosmagnificus*	-	-	-
5	*Peridinium*			
	a. *P. Depressum*	2200	1800	3100
	b. *P. Divergens*	1100	-	1400
	c. *P. Granii*	-	-	-
	d. *P. Excentricum*	-	1200	-
	e. Others	-	-	-
6	*Preperidinium*	1400	3900	2500
7	*Noctiluca*			
	a. *N. Scintillans*	1200	1400	2600
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	1600	3600	2300
Biomass [wet weight - mg/m^3]		**352.19**	**311.06**	**298.14**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during February, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	8800	6400	5200
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	3700	2800	3100
2	**Radiolarians**	1100	1900	2100
3	**Medusae**			
	a. *Obelia* sp.	3600	600	8400
	b. *Octocostatum* sp.	3100	-	2100
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	2300	-	-
	b. *Diphysis* sp.	-	1200	1700
5	**Ctenophores**			
	a. *Plurobranchia* sp.	3300	2400	1800
6	**Chaetognaths-**			
	a. Sagitta enflata	2100	3700	
	b. *Pterosagittadraco*	-	-	-
	c. *Krohnitta subtilis*	2600	-	600
7	**Polychaetes**	1800	1200	-
8	**Cladocerans**			
	a. *Peniliaavirostris*	-	1400	-
	b. *Evadnaenordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	1700	2300	2100
	b. *Tamora longicornis*	2800	1400	-
	c. *Parapontellabrevicornis*	-	-	-
	d. *Oithonahelgolandica*	1200	-	1900
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	1800	1900	2700
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	1900	2100	1800
	b. *Oikopleura* sp.	1600	700	1600
	c. *Doliolom* sp.	2700	-	1400
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	2700	-	2800
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	1200	1800	1400
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	2200	1700	1100
20	**Chaetognath Larvae**	1900	-	700
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**375.18**	**294.29**	**301.56**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during February, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	36	42	28
2	*Anadora* sp.	06	17	24
3	Bivalve Spats	37	21	29
4	*Cardium* sp.	36	19	16
5	*Donax* sp.	41	29	31
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	21	24	37
8	*Perna* sp.	19	33	38
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	27	20	12
B	**Gastropods**			
1	*Babylonia* sp.	23	19	14
2	*Cavolinia* sp.	19	21	13
3	*Cerithedia* sp.	15	18	25
4	*Conus* sp.	16	11	25
5	*Oliva* sp.	09	15	12
6	*Patella* sp.	15	-	16
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	21	-	15
9	*Trochus* sp.	-	14	19
10	*Turitella* sp.	29	11	09
11	*Umbonium* sp.	-	-	-

C	**Scaphopods**			
1	*Dentalium* sp.	144	123	152
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	21	-	12
2	*Ophiocoma* sp.	19	20	10
3	*Holothuria* sp.	08	11	07
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	23	42	51
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	08	19	21
2	Shrimps	-	15	39
3	Fishes	-	01	-
4	Mud tubes	23	31	29
5	Sand tubes	24	29	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**579.00**	**537.00**	**603.00**

- : Absent

Table 5. Results of Bioassay experiment for the coastal waters off Padubidri during February, 2024

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 7.84cms (Average)
3.	Weight of the Test Organism	: 10.44gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluentfallout from APL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. Capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	HOUR / MORTALITY (%)			
	24	48	72	96
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of February, 2024 are given below.

The water temperature varied from 32.10 to 34.80^{0}C. The pHvalues ranged between 7.69 and 8.65. The salinity varied from 36.56 to 38.44 PSU. The dissolved oxygen (DO) varied between 5.20 and 7.20 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.20 to 2.00 mg/l in the study region. The COD values ranged between 10.00 and 15.00 mg/l. The total suspended solids (TSS) ranged between 340.00 and 460.00 mg/l and the total dissolved solids (TDS) ranged between 39800 and 43600 mg/l. The transparency values varied from 1.56 to 2.82 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 1.666 to 2.499 µg-at/l, while nitrate (NO_3-N) varied between 1.714 and 2.618 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 1.037 and 15.820 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 3.737 and 6.212 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 55.176 and 121.605 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in respective Table. Phytoplanktons were dominant in the study area with 45 different genera with the abundance of *Coscinodiscus* , *Fragillaria* and *Diatoma vulgare.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 298.14 to 352.19 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 22 different groups of zooplankton. Among zooplankton *Obelia* sp., *Tintinopsis* sp. and *Favella* sp. were dominant. The biomass ranged from 294.29 to 375.18 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 25 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Arca* sp., and Polychaetes. The density ranged from 537.00 to 603.00 no/m^2.

Bioassay:

The bioassay studies indicated no mortality of mussels in the seawater samples collected from effluent discharge location in the Padubidri region.

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Table 1. Data on water quality parameters off Padubidri during March, 2024

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (^{0}C)	S	27.20	27.60	28.30	28.50	29.30	29.70	29.80
		SS	30.80	30.30	30.00	31.50	30.90	31.00	30.60
2	pH	S	7.63	7.28	7.54	7.57	7.63	7.67	7.70
		SS	7.65	7.61	7.74	7.74	7.79	7.78	7.77
3	Salinity (psu)	S	35.00	35.63	34.38	34.38	35.00	34.06	34.25
		SS	34.00	34.44	33.81	34.69	33.94	33.56	33.81
4	Dissolved Oxygen (mg/l)	S	8.40	8.00	7.60	7.20	6.80	7.60	7.60
		SS	7.20	7.20	7.60	7.60	7.20	6.80	7.20
5	BOD_3 at 27 °C	S	-	1.20	-	-	1.60	-	1.60
		SS		1.60			2.00		1.60
6	COD (mg/l)	S	-	12	-	-	14	-	15
		SS		10			12		13
7	Transparency (m)		1.48	1.46	1.46	1.44	1.59	1.56	2.13
8	Total Suspended Solids (mg/l)		-	400	-	-	400	-	460
9	Total Dissolved Solids (mg/l)		-	41280	-	-	48620	-	47100
10	Ammonia (µg-at/l)	S	12.535	9.077	9.164	9.510	9.510	7.002	9.164
		SS	6.916	7.348	8.991	5.706	6.570	7.089	6.397
11	Nitrite (µg-at/l)	S	1.452	0.952	0.952	1.452	0.881	0.881	1.000
		SS	1.309	1.309	1.238	1.214	1.071	1.452	1.190
12	Nitrate (µg-at/l)	S	1.856	1.476	2.190	2.094	1.476	1.642	1.714
		SS	1.785	2.071	2.166	1.975	1.618	2.094	1.785
13	Phosphate (µg-at/l)	S	1.414	2.172	2.121	1.515	0.859	2.020	2.071
		SS	1.515	1.970	1.414	1.566	1.869	1.414	1.919
14	Silicate (µg-at/l)	S	11.13	13.55	13.19	12.34	12.95	14.64	16.46
		SS	15.25	13.55	11.86	13.43	11.98	15.49	13.67
15	Oil and Grease (mg/l)	S	BDL	BDL	BDL	BDL	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during March, 2024

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1300	-	2100
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	2300	1900	1800
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1300	1100	2500
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	1000	1600	2500
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. perlagica*	1300	1600	2200
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1100	1900	2900
	b. *C. decipiens*	1000	800	2600
	c. *C. compressus*	-	-	1000
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	10800	11400	13500
	b. *C. lineatus*	2400	1400	2600
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	3200	1800	4500
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	9500	1600	2900
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	2600	1800	2000
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	4900	7800	6700
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	6100	6800	8900
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	3400	6100	4900
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	-	2000	3100
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	1300	3000	1900
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	2900	2300	3400
	b. Others	-	-	-
17	*Nitzschia*			
	a. *N. closterium*	3200	2700	2000
	b. *N. striata*	2400	6200	3000
	c. *N. longissima*	2900	-	-
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1100	3700	6100
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	2100	4100	2800
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	-	800	1400
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	1700	-	1200
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	1900	3100	1100
	b. Others	-	-	1200
22	*Staurastrum* sp.	-	1500	2600
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	2700	5100	4500
	b. *T. longissima*	2300	4400	6300
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	3400	2700	1800
	b. *T. favus*	6100	2900	-
	c. Others	-	-	-
26	*Diatoma*			

	a. *Diatoma vulgare*	6300	8400	7900
	b. Other diatoms	-	-	-
II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	10500	8900	11400
	b. *C. fusus*	-	1100	2100
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	1700	1300	1100
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	2600	-	1900
	b. *G. rhombodes*	1100	1400	3100
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	2600	1400	3200
	b. *P. divergens*	-	-	1100
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	-	-
6	*Preperidinium*	3100	4200	5900
7	*Noctiluca*			
	a. *N. Scintillans*	-	-	1100
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	2700	4800	6500
Biomass [wet weight - mg/m^3]		**305.24**	**338.15**	**359.23**

-: Absent

Table 3. Zooplankton diversity (no/m^3) and Biomass (mg/m^3) in the coastal waters off Padubidri during March, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	4500	5100	6500
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	3800	1600	-
2	**Radiolarians**	2100	2300	1100
3	**Medusae**			
	a. *Obelia* sp.	5300	-	8400
	b. *Octocostatum* sp.	2300	-	-
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	1300	1900	2100
5	**Ctenophores**			
	a. *Plurobranchia* sp.	3000	2800	1500
6	**Chaetognaths**			
	a. Sagitta enflata	3500	4500	5200
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	2800	-	2300
7	**Polychaetes**	3500	-	-
8	**Cladocerans**			
	a. *Penilia avirostris*	2300	-	-
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finmarchicus*	1200	2300	1500
	b. *Tamora longicornis*	1500	1200	1600
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	-	1300	2000
10	**Copepod nauplius**	-	-	1200
11	**Lucifer**	2600	1800	3000
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	1800	2600	2900
	b. *Oikopleura* sp.	1300	1200	2600
	c. *Doliolom* sp.	1800	-	2100
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	1200	1600	1500
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	1100	1000	1300
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	1800	1400	1700
20	**Chaetognath Larvae**	1400	-	1100
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**356.22**	**322.45**	**312.41**

Table 4. Macrobenthos diversity (no/m^2) in the coastal waters off Padubidri during March, 2024

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	31	19	16
2	*Anadora* sp.	17	14	14
3	Bivalve Spats	-	-	21
4	*Cardium* sp.	13	24	-
5	*Donax* sp.	-	-	14
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	16	18	13
8	*Perna* sp.	-	14	18
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	17	12	-
B	**Gastropods**			
1	*Babylonia* sp.	11	13	12
2	*Cavolinia* sp.	-	11	-
3	*Cerithedia* sp.	12	-	13
4	*Conus* sp.	-	15	-
5	*Oliva* sp.	-	-	12
6	*Patella* sp.	-	12	10
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	08	-	-
9	*Trochus* sp.	08	10	16
10	*Turitella* sp.	12	15	19
11	*Umbonium* sp.	-	-	-

C	**Scaphopods**			
1	*Dentalium* sp.	141	120	123
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	-	09	11
2	*Ophiocoma* sp.	14	19	23
3	*Holothuria* sp.	18	24	17
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	49	37	45
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	13	17	19
2	Shrimps	-	-	-
3	Fishes	-	-	-
4	Mud tubes	25	31	29
5	Sand tubes	17	20	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**422.00**	**454.00**	**445.00**

- : Absent

Table 5. Characteristics of water collected at APL plant during March, 2023.

Sl. No.	Parameters	Station	
		Intake pump	Discharge pump
1.	Water Temperature (°C)	32.00	32.50
2.	pH	7.64	7.59
3.	Dissolved Oxygen (mg/l)	8.00	7.20
4.	BOD (mg/l)	1.20	1.60
5.	COD (mg/l)	8.00	12.00
6.	Free ammonia (µg-at/l)	28.45	36.25
7.	Nitrite – Nitrogen (µg-at/l)	3.45	4.71
8.	Nitrate – Nitrogen (µg-at/l)	4.66	4.88
9.	Phosphate (µg-at/l)	1.22	1.18
10.	Oil and Grease (mg/l)	ndl	ndl

ndl= non detectable level

Table 6. Characteristics of sediments collected at APL plant during March, 2023.

SI. No.	Parameter \ Stations		Pump House	Cooling tower	Sedimentation tank	Sea sample
1	pH		7.76	8.21	7.15	8.43
2	Texture (%)	Gravel	-	-	-	-
		Sand	0.3	0.2	2.1	9.8
		Silt	98.4	99.2	96.6	80.1
		Clay	1.3	0.6	1.3	10.1
3	Sulphur (%)		0.28	0.21	0.35	0.1

Table 7. Results of Bioassay experiment for the coastal waters off Padubidri during March, 2024

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 7.50 cms (Average)
3.	Weight of the Test Organism	: 10.0 gms (Average)
4.	Test Medium	: Sea water collected from the vicinity of effluent fallout from APL, Padubidri
5.	Control	: Filtered sea water
6.	Container	: Glass aquarium of 20 ltr. capacity
7.	Number of Organisms	: 10 in each container
8.	Number of Experiments	: Two
9.	Duration of the Test	: 96 hrs.
10.	Methodology	: Static bioassay

EXPERIMENT

MEDIUM	HOUR / MORTALITY (%)			
	24	48	72	96
CONTROL	Nil	Nil	Nil	Nil
TEST MEDIUM	Nil	Nil	Nil	Nil

Result: No mortality

Inference:

The inferences drawn on the various physical, chemical and biological parameters for the month of March, 2024 are given below.

The water temperature varied from 27.20 to 31.50 °C. The pH values ranged between 7.28 and 7.79. The salinity varied from 33.56 to 35.63 PSU. The dissolved oxygen (DO) varied between 6.80 and 8.40 mg/l. The biochemical oxygen demand (BOD_3) is an empirical biological test in which the water conditions such as temperature; dissolved oxygen and microbial flora play a decisive role. The BOD_3 values ranged from 1.2 to 2.0 mg/l in the study region. The COD values ranged between 10.00 and 15.00 mg/l. The total suspended solids (TSS) ranged between 400.00 and 460.00 mg/l and the total dissolved solids (TDS) ranged between 41280 and 48620 mg/l. The transparency values varied from 1.44 to 2.13 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.881 to 1.452 µg-at/l, while nitrate (NO_3-N) varied between 1.476 and 2.190 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 5.706 and 12.535 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.859 and 2.172 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 11.13 and 16.46 µg-at/l in the coastal waters off Padubidri. The oil and grease content was below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in respective Table 2. Phytoplankton were dominant in the study area with 45 different genera with the abundance of *Coscinodiscus oculus iridis* and *Ceratium macroceros.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 305.24 to 359.23 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 22 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp. and *Obelia* sp. were dominant. The biomass ranged from 312.41 to 356.22 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 25 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Arca* sp., Polychaetes and Mud tubes. The density ranged from 422.00 to 454.00 no/m^2.

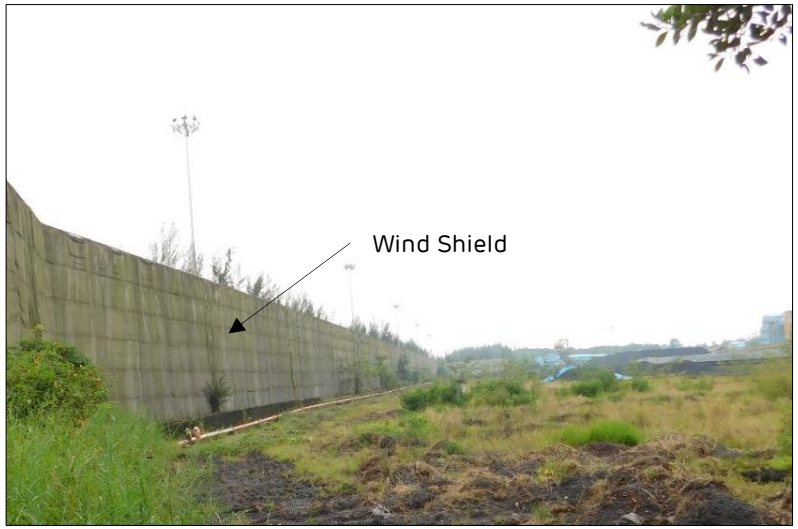
Bioassay:

The bioassay studies indicated no mortality of mussels in the seawater samples collected from effluent discharge location in the Padubidri region.

(Lakshmipathi M. T.)
PRINCIPAL INVESTIGATOR
Dept. of Aquatic Environment Management
KVAFSU–College of Fisheries
MANGALURU–575 002

Coal Handling Plant – Wind Shield

Annexure - II



Ash Generation and Utilization Details (October'2023 to March'2024)						
Month	Total Ash Generation (MT)	Ash Utilization			Total Ash Utilization	% age Utilization
		Cement Industries (MT)	Fly ash-based products (bricks or blocks (MT)	Ready mix concrete (MT)		
October'2023	19141	5265	3435	5446	14146	**73.90**
November'2023	15933	8079	3487	5877	17443	**109.48**
December'2023	19450	10819	3809	4312	18940	**97.38**
January'2024	15389	9083	4113	3501	16697	**108.50**
February'2024	10334	4886	2739	2801	10426	**100.89**
March'2024	12716	7017	1933	3406	12356	**97.17**
Total	**92963**	**45149**	**19515**	**25344**	**90008**	**96.82**

Rainwater Harvesting Ponds

Annexure - IV

Annexure - V

Green Belt development:

Plantation was carried in and around plant premises with local species.
Total plantation carried so far is around 4,12,505 No's in 195 acres.

Plantation Details	Area (Acres)
4,12,505 Saplings	**195**

List of the Plant Species planted in and around the plant premises.

Sl. No.	Species
1	Honge
2	Neem
3	Mahagani
4	T. Rosea
5	Melengia
6	Seetha Ashoka
7	Alstonia
8	T. Arjuna
9	Honne
10	Kadu Badami
11	Lebeka
12	Leqestonia
13	Nerale
14	Peltaform
15	Rain Tree
16	Gulmava
17	Beete
18	Cassurina
19	Holenandi
20	May Flower
21	Palaksha
22	Garige
23	Budubende
24	Surage
25	Dhupa
26	Basavanapada
27	Jack Fruit
28	Ramatre
29	Coconut Plant

Roadside Plantation

Thick plantation near Coal Handling Plant on both sides of the Road

Plantation developed all along inside fencing boundary

Plantation developed all along the inside boundary

Gardening Plantation developed

Vegetable & Fruit Plantation developed

Plantation near Fly Ash silo

Plantation developed Surrounding Guest House

ANNEXURE-VI

ACTIVITIES & FINANCIALS OF CSR FOR THE PERIOD OCTOBER 2023 TO MARCH 2024

Activity Head		Educational Initiatives		Community Health Care	
Activity		Education Kits	Scholarship	Mobile Health Care Unit	Health Insurance
October, 2023	Programme	---	---	Free Medical Services through Mobile Health Care Unit	Coverage of Health Insurance Policy to the villagers of Yellur and Mudarangadi Grama Panchayat
	Amt. Rs.			6,09,188	63,72,000
November, 2023	Programme			Free Medical Services through Mobile Health Care Unit	---
	Amt. Rs.			1,63,710	
January, 2024	Programme		Scholarship to 773 Meritorious Students	Free Medical Services through Mobile Health Care Unit	
	Amt. Rs.		20,00,000	1,63,710	
February, 2024	Programme		---	Free Medical Services through Mobile Health Care Unit	
	Amt. Rs.			1,63,710	
March, 2024	Programme			Free Medical Services through Mobile Health Care Unit	
	Amt. Rs.			3,27,420	
Total	Amt. Rs.	---	20,00,000	14,27,738	63,72,000

Activity Head		Community Infrastructure Development
Activity		Construction of Approach / Internal Roads in rural areas
October, 2023	Programme	Handed over 2 vehicles to Bada Grama Panchayat for collection and management of wastes

	Amt. Rs.	14,92,500
February, 2024	Programme	(1) Concreting of Kunjali Road in Palimar GP (2) Concreting of road measuring a length of 150 metres from Bellibettu Alade to the resident of Nursery Ganesh Poojary in Yellur GP (3) Concreting of premises of Kunjigudde Ganapati Katte in Mudarangadi GP (4) Roofing at Muggerkela Daivasthana in Pilar village in Mudarangadi GP (5) Concreting of Jangamana Mutt Road in Mudarangadi GP (6) Cleaning of Natural Nallah at Tenka GP (7) Concreting of road from Fisheries road to Sushila poojarthi residence in Tenka GP (8) Developments to the floor / concreting of floor for the community centre of Veerabhadra auditorium in Tenka GP (9) Erection of roofing for the community centre at Narayana Guru Auditorium in Tenka GP "
	Amt. Rs.	45,48,738.76
March, 2024	Programme	(1) Concreting of Kunjali Road in Palimar GP (2) Concreting of road measuring a length of 150 metres from Bellibettu Alade to the resident of Nursery Ganesh Poojary in Yellur GP (3) Concreting of premises of Kunjigudde Ganapati Katte in Mudarangadi GP (4) Roofing at Muggerkela Daivasthana in Pilar village in Mudarangadi GP (5) Concreting of Jangamana Mutt Road in Mudarangadi GP (6) Cleaning of Natural Nallah at Tenka GP (7) Concreting of road from Fisheries road to Sushila poojarthi residence in Tenka GP (8) Developments to the floor / concreting of floor for the community centre of Veerabhadra auditorium in Tenka GP (9) Erection of roofing for the community centre at Narayana Guru Auditorium in Tenka GP (10) Construction of retaining wall for natural nallah in Paniyoor village in Belapu GP (11) Developments to ST colony in Devinagara in Belapu GP (12) Developments to Jarandaya Lake in Belapu GP (13) Setting-up of Sanitar Pads Incinerator device in Padubidri GP"
	Amt. Rs.	38,48,980.23
Total	Amt. Rs.	98,90,218.99

Activity Head		**Community Infrastructure Development**
Activity		**Safe Drinking Water Unit**
January, 2024	Programme	AMC of Safe Drinking Water Units
	Amt. Rs.	32,450
February, 2024	Programme	Water Supply Charges & Operators Charges for Safe Drinking Water Plant
	Amt. Rs.	70,000
March, 2024	Programme	AMC of Safe Drinking Water Units
	Amt. Rs.	32,450
Total	Amt. Rs.	1,34,900

Activity Head		Impromptu Nature of Expenses
Activity		Support to NGOs / Associations for promotion of Rural Sports, Education, Imparting of Vocational Training, Restoration of ancient / historical monument and Protection and Promotion of art and culture; promotion and development of traditional art
February, 2024	Programme	Support to 4 Kambala Events for promotion of Rural Sports
	Amt. Rs.	8,00,000
January, 2023	Programme	Support to Buntara Sangha (R), Perdur Mandala, for setting-up of facilities for promoting education, imparting of vocational training
	Amt. Rs.	10,00,000
	Programme	Support to Anekere Chaturmukha Kerebasadi Jeernodhara Samiti, Karkala, Udupi District, for protection and restoration of Anekere Chaturmukha Kerebasadi, a famous pilgrimage having historical importance
	Amt. Rs.	10,00,000
	Programme	Support to The Bharat Scouts & Guides Dakshina Kannada District Association, Mangalore, for setting-up of traditional art centre for the protection and promotion of art and culture; promotion and development of traditional art
	Amt. Rs.	25,00,000
Total	Amt. Rs.	53,00,000
Activity Head		**Administrative Expenses**
Activity		**Salaries / Manpower cost**
Oct'23 to Mar'24		7,41,968
Activity		**Salaries / Manpower cost**
Activity		**Event Expenses**
Oct'23 to Mar'24		2,36,000

FINANCIALS OF CSR FOR THE PERIOD OCTOBER 2023 TO MARCH 2024	
October, 2023	85,91,265
November, 2023	2,81,287
December, 2023	38,512
January, 2024	68,92,848
February, 2024	57,01,088
March, 2024	43,61,825
Total	**2,58,66,825**

Concreting of road from Bellibettu Alade to the resident of Nursery Ganesh Poojary in Yelluru Panchayath

Concreting of road from the residence of Umesh Poojary to the resident of Nadiyaaru Prakash Kotian in Palimar Panchayath

Roofing of Muggerkala Dhaivastana in Mudarangadi Panchayath

Scholarship awarded to 773 Meritorious Students

Establishment of Diaper and Sanitary Pads Incinerator unit in Padubidri Panchayath

Concreting of retaining wall in paniyoor in in Belapu Panchayath

Comparison of Base Line Data with the analysis report of March 2024

Annexure-VII

S.No	Parameters	Karnire (Surface water)		Nandikur Village		Santhoor Village		UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012
		As Per EIA-507.5 MU	Mar 2024	As Per EIA-507.5 MU	Mar 2024	As Per EIA-507.5 MU	Mar 2024			
1	Color	Colorless	BLQ	Colorless	BLQ	Colorless	BLQ	Hz	5	15
2	Odour		A		A		A	-	Agreeable	Agreeable
3	Taste		A		A		A	-	Agreeable	Agreeable
4	Turbidity		1.60		1.40		BLQ	NTU	1	5
5	TDS	17222	174.0	8	64.0	16	51.0	mg/l	500	2000
6	pH	7.1	6.92	6.2	6.97	6.8	6.89	-	6.5 - 8.5	No relaxation
7	Alkalinity		30.0		24.0		15.0	mg/l	200	600
8	Total Hardness as $CaCO_3$		54.0		20.0		13.0	mg/l	200	600
9	Calcium as Ca		4.48		4.01		2.80	mg/l	75	200
10	Magnesium as Mg		2.93		2.43		1.46	mg/l	30	100
11	Iron as Fe	0.1	0.23	0.3	0.11	1.5	BLQ	mg/l	0.3	No relaxation
12	Sulphate as SO_4	1096	1.45	1.9	2.48	2.1	1.62	mg/l	200	400
13	Chloride as Cl	9264	26.20	8.6	13.85	9.6	10.88	mg/l	250	1000
14	Fluoride as F	0.5	BLQ	0.05	BLQ	0.1	BLQ	mg/l	1	1.5
15	Phenolic Compounds	0.04	BLQ	0.01	BLQ	0.02	BLQ	mg/l	0.001	0.002
16	Manganese as Mn		BLQ		BLQ		BLQ	mg/l	0.1	0.3
17	Zinc as Zn	0.02	BLQ	0.02	BLQ	0.03	BLQ	mg/l	5	15
18	Arsenic as As	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.05	No relaxation
19	Cyanide as CN		BLQ	ND	BLQ		BLQ	mg/l	0.05	No relaxation
20	Cadmium as Cd	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.003	No relaxation
21	Chromium as Cr^{6+}	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.05	No relaxation
22	Aluminium as Al		BLQ	ND	BLQ		BLQ	mg/l	0.03	0.2
23	Selenium as Se	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.01	No relaxation
24	Lead as Pb	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.01	No relaxation
25	Mercury as Hg	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.001	No relaxation
26	Boron as B	ND	BLQ	ND	BLQ	ND	BLQ	mg/l	0.5	1
27	Residual Free Chlorine	NT	BLQ	ND	BLQ	NT	BLQ	mg/l	0.2	1
28	Nitrate as NO_3-N		2.23	ND	8.16		7.87	mg/l	45	No relaxation
29	E.Coli	280	Nil	350	Nil	1800	Nil	MPN/ 100 ml	Shall not be detectable in any 100 ml sample	

Note: A- Agreeable, BLQ-Below Level of Quantification, ND-Not detectable, NT-Not Traceable & Nil-Zero

Comparison of Base Line Data of EIA Report (2009) with the Ambient air quality analysis report of March 2024

Annexure-VII

Location: Plant Site									
March 2024					As per EIA Report - 2009				
Date of Sampling	SO_2	NO_2	PM $_{10}$	PM $_{2.5}$	Date of Sampling	SO_2	NO_2	PM $_{10}$	$PM_{2.5}$
	µg/m³					µg/m³			
07.03.2024	14.7	16.1	60.2	38.4	28.04.2007	BDL	12.5	138	45
08.03.2024	15.4	16.5	61.4	38.6	30.04.2007	BDL	9.5	121	41
14.03.2024	15.2	16.6	60.7	38.7	07.05.2007	BDL	15.0	148	47
15.03.2024	15.3	15.8	60.5	39.6	11.05.2007	BDL	8.0	92	35
21.03.2024	14.5	15.9	60.9	38.4	14.05.2007	BDL	9.5	132	43
22.03.2024	13.3	15.2	59.4	38.6	18.05.2007	BDL	8.5	118	38
28.03.2024	13.9	16.3	60.7	38.7	20.05.2007	BDL	10.5	138	45
29.03.2024	14.2	16.4	61.8	39.2	23.05.2007	BDL	8.5	85	30
Min.	**13.3**	**15.2**	**59.4**	**38.4**	**Min.**	**0**	**8.0**	**85.0**	**30.0**
Max.	**15.4**	**16.6**	**61.8**	**39.6**	**Max.**	**0**	**15.0**	**148.0**	**47.0**
Avg.	**14.6**	**16.1**	**60.7**	**38.8**	**Avg.**	**0**	**10.25**	**121.5**	**40.5**
NAAQ Standards (2009)	**80**	**80**	**100**	**60**	**NAAQ Standards (1994)**	**120**	**120**	**500**	**150**

Note: BDL-Below detection level

Location: Mudarangadi									
March 2024					As per EIA Report - 2009				
Date of Sampling	SO_2	NO_2	PM $_{10}$	PM $_{2.5}$	Date of Sampling	SO_2	NO_2	PM $_{10}$	$PM_{2.5}$
	µg/m³				mg/m³	µg/m³			
07.03.2024	13.5	16.5	55.6	31.7	29.04.2007	5.5	31.5	120	65
08.03.2024	13.4	16.4	55.4	32.6	03.05.2007	6.0	34.5	135	72
14.03.2024	13.7	16.6	54.3	32.7	05.05.2007	5.5	30.5	130	68
15.03.2024	13.2	16.2	54.7	31.4	09.05.2007	5.0	28.5	102	57
21.03.2024	13.4	16.8	54.6	32.5	13.05.2007	5.0	32.5	112	60
22.03.2024	13.5	16.9	54.3	32.8	16.05.2007	6.5	38.5	138	72
28.03.2024	13.6	16.5	55.8	32.4	22.05.2007	6.0	36.5	141	74
29.03.2024	13.3	16.6	55.9	32.9	25.02.2007	6.5	32.5	118	68
Min.	**13.2**	**16.2**	**54.3**	**31.4**	**Min.**	**5.0**	**28.5**	**102.0**	**57.0**
Max.	**13.7**	**16.9**	**55.9**	**32.9**	**Max.**	**6.5**	**38.5**	**141.0**	**74.0**
Avg.	**13.5**	**16.6**	**55.1**	**32.4**	**Avg.**	**5.75**	**33.12**	**124.5**	**67.0**
NAAQ Standards (2009)	**80**	**80**	**100**	**60**	**NAAQ Standards (1994)**	**120**	**120**	**500**	**150**

O/C

Annexure VIII

adani
Power

REF: APLUdupiTPP/ENV/2023-24/ 0533.

26.09.2023

To,
The Environment Officer
Karnataka State pollution Control Board
Regional Office
Plot No-36-C, Shivalli Industrial Area
Manipal, Udupi - 576104

Sub: Submission of Environmental Statement for Financial Year 2022-23 in Form-V for 2x600 MW coal based Thermal Power Plant of Adani Power Limited, Udupi Thermal Power Plant.

Ref: 1) Consent for Operation No: **AW-334454 dated: 18.11.2022**
2) Environmental Clearance No: - **J-13011/23/1996-IA.II (T) dated: 01.09.2011**

Dear Sir,

With reference to the above cited subject, please find the enclosed Environmental Statement in Form-V for the financial year 2022-23 along with supporting data for 2x600 MW Coal based Thermal Power Plant of Adani Power Limited Udupi TPP.

Thanking you,

Yours faithfully

Authorized Signatory
Adani Power Limited, Udupi TPP

27/9/23

Encl: Environmental Statement in Form-V (FY 2022-23)

Copy to:
Member Secretary
Karnataka State Pollution Control Board
"Parisara Bhavana", #49 1st to 5th Floor
Church Street, Bengaluru – 560001

Adani Power Limited
Correspondence Address:
Yelluru Village
Pilar Post, Padubidri
Udupi 574113
Karnataka, India
CIN: L40100GJ1996PLC030533

Tel +91 820 270 3500
Fax +91 820 270 3345
www.adanipower.com

Registered Office: "Adani Corporate House", Shantigram, Near Vaishno Devi Circle, S. G. Highway, Khodiyar, Ahmedabad-382421

ANNEXURE

ENVIRONMENTAL STATEMENT FORM-V
(See rule 14)

Environmental Statement for the financial year ending with 31st March 2023

PART-A

i	Name and address of the owner/occupier of the industry	Mr. Arindam Chatterjee Station Head Adani Power Limited Udupi TPP Yelluru Village, Pillar Post Padubidri, Udupi District Karnataka – 574113
ii	Industry category Primary-(STC code) Secondary- (STC Code)	Large scale Industry- Red Category
iii	Production category –Units	2X600 MW Coal based Thermal Power Plant
iv	Year of establishment	Unit-I: 2010 Unit-II: 2012
v	Date of the last environmental statement submitted	Letter No: UPCL/PLANT/O&M/ENV/2022-23/471 Dated: 12.09.2022

PART-B

Water and Raw Material Consumption:

i. Water consumption in m^3/d

Process	: 15185.64
Cooling	: 192665.72
Domestic	: 57.31
Total	: 207908.67
Sea Water returned back to Sea	: 143081.38

Name of Products	Process water consumption per unit of products	
	During the previous financial year (2021-22)	During the current financial year (2022-23)
Power Generation (1410.94 MU)	0.00566 kl/kwh	0.00327 kl/kwh

ii. Raw material consumption

Name of raw materials	Name of Products	Consumption of raw material per unit of output	
		During the previous financial year (2021-22)	During the current financial year (2022-23)
Coal	Power Generation	0.424 kg/kWh	0.461 kg/kWh
Heavy Fuel Oil (HFO)	Flame Stabilization during power generation and start-up	Nil	Nil
Light Diesel oil (LDO)		0.000503 ml/kWh	0.000477 ml/kWh

*Industry may use codes if disclosing details of raw material would violate contractual obligations, otherwise all industries have to name the raw materials used.

ADANI POWER LIMITED * Yelluru Pilar Post Padubidri Udupi * THERMAL POWER PLANT

PART-C

Pollution discharged to environment/unit of output

(Parameter as specified in the consent issued)

Pollutants	Quantity of Pollutants discharged (mass/day) i.e., (**Kg/day**)		Concentration of Pollutants discharged (Mass/Volume)		Percentage of variation from prescribed standards with reasons
a) Water	Parameter	Results	Parameter	Results	No deviation
	Odour	Agreeable	Odour	Agreeable	
	Colour	Not Applicable	Colour	1.00	
	pH		pH	8.17	
	TSS	194.32	TSS (mg/l)	4.72	
	BOD	105.65	BOD (mg/l)	2.57	
	COD	524.93	COD (mg/l)	12.75	
	Oil& grease	BLQ	Oil & grease	BLQ	
	Arsenic	BLQ	Arsenic (mg/l)	BLQ	
	Lead	BLQ	Lead (mg/l)	BLQ	
	Mercury	BLQ	Mercury (mg/l)	BLQ	
	Total Cr	BLQ	Total Cr (mg/l)	BLQ	
	Hexavalent Cr	BLQ	Hexavalent Cr	BLQ	
	Phenolic Compounds	BLQ	Phenolic Compounds	BLQ	

b) Air	Unit-I (kg/day)		Unit-II (kg/day)	Unit-I (mg/Nm^3)		Unit-II (mg/Nm^3)	No deviation
	PM	1993.06	1775.66	PM	37.70	33.23	
	SO_X	31125.29	36935.31	SO_X	588.76	691.19	
	NO_X	8616.02	8005.72	NO_X	162.98	149.81	

Note: BLQ = Below Limit of Quantification

PART-D

HAZARDOUS WASTE

{As specified under the Hazardous and Other wastes (Management and Transboundary Movement) Rules, 2016}

Hazardous Wastes	Total Quantity (MT)			
	During the previous financial year (2021-22)		During the current financial year (2022-23)	
1) From Process	Used Oil	8.40 MT	Used Oil	19.11 MT
	Oil-Soaked Cotton waste	4.33 MT	Oil-Soaked Cotton waste	4.93 MT
	Discarded Containers	4.56 MT	Discarded Containers	3.11 MT
	Spent Ion exchange resins containing toxic metals	0.00 MT	Spent Ion exchange resins containing toxic metals	3.94 MT
	Paint Residue	0.00 MT	Paint Residue	0.00 MT
2) Pollution Control Facilities	Not Applicable		Not Applicable	

PART-E

*SOLID WASTES**

Solid Wastes	Total Quantity (MT)			
	During the previous financial year (2021-22)		During the current financial year (2022-23)	
a)From Process	Bottom Ash	5590.00	Bottom Ash	5328.30
b)From Pollution Control Facility	Fly Ash	51633.74	Fly Ash	39219.40
	Gypsum	402.41	Gypsum	657.04
c) Quantity recycled or reutilized	Fly Ash	41091.00	Fly Ash	36030.0
	Bottom/Pond Ash	17632.00	Bottom/Pond Ash	14,600.17
	Gypsum	244.51	Gypsum	610.17

ADANI POWER LIMITED * UDUPI THERMAL POWER PLANT * Yelluru Pilar Post Padubidri Udupi 574 113

PART-F

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

a) Hazardous waste: As per Hazardous and Other Wastes (Management & Transboundary Movement) Rules 2016, hazardous wastes generated in the industry are of five categories i.e., 5.1 Used Oil, 5.2 Oil soaked Cotton Waste, 21.1 Paint Sludge, 33.1 Discarded Containers and 35.2 Spent Ion Exchange resin. All these generated wastes are stored on the concrete platform in designated location and disposed to KSPCB/CPCB authorized vendors.

b) Solid Waste: Solid waste in industry is generated from process and pollution control facilities.

i. Bottom Ash is generated from the process of burning coal and is collected in the water impounding basin and the same is disposed to brick manufacturers & disposal to ash pond which is 3 km away from the plant.

ii. Fly Ash is generated from the process trapped in the electrostatic precipitators (ESPs) in dry form and stored in silos. Fly ash is disposed to various end users like cement manufacturers, brick manufacturers and Ready-Mix Concrete works.

iii. Gypsum is generated from the FGD (flue gas desulphurization) units when flue gas is passed through wet lime to remove Sulphur Di-oxides. Generated gypsum is disposed to end users like cement manufacturers, fertilizers industries and plasterboard manufacturers.

iv. Sludge generated from the STP was utilized as manure after drying and composting along with garden waste.

PART-G

Impact of the pollution control measures taken on conservation of natural resources and consequently on the cost of production

a) The Ambient Air Quality surrounding the coal handling facility is monitored through Online Continuous Ambient Air Quality Monitoring Stations and the Ambient Air Quality is within the prescribed limits throughout the year.

b) The coal conveyor belts are fully covered and installed with Dust Suppression system at transfer points for arresting the fugitive emissions.

c) The Units are equipped with Pollution Control Equipment such as Low NOx Burner, ESP & FGD (flue gas desulphurization) for controlling the Stack Emission.

d) Fly Ash generated is conveyed in dry form through conduits and stored in silos. Fly Ash is utilized by cement manufacturers, brick manufacturers and RMC works.

e) Gypsum generated is stored in closed yard and disposed to end users like cement manufacturers, fertilizers industries and plasterboard manufacturers.

f) ETP of 7200 KLD and three STP of each 20 KLD (total 60 KLD) is in operation and treated water is reused for green belt development/ gardening.

g) Water Sprinkling is undertaken in the Ash Pond for suppression of dust.

PART-H

Additional measures/investment proposal for environmental protection including abatement of pollution.

a) Wind shield installed in the coal handling plant for controlling fugitive emissions.

b) Three Rain Harvesting Ponds of capacities 73000 m^3, 73000 m^3 and 143000 m^3 are constructed for harvesting rainwater during rainy season and utilization in Cooling Tower and other purposes.

c) Organic Waste Converter is installed for converting food and green waste into compost and used in green belt/ gardening.

d) Deployment of Road Sweeping machine to reduce fugitive dust emissions.

e) Fly ash brick manufacturing plant is installed for production of fly ash brick and paver block for internal utilization.

f) Paper recycling unit is installed for recycling and reusing the wastepaper generated in the plant.

ADANI POWER LIMITED
Yelluru
Pilar Post
Padubidri
Udupi
574 113
UDUPI THERMAL POWER PLANT

PART-I

Any other particulars in respect of environmental protection and abatement of pollution

a) APL Udupi TPP is certified with ISO 9001, ISO 14001, ISO 45001, ISO 50001, ISO 55001, ISO 22301 and ISO 46001.
b) World Environment Day celebration to create Environmental awareness among employees and community by conducting various environmental competitions, workshops & presentations.
c) Nearly 1300 saplings were planted inside the plant on the day of world Environment Day - 2022.
d) Single Use Plastic (SuP) free plant, an initiative taken to mitigate the problems caused by single use of Plastic to environment.

ADANI POWER LIMITED
Yelluru
Pilar Post
Padubidri
Udupi
574 113
UDUPI THERMAL POWER PLANT

Caution Boards at Pipeline Corridor **Annexure-IX**

Caution Boards are installed at every critical area like Road Crossing, Village areas throughout the 6 km pipeline corridor. Snapshots of the caution boards are placed below: