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Power

Ref.: APL/UPCL/P-I/ENV/EC/MoEFCC/231/11/24
Date: 28/11/2024

To,
The 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 the above subject, please find enclosed herewith the Six-monthly compliance report for the period of **April'2024 to September'2024** against the conditions of Consolidated Environmental Clearance for **2x600 MW Udupi Thermal Plant** and CRZ Clearance granted to UPCL for Sea Water Pipe-Line intake system, through **e-mail.**

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

(R N Shukla)
Head Env. & Forest

Encl: As above

CC:

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

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

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

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
Ahmedabad 382 421
Gujarat, India
CIN: L40100GJ1996PLC030533

Tel +91 79 2555 4444
Fax +91 79 2555 7177
www.adanipower.com

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: April'2024 to September'2024

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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 sub 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 main stream 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 fresh water 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: 5.09.2022 timeline for compliance for SO_2 emissions for Category C TPPs is 31st December 2026. In line with the notification, existing FGD units (25% of flue gas capacity) has been completely dismantled. As on today, installation of FGD (100% flue gas capacity) has been commenced to comply with 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. Average Sulphur and Ash content in coal used for the period of April'2024 to September'2024 is as below: 1. Sulphur Content: **0.60 %** 2. Ash Content: **5.13 %**
(III)	A single bi-flue stack of 275 m height shall be provided with continuous online monitoring equipment's 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 April'2024 to September'2024 was 23.50 to 27.10 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 April'2024 to September'2024 is enclosed as **Annexure-I**.
(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 April'2024 to September'2024 is enclosed as **Annexure-I** for reference.
(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 BORBN 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 April'2024 to September'2024 is enclosed as **Annexure-I**.

(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 Grinding unit of M/s ACC Ltd. is set up. Monitoring of particulate emissions along the route of transportation shall be carried out	Complied 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 of particulate emission 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 April'2024 to September'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 April'2024 to September'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 April'2024 to September'2024 is enclosed as **Annexure-I**.
(XII)	Fugitive emission of fly ash (dry or wet) shall be controlled so that no	Complied

	agricultural or non-agricultural land is affected. Damage to any land shall be mitigated and suitable compensation provided in consultation with the local Panchayat.	Disposal of fly ash is handled through closed conduit within plant. No damage has happened to any land.
(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 TPP 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 MoEF&CC and NABL accredited laboratory. Guard pond effluent monitoring reports for the period of April'2024 to September'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 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.	Complied Ground water and Surface water monitoring is carried regularly in the locations finalized in consultation with KSPCB and records are maintained. Monitoring reports are sent to KSPCB once in every month. Monitoring of heavy metals in ground water is carried out monthly. Water monitoring reports for the period of April'2024 to September'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 with previous compliance report.
(XXI)	Acquisition of land should be restricted to 550 ha as per the following breakup:	Complied Following is the current status:

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 of about 423547 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.
Adequate financial provision for the plantation under Environment budget is made separately. The amount spent for various activities under Environment for the period of April'2024 to September'2024.
<table>
<tr><th>Description</th><th>Amount (Rs.)</th></tr>
<tr><td>Afforestation</td><td>5578712.72</td></tr>
<tr><td>Environment Monitoring</td><td>2723335.00</td></tr>
<tr><td>General Environment Management</td><td>5819265.87</td></tr>
<tr><td>Total</td><td>14121313.59</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</td><td>Complied</td></tr>
</table>

	earmarked and shall not be diverted for the other purposes. Adequate provision should be ensured for enhancement of funds required, if any, in future.	Financial requirement for Environmental mitigative measures was earmarked at the time of project as per EIA report and measures have been implemented. Operating expenses 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	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

	project as required after imparting relevant training shall be also undertaken as necessary.	villages for CSR activities on a continuous basis. For local youth, scholarships and various other schemes including trainings are provided so as to get them proper education and getting eventual employment opportunities. Snapshots of CSR activities are enclosed as **Annexure-VI**.
(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 Green belt 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 reusing 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 monthly to KSPCB office and the same is submitted to RO-MoEF&CC once in six months. Monitoring reports are enclosed as **Annexure-I**. The compared baseline data for the period of September'2024 for water quality and ambient air quality is enclosed as **Annexure-VII**
(VIII)	Monitoring surface water quantity and quality shall also be regularly	Complied

	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.	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-MoEF&CC once in six months. Monitoring reports for the period of April'2024 to September'2024 is enclosed as **Annexure-I**. 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 / 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.	Complied Enclosures are provided for turbines to control the noise. The persons working in the high 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-MoEF&CC 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	Complied All the arrangements are made during the construction phase

	housing may be in the form of temporary structures to be removed after the completion of the project	
(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 displayed 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 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.	Complied A well-qualified Environment cell is established. Head of the Environment 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 on website and being 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 MoEF&CC, 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 2023-24 is submitted to RO-MoEF&CC and RO-KSPCB. Copy is enclosed as **Annexure-VIII**. 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 MoEF&CC, Regional Office of KSPCB and Zonal Office of CPCB. Last Compliance report for the period of October'2023 to March'2024 submitted vide letter no. APL/UPCL/P-I/ENV/EC/291/05/24 dated 25/05/2024. The same is displayed in the company website. http://www.adanipower.com/downloads
(XIX)	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.	Complied. Complete set of documents including EIA/EMP report was submitted to MoEF&CC 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.

<table>
<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 April'2024 to September'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>5578712.72</td></tr>
<tr><td>2</td><td>Environment Monitoring</td><td>2723335</td></tr>
<tr><td>3</td><td>Environment Management</td><td>5819265.87</td></tr>
<tr><td></td><td>Total</td><td>14121313.59</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>
<tr><td>(5)</td><td>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.</td><td>Noted</td></tr>
<tr><td>(6)</td><td>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</td><td>Noted</td></tr>
</table>

(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

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 MoEF&CC.	Complied. Regular joint meeting of UPCL monitoring team and third party MoEF&CC and NABL approved lab is conducted and monitoring reports are submitted to MoEF&CC on six monthly basis.
(IV)	It should be ensured that there shall not be any disturbance to fishing activity.	Condition is 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	Complied. Monitoring is carried for sea water quality at intake and outfall points by Fisheries college, Mangalore.

	characteristics and the report shall be submitted every six month to Ministry's Regional Office at Bangalore.	Monitoring Reports for the period of April'2024 to September'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.	Condition is noted & complied.
(X)	There shall be no withdrawal of ground water in CRZ area, for the project.	Condition is 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	Complied.

	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	
(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.
(II)	**OPERATION PHASE**	
(I)	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	Not applicable in the area because no structure is available in the area.
(II)	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.	Complied. Green belt is developed in the power plant area in accordance with environmental clearance.
(III)	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	Complied.
(IV)	The ground water level and its quality should be monitored regularly	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 April'2024 to September'2024 is enclosed as **Annexure-I.**
(V)	The mangroves, if any, on the site should not be disturbed in anyway	Complied with at the time of pipeline construction.
(VI)	The environmental safeguards contained in the application should be implemented in letter and spirit	Complied with at the time of pipeline construction.

<table>
<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>Noted and 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 April'2024 to September'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>5578712.72</td></tr>
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<tr><td>3</td><td>General Environment Management</td><td>5819265.87</td></tr>
<tr><td>4</td><td>Total</td><td>14121313.59</td></tr>
</table></td></tr>
<tr><td>(IX)</td><td>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.</td><td>Condition is noted & agreed.</td></tr>
<tr><td>(X)</td><td>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</td><td>Condition is noted & agreed.</td></tr>
<tr><td>(6)</td><td colspan="2">GENERAL CONDITIONS</td></tr>
<tr><td>(I)</td><td>Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction</td><td>Complied.
All the arrangements are made during the construction phase.</td></tr>
</table>

	phase of the project to avoid any damage to the environment.	
(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. 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	Complied during said activity.
(VI)	Adequate financial provision must be made in the project to implement the aforesaid safeguards.	Complied.
(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	Noted for compliance.

	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.	
(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 MoEF	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 MOEF&CC 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, etc shall be obtained, as applicable by project proponents from the respective competent authorities.	Noted. These clearances were not applicable for sea water pipeline work.

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-MoEF&CC 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 MOEF&CC 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,	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

	indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	
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 MoEF&CC, Regional Office of KSPCB and Zonal Office of CPCB. Last Compliance report for the period of October'2023 to March'2024 submitted vide letter no. APL/UPCL/P-I/ENV/EC/291/05/24 dated 25/05/2024.
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 with. Copy of Environmental statement for the Financial Year 2023-24 is submitted to RO-MoEF&CC and RO-KSPCB is enclosed as **Annexure-VIII**. The copy of the same is displayed through company website as part of the six-monthly EC compliance report. http://www.adanipower.com/downloads

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Meteorological Data

Annexure-I

Continuous Meteorological Observatory Station installed at site to observe following parameters: Temperature, Humidity, Wind Speed, Wind Direction and Rainfall.

TABLE-1: AVERAGE DAILY METEOROLOGICAL DATA OF APRIL-2024

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/Apr/2024	27.8	33.85	68.78	100	0
2/Apr/2024	27.14	34.02	67.13	100	0
3/Apr/2024	26.51	33.92	66.51	100	0
4/Apr/2024	26.43	33.76	64.72	100	0
5/Apr/2024	25.91	33.03	66.78	100	0
6/Apr/2024	26.3	33.9	69.35	100	0
7/Apr/2024	27.14	35.18	58.92	100	0
8/Apr/2024	26.63	34.81	64.09	100	0
9/Apr/2024	27.11	34.46	63.24	100	0
10/Apr/2024	26.41	34.37	57.46	100	0
11/Apr/2024	26.24	34.86	58.9	100	0
12/Apr/2024	26.99	33.99	65.95	100	0
13/Apr/2024	25.96	34.08	66.61	98.3	0
14/Apr/2024	25.47	34.11	66.32	97.6	0
15/Apr/2024	27.04	35.21	63.99	100	0
16/Apr/2024	26.37	35.24	57.17	100	0
17/Apr/2024	26.76	33.9	62.33	100	0
18/Apr/2024	26.39	35.21	61.19	99.2	0
19/Apr/2024	25.97	33.7	74.63	100	0
20/Apr/2024	23.5	32.08	65.39	100	129.61
21/Apr/2024	25.33	33.68	68.21	100	0
22/Apr/2024	27.31	34.32	64.49	100	0
23/Apr/2024	26.73	33.24	72.2	100	0
24/Apr/2024	28.32	34.79	70.56	100	0
25/Apr/2024	27.01	35.03	65.39	100	0
26/Apr/2024	26.8	35.4	47.75	100	0
27/Apr/2024	26.31	34.69	58.44	100	0
28/Apr/2024	27.57	35.4	62.09	100	0
29/Apr/2024	28.18	34.77	71.84	100	0
30/Apr/2024	27.51	34.37	71.86	100	0

TABLE-2: AVERAGE DAILY METEOROLOGICAL DATA OF MAY-2024

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/May/2024	27.85	34.84	69.56	100	0.0
2/May/2024	27.97	34.28	71.95	100	0.0
3/May/2024	26.79	34.19	58.17	100	0.0
4/May/2024	25.90	34.40	62.46	100	0.0
5/May/2024	25.62	33.96	62.37	100	0.0
6/May/2024	27.32	34.54	60.33	96.1	0.0
7/May/2024	28.23	34.56	65.58	96.8	0.0
8/May/2024	27.18	36.56	46.21	97.3	0.0
9/May/2024	26.38	35.01	60.64	100	0.0
10/May/2024	26.74	34.29	62.49	100	0.0
11/May/2024	26.79	34.54	58.64	100	3.82
12/May/2024	26.25	34.92	64.67	99.1	8.11
13/May/2024	24.80	34.22	56.17	100	0.0
14/May/2024	26.82	34.11	67.67	100	0.0
15/May/2024	26.66	33.81	62.89	95.5	0.0
16/May/2024	26.89	33.78	68.65	96	0.0
17/May/2024	26.26	34.00	60.32	97.3	0.0
18/May/2023	25.48	33.98	68.64	100	19.26
19/May/2024	25.33	33.74	57.19	100	13.38
20/May/2024	25.12	30.81	81.20	100	6.84
21/May/2024	25.22	34.4	66.89	100	16.14
22/May/2024	26.43	33.63	74.66	100	6.08
23/May/2024	26.93	31.13	82.00	100	31.58
24/May/2024	24.7	31.48	81.20	100	76.97
25/May/2024	23.94	28.8	89.50	100	2.92
26/May/2024	26.11	32.31	79.88	100	2.69
27/May/2024	26.6	33.12	71.87	100	1.17
28/May/2024	27.45	33.33	77.05	100	7.49
29/May/2024	26.72	32.09	85.60	100	15.67
30/May/2024	26.5	33.96	72.17	100	7.02
31/May/2024	26.75	33.67	77.64	100	0.0

TABLE-3: AVERAGE DAILY METEOROLOGICAL DATA OF JUNE-2024

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/Jun/2024	28.60	34.10	66.00	100	49.81
2/Jun/2024	25.00	33.60	73.30	100	4.23
3/Jun/2024	25.20	34.70	68.80	100	4.21
4/Jun/2024	24.90	31.90	74.90	100	1.40
5/Jun/2024	26.10	33.30	72.60	100	5.61
6/Jun/2024	26.20	33.00	73.00	100	5.20
7/Jun/2024	24.90	28.60	91.50	100	47.26
8/Jun/2024	24.30	29.60	90.80	100	39.29
9/Jun/2024	24.10	29.50	89.90	100	42.59
10/Jun/2024	24.00	28.90	90.20	100	48.9
11/Jun/2024	24.70	31.90	76.70	100	22.93
12/Jun/2024	24.00	30.00	81.80	100	11.23
13/Jun/2024	23.90	31.30	78.20	100	2.34
14/Jun/2024	25.20	32.70	73.90	100	0.0
15/Jun/2024	25.70	32.60	65.50	100	9.26
16/Jun/2024	25.60	31.20	75.60	100	0.0
17/Jun/2024	25.50	31.90	74.50	100	13.69
18/Jun/2024	24.80	31.70	73.90	100	6.08
19/Jun/2024	24.10	32.70	75.40	100	25.74
20/Jun/2023	23.60	30.30	81.70	100	6.78
21/Jun/2024	22.10	31.10	77.90	100	29.24
22/Jun/2024	23.40	29.70	75.50	100	8.03
23/Jun/2024	24.90	31.50	76.60	100	26.13
24/Jun/2024	23.40	31.00	81.00	100	62.93
25/Jun/2024	23.50	30.60	87.00	100	105.28
26/Jun/2024	23.20	26.00	98.90	100	127.27
27/Jun/2024	23.60	28.30	96.30	100	27.14
28/Jun/2024	25.20	31.20	84.50	100	8.42
29/Jun/2024	25.20	30.60	85.80	100	45.38
30/Jun/2024	25.20	31.00	88.10	100	20.83

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

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/Jul/2024	23.90	30.20	91.50	100	85.16
2/Jul/2024	24.70	30.40	86.40	100	19.18
3/Jul/2024	25.10	30.90	88.60	100	51.94
4/Jul/2024	23.70	27.10	96.40	100	15.44
5/Jul/2024	24.30	29.80	88.40	100	77.67
6/Jul/2024	22.90	26.00	100.00	100	71.52
7/Jul/2024	23.20	27.40	93.20	100	43.35
8/Jul/2024	23.30	24.80	100.00	100	63.17
9/Jul/2024	23.50	32.30	64.63	100	24.80
10/Jul/2024	23.60	29.90	82.30	100	3.16
11/Jul/2024	24.50	31.40	76.74	100	8.42
12/Jul/2024	25.00	30.20	87.60	100	94.99
13/Jul/2024	24.00	29.80	90.90	100	40.31
14/Jul/2024	24.50	28.30	98.50	100	68.25
15/Jul/2024	24.30	28.10	98.10	100	63.64
16/Jul/2024	24.90	29.50	89.40	100	35.09
17/Jul/2024	24.50	29.10	95.70	100	68.31
18/Jul/2024	24.00	27.20	100.00	100	182.02
19/Jul/2024	23.60	27.10	99.10	100	30.41
20/Jul/2024	24.80	30.40	87.80	100	34.85
21/Jul/2024	23.70	28.60	96.40	100	42.59
22/Jul/2024	24.30	30.80	84.00	100	42.58
23/Jul/2024	24.30	29.10	90.70	100	18.95
24/Jul/2024	24.60	30.20	90.20	100	60.01
25/Jul/2024	24.30	29.50	92.20	100	17.78
26/Jul/2024	24.00	30.10	91.70	100	32.64
27/Jul/2024	23.80	31.20	84.90	100	1.87
28/Jul/2024	27.20	30.40	86.90	100	0.00
29/Jul/2024	25.50	30.60	87.70	100	78.61
30/Jul/2024	23.30	27.60	100.00	100	76.85
31/Jul/2024	23.50	29.30	92.30	100	138.97

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

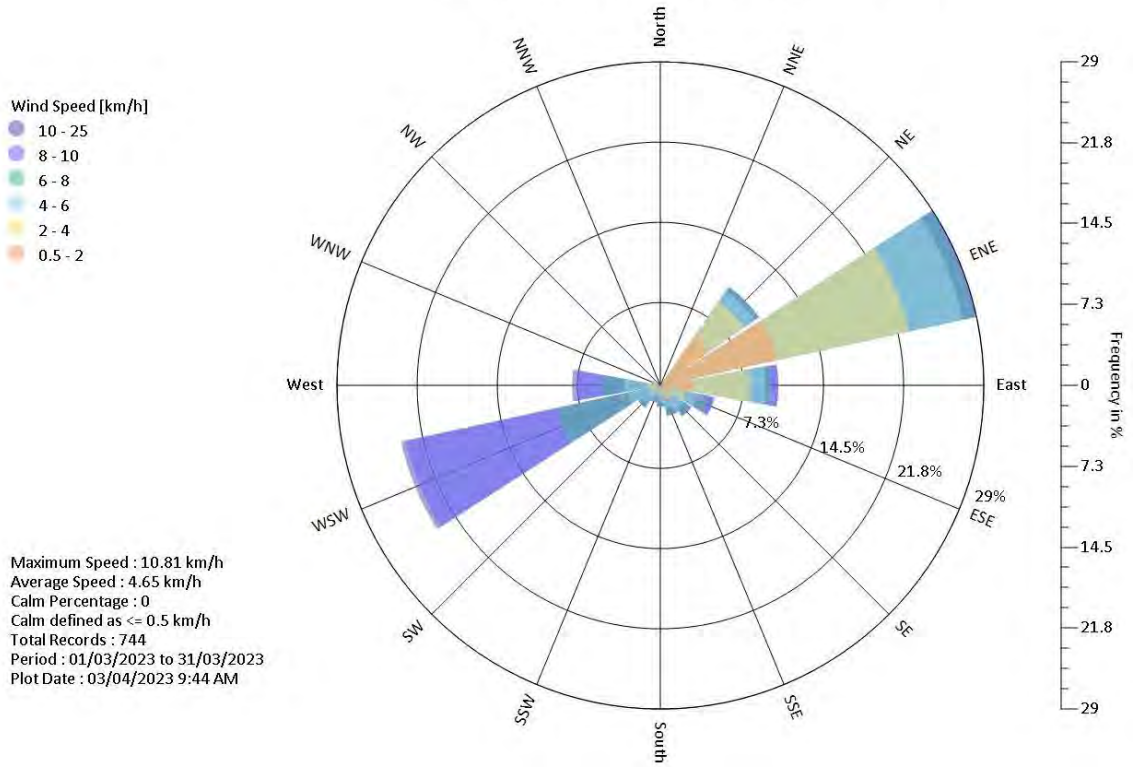
Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/Aug/2024	23.82	29.59	90.50	100	130.55
2/Aug/2024	23.24	28.79	96.10	100	75.80
3/Aug/2024	23.63	30.29	85.30	100	13.47
4/Aug/2024	23.4	29.99	86.10	100	53.904
5/Aug/2024	24.15	30.95	80.2	100	37.9
6/Aug/2024	23.9	27.51	94.00	100	11.00
7/Aug/2024	24.65	29.2	87.70	100	4.45
8/Aug/2024	23.89	27.72	92.50	100	57.32
9/Aug/2024	23.79	30.93	74.96	100	42.58
10/Aug/2024	24.12	30.93	78.89	100	6.12
11/Aug/2024	25.12	31.71	76.6	100	1.37
12/Aug/2024	25.7	31.75	76.53	100	0.00
13/Aug/2024	26.39	33.06	71.27	100	8.89
14/Aug/2024	25.75	33.08	71.06	100	4.89
15/Aug/2024	26.34	31.73	83.00	100	17.8
16/Aug/2024	26.08	31.25	84.6	100	0.47
17/Aug/2024	25.27	31.76	80.00	100	1.87
18/Aug/2024	24.65	32.36	78.22	100	0.00
19/Aug/2024	26	32.05	78.46	100	0.94
20/Aug/2024	25.65	31.64	78.50	100	0.00
21/Aug/2024	25.64	31.34	79.43	100	22.46
22/Aug/2024	25.17	30.41	82.50	100	28.54
23/Aug/2024	25.14	30.86	79.08	100	29.48
24/Aug/2023	24.91	30.22	88.80	100	16.10
25/Aug/2023	24.96	30.58	83.70	100	4.80
26/Aug/2024	25.4	30.54	82.70	100	32.91
27/Aug/2024	24.03	30.77	84.50	100	32.64
28/Aug/2024	23.74	30.75	81.60	100	20.59
29/Aug/2024	24.17	30.68	86.20	100	27.37
30/Aug/2024	24.76	30.93	85.70	100	31.35
31/Aug/2024	24.48	30.22	86.10	100	39.41

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

Date	Temperature (°C)		Relative Humidity (%)		Rainfall (mm)
	Min	Max	Min	Max	
1/Sep/2024	24.47	30.31	83.50	100	11.12
2/Sep/2024	25.56	30.24	91.80	100	5.15
3/Sep/2024	24.57	30.93	86.60	100	20.12
4/Sep/2024	25.45	31.13	82.40	100	4.21
5/Sep/2024	25.06	31.13	82.10	100	49.6
6/Sep/2024	25.11	30.98	82.60	100	16.84
7/Sep/2024	25.27	30.89	82.20	100	9.40
8/Sep/2024	24.7	29.99	88.30	100	16.92
9/Sep/2024	25.06	30.81	84.2	100	24.33
10/Sep/2024	24.64	30.94	79.96	100	4.68
11/Sep/2024	24.66	30.72	82.2	100	25.27
12/Sep/2024	23.99	31.42	74.96	100	5.61
13/Sep/2024	23.94	32.16	72.18	100	14.74
14/Sep/2024	24.31	31.15	74.29	100	4.46
15/Sep/2024	24.46	31.84	75.45	100	9.23
16/Sep/2024	24.77	31.73	74.38	100	18.95
17/Sep/2024	24.38	31.77	71.83	100	0.00
18/Sep/2024	24.28	32.42	62.97	100	0.00
19/Sep/2024	25.36	31.4	73.48	100	0.00
20/Sep/2024	23.98	32.49	68.18	100	27.61
21/Sep/2024	23.9	31.44	73.49	100	0.00
22/Sep/2024	24.68	31.86	72.3	100	40.71
23/Sep/2023	24.38	29.38	87.7	100	71.12
24/Sep/2024	24.36	27.66	96.6	100	36.03
25/Sep/2024	24.36	30.12	83.8	100	38.84
26/Sep/2024	24.33	31.05	79.57	100	28.00
27/Sep/2024	23.78	31.08	78.25	100	14.51
28/Sep/2024	23.94	32.52	69.27	100	0.00
29/Sep/2024	25.18	33.73	61.88	100	1.17
30/Sep/2024	26.12	32.72	78.05	104.4	3.74

Wind Rose Month of April - 2023 (01:00 to 24:00)

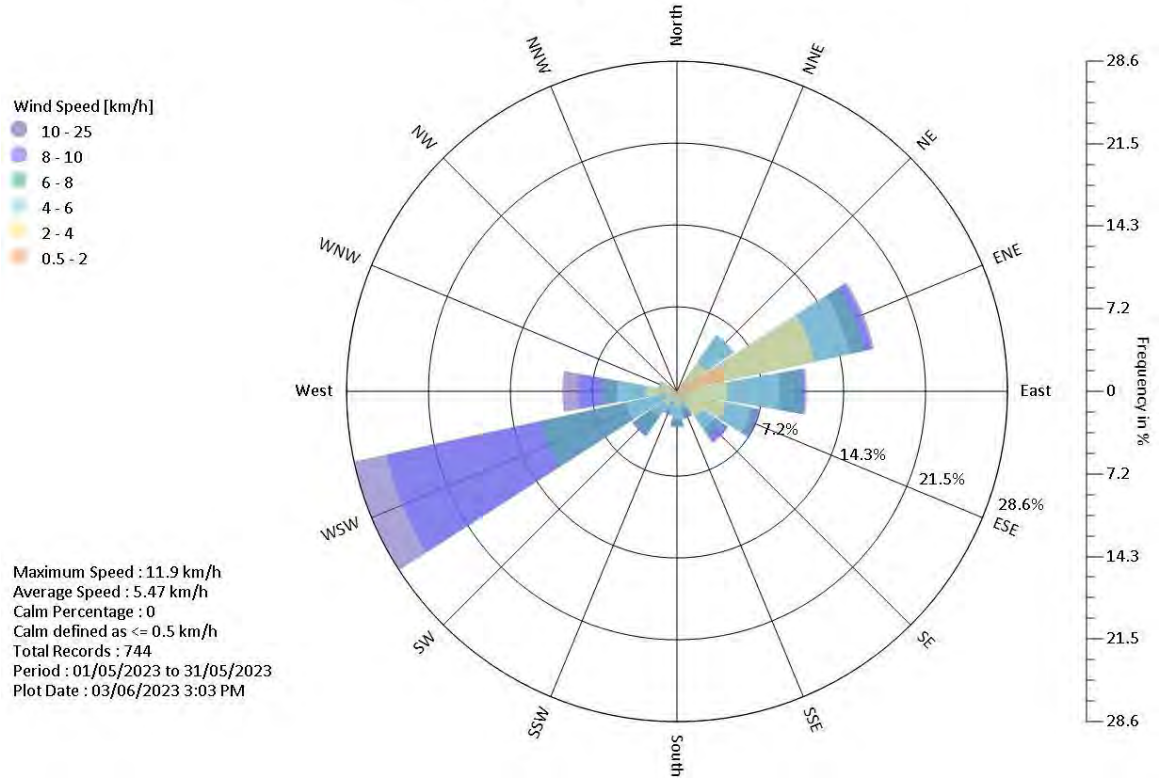
% Frequency of Wind Speed from a Direction



Maximum Speed : 10.81 km/h
Average Speed : 4.65 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/03/2023 to 31/03/2023
Plot Date : 03/04/2023 9:44 AM

Wind Rose Month of May- 2023 (01:00 to 24:00)

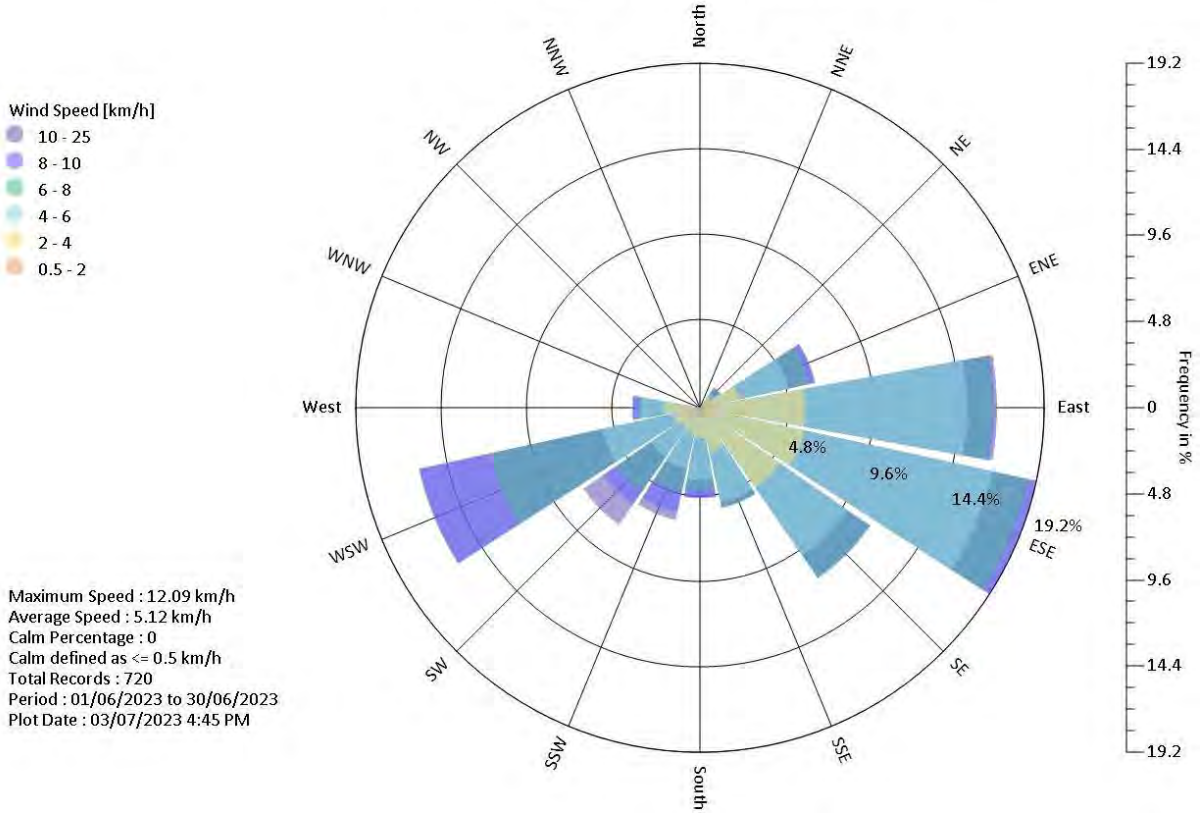
% Frequency of Wind Speed from a Direction



Maximum Speed : 11.9 km/h
Average Speed : 5.47 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/05/2023 to 31/05/2023
Plot Date : 03/06/2023 3:03 PM

Wind Rose Month of June-2023 (01:00 to 24:00)

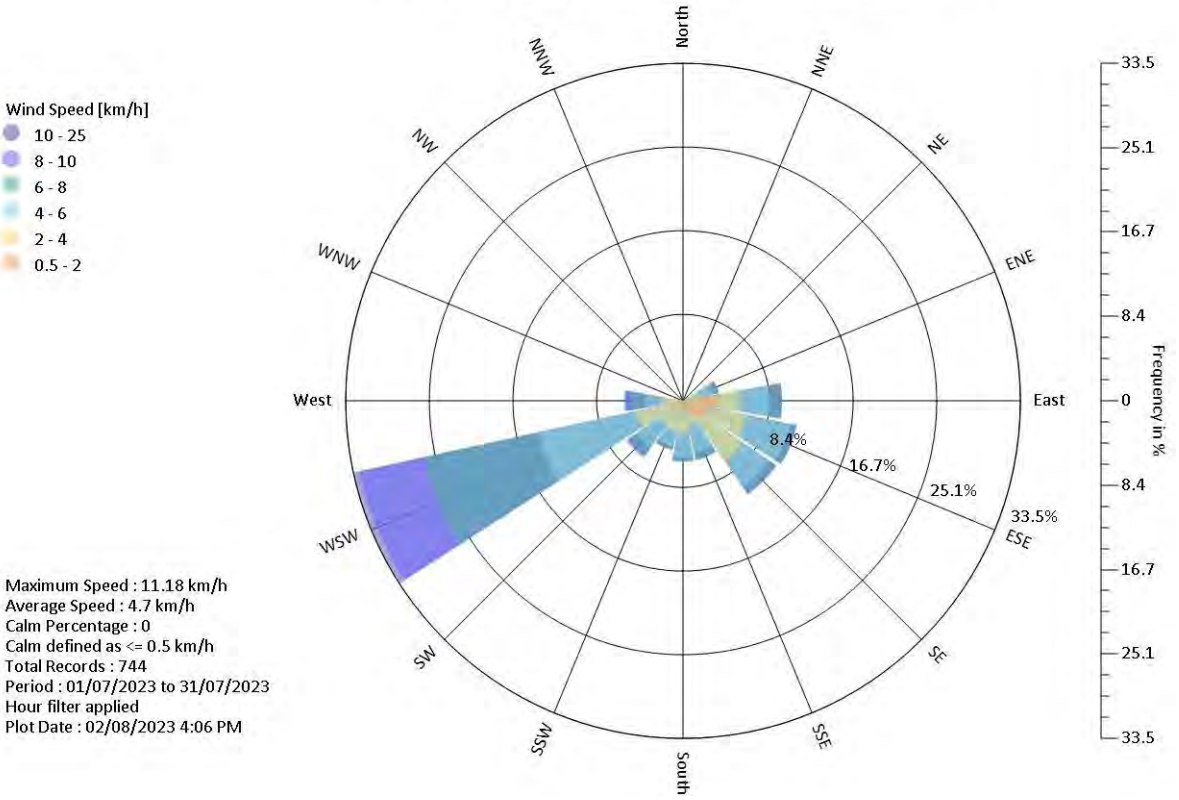
% Frequency of Wind Speed from a Direction



Maximum Speed : 12.09 km/h
Average Speed : 5.12 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 720
Period : 01/06/2023 to 30/06/2023
Plot Date : 03/07/2023 4:45 PM

Wind Rose month of July- 2023 (01:00 to 24:00)

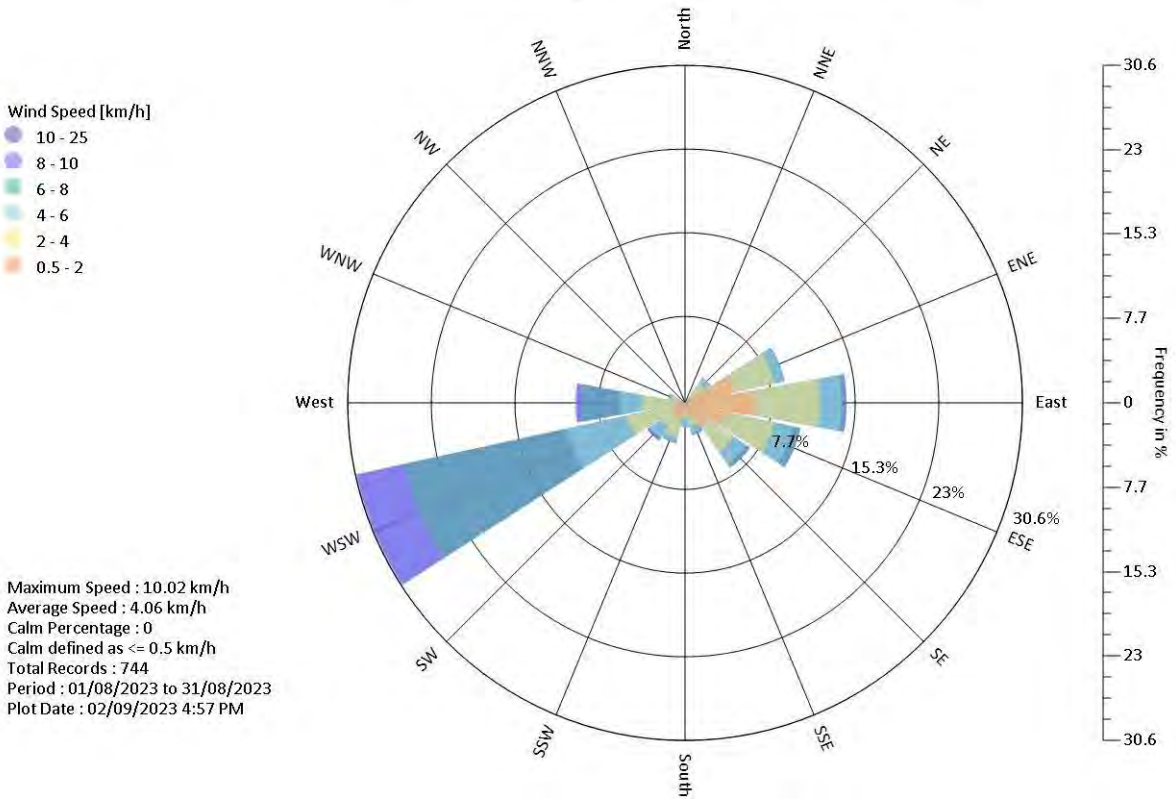
% Frequency of Wind Speed from a Direction



Maximum Speed : 11.18 km/h
Average Speed : 4.7 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/07/2023 to 31/07/2023
Hour filter applied
Plot Date : 02/08/2023 4:06 PM

Wind Rose Month of August-2023 (01:00 to 24:00)

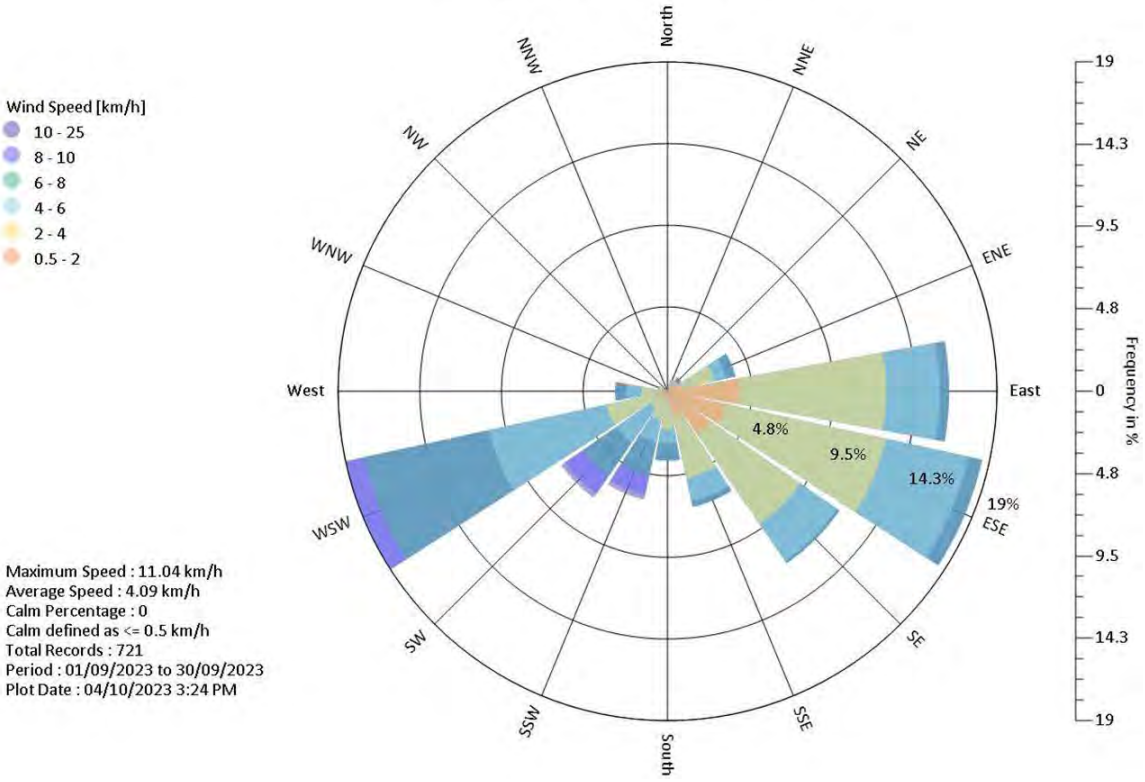
% Frequency of Wind Speed from a Direction



Maximum Speed : 10.02 km/h
Average Speed : 4.06 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 744
Period : 01/08/2023 to 31/08/2023
Plot Date : 02/09/2023 4:57 PM

Wind Rose Month of September-2023 (01:00 to 24:00)

% Frequency of Wind Speed from a Direction



Maximum Speed : 11.04 km/h
Average Speed : 4.09 km/h
Calm Percentage : 0
Calm defined as <= 0.5 km/h
Total Records : 721
Period : 01/09/2023 to 30/09/2023
Plot Date : 04/10/2023 3:24 PM

AMBIENT AIR QUALITY MONITORING

Annexure-I

Table-1: Ambient Air Quality Monitoring in Plant Site (Near DM Plant) for the period of April 2024 to Sep 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 DM Plant (A1)	APR 2024	62.4	63.8	62.9	40.2	41.6	40.8	15	15.7	15.4	15.9	16.9	16.4	BLQ	BLQ	BLQ
	MAY 2024	60.2	64.7	62.1	38.2	41.7	39.6	14.7	16	15.3	15.5	16.8	16.2	BLQ	BLQ	BLQ
	JUN 2024	48.3	51.4	49.2	28.3	30.4	29.4	12.2	12.7	12.4	14	14.6	14.3	BLQ	BLQ	BLQ
	JUL 2024	43.3	45.6	44.4	24.8	25.7	25.3	11.7	12.3	12	13.6	14.3	14	BLQ	BLQ	BLQ
	AUG 2024	42.1	43.1	42.6	23.1	23.8	23.5	11.9	12.6	12.2	13.2	14.1	13.7	BLQ	BLQ	BLQ
	SEP 2024	43.2	43.9	43.6	24.1	24.8	24.5	12.4	13	12.7	14	14.5	14.2	BLQ	BLQ	BLQ

Table-2: Ambient Air Quality Monitoring at Admar village for the period of April 2024 to Sep 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)	APR 2024	59.9	61.3	60.6	39.9	40.8	40.4	14.2	14.7	14.4	15.2	16.7	15.9	BLQ	BLQ	BLQ
	MAY 2024	58.3	61.7	60	37.8	41.8	39.7	13.9	14.9	14.4	15.1	15.8	15.4	BLQ	BLQ	BLQ
	JUN 2024	47	50.3	48.5	27.2	29.5	28.1	11.1	12.3	11.8	13	14.7	13.8	BLQ	BLQ	BLQ
	JUL 2024	41.6	42.7	42.2	22.2	23.9	23.2	10.6	12	11.3	12.4	14.2	13.2	BLQ	BLQ	BLQ
	AUG 2024	40.1	40.8	40.4	21	21.8	21.4	10.1	10.7	10.4	12.1	12.7	12.4	BLQ	BLQ	BLQ
	SEP 2024	41.2	41.9	41.6	22.1	22.9	22.5	10.4	11	10.7	12.4	12.9	12.7	BLQ	BLQ	BLQ

Table-3: Ambient Air Quality Monitoring at Inna village for the period of April 2024 to Sep 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)	APR 2024	60.3	62.5	61.3	40.3	41.2	40.6	14.9	16	15.5	17	18.2	17.6	BLQ	BLQ	BLQ
	MAY 2024	58.2	64.3	60.7	38.2	42.6	40	15.1	15.8	15.4	17.1	18.3	17.5	BLQ	BLQ	BLQ
	JUN 2024	49	52.6	50	27.5	30.5	28.9	11.8	13.5	12.6	13.9	15.9	14.8	BLQ	BLQ	BLQ
	JUL 2024	44.7	46.8	45.8	22.1	23.9	23	11.2	13.2	12.1	13.2	15.6	14.3	BLQ	BLQ	BLQ
	AUG 2024	43.1	43.7	43.4	21.1	21.9	21.5	10.9	11.6	11.3	12.9	13.8	13.3	BLQ	BLQ	BLQ
	SEP 2024	44.2	44.9	44.6	21.9	22.8	22.3	11.3	11.8	11.6	13.5	14.1	13.7	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

Table-4: Ambient Air Quality Monitoring at Hejmady Village for the period of April 2024 to Sep 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)	APR 2024	56.2	56.9	56.5	42.5	44.9	43.9	14.2	14.9	14.7	17.4	18.2	17.8	BLQ	BLQ	BLQ
	MAY 2024	54.1	57.6	55.7	41.3	44.7	42.5	14	14.9	14.4	17	17.9	17.4	BLQ	BLQ	BLQ
	JUN 2024	44.3	45.8	45.2	32.1	34.5	33.3	12.3	12.6	12.5	15	15.6	15.3	BLQ	BLQ	BLQ
	JUL 2024	39.8	41.6	40.5	22.1	23.8	23	11.6	12.3	12.1	14.2	15.2	14.9	BLQ	BLQ	BLQ
	AUG 2024	38.9	39.7	39.4	21	21.8	21.4	11.1	11.9	11.5	13	13.9	13.4	BLQ	BLQ	BLQ
	SEP 2024	40.2	40.9	40.6	22.2	22.9	22.6	11.5	12.2	11.9	13.6	14.5	14.1	BLQ	BLQ	BLQ

Table-5: Ambient Air Quality Monitoring at Baikampady Village for the period of April 2024 to Sep 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)	APR 2024	60.5	61.8	61.2	40.4	41.7	41	19.2	19.9	19.6	25.5	26	25.7	BLQ	BLQ	BLQ
	MAY 2024	58.3	62.4	60	38.2	42.5	40.0	19.1	19.8	19.4	25	25.9	25.4	BLQ	BLQ	BLQ
	JUN 2024	49.6	51.6	50.6	30.1	31.4	30.7	15.6	16.8	16.2	20.6	21.6	21.1	BLQ	BLQ	BLQ
	JUL 2024	43.1	44.8	43.9	21.1	22.8	22.2	15	16.5	15.7	18.5	19.7	19.3	BLQ	BLQ	BLQ
	AUG 2024	42.1	42.9	42.5	20	20.7	20.3	14.2	15.7	15.1	17.1	17.6	17.3	BLQ	BLQ	BLQ
	SEP 2024	43.1	43.9	43.5	21.3	21.8	21.6	15.2	15.8	15.5	17.4	17.9	17.7	BLQ	BLQ	BLQ

Table-6: Ambient Air Quality Monitoring at Paradka Village for the period of April 2024 to Sep 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)	APR 2024	54.30	55.1	54.7	32.4	33.3	32.7	14.2	14.7	14.5	16.4	16.9	16.7	BLQ	BLQ	BLQ
	MAY 2024	52.10	56.7	54.1	30.1	34.6	32.0	14.0	14.9	14.4	16.0	17.0	16.5	BLQ	BLQ	BLQ
	JUN 2024	42.4	46.6	44.6	20.2	24.6	22.6	11.0	11.8	11.4	13.0	13.8	13.4	BLQ	BLQ	BLQ
	JUL 2024	41.0	42.8	42	19.6	21.9	20.8	10.2	11.4	10.9	12.3	13.4	12.9	BLQ	BLQ	BLQ
	AUG 2024	40.1	40.8	40.4	19.1	19.8	19.5	10.1	10.9	10.5	12.1	13.1	12.5	BLQ	BLQ	BLQ
	SEP 2024	41.2	41.9	41.5	19.9	20.7	20.3	10.5	11.2	10.8	12.3	12.9	12.7	BLQ	BLQ	BLQ

[BLQ-Below Limit of Quantification]

Table-7: Ambient Air Quality Monitoring at Mudarangadi Village for the period of April 2024 to Sep 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)	APR 2024	56.1	58.1	57.2	33.6	34.9	34.4	13.6	14.0	13.8	16.6	17.3	16.9	BLQ	BLQ	BLQ
	MAY 2024	54.2	58.9	56	32.1	35.4	33.5	13.1	14.3	13.6	16.2	16.9	16.6	BLQ	BLQ	BLQ
	JUN 2024	44.3	48.9	46.5	22.9	25.4	24.3	11.1	11.5	11.3	13.4	13.9	13.6	BLQ	BLQ	BLQ
	JUL 2024	41.1	42.9	42.0	20.2	21.6	21.0	10.1	11.1	10.7	12.6	13.6	13.2	BLQ	BLQ	BLQ
	AUG 2024	40.1	40.8	40.5	19.1	19.7	19.4	10.0	10.7	10.4	12.1	12.7	12.4	BLQ	BLQ	BLQ
	SEP 2024	41.3	41.9	41.6	20.1	20.8	20.5	10.4	10.9	10.7	12.4	12.9	12.6	BLQ	BLQ	BLQ

Table-8: Ambient Air Quality Monitoring at Adani Pump House for the period of April 2024 to Sep 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)	APR 2024	52.6	53.9	53.3	36.3	37.9	37.4	14.5	15.3	14.8	16.5	16.9	16.7	BLQ	BLQ	BLQ
	MAY 2024	51.1	54.4	52.4	35.1	38.6	36.8	14.1	15.1	14.5	16.2	16.9	16.5	BLQ	BLQ	BLQ
	JUN 2024	41.2	43.3	42	25.4	28.5	26.7	12.1	12.8	12.4	14.2	14.9	14.5	BLQ	BLQ	BLQ
	JUL 2024	38.6	39.7	39.3	21.2	22.7	22.1	11.1	12.1	11.6	13.1	14.2	13.7	BLQ	BLQ	BLQ
	AUG 2024	37.1	37.7	37.4	20.2	20.7	20.4	10.1	10.8	10.5	12	12.7	12.4	BLQ	BLQ	BLQ
	SEP 2024	38.2	38.9	38.6	21.1	21.7	21.4	10.4	11.1	10.7	12.3	12.9	12.6	BLQ	BLQ	BLQ

Table-9: Ambient Air Quality Monitoring at Near Ash Pond for the period of April 2024 to Sep 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)	APR 2024	54.2	55.9	55.3	43.2	45.7	44.7	14.2	15.2	14.6	16.2	17.5	16.7	BLQ	BLQ	BLQ
	MAY 2024	52.6	56.9	54.7	42.4	46.4	44.1	13.8	14.9	14.4	15.1	16.9	16	BLQ	BLQ	BLQ
	JUN 2024	42.6	46.9	44.8	32.4	36.4	34.2	11.1	12.5	11.7	14.1	14.9	14.5	BLQ	BLQ	BLQ
	JUL 2024	38	41.8	40.1	22.1	25.9	23.7	10.8	12.0	11.3	13.7	14.6	14.1	BLQ	BLQ	BLQ
	AUG 2024	37.1	38.9	38	21.1	21.9	21.5	10.2	11.8	11	13.1	14.2	13.5	BLQ	BLQ	BLQ
	SEP 2024	39.1	39.9	39.5	22.1	22.9	22.5	11.0	11.8	11.4	13.3	14.4	13.8	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 April 2024 to September 2024 are as Table-1 below.

Table-1: Stack monitoring report for the period of April 2024 to September 2024

Stack	Parameters	Apr-24		May-24		Jun-24		Jul-24		Aug-24		Sep-24	
		11.04.24	24.04.24	14.05.2024	29.05.2024	15.06.2024	28.06.2024	09.07.2024	26.07.2024	08.08.2024		20.09.24	
Boiler-I	Particulate Matter (mg/Nm³)	45.20	46.10	44.70	43.60	27.30	28.70	42.60	27.60	38.20	SD	39.60	SD
	SO2 (mg/Nm³)	471.10	454.20	477.70	460.30	295.80	316.20	426.30	311.60	325.60		410.20	
	NOx (mg/Nm³)	183.20	172.40	177.50	177.51	115.10	126.80	181.10	119.10	165.50		149.10	
	Mercury mg/Nm³)	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ		BLQ	
	Flue Gas Velocity (m/s)	24.40	24.20	24.80	23.30	23.50	23.50	26.20	25.0	24.40		27.10	
	Flow Rate (Nm³/hr)	2297601.56	2290454.75	2366358.82	2199632.47	2216615.74	2253088	2511953.06	2404078.63	2339376.14		2451772.03	
Boiler-II	Particulate Matter (mg/Nm³)	43.6	45.2	43.9	41.2	SD				42.5	SD	SD	SD
	SO2 (mg/Nm³)	490.3	468.2	469.9	453.2					347.4			
	NOx (mg/Nm³)	189	183.4	173.4	171.4					171.6			
	Mercury (mg/Nm³)	BLQ	BLQ	BLQ	BLQ					BLQ			
	Flue Gas Velocity (m/s)	24.2	24.4	24.55	23.00					24.7			
	Flow Rate (Nm³/hr)	2302261.22	2321288.17	2354673.25	2193753.52					2355900.51			

Note: SD = Shut down, BLQ = Below Limit of Quantification

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 April 2024 to September 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 April 2024 to September 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024
1	Color	Hazen	5	15	BLQ	1	BLQ	1	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.81	6.9	6.97	6.92	7.51	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	1.2	1.4	1.4	1.3	4	0.8
6	TDS	mg/l	500	2000	57	83	69	72	72.8	81
7	Alkalinity as $CaCO_3$	mg/l	200	600	20	42	56.75	28.11	36	31.22
8	Total Hardness	mg/l	200	600	18	24	32.38	27.88	24	23.9
9	Calcium as Ca	mg/l	75	200	4.01	6.41	6.48	6.38	6.41	4.78
10	Magnesium as Mg	mg/l	30	100	1.94	1.94	3.93	2.9	1.94	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	0.16	0.25	0.24	0.24	0.25	0.24
12	Sulphate as SO_4	mg/l	200	400	8.12	11.2	3.23	9.44	4.67	8.14
13	Chloride as Cl	mg/l	250	1000	13.62	11.87	11.8	15.92	15.92	19.82
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	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	1.78	BLQ	BLQ	BLQ	BLQ	BLQ
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 April 2024 to September 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	1	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.91	6.95	6.84	7.04	6.96	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	1.2	1.3	1.2	BLQ	0.9
6	TDS	mg/l	500	2000	74	105	94	58	54	91
7	Alkalinity as $CaCO_3$	mg/l	200	600	48	60	74.22	32.12	36	53.52
8	Total Hardness	mg/l	200	600	14	70	76.91	43.82	40	51.79
9	Calcium as Ca	mg/l	75	200	3.2	20.84	21.09	11.17	12.82	14.36
10	Magnesium as Mg	mg/l	30	100	1.45	4.37	5.9	3.87	1.94	3.87
11	Iron as Fe	mg/l	0.3	No relaxation	0.19	0.21	0.26	0.26	0.22	0.21
12	Sulphate as SO_4	mg/l	200	400	8.06	84	4.06	4.91	2.31	9.51
13	Chloride as Cl	mg/l	250	1000	10.88	5.93	7.87	5.97	7.96	13.87
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	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	1.69	BLQ	1.68	BLQ	BLQ	BLQ
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 April 2024 to September 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024
1	Color	Hazen	5	15	B LQ	BLQ	BLQ	1	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.03	6.88	6.85	6.95	6.92	6.9
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	B LQ	1	1.2	1.4	1.4	0.7
6	TDS	mg/l	500	2000	94	154	120	150	147	98
7	Alkalinity as $CaCO_3$	mg/l	200	600	42	20	8.73	8.03	13.5	17.84
8	Total Hardness	mg/l	200	600	46	65	65.6	75.3	76	63.3
9	Calcium as Ca	mg/l	75	200	9.61	16.08	45.42	14.7	8.4	16.3
10	Magnesium as Mg	mg/l	30	100	5.34	4.58	12.78	5.48	1.74	6.1
11	Iron as Fe	mg/l	0.3	No relaxation	0.16	0.23	0.21	0.24	0.27	0.25
12	Sulphate as SO_4	mg/l	200	400	10.26	9.7	12.09	3.15	3.51	8.35
13	Chloride as Cl	mg/l	250	1000	19.79	16.2	21.7	13.7	13.7	17.48
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	1.41	0.41	BLQ	BLQ	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 April 2024 to September 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	1	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.92	6.82	6.82	6.96	6.87	6.86
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	1.1	1.6	1.4	1.4	0.9	1.5
6	TDS	mg/l	500	2000	41	163	180	44	30	43
7	Alkalinity as $CaCO_3$	mg/l	200	600	9	80	104.78	23.9	13.5	17.84
8	Total Hardness	mg/l	200	600	11	55	56.67	27.88	16	23.9
9	Calcium as Ca	mg/l	75	200	2.4	14.03	16.22	7.98	3.2	6.38
10	Magnesium as Mg	mg/l	30	100	1.22	4.86	3.93	1.93	1.94	1.93
11	Iron as Fe	mg/l	0.3	No relaxation	0.14	0.2	0.18	0.25	0.22	0.24
12	Sulphate as SO_4	mg/l	200	400	4.85	10.6	28.42	3.82	3.86	4.53
13	Chloride as Cl	mg/l	250	1000	9.41	14.84	13.77	7.96	7.96	15.85
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	0.01	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	1.78	BLQ	BLQ	BLQ	BLQ	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 April'2024 to September'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 April'2024 to September'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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.98	7.85	7.19	7.16	6.98	7.23
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	1.6	1.5	1.1	1	1.9	0.8
6	TDS	mg/l	500	2000	79	165	150	59	44	51
7	Alkalinity as $CaCO_3$	mg/l	200	600	14	60	39.29	12.09	13.5	15.93
8	Total Hardness	mg/l	200	600	26	62	96.2	20.08	20	15.93
9	Calcium as Ca	mg/l	75	200	5.61	18.96	16.5	3.21	4.08	4.79
10	Magnesium as Mg	mg/l	30	100	2.91	12.15	7.88	2.92	1.94	BLQ
11	Iron as Fe	mg/l	0.3	No relaxation	0.16	0.21	0.26	0.23	0.26	0.26
12	Sulphate as SO_4	mg/l	200	400	1.56	8.17	14.25	6.12	5.31	7.35
13	Chloride as Cl	mg/l	250	1000	32.66	26.03	42.29	19.99	13.93	19.82
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	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	1.04	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	<2	<2	<2

Note: BLQ- Below Level of Quantification

Table-2: Water Quality Monitoring carried out in Pangala River (SW-2) for the period April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.81	6.91	7.18	7.1	6.88	6.95
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	1.2	1.2	1.2	1.2	0.8	0.3
6	TDS	mg/l	500	2000	33	53	76	27	26.8	29
7	Alkalinity as $CaCO_3$	mg/l	200	600	10	23	52.2	8.06	9	7.96
8	Total Hardness	mg/l	200	600	13	20	52.41	12.04	12	11.95
9	Calcium as Ca	mg/l	75	200	2.81	4.41	17.7	3.21	3.2	3.19
10	Magnesium as Mg	mg/l	30	100	1.46	2.18	1.95	BLQ	BLQ	BLQ
11	Iron as Fe	mg/l	0.3	No relaxation	0.075	0.22	0.27	0.21	0.22	0.24
12	Sulphate as SO_4	mg/l	200	400	BLQ	1.35	4.6	1.27	2.14	2.35
13	Chloride as Cl	mg/l	250	1000	10.39	9.4	11.99	7.99	9.95	11.89
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	0.05	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	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	<2	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.91	6.81	6.82	7.18	7.56	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	BLQ	BLQ	BLQ	0.4	0.1	0.2
6	TDS	mg/l	500	2000	32	78	70	75	54.8	38
7	Alkalinity as $CaCO_3$	mg/l	200	600	12	20	17.46	44.35	31.5	17.84
8	Total Hardness	mg/l	200	600	11	26	32.38	48.19	32	19.92
9	Calcium as Ca	mg/l	75	200	2.4	5.61	6.48	16.09	8.01	4.78
10	Magnesium as Mg	mg/l	30	100	1.22	2.91	3.93	1.95	2.91	1.93
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	BLQ	0.14	0.16	0.21	0.21
12	Sulphate as SO_4	mg/l	200	400	1.34	4.2	1.41	2.71	2.65	4.07
13	Chloride as Cl	mg/l	250	1000	18.8	16.83	19.68	9.99	9.95	9.91
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	1.26	12.96	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.16	6.89	6.91	7.12	7.17	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	1.4	BLQ	BLQ	BLQ	BLQ	0.6
6	TDS	mg/l	500	2000	62	47	56	58	42.8	30
7	Alkalinity as $CaCO_3$	mg/l	200	600	36	14	8.73	16.12	4.5	4.46
8	Total Hardness	mg/l	200	600	46	13	28.33	32.12	20	15.93
9	Calcium as Ca	mg/l	75	200	8.81	3.2	4.86	8.04	3.2	3.19
10	Magnesium as Mg	mg/l	30	100	4.86	1.2	3.93	2.92	2.91	1.93
11	Iron as Fe	mg/l	0.3	No relaxation	0.16	BLQ	0.19	0.2	0.18	0.24
12	Sulphate as SO_4	mg/l	200	400	1.47	1.15	1.3	2.46	2.84	4.83
13	Chloride as Cl	mg/l	250	1000	11.38	9.4	25.58	13.99	15.92	11.89
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	0.05	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	1.56	3.98	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.95	6.91	7.63	7.2	7.1	7.92
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	BLQ	BLQ	1	1.3	0.3	1.2
6	TDS	mg/l	500	2000	131	92	110	130	160	170
7	Alkalinity as $CaCO_3$	mg/l	200	600	64	34	16.5	48.38	81	75.82
8	Total Hardness	mg/l	200	600	70	50	23.84	72.28	88	91.63
9	Calcium as Ca	mg/l	75	200	14.42	17.63	5.29	20.92	30.46	28.74
10	Magnesium as Mg	mg/l	30	100	8.26	1.46	8.2	4.87	2.91	4.84
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	BLQ	0.26	0.23	0.23	0.22
12	Sulphate as SO_4	mg/l	200	400	12.63	8.31	2.46	4.95	5.54	14.33
13	Chloride as Cl	mg/l	250	1000	23.75	15.84	26.73	27.99	19.9	25.77
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	2.63	2.91	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.92	6.82	6.79	7.1	7.83	7.15
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	0.2	BLQ	0.2	BLQ
6	TDS	mg/l	500	2000	123	91	44.8	41	94.8	200
7	Alkalinity as $CaCO_3$	mg/l	200	600	58	54	28.11	12.09	45	93.66
8	Total Hardness	mg/l	200	600	66	44	32.25	28.11	48	111.55
9	Calcium as Ca	mg/l	75	200	13.62	15.23	8.08	4.82	16.03	39.91
10	Magnesium as Mg	mg/l	30	100	7.78	1.46	2.93	3.9	1.94	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	0.094	0.18	0.17	0.22	0.23
12	Sulphate as SO_4	mg/l	200	400	11.26	4.5	BLQ	BLQ	4.67	17.02
13	Chloride as Cl	mg/l	250	1000	22.76	13.85	9.99	17.99	19.9	15.85
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	1.96	2.83	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.81	6.91	7.3	7.47	7.15	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	1.5	1.4	1.2	1.1	0.2	0.9
6	TDS	mg/l	500	2000	135	105	190	54	54	52
7	Alkalinity as $CaCO_3$	mg/l	200	600	44	42	60.24	28.22	22.5	26.76
8	Total Hardness	mg/l	200	600	58	44	116.93	32.12	32	31.87
9	Calcium as Ca	mg/l	75	200	15.23	14.43	25.85	9.65	9.61	9.57
10	Magnesium as Mg	mg/l	30	100	4.86	1.94	12.73	1.95	1.94	1.93
11	Iron as Fe	mg/l	0.3	No relaxation	0.176	0.21	0.24	0.24	0.22	0.24
12	Sulphate as SO4	mg/l	200	400	14.56	7.3	4.21	2.61	2.57	5.17
13	Chloride as Cl	mg/l	250	1000	41.57	21.77	11.99	9.99	9.95	13.87
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	0.23	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 NO3-N	mg/l	45	No relaxation	2.61	1.24	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.05	6.83	7.22	7.18	7.03	7.26
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	1.2	0.2	0.1	0.2	BLQ
6	TDS	mg/l	500	2000	127	179	230	230	220	220
7	Alkalinity as $CaCO_3$	mg/l	200	600	62	40	116.46	88.7	72	102.58
8	Total Hardness	mg/l	200	600	74	65	145.15	132.52	104	127.48
9	Calcium as Ca	mg/l	75	200	22.44	6.09	54.94	46.67	17.63	41.51
10	Magnesium as Mg	mg/l	30	100	8.75	2.15	1.96	3.9	14.58	5.8
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	0.16	0.14	0.19	0.23	0.28
12	Sulphate as SO_4	mg/l	200	400	12.56	6.2	21.2	22.55	19.5	16.9
13	Chloride as Cl	mg/l	250	1000	15.23	12.16	37.98	27.99	27.87	25.77
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	2.69	10.46	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.82	7.03	7.45	7.15	7.82	7.2
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	1.3	1.2	1.6	0.1	0.3	0.8
6	TDS	mg/l	500	2000	103	164	190	130	110	120
7	Alkalinity as $CaCO_3$	mg/l	200	600	46	90	80.32	72.28	63	66.9
8	Total Hardness	mg/l	200	600	70	60	100.8	80.32	60	75.69
9	Calcium as Ca	mg/l	75	200	15.23	10.08	33.94	24.14	20.84	23.95
10	Magnesium as Mg	mg/l	30	100	7.76	6.07	3.9	4.87	1.94	3.87
11	Iron as Fe	mg/l	0.3	No relaxation	0.15	0.11	0.26	0.2	0.22	0.23
12	Sulphate as SO_4	mg/l	200	400	7.11	5.5	23.34	15.5	9.99	10.96
13	Chloride as Cl	mg/l	250	1000	14.85	14.43	31.99	13.99	13.93	11.89
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	0.05	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	1.58	3.91	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.78	7.03	6.96	6.97	6.85	7.7
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	1.2	0.9	0.4	0.5	0.7
6	TDS	mg/l	500	2000	79	164	23	61	38	140
7	Alkalinity as $CaCO_3$	mg/l	200	600	45	90	8.03	16.12	22.5	57.98
8	Total Hardness	mg/l	200	600	58	60	16.13	28.11	24	71.72
9	Calcium as Ca	mg/l	75	200	12.02	10.08	3.23	8.04	6.41	20.75
10	Magnesium as Mg	mg/l	30	100	6.8	6.07	1.96	1.95	1.94	4.84
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	0.11	0.26	0.25	0.21	0.26
12	Sulphate as SO_4	mg/l	200	400	3.78	5.5	BLQ	BLQ	1.56	13.89
13	Chloride as Cl	mg/l	250	1000	11.87	14.43	11.99	13.99	9.95	21.8
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	2.17	3.91	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

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 April 2024 to Sep 2024

S.No	Parameters	Unit	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.95	6.94	6.97	7.1	7.05	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	BLQ	1.3	1.2	BLQ	0.2	BLQ
6	TDS	mg/l	500	2000	58	33	120	21	42	35
7	Alkalinity as $CaCO_3$	mg/l	200	600	26	8	4.36	4.03	9	13.38
8	Total Hardness	mg/l	200	600	42	9	79.3	12.04	12	27.88
9	Calcium as Ca	mg/l	75	200	8.81	1.6	16.78	3.21	3.2	4.78
10	Magnesium as Mg	mg/l	30	100	4.86	1.2	3.44	BLQ	BLQ	3.87
11	Iron as Fe	mg/l	0.3	No relaxation	BLQ	0.18	0.27	0.26	0.24	0.22
12	Sulphate as SO_4	mg/l	200	400	1.33	1.31	3.48	BLQ	2.33	3.52
13	Chloride as Cl	mg/l	250	1000	9.89	6.43	38.6	7.99	13.93	13.87
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	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	1.36	2.25	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	Absent	Absent	<2	<2

Note: BLQ- Below Level of Quantification

Guard Pond Effluent Water Monitoring

Annexure-I

Samples are collected and the monitoring values for the period of April 2024 to September 2024 are presented in Table as below:

S.N	Parameter	Limit	Unit	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Temperature	Not more than 5°C higher than intake sea water	°C	29.23	29.56	29.05	27.78	28.35	28.63
2	pH (at 25 °C)	5.5 – 9.0	-	7.49	7.46	7.72	7.47	7.32	7.21
3	Colour	-	-	1.00	BLQ	BLQ	1.00	1.00	1.00
4	Odour	-	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	Total Suspended Solids	Not more than 10% higher than intake sea water	mg/l	5.80	4.32	4.98	8.64	14.03	11.70
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	BLQ	BLQ	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	BLQ	BLQ	BLQ
16	Nitrate NO3-	20.0	Mg/l	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
17	Iron	3	mg/l	0.26	0.23	0.23	0.24	0.27	0.27

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 April 2024 to September 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 April 2024 to Sep 2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.81	6.94	6.93	6.98	6.79	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	1.8	1.5	1.2	1.3	1.2	0.8
6	TDS	mg/l	500	2000	82	104	88	71	160	85
7	Alkalinity as $CaCO_3$	mg/l	200	600	10	6	4.01	12.09	9	8.92
8	Total Hardness	mg/l	200	600	30	28	28.22	28.11	48	27.88
9	Calcium as Ca	mg/l	75	200	6.41	5.61	6.46	4.82	8.01	4.78
10	Magnesium as Mg	mg/l	30	100	3.4	3.4	2.93	3.9	6.8	3.87
11	Iron as Fe	mg/l	0.3	No relaxation	0.10	0.20	0.25	0.25	0.20	0.26
12	Sulphate as SO_4	mg/l	200	400	1.33	10.2	8.34	5.99	14.23	8.13
13	Chloride as Cl	mg/l	250	1000	35.63	18.67	37.98	21.89	53.75	25.77
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	1.11	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	4.69	2.18	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

BLQ - Below Limit of Quantification

Table-2: Pipeline Corridor Test Well (PC-2) for the period of April 2024 to Sep 2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.86	6.94	6.72	7.08	6.87	6.95
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	1.5	1.2	1.3	1.3	1.5	1
6	TDS	mg/l	500	2000	78	105	160	130	150	89
7	Alkalinity as $CaCO_3$	mg/l	200	600	9	30	24.1	36.28	15.3	12.3
8	Total Hardness	mg/l	200	600	28	70	47.8	72.28	85	46
9	Calcium as Ca	mg/l	75	200	5.61	8.06	16.16	17.7	8.56	7.56
10	Magnesium as Mg	mg/l	30	100	3.4	4.3	11.76	6.83	9.35	2.58
11	Iron as Fe	mg/l	0.3	No relaxation	0.061	0.24	0.24	0.26	0.24	0.25
12	Sulphate as SO_4	mg/l	200	400	1.58	4.1	7.25	15.83	18.8	7.4
13	Chloride as Cl	mg/l	250	1000	34.64	17.23	37.96	33.97	56.32	23.55
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	1.13	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	4.58	3.15	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

BLQ - Below Limit of Quantification

Table-3: Pipeline Corridor Test Well (PC-3) for the period of April 2024 to Sep 2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.13	6.87	6.92	6.97	7.64	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	0.9	1.3	1.2	1.2	0.6	0.8
6	TDS	mg/l	500	2000	86	96	180	190	62.8	57
7	Alkalinity as $CaCO_3$	mg/l	200	600	12	BLQ	4.02	4.03	27	8.92
8	Total Hardness	mg/l	200	600	34	55	52.42	48.19	32	23.9
9	Calcium as Ca	mg/l	75	200	7.21	12.02	9.69	9.65	9.61	4.78
10	Magnesium as Mg	mg/l	30	100	3.88	6.07	6.85	5.85	1.94	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	0.056	0.22	0.23	0.25	0.25	0.26
12	Sulphate as SO_4	mg/l	200	400	1.56	5.5	8.25	15.54	9.58	7.97
13	Chloride as Cl	mg/l	250	1000	35.63	18.65	35.97	31.97	11.94	17.84
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	1.1	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	4.89	2.32	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

BLQ - Below Limit of Quantification

Table-4: Pipeline Corridor Test Well (PC-4) for the period of April 2023 to Sep 2023

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.91	6.98	7.11	7.37	7.43	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	1.3	1.2	1.2	1.7	0.2	0.7
6	TDS	mg/l	500	2000	85	101	80	71	46	56
7	Alkalinity as $CaCO_3$	mg/l	200	600	12	52	36.14	36.28	22.5	4.46
8	Total Hardness	mg/l	200	600	30	64	56.45	44.17	24	27.88
9	Calcium as Ca	mg/l	75	200	6.41	9.84	14.54	12.87	6.41	6.38
10	Magnesium as Mg	mg/l	30	100	3.4	2.91	4.89	2.92	1.94	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	0.096	0.16	0.27	0.25	0.22	0.2
12	Sulphate as SO_4	mg/l	200	400	1.47	11.5	9.11	8.29	5.49	7.38
13	Chloride as Cl	mg/l	250	1000	36.62	2.91	11.99	9.99	11.94	15.85
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	1.17	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	5.16	2.17	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

A – Agreeable; BLQ – Below Limit of Quantification

Table-5: Pipeline Corridor Test Well (PC-5) for the period of April 2024 to Sep 2024

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	7.03	6.95	7.04	7.12	6.82	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	1.3	1.5	1.3	0.9	1.2	0.6
6	TDS	mg/l	500	2000	91	115	100	110	80	70
7	Alkalinity as $CaCO_3$	mg/l	200	600	13	75	56.22	56.44	9	8.92
8	Total Hardness	mg/l	200	600	34	50	52.42	76.3	32	19.92
9	Calcium as Ca	mg/l	75	200	7.21	14.03	12.93	24.14	6.41	3.19
10	Magnesium as Mg	mg/l	30	100	3.89	3.64	4.89	3.9	3.88	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	0.14	0.26	0.26	0.24	0.22	0.22
12	Sulphate as SO_4	mg/l	200	400	1.83	14.1	5.83	4.45	3.46	7.16
13	Chloride as Cl	mg/l	250	1000	35.63	14.85	17.99	23.99	29.86	23.78
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	7.2	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	6.14	2.11	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

BLQ - Below Limit of Quantification

Table-6: Pipeline Corridor Test Well (PC-6) for the period of April 2023 to Sep 2023

S.No	PARAMETERS	UNIT	Acceptable Limits as per IS:10500:2012	Permissible Limits as per IS:10500:2012	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
1	Color	Hazen	5	15	BLQ	BLQ	BLQ	BLQ	BLQ	BLQ
2	pH	-	6.5 - 8.5	No Relaxation	6.92	6.98	7.2	6.95	6.97	6.93
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	1.1	1.1	1.4	0.8	1.1	1.8
6	TDS	mg/l	500	2000	78	114	160	180	120	63
7	Alkalinity as $CaCO_3$	mg/l	200	600	7	60	32.4	8.06	72	4.46
8	Total Hardness	mg/l	200	600	24	70	47.3	72.28	56	23.9
9	Calcium as Ca	mg/l	75	200	4.8	14.3	17.2	12.87	12.82	4.78
10	Magnesium as Mg	mg/l	30	100	2.92	5.89	9.19	9.75	5.83	2.9
11	Iron as Fe	mg/l	0.3	No relaxation	0.15	0.21	0.2	0.26	0.26	0.24
12	Sulphate as SO_4	mg/l	200	400	1.26	8.41	BLQ (LOQ 1)	2	2.67	7
13	Chloride as Cl	mg/l	250	1000	35.63	20.39	41.5	39.97	13.93	19.82
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	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	5	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	3.47	1.31	BLQ	BLQ	BLQ	BLQ
29	E.Coli	MPN/ 100 ml	Should Not be Detectable		Absent	Absent	<2	Absent	<2	<2

BLQ - Below Limit of Quantification

COASTAL WATER QUALITY MONITORING NEAR THE APL UDUPI THERMAL POWER PLANT SEA WATER INTAKE AND EFFLUENT DISCHARGE POINT OFF PADUBIDRI, UDUPI DISTRICT, KARNATAKA

Submitted to:

APL UDUPI THERMAL POWER PLANT
Kolachure, Yelluru village,
Pilar post, Padubidri, Udupi – 574 138

Prepared by:

DEPARTMENT OF AQUATIC ENVIRONMENT MANAGEMENT
KARNATAKA VETERINARY, ANIMAL AND FISHERIES SCIENCES UNIVERSITY

COLLEGE OF FISHERIES, MANGALORE – 575 002.

April, 2024

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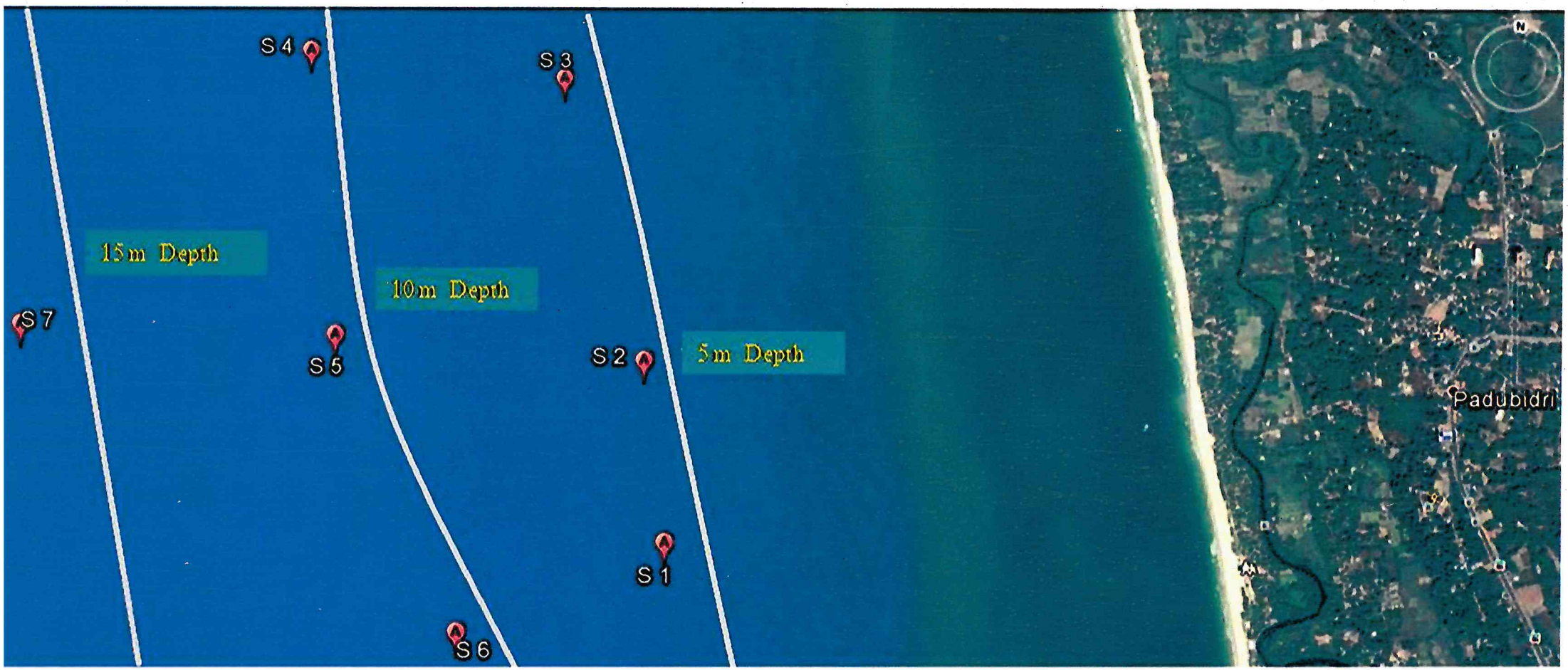

Fig 1. Location of sampling stations off Padubidri

Introduction:

The Adani Power Limited. (APL) 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 April, 2024 is provided in this report.

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

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (°C)	S	31.50	31.50	31.40	31.50	31.30	31.60	31.40
		SS	31.60	31.40	31.30	31.40	31.20	31.50	31.50
2	pH	S	7.78	7.84	7.69	7.51	7.91	7.84	7.81
		SS	7.45	7.71	7.65	7.43	7.82	7.62	7.49
3	Salinity (psu)	S	33.75	33.25	33.69	33.00	34.75	33.81	34.13
		SS	33.38	33.06	33.13	32.38	33.88	33.50	33.38
4	Dissolved Oxygen (mg/l)	S	4.80	6.00	4.40	4.00	6.80	5.60	5.20
		SS	7.20	6.40	6.80	5.60	6.00	7.20	6.40
5	BOD_3 at 27 °C	S	-	1.60	-	-	1.60	-	1.20
		SS		2.0			2.00		1.60
6	COD (mg/l)	S	-	13	-	-	12	-	16
		SS		10			11		14
7	Transparency (m)		2.32	2.15	2.19	1.89	1.95	1.97	2.10
8	Total Suspended Solids (mg/l)		-	360	-	-	460	-	440
9	Total Dissolved Solids (mg/l)		-	49200	-	-	47600	-	48200
10	Ammonia (µg-at/l)	S	2.161	4.409	1.815	3.544	2.334	1.902	2.853
		SS	2.075	0.951	3.112	1.556	3.458	2.421	1.643
11	Nitrite (µg-at/l)	S	1.285	0.904	1.094	1.071	0.928	0.856	0.975
		SS	1.118	0.785	0.999	0.975	0.856	0.809	0.928
12	Nitrate (µg-at/l)	S	1.761	1.451	1.951	1.713	1.547	1.285	1.404
		SS	1.927	1.737	2.165	1.927	1.737	1.451	1.594
13	Phosphate (µg-at/l)	S	1.767	2.070	2.424	2.575	2.171	2.474	2.626
		SS	1.919	2.323	2.878	3.181	2.474	2.828	3.181
14	Silicate (µg-at/l)	S	9.438	10.648	11.253	12.342	12.947	13.552	14.278
		SS	12.826	13.794	15.488	14.762	14.883	12.705	14.036
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 April, 2024

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1100	900	1500
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	-	1400	1600
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	1300	-	2200
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	1800	1200	2100
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. perlagica*	-	-	1100
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1300	1600	2300
	b. *C. decipiens*	-	1100	1900
	c. *C. compressus*	1500	-	1000
	d. *C. curvisetus*	-	-	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	7800	13200	16100
	b. *C. lineatus*	3500	4600	1200
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	-	2100	2300
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	6800	4700	3600
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	3000	2400	3200
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	5600	8000	10500
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	7400	8100	9300
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	2100	5400	3600
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	1500	-	-
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	1700	3600	2400
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	2600	-	-
	b. Others	-	-	-
17	*Nitzschia*			
	a. *N. closterium*	4500	6100	2400
	b. *N. striata*	-	-	1500
	c. *N. longissima*	800	-	1100
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1400	2600	4500
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	2400	3800	5600
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	700	1200	900
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	-	-	1000
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	1400	2300	-
	b. Others	-	-	-
22	*Staurastrum* sp.	-	2000	1800
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	3100	2400	3600
	b. *T. longissima*	-	2900	5100
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	1500	3000	1100
	b. *T. favus*	1300	-	-
	c. Others	-	-	-
26	*Diatoma*			

	a. Diatoma vulgare	-	4800	4200
	b. Other diatoms	-	-	-
II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	8900	9900	13200
	b. *C. fusus*	-	-	3500
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	2100	-	3400
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	800	-	1100
	b. *G. rhombodes*	-	2600	1300
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	1200	-	1600
	b. *P. divergens*	-	-	-
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	-	-
6	*Preperidinium*	-	2800	3100
7	*Noctiluca*			
	a. *N. Scintillans*	1500	1900	900
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	2700	6900	5100
Biomass [wet weight - mg/m^3]		**295.11**	**302.16**	**341.12**

-: Absent

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

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	3200	-	4700
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	2600	1500	1100
2	**Radiolarians**	1800	1100	1400
3	**Medusae**			
	a. *Obelia* sp.	4700	1200	6400
	b. *Octocostatum* sp.	-	-	-
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	4800	3100	2400
5	**Ctenophores**			
	a. *Plurobranchia* sp.	2700	2000	1900
6	**Chaetognaths**			
	a. Sagitta enflata	2100	4900	3400
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	3000	1500	4100
7	**Polychaetes**	4900	2600	-
8	**Cladocerans**			
	a. *Penilia avirostris*	3200	-	1800
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finAprilicus*	1800	2900	3100
	b. *Tamora longicornis*	3100	4800	2500
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	1800	3200	2600
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	1500	-	-
12	**Planktonic Urochordates**			
	a. *Frililaria* sp.	2300	3000	2400
	b. *Oikopleura* sp.	800	1900	3600
	c. *Doliolom* sp.	2900	-	-
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	1600	3200	-
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	-	500	600
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	1100	800	1000
20	**Chaetognath Larvae**	1300	1800	900
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**326.55**	**328.21**	**346.23**

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

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	26	31	29
2	*Anadora* sp.	21	34	25
3	Bivalve Spats	13	15	23
4	*Cardium* sp.	26	-	-
5	*Donax* sp.	19	16	23
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	21	28	34
8	*Perna* sp.	35	20	29
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	23	19	-
B	**Gastropods**			
1	*Babylonia* sp.	-	08	10
2	*Cavolinia* sp.	-	10	15
3	*Cerithedia* sp.	17	-	-
4	*Conus* sp.	12	-	23
5	*Oliva* sp.	-	-	-
6	*Patella* sp.	11	18	12
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	15	11	09
9	*Trochus* sp.	-	13	10
10	*Turitella* sp.	13	16	20
11	*Umbonium* sp.	-	-	-

C	**Scaphopods**			
1	*Dentalium* sp.	166	138	129
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	-	03	08
2	*Ophiocoma* sp.	21	11	16
3	*Holothuria* sp.	05	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	35	21	16
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	20	11	15
2	Shrimps	-	-	-
3	Fishes	-	-	-
4	Mud tubes	20	26	35
5	Sand tubes	18	13	-
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**537.00**	**462.00**	**465.00**

- : Absent

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

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 7.00 cms (Average)
3.	Weight of the Test Organism	: 9.00 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 April, 2024 are given below.

The water temperature varied from 31.20 to 31.60 °C. The pH values ranged between 7.43 and 7.91. The salinity varied from 33.06 to 34.75 PSU. The dissolved oxygen (DO) varied between 4.00 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 2.0 mg/l in the study region. The COD values ranged between 10.00 and 16.00 mg/l. The total suspended solids (TSS) ranged between 360.00 and 460.00 mg/l and the total dissolved solids (TDS) ranged between 47600 and 49200 mg/l. The transparency values varied from 1.89 to 2.32 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.7851 to 1.285 µg-at/l, while nitrate (NO_3-N) varied between 1.285 and 2.165 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 0.951 and 4.409 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 1.767 and 3.181 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 9.438 and 15.488 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 43 different genera with the abundance of *Coscinodiscus oculus iridis, Ceratium macroceros* and *Gyrosigma balticum.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 295.11 to 341.12 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 21 different groups of zooplankton. Among zooplankton, *Tintinopsis* sp., *Obelia* sp. and *Tamora longicornis* were dominant. The biomass ranged from 312.41 to 356.22 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 24 different groups of macrobenthos. *Dentalium* sp. dominated the macrobenthos, followed by *Arca* sp., *Perna* sp. and Polychaetes. The density ranged from 462.00 to 537.00 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

COASTAL WATER QUALITY MONITORING NEAR THE APL UDUPI THERMAL POWER PLANT SEA WATER INTAKE AND EFFLUENT DISCHARGE POINT OFF PADUBIDRI, UDUPI DISTRICT, KARNATAKA

Submitted to:

APL UDUPI THERMAL POWER PLANT
Kolachure, Yelluru village,
Pilar post, Padubidri, Udupi – 574 138

Prepared by:

DEPARTMENT OF AQUATIC ENVIRONMENT MANAGEMENT
KARNATAKA VETERINARY, ANIMAL AND FISHERIES SCIENCES UNIVERSITY

COLLEGE OF FISHERIES, MANGALORE – 575 002.

May, 2024

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Introduction:

The Adani Power Limited. (APL) 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 May, 2024 is provided in this report.

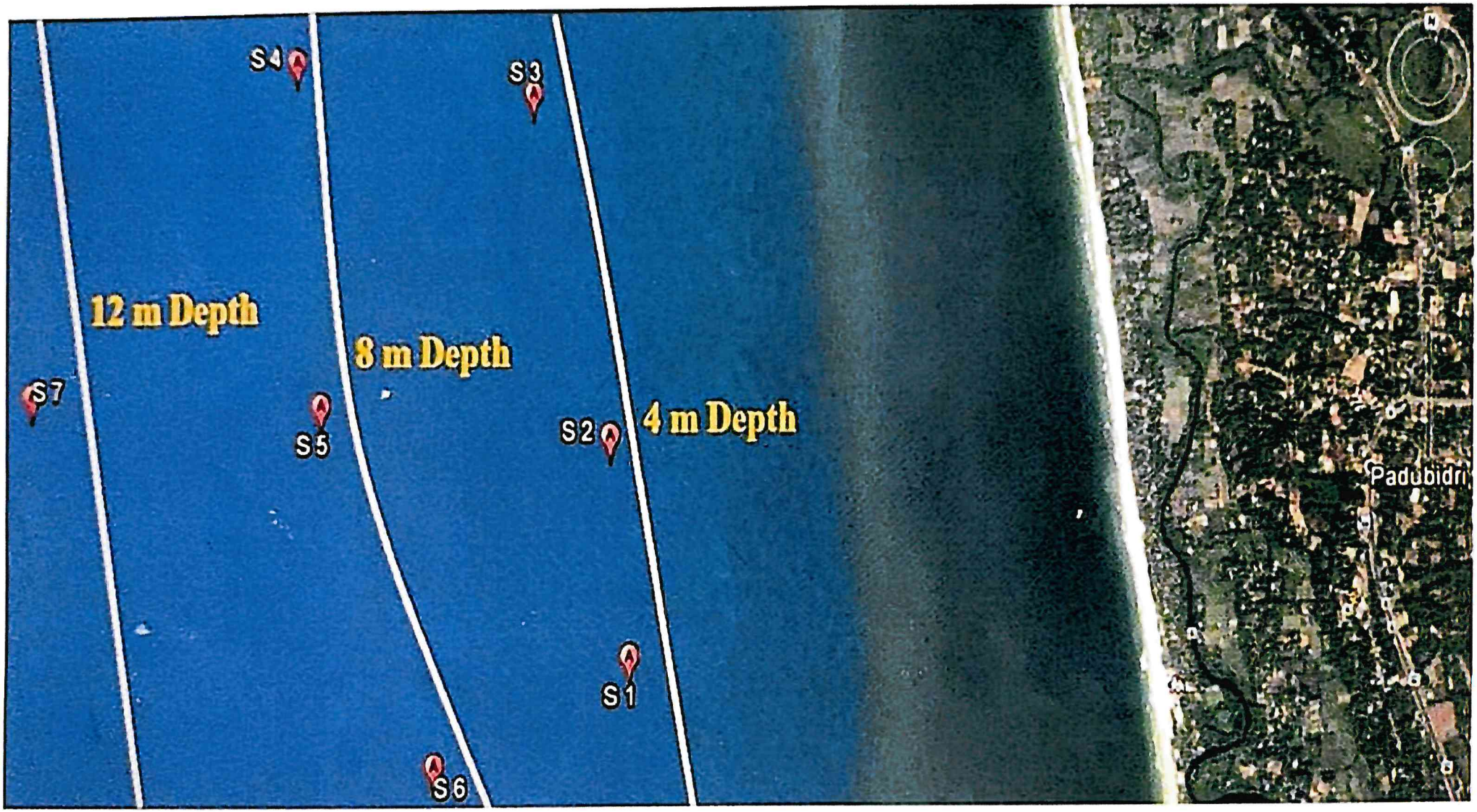

Fig 1. Location of sampling stations off Padubidri

Sampling GPS coordinates coastal waters off Padubidri			
S. No.	**Sampling Locations**	**Latitude**	**Longitude**
1	Pipeline north side Point 1	N 13° 09'55.99"	E 074° 45'13.56"
2	Pipeline north side Point 2	N 13° 09'59.74"	E 074° 45'12.63"
3	Pipeline north side Point 3	N 13° 09'51.84"	E 074° 45'14.27"
4	Sea pipe point	N 13° 09'50.57"	E 074° 45'14.36"
5	Pipeline south side Point 1	N 13° 09'47.31"	E 074° 45'15.60"
6	Pipeline south side Point 2	N 13° 09'42.91"	E 074° 45'16.71"

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

Sl. No.	Parameters		Stations						
			1	2	3	4	5	6	7
1	Water Temperature (°C)	S	33.00	32.60	33.40	32.80	32.30	32.80	32.40
		SS	33.10	32.80	33.80	32.90	32.50	32.90	32.60
2	pH	S	7.74	7.87	7.36	7.45	7.51	7.59	7.67
		SS	7.89	8.12	8.56	7.56	7.64	7.89	7.88
3	Salinity (psu)	S	32.88	32.13	32.50	33.25	33.81	34.31	34.56
		SS	33.31	32.56	33.06	33.69	34.50	34.75	34.94
4	Dissolved Oxygen (mg/l)	S	6.00	7.60	6.40	6.80	5.20	7.60	6.40
		SS	7.20	6.80	6.40	7.20	6.00	6.80	7.20
5	BOD_3 at 27 °C	S	-	2.40	-	-	1.60	-	1.60
		SS		1.6			1.20		2.00
6	COD (mg/l)	S	-	14	-	-	15	-	18
		SS		12			14		15
7	Transparency (m)		1.42	1.31	1.16	1.33	1.41	2.15	2.14
8	Total Suspended Solids (mg/l)		-	400	-	-	540	-	720
9	Total Dissolved Solids (mg/l)		-	52420	-	-	66640	-	43780
10	Ammonia (µg-at/l)	S	6.311	6.052	7.002	7.867	6.138	4.063	4.063
		SS	3.890	5.533	9.423	6.397	7.694	4.582	7.002
11	Nitrite (µg-at/l)	S	0.547	1.000	0.833	0.881	0.666	0.619	0.857
		SS	0.738	1.142	0.405	0.666	0.785	0.405	6.902
12	Nitrate (µg-at/l)	S	0.714	1.214	1.095	0.952	0.809	0.809	1.309
		SS	0.785	1.309	0.928	0.714	0.904	0.762	0.833
13	Phosphate (µg-at/l)	S	1.414	0.758	2.828	2.424	1.212	1.717	2.071
		SS	2.172	1.465	3.788	2.980	2.475	3.081	3.636
14	Silicate (µg-at/l)	S	35.332	33.275	45.980	40.414	35.453	32.065	30.976
		SS	28.919	31.097	36.058	25.773	33.638	16.698	50.820
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 May, 2024

Sl. No.	Flora	Depth (m)		
		4	8	12
I	**Diatoms**			
1	*Asterionella*			
	a. *A. japonica*	1200	1500	2000
	b. Others	-	-	-
2	*Bacteriastrum*			
	a. *B. varians*	1500	1900	-
	b. Others	-	-	-
3	*Biddulphia*			
	a. *Biddulphia regia*	2300	1400	1700
	b. *B.sinensis*	-	-	-
	c. *Biddulphia mobiliensis*	-	1900	1400
	d. Others	-	-	-
4	*Cerataulina*			
	a. *C. perlagica*	1100	1800	900
	b. Others	-	-	-
5	*Chaetoceros*			
	a. *C. lorenzianus*	1400	-	1100
	b. *C. decipiens*	-	1700	1400
	c. *C. compressus*	1000	-	1600
	d. *C. curvisetus*	-	1500	-
	e. Others	-	-	-
6	*Coscinodiscus*			
	a. *C. oculus iridis*	8600	14300	18000
	b. *C. lineatus*	2600	4900	5200
	c. *C. excentricus*	-	-	-
	d. Others	-	-	-
7	*Cyclotella*			
	a. *C. stelligera*	2900	-	-
	b. Others	-	-	-
8	*Dynobryon setularia*	-	-	-
9	*Ditylum*			
	a. *D. brightwelli*	7200	5800	4500
	b. Others	-	-	-
10	*Eucamphia*			
	a. *E. zoodiacus*	4700	2900	4300
	b. Others	-	-	-
11	*Fragillaria*			
	a. *F. oceanica*	11200	9100	8500
	b. Others	-	-	-
12	*Gyrosigma*			
	a. *G. balticum*	8900	7800	9500
	b. Others	-	-	-

13	*Lauderia*			
	a. *L. borealis*	2300	6500	4800
	b. Others	-	-	-
14	*Leptocylindricus*			
	a. *L. danicus*	2300	-	1500
	b. Others	-	-	-
15	*Melosira*			
	a. *M. monilifornas*	2100	3800	2600
	b. Others	-	-	-
16	*Navicula*			
	a. *N. longa*	3100	1700	1500
	b. Others	-	-	-
17	*Nitzschia*			
	a. *N. closterium*	5900	6700	3800
	b. *N. striata*	1000	-	1300
	c. *N. longissima*	2100	2900	1800
	d. Others	-	-	-
18	*Planktoniella*			
	a. *P. sol*	1400	2600	4500
	b. Others	-	-	-
19	*Pleurosigma*			
	a. *P. normanii*	2100	3000	4900
	b. *P. elongatum*	-	-	-
	c. Others	-	-	-
20	*Rhizosolenia*			
	a. *R. stolterfothii*	1600	2300	1700
	b. *R. shrubsolei*	-	-	-
	c. *R. stliformis*	1800	1000	1300
	d. Others	-	-	-
21	*Skeletonema*			
	a. *S. costatum*	2300	2900	5900
	b. Others	-	-	-
22	*Staurastrum* sp.	2600	4700	3000
23	*Streptotheca*			
	a. *S. thamensis*	-	-	-
	b. Others	-	-	-
24	*Thalassiothrix*			
	a. *T. decipiens*	4000	3800	5900
	b. *T. longissima*	1300	1400	4800
	c. Others	-	-	-
25	*Triceratium*			
	a. *T. reticulate*	2900	3400	1900
	b. *T. favus*	1300	-	1600
	c. Others	-	-	-
26	*Diatoma*			

	a. Diatoma vulgare	-	2300	1400
	b. Other diatoms	-	-	-
II	**Dinoflagellates**			
1	*Ceratium*			
	a. *C. macroceros*	9600	10800	15200
	b. *C. fusus*	-	8100	4800
	c. *C. longipes*	-	-	-
	d. others	-	-	-
2	*Dinophysis*			
	a. *D. acuta*	4800	-	6100
	b. Others	-	-	-
3	*Gymnodinium*			
	a. *G. splendens*	6100	-	2600
	b. *G. rhombodes*	-	2900	2100
	c. Others	-	-	-
4	*Ornithoceros magnificus*	-	-	-
5	*Peridinium*			
	a. *P. depressum*	1800	1600	1200
	b. *P. divergens*	-	-	-
	c. *P. granii*	-	-	-
	d. *P. excentricum*	-	-	-
	e. Others	-	-	-
6	*Preperidinium*	1800	3100	4700
7	*Noctiluca*			
	a. *N. Scintillans*	-	1100	-
	b. Others	-	-	-
III	**Blue green algae**			
1	Blue Green Algae	3400	4800	2300
Biomass [wet weight - mg/m^3]		**284.18**	**319.22**	**306.14**

-: Absent

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

Sl. No.	Fauna	Depth (m)		
		4	8	12
1	**Tintinids**			
	a. *Tintinopsis* sp.	2700	1500	2300
	b. *Rabdonella* sp.	-	-	-
	c. *Favella* sp.	1700	1900	1500
2	**Radiolarians**	2000	1000	1400
3	**Medusae**			
	a. *Obelia* sp.	3500	2300	4700
	b. *Octocostatum* sp.	-	-	-
	c. *Quadrata* sp.	-	-	-
4	**Siphonophores**			
	a. *Lensia* sp.	-	-	-
	b. *Diphysis* sp.	5100	3000	1400
5	**Ctenophores**			
	a. *Plurobranchia* sp.	1600	2300	3100
6	**Chaetognaths**			
	a. Sagitta enflata	2800	4100	1800
	b. *Pterosagitta draco*	-	-	-
	c. *Krohnitta subtilis*	-	-	3100
7	**Polychaetes**	5600	3100	1800
8	**Cladocerans**			
	a. *Penilia avirostris*	2600	-	2300
	b. *Evadnae nordmanni*	-	-	-
9	**Copepods**			
	a. *Calanus finMayicus*	1900	3000	2400
	b. *Tamora longicornis*	2300	5700	3200
	c. *Parapontella brevicornis*	-	-	-
	d. *Oithona helgolandica*	2500	3300	2800
10	**Copepod nauplius**	-	-	-
11	**Lucifer**	3200	-	1500
12	**Planktonic Urochordates**			
	a. *Frilillaria* sp.	2900	1000	3200
	b. *Oikopleura* sp.	2800	2000	1400
	c. *Doliolom* sp.	-	-	-
13	**Fish Eggs**	-	-	-
14	**Copepod egg**	-	900	-
15	**Echinoderm Larvae**	-	-	-
16	**Decapod Larvae**	-	-	-
17	**Bivalve Larvae**	100	800	300
18	**Fish Larvae**	-	-	-
19	**Polychaete Larvae**	2100	1900	3200
20	**Chaetognath Larvae**	3200	900	-
21	Others	-	-	-
Biomass [wet weight - mg/m^3]		**299.43**	**318.12**	**333.12**

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

Sl. No.	Fauna	Depth (m)		
		4	8	12
I	**Molluscs**			
A	**Bivalves**			
1	*Arca* sp.	32	16	11
2	*Anadora* sp.	16	24	-
3	Bivalve Spats	23	29	34
4	*Cardium* sp.	19	15	-
5	*Donax* sp.	29	36	37
6	*Katalysia* sp.	-	-	-
7	*Meritrix* sp.	14	23	18
8	*Perna* sp.	22	16	13
9	*Modiolus* sp.	-	-	-
10	*Pecten* sp.	14	19	18
B	**Gastropods**			
1	*Babylonia* sp.	-	13	-
2	*Cavolinia* sp.	-	13	11
3	*Cerithedia* sp.	14	-	08
4	*Conus* sp.	18	13	17
5	*Oliva* sp.	-	-	-
6	*Patella* sp.	10	22	18
7	*Surcula* sp.	-	-	-
8	*Telescopium* sp.	29	14	16
9	*Trochus* sp.	-	-	-
10	*Turitella* sp.	08	19	26
11	*Umbonium* sp.	-	-	-

C	**Scaphopods**			
1	*Dentalium* sp.	154	185	148
D	**Other Molluscs**	-	-	-
II	**Echinodermata**			
1	*Astropecten* sp.	05	10	11
2	*Ophiocoma* sp.	14	09	11
3	*Holothuria* sp.	-	-	-
III	**Echiuroids**	-	-	-
IV	**Sipunculids**	-	-	-
V	**Polychaetes**	42	31	18
VI	**Coelenterates**	-	-	-
VII	**Miscellaneous**			
1	Crabs	09	13	-
2	Shrimps	-	-	-
3	Fishes	-	-	-
4	Mud tubes	14	22	46
5	Sand tubes	16	29	24
6	Egg Cases	-	-	-
Density (Individuals/m^2)		**502.00**	**571.00**	**485.00**

- : Absent

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

1.	Organism Used for the Test	: *Perna viridis* (Green mussel)
2.	Length of the Test Organism	: 6.50 cms (Average)
3.	Weight of the Test Organism	: 7.80 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 May, 2024 are given below.

The water temperature varied from 32.50 to 33.80 °C. The pH values ranged between 7.36 and 8.56. The salinity varied from 32.13 to 34.94 PSU. The dissolved oxygen (DO) varied between 5.20 and 7.60 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 12.00 and 18.00 mg/l. The total suspended solids (TSS) ranged between 400.00 and 720.00 mg/l and the total dissolved solids (TDS) ranged between 43780 and 66640 mg/l. The transparency values varied from 1.16 to 2.14 m.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) varied from 0.405 to 1.142 µg-at/l, while nitrate (NO_3-N) varied between 0.714 and 1.309 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 3.890 and 9.423 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.758 and 3.788 µg-at/l. Silicate – Silicon (SiO_2-Si), one of the major nutrients for phytoplankton growth ranged between 16.698 and 50.820 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 43 different genera with the abundance of *Coscinodiscus oculus iridis, Ceratium macroceros* and *Fragillaria oceanica.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 284.18 to 319.22 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 20 different groups of zooplankton. Among zooplankton, *Tamora longicornis, Diphysis* sp. and Polychaetes were dominant. The biomass ranged from 299.43 to 333.12 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., Bivalve Spats and Polychaetes. The density ranged from 485.00 to 571.00 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

COASTAL WATER QUALITY MONITORING NEAR THE APL UDUPI THERMAL POWER PLANT SEA WATER INTAKE AND EFFLUENT DISCHARGE POINT OFF PADUBIDRI, UDUPI DISTRICT, KARNATAKA

Submitted to:

APL UDUPI THERMAL POWER PLANT
Kolachure, Yelluru village,
Pilar post, Padubidri, Udupi – 574 138

Prepared by:

DEPARTMENT OF AQUATIC ENVIRONMENT MANAGEMENT
KARNATAKA VETERINARY, ANIMAL AND FISHERIES SCIENCES UNIVERSITY

COLLEGE OF FISHERIES, MANGALORE – 575 002.

JUNE, 2024

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6	Inference	8

Introduction:

The M/s Adani Power Limited (APL) 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.

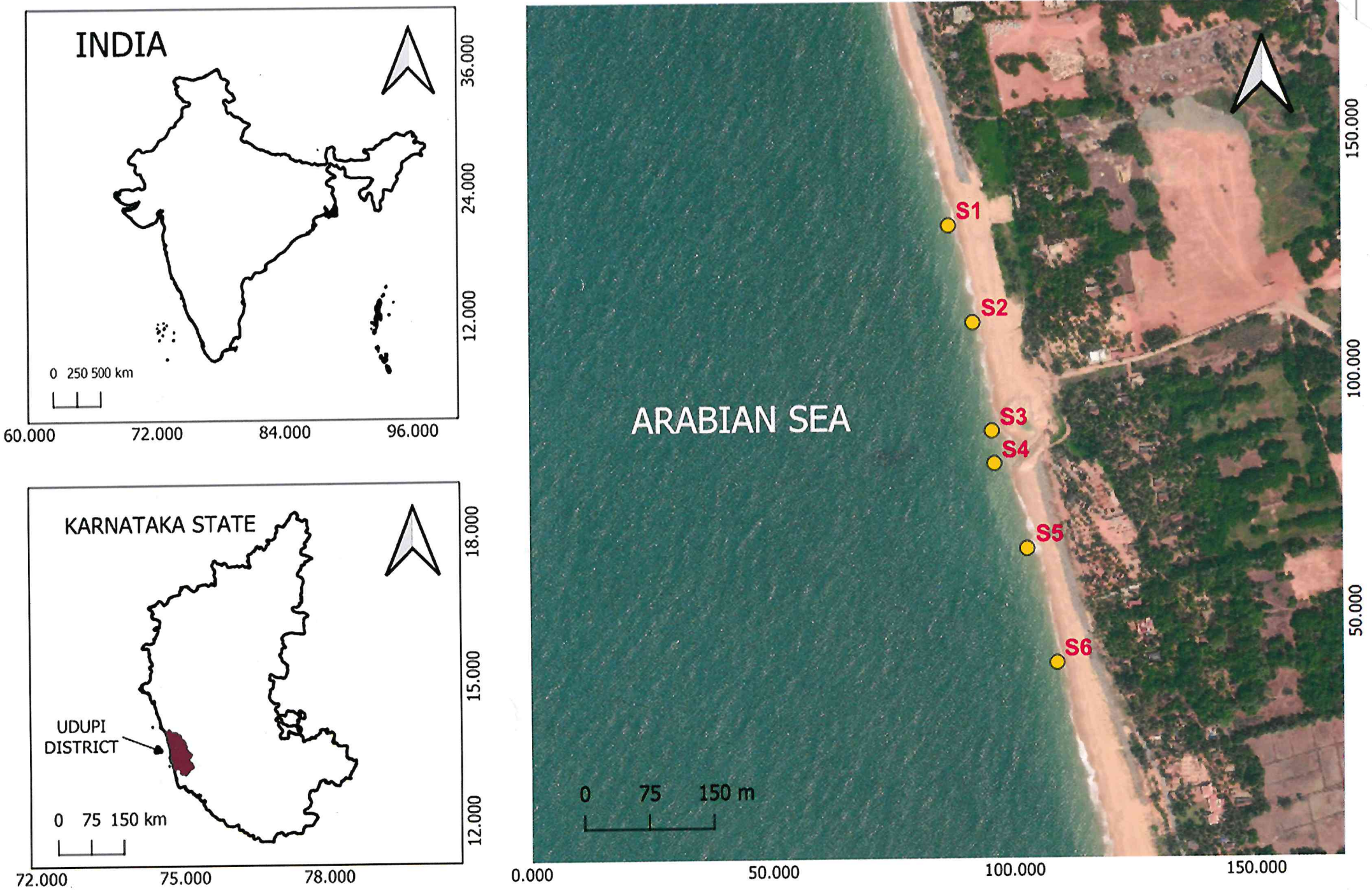
The base line data on environmental parameters are pre-requisites for understanding the impact of developmental activity and to assess the environmental quality before, during and after implementation of project in order to assess the quality of water. Therefore, it is essential to study the spatial 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, three stations were selected along the shore area of Padubidri and the sampling was carried out at surface considering 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 June, 2024 is provided in this report.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Sampling GPS coordinates coastal waters off Padubidri			
S. No.	**Sampling Locations**	**Latitude**	**Longitude**
1	Pipeline north side Point 1	N 13° 09'55.99"	E 074° 45'13.56"
2	Pipeline north side Point 2	N 13° 09'59.74"	E 074° 45'12.63"
3	Pipeline north side Point 3	N 13° 09'51.84"	E 074° 45'14.27"
4	Sea pipe point	N 13° 09'50.57"	E 074° 45'14.36"
5	Pipeline south side Point 1	N 13° 09'47.31"	E 074° 45'15.60"
6	Pipeline south side Point 2	N 13° 09'42.91"	E 074° 45'16.71"

Table 1. Data on water quality parameters in the beach waters of Padubidri during June, 2024.

Sl. No.	Parameters	Stations		
		1	2	3
1.	Temperature (^{0}C)	28.40	28.50	28.50
2.	pH	7.90	7.85	8.1
3.	Salinity (ppt)	24.45	25.62	25.50
4.	Dissolved Oxygen (mg/l)	8.6	8.6	8.4
5.	BOD_3 (mg/l)	4.0	3.6	3.2
6.	COD (mg/l)	14.00	12.00	15.00
7.	Turbidity (NTU)	98.44	105.12	109.22
8.	Total Suspended Solids (mg/l)	132.55	148.22	142.32
9.	Total Dissolved Solids (mg/l)	27900	27600	28700
10.	Ammonia (µg-at/l)	12.07	22.41	21.29
11.	Nitrite (µg-at/l)	0.48	0.68	0.85
12.	Nitrate (µg-at/l)	5.23	4.48	4.59
13.	Phosphate (µg-at/l)	0.79	0.71	0.88
14.	Silicate (µg-at/l)	22.15	23.14	25.22
15.	Oil and Grease (mg/l)	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during June, 2024.

Sl. No.	*Flora*	Stations		
		1	2	3
I	**DIATOMS**			
1.	*Asterionella*	2100	1500	2000
2.	*Bacteriastrum*	-	-	-
3.	*Biddulphia*	-	1500	1000
4.	*Cerataulina*	1600	2100	2400
5.	*Chaetoceros*	1500	950	1300
6.	*Coscinodiscus*	-	1100	1200
7.	*Cyclotella*	-	-	-
8.	*Ditylum*	1000	1800	2300
9.	*Dynobryon*	-	-	-
10.	*Eucamphia*	-	-	-
11.	*Fragillaria*	1900	2300	1200
12.	*Gyrosigma*	1100	1600	-
13.	*Lauderia*	-	-	-
14.	*Leptocylindricus*	-	-	-
15.	*Melosira*	-	-	-
16.	*Navicula*	-	-	1100
17.	*Nitzschia*	900	1300	2250
18.	*Pediastrum*	-	-	-
19.	*Planktoniella*	1150	1450	2300
20.	*Pleurosigma*	900	1250	-
21.	*Rhizosolenia*	-	-	-
22.	*Skeletonema*	900	1150	1350
23.	*Staurastrum*	-	-	-
24.	*Streptotheca*	-	-	-
25.	*Thallassiothrix*	1300	2450	1500
26.	*Triceratium*	1900	1500	-
27.	***Other diatoms***	-	-	-
II	**DINOFLAGELLATES**			
1.	*Ceratium*	1120	1550	2200
2.	*Dinophysis*	2300	-	-
3.	*Gymnodinium*	7800	7100	10800
4.	*Ornithoceros*	-	-	-
5.	*Peridinium*	1100	1500	2300
6.	*Preperidinium*	-	-	-
7.	*Noctiluca*	-	-	-
III	**BLUE GREEN ALGAE**			
1.	**Blue Green Algae**	9800	11800	9500
Biomass (mg/m^3)		**135.12**	**149.22**	**178.22**

Table 3. Zooplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during June, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
1.	Tintinids	9600	11400	7900
2.	Medusae	–	–	–
3.	Ctenophore	–	–	–
4.	Chaetognath	2100	1600	2500
5.	Chaetognath Larvae	-	-	2300
6.	Polychaete	-	-	-
7.	Polychaete Larvae	-	-	-
8.	Cladocera	3600	2100	1500
9. -	Ostracoda	–	–	–
10. -	Rotifera	–	–	–
11.	Copepod	1600	1500	3200
12.	Copepod nauplius	1600	-	-
13.	Copepod egg	-	-	-
14.	Lucifer	-	3500	2900
15.	Decapod Larvae	–	–	–
16.	Gastropod Larvae	–	–	–
17. -	Barnacle Larvae	-	-	-
18.	Bivalve Larvae	800	-	400
19.	Echinoderm Larvae	–	–	–
20.	*Oikopleura*	-	1100	900
21.	Doliolids	–	–	–
22.	*Lensia*	1100	1500	-
23.	*Creseis*	1600	1800	2100
24.	*Cavolinia*	–	–	–
25.	Fish Eggs	–	–	–
26.	Fish Larvae	-	-	-
Biomass (mg/m^3)		**193.12**	**207.23**	**185.30**

'-': Absent

Table 4. Macrobenthos diversity (no/m^2) and density (no/m^2) in the beach waters of Padubidri during June, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
I	**Echiuroids**	-	-	-
II	**Sipunculids**	-	-	-
III	**Mud tubes**	-	-	-
IV	**Sand tubes**	-	-	-
V	**Polychaetes**	238	245	262
VI	**Coelenterates**	-	-	-
VII	**Molluscs**			
1.	*Arca*	21	32	41
2.	*Anadora*	153	121	145
3.	*Auger*	-	-	-
4.	*Babylion*	08	10	10
5.	Bivalve Spats	-	19	0
6.	*Cardium*	-	-	-
7.	*Cavolinia*	-	-	-
8.	*Cerithedia*	-	-	-
9.	*Conus*	-	08	13
10.	*Dentalium*	38	23	21
11.	*Donax*	74	91	110
12.	*Drupa*	98	148	112
13.	*Katalysia*	-	-	-
14.	*Littorina*	-	-	-
15.	*Meritrix*	15	29	12
16.	*Modiolus*	-	-	-
17.	*Oliva*	-	-	-
18.	*Patella*	-	-	-
19.	Scallop	-	-	-
20.	*Surcula*	-	-	-
21.	*Telescopium*	-	-	-
22.	*Trochus*	-	-	-
23.	*Turitella*	32	26	14
24.	*Umbonium*	-	-	-
25.	Other Molluscs	26	35	53
VIII	**Echinodermata**			
1.	*Astropecten*	-	-	-
2.	*Ophiocoma*	-	-	-
3.	Egg Cases	-	34	59
IX	**Miscellaneous**			
1.	Crab	32	26	38
2.	Shrimp	45	26	31
3.	Fish	-	-	-
Density (Individuals/m^2)		**780**	**873**	**921**

Table 5. Results of Bioassay experiment in the beach waters of Padubidri during June, 2024.

1	Test Organism	:	Green Mussel (*Perna viridis*)
2	Number of Test Organisms	:	10 per replicate
3	Number of Replicates	:	3 for each treatment
4	Size (Average)	:	3.20 – 3.60 cm

EXPERIMENT

Medium	Mortality			
	24h	**48h**	**72h**	**96h**
Control (aged seawater)	Nil	Nil	Nil	Nil
50% seawater from station 2 + 50% aged seawater	Nil	Nil	Nil	Nil
100% seawater from station 2	Nil	Nil	Nil	Nil

Inference:

The inferences drawn on the various physical, chemical and biological parameters in the shore waters of Padubidri for the month of June, 2024 are given below.

The water temperature varied from 28.40 to 28.50 °C. The pH values ranged between 7.85 and 8.10. The salinity varied from 24.45 to 25.62 psu. The dissolved oxygen (DO) varied between 8.40 and 8.60 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 3.20 to 4.00 mg/l in the study region indicate that these values are within the primary water quality criteria and do not pose any threat to the environment under the present condition. The COD values ranged between 12.00 to 15.00 mg/l, the total suspended solids (TSS) ranged between 132.55 to 148.22 mg/l and the total dissolved solids (TDS) ranged between 27600 to 28700 mg/l. The turbidity values were in the range of 98.44 to 109.22 NTU.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) in beach waters varied from 0.48 to 0.85 µg-at/l, while nitrate (NO_3-N) varied between 4.48 and 5.23 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 12.07 and 22.41 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.71 and 0.88 µg-at/l. Silicate – Silicon (SiO_3-Si), one of the major nutrients for phytoplankton growth ranged between 22.15 and 25.22 µg-at/l in the beach waters.

The oil and grease content were below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in Table 2. Phytoplankton study showed the presence of 20 different genera with the abundance of Blue green algae, *Gymnodinium* and *Asterionella.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 135.12 to 178.22 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 11 different groups of zooplankton. Among zooplankton, Tintinids remained the most dominant group, followed by Cladocera and Lucifer. The biomass ranged between 185.30 to 207.23 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 15 different groups of macrobenthos. Polychaetes dominated the macrobenthos followed by *Anadora* and *Drupa*. Macrofaunal density ranged from 780 to 921 nos/m^2.

Bioassay:

The bio assay studies indicated no mortality of mussels in the beach waters of Padubidri. The results indicated no environmental stress on aquatic life.

(LAKSHMIPATHI M. T)

PRINCIPAL INVESTIGATOR
Dept. of Aquatic Environment Management
KVAFSU-College of Fisheries
MANGALURU-575 002

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Submitted to:

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JULY, 2024

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1. Assessment of physical and chemical parameters of seawater near the vicinity of effluent discharge point.
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3. Bioassay studies on the receiving water.

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Altogether, three stations were selected along the shore area of Padubidri and the sampling was carried out at surface considering 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 July, 2024 is provided in this report.

Sampling GPS coordinates coastal waters off Padubidri			
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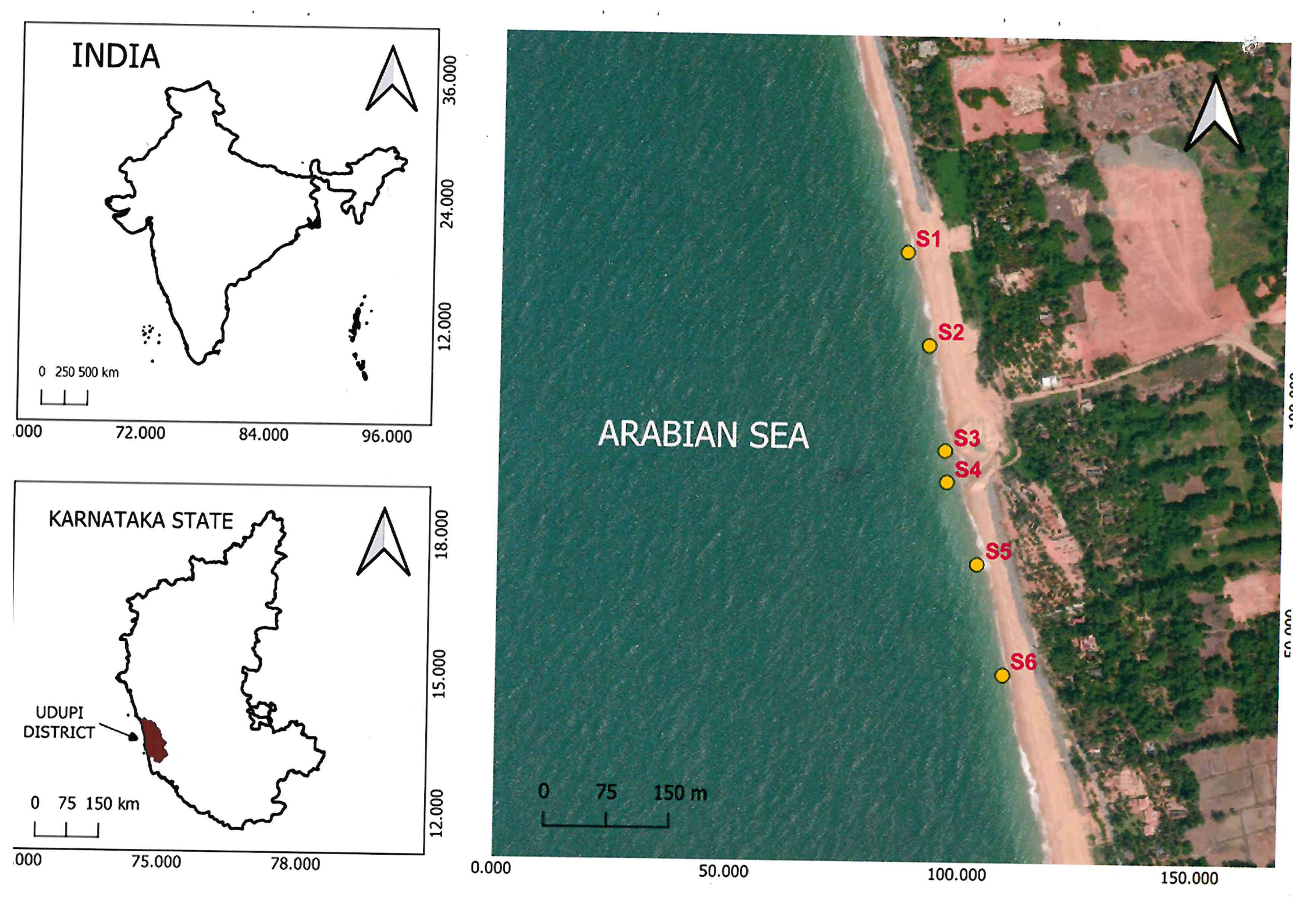
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Table 1. Data on water quality parameters in the beach watersof Padubidri during July, 2024.

Sl. No.	Parameters	Stations		
		1	2	3
1.	Temperature (^{0}C)	27.80	27.50	27.90
2.	pH	7.55	7.68	7.41
3.	Salinity (ppt)	23.52	24.52	24.63
4.	Dissolved Oxygen (mg/l)	8.5	8.2	8.8
5.	BOD_3 (mg/l)	3.1	4.2	3.8
6.	COD (mg/l)	16.00	14.00	18.00
7.	Turbidity (NTU)	104.52	98.56	101.75
8.	Total Suspended Solids (mg/l)	152.34	132.41	130.48
9.	Total Dissolved Solids (mg/l)	29200	26800	28500
10.	Ammonia (µg-at/l)	20.12	19.52	23.65
11.	Nitrite (µg-at/l)	0.55	0.72	0.63
12.	Nitrate (µg-at/l)	6.32	5.41	5.17
13.	Phosphate (µg-at/l)	0.82	0.65	0.62
14.	Silicate (µg-at/l)	24.21	21.25	22.21
15.	Oil and Grease (mg/l)	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during July, 2024.

Sl. No.	*Flora*	Stations		
		1	2	3
I	**DIATOMS**			
1.	*Asterionella*	1800	1100	1800
2.	*Bacteriastrum*	-	-	-
3.	*Biddulphia*	1200	900	700
4.	*Cerataulina*	1700	1800	2100
5.	*Chaetoceros*	1200	1100	1900
6.	*Coscinodiscus*	1300	700	1400
7.	*Cyclotella*	-	-	-
8.	*Ditylum*	1700	1200	1600
9.	*Dynobryon*	-	-	-
10.	*Eucamphia*	-	-	-
11.	*Fragillaria*	2500	2200	2200
12.	*Gyrosigma*	1400	1100	1200
13.	*Lauderia*	-	-	-
14.	*Leptocylindricus*	-	-	-
15.	*Melosira*	-	-	-
16.	*Navicula*	1400	-	500
17.	*Nitzschia*	1400	1100	1800
18.	*Pediastrum*	-	-	-
19.	*Planktoniella*	2200	1700	1900
20.	*Pleurosigma*	1100	1500	600
21.	*Rhizosolenia*	-	-	-
22.	*Skeletonema*	1200	1250	1450
23.	*Staurastrum*	-	-	-
24.	*Streptotheca*	-	-	-
25.	*Thallassiothrix*	1200	2200	1300
26.	*Triceratium*	1500	1200	1100
27.	***Other diatoms***	-	-	-
II	**DINOFLAGELLATES**			
1.	*Ceratium*	1450	1740	1960
2.	*Dinophysis*	1600	-	1520
3.	*Gymnodinium*	12000	8500	9200
4.	*Ornithoceros*	-	-	-
5.	*Peridinium*	1100	1700	1500
6.	*Preperidinium*	-	-	-
7.	*Noctiluca*	-	-	-
III	**BLUE GREEN ALGAE**			
1.	**Blue Green Algae**	10200	12800	11500
Biomass (mg/m^3)		**185.42**	**164.27**	**172.51**

Table 3. Zooplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during July, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
1.	Tintinids	8700	13200	9500
2.	Medusae	–	–	–
3.	Ctenophore	–	–	–
4.	Chaetognath	2100	2500	1300
5.	Chaetognath Larvae	1300	-	2100
6.	Polychaete	-	-	-
7.	Polychaete Larvae	-	-	-
8.	Cladocera	2800	1900	2100
9. -	Ostracoda	–	–	–
10. -	Rotifera	–	–	–
11.	Copepod	2500	2000	1800
12.	Copepod nauplius	1100	1200	1200
13.	Copepod egg	-	-	-
14.	Lucifer	2100	2500	-
15.	Decapod Larvae	–	–	–
16.	Gastropod Larvae	–	–	–
17. -	Barnacle Larvae	-	-	-
18.	Bivalve Larvae	500	200	600
19.	Echinoderm Larvae	–	–	–
20.	*Oikopleura*	700	-	800
21.	Doliolids	–	–	–
22.	*Lensia*	900	1800	1100
23.	*Creseis*	1200	2800	1700
24.	*Cavolinia*	–	–	–
25.	Fish Eggs	–	–	–
26.	Fish Larvae	-	-	-
Biomass (mg/m^3)		**211.14**	**203.85**	**207.21**

'-': Absent

Table 4. Macrobenthos diversity (no/m^2) and density (no/m^2) in the beach waters of Padubidri during July, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
I	**Echiuroids**	-	-	-
II	**Sipunculids**	-	-	-
III	**Mud tubes**	-	-	-
IV	**Sand tubes**	-	-	-
V	**Polychaetes**	212	250	310
VI	**Coelenterates**	-	-	-
VII	**Molluscs**			
1.	*Arca*	45	28	52
2.	*Anadora*	152	133	115
3.	*Auger*	-	-	-
4.	*Babylion*	15	05	10
5.	Bivalve Spats	20	25	15
6.	*Cardium*	-	-	-
7.	*Cavolinia*	-	-	-
8.	*Cerithedia*	-	-	-
9.	*Conus*	09	15	20
10.	*Dentalium*	22	20	15
11.	*Donax*	85	75	90
12.	*Drupa*	80	90	125
13.	*Katalysia*	-	-	-
14.	*Littorina*	-	-	-
15.	*Meritrix*	19	15	32
16.	*Modiolus*	-	-	-
17.	*Oliva*	-	-	-
18.	*Patella*	-	-	-
19.	Scallop	-	-	-
20.	*Surcula*	-	-	-
21.	*Telescopium*	-	-	-
22.	*Trochus*	-	-	-
23.	*Turitella*	28	20	15
24.	*Umbonium*	-	-	-
25.	Other Molluscs	53	45	25
VIII	**Echinodermata**			
1.	*Astropecten*	-	-	-
2.	*Ophiocoma*	-	-	-
3.	Egg Cases	15	25	30
IX	**Miscellaneous**			
1.	Crab	25	29	25
2.	Shrimp	40	35	30
3.	Fish	-	-	-
Density (Individuals/m^2)		**820**	**810**	**909**

Table 5. Results of Bioassay experiment in the beach waters of Padubidri during July, 2024.

1	Test Organism	:	Green Mussel (*Perna viridis*)
2	Number of Test Organisms	:	10 per replicate
3	Number of Replicates	:	3 for each treatment
4	Size (Average)	:	3.18 – 3.72 cm

EXPERIMENT

Medium	Mortality			
	24h	**48h**	**72h**	**96h**
Control (aged seawater)	Nil	Nil	Nil	Nil
50% seawater from station 2 + 50% aged seawater	Nil	Nil	Nil	Nil
100% seawater from station 2	Nil	Nil	Nil	Nil

Inference:

The inferences drawn on the various physical, chemical and biological parameters in the shore waters of Padubidri for the month of July, 2024 are given below.

The water temperature varied from 27.50 to 27.90 °C. The pH values ranged between 7.41 and 7.68. The salinity varied from 23.52 to 24.63 psu. The dissolved oxygen (DO) varied between 8.2 and 8.8 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 3.1 to 4.2 mg/l in the study region indicate that these values are within the primary water quality criteria and do not pose any threat to the environment under the present condition. The COD values ranged between 14.00 to 18.00 mg/l, the total suspended solids (TSS) ranged between 130.48 to 152.34 mg/l and the total dissolved solids (TDS) ranged between 26800 to 29200 mg/l. The turbidity values were in the range of 98.56 to 104.52 NTU.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) in beach waters varied from 0.55 to 0.72 µg-at/l, while nitrate (NO_3-N) varied between 5.17 and 6.32 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 19.52 and 23.65 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.62 and 0.82 µg-at/l. Silicate – Silicon (SiO_3-Si), one of the major nutrients for phytoplankton growth ranged between 21.25 and 24.21 µg-at/l in the beach waters.

The oil and grease content were below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in Table 2. Phytoplankton study showed the presence of 20 different genera with the abundance of Blue green algae, *Gymnodinium, Fragillaria* and *Asterionella.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 164.27 to 185.42 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 11 different groups of zooplankton. Among zooplankton, Tintinids remained the most dominant group, followed by Cladocera and Lucifer. The biomass ranged between 203.85 to 211.14 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 15 different groups of macrobenthos. Polychaetes dominated the macrobenthos followed by *Anadora* and *Drupa*. Macrofaunal density ranged from 810 to 909 nos/m^2.

Bioassay:

The bio assay studies indicated no mortality of mussels in the beach waters of Padubidri. The results indicated no environmental stress on aquatic life.

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

COASTAL WATER QUALITY MONITORING NEAR THE APL UDUPI THERMAL POWER PLANT SEA WATER INTAKE AND EFFLUENT DISCHARGE POINT OFF PADUBIDRI, UDUPI DISTRICT, KARNATAKA

Submitted to:

APL UDUPI THERMAL POWER PLANT
Kolachure, Yelluru village,
Pilar post, Padubidri, Udupi – 574 138

Prepared by:

DEPARTMENT OF AQUATIC ENVIRONMENT MANAGEMENT
KARNATAKA VETERINARY, ANIMAL AND FISHERIES SCIENCES UNIVERSITY

COLLEGE OF FISHERIES, MANGALORE – 575 002.

AUGUST, 2024

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6	Inference	8

Introduction:

The M/s Adani Power Limited (APL) 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, three stations were selected along the shore area of Padubidri and the sampling was carried out at surface considering 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 August, 2024 is provided in this report.

Sampling GPS coordinates coastal waters off Padubidri			
S. No.	**Sampling Locations**	**Latitude**	**Longitude**
1	Pipeline north side Point 1	N 13° 09'55.99"	E 074° 45'13.56"
2	Pipeline north side Point 2	N 13° 09'59.74"	E 074° 45'12.63"
3	Pipeline north side Point 3	N 13° 09'51.84"	E 074° 45'14.27"
4	Sea pipe point	N 13° 09'50.57"	E 074° 45'14.36"
5	Pipeline south side Point 1	N 13° 09'47.31"	E 074° 45'15.60"
6	Pipeline south side Point 2	N 13° 09'42.91"	E 074° 45'16.71"

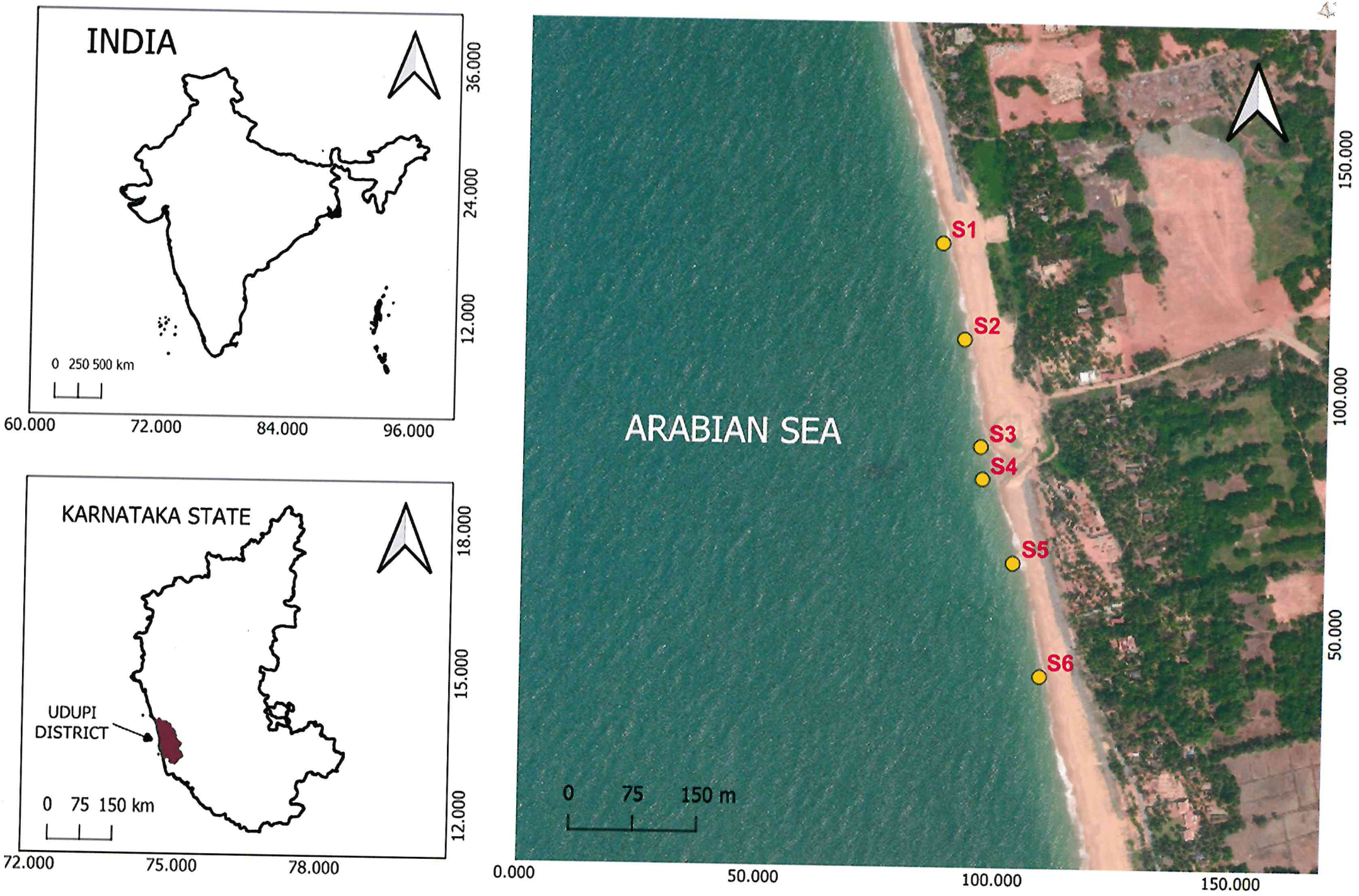
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Table 1. Data on water quality parameters in the beach watersof Padubidri during August, 2024.

Sl. No.	Parameters	Stations		
		1	2	3
1.	Temperature (^{0}C)	27.20	27.10	26.90
2.	pH	7.12	7.28	7.52
3.	Salinity (ppt)	23.42	23.22	23.86
4.	Dissolved Oxygen (mg/l)	9.1	9.2	8.7
5.	BOD_3 (mg/l)	3.8	3.2	3.5
6.	COD (mg/l)	15.00	17.00	13.00
7.	Turbidity (NTU)	108.32	101.25	98.35
8.	Total Suspended Solids (mg/l)	165.21	157.48	155.21
9.	Total Dissolved Solids (mg/l)	27200	25200	29300
10.	Ammonia (µg-at/l)	24.25	20.74	21.75
11.	Nitrite (µg-at/l)	0.86	0.49	0.71
12.	Nitrate (µg-at/l)	7.10	6.95	6.47
13.	Phosphate (µg-at/l)	0.97	0.85	0.77
14.	Silicate (µg-at/l)	23.24	23.84	21.56
15.	Oil and Grease (mg/l)	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during August, 2024.

Sl. No.	*Flora*	Stations		
		1	2	3
I	**DIATOMS**			
1.	*Asterionella*	1300	1600	1700
2.	*Bacteriastrum*	-	-	-
3.	*Biddulphia*	1400	-	1100
4.	*Cerataulina*	1300	1200	1700
5.	*Chaetoceros*	1700	900	1800
6.	*Coscinodiscus*	2100	1900	2000
7.	*Cyclotella*	-	-	-
8.	*Ditylum*	1400	1300	1200
9.	*Dynobryon*	-	-	-
10.	*Eucamphia*	-	-	-
11.	*Fragillaria*	1900	2400	2700
12.	*Gyrosigma*	1600	1200	1700
13.	*Lauderia*	-	-	-
14.	*Leptocylindricus*	-	-	-
15.	*Melosira*	-	-	-
16.	*Navicula*	1300	900	1100
17.	*Nitzschia*	1200	1700	1400
18.	*Pediastrum*	-	-	-
19.	*Planktoniella*	2700	2400	2100
20.	*Pleurosigma*	1100	1500	600
21.	*Rhizosolenia*	-	-	-
22.	*Skeletonema*	1500	1100	1300
23.	*Staurastrum*	-	-	-
24.	*Streptotheca*	-	-	-
25.	*Thallassiothrix*	1600	1900	2100
26.	*Triceratium*	1200	1800	1500
27.	*Other diatoms*	-	-	-
II	**DINOFLAGELLATES**			
1.	*Ceratium*	1550	1860	1740
2.	*Dinophysis*	1750	1520	1850
3.	*Gymnodinium*	13000	7200	6300
4.	*Ornithoceros*	-	-	-
5.	*Peridinium*	1800	1500	1400
6.	*Preperidinium*	-	-	-
7.	*Noctiluca*	-	-	-
III	**BLUE GREEN ALGAE**			
1.	**Blue Green Algae**	11900	15200	12600
Biomass (mg/m^3)		**192.32**	**158.64**	**169.73**

Table 3. Zooplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during August, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
1.	Tintinids	12200	10100	11700
2.	Medusae	–	–	–
3.	Ctenophore	–	–	–
4.	Chaetognath	1800	1700	2100
5.	Chaetognath Larvae	2200	1400	1900
6.	Polychaete	-	-	-
7.	Polychaete Larvae	-	-	-
8.	Cladocera	2100	2300	2500
9. -	Ostracoda	–	–	–
10. -	Rotifera	–	–	–
11.	Copepod	2100	2500	2100
12.	Copepod nauplius	1700	1900	1600
13.	Copepod egg	-	-	-
14.	Lucifer	1600	1300	1900
15.	Decapod Larvae	–	–	–
16.	Gastropod Larvae	–	–	–
17. -	Barnacle Larvae	-	-	-
18.	Bivalve Larvae	300	500	700
19.	Echinoderm Larvae	–	–	–
20.	*Oikopleura*	200	150	400
21.	Doliolids	–	–	–
22.	*Lensia*	1200	900	1400
23.	*Creseis*	2100	1700	2300
24.	*Cavolinia*	–	–	–
25.	Fish Eggs	–	–	–
26.	Fish Larvae	-	-	-
Biomass (mg/m^3)		**223.52**	**219.46**	**214.89**

'-': Absent

Table 4. Macrobenthos diversity (no/m^2) and density (no/m^2) in the beach waters of Padubidri during August, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
I	**Echiuroids**	-	-	-
II	**Sipunculids**	-	-	-
III	**Mud tubes**	-	-	-
IV	**Sand tubes**	-	-	-
V	**Polychaetes**	280	210	290
VI	**Coelenterates**	-	-	-
VII	**Molluscs**			
1.	*Arca*	52	41	38
2.	*Anadora*	128	147	162
3.	*Auger*	-	-	-
4.	*Babylion*	25	20	15
5.	Bivalve Spats	30	15	10
6.	*Cardium*	-	-	-
7.	*Cavolinia*	-	-	-
8.	*Cerithedia*	-	-	-
9.	*Conus*	13	17	22
10.	*Dentalium*	28	21	20
11.	*Donax*	73	87	85
12.	*Drupa*	55	95	89
13.	*Katalysia*	-	-	-
14.	*Littorina*	-	-	-
15.	*Meritrix*	21	17	35
16.	*Modiolus*	-	-	-
17.	*Oliva*	-	-	-
18.	*Patella*	-	-	-
19.	Scallop	-	-	-
20.	*Surcula*	-	-	-
21.	*Telescopium*	-	-	-
22.	*Trochus*	-	-	-
23.	*Turitella*	35	30	25
24.	*Umbonium*	-	-	-
25.	Other Molluscs	41	52	39
VIII	**Echinodermata**			
1.	*Astropecten*	-	-	-
2.	*Ophiocoma*	-	-	-
3.	Egg Cases	17	21	28
IX	**Miscellaneous**			
1.	Crab	30	24	19
2.	Shrimp	35	39	41
3.	Fish	-	-	-
Density (Individuals/m^2)		**863**	**837**	**918**

Table 5. Results of Bioassay experiment in the beach waters of Padubidri during August, 2024.

1	Test Organism	:	Green Mussel (*Perna viridis*)
2	Number of Test Organisms	:	10 per replicate
3	Number of Replicates	:	3 for each treatment
4	Size (Average)	:	3.23 – 3.94 cm

EXPERIMENT

Medium	Mortality			
	24h	**48h**	**72h**	**96h**
Control (aged seawater)	Nil	Nil	Nil	Nil
50% seawater from station 2 + 50% aged seawater	Nil	Nil	Nil	Nil
100% seawater from station 2	Nil	Nil	Nil	Nil

Inference:

The inferences drawn on the various physical, chemical and biological parameters in the shore waters of Padubidri for the month of August, 2024 are given below.

The water temperature varied from 26.90 to 27.20 °C. The pH values ranged between 7.12 and 7.52. The salinity varied from 23.22 to 23.86 psu. The dissolved oxygen (DO) varied between 8.7 and 9.2 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 3.2 to 3.8 mg/l in the study region indicate that these values are within the primary water quality criteria and do not pose any threat to the environment under the present condition. The COD values ranged between 13.00 to 17.00 mg/l, the total suspended solids (TSS) ranged between 155.21 to 165.21 mg/l and the total dissolved solids (TDS) ranged between 25200 to 29300 mg/l. The turbidity values were in the range of 98.35 to 108.32 NTU.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) in beach waters varied from 0.49 to 0.86 µg-at/l, while nitrate (NO_3-N) varied between 6.47 and 7.10 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 20.74 and 24.25 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.77 and 0.97 µg-at/l. Silicate – Silicon (SiO_3-Si), one of the major nutrients for phytoplankton growth ranged between 21.56 and 23.84 µg-at/l in the beach waters.

The oil and grease content were below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in Table 2. Phytoplankton study showed the presence of 20 different genera with the abundance of Blue green algae, *Gymnodinium, Fragillaria* and *Asterionella.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 158.64 to 192.32 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 11 different groups of zooplankton. Among zooplankton, Tintinids remained the most dominant group, followed by Cladocera and Lucifer. The biomass ranged between 214.89 to 223.52 mg/m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 15 different groups of macrobenthos. Polychaetes dominated the macrobenthos followed by *Anadora* and *Drupa*. Macrofaunal density ranged from 837 to 918 nos/m^2.

Bioassay:

The bio assay studies indicated no mortality of mussels in the beach waters of Padubidri. The results indicated no environmental stress on aquatic life.

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Submitted to:

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Kolachure, Yelluru village,
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Prepared by:

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COLLEGE OF FISHERIES, MANGALORE – 575 002.

SEPTEMBER, 2024

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1. Assessment of physical and chemical parameters of seawater near the vicinity of effluent discharge point.
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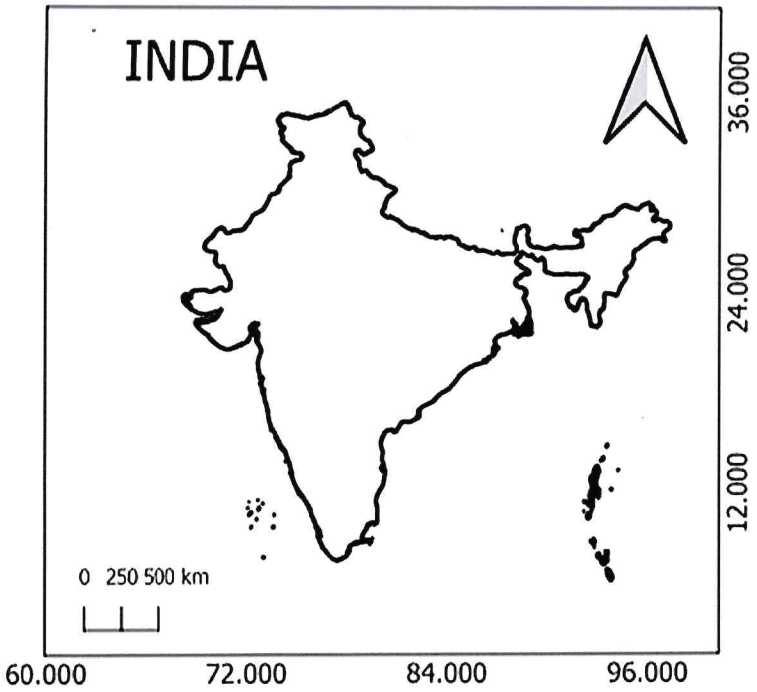
Altogether, three stations were selected along the shore area of Padubidri and the sampling was carried out at surface considering discharge points. The water and sediment samples collected were analysed for physical, chemical and biological characteristics. Standard procedure was followed for the analyses. The details of results obtained for the month of September, 2024 is provided in this report.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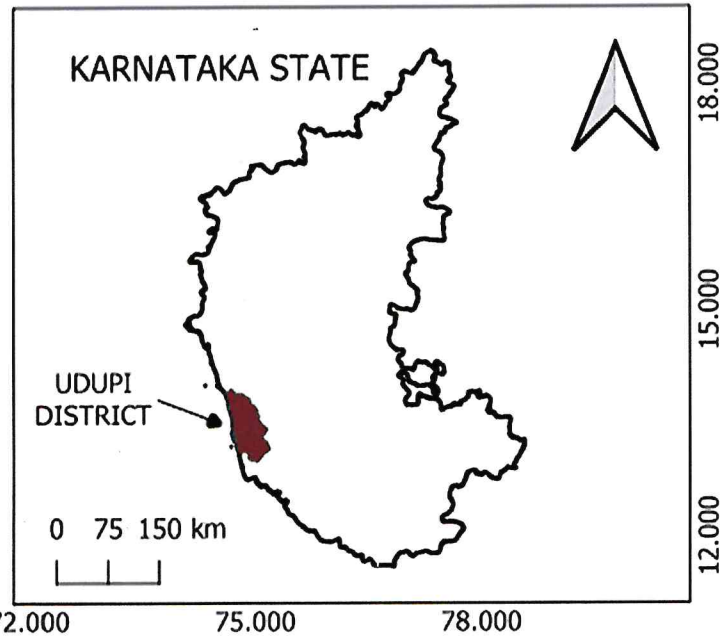
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Sampling GPS coordinates coastal waters off Padubidri			
S. No.	**Sampling Locations**	**Latitude**	**Longitude**
1	Pipeline north side Point 1	N 13° 09'55.99"	E 074° 45'13.56"
2	Pipeline north side Point 2	N 13° 09'59.74"	E 074° 45'12.63"
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6	Pipeline south side Point 2	N 13° 09'42.91"	E 074° 45'16.71"

Table 1. Data on water quality parameters in the beach waters of Padubidri during September, 2024.

Sl. No.	Parameters	Stations		
		1	2	3
1.	Temperature (^{0}C)	28.60	27.80	28.00
2.	pH	7.52	7.85	7.47
3.	Salinity (ppt)	21.23	24.52	24.12
4.	Dissolved Oxygen (mg/l)	8.5	8.8	9.3
5.	BOD_3 (mg/l)	2.9	3.6	3.0
6.	COD (mg/l)	18.00	14.00	12.00
7.	Turbidity (NTU)	95.63	99.75	102.42
8.	Total Suspended Solids (mg/l)	185.41	167.84	135.87
9.	Total Dissolved Solids (mg/l)	28400	27800	28600
10.	Ammonia (µg-at/l)	19.23	17.52	20.57
11.	Nitrite (µg-at/l)	0.52	0.63	0.39
12.	Nitrate (µg-at/l)	6.24	4.57	5.84
13.	Phosphate (µg-at/l)	0.87	0.91	0.85
14.	Silicate (µg-at/l)	21.41	25.12	22.75
15.	Oil and Grease (mg/l)	BDL	BDL	BDL

BDL: Below Detectable Level

Table 2. Phytoplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during September, 2024.

Sl. No.	*Flora*	Stations		
		1	2	3
I	**DIATOMS**			
1.	*Asterionella*	1200	1300	1500
2.	*Bacteriastrum*	-	-	-
3.	*Biddulphia*	-	1200	1600
4.	*Cerataulina*	1200	1100	1500
5.	*Chaetoceros*	1300	1300	1100
6.	*Coscinodiscus*	2500	1800	1900
7.	*Cyclotella*	-	-	-
8.	*Ditylum*	1200	1100	1500
9.	*Dynobryon*	-	-	-
10.	*Eucamphia*	-	-	-
11.	*Fragillaria*	2100	1800	2500
12.	*Gyrosigma*	1800	1100	1500
13.	*Lauderia*	-	-	-
14.	*Leptocylindricus*	-	-	-
15.	*Melosira*	-	-	-
16.	*Navicula*	800	1100	1300
17.	*Nitzschia*	1500	1300	1100
18.	*Pediastrum*	-	-	-
19.	*Planktoniella*	2100	2500	2200
20.	*Pleurosigma*	1200	1600	1200
21.	*Rhizosolenia*	-	-	-
22.	*Skeletonema*	1300	1600	1200
23.	*Staurastrum*	-	-	-
24.	*Streptotheca*	-	-	-
25.	*Thallassiothrix*	1800	1400	1700
26.	*Triceratium*	1500	2100	1200
27.	***Other diatoms***	-	-	-
II	**DINOFLAGELLATES**			
1.	*Ceratium*	1420	1750	1960
2.	*Dinophysis*	1850	1170	1820
3.	*Gymnodinium*	6500	8200	8700
4.	*Ornithoceros*	-	-	-
5.	*Peridinium*	1200	1100	1200
6.	*Preperidinium*	-	-	-
7.	*Noctiluca*	-	-	-
III	**BLUE GREEN ALGAE**			
1.	**Blue Green Algae**	15200	14700	16300
Biomass (mg/m^3)		**188.41**	**174.25**	**197.48**

Table 3. Zooplankton diversity (no/m^3) and biomass (mg/m^3) in the beach waters of Padubidri during September, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
1.	Tintinids	13200	12500	12100
2.	Medusae	–	–	–
3.	Ctenophore	–	–	–
4.	Chaetognath	1900	1500	1800
5.	Chaetognath Larvae	1800	1500	1700
6.	Polychaete	-	-	-
7.	Polychaete Larvae	-	-	-
8.	Cladocera	2800	2500	2700
9. -	Ostracoda	–	–	–
10. -	Rotifera	–	–	–
11.	Copepod	2200	2500	2500
12.	Copepod nauplius	1900	1400	1700
13.	Copepod egg	-	-	-
14.	Lucifer	1700	1400	1500
15.	Decapod Larvae	–	–	–
16.	Gastropod Larvae	–	–	–
17. -	Barnacle Larvae	-	-	-
18.	Bivalve Larvae	900	1000	800
19.	Echinoderm Larvae	–	–	–
20.	*Oikopleura*	400	650	550
21.	Doliolids	–	–	–
22.	*Lensia*	1100	1600	1200
23.	*Creseis*	1800	1500	2100
24.	*Cavolinia*	–	–	–
25.	Fish Eggs	–	–	–
26.	Fish Larvae	-	-	-
Biomass (mg/m^3)		**245.12**	**230.75**	**220.41**

'-': Absent

Table 4. Macrobenthos diversity (no/m^2) and density (no/m^2) in the beach waters of Padubidri during September, 2024.

Sl. No.	Fauna	Stations		
		1	2	3
I	**Echiuroids**	-	-	-
II	**Sipunculids**	-	-	-
III	**Mud tubes**	-	-	-
IV	**Sand tubes**	-	-	-
V	**Polychaetes**	250	220	310
VI	**Coelenterates**	-	-	-
VII	**Molluscs**			
1.	*Arca*	39	52	74
2.	*Anadora*	112	121	152
3.	*Auger*	-	-	-
4.	*Babylion*	21	23	18
5.	Bivalve Spats	25	20	35
6.	*Cardium*	-	-	-
7.	*Cavolinia*	-	-	-
8.	*Cerithedia*	-	-	-
9.	*Conus*	28	22	32
10.	*Dentalium*	25	29	31
11.	*Donax*	82	91	52
12.	*Drupa*	84	84	94
13.	*Katalysia*	-	-	-
14.	*Littorina*	-	-	-
15.	*Meritrix*	19	30	15
16.	*Modiolus*	-	-	-
17.	*Oliva*	-	-	-
18.	*Patella*	-	-	-
19.	Scallop	-	-	-
20.	*Surcula*	-	-	-
21.	*Telescopium*	-	-	-
22.	*Trochus*	-	-	-
23.	*Turitella*	45	35	30
24.	*Umbonium*	-	-	-
25.	Other Molluscs	53	61	42
VIII	**Echinodermata**			
1.	*Astropecten*	-	-	-
2.	*Ophiocoma*	-	-	-
3.	Egg Cases	28	22	27
IX	**Miscellaneous**			
1.	Crab	28	35	28
2.	Shrimp	25	28	23
3.	Fish	-	-	-
Density (Individuals/m^2)		**864**	**873**	**963**

Table 5. Results of Bioassay experiment in the beach waters of Padubidri during September, 2024.

1	Test Organism	:	Green Mussel (*Perna viridis*)
2	Number of Test Organisms	:	10 per replicate
3	Number of Replicates	:	3 for each treatment
4	Size (Average)	:	4.12 – 4.85 cm

EXPERIMENT

Medium	**Mortality**			
	24h	**48h**	**72h**	**96h**
Control (aged seawater)	Nil	Nil	Nil	Nil
50% seawater from station 2 + 50% aged seawater	Nil	Nil	Nil	Nil
100% seawater from station 2	Nil	Nil	Nil	Nil

Inference:

The inferences drawn on the various physical, chemical and biological parameters in the shore waters of Padubidri for the month of September, 2024 are given below.

The water temperature varied from 27.80 to 28.60 °C. The pH values ranged between 7.47 and 7.85. The salinity varied from 21.23 to 24.52 psu. The dissolved oxygen (DO) varied between 8.5 and 9.3 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 2.9 to 3.6 mg/l in the study region indicate that these values are within the primary water quality criteria and do not pose any threat to the environment under the present condition. The COD values ranged between 12.00 to 18.00 mg/l, the total suspended solids (TSS) ranged between 135.87 to 185.41 mg/l and the total dissolved solids (TDS) ranged between 27800 to 28600 mg/l. The turbidity values were in the range of 95.63 to 102.42 NTU.

Nutrients play a vital role in the biogeochemical cycles in the marine environment. The concentrations of nitrite (NO_2-N) in beach waters varied from 0.39 to 0.63 µg-at/l, while nitrate (NO_3-N) varied between 4.57 and 6.24 µg-at/l, which are within the acceptable limits of coastal environment. Ammonia content (NH_3-N) varied between 17.52 and 20.57 µg-at/l. Inorganic phosphate (PO_4-P) was in the range of 0.85 and 0.91 µg-at/l. Silicate – Silicon (SiO_3-Si), one of the major nutrients for phytoplankton growth ranged between 21.41 and 25.12 µg-at/l in the beach waters.

The oil and grease content were below detectable limits.

Phytoplankton:

The relative abundance of various forms of phytoplankton is depicted in Table 2. Phytoplankton study showed the presence of 20 different genera with the abundance of Blue green algae, *Gymnodinium, Fragillaria* and *Asterionella.* The phytoplankton species recorded in this area are common types occurring along the west coast of India. The biomass varied from 174.25 to 197.48 mg/m^3.

Zooplankton:

The qualitative analyses revealed the presence of 11 different groups of zooplankton. Among zooplankton, Tintinids remained the most dominant group, followed by Cladocera and Lucifer. The biomass ranged between 220.41 to 245.12 mg /m^3.

Macrobenthos:

The qualitative analyses revealed the presence of 15 different groups of macrobenthos. Polychaetes dominated the macrobenthos followed by *Anadora* and *Drupa*. Macrofaunal density ranged from 864 to 963 nos/m^2.

Bioassay:

The bio assay studies indicated no mortality of mussels in the beach waters of Padubidri. The results indicated no environmental stress on aquatic life.

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

Coal Handling Plant – Wind Shield

Annexure - II

Annexure-III

Fly Ash Generation & Utilization for the period of April' 2024 to September' 2024

Month	Ash Generation			Ash Utilization			
	Fly Ash (MT)	Bottom Ash (MT)	Total Ash Generation (MT)	Fly Ash (MT)	Bottom Ash + Pond ash (MT)	Total Ash Utilization (MT)	Ash Utilized (%)
Apr-24	12272.00	2507.00	14779.00	11,457.00	2,660.00	14,117.00	95.52
May-24	12106.00	2138.00	14244.00	13,226.00	2,138.00	15,364.00	107.86
Jun-24	8842.00	1617.00	10459.00	8,862.00	1,617.00	10,479.00	100.19
July-24	6214.00	948.00	7162.00	5,814.00	948.00	6,762.00	94.41
Aug-24	5462.00	721.00	6183.00	5,632.00	721.00	6,353.00	102.75
Sep-24	2330.00	418.00	2748.00	2,330.00	418.00	2,748.00	100.01
Total	**47226**	**8349**	**55575**	**47321**	**8502**	**55,823.00**	**100.45**

Rainwater Harvesting Ponds

Annexure - IV

Three Numbers of Rainwater Harvesting Ponds constructed to conserve rainwater.

Annexure - V

Green Belt development:

Plantation was carried in and around plant premises with local species.
Total plantation carried so far is around 423547 No's in 195 acres.

Plantation Details	Area (Acres)
423547 Saplings	**195**

List of the Plant Species planted in and around the UPCL 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 the Outside 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

adani Foundation

ADANI POWER LIMITED – UDUPI TPP

A Report on CSR for the period April 2024 to October 2024

Activity Highlights

Educational Initiative	• **School Kits:** Distribution School Kits / Education Kits, comprising Note Books, Geometry Box, School Bag and Umbrellas to students, studying in Government / Government Aided Kannada Medium Schools.
Community Health	• **Adani Mobile Health Service:** Providing cash-less Medical services at doorstep. • **Adani Aarogya Card:** Renewed the Health Insurance Policy taken for the coverage of medical expenses for the residents of Yellur and Mudarangadi Grama Panchayats. • **Go-Red Drive**: Blood Donation Drive conducted. Total number of units collected was 350
Community Infrastructure Development	• **Safe Drinking Water Units:** Supply of potable water through RO Plant installed at Yellur, Belapu, Mudarangadi and Tenka Panchayat

Educational Initiatives (1/1)

Education Kits

- To promote education in rural areas
- To reduce drop out cases in Government Schools
- To provide education to the financially weaker sections of the society

- Education Kits comprising of Notebooks, Bag, Compass Box and Umbrella were distributed to the students studying in Kannada Medium Government and Government Aided Schools.
- Totally 6,800 students were distributed with the education kits.
- 76 Government / Government Aided Kannada Medium Schools located in 39 villages in the rural areas of Udupi District were covered under this activity.
- The Education Kits were distributed to the students at a stage programme organized at Bunts Sangha Auditorium in Padubidri in the vicinity of APL – Udupi Plant in presence of Head Master / Head Mistress of the respective Government / Government Aided Schools and the Presidents of respective Grama Panchayats.

Community Health (1/3)

Mobile Health Care Unit (MHCU)

- Delivering the Cash Less Quality Medical Services at the doorsteps of the villagers.
- 1 Ambulance with a qualified Doctor and Nurse are plying to 2 villages each day.
- Services being delivered in 13 villages in the vicinity of APL – Udupi plant.

Summary on the Patients under the facility of Adani Mobile Health Care Unit							
Month	**Male**	**Female**	**Total**	**No. of Days Camps conducted**	**No. of Camps**	**Avg. no. of beneficiary visit per camp**	**Avg. No. of beneficiary visited per day**
April, 2024	544	817	1361	26	52	26.17	52.35
May, 2024	548	786	1334	26	52	25.65	51.31
June, 2024	515	747	1262	25	50	25.24	50.48
July, 2024	565	814	1379	27	54	25.54	51.07
August, 2024	532	820	1352	25	50	27.04	54.08
September, 2024	538	765	1303	24	48	27.15	54.29
October, 2024	516	873	1389	24	48	28.94	57.88
TOTAL	**3758**	**5622**	**9380**	**177**	**354**	**26.50**	**52.99**

Community Health (2/3)

Adani Aarogya Card

- Facilitate all the villagers of Yellur and Mudarangadi to avail cash-less medical treatment / specialized treatments in the private multi-specialty hospitals.
- Reducing the burden on needy and poor villagers for expensive medical treatment.
- Improve the health condition of the villagers.
- Helping tool to the senior citizens to avail medical treatment in cases of emergency, who does not have any support, morally and financially.

- The Adani Aarogya Card / Mediclaim Insurance Policy taken for the coverage of health insurance for the villagers of Yellur and Mudarangadi is renewed with effect from 21.10.2024
- Number of families covered → 2366
- Total Number of beneficiaries → 9529
- Total Sum Insured → Rs. 11,83,00,000/-
- Total Sum Assured per family → Rs. 50,000/-

Community Health (3/3)

Go Red Drive

- Volunteer Blood Donation Drive
- Support to the needy

- On 24th June, 2024 a Blood Donation camp under the theme of **'Go Red'** was organized at APL, Udupi Plant premises.
- Employees, both regular and associate employees, family members of employees volunteered in the Blood Donation Drive
- Totally 350 units of blood was collected.
- The medical facility from District Government Hospital, Udupi and District Government Hospital (Wenlock Hospital), Mangalore, visited the APL, Udupi Plant and facilitated the Blood donation drive.

Community Infrastructure Development (1/1)

Safe Drinking Water Plants

- To provide potable drinking water to the community
- To arrest people suffering from water borne diseases.
- To overcome the problem of salt water being faced by community

- The Safe Drinking Water Plants, based on RO technology, is installed at Yellur, Mudarangadi, Belapu and Tenka Village.
- Each RO unit is having the capacity of purifying 1,000 litres per hour. The tanks of 5000 litres capacity has been installed for storage of purified water.
- Following is the summary of beneficiaries / availing the services of Safe Drinking Water facility:

Month	No. of beneficiaries
April, 2024	5850
May, 2024	5860
June, 2024	5860
July, 2024	5860
August, 2024	5860
September, 2024	5862
October, 2024	5862
TOTAL	**41014**

Budget V/s. Actuals Section

CSR Update: Udupi : Budget Vs. Utilization

Sl. No.	List of Projects/ Initiatives	Budget for the FY 2024-25 Rs.	Utilization as on 31.10.24 Rs.	Remarks
(i)	**PLANNED ACTIVITIES:**			
A	**Educational Initiatives:**			
A1	Scholarships	20.00		Activity Planned in the month of January, 2025
A2	Education Kits	40.00	33.61	Education Kits distributed in the month of August, 2024
(A) Total Educational Initiatives		**60.00**	**33.61**	
B	**Community Health Care Programmes Initiatives:**			
B1	Mobile Health Care Units	28.13	14.78	On-going activity
B2	Health Insurance	64.00	62.72	Adani Health Insurance Policy is renewed w.e.f 21.10.24
(B) Total Community Health Care Initiatives		**92.13**	**77.50**	

CSR Update: Udupi : Budget Vs. Utilization

Sl. No.	List of Projects/ Initiatives	Budget for the FY 2024-25 Rs.	Utilization as on 31.10.24 Rs.	Remarks
C	**Sustainable Livelihood Development Initiatives**			
C1	Plantation / Social Forestry	10.00		PR raised. Expected PO in the month of Nov, 24.
(C) Total Sustainable Livelihood Development Initiatives		**10.00**		
D	**Community Infrastructure Development Initiatives**			
D1	Drinking Water Facility	12.00	8.21	On-going activity
D2	Infrastructure Development works in 7 Grama Panchayats	118.09	8.06	Activity Planned effective Nov, 2024. PR raised for the works related to 5 Grama Panchayats. BOQ prepared for the works related to 2 Grama Panchayats
(D) Total Sustainable Livelihood Development Initiatives		**130.09**	**16.27**	
E	**Admin. Expenses**			
E1	Salaries	5.78	3.08	
E2	Miscellaneous / Unforeseen Exp.	2.00		
(D) Total Admin. Expenses		**7.78**	**3.08**	
TOTAL		**300.00**	**130.46**	

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

Annexure-VII

Location: Plant Site									
September - 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 $_{10}$	$PM_{2.5}$
	$\mu g/m^3$					$\mu g/m^3$			
05.09.2024	12.80	14.30	43.50	24.10	28.04.2007	BDL	12.5	138	45
06.09.2024	12.70	14.40	43.80	24.30	30.04.2007	BDL	9.5	121	41
12.09.2024	12.40	14.10	43.70	24.20	07.05.2007	BDL	15.0	148	47
13.09.2024	12.90	14.20	43.60	24.60	11.05.2007	BDL	8.0	92	35
19.09.2024	13.00	14.50	43.20	24.80	14.05.2007	BDL	9.5	132	43
20.09.2024	12.60	14.00	43.80	24.50	18.05.2007	BDL	8.5	118	38
26.09.2024	12.70	14.20	43.90	24.70	20.05.2007	BDL	10.5	138	45
27.09.2024	12.50	14.10	43.40	24.40	23.05.2007	BDL	8.5	85	30
Min.	12.40	14.00	43.20	24.10	**Min.**	**0**	**8.0**	**85.0**	**30.0**
Max.	13.00	14.50	43.90	24.80	**Max.**	**0**	**15.0**	**148.0**	**47.0**
Avg.	12.70	14.22	43.61	24.45	**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									
September - 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 $_{10}$	$PM_{2.5}$
	$\mu g/m^3$				mg/m^3	$\mu g/m^3$			
05.09.2024	10.80	12.60	41.50	20.10	29.04.2007	5.5	31.5	120	65
06.09.2024	10.60	12.50	41.30	20.30	03.05.2007	6.0	34.5	135	72
12.09.2024	10.90	12.70	41.70	20.40	05.05.2007	5.5	30.5	130	68
13.09.2024	10.80	12.80	41.40	20.50	09.05.2007	5.0	28.5	102	57
19.09.2024	10.70	12.90	41.60	20.20	13.05.2007	5.0	32.5	112	60
20.09.2024	10.60	12.70	41.90	20.70	16.05.2007	6.5	38.5	138	72
26.09.2024	10.50	12.50	41.80	20.60	22.05.2007	6.0	36.5	141	74
27.09.2024	10.40	12.40	41.50	20.80	25.02.2007	6.5	32.5	118	68
Min.	**10.40**	**12.40**	**41.30**	**20.10**	**Min.**	**5.0**	**28.5**	**102.0**	**57.0**
Max.	**10.90**	**12.90**	**41.90**	**20.80**	**Max.**	**6.5**	**38.5**	**141.0**	**74.0**
Avg.	**10.66**	**12.63**	**41.58**	**20.45**	**Avg.**	**5.75**	**33.12**	**124.5**	**67.0**
NAAQ Standards (2009)	**80**	**80**	**100**	**60**	**NAAQ Standards (1994)**	**120**	**120**	**500**	**150**

Comparison of Base Line Data with the analysis report of September 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	Sep 2024	As Per EIA-507.5 MU	Sep 2024	As Per EIA-507.5 MU	Sep 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		0.8		0.6		0.2	NTU	1	5
5	TDS	17222	51	8	30	16	38	mg/l	500	2000
6	pH	7.1	7.23	6.2	6.97	6.8	6.83	-	6.5 - 8.5	No relaxation
7	Alkalinity		15.93		4.46		17.84	mg/l	200	600
8	Total Hardness as $CaCO_3$		15.93		15.93		19.92	mg/l	200	600
9	Calcium as Ca		4.79		3.19		4.78	mg/l	75	200
10	Magnesium as Mg		BLQ		1.93		1.93	mg/l	30	100
11	Iron as Fe	0.1	0.26	0.3	0.24	1.5	0.21	mg/l	0.3	No relaxation
12	Sulphate as SO_4	1096	7.35	1.9	4.83	2.1	4.07	mg/l	200	400
13	Chloride as Cl	9264	19.82	8.6	11.89	9.6	9.91	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		BLQ	ND	BLQ		BLQ	mg/l	45	No relaxation
29	E.Coli	280	<2	350	<2	1800	<2	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

Annexure - VIII

adani
Power

REF: APL UdupiJetty/ENV/2024-25/ 1352.

23.09.2024

To,
The Environment Officer
Karnataka State Pollution Control Board
Plot No. 10-B, "Parisara Bhavan"
Baikampady Industrial Area
Mangalore - 575 011

Sub: Submission of Environmental Statement for FY 2023-24 in Form-V for Captive Jetty with associated facilities for handling of coal and bulk cargos/ liquid cargo for Adani Power Limited, Udupi Thermal Power Plant

Ref: 1) Consent for Operation No: **AW-328135 dated: 18.11.2021**
2) Environmental Clearance No:-**J-16011/13/2002-IA.III (T) dated: 16.01.2003**

Dear Sir,

With reference to the above cited subject, please find the enclosed Environmental Statement in Form-V for the financial year 2023-24 for Captive Jetty with associated facilities for handling of coal and bulk cargos/ liquid cargo for Adani Power Limited, Udupi Thermal Power Plant.

Thanking you,

Yours faithfully

Dr. Suneel Naik
Site Head – Environment
Adani Power Limited, Udupi

RECEIVED
Regional Office
Karnataka State Pollution Control Board
Plot No.10-'B', Baikampady Industrial Area
Mangaluru-575011
27/9/2024

Encl: Environmental Statement in Form-V (FY 2023-24)

Copy to:
Member Secretary,
Karnataka State Pollution Control Board,
"Parisara Bhavana", 1st to 5th Floor,
#49 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, 2024

PART-A

i	Name and address of the owner/occupier of the industry	Mr. Sridhar Ganesan Station Head Adani Power Limited Udupi TPP Berth No: 15, NMPA Premises, Panambur, Dakshina Kannada District, Karnataka - 575010
ii	Industry category Primary-(STC code) Secondary- (STC Code)	Large scale Industry - Red Category
iii	Production category –Units	Bulk handling coal terminal and its allied facilities and utilized for coal unloading, stacking and loading into railway wagons and handling of bulk cargos/ liquid cargo.
iv	Year of establishment/Commission	2011
v	Date of the last environmental statement submitted	Letter No: UPCL/PLANT/O&M/ENV/2022-23/469 Dated: 12.09.2022

PART-B

Water and Raw Material Consumption:

i. Water consumption in m^3/d

Process (Dust suppression)	: 12.51
Cooling	: Not Applicable
Domestic	: 0.36
Total	: 12.87

Name of Products	Process water consumption per unit of products	
	During the previous financial year	During the current financial year
Bulk handling coal terminal and its allied facilities and utilized for coal unloading, stacking and loading into railway wagons and handling of bulk cargos/ liquid cargo		

ii. Raw material consumption

Name of raw materials	Name of Products	Consumption of raw material per unit of output	
		During the previous financial year	During the current financial year
Bulk handling coal terminal and its allied facilities and utilized for coal unloading, stacking and loading into railway wagons and handling of bulk cargos/ liquid cargo			

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

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
	Color& Odor	Not Applicable	Color & Odour	Agreeable	
	pH		pH	6.91	
	TSS		TSS, mg/l	12.40	
	BOD		BOD, mg/l	8.0	
	COD		COD, mg/l	42.94	
	Floating Material		Floating Material, oil & grease and scum (including POL products)	BLQ	
b) Air (DG Stack)	Parameter		Parameter	Results	No deviation
	NMHC		NMHC (mg/Nm^3)	11.8	
	PM		PM (mg/Nm^3)	22.3	
	NO_X		NO_X (mg/Nm^3)	41.80	
	CO		CO (mg/Nm^3)	41.60	

PART-D

*HAZARDOUS WASTES**

{As specified under Hazardous and Other Wastes (Management & Trans-boundary Movement) Rules, 2016}

Hazardous Wastes	Total Quantity (MT)			
	During the previous financial year (2022-23)		During the current financial year (2023-24)	
From Process	Used Oil	0.0 MT	Used Oil	0.0 MT
	Oil Soaked Cotton waste	0.99 MT	Oil Soaked Cotton waste	0.0 MT
	Discarded Containers	0.0 MT	Discarded Containers	0.50 MT
From Pollution Control Facilities	Not Applicable		Not Applicable	

PART-E

*SOLID WASTES**

Solid Wastes	Total Quantity (Kg)	
	During the previous financial year	During the current financial year
a)From Process	Bulk handling coal terminal and its allied facilities and utilized for coal unloading, stacking and loading into railway wagons and handling of bulk cargos/ liquid cargo	
b)From Pollution Control Facility		
c) Quantity recycled or reutilized		

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 & Trans boundary Movement) Rules 2016 and amendments, hazardous wastes generated in the industry are of three categories i.e., 5.1 Used oil, 5.2 Oil soaked cotton waste and 33.1 Discarded containers. All these generated wastes are stored on the concrete platform in designated location and disposed to KSPCB/CPCB authorized vendors only.

PART-G

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

- Coal handling is completely mechanized by usage of grab, hopper, belt conveyors, traverse points, stacker-reclaimer and silos which is loaded to wagons after storage.
- Water sprinkler system and dust suppression system is installed in the coal handling area to control the fugitive dust emissions.
- Coal Settling ponds are constructed to settle the suspended solids by adding Ferric alum.

PART-H

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

PART-I

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

a) World Environment Day celebration to create Environmental awareness among employees and community by conducting various environmental competitions, workshops & presentations.
b) 1000 sapling planted in Mass plantation drive inside the plant on the day of world Environment Day – 2023-24.
c) 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

23/09/24.

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: