HINDUJA NATIONAL POWER CORPORATION LIMITED

Corporate Office : Hinduja House, 171 Dr. Annie Besant Road, Worli, Mumbai - 400 018
www.hindujagroup.com, Office Tel : +91-22-61360407, Fax : +91-22-2497 4208
Plant Office : Palavalasa Village, T.Devada Post, Steel Plant (Sub Office), Pedagantyada Mandal, Visakhapatnam-530 031. A.P. India.
CIN : U40109TG1994PLC017199

HNPCL/VSKP/APPCB/156/2021-22/290623
Date: 29 June' 2023

To

Regional Directorate - Bengalure
A – Block, Nisarga Bhavan,
1st and 2nd Floors,
7th D Cross, Thimmaiah Road,
Shivanagar,
Bengalure-560079

Dear Sir,

Sub: HNPCL – 2X520MW TPP Submission of compliance status report from October 2022 - March 2023

Ref: E C Letter No. J-13011/11/90-IA-II(T) dated 3rd September, 1996 &
Letter No: J-13012/92/2008-IA.II(T) dated 10th June, 2010

Hinduja National Power Corporation Ltd. here with submitting half-yearly EC/CFO compliance report for the period from October 2022 - March 2023 for your kind perusal.

Thanking you,

Yours faithfully,
For Hinduja National Power Corporation Limited

Sabyasachi Mukherjee
Sr. Vice President

Encl: as above

ENVIRONMENTAL COMPLIANCE STATUS REPORT

FOR

1040 MW (2 x 520 MW) THERMAL POWER PLANT
VISAKHAPATNAM, ANDHRA PRADESH

OCTOBER 2022 - MARCH 2023

Sponsor:

HINDUJA NATIONAL POWER CORPORATION LIMITED
VISAKHAPATNAM, ANDHRA PRADESH

Prepared by:

VIMTA Labs Ltd.,
142, IDA, Phase-II,
Cherlapally, Hyderabad–500 051, Telangana State
www.vimta.com,www.env@vimta.com

PREFACE

HINDUJA NATIONAL POWER CORPORATION LIMITED

ENVIRONMENTAL COMPLIANCE STATUS REPORT
FOR
1040 MW (2 x 520 MW) THERMAL POWER PLANT
VISAKHAPATNAM, ANDHRA PRADESH

OCTOBER 2022 – MARCH 2023

For and on behalf of VIMTA Labs Limited

Approved by : **M. Janardhan**

Signed : 

Designation : **Head & Vice President (Environment)**

Date : **30th June, 2023**

This report has been prepared by **Vimta Labs Limited** with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

Table of Contents

List of Tables

Chapter-1
Introduction

1.0 INTRODUCTION

1.1 The Background

Hinduja National Power Corporation Limited (HNPCL) is part of Hinduja Group to realize the ambitions of the Group in Power Sector. HNPCL is planning to create a power generation capacity of 10,000 MW over the next ten years at an expected investment of over $10 billion across India. The total projected capacity will be a mix of thermal, hydro, nuclear and renewable energy.

As a first step in power sector, HNPCL is setting up a 1,040 MW coal based merchant power plant and is located on the coast of the Bay of Bengal at Palavalasa, Pedagantyada Mandal, Visakhapatnam District in the State of Andhra Pradesh, India. The project configuration is 2x520 MW.

The earlier Environmental Clearance (EC) has been confirmed from Ministry of Environment & Forests, Consent for Establish (CFE) and Consent for Operation (CFO) from Andhra Pradesh Pollution Control Board (APPCB) has been obtained.

Hinduja National Power Corporation Limited (HNPCL) has retained M/s **VIMTA LABS LIMITED, Hyderabad** to undertake Environmental Data Generation for various environmental factors on monthly and seasonal basis, which may be affected due to the likely impact arising out of the existing Power plant. Environmental data has been collected for various environmental components viz. Air, water, Noise and Soil quality during October 2022 to March 2023 and prepared compliance to Environmental clearance involved by MOEF vide Letter No:J-13011/11/90-IA-II(T) dated 3rd September, 1996, No: J-13012/92/2008.IA.II(T) dated 4th March 2009, No. J 13012/92/2008-IA.II(T) dated 10th June 2010 and CRZ Clearance vide letter F. No 11-58/2011-1A-III dated 3rd January 2014, F. No: 11-58/2011-IA-III dated 17/19th March, 2015, Letter No: 245/Env/CZMA/2015, dated 05th June, 2015, F. No: 11-58/2011-IA-III dated 01th October, 2015, F. No: 11-58/2011-IA-III dated 01th 2019, 2015 (Amendment), CFO No: APPCB/VSP/VSP/19/HO/CFO/2020, dated 06th March, 2020.

1.2 Project Setting

The existing plant is located in Palavalasa, Pedagantyada Mandal, Visakhapatnam District of Andhra Pradesh and the same is identified on the survey of India toposheet no 65 O/2, O/6 at the Latitude $17^0$34'30" North and Longitude $83^0$07'30" East at an elevation of 8.5 m above Mean Sea Level (MSL).

The present study of various environmental attributes establishes the post operational characteristics and this will help in identifying the incremental concentrations if any, due to the operation of the existing plant.

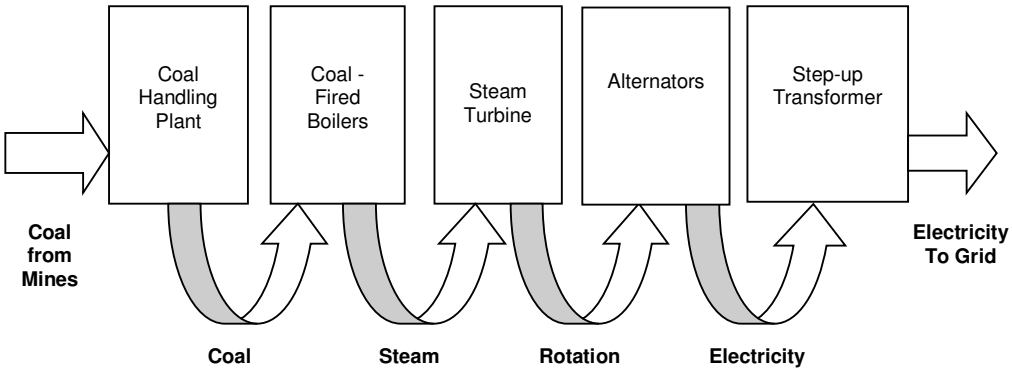
The geographical location of the plant is shown in **Figures-1.1.** The topographical features of the project area (within 10 km radius of plant site) are depicted in **Figures-1.2.**

The long-term data recorded at India Meteorological Center at Visakhapatnam indicates temperature in the range of 15.8°C to 37.7°C. The mean total rainfall is about 1300 mm for the whole year. The relative humidity is generally high during the period from September to January and is least during the summer afternoons.

The predominant wind direction and wind speed as recorded by IMD Visakhapatnam during the winter season are E (32.4%) followed by ESE (19.9 %) and during the Pre monsoon season are SW (42.5%) followed by SSW (35.8%). This variation in wind pattern can be attributed to the hilly terrain prevailing in the region. The Relative Humidity was observed to be in the range of 63 to 80% during the winter and Pre monsoon seasons.

1.3 Process Description

Each of the coal-fired power projects currently in development would employ pulverized coal combustion (PCC) technology. In the PCC process, the coal-handling plants receive coal, crush it to the required size and feed it to the boiler plants. The boiler plants then use coal pulverisers to grind the coal to a finer size before it is fed to the boiler furnace. The boilers are enclosures encased by tubes filled with flowing water. As the boiler furnace heats, the water flowing in the boiler tubes is converted into high pressure and high temperature steam. This steam is conveyed to the turbine through steam pipelines. The steam produced in the boiler drives steam turbines, making the turbines' rotors rotate at high speeds. Alternators are coupled to the steam turbines and rotate with the turbines' rotors. The alternators convert the energy generated by the rotation of the turbines' rotors into electricity. Step-up transformers then step up the voltage of generated electricity before it is fed to the grids for transmission. Transmission of electricity is done at very high voltage to minimize transmission losses.
The coal-fired power process is illustrated below:



The process of generation of power from coal (water steam cycle) essentially entails two main stages. In the first stage, the chemical energy stored in coal is converted into heat energy in the coal-fired boilers. In the second stage, the high-pressure steam, which is generated in the boilers, is passed through turbines (conversion of heat energy into mechanical energy) which in turn is coupled to generators (conversion of mechanical energy into electrical energy), thereby generating electricity.

The water steam cycle essentially contains the coal fired steam generator, the steam turbine with condenser, feed-water tank, low-pressure (LP) heaters and high-pressure (HP) heaters and the connecting pipelines. The superheated steam produced in the steam generator is supplied to the steam turbine, which drives the three-phase AC generator. After leaving the HP turbine, the steam is reheated in the steam generator and fed to the Intermediate Pressure (IP) turbine. In the LP turbine the steam coming directly from the IP turbine expands to condenser pressure and is condensed in the condenser.

Once through system is used for cooling of the condenser. The condensate collected in the condenser hot well is discharged by the condensate pumps and supplied via the LP condensate heaters into the feed water tank. The feed water is further heated by bled steam from turbine and dissolved gases from the feed-water are liberated. The boiler feed pumps discharge feed water from the feed-water tank via the HP heaters to the economizer. Steaming starts from this point onwards. The high temperature steam-water mix is further converted into steam in water walls and finally passed through the super heaters sections for converting the saturated steam into superheated steam.

The power station would be designed with two power generating units of 520 MW each, along with the auxiliaries and common utility services like plant water system, coal handling system, ash handling plant, and switchyard for power evacuation, plant electrical system and workshop.

The main sections of the power generating unit include Steam Generator along with milling system and electrostatic precipitator, integral piping, integral control system, turbine and generator unit, boiler feed pump, regenerative heaters, condensate extraction pump, circulating and auxiliary cooling water pumps and the generator transformer with bus duct. The main sections of the utility system are the coal handling system, ash handling system, fire fighting system, AC & Ventilation system, switchyard and the plant water system. The power generated at lower voltage of 21 KV would be stepped up to 400 KV and will be connected to the proposed 400 KV switchyard for dispatch.

The plant layout is shown in **Figure-1.3**.

1.4 Scope of the Study

Under the scope of the study, an area of 10 km radius from the centre of the existing plant was covered in detail for various environmental components viz Air, water, Noise and Soil based on the guidelines of Ministry of Environment and Forests, Government of India.

1.4.1 Micrometeorological data

The meteorological and micro-climatic parameters were also recorded simultaneously using automatic weather station located within the plant site. Wind speed, Wind Direction, Relative Humidity and Rainfall were recorded on hourly basis during the study period. Minimum and maximum temperatures were also recorded.

1.4.2 Air Environment

The baseline status of the existing ambient air quality within the study region has been assessed through a monitoring network of Eight Ambient Air Quality (AAQ) sampling stations during study period (October 2022–March 2023). The monitoring network has been established depending on the available climatological norms of predominant wind directions and wind speeds of the study region in the Post monsoon, winter and part of Pre monsoon season. The baseline status of air environment was monitored for Fine Respirable Particulate Matter (PM2.5), Respirable particulate matter PM10 (RPM) and gaseous pollutants like Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni).

1.4.3 Fugitive Dust Emission Monitoring

Fugitive dust emission monitoring was carried out at 5 locations within the plant site to assess the uncontrolled emissions from the sources like dust handling areas, construction areas and roads etc.

1.4.4 Water Quality

Information on water resources (ground) was collected during the study period. The parameters of prime importance were selected under physical, chemical, inorganic, chemical organic and heavy metal groups. Samples were collected for basic nutrient demand; toxic parameters and baseline data on bacteriological aspects were also collected from the existing dug and bore wells. Open well and bore well samples were collected within 10 Km around the existing site.

1.4.5 Noise Quality

A detailed survey on noise environment was carried out in and around the project site to study the levels of noise, as the high dB (A) levels may cause adverse effect on human beings and associated environment. Spot noise levels were measured using a precision noise level meter, at residential areas, schools, hospitals, bus stands and commercial centers etc. The major noise generating sources were identified in the existing plant and were monitored to study noise environment. Ambient noise levels were measured at 8 locations in 5 Km radial distance.

1.5 Compliance to Environmental Clearance

Compliance to Environmental Clearance obtained for 2x520 MW Thermal Power Plant near Visakhapatnam. **Vide Letter No: J-13011/11/90-IA-II (T) dated 3rd September, 1996 and**

CRZ Clearance for the Seawater intake & outfall system and Rail line for Coal transport at palavalasa, Visakhapatnam **Vide Letter F.No: 11-58/2011-IA-III dated 3rd January, 2014 and 17/19th March, 2015.**

Consent Order **No: APPCB/VSP/19/HO/CTO/2016,** dated:**21stMarch, 2023**. A compliance Status Report is prepared for 6 months' period from **October 2022-March 2023** is given in **Chapter-2.**

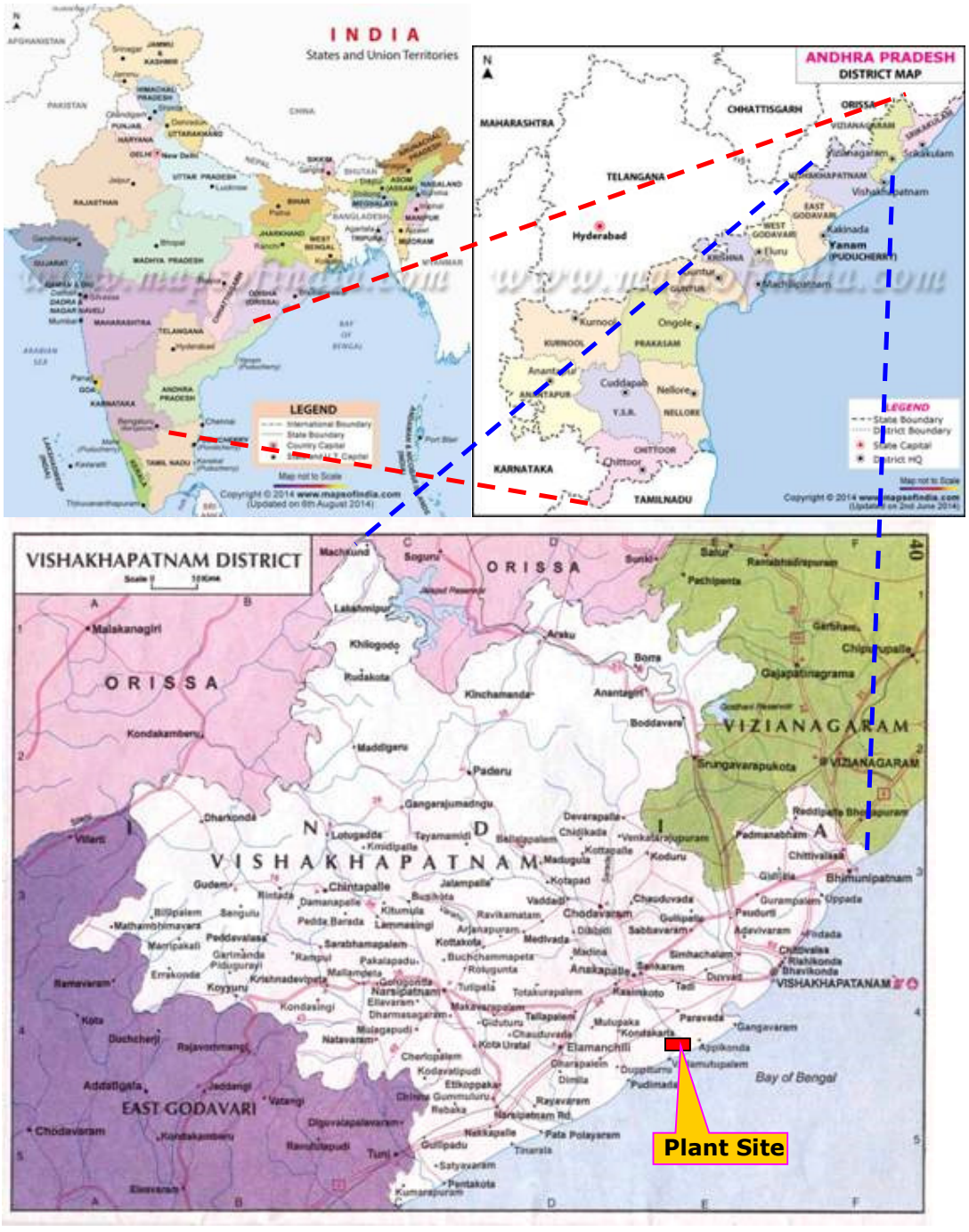


FIGURE-1.1
GEOGRAPHICAL LOCATION MAP

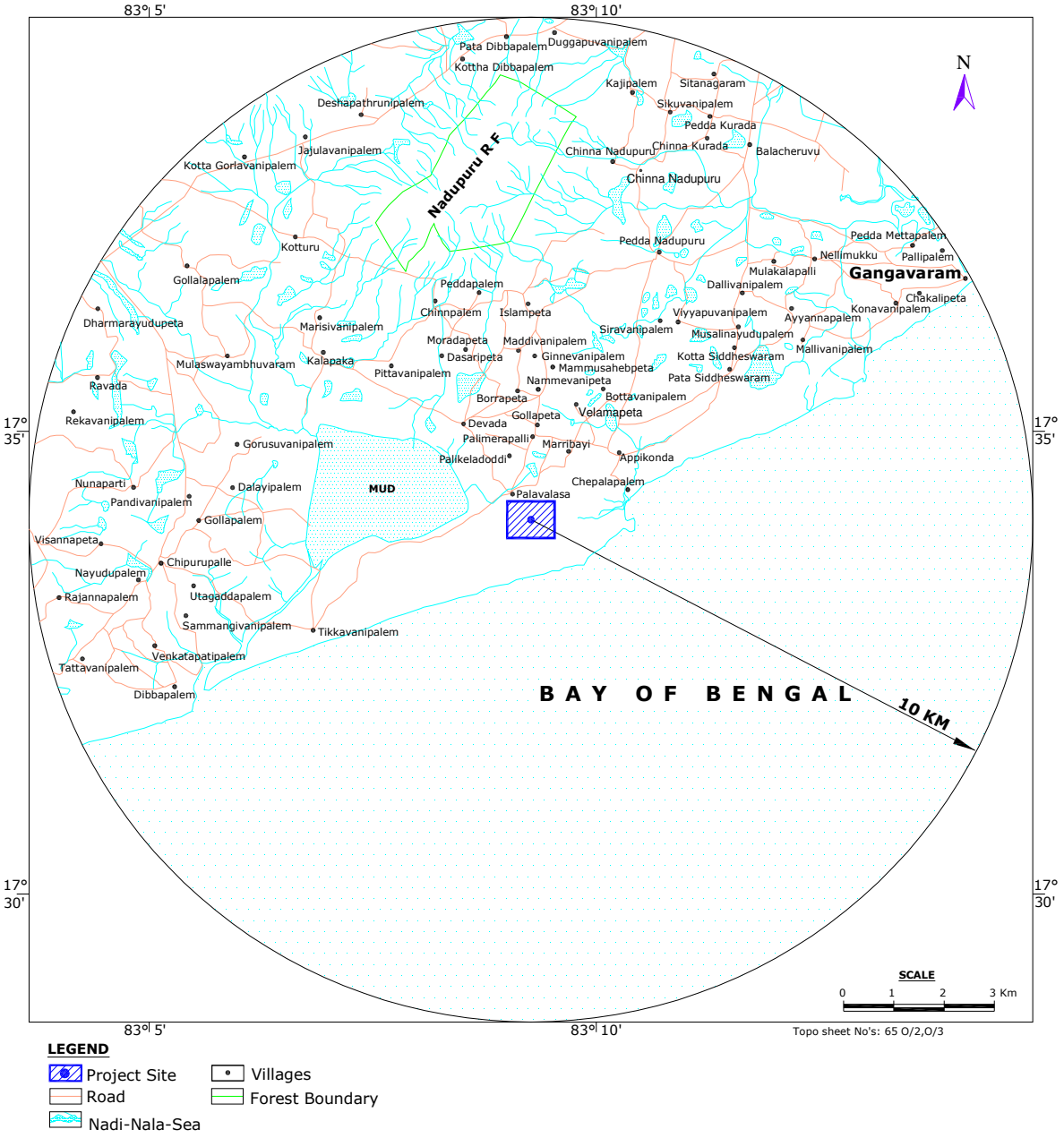


FIGURE-1.2
LOCATION MAP-10KM RADIUS

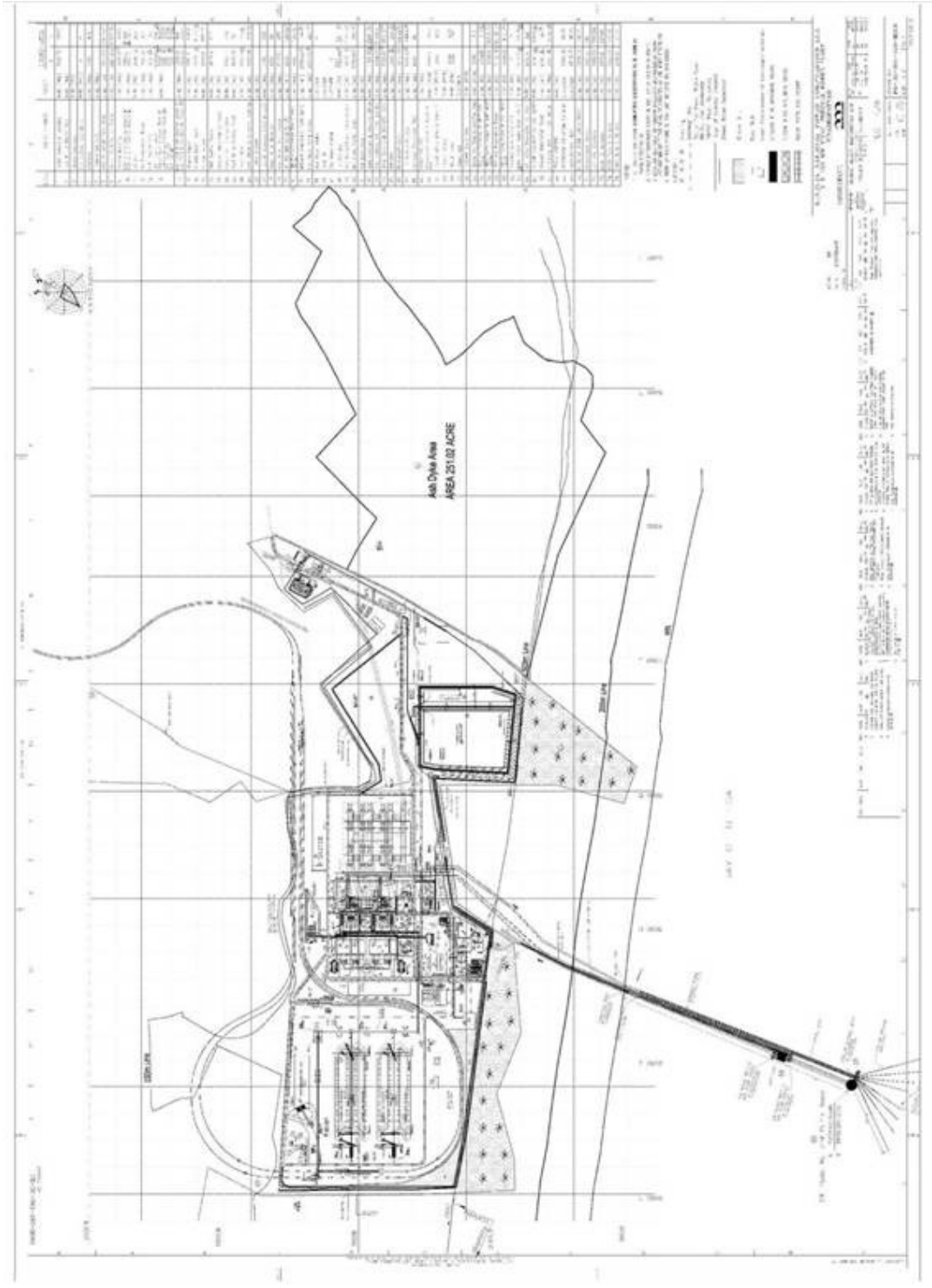


FIGURE-1.3

PLANT LAYOUT FOR HNPCL'S 2 X 520 MW THERMAL POWER PLANT AT VISHAKAPATNAM

Chapter-2

Compliance Status Report

COMPLIANCE STATUS REPORT – OCTOBER TO MARCH 2023

Ref: **Environment Clearance & Amendments to Environment Clearance Letter and Consent for Operation as mentioned below:**

1. Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996
2. Letter No: J–13011/11/90-IA-II(T) dated 10th September, 1996
3. Letter No: J-13011/11/90-IA.II dated 15th November, 1996
4. Letter No: J-13011/11/90-IA.II(T) dated 20th April, 1999
5. Letter No: J-13012/92/2008.IA.II(T) dated 4th March, 2009
6. Letter No: J-13012/92/2008-IA.II(T) dated 10th June, 2010
7. F. No: 11-58/2011-IA-III dated 3rd January, 2014
8. F. No: 11-58/2011-IA-III dated 17/19th March, 2015
9. Letter No: 245/Env/CZMA/2015, dated 05th June, 2015
10. F. No: 11-58/2011-IA-III dated 01st October, 2015
11. F. No: 11-58/2011-IA-III dated 01st October, 2015 (Amendment)
12. Consent Order No:APPCB/VSP/VSP/19/HO/CFO/2017- dated :10th May,2017
13. Consent Order No:APPCB/VSP/VSP/19/HO/CFO/2020- dated :06th March,2020
14. Consent Order No:APPCB/VSP/19/HO/CTO/2016- dated :21st March,2023

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
Specific Conditions		
i)	All the conditions stipulated by Andhra Pradesh Pollution Control board vide their letter No.19/PCB/ C.Estt./RO/VSP/AEE/V111/95-4433 dated 13th November, 1995 should be strictly implemented	Noted and are being complied as applicable. A monthly environmental monitoring report is being submitted to APPCB every month.
ii)	A bi-flue stack of 275 m with continuous stack monitoring system should be installed.	A bi-flue stack of 275 m has been constructed with continuous stack monitoring system.
iii)	Electrostatic precipitator having efficiency of not less than 99.8% should be installed and it should be ensured that particulate emissions would not exceed the prescribed limit of 150 mg/Nm3.	An ESP with 99.8% efficiency has been installed to control the Particulate matter emissions below 50 mg/Nm3.
iv)	Once through cooling system should be provided and the rise in temperature should be maintained within 7 degrees centigrade of the ambient water. The proposed pipeline for sea water intake and outlet should conform to the regulations of the coastal zone notification of February, 1991. Desalination plant should be provided for meeting the water requirement of the power project and other auxiliary activities.	Water balance of the power plant enclosed as **Annexure-II** (Please check with HNPCL Engineering for Latest WBD). We have obtained the CRZ clearance from MoEF has been obtained for sea water intake//outfall system. Once through cooling system has been designed to maintain temperature differential within 7 deg centigrade over and above the ambient temperature of receiving water body and being maintained the same during operation of the Plant. Desalination plant with a capacity of 12.5 MLD has been installed to meet the sweet water requirement.

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
v)	Adequate space should be provided for installation of flue gas desulphurization plant in future for control of sulphur dioxide.	Space provision for installing FGD if required, has been provided in the plant layout in future for control Sulphur dioxide.
vi)	Acquisition of land should be restricted to 2682 acres including 890 acres for ash disposal.	Complied. The plant has been established in an area of 723 acres including ash pond.
vii)	Only beneficiated coal to the tune of 16080 MT/day should be used with ash content not exceeding 34%. Fly ash generated should be collected in dry form in silos and fully utilized in a phased manner. As indicated in the Environmental Management plan, increase in the dyke height above 8 m should be undertaken through use of fly ash. For avoiding contamination of ground water, ash pond area should be suitably lined and dyked. As provided in the layout, adequate space should be earmarked for getting up of ash user plants to avoid long distance transportation to fly ash.	MoEF vide its letter mentioned in Ref:3 has modified this condition to be read as "Only beneficiated coal to the tune of 16080 metric tonnes/day should be used with average annual ash content supplied by Mahanadi Coalfields Limited not exceeding 34+ or - 1-2%. Fly ash generated should be collected in dry form in silos and fully utilized in a phased manner. As indicated in the Environmental Management plan, increase in the dyke height above 8 m should be undertaken through use of fly ash. For avoiding contamination of ground water, ash pond area should be suitably lined and dyked. As provided in the layout, adequate space should be earmarked for getting up of ash user plants to avoid long distance transportation to fly ash." Further vide letter mentioned in Ref:4 MoEF has accorded "no objection to the use of fuel from alternative sources which will have the same coal quality as beneficiated coal". • With respect to the above we confirm that: Total coal expected to be used in a day will be well within the quantity recommended. Fly ash will be fully utilized in a phased manner as mentioned in the condition. • Ash pond is being lined with HDPE to prevent contamination of ground water. Further the Ground water monitoring is being undertaken by a third party on Monthly basis as per the monitored data the levels are within permissible limits. • Pond ash and Fly ash will be utilized by the following Agencies: 1) Simhadri Constructions. 2) Ramco cements 3) My home cements 4) Sagar cements 5) Vipasana 6) Sri Sai Ganesh Transporter 7) Chettinad cements 8) Nagrajuna cements 9) Ultra tech cements 10) Brick industries.
viii)	Noise level should be limited to 85 dBA and regular maintenance of equipments be undertaken. For people working in the area of	Noise levels are being monitored by third part at locations within the plant area and the results are within prescribed limits.

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
	generator halls and other high noise areas, ear plugs should be provided.	Requisite personnel protective equipment has already been provided to people working in high noise areas.
ix)	For controlling fugitive dust, regular sprinkling of water in coal handling and other vulnerable areas of the plant should be ensured.	Dust Suppression system installed and regular sprinkling of water on coal in stock yard and conveyors is being ensured.
x)	Afforestation plan should be formulated in consultation with the local DFO and implemented by creating a greenbelt of 500 m along the sea side from High Tide Line. A strip of greenbelt of 150-200 m should also be created along the ash pond area and about 100 m in available spaces within the colony along the road etc. A norm of 1500-2000 trees per ha should be followed and aftercare and monitoring should also be ensured.	The power project including ash pond is restricted to 533 acres. Presently green belt is being developed in and around the power project area and an area of 249.14 acres has already been developed. Further development of Green belt continues.
xi)	Continuous monitoring of ground water should be undertaken by establishing good network of observation wells in consultation with the Central ground water board. Results and data collected should be analysed to ascertain the status of water quality and findings should be submitted for evaluation.	Continuous ground water monitoring is being carried out at seven locations on Monthly basis and the monthly data is being submitted to APPCB. As per the results the limits are within the prescribed norms. The same has been compiled and is enclosed in **Chapter-3, Section-3.5.**
xii)	All effluents generated in various plant activities should be collected in the Central Effluent Treatment Plant and treated to ensure adherence to specified standards of discharge. The concept of zero discharge should be adopted to a maximum possible extent.	Complied. All the effluents generated are being treated in the Effluent Treatment Plant (ETP). The outflow is being monitored by continuous monitoring system. Zero discharge has been adopted to the maximum possible extent.
	Keeping in view the fact that 2x500 MW thermal power plant by M/s. National Thermal Power Corporation limited proposed in the vicinity of 1040 MW thermal power project, common facilities for coal transportation, laying of rail lines etc. should be worked out with mutual consultation to avoid duplication of facilities and acquisition of additional land.	Noted For coal transportation, the facilities are being explored with NTPC and discussions are under progress.
xiv)	A financial provision of Rs. 250 crores should be provided for implementation of environmental mitigative measures with adequate scope for its enhancement in future. These funds should not be diverted for any other activities and separate account should be maintained.	Noted
xv)	Regular monitoring for SPM, SO_2 and NOx around the power plant may be carried out and records maintained. The data also collected should be properly analysed and submitted to the Ministry every six months.	Monitoring is being carried out at eight ambient air quality monitoring stations within the 10 km radius study area from the existing power plant complex, with two in the predominantly downward wind direction.

Sr. No.	Condition (*Letter No: J–13011/11/90-IA-II(T) dated 3rd September, 1996)*	Status
		Data on ambient air quality is being submitted to APPCB on monthly basis and also to the regional office of MOEF. As per the AAQ data, the results are within limits. The same has been compiled and is enclosed in **Chapter-3, Section-3.2.**
xvi)	Full cooperation should be extended to the Scientists/officers from the Regional Office of the Ministry at Bangalore and also to the State Pollution Control Board who would be monitoring the compliance of environmental status. Complete set of impact assessment report and the Management Plans should be forwarded to the Regional Office for their use during monitoring.	Noted.
xvii)	Monitoring committee should be constituted for reviewing the compliance to various safeguard measures by involving recognized local NGOs, Pollution Control Board experts etc.	Internal Environmental Monitoring Committee is in place.
3	The Ministry reserves the right to revoke the clearance if conditions stipulated are not implemented to the satisfaction of the Ministry	Noted
4	For any deviation or alteration in the project proposed from those submitted to this Ministry for clearance, a fresh reference should be made to the Ministry to assess the adequacy of the conditions imposed and to add additional environmental protection measures required, if any.	Noted
5	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, the public liability Insurance Act, 1991, the Impact Assessment Notification of January, 1994 and its amendments.	Noted

Ref Letter No J-13012/ 92/2008. IA.II (T) dated 4th March, 2009		
S.No.	**Conditions**	**Compliance status**
6	Map indicating CRZ area duly certified by the approved agency and authenticated by the state coastal zone management authority may be submitted on Top priority.	Map has already been submitted to MOEF,
7	Compliance status w.r.to stipulated EC conditions should be uploaded in the company web site and updated twice in a year and the same will also be sent by e-mail to the MOEF regional office located at Bangalore.	Six monthly compliance reports are being regularly uploaded on the company web site. The link is as below. http://www.hindujanationalpower.com/images/compliance-status October 2022 - March 2023 -website-version.pdf
8	The ambient levels of criteria pollutants (SO2, NOX & SPM) should be uploaded and displaced on your website and also at a convenient place in the plant premises periodically.	Display is kept at the entrance of power project.

Sr. No	**Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)**	**Compliance Status**
SPECIFIC CONDITIONS		
(i)	"Consent for Establishments" shall be obtained from State Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.	"Consent for Establishment" was issued by state pollution control board vide their order no 19/PCB/C.ESTI/RO/VSPI AEE- VIII/95 -4433 signed dated 13/11/1995 and complied with.
(ii)	Shall maintain the existing vegetation cover in the area between HTL and 500m line which is approximately 180 acres, belonging to government, located adjacent to the project area, in consultation with the State Government and there shall be no industrial development with in this area as committed.	Existing plantation is being maintained between HTL and 500 m line. Additional 5 acres of land has been developed.
(iii)	The railway line has been shifted from mud flat area and as per the modified line only 160m is with in mud flat area as against the original plan on 1500m. Railway line in CRZ area shall be on stilt.	Noted. Correction in the design has been done for implementation and as per revised proposal length of Railway line in CRZ3 area is 0.375 Route Km and Railway

Sr. No	Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)	Compliance Status
		line does not pass through CRZ1 area or Inter tidal waters of mud flat. The proposal was approved by MOEF&CC vide letter No.F.No.11-58/2011-IA-III dated:1st October, 2015.
(iv)	There shall be no construction in mudflat except part of railway line on stilt as committed.	Noted.
(v)	Adequate spare diffuser arms for operation and maintenance of the marine outfall systems shall be Provided.	Noted
(vi)	Pipelines shall be laid with more care to minimize the impact to sand dunes	Noted.
(vii)	The double story switchgear, electro chlorination building and two numbers of storage tanks Proposed between 200 and 500 m from HTL shall be located beyond 500 m from HTL as committed.	Complied. The electro chlorination building and the storage tanks have been constructed beyond 500 m from the HTL with in the plant premises.
(viii)	Periodic monitoring of water quality in terms of temperature chlorine content if applicable, salinity etc at the outfall locations shall be carried out. If the impact of temperature and salinity is found significant in future, necessary remediation measures shall be taken by extending the outfall as well as the intake lines and/or providing augmentation in inland cooling facilities.	Periodic monitoring of water quality is going on at outfall location. Agreed.
(ix)	Installation of trash bar/screens shall be put in place at the intake well to avoid fish entrapment	Complied. Trash rack has been installed.
(x)	All the conditions laid by the SCZMA shall be strictly adhered to.	Agreed
(xi)	Construction activity shall be carried out strictly as per the provisions of CRZ Notification, 2011. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	Agreed
(xii)	The project shall be executed in such a manner that there shall not be any Disturbance to the fishing activity.	Noted. There is no disturbance to fishing activity
	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project	Being followed.
(xiii)	The project proponents shall set up separate Environment management cell for effective implementation of the stipulated environmental Safeguard under the supervision of a Senior executive.	Environment management cell is in place to monitor the implementation on continuous basis.
	The funds earmarked for environment management shall be included in the budget and this shall not be diverted for any other purposes.	Noted.
General Conditions		
Sr.No	**Condition**	**Compliance Status**

Sr. No	Condition (Letter No: 11/58/2011 IA.III dated 3rd January, 2014)	Compliance Status
	(Letter F.No: 11-58/2011-IA-III dated 3rd January, 2014)	
(i)	Appropriate measures must be take while undertaking digging activities to avoid any likely degradation of water quality.	Noted.
(ii)	Full supports shall be extended to the officer of this Ministry/Regional office at Bengaluru by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environment protection activities.	Noted.
(iii)	A six-Monthly monitoring report shall need to be submitted by the project proponents to the Regional Office of this Ministry at Bengaluru regarding the implementation of the stipulated Conditions.	Noted and being complied with.
(iv)	Ministry of Environment & Forests 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.	Agreed.
(v)	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
(vi)	In the event of a change in project profile or change in the implementation agency, fresh references shall be made to the Ministry of Environment and Forests.	Noted
(vii)	The project proponent 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.	Complied.
(viii)	A copy of the clearance letter shall be marked to concerned Panchayat/local NGO, if any, from whom any suggestion /representation has been Made received while processing the Proposal.	Agreed.
(ix)	State Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's Office/ Tehsildar's office for 30 days.	NA

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA.III dated 17/19th March 2015)	Compliance Status
(i)	Railway line, in the CRZ, shall be on embankment with clear openings or on stilt so as to ensure free flow of water.	Noted. Being complied with.
(ii)	PP shall get an expert opinion on the design of alignment on CRZ area on embankment with clear openings or on stilt so as to ensure free flow of water and submit to Ministry prior to commencement of Railway line work in CRZ area.	Noted
(iii)	The water bodies present adjacent to the proposed to the Railway alignment shall not be disturbed.	Noted. Shall be adhered to.

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA-III dated 01th October 2015) (Amendment in CRZ Clearance-reg)	Compliance Status
(i)	All the conditions/recommendation stipulated by Andhra Pradesh Coastal zone Management Authority (APCZMA) vide letter No.245/Env/CZMA/2015 dated 05.06.2015 shall strictly be complied with	Noted. Details are furnished below
(ii)	All the condition stipulated in the clearance vide letter No.11-58/2011-IA-III dated 3rd January, 2014 and subsequent amendment dated 17th March, 2015 shall remain unchanged.	Noted and complied as detailed above

Sr. No.	Condition (Letter No: F.NO. 11-58/ 2011-IA-III dated 01th October 2015) (Interim arrangement for the sea water intake and outfall system-reg)	Compliance Status
(i)	All the conditions/recommendation stipulated by Andhra Pradesh Coastal zone Management Authority (APCZMA) vide letter No.245/Env/CZMA/2015 dated 06.07.2015 shall strictly be complied with	Noted. Details are furnished below
(ii)	All the condition stipulated in the clearance granted by this Ministry vide letter No.11-58/2011-IA-III dated 3rd January, 2014 and subsequent amendment dated 17th March, 2015 shall remain unchanged.	Noted and being complied with
(iii)	The PP shall use multi diffuser in the outfall. As suggested by NCSCM, the thermal water shall be release at 10 m depth from the 8 diffuser.	Noted and being complied with
(iv)	A monitoring system shall be deployed by the PP to assess the movement of thermal plume in and around the outfall coolant water jetty due to the occurrence of thermal plume oscillation in south-north direction during monsoon and also to monitor the impact of hot water discharge in to the sea water flora and fauna. The PP shall comply with at the direction of the APCZMA and take necessary corrective measures wherever required.	Noted and being complied with. Hydro dynamic Studies, dispersion modeling studies for Intake and Outfall discharge studies are being carried out by Environ software(P) Ltd and the same is submitting to the concerned parties
(v)	The PP shall take all necessary clearance from the concerned authorities viz-a-viz from the concerned State Pollution Control Board	Noted and being complied with
(vi)	Care should also be take to ascertain minimal impact on the shore line change due to construction of coastal structures. For this purpose, shoreline change shall be monitored using the satellite imaginary and by beach profile studies at regular intravels.	Noted and being complied with

Sr. No.	Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)	Compliance Status
1	The proposed pipeline shall conform to the norms prescribed in the CRZ Notification issued by the Ministry of Environment and Forests, Government of India S. 0. No.19(E), dated 06-01-2011	Complied
2	No activity on the ground shall be undertaken without	Noted

Sr. No.	**Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)**	Compliance Status
	obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India as per S. 0. No.19(E), dated 06-01-2011 and the amendments issued thereof	
3	There shall be minimum disturbance to the sand dunes and other vegetation	Noted
4	On account of inversion process occurring along the Vizag coast, wherein the temperature profile gets reversed in such a way that bottom temperature tends to become higher than surface temperature on seasonal basis. Hence, it is suggested that a constant monitoring system shall be established to monitor the physical, chemical and biological activity near the outfall point and its surroundings. The industry shall take necessary steps to attain the safe diffusion of used ballast sea water discharged through outfall system	Temperature is Regularly monitoring at discharge points. All necessary measures has taken for safe discharge of ballast sea water.
5	Marker buoy and light indicators shall be established close to the intake and outfall points to avoid fishing net damage	Maker buoys and light indicators were installed.
6	Residual chlorine in the return water shall be kept at a very low concentration at discharge point. If possible, de-chlorination by hypo may be taken up before disposal of warm water into the sea	Residual chlorine is observed within limit. (<0.2ppm).
7	Additional diffusers shall be installed to enhance the dispersion of the hot water to facilitate the dissipation of temperature	Noted.
8	Regular monitoring of water quality at bottom and surface shall be carried out for pH, TSM, Salinity, DO, BOD, dissolved phosphate, nitrate, ammonia and PHC	Water quality monitoring in sea water is being carried out regularly.
9	Inter-tidal region shall be analyzed for texture, phosphorous, chromium, nickel, copper, cadmium, lead, mercury and PHC	Noted and being complied with
10	Biological characteristics shall be assessed based on primary productivity, phytopigments, phytoplankton populations and their generic diversity, biomass, population and community diversity of benthos, fisheries composition and density as well as species diversity	Noted and being complied with
11	Regular (seasonal) monitoring of temperature at the outfall to take necessary mitigation measures. Online monitoring of salinity and temperature may be implemented	Is being complied
12	Shoreline evolution to be predicted by using Mathematical Model preferably `LITPACK of MIKE.21' due to the impact that may be caused by the piers constructed to carry intake and outfall pipelines	Noted and being complied with
13	Shoreline monitoring shall be carried out regularly by a reputed organization having requisite experience, in order to take up suitable preventive measures.	Noted and being complied with
14	The geographical position of the present HTL, LTL and slope of the beaches shall be maintained i.e. any erosion that may occur need to be prevented. The	Noted and being followed.

Sr. No.	**Condition (Letter No: 245/Env/CZMA/2015, dated 05th June 2015)**	Compliance Status
	beach front shall be restored to the normal condition by adopting suitable engineering and vegetative measures	
15	The Ash generated shall be utilized as per the norms stipulated in Fly Ash Notification dated 14-09-1999	Noted and being complied with
16	Environmental audit shall be taken up periodically by the independent agency and submit the report to the Regulatory Agencies	Noted and Form-V is being submitted

Sr. No.	**Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II**	**Compliance Status**
	SCHEDULE-A	
1	Any up-set condition in any industrial plant / activity of the industry, which result in, increased effluent / emission discharge and/ or violation of standards stipulated in this order shall be informed to this Board, under intimation to the Collector and District Magistrate and take immediate action to bring down the discharge / emission below the limits.	Noted and shall be complied when such condition arises.
2	The industry should carryout analysis of waste water discharges or emissions through chimneys for the parameters mentioned in this order on quarterly basis and submit to the Board.	Noted and being complied with
3	Notwithstanding anything contained in this consent order, the Board hereby reserves the right and powers to review / revoke any and/or all the conditions imposed herein above and to make such variations as deemed fit for the purpose of the Acts by the Board.	Noted
4	The industry shall ensure that there shall not be any change in the process technology, source & composition of raw materials and scope of working without prior approval from the Board	Noted
5	The applicant shall submit Environment statement in Form V before 30th September every year as per Rule No.14 of E(P) Rules, 1986 & amendments thereof	Noted and being complied with
6	The applicant should make applications through Online for renewal of Consent (under Water and Air Acts) and Authorization under HWM Rules at least 120 days before the date of expiry of this order, along with prescribed fee under Water and Air Acts and detailed compliance of CFO conditions for obtaining Consent & HW Authorization of the Board.	Noted
7	The industry should immediately submit the revised application for consent to this Board in the event of any change in the raw material used, processes employed, quantity of trade effluents & quantity of emissions. Any change in the management shall be informed to the Board. The person authorized should not let out the premises / lend / sell / transfer their industrial premises without obtaining prior permission of the State Pollution Control Board.	Noted
8	Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer	Noted

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules 1982, to Appellate authority constituted under Section 28 of the Water(Prevention and Control of Pollution) Act, 1974 and Section 31 of the Air(Prevention and Control of Pollution) Act, 1981.	
9	The industry shall be liable to pay Environmental Compensation / Other Environmental Taxes, if any environmental damage caused to the surroundings, as fixed by the Collector & District Magistrate or any other competent authority as per the Rules in vogue.	Noted
10	The industry may explore the possibility of tapping the solar energy for their energy requirements.	Under review.
11	The industry should educate the workers and nearby public of possible accidents and remedial measures	Noted
	SCHEDULE – B	
	<u>The industry shall comply with the following conditions:</u>	
1	The industry shall complete the installation of FGD by 31.12.2024 as per MoEF &CC G.S.R.No. 682 dated 05.09.2022	HNPCL achieved COD of both the units is 2016. The plant was in reserved shutdown for more than 3 years since COD due to litigation with Discoms. HNPCL plant started operations after Hon'ble Supreme Court's order dated 02-Feb-2022. Meanwhile HNPCL has conducted a Pre-feasibility Study for FGD by TCE which was sent to CEA for approval 05-05-2018. CEA recommended that the process of tendering and finalization of commercial contracts should be done jointly with procurers, AP Discoms. As per Supreme court order the PPA was approved by APERC in Aug'22. HNPCL has approached AP Discoms for a joint decision on FGD technology and project finalization as per the CEA recommendation. The nomination of a Team from Discom is awaited. Follow-up is being done. Furthermore, HNPCL was categorized in category-A as per the notification dated 31-3-2021 stating that it is under 10KM radius of Visakhapatnam city. HNPCL appealed to MOEF and CPCB for re-categorization of plant to category-C. As per CPCB the task force decision is final. Meanwhile, HNPCL is in process of pursuing MoP for extension of time on grounds that the project has suffered due to regulatory issues.

<table>
<tr><th>Sr. No.</th><th>Condition
(Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II</th><th>Compliance Status</th></tr>
<tr><td></td><td></td><td>As per MOEF&CC Notification Dated 05.09.2022, FGD completion time lines have been extended up to 31.12.2024.</td></tr>
<tr><td>2</td><td>The industry shall transmit the data of CEMS connected to the Stacks to the APPCB website without interruption.</td><td>Online monitoring systems are available and Connected to board through online website.</td></tr>
<tr><td></td><td>WATER POLLUTION</td><td></td></tr>
<tr><td>3</td><td>The effluent discharged shall not contain constituents in excess of the tolerance limits mentioned below
<table>
<tr><th>Outlet</th><th>Parameter</th><th>Limiting Standards</th></tr>
<tr><td>1</td><td>pH</td><td>6.50 — 8.50</td></tr>
<tr><td></td><td>Temperature-not more than 7°C higher than intake water as per MoEF Communication dated 20.04.1999.</td><td></td></tr>
<tr><td></td><td>Total Suspended Solids(at 103—105° C)</td><td>100 mg/I</td></tr>
<tr><td></td><td>Oil and Grease</td><td>20 mg/I</td></tr>
<tr><td></td><td>Free chlorine</td><td>0.5 mg/I</td></tr>
<tr><td></td><td>Phosphate as PO4</td><td>20 mg/I</td></tr>
<tr><td></td><td>Chromium (Total)</td><td>0.2 mg/I</td></tr>
<tr><td></td><td>Copper (Total)</td><td>1mg/I</td></tr>
<tr><td></td><td>Iron</td><td>1 mg/I</td></tr>
<tr><td></td><td>Zinc</td><td>1 mg/I</td></tr>
<tr><td>2</td><td>pH</td><td>6.50 — 8.50</td></tr>
<tr><td></td><td>Oil and Grease</td><td>10 mg/l</td></tr>
<tr><td></td><td>BOD (3 days at 27 °C)</td><td>30 mg/l</td></tr>
<tr><td></td><td>Total Suspended Solids</td><td><100 mg/I</td></tr>
<tr><td></td><td>Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml</td><td><1000MPN /100 ml</td></tr>
</table></td><td>Noted and the effluent is Within the prescribed limits</td></tr>
<tr><td>4</td><td>The industry water consumption shall not exceed the quantities mentioned below:
<table>
<tr><th>S.No</th><th>Purpose</th><th>Quantity (m3/hr)</th></tr>
<tr><td>1</td><td>Condenser & Auxiliary Cooling Water System</td><td>175580</td></tr>
<tr><td>2</td><td>Ash water sump</td><td>2600</td></tr>
<tr><td>3</td><td>Dust Suppression system</td><td>220</td></tr>
<tr><td>4</td><td>For Desalination Plant feed</td><td>1600</td></tr>
<tr><td></td><td>Total</td><td>180000</td></tr>
<tr><td colspan="3">Details of specific consumption:</td></tr>
<tr><td>4 A</td><td colspan="2">From Desalination Plant to Reservoir</td></tr>
<tr><td>4 A 1</td><td>From reservoir to UF/RO System</td><td>503</td></tr>
<tr><td>a</td><td>RO Plant to Boiler Make Up, CPU Regeneration & other utilities</td><td>110</td></tr>
<tr><td>b</td><td>Blow down Quenching</td><td>90</td></tr>
<tr><td>C</td><td>Domestic Water</td><td>30</td></tr>
<tr><td>d</td><td>HVAC & Ventilation</td><td>80</td></tr>
<tr><td>e</td><td>Seal Water</td><td>75</td></tr>
<tr><td>f</td><td>Service water</td><td>52</td></tr>
<tr><td>g</td><td>APH & ESP Wash (As and when required)</td><td>06</td></tr>
<tr><td>h</td><td>RO Plant to Clarifier</td><td>---</td></tr>
<tr><td>i</td><td>UF , RO & EDI reject</td><td>70</td></tr>
<tr><td>4 A B</td><td>Water remain in recovery</td><td>11</td></tr>
</table>
Separate meters with necessary pipe-line shall be maintained for assessing the quantity of water used for each of the purposes mentioned above for Cess assessment purpose.</td><td>Noted and being complied with</td></tr>
<tr><td>5</td><td>The industry shall install and maintain digital electromagnetic flow meters with totalizers for Sea water drawl, water consumption and waste water generation for</td><td>Noted and being complied with</td></tr>
</table>

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	different streams of effluents and different categories of water usage stipulated in this order	
6	The industry shall maintain proper arrangements for collection of seepage from ash pond and pumped back into the ash water system, so as to avoid ground water pollution in the surrounding area. The run-off water from coal yard shall be treated to on land for irrigation standards before final disposal.	Noted and being complied with
7	The industry shall discharge the once through cooling water into sea through a suitable sub-marine pipeline. The industry shall discharge off once through cooling effluents from Unit – 1 & 2 at a distance of 900 mts from the shoreline	Noted and being complied with
8	The PP shall use multi diffuser in the outfall. As suggested by NCSCM, the thermal water release shall be release at 10 m depth from the 8 diffuse	Noted and being complied with
9	The industry shall monitor all ground water peizo wells and submit report to RO Visakhapatnam every three months indicating trends	Noted and being complied with
10	The industry shall construct separate storm water drains and provide rain water harvesting structures. No effluents shall be discharged in to the storm water drains	No effluents are discharged into drains. Storm water drains are available in the plant. Harvesting of Rain water will be reviewed.
11	The industry shall maintain Continuous Effluent Quality Monitoring Stations (CEQMS) for the parameters pH, TSS and Temperature data is transmitted to CPCB / APPCB on continuous basis.The industry shall comply with CPCB directions dated 05.02.2014 / 02.03.2015 and guidelines issued regarding online monitoring systems File No.APPCB/VSP/VSP/19/HO/CFO/2017 issued from time to time. The online monitoring system shall be calibrated periodically as per equipment suppliers manual / CPCB guidelines.	Being followed.
	AIR POLLUTION	
12	The emissions shall not contain constituents in excess of the prescribed limits mentioned below. **Chimney No. / Parameter / Emission Standards** 1 / Particulate matter / 50 mg/Nm3 / SO2 / 200 mg/Nm3 / NOx / 450 mg/Nm3 / Mercury / 0.03 mg/Nm3	Noted.
13	The industry shall comply with emission limits for DG sets of capacity upto 800 KW as per the Notification G.S.R.520 (E), dated 01.07.2003 under the Environment (Protection) Amendment Rules, 2003 and G.S.R.448(E), dated 12.07.2004 under the Environment (Protection) Second Amendment Rules, 2004. In case of DG sets of capacity more than 800 KW shall comply with emission limits as per the Notification G.S.R.489 (E), dated 09.07.2002 at serial No.96, under the Environment (Protection) Act, 1986.	Noted and being complied with. The DG sets are standby and used only in the absence of grid power supply.
14	The industry shall comply with ambient air quality standards of PM10 (Particulate Matter size less than 10µm) - 100 µg/m3; PM2.5 (Particulate Matter size less than 2.5 µm)60 µg/m3; SO2	Noted and being complied with

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	- 80 µg/m3; NO2 - 80 µg/m3 outside the factory premises at the periphery of the industry. Standards for other parameters as mentioned in the National Ambient Air Quality Standards CPCB Notification No.B-29016/20/90/PCI-I, dated 18.11.2009 **Noise Levels**: Day time (6 AM to 10 PM) - 75 dB (A) Night time (10 PM to 6 AM) - 70 dB (A).	The Ambient air Quality and noise parameters with in the stipulated standards and reports are being submitted regularly
15	The industry shall provide a sampling port with removable dummy of not less than 15 cm diameter in the stack at a distance of 8 times the diameter of the stack from the nearest constraint such as bends etc. A platform with suitable ladder shall be provided below 1 meter of sampling port to accommodate three persons with instruments. A 15 AMP 250 V plug point shall be provided on the platform	Noted and being complied
16	The industry shall provide interlocking facility between APC equipment (ESP) and fuel feeding system, in such a way that the feeding of the fuel shall be stopped automatically, in case, the ESP fails/ tripping's are occurred.	Noted Alarm system of ESP fields is hooked up to main plant control room for taking immediate corrective measures.
17	The industry shall maintain suitable control equipment facilities in the coal handling plant and dust suppression in all coal and material handling areas shall be achieved through appropriate methods	Noted and being complied
18	The industry shall maintain 3 CAAQM station at different locations and data File No.APPCB/VSP/VSP/19/HO/CFO/2017 transmitted to APPCB website	3 CAAQMS stations are being maintained.
19	The industry shall not exceed of emissions standards at any point of time. In case the industry exceeds the standards in the CEMS data, environmental compensation will be levied	Noted
	GENERAL:	
20	The industry shall not increase the capacity beyond the permitted capacity mentioned in this order.	Noted
21	.The industry shall maintain permanent mechanical sprinklers for suppression of dust on the haul roads in between the villages and report the compliance to RO-Visakhapatnam	Complied. Mobile water tankers are being used for water sprinkling on roads.
22	The industry shall not use any fuels other than those permitted in this order without prior consent from the Board. They shall maintain log registers on type of fuels & daily consumption, ash content, sulphur content etc., and shall furnish consolidated records to R.O., Visakhapatnam for every three months	Noted
23	The industry shall maintain duly compacted soil cover of requisite thickness as per norms for the ash ponds to avoid dust pollution and report the compliance to RO-Visakhapatnam.	Usually, Abandoned/closed/ not in use ash ponds were compacted with soil cover of requisite thickness. HNPCL is having only two ash ponds, one for filling and one for evacuation. Ash pond for filling is maintained with water curtain and the one which is

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
		used for evacuation, is maintained with water sprinklers.
24	The industry shall achieve 100% utilization of fly ash as per the Fly Ash Notification	Noted.
25	The industry shall establish a dedicated Environmental cell for continuous monitoring of plant environment to ensure compliance of CFO conditions.	Dedicated Environment Management cell is in place to ensure compliance to CFO Conditions.
26	The industry shall maintain the following records and the same shall be made available to the Board Officials during the inspection. • Daily power generation details. • Quantity of Effluents generated and disposed. • Log Books for pollution control systems. • Daily Fly ash generated and disposed.	Noted and being complied with
27	The industry shall provide truck-tyre washing facility near ash pond area to avoid dust emissions during the movement of the trucks.	Complied.
28	The industry shall dispose fly ash to cement / brick units and export, excess to ash pond	Pond ash and Fly ash will be utilized by the following Agencies: 1) Simhadri Constructions. 2) Ramco cements 3) My home cements 4) Sagar cements 5) Vipasana 6) Sri Sai Ganesh Transporter 7) Chettinad cements 8) Nagrajuna cements 9) Ultra tech cements 10) Brick industries.
29	The industry shall maintain water curtain in ash ponds as the fly ash is exposing to atmosphere and causing dust emissions during wind blow	Noted and being complied with
30	Thick green belt shall be maintained by the industry covering an area of minimum 33% of total area.	Presently green belt is being developed in and around the power project area in consultation with DFO and an area of 252 acres has already been developed. Further development of Green belt continuous.
31	A monitoring system shall be deployed by the industry to assess the movement of thermal plume in and around the outfall coolant water jetty due to the occurrence of thermal plume oscillation in south-north direction during monsoon and also to monitor the impact of hot water discharge into the Sea and the flora and fauna. The industry shall comply with at the directions of APCZMA and take necessary	Noted and being complied with

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
	corrective measures wherever required	
32	The industry shall maintain valid PLI policy which includes Environmental Relief Fund (ERF) and submit copy to RO, Visakhapatnam on yearly basis	Complied.
33	The industry shall comply with SoPs issued by CPCB time to time for all the wastes.	Noted
34	The industry shall install digital display boards at publicly visible places at the main gate indicating the products manufactured Vs permitted quantities, Treated effluent concentrations Vs discharge standards, Stack emission & AAQ concentrations Vs standards, hazardous waste generation, disposed, stock Vs permitted quantities and validity of CTO; and exhibit the CTO order at a prominent place in the factory premises, as per Hon'ble Supreme Court order.	Display is kept at the entrance of power project.
35	The industry shall submit Half yearly compliance reports to all the stipulated conditions in Environmental Clearance (EC), Consent to Establishment (CTE) and Consent to Operation (CTO) through website i.e., https://pcb.ap.gov.in by 1st of January and 1st July of every year. The first half yearly compliance reports shall be furnished by the industry and second half yearly compliance reports shall be the audited through MoEF&CC recognized and National Accreditation Board for Laboratory Testing (NABL) accredited third party	Noted and being complied
36	The industry shall comply with conditions stipulated in EC, CRZ, CFE orders & their amendments and Taskforce directions issued by the Board from time to time.	Noted
37	Any other directions / circulars / notices issued by CPCB, MoEF&CC and APPCB shall be followed from time to time.	Noted
38	The conditions stipulated are without prejudice to the rights and contentions of this Board in any Hon'ble Court of Law.	Noted
	Special Conditions	
39	The industry shall posses a valid NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) at concerned Regional Office, APPCB.	
40	The industry shall prepare a safety report and carry out an independent safety audit report of the respective industrial activities including chemical storages / isolated storages by an expert not associated with such industrial activity as required under Rule 10 of MSIHC Rules, 1989 and get it approved by the Factories Dept., and submit the compliance along with copy of the safety report, safety audit report and safety certificate at concerned Regional Office, APPCB	Noted and being complied with
41	The industry shall extend training to the working personnel for the prevention of accidents and necessary antidotes to ensure safety, as per the MSIHC Rules, 1989.	Noted and being complied with
42	The industry shall carryout calibration of safety equipment and leak detection systems at regular intervals and shall certify the same with the Factories Department. That File No.APPCB/VSP/VSP/19/HO/CFO/2017 certified copy shall be submitted to the APPCB, Regional Office	Being complied.
43	The industry shall install fluorescent Wind Vane at the highest point in the industry premises	Fluorescent wind socks are provided at 5 strategic highest locations.

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
44	The industry shall submit Risk analysis and risk assessment covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system.	HARA report is available for hydrogen plant.
45	The industry shall submit the copy of the safety audit report and On-Site / Off Site Emergency Plans as applicable after being certified by the Factories Department to the APPCB, Regional Office from time to time, if the storage quantity of hazardous chemicals is equal to or, in excess of the threshold quantities specified in schedule 2 & 3 of MSIHC Rules, 1989	Onsite emergency plan is available.
	SCHEDULE – C [*see rule 6(2)]*	
	[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]	
1	The authorized person shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made there under.	Noted and being complied with
2	The authorisation shall be produced for inspection at the request of an officer authorised by the State Pollution Control Board.	Noted
3	The person authorised shall not rent, lend, sell, transfer or otherwise transport the hazardous and other wastes except what is permitted through this authorization.	Noted
4	Any unauthorized change in personnel, equipment or working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorization.	Noted
5	The person authorised shall implement Emergency Response Procedure (ERP) for which this authorisation is being granted considering all site specific possible scenarios such as spillages, leakages, fire etc. and their possible impacts and also carry out mock drill in this regard at regular interval of time;	Noted and being complied with
6	The person authorized shall comply with the provisions outlined in the Central Pollution Control Board guidelines on "Implementing Liabilities for Environmental Damages due to Handling and Disposal of Hazardous Waste and Penalty".	Noted and being complied with
7	It is the duty of the authorised person to take prior permission of the State Pollution Control Board to close down the facility.	Noted
8	An application for the renewal of an authorization shall be made as laid down under these Rules.	Noted and being complied
9	Any other conditions for compliance as per the Guidelines issued by the Ministry of Environment, Forest and Climate Change or Central Pollution Control Board from time to time.	Noted
	Specific Conditions:	
10	The industry shall comply with the provisions of HWM Rules, 2016 in terms of interstate transport of Hazardous Waste and manifest document prescribed Under Rule 18 and 19 of the HWM Rules, 2016.	Noted and being complied
11	The industry shall not store hazardous waste for more than 90 days as per the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.	Noted and being complied

Sr. No.	Condition (Consent Order No:APPCB/VSP/19/HO/CTO/2016, dated 21st March 2023) for Unit – I & Unit – II	Compliance Status
12	The industry shall store Used / Waste Oil and Used Lead Acid Batteries in a secured way in their premises till its disposal to the manufacturers / dealers on buyback basis.	Noted and being complied
13	The industry shall maintain 7 copy manifest system for transportation of waste generated and a copy shall be submitted to concern Regional Office of APPCB. The driver who transports Hazardous Waste should be well acquainted about the procedure to be followed in case of an emergency during transit. The transporter should carry a Transport Emergency (TREM) Card.	Noted and being complied
14	The industry shall maintain proper records for Hazardous and Other Wastes stated in Authorisation in Form-3 i.e., quantity of Incinerable waste, land disposal waste, recyclable waste etc., and file annual returns in Form-4 as per Rule 20 (2) of the Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016.	Noted and being complied
15	The industry shall route all the hazardous waste through M/s. APEMC	Noted and being complied

Chapter-3

Description of the Environment

3.0 BASELINE ENVIRONMENTAL STATUS

3.1 Meteorology

Micro - Meteorological data within the project area during the air quality survey period is an indispensable part of the air pollution study. A meteorological station was installed on the top of Plant Security office, which is about 10 m height from the ground level in plant site free from obstructions to free flow of winds.

Wind speed and Wind direction data recorded during the study period are useful for the calculation of relative percentage frequencies of different wind directions and are plotted as wind roses of sixteen directions Viz. N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW and NNW for twenty-four hours' duration respectively.

Maximum and Minimum temperatures including the percentage relative humidity were also recorded simultaneously.

3.1.1 Wind Pattern during October 2022 - March 2023

The area is marked by high wind speeds in the range of calm to 19 KMPH winds. During the 00-24 hrs, the predominant wind directions were from E (14.7%), NE (14.2%), ENE (9.9%), SW (8.8 % , WSW (7.0)%) and NNE (6.1.0%) of the total time. The calm conditions prevailed for 11.9% of the total time. The winds prevailed for 27.4 % of the total time in other directions. The average wind rose for the study period is shown in **Figure-3.1.**

- ***Temperature and Relative Humidity Levels during October 2022-March 2023.***

  Maximum and minimum temperatures recorded during the study period were 36.3 and 15.0°C respectively. Maximum and minimum relative humidity recorded during the study period was 95 and 33 % respectively. Rainfall was observed during the study period is about 333.0 mm which is given in **Table-3.1.**

TABLE-3.1
METEOROLOGICAL DATA GENERATED AT PROJECT SITE

Sr. No	Parameters	October 2022 – March 2023	
		Min	Max
1	Temperature (°C)	15.0	36.3
2	Relative humidity (%)	33	95
63	Atmospheric Pressure (mb)	1007.8	1016.0
4	Rainfall (mm)	333	

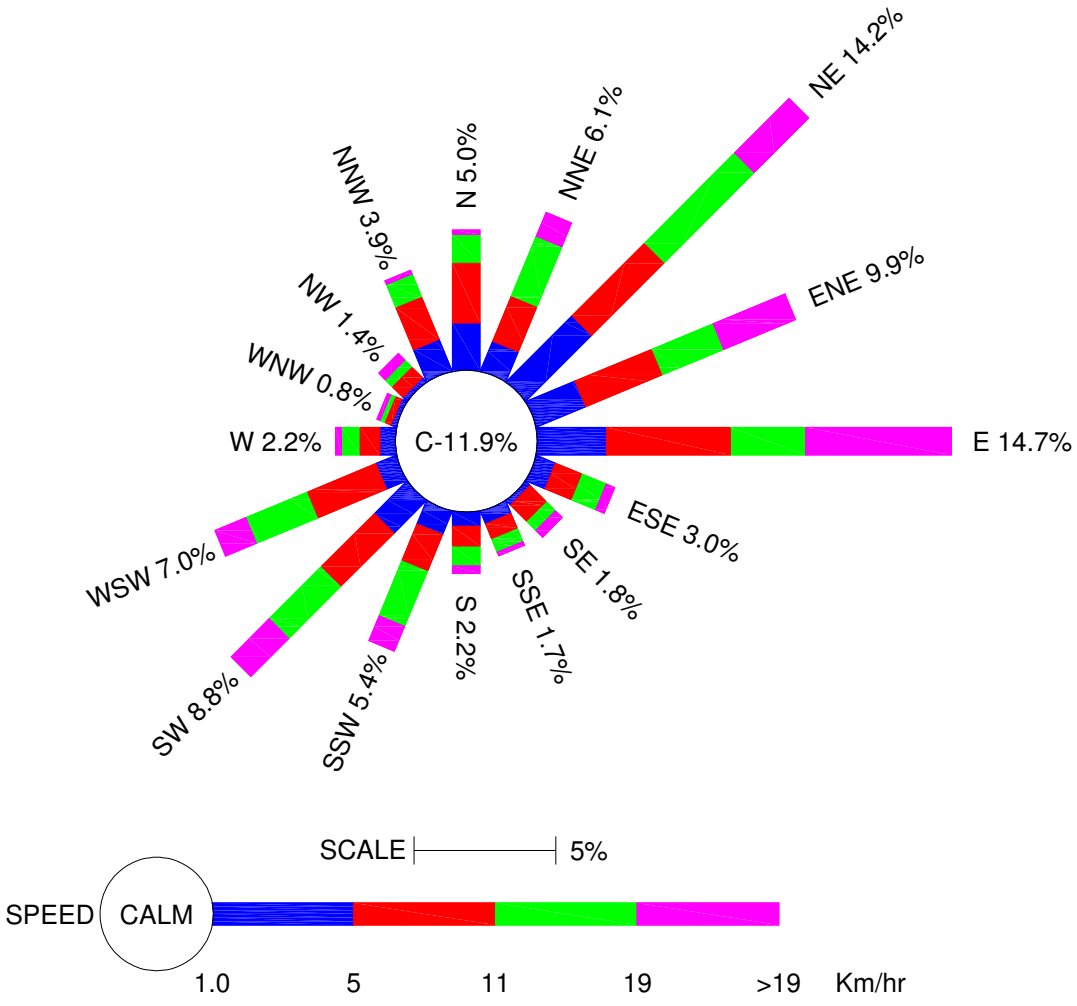


FIGURE-3.1
WINDROSE FOR OCTOBER 2022 TO MARCH 2023

3.2 Ambient Air Quality

Dispersion of different air pollutants released into the atmosphere has significant impacts on neighborhood air environment of an industrial project. The existing ambient air quality status with respect to the study zone of 10 km radial distance from the plant site has been assessed through a monitoring network of 8 AAQ stations during the **October 2022 - March 2023.**

The design of monitoring network in the air quality surveillance program has been based on the GLC's obtained using long term screening model considering the following:

(i) Meteorological conditions on synoptic scale;
(ii) Topography of the study area;
(iii) Representation of regional background levels;
(iv) Representation of plant site; and
(v) Representation of cross sectional distribution in the downward direction.

The existing status of Air environment was monitored for PM2.5, PM10, and gaseous pollutants like Sulphur dioxide (SO_2), Nitrogen dioxide (NO2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni).

Ambient Air Quality Monitoring (AAQM) stations were set up at 8 locations with due consideration to the above mentioned points. **Table-3.2** gives the details of environmental setting around each monitoring station. The location of the selected stations with reference to the plant site is given in the same table and depicted in **Figure–3.2**.

3.2.1 Frequency and Parameters for Sampling

The following frequency has been adopted for sampling:

Ambient air quality monitoring has been carried out with a frequency of 2 days per week at 8 locations. (October 2022-March 2023).

The Post monitoring of air environment is generated for the following parameters:

- Fine Respirable Particulate Matter (PM2.5);
- Respirable Particulate Matter (PM10);
- Sulphur dioxide (SO_2);
- Nitrogen dioxide (NO_2);
- Carbon Monoxide (CO);
- Ammonia (NH_3);
- Ozone (O_3);
- Benzene (C_6H_6);
- Benzo(a)pyrene;
- Lead (Pb);
- Arsenic (As) and
- Nickel (Ni).

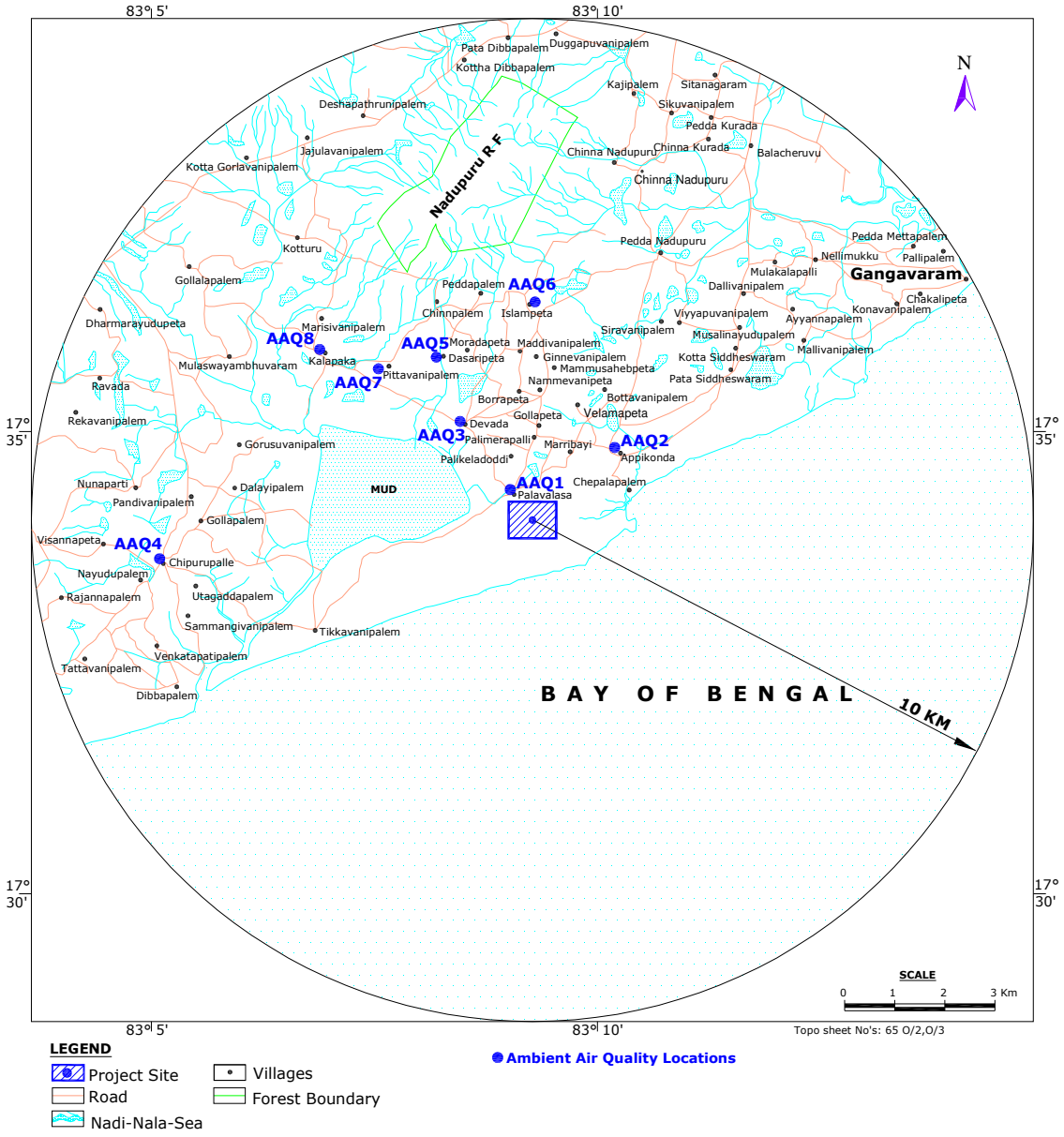


FIGURE-3.2
AIR QUALITY SAMPLING LOCATIONS

TABLE-3.2
DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

Station Code	Name of the Station	Distance w.r.t. site (km)	Direction w.r.t. site	Environmental Setting
AAQ1	Palavalasa	0.5	N	Rural/Residential activities
AAQ2	Appikonda	2.2	NE	Rural/Residential activities
AAQ3	Devada	2.3	NW	Rural/Residential activities
AAQ4	Cheepurupalli	7.4	W	Rural/Residential activities
AAQ5	Dasaripeta	3.7	NNW	Rural/Residential activities
AAQ6	Islampeta	4.3	N	Rural/Residential activities.
AAQ7	Pittavanipalem	4.2	NW	Rural/Residential activities
AAQ8	Kalapaka	5.3	NW	Rural/Residential activities

3.2.2 Duration of Sampling

The sampling duration for Particulate Matter PM2.5, PM10, SO_2, NO2, Ammonia, Benzo(a)Pyrene, Benzene, Arsenic, Nockel and Lead is twenty four hourly continuous sample per day and CO and Ozone is sampled for 8 hours continues thrice a day. This is to allow a comparison with the present revised standards mentioned in the latest Gazette notification of the Central Pollution Control Board (CPCB).

3.2.3 Method of Analysis

The air samples were analyzed as per standard methods specified by Central Pollution Control Board (CPCB) (16th November, 2009); IS: 5182 and American Public Health Association (APHA).

3.2.4 Details of the Sampling Locations

AAQ1: PALAVALASA

The monitoring station was installed on top of a residential building at a height of 4.5 m from ground level at a distance of 0.5 km in the N direction from the proposed plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ2: APPIKONDA

The monitoring station was installed on top of a residential building at a height of 5.0 m from ground level at a distance of 2.2 km in the NE direction from the plant site. This station was selected to assess the air quality levels in the Down wind direction. This location is situated within rural/residential activities.

AAQ3: DEVADA

The monitoring station was installed on top of a residential building at a height of 4 m from ground level at a distance of 2.3 km in the North West direction from the

plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ4: CHEEPURUPALLE

The location has been finalized to assess the air quality levels in the Up wind direction to the proposed plant site. The monitoring station is located at a distance of about 7.4 km west of the proposed plant site. The sampler is installed on a residential building at a height of about 4.5 m from ground level. Rural residential activities surround the station.

AAQ5: DASARIPETA

The sampling station has been finalized to assess the air quality levels in the crosswind direction to the proposed plant site. The monitoring station is located NNW of the plant site at about 3.7 km. The sampler was installed on top of residential building at a height of about 5.0 m from ground level free from any obstructions. This location is situated in rural/residential activities with village activities.

AAQ6: ISLAMPETA

The monitoring station was installed on top of a residential building at a height of 4.5 m from ground level at a distance of 4.3 km in the N direction from the plant site. This station was selected to assess the air quality levels in the crosswind direction. This location is situated within rural/residential activities.

AAQ7: PITTAVANIPALEM

The location has been finalized to assess the air quality levels in the downwind direction to the proposed plant site. The monitoring station is located at a distance of about 4.2 km North West of the proposed plant site. The sampler is installed on a residential building at a height of about 6.0 m from ground level. Rural residential activities surround the station.

AAQ8: KALAPAKA

At this monitoring station the sampler was installed on top of a residential building at a height of 5.0 m from ground level at a distance of 5.3 km in the NW direction from the proposed plant site. This station was selected to assess the air quality levels in the cross wind direction. This location is situated within rural/residential activities.

3.2.5 Selection of Instruments for Air Quality Sampling

Respirable Dust Samplers of Envirotech instruments are being used for monitoring Respirable Particulate Matter (PM10), Respirable fraction (<10 microns), Fine Respirable Particulate Matter (PM2.5), Respirable fraction (<2.5 microns), and gaseous pollutants like SO_2 and NO2. Gas Chromatography techniques have been used for the estimation of CO.

3.2.6 Sampling and Analytical Techniques

1] Fine Respirable Particulate matter (PM2.5) and Respirable Particulate matter (PM10)

Fine Respirable Particulate Matter – FRPM (PM2.5) and particles below 10 μ (PM10), which are more likely Respirable (Respirable Particulate matter – RPM). RPM Present in ambient air is measured by Gravemetric method by using Respirable Dust Sampler with a cyclone attachment over a period of 24 hours by sucking known quantity of air through Glass micro fibre filter paper and PM2.5 by Teflon filter paper. Respirable Dust (<10μ) is computed by measuring weight of collected matter in known volume of air sampled (BIS:5182 part IV, 1973; ASTM D-4096 -91).

2] Sulphur Dioxide

The most commonly used method for measuring atmospheric SO_2 is based on colorimetry and is known as modified West - Gaeke method. In this method SO_2 from a measured quantity of air is absorbed in a solution of sodium tetrachloromercurate to form a stable and non-volatile dichlorosulphitomercurate complex. This is then reacted with formaldehyde and bleached pararosaniline, yielding magenta - coloured pararosaniline methyl sulfonic acid. The colour intensity of this acid is detected photometrically at 560 nm (A.P.H.A and BIS: 5182 Part-II, 1969).

3] Nitrogen Dioxide

Concentration of nitrogen dioxide is estimated in ambient air by using Jacob and Hochheiser method. Nitrogen dioxide are collected by bubbling air through a sodium hydroxide solution to form a stable solution of sodium nitrite. The nitrite ion produced during sampling is determined colorimetrically by reacting the exposed absorbing reagent with phosphoric acid, sulfanilamide, and NEDA (1-naphthyl ethylenediamine dihydrochloride) at 540 nm (BIS: 5182 Part-VI, 1975).

4] Carbon Monoxide

A sample of the air containing carbon monoxide is adsorbed on Charcoal plugged into a glass tube. The adsorbed charcoal is eluted using the solvent, which in turn is projected into the gas chromatograph where it is carried from one end of the column to the other. During its movement, the constituents of the sample undergo distribution at different rates and ultimately get separated from one another. The separated constituents emerge from the end of the column one after the other and are detected by suitable means whose response is related to the amount of a specific component leaving the column [CO- IS: 5182 (Part-X)].

The details of the methods used for monitoring studies are presented in **Table-3.3.**

TABLE-3.3
TECHNIQUES USED FOR AMBIENT AIR QUALITY MONITORING

Sr. No.	Parameter	Method of Mesuarement
1	Fine Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric method)
2	Respirable Particulate Matter	Respirable Dust Sampler (Gravimetric method)
3	Sulphur Dioxide	Improved West and Gaeke method
4	Nitrogen Oxide	Modified Jacob & Hochheiser method
5	Carbon Monoxide	NDIR (Non Dispersive Infrared Spectroscopy)
6	Ammonia (NH_3)	Indophenol Blue method
7	Ozone (O_3)	Spectrophotometric method
8	Benzene (C_6H_6)	Gas Chromatography
9	Benzo(a)pyrene	Solvent extraction followed by GC MS
10	Lead (Pb)	AAS / ICP-MS method
11	Arsenic (As)	AAS / ICP-MS method
12	Nickel (Ni)	AAS / ICP-MS method

3.2.7 Presentation of Primary Data

a) Observations of Primary Data (October 2022 - March 2023)

Various statistical parameters like 98th percentile, average, maximum and minimum values have been computed from the observed raw data for all the AAQ monitoring stations.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ1) Palavalasa village

The maximum concentration for PM2.5 is recorded as 26.4 μg/m^3 with minimum concentration as 19.5 μg/m^3. The 98th percentile values are observed as 25.9 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 58.2 μg/m^3 with minimum concentration as 46.3 μg/m^3. The 98th percentile values are observed as 57.6 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.9 μg/m^3 with minimum concentration as 9.1 μg/m^3. The 98th percentile values are observed as 13.7 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.6 μg/m3 with minimum concentration as 11.2 μg/m^3. The 98th percentile values are observed as 15.5 μg/ m^3 respectively.

The maximum CO concentration is recorded as 284 μg/m3 with minimum concentration as 177 μg/m^3. The 98th percentile values are observed as 282 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 8.1 µg/m3 with minimum concentration as 4.3 µg/m^3. The 98th percentile values are observed as 8.1 µg/m^3 respectively.
The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ2) Appikonda village

The maximum concentration for PM2.5 is recorded as 26.7 µg/m^3 with minimum concentration at 18.7 µg/m^3. The 98th percentile values are observed as 26.3 µg/m^3 respectively.

The maximum concentration for PM10 is recorded as 54.2 µg/m^3 with minimum concentration as 41.8 µg/m^3. The 98th percentile values are observed as 53.6 µg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.4 µg/m^3 with minimum concentration as 9.2 µg/m^3. The 98th percentile values are observed as 13.3 µg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.6 µg/m^3 with minimum concentration as 11.7 µg/m^3. The 98th percentile values are observed as 15.1 µg/m^3 respectively.

The maximum CO concentration is recorded as 295 µg/m3 with minimum concentration as 187 µg/m^3. The 98th percentile values are observed as 290 µg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.7 µg/m3 with minimum concentration as 3.8 µg/m^3. The 98th percentile values are observed as 7.5 µg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ3) Devada villag5

The maximum concentration for PM2.5 is recorded as 26.7 µg/m^3 with minimum concentration as 18.8 µg/m^3. The 98th percentile values are observed as 25.4 µg/m^3 respectively.

The maximum concentration for PM10 is recorded as 52.7 µg/m^3 with minimum concentration as 40.1 µg/m^3. The 98th percentile values are observed as 51.8 µg/m^3 respectively.

The maximum SO_2 concentration is recorded as 14.5 µg/m^3 with minimum concentration as 9.5 µg/m^3. The 98th percentile values are observed as 14.1 µg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.7 μg/m^3 with minimum concentration as 12.1 μg/m^3. The 98th percentile values are observed as 15.6 μg/m^3 respectively.

The maximum CO concentration is recorded as 268 μg/m3 with minimum concentration as 192 μg/m^3. The 98th percentile values are observed as 264 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.0 μg/m3 with minimum concentration as 3.5 μg/m^3. The 98th percentile values are observed as 6.7 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ4) Cheepurupalle village

The maximum concentration for PM2.5 is recorded as 26.4 μg/m^3 with minimum concentration as 17.2 μg/m^3. The 98th percentile values are observed as 26.3 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 57.2 μg/m^3 with minimum concentration as 43.2 μg/m^3. The 98th percentile values are observed as 56.3 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.6 μg/m^3 with minimum concentration as 9.2 μg/m^3. The 98th percentile values are observed as 13.1 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 16.1 μg/m^3 with minimum concentration as 12.3 μg/m^3. The 98th percentile values are observed as 15.8 μg/m^3 respectively.

The maximum CO concentration is recorded as 272 μg/m3 with minimum concentration as 192 μg/m^3. The 98th percentile values are observed as 269 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 8.6 μg/m3 with minimum concentration as 3.8 μg/m^3. The 98th percentile values are observed as 9.2μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ5) Dasaripeta village

The maximum concentration for PM2.5 is recorded as 26.3 μg/m^3 with minimum concentration as 19.8 μg /m^3. The 98th percentile values are observed as 25.9 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 54.2 μg/m^3 with minimum concentration as 42.6 μg/m^3. The 98th percentile values are observed as 53.9 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.9 μg/m^3 with minimum concentration as 9.3 μg/m^3. The 98th percentile values are observed as 13.9 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.8 μg/m^3 with minimum concentration as 11.6 μg/m^3. The 98th percentile values are observed as 15.6 μg/m^3 respectively.

The maximum CO concentration is recorded as 274 μg/m3 with minimum concentration as 167 μg/m^3. The 98th percentile values are observed as 273 μg/ m^3 respectivel

The maximum O_3 concentration is recorded as 7.6 μg/m3 with minimum concentration as 3.8 μg/m^3. The 98th percentile values are observed as 8.1 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ6) Islampeta village

The maximum concentration for PM2.5 is recorded as 25.3 μg/m^3 with minimum concentration as 18.4 μg/m^3. The 98th percentile values are observed as 24.8 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 56.7 μg/m^3 with minimum concentration as 43.2 μg/m^3. The 98th percentile values are observed as 55.4 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 13.6 μg/m^3 with minimum concentration as 9.4 μg/m^3. The 98th percentile values are observed as 12.8 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.6 μg/m^3 with minimum concentration as 11.6 μg/m^3. The 98th percentile values are observed as 15.0 μg/m^3 respectively.

The maximum CO concentration is recorded as 246 μg/m3 with minimum concentration as 175 μg/m^3. The 98th percentile values are observed as 246 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 6.9 μg/m3 with minimum concentration as 3.4 μg/m^3. The 98th percentile values are observed as 6.7 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ7) Pittavanipalem village

The maximum concentration for PM2.5 is recorded as 28.1 μg/m^3 with minimum concentration as 19.8 μg/m^3. The 98th percentile values are observed as 28.1 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 66.2 μg/m^3 with minimum concentration as 43.6 μg/m^3. The 98th percentile values are observed as 64.6 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 14.0 μg/m^3 with minimum concentration as 10.2 μg/m^3. The 98th percentile values are observed as 13.7 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 16.2 μg/m^3 with minimum concentration as 12.4 μg/m^3. The 98th percentile values are observed as 15.6 μg/m^3 respectively.

The maximum CO concentration is recorded as 276 μg/m3 with minimum concentration as 204 μg/m^3. The 98th percentile values are observed as 274 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.8 μg/m3 with minimum concentration as 3.7 μg/m^3. The 98th percentile values are observed as 7.4 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

AAQ8) Kalapaka village

The maximum concentration for PM2.5 is recorded as 25.3 μg/m^3 with minimum concentration as 18.4 μg/m^3. The 98th percentile values are observed as 25.2 μg/m^3 respectively.

The maximum concentration for PM10 is recorded as 58.2 μg/m^3 with minimum concentration as 45.2 μg/m^3. The 98th percentile values are observed as 57.5 μg/m^3 respectively.

The maximum SO_2 concentration is recorded as 14.2 μg/m^3 with minimum concentration as 9.4 μg/m^3. The 98th percentile values are observed as 14.1 μg/m^3 respectively.

The maximum NO_2 concentration is recorded as 15.8 μg/m^3 with minimum concentration as 12.2 μg/m^3. The 98th percentile values are observed as 15.5 μg/m^3 respectively.

The maximum CO concentration is recorded as 259 μg/m3 with minimum concentration as 195 μg/m^3. The 98th percentile values are observed as 259 μg/ m^3 respectively.

The maximum O_3 concentration is recorded as 7.4 μg/m3 with minimum concentration as 4.2 μg/m^3. The 98th percentile values are observed as 7.2 μg/m^3 respectively.

The concentration of NH3, Pb, As, Ni, B(a)P and C6H6 values are well within the detectable limits.

3.2.8 Regional Scenario

The ambient air quality survey was carried out for at eight locations in the 10 Km radial distance. The monitoring was carried out for **October 2022 - March 2023.** Fine Respirable Particulate Matter (PM2.5), Respirable Particulate Matter (PM10), Sulphur dioxide (SO_2), Nitrogen dioxide (NO_2) and Carbon monoxide (CO), Ammonia (NH_3), Ozone (O_3), Benzene (C_6H_6) and metals like Benzo(a)pyrene, Lead (Pb), Arsenic (As) and Nickel (Ni). The results of monitoring carried out during study period are presented in **Annexure-II** for **October 2022 - March 2023.**

Various statistical parameters like Maximum, Minimum, Average and 98th percentile have been computed from the observed raw data for all sampling stations. The ambient air quality Summary of concentrations of different parameters (PM2.5, PM10, SO_2, NO_2, CO, NH3, O3, C6H6, B(a)P, As, Ni and Pb is presented in **Tables 3.4 and 3.5**

The AAQ levels observed at all the sampling locations were within the limits specified by CPCB for Industrial/Mixed use and Residential/Rural use.

TABLE - 3.4
SUMMARY OF AMBIENT AIR QUALITY DATA (OCTOBER 2022-MARCH 2023)

Location Code	Location	PM2.5				PM10				SO_2			
		Min	Max	Avg	98% Tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	19.5	26.4	22.7	25.9	46.3	58.2	53.0	57.6	9.1	13.9	11.7	13.7
AAQ2	Appikonda village	18.7	26.7	23.1	26.3	41.8	54.2	48.9	53.6	9.2	13.4	11.4	13.3
AAQ3	Devada village	18.8	26.7	22.5	25.4	40.1	52.7	46.8	51.8	9.5	14.5	11.7	14.1
AAQ4	Cheepurupalle village	17.2	26.4	23.0	26.3	43.2	57.2	51.4	56.3	9.2	13.6	11.6	13.1
AAQ5	Dasaripeta village	19.8	26.3	23.1	25.9	42.6	54.2	49.5	53.9	9.3	13.9	13.8	15.6
AAQ6	Islampeta village	18.4	25.3	21.7	24.8	43.2	56.7	49.3	55.4	9.4	13.6	11.3	12.8
AAQ7	Pittavanipalem village	19.8	28.1	24.4	28.1	43.6	66.2	54.5	64.6	10.2	14.0	11.8	13.7
AAQ8	Kalapaka village	18.4	25.3	22.4	25.2	45.2	58.3	50.6	57.5	9.4	14.2	11.6	14.1

Location Code	Location	NO_2				CO				O3			
		Min	Max	Avg	98% Tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% Tile
AAQ1	Palavalasa village	11.2	15.6	13.7	15.5	177	284	234	282	4.3	8.1	5.9	7.8
AAQ2	Appikonda village	11.7	15.6	13.6	15.1	187	295	237	290	3.8	7.7	5.5	7.5
AAQ3	Devada village	12.1	15.7	13.9	15.6	192	268	230	264	3.5	7.0	5.1	6.7
AAQ4	Cheepurupalle village	12.3	16.1	14.1	15.8	192	272	234	269	3.8	8.6	5.6	8.0
AAQ5	Dasaripeta village	11.6	15.8	13.8	15.6	167	274	231	273	3.8	7.6	5.5	7.3
AAQ6	Islampeta village	11.6	15.6	13.7	15.0	175	246	218	246	3.4	6.9	5.2	6.7
AAQ7	Pittavanipalem village	12.4	16.2	14.1	15.6	204	276	241	274	3.7	7.8	5.6	7.4
AAQ8	Kalapaka village	12.2	15.8	13.7	15.5	195	259	229	259	4.2	7.4	5.4	7.2

**Note: (Concentrations are expressed in µg /m³)*

TABLE - 3.5
SUMMARY OF AMBIENT AIR QUALITY DATA (OCTOBER 2022-MARCH 2023)

Location Code	Location	NH_3				Pb				As			
		Min	Max	Avg	98% tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ2	Appikonda village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ3	Devada village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ4	Cheepurupalle village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ5	Dasaripeta village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ6	Islampeta village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ7	Pittavanipalem village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0
AAQ8	Kalapaka village	<20	<20	<20	<20	<0.001	<0.001	<0.001	<0.001	<1.0	<1.0	<1.0	<1.0

Location Code	Location	Ni				B(a)P				C6H6			
		Min	Max	Avg	98% tile	Min	Max	Avg	98% tile	Min	Max	Avg	98% tile
AAQ1	Palavalasa village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ2	Appikonda village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ3	Devada village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ4	Cheepurupalle village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ5	Dasaripeta village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ6	Islampeta village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ7	Pittavanipalem village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0
AAQ8	Kalapaka village	<1.0	<1.0	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	1.0	1.0	1.0	1.0

**Note: (Concentrations are expressed in μg /m³ except As, Ni and B(a)p are ng /m³)*

3.3 Fugitive Dust Emission Monitoring

Fugitive dust emission monitoring has been carried out eight hours monitoring during the **October 2022–March 2023**. The monitoring has been carried out in five locations. The analysis results of fugitive dust monitoring are represented in **Table-3.6.**

TABLE-3.6
FUGITIVE DUST MONITORING RESULTS

All values are in ($\mu g/m^3$)

Sr.No	Location Name	Oct 2022	Nov 2022	Dec 2022	Jan 2023	Feb 2023	Mar 2023
	Sampling Date	19.10.22	28.11.22	14.12.22	25.01.23	11.02.23	15.03.23
1	Plant Main gate	144	128	148	163	148	124
2	Power Plant service building	167	149	165	180	194	157
3	Coal handling plant	221	208	227	241	222	191
4	Work shop building	173	161	182	193	217	170
5	Ash handling plant	233	216	245	263	244	204

3.4 Ambient Noise Quality

Eight locations were monitored for ambient noise levels within the 10-km radius of the Thermal power plant and three locations for Inside the Plant. The monitoring will be carried out every month and details of presented in **Table-3.7** and are shown in **Figure-3.3.**

TABLE-3.7
AMBIENT NOISE MONITORING LOCATIONS

Sampling Code	Name of the Location	Direction w.r.t to Plant
N1	Palavalasa village	N
N2	Appikonda village	NE
N3	Devada village	NW
N4	Cheepurapalli village	W
N5	Dasaripeta village	NNW
N6	Islampeta village	N
N7	Pittavanipalem village	NW
N8	Kalapaka village	NW
	Inside the Plant Area	
N9	Near HNPCL Office	-
N10	Near Boiler Area	-
N11	Near Power Mech Stores	-

Sound Pressure Level (SPL) measurements were measured by noise meter at all the above locations. Noise level monitoring was carried continuously for 24-hours with one hour interval. During each hour parameters like L_{10}, L_{50}, L_{90}, L_{eq}, L_{day} and L_{night} were directly computed by the instrument based on the sound pressure levels. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am.

3.4.1 Noise Quality

Noise levels were measured in 8 villages and 1 inside the plant area for 24 hours and 2 locations in plant site for source noise levels on monthly basis and the measured noise levels in day time and night time from April to September 2022 are given below in **Table-3.8 and 3.9.** The noise levels are well within the CPCB norms for Rural Residential zones.

TABLE-3.8
AMBIENT NOISE LEVEL MONITORING RESULTS
(OCTOBER 2022 TO MARCH 2023)

S.No	Sources	October 2022		November 2022		December 2022		January 2023		February 2023		March 2023	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	Palavalasa	52.5	41.6	53.1	43.1	54.0	42.5	52.4	44.1	54.1	43.8	52.1	42.6
2	Appikonda	54.2	42.3	52.4	41.6	51.6	40.8	53.5	42.3	52.6	41.8	53.5	40.8
3	Devada	52.0	43.1	50.3	42.3	51.2	41.5	52.2	43.0	50.8	42.4	51.8	43.2
4	Cheepurupalle	54.4	44.2	53.2	43.0	52.5	42.9	54.1	41.7	52.3	41.5	53.0	42.8
5	Dasaripeta	50.8	42.1	51.9	42.6	53.1	43.2	51.3	42.6	50.5	43.7	52.4	42.0
6	Islampeta	52.5	43.8	52.1	41.8	51.7	42.9	53.2	43.2	51.7	42.3	50.8	41.8
7	Pittavanipalem	51.8	41.4	53.0	42.5	52.4	41.4	51.8	42.5	53.2	43.0	51.7	43.7
8	Kalapaka	52.9	42.2	51.5	43.1	50.7	42.1	52.7	43.6	51.8	42.8	52.0	41.6
CPCB Limits		**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**	**55**	**45**

TABLE-3.9
NOISE LEVEL MONITORING RESULTS INSIDE THE PLANT

S.No	Sources	October 2022		November 2022		December 2022		January 2023		February 2023		March 2023	
		Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
1	Near Plant main gate	60.2	53.5	62.4	55.3	65.2	57.1	67.3	59.3	65.9	56.8	62.8	54.9
CPCB Limits		**75**	**75**	**70**	**75**	**70**	**75**	**70**	**75**	**70**	**75**	**70**	**70**
2	Near Boiler area	87.2		86.2		87.4		86.4		85.6		86.3	
3	Near Turbine area	86.4		88.1		86.1		84.6		86.2		88.1	
CPCB Limits		**90**		**90**		**90**		**90**		**90**		**90**	

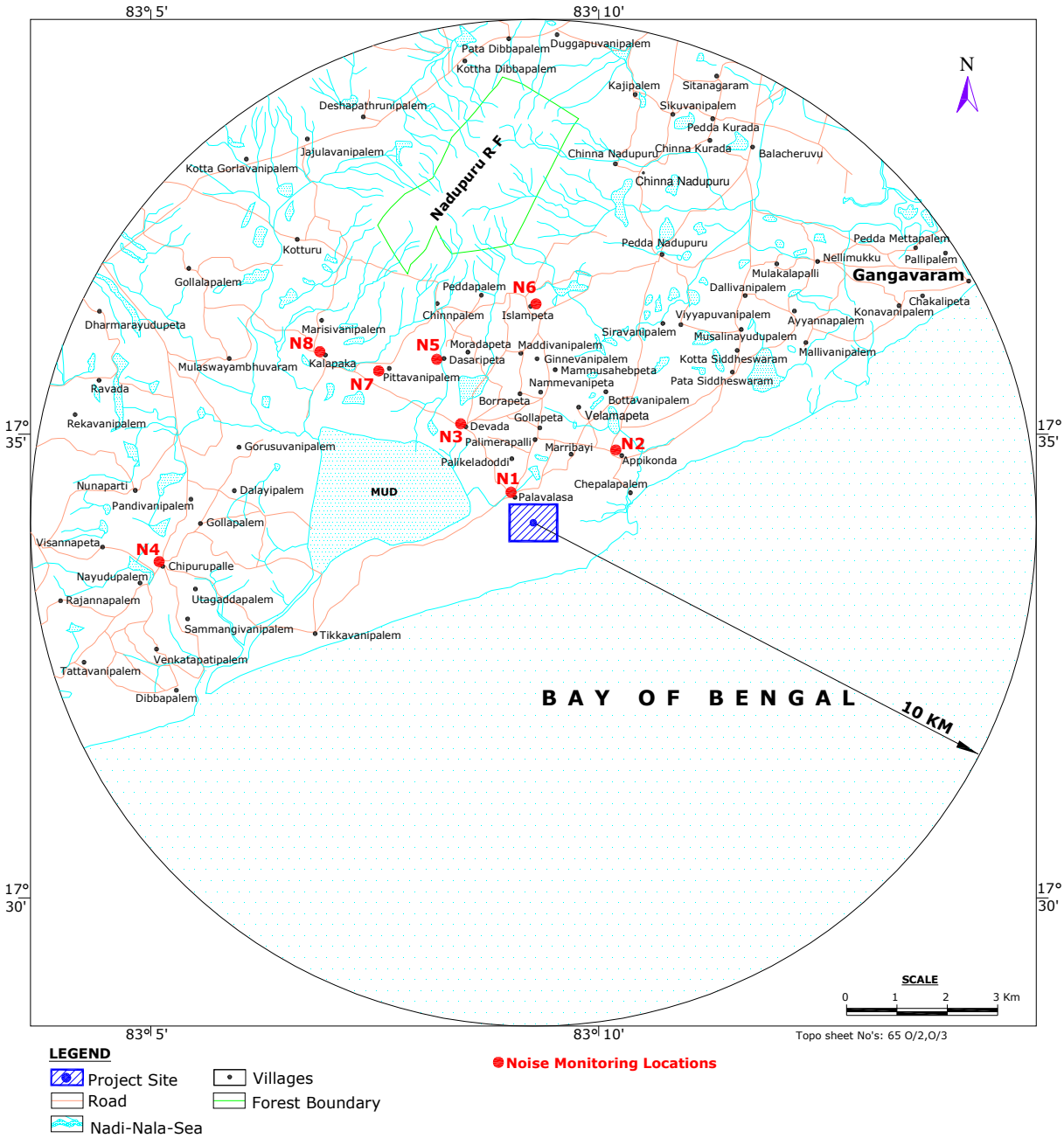


FIGURE-3.3
NOISE MONITORING LOCATIONS

3.5 WATER QUALITY

Water quality of ground water samples is collected to assess the quality of water with in the 10Km radius. Water samples were collected from six Ground water locations and four Surface water locations.

These samples were taken as grab samples and preservation and transportation of the samples are done as per the standard sampling procedures and analyzed in laboratory. The details of the sampling locations are given below in **TABLE-3.10** and shown in **Figure-3.4**

TABLE-3.10
WATER QUALITY SAMPLING LOCATIONS

Sampling Code	Name of the Location	Direction w.r.t to Plant
I	**Ground Water Samples**	
GW1	Devada village	NW
GW2	Islampeta village	N
GW3	Velama Appikonda village	NNE
GW4	Dasaripeta village	NNW
GW5	Palavalasa village	N
GW6	Rajiv Nagar	NE
GW7	Gouruvanipalem village	N
III	**Creek Water Samples**	
SW1	At Vade cheepurapalli	WSW
II	**Surface water Samples (**Marine Water)	
SW2	Appikonda beach	ENE
SW3	Tikavanipalem beach	SW
III	**Waste Water Samples**	
SW4	ETP Outlet	-
SW5	Outfall water at diffusion point	SE

The details of the Water Quality Analysis of **(October 2022 to March 2023)** are given below in **Table-3.11 to Table-3.19.**

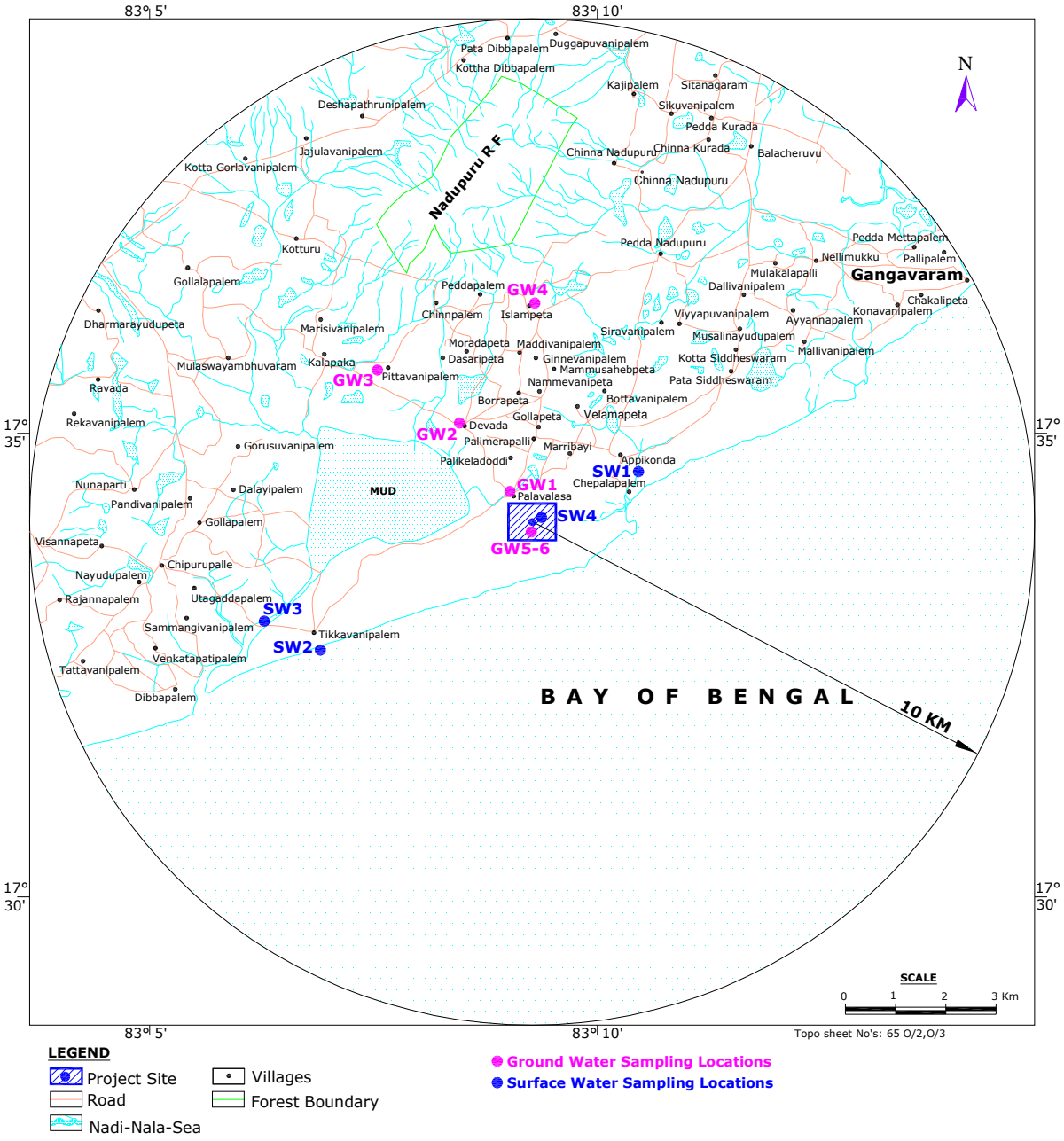


FIGURE-3.4
WATER SAMPLING LOCATIONS

TABLE-3.11
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW1 - Devada village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.82	7.4	7.54	7.67	7.43	7.13	6.5 – 8.5 (NR)
2	Colour	Hazen	1	1	2	2	2	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeabla
5	Conductivity	µS/cm	1566	1267	1381	1763	1904	1774	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	1033	810	899	1164	1218	1138	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	293.5	325.1	249.1	345.0	389.5	455	200(600)
9	Total Alkalinity	mg/l	285	278.2	253	304.8	331.6	350	200(600)
10	Calcium as Ca	mg/l	65.7	57.3	52.4	70.2	81.4	76.3	75(200)
11	Magnesium as Mg	mg/l	31.4	44.2	28.7	41.2	45.2	64.2	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	<0.01	<0.01	0.01	0.02	0.04	0.5(1)
14	Chlorides as Cl	mg/l	294.5	180.4	267.2	339.2	360.4	285.4	250(1000)
15	Sulphates as SO_4	mg/l	69.5	83.6	51.8	83.2	96.8	112.3	200(400)
16	Fluorides as F	mg/l	1.1	0.7	0.9	1.3	0.9	1.3	1.0(1.5)
17	Nitrates as NO_3	mg/l	5.6	10.8	4.7	6.2	9.8	13.2	45(NR)
18	Sodium as Na	mg/l	223.0	136.7	201.2	242.5	252.5	193.5	$
19	Potassium as K	mg/l	3.6	7.9	2.8	7.3	10.4	7.3	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	0.1 (0.3)
29	Iron as Fe	mg/l	0.08	0.07	0.05	0.09	0.05	0.12	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.44	0.21	0.28	0.42	0.34	0.36	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.12
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW2 – Islampeta village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.63	7.9	7.72	7.51	7.78	7.24	6.5 – 8.5 (NR)
2	Colour	Hazen	1	3	2	1	2	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
5	Conductivity	µS/cm	1338	1532	1429	1382	1533	1208	$
6	Turbidity	NTU	1	2	1	1	1	1	1(5)
7	TDS	mg/l	856	1012	945	871	982	741	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	256.4	473.4	283.4	283.3	287.7	248	200(600)
9	Total Alkalinity	mg/l	245	345.7	265	255.4	271.4	244	200(600)
10	Calcium as Ca	mg/l	59.6	95.2	63.8	66.4	58.3	51.8	75(200)
11	Magnesium as Mg	mg/l	26.1	57.2	30.1	28.8	34.5	28.7	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	0.03	0.03	0.02	<0.01	0.05	0.5(1)
14	Chlorides as Cl	mg/l	257.6	208.7	271.4	263.4	297.3	202.3	250(1000)
15	Sulphates as SO_4	mg/l	53.4	109.8	58.1	54.5	61.9	54.2	200(400)
16	Fluorides as F	mg/l	0.6	0.4	0.8	1.0	1.2	0.8	1.0(1.5)
17	Nitrates as NO_3	mg/l	3.2	11.7	2.9	4.2	7.3	18.9	45(NR)
18	Sodium as Na	mg/l	187.5	126.3	195.3	185.2	212.5	159.0	$
19	Potassium as K	mg/l	4.2	13.9	3.9	5.1	12.7	8.4	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.06	0.22	0.08	0.11	0.08	0.15	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.32	0.41	0.37	0.34	0.28	0.44	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.13
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW3 – Velama Appikonda village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.45	7.2	7.62	7.81	7.48	7.07	6.5 – 8.5 (NR)
2	Colour	Hazen	1	2	2	2	1	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
5	Conductivity	µS/cm	1632	1154	1507	2084	1872	1804	$
6	Turbidity	NTU	1	1	1	1	1	1	1(5)
7	TDS	mg/l	1044	750	963	1334	1198	1140	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	313.4	302.0	294	406.0	380.0	371	200(600)
9	Total Alkalinity	mg/l	310	257.6	286	375.3	327.3	352	200(600)
10	Calcium as Ca	mg/l	76.3	63.5	69.2	87.0	83.2	73.8	75(200)
11	Magnesium as Mg	mg/l	29.8	34.8	29.4	45.8	41.8	45.2	30(100)
12	Free Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	<0.01	<0.01	0.02	0.01	0.02	0.5(1)
14	Chlorides as Cl	mg/l	305.6	152.7	284.6	404.6	372.5	303.7	250(1000)
15	Sulphates as SO4	mg/l	65.7	89.8	57.3	81.6	71.4	96.5	200(400)
16	Fluorides as F	mg/l	0.9	0.4	0.7	1.2	0.7	0.6	1.0(1.5)
17	Nitrates as NO3	mg/l	4.9	11.7	4.3	7.1	5.5	22.1	45(NR)
18	Sodium as Na	mg/l	224.6	121.5	205.7	285.1	250.1	233.5	$
19	Potassium as K	mg/l	12.4	8.5	8.8	12.8	9.5	18.3	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	<0.01	*<0.01*	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.14	0.04	0.12	0.08	0.12	0.07	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.31	0.29	0.32	0.37	0.24	0.28	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.14
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW4 – Dasaripeta village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.67	7.5	7.81	7.56	7.61	7.31	6.5 – 8.5 (NR)
2	Colour	Hazen	1	4	2	2	2	3	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agree
5	Conductivity	µS/cm	1881	1602	1713	1906	2158	1883	$
6	Turbidity	NTU	2	3	1	1	1	2	1(5)
7	TDS	mg/l	1241	1026	1132	1182	1351	1211	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	404.0	568.6	349.3	372.7	441.7	502	200(600)
9	Total Alkalinity	mg/l	375	339.5	348	357.2	398.1	407	200(600)
10	Calcium as Ca	mg/l	89.5	117.5	77.5	82.1	94.2	88.4	75(200)
11	Magnesium as Mg	mg/l	43.8	66.8	37.8	40.7	50.1	68.2	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	0.01	0.01	0.01	<0.01	0.01	0.5(1)
14	Chlorides as Cl	mg/l	342.1	196.4	309.2	367.2	410.7	286.5	250(1000)
15	Sulphates as SO_4	mg/l	71.9	165.2	63.2	69.4	83.5	104.2	200(400)
16	Fluorides as F	mg/l	0.8	0.8	0.9	0.6	1.3	1.3	1.0(1.5)
17	Nitrates as NO_3	mg/l	5.2	8.8	4.8	8.1	8.1	18.3	45(NR)
18	Sodium as Na	mg/l	235.8	98.1	225.3	257.8	281.5	197.4	$
19	Potassium as K	mg/l	18.7	14.7	13.4	15.5	13.4	7.9	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	0.01	0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.11	0.19	0.13	0.16	0.07	0.13	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.26	0.26	0.26	0.41	0.33	0.34	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.15
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW5 – Palavalasa village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.81	7.6	7.45	7.55	7.82	7.27	6.5 – 8.5 (NR)
2	Colour	Hazen	2	3	2	2	2	3	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	2065	1510	1804	2492	2207	4117	$
6	Turbidity	NTU	1	2	1	2	2	2	1(5)
7	TDS	mg/l	1362	967	1137	1645	1410	2599	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	426.5	509.3	336.1	544.5	486.5	1096	200(600)
9	Total Alkalinity	mg/l	370	274.6	338	426.8	372.3	641	200(600)
10	Calcium as Ca	mg/l	92.4	111.7	81.6	120.2	113.2	189.3	75(200)
11	Magnesium as Mg	mg/l	47.5	55.9	32.1	59.3	49.4	151.3	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	0.02	0.04	0.05	0.03	0.04	0.5(1)
14	Chlorides as Cl	mg/l	413.2	235.8	360.1	495.2	418.6	762.1	250(1000)
15	Sulphates as SO4	mg/l	65.6	128.4	46.0	104.6	125.3	303.2	200(400)
16	Fluorides as F	mg/l	1.1	0.6	0.8	1.2	1.0	1.4	1.0(1.5)
17	Nitrates as NO3	mg/l	6.4	13.4	5.9	4.9	6.4	21.4	45(NR)
18	Sodium as Na	mg/l	272.1	103.8	254.9	311.3	275.4	429.4	$
19	Potassium as K	mg/l	10.5	15.4	8.5	19.5	14.2	23.2	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.12	0.25	0.10	0.12	0.15	0.21	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.26	0.32	0.41	0.31	0.46	0.47	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.16
GROUND WATER QUALITY

Sr.No.	Parameters	Unit	GW6 – Rajiv Nagar						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.65	7.4	7.61	7.43	7.56	7.46	6.5 – 8.5 (NR)
2	Colour	Hazen	2	2	2	1	1	2	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	1932	1454	2016	2218	2381	2287	$
6	Turbidity	NTU	1	2	3	1	1	1	1(5)
7	TDS	mg/l	1217	902	1331	1420	1572	1446	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	377.2	504.9	403.6	447.2	562.3	572	200(600)
9	Total Alkalinity	mg/l	360	266.3	348	365.8	348.3	333	200(600)
10	Calcium as Ca	mg/l	84.7	101.2	87.7	92.8	121.4	108.3	75(200)
11	Magnesium as Mg	mg/l	40.2	61.2	44.8	52.3	62.9	73.2	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	0.03	0.03	0.02	0.01	0.05	0.5(1)
14	Chlorides as Cl	mg/l	367.2	227.3	392.4	433.7	473.8	422.1	250(1000)
15	Sulphates as SO_4	mg/l	76.4	122.3	95.3	115.7	155.7	185.2	200(400)
16	Fluorides as F	mg/l	0.8	0.7	1.0	0.8	0.6	1.1	1.0(1.5)
17	Nitrates as NO_3	mg/l	4.8	9.6	5.3	6.1	8.6	24.2	45(NR)
18	Sodium as Na	mg/l	265.7	95.2	270.6	295.4	281.6	253.1	$
19	Potassium as K	mg/l	9.8	11.8	3.9	14.8	12.5	17.3	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	0.01	0.02	0.02	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.15	0.15	0.17	0.18	0.08	0.12	0.3(NR)
30	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.38	0.24	0.35	0.43	0.34	0.36	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pdes	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.17
GROUND WATER QUALITY

SrNo.	Parameters	Unit	GW7 – Gouruvanipalem village						Limits as per IS:10500
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	
			20.10.22	07.11.22	15.12.22	11.01.22	07.02.23	18.03.23	
1	pH	-	7.56	7.8	7.73	7.82	7.61	7.62	6.5 – 8.5 (NR)
2	Colour	Hazen	1	3	1	2	2	3	5(15)
3	Taste	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
4	Odour	-	Agree	Agree	Agree	Agree	Agree	Agree	Agreeable
5	Conductivity	µS/cm	2260	1514	1957	2633	2581	3205	$
6	Turbidity	NTU	2	2	2	3	1	1	1(5)
7	TDS	mg/l	1469	954	1253	1712	1653	2013	500(2000)
8	Total Hardness as $CaCO_3$	mg/l	389.2	514.8	382.4	584.0	549.5	885	200(600)
9	Total Alkalinity	mg/l	381	317.6	351	472.7	453.6	489	200(600)
10	Calcium as Ca	mg/l	96.9	109.3	84.3	130.4	127.3	146.2	75(200)
11	Magnesium as Mg	mg/l	35.7	58.7	41.7	62.7	56.2	126.3	30(100)
12	Residual Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2(1)
13	Boron	mg/l	<0.01	0.02	0.02	0.04	0.02	0.02	0.5(1)
14	Chlorides as Cl	mg/l	457.3	188.3	387.2	495.1	481.3	610.8	250(1000)
15	Sulphates as SO4	mg/l	89.2	155.2	70.1	127.5	137.3	225.3	200(400)
16	Fluorides as F	mg/l	1.2	0.5	1.1	0.6	0.9	0.9	1.0(1.5)
17	Nitrates as NO3	mg/l	7.6	11.5	6.6	7.5	9.3	17.3	45(NR)
18	Sodium as Na	mg/l	332.8	103.2	264.7	324.5	330.2	318.4	$
19	Potassium as K	mg/l	13.8	13.8	8.8	20.7	15.3	19.6	$
20	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(0.002)
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05 (NR)
22	Anionic Detergents	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2 (1.0)
23	Mineral Oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5 (NR)
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003 (NR)
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (0.05)
26	Copper as Cu	mg/l	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.05 (1.5)
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01 (NR)
28	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1 (0.3)
29	Iron as Fe	mg/l	0.12	0.23	0.14	0.13	0.09	0.15	0.3(NR)
30	Chromium as Cr+6	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05(NR)
31	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01(NR)
32	Zinc as Zn	mg/l	0.22	0.30	0.22	0.35	0.27	0.41	5(15)
33	Aluminum as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03(0.2)
34	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001(NR)
35	Pesticides	µg/l	Absent	Absent	Absent	Absent	Absent	Absent	Absent
36	E. Coil	-	Absent	Absent	Absent	Absent	Absent	Absent	Absent
37	Total Coliforms	MPN/100	<2	<2	<2	<2	<2	<2	10

Note: *$ - Limits not specified;*
NR - No Relaxation
Limits are shown in IS 10500 are Acceptable limits (Requirement) and in parenthesis are Permissible limit in absence of alternate source

TABLE-3.18
SURFACE WATER QUALITY (MARINE WATER SAMPLES) FROM OCTOBER 2022 TO SEPTEMBER 2022

S. No.	Parameter	Units	Oct 22		Nov 22		Dec 22		Jan 23		Feb 23		Mar 23	
			SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3	SW2	SW3
			20.10.22	20.10.22	07.11.22	07.11.22	15.12.22	15.12.22	11.01.22	11.01.22	07.02.23	07.02.23	18.03.23	18.03.23
1	pH	-	7.96	8.05	7.9	8.0	8.03	7.81	7.94	8.13	8.04	7.84	8.03	7.91
2	Color	Hazen	3	4	6	7	5	4	6	5	4	4	5	4
3	Conductivity	µS/cm	54142	53092	50400	51400	52305	52910	53820	51335	55300	53600	54200	55600
4	Total Dissolved Solids	mg/l	39523	39820	37300	38500	38710	39685	39830	38505	40370	39120	39580	41150
5	DO	mg/l	4.8	5.2	5.6	5.5	4.9	5.2	5.1	5.4	4.9	5.2	5.1	5.0
6	BOD	mg/l	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
7	COD	mg/l	114	106	121	114	107	124	113	104	122	116	113	108
8	Total Hardness as $CaCO_3$	mg/l	3395.9	3500.4	5157.9	5522.6	3045.7	3438.8	3168.7	3294.2	3383.4	3404.7	3146	3718
9	Total Alkalinity as $CaCO_3$	mg/l	310	350	315.2	336.3	294	401	351.6	371.1	317.8	508.3	368	422
10	Calcium as Ca^{+2}	mg/l	412.5	391.6	462.5	521.3	391.1	389.2	402.3	372.5	434.5	388.4	408.6	447.3
11	Magnesium as Mg^{+2}	mg/l	574.6	612.7	972.4	1025.3	502.5	599.2	525.6	574.2	558.2	591.4	516.2	631.8
12	Chlorides as Cl	mg/l	17467.8	16987.5	16525	16795	17013.5	17100.1	17353.5	16604.3	18106.3	17074.3	17658.3	18083.2
13	Residual free Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
14	Phosphates PO_4	mg/l	4.9	3.8	1.0	1.4	2.3	3.1	4.2	2.7	2.5	1.8	3.8	4.1
15	Sulphates as SO_4	mg/l	1958.6	1892.4	1198.6	1285.5	1762.4	1835.2	1873.4	1763.5	1702.3	1904.3	1634.6	1705.3
16	Fluorides as F	mg/l	1.1	1.2	0.9	0.8	1.0	1.1	1.2	0.8	0.7	1.2	1.5	1.4
17	Nitrates as NO_3	mg/l	22.6	19.8	16.8	13.6	20.4	22.6	23.6	19.5	17.4	21.8	20.7	16.8
18	Sodium as Na^+	mg/l	10812	10518	8982.5	9034.3	10546.3	10498.5	10833.3	10219.5	11083.0	10612.3	10938.2	10977.4
19	Potassium as K	mg/l	126.3	134.5	394.8	412.3	132.6	143.8	141.2	116.5	136.9	128.3	136.9	156.3
20	Total Boron as B	mg/l	<0.01	0.01	0.05	0.04	0.07	0.05	0.05	0.08	0.07	0.04	0.05	0.03
21	Cyanides	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22	Phenol compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
24	Cadmium as Cd	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Iron as Fe	mg/l	0.18	0.13	0.23	0.25	0.16	0.12	0.13	0.18	0.08	0.14	0.14	0.17
29	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
31	Zinc as Zn	mg/l	0.25	0.28	<0.01	<0.01	0.28	0.23	0.31	0.26	0.25	0.34	0.32	0.39
32	Aluminium as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
33	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

SW2- Appikonda beach(marine); SW3-Tikkavanipalem beach(marine);

TABLE-3.19
MARINE WATER SAMPLES RESULTS (INTAKE WATER)

Sr. No.	Parameter	Units	SW4					
	Sampling Date		20.10.22	07.11.22	15.12.22	25.01.23	07.02.23	18.03.23
1	pH	-	8.18	8.11	7.93	8.07	7.93	7.88
2	Color	Hazen	6	5	4	6	4	5
3	Conductivity	□S/cm	52560	50678	53210	54950	54950	53700
4	Total Dissolved Solids	mg/l	38368	36874	38850	40660	40650	39750
5	DO	mg/l	5.1	5.1	5.3	5.0	4.9	5.3
6	BOD	mg/l	<3	<3	<3	<3	<3	<3
7	COD	mg/l	121	123	116	108	115	120
8	Total Hardness as $CaCO_3$	mg/l	3508.8	3987	3733.3	3774.0	3583.6	3288
9	Total Alkalinity as $CaCO_3$	mg/l	2401	298	303	327.2	362.4	378
10	Calcium as Ca^{+2}	mg/l	374.4	383	407.9	417.4	409.4	372.4
11	Magnesium as Mg^{+2}	mg/l	625.2	743.7	659.4	663.5	622.1	572.8
12	Chlorides as Cl	mg/l	17114	17002.4	17254.4	17734.2	18102.4	17266.3
13	Residual free Chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
14	Phosphates PO_4	mg/l	3.3	1.4	2.2	3.5	6.1	4.2
15	Sulphates as SO_4	mg/l	1728.2	1432	1864.8	1907.3	1878.0	1948.1
16	Fluorides as F	mg/l	1.2	1.3	1.0	1.1	0.8	1.2
17	Nitrates as NO_3	mg/l	12.8	13.5	18.8	22.1	16.8	13.9
18	Sodium as Na^+	mg/l	10405	9798.3	10437.9	10805.9	11093.6	10753.2
19	Potassium as K	mg/l	112.2	293.4	133.4	155.3	142.8	127.3
20	Total Boron as B	mg/l	0.03	0.02	0.04	0.06	0.02	0.04
21	Cyanides as CN	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
22	Phenolic compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
24	Cadmium as Cd	mg/l	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001
25	Arsenic as As	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Iron as Fe	mg/l	0.16	0.21	0.18	0.15	0.09	0.11
29	Total Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30	Selenium as Se	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
31	Zinc as Zn	mg/l	0.14	0.22	0.34	0.28	0.22	0.32
32	Aluminium as Al	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
33	Mercury as Hg	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
34	Sulphide as H_2S	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
35	Bromide as Br	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
36	Iodides as I	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Sampling Location Name
SW4- Intake sea water;

TABLE-3.20
SURFACE WATER QUALITY (CREEK WATER SAMPLES)
FROM OCTOBER 2022 TO MARCH 2023

S.No	Parameters	Units	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23
			20.10.22	07.11.22	15.12.22	11.01.23	07.02.23	18.03.23
1	pH	-	8.04	7.9	8.1	7.92	8.08	7.81
2	Suspended solids	mg/l	27	42	35	29	34	27
3	Conductivity	µS/cm	42657	32740	40825	42817	40250	32770
4	TDS	mg/l	29430	23220	28170	29545	28570	22614
5	DO	mg/l	5.0	5.3	5.1	4.9	5.2	5.0
6	BOD	mg/l	<3	<3	<3	<3	<3	<3
7	Turbidity	NTU	46	26	41	35	27	35
8	Salinity	ppt	26.2	20	25	26	25	20
9	Total Alkalinity as $CaCO_3$	mg/l	260	214.8	234	325.4	308.3	253
10	Calcium as Ca	mg/l	287.4	181.6	251.4	340.1	305.2	242.4
11	Magnesium as Mg	mg/l	413.5	388.6	395.1	454.3	425.3	327.3
12	Chlorides as Cl	mg/l	14572	11316.7	14001.2	14567.3	13765.3	11103.4
13	Phosphates as PO_4	mg/l	4.2	2.4	3.4	6.1	3.8	5.1
14	Sulphates as SO_4	mg/l	426.5	148.7	394.7	448.3	325.6	371.8
15	Fluorides as F	mg/l	1.0	0.7	1.2	0.9	1.1	1.2
16	Nitrates as NO_3	mg/l	15.9	12.4	17.2	15.4	12.5	8.9
17	Sodium as Na	mg/l	8631.4	6508.4	8298.3	8522.4	8051.3	10938.2
18	Potassium as K	mg/l	105.6	124.4	86.1	20.7	84.2	136.9
19	Phenolic Compounds	mg/l	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
20	Copper as Cu	mg/l	0.31	<0.01	<0.01	<0.01	<0.01	<0.01
21	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22	Iron as Fe	mg/l	0.15	0.7	0.23	0.21	0.27	0.32
23	Chromium as Cr^{+6}	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	Zinc as Zn	mg/l	0.25	<0.01	0.31	0.28	<0.01	<0.01

Creek water in Mud flat area at Vade cheepurapalli.

3.6 Soil Quality

Soil Samples were collected from eight locations around the plant site area, out of which, three locations (S1 to S3) are monthly and the remaining five locations (S4 to S8) are quarterly samples. The soil quality is given below in **Table-3.21** and **Table-3.25.**

TABLE-3.21
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S1 –Palavalasa Village					
			Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23
			20.10.22	07.11.22	15.12.22	25.01.23	07.02.23	18.03.23
1	Texture	--	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
a	Sand	%	47	45	48	52	46	48
b	Silt	%	14	22	16	9	12	14
c	Clay	%	39	33	36	39	42	38
2	Bulk Density	g/cc	1.28	1	1.23	1.27	1.31	1.28
3	pH (1:5 Aq.Extraction)		7.36	7.2	7.14	7.23	7.32	7.46
4	Conductivity (1:5 Aq.Extraction)	µS/cm	378	394	387	395	384	588
5	Cation Exchange Capacity	(meq/100gm)	15.18	25.53	27.11	25.86	23.33	31.3
6	Exchangeable Calcium	(meq/100gm)	12.82	19.12	17.13	16.43	15.57	20.1
7	Exchangeable Magnesium	(meq/100gm)	4.73	12.28	9.43	8.77	7.18	10.4
8	Exchangeable Potassium	(meq/100gm)	0.29	0.28	0.29	0.35	0.30	0.38
9	Exchangeable Sodium	(meq/100gm)	0.28	0.21	0.27	0.31	0.27	0.42
10	Sodium Absorption Ratio (SAR)	----	0.13	0.11	0.11	0.12	0.11	0.15
11	Available Nitrogen as N	Kg/ha	83.0	101.3	98.4	60.4	81.7	74.3
12	Available Phosphorous as P	Kg/ha	58.2	57.9	49.7	76.3	60.0	56.8
13	Available Potassium as K	Kg/ha	223.2	297.3	217.9	269.5	243.1	232.7
14	Organic Carbon	%	0.39	0.54	0.47	0.28	0.37	0.29
15	Organic Matter	%	0.67	0.92	0.81	0.49	0.64	0.5
16	Water Soluble Chlorides as Cl	mg/kg	57.8	113.1	104.3	94.3	63.8	72.6
17	Water Soluble Sulphates as SO4	mg/kg	28.4	33.2	41.3	38.4	31.8	29.8
18	Aluminium	%	0.83	0.42	0.36	0.47	0.56	0.64
19	Total Iron	%	1.84	0.96	0.84	0.73	0.84	0.73
20	Manganese	mg/kg	398	353	378	354	362	398
21	Boron	mg/kg	21.3	37.5	24.8	31.6	27.5	24.7
22	Zinc	mg/kg	36.7	43.2	37.2	43.5	36.8	42.5

TABLE-3.22
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S2 –Appikonda Village					
			Oct 22	**Nov 22**	**Dec 22**	**Jan 23**	**Feb 23**	**Mar 23**
			20.10.22	07.11.22	15.12.22	25.01.23	07.02.23	18.03.23
1	Texture	--	Clay	Clay	Clay	Clay	Clay	Clay
a	Sand	%	22	22	19	17	21	18
b	Silt	%	16	24	23	21	14	15
c	Clay	%	62	54	58	62	65	67
2	Bulk Density	g/cc	1.17	1.1	1.14	1.19	1.12	1.16
3	pH (1:5 Aq.Extraction)		7.54	7.6	7.48	7.54	7.47	7.29
4	Conductivity (1:5 Aq.Extraction)	µS/cm	625	544	498	510	569	618
5	Cation Exchange Capacity	(meq/100gm)	28.27	36.97	32.36	30.74	28.94	28.21
6	Exchangeable Calcium	(meq/100gm)	19.94	26.66	19.27	18.56	17.66	19.35
7	Exchangeable Magnesium	(meq/100gm)	7.28	16.15	12.23	11.28	10.28	8.02
8	Exchangeable Potassium	(meq/100gm)	0.43	0.39	0.40	0.43	0.44	0.36
9	Exchangeable Sodium	(meq/100gm)	0.62	0.13	0.46	0.50	0.56	0.48
10	Sodium Absorption Ratio (SAR)	----	0.24	0.13	0.16	0.17	0.21	0.18
11	Available Nitrogen as N	Kg/ha	116.9	129.8	132.5	103.0	109.1	116.5
12	Available Phosphorous as P	Kg/ha	97.6	90.6	87.4	83.1	93.8	87.3
13	Available Potassium as K	Kg/ha	305.0	354.1	273.2	311.4	299.5	312.5
14	Organic Carbon	%	0.60	0.81	0.76	0.52	0.58	0.45
15	Organic Matter	%	1.03	1.39	1.31	0.89	1.01	0.78
16	Water Soluble Chlorides as Cl	mg/kg	125.2	146.8	152.6	143.5	113.4	105.2
17	Water Soluble Sulphates as SO4	mg/kg	56.9	58.9	64.4	57.2	47.6	38.4
18	Aluminium	%	1.37	0.86	0.91	0.81	0.79	0.82
19	Total Iron	%	2.74	1.27	1.14	1.05	1.12	1.19
20	Manganese	mg/kg	589	699	593	487	523	497
21	Boron	mg/kg	43.6	53.9	47.4	44.7	38.3	43.2
22	Zinc	mg/kg	59.7	71.9	65.8	58.4	49.4	54.6

TABLE-3.23
SOIL QUALITY RESULTS

S. No	Parameters	Unit	S3 –Devada Village					
			Oct 22	**Nov 22**	**Dec 22**	**Jan 23**	**Feb 23**	**Mar 23**
			20.10.22	07.11.22	15.12.22	25.01.23	07.02.23	18.03.23
1	Texture	--	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
a	Sand	%	49	47	51	49	48	51
b	Silt	%	13	18	12	13	11	12
c	Clay	%	38	35	37	38	41	37
2	Bulk Density	g/cc	1.36	1	127	1.21	1.24	1.31
3	pH (1:5 Aq.Extraction)		7.28	7	7.23	7.31	7.26	7.37
4	Conductivity (1:5 Aq.Extraction)	µS/cm	356	315	297	324	351	374
5	Cation Exchange Capacity	(meq/100gm)	18.23	30.06	28.62	26.91	24.19	25.62
6	Exchangeable Calcium	(meq/100gm)	13.16	21.94	17.53	16.59	14.81	17.8
7	Exchangeable Magnesium	(meq/100gm)	5.63	14.18	10.27	9.51	8.80	7.15
8	Exchangeable Potassium	(meq/100gm)	0.26	0.2	0.50	0.49	0.29	0.41
9	Exchangeable Sodium	(meq/100gm)	0.31	0.1	0.32	0.35	0.30	0.26
10	Sodium Absorption Ratio (SAR)	----	0.14	0.09	0.12	0.13	0.12	0.11
11	Available Nitrogen as N	Kg/ha	78.2	89.6	73.2	96.5	68.2	71.5
12	Available Phosphorous as P	Kg/ha	61.8	75.1	62.1	68.8	56.7	49.8
13	Available Potassium as K	Kg/ha	216.1	237.5	387.2	354.7	218.4	205.7
14	Organic Carbon	%	0.34	0.57	0.63	0.48	0.33	0.36
15	Organic Matter	%	0.59	0.97	1.09	0.82	0.57	0.61
16	Water Soluble Chlorides as Cl	mg/kg	63.7	119.3	98.7	89.4	54.9	63.9
17	Water Soluble Sulphates as SO4	mg/kg	32.5	37.4	28.5	31.2	28.2	31.7
18	Aluminium	%	0.67	0.32	0.28	0.37	0.43	0.54
19	Total Iron	%	1.53	0.86	0.79	0.64	0.71	0.62
20	Manganese	mg/kg	345	668	461	396	379	356
21	Boron	mg/kg	24.9	32.1	29.3	24.6	23.2	29.8
22	Zinc	mg/kg	42.4	38.8	41.4	38.4	31.7	34.3

TABLE-3.24
SOIL QUALITY RESULTS (QUARTERLY)

S. No	Parameters	Unit	S4	S5	S6	S7	S8
	Sampling date		15.12.22	15.12.22	15.12.22	15.12.22	15.12.22
1	Texture	--	Sandy	clay	sandy clay	clay	Sandy
A	Sand	%	62	17	52	23	59
B	Silt	%	16	20	12	16	16
C	Clay	%	22	63	36	61	25
2	Bulk Density	g/cc	131	1.18	1.29	1.12	1.38
3	pH (1:5 Aq.Extraction)		7.41	7.37	7.63	7.51	7.47
4	Conductivity (1:5 Aq.Extraction)	µS/cm	328	412	337	389	325
5	Cation Exchange Capacity	(meq/100gm)	23.02	26.47	45.61	38.18	49.16
6	Exchangeable Calcium	(meq/100gm)	15.45	16.56	23.14	19.26	25.74
7	Exchangeable Magnesium	(meq/100gm)	7.04	9.08	21.76	17.95	22.90
8	Exchangeable Potassium	(meq/100gm)	0.30	0.35	0.28	0.42	0.26
9	Exchangeable Sodium	(meq/100gm)	0.24	0.49	0.44	0.55	0.27
10	Sodium Absorption Ratio (SAR)	----	0.10	0.19	0.13	0.18	0.08
11	Available Nitrogen as N	Kg/ha	57.3	68.3	47.6	72.5	59.2
12	Available Phosphorous as P	Kg/ha	43.2	51.4	32.5	54.3	34.6
13	Available Potassium as K	Kg/ha	234.1	247.3	216.5	285.7	218.8
14	Organic Carbon	%	0.31	0.67	0.45	0.73	0.27
15	Organic Matter	%	0.53	1.16	0.78	1.26	0.47
16	Water Soluble Chlorides as Cl	mg/kg	83.4	124.4	97.4	146.3	65.6
17	Water Soluble Sulphates as SO4	mg/kg	42.8	64.9	54.9	98.5	34.5
18	Aluminium	%	0.81	1.62	1.41	1.74	0.74
19	Total Iron	%	1.52	2.12	1.73	2.23	1.23
20	Manganese	mg/kg	287	412	389	451	298
21	Boron	mg/kg	14.3	21.5	13.5	28.4	19.6
22	Zinc	mg/kg	23.1	35.4	28.7	32.8	37.3

Soil Sampling Locations
S4- Islampeta village
S5- Namidoddi village
S6- Palikiladoddi village
S7- Dasaripeta village
S8- 8th feet road (Near Islampet village)

TABLE-3.25
SOIL QUALITY RESULTS (QUARTERLY)

S. No	Parameters	Unit	S4	S5	S6	S7	S8
			18.03.23	18.03.23	18.03.23	18.03.23	18.03.23
1	Texture	--	Sandy	clay	sandy clay	clay	Sandy
A	Sand	%	68	21	47	24	66
B	Silt	%	14	17	16	13	12
C	Clay	%	18	62	37	63	22
2	Bulk Density	g/cc	1.26	1.12	1.34	1.19	1.29
3	pH (1:5 Aq.Extraction)		7.54	7.49	7.53	7.35	7.68
4	Conductivity (1:5 Aq.Extraction)	µS/cm	342	397	457	411	342
5	Cation Exchange Capacity	(meq/100gm)	27.31	30.44	41.08	43.86	47.73
6	Exchangeable Calcium	(meq/100gm)	18.39	18.2	20.5	23.5	21.7
7	Exchangeable Magnesium	(meq/100gm)	8.21	11.3	19.73	19.2	25.3
8	Exchangeable Potassium	(meq/100gm)	0.33	0.41	0.37	0.52	0.4
9	Exchangeable Sodium	(meq/100gm)	0.38	0.53	0.48	0.64	0.33
10	Sodium Absorption Ratio (SAR)	----	0.15	0.22	0.14	0.22	0.1
11	Available Nitrogen as N	Kg/ha	63.8	65.6	54.7	69.8	53.8
12	Available Phosphorous as P	Kg/ha	39.7	49.5	38.9	48.7	39.7
13	Available Potassium as K	Kg/ha	249.5	238.7	224.6	267.8	205.5
14	Organic Carbon	%	0.35	0.71	0.68	0.58	0.48
15	Organic Matter	%	0.60	1.22	1.17	1.00	0.84
16	Water Soluble Chlorides as Cl	mg/kg	76.8	118.7	89.8	134.5	74..5
17	Water Soluble Sulphates as SO4	mg/kg	35.4	52.6	43.4	73.6	89.6
18	Aluminium	%	0.73	1.54	1.28	1.69	0.69
19	Total Iron	%	0.97	1.97	1.82	2.15	1.05
20	Manganese	mg/kg	316	384	478	424	312
21	Boron	mg/kg	12.5	27.5	15.9	32.6	23.5
22	Zinc	mg/kg	25.6	43.2	31.4	37.5	46.8

Soil Sampling Locations
S4- Islampeta village ,S5- Namidoddi village, S6- Palikiladoddi village
S7- Dasaripeta village, S8- 8th feet road (Near Islampet village)

TABLE-3.26
SOIL QUALITY OF INTER-TIDAL REGION

Sr.No	Parameters	Unit	Sediment Sample			
			Post Monsoon Season		Winter Season	
	Sampling date		20.10.2022	28.11.2022	14.12.2022	25.01.2023
1	Texture	--	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
a	Sand	%	62	57	56	52
b	Silt	%	28	26	29	31
c	Clay	%	10	17	15	17
2	Phosphorous as P	mg/kg	41.3	36.3	41.3	32.8
3	Chromium as Cr	mg/kg	20.7	16.3	20.3	25.1
4	Nickel as Ni	mg/kg	18.3	21.2	18.3	23.6
5	Cadmium as Cd	mg/kg	<1.0	<1.0	<1.0	<1.0
6	Lead as Pb	mg/kg	2.8	4.1	5.5	2.7
7	Mercury as Hg	mg/kg	<1.0	<1.0	<1.0	<1.0
8	Total Petroleum hydrocarbons (TPH)	%	<0.01	<0.01	<0.01	<0.01

TABLE-3.27
SOIL QUALITY OF INTER-TIDAL REGION

Sr.No	Parameters	Unit	Sediment Sample	
			Winter Season	Post-Monsoon Season
	Sampling date		07.02.2023	15.03.2023
1	Texture	--	Sandy Loam	Sandy Loam
a	Sand	%	55	52
b	Silt	%	27	32
c	Clay	%	18	16
2	Phosphorous as P	mg/kg	46.9	34.1
3	Chromium as Cr	mg/kg	19.5	15.9
4	Nickel as Ni	mg/kg	27.4	21.3
5	Cadmium as Cd	mg/kg	<1.0	<1.0
6	Lead as Pb	mg/kg	3.3	2.7
7	Mercury as Hg	mg/kg	<1.0	<1.0
8	Total Petroleum hydrocarbons (TPH)	%	<0.01	<0.01

3.7 Waste Water Quality

3.7.1 Effluent Treatment Plant and Outfall water at diffusion point water Quality

There are one ETP water inside plant and two Outfall water at diffusion point these sample were collected and these were as per analyzed as per the standards to know the quality of water. The Summary of analyzed parameters results is given in **Table-3.28** and **Table-3.26.**

TABLE-3.28
ETP OUTLET ANALYSIS RESULT AT PLANT SITE

Sr.no	Parameters	Unit	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23	Limiting standards
			19.10.22	28.11.22	15.12.22	11.01.23	07.02.23	15.03.23	
1	Ph	-	7.83	7.51	7.83	7.52	7.81	7.55	6.50—8.50
2	Total Suspended Solids (at 103—105° C)	mg/l	56.4	47.9	52	67	48.4	53.7	100 mg/l
3	Oil and Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	20 mg/l
4	Free chlorine	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5 mg/l
5	Phosphate as PO4	mg/l	8.1	6.9	7.1	9.4	5.7	2.11	20 mg/l
6	Chromium (Total)	mg/l	0.05	0.08	0.04	0.07	0.011	<0.01	0.2 mg/l
7	Copper (Total)	mg/l	0.23	0.41	0.24	0.41	0.53	0.42	1 mg/l
8	Iron	mg/l	0.19	0.30	0.19	0.23	0.24	0.18	1 mg/l
9	Zinc	mg/l	0.41	0.57	0.36	0.43	0.37	0.27	1 mg/l

TABLE-3.29
OUTFALL WATER QUALITY AT DIFFUSION POINT

Sr No	Parameters	Unit	Outfall water at diffusion point					
			Surface area	Bottom area	Surface area	Bottom area	Surface area	Bottom area
			October 2022		November 2022		December 2022	
	Sampling Date		19.10.2022		28.11.2022		14.12.22	
1	pH	-	7.81	8.02	7.67	7.92	8.04	7.84
2	Temperature	°C	31.8	34.8	32.9	35.1	33.2	36.2
3	Salinity	mg/l	28.6	31.4	27.9	29.8	28.3	30.5
4	DO	mg/l	5.3	5.0	4.9	5.2	4.9	5.3
5	BOD	mg/l	<3	<3	<3	<3	<3	<3
6	Dissolved Phosphate	mg/l	4.1	6.7	5.2	7.3	2.8	5.9
7	Ammonia	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	Total Petroleum hydrocarbons	%	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TABLE-3.30
OUTFALL WATER QUALITY AT DIFFUSION POINT

Sr No	Parameters	Unit	Outfall water at diffusion point					
			Surface area	Bottom area	Surface area	Bottom area	Surface area	Bottom area
			January 2023		February 2023		March 2023	
	Sampling Date		25.01.2023		07.02.23		15.03.23	
1	pH	-	8.11	7.93	8.03	8.32	8.14	7.91
2	Temperature	°C	32.1	36.7	32.6	35.7	32.1	36.2
3	Salinity	mg/l	27.5	29.8	28.1	30.7	27.3	29.4
4	DO	mg/l	5.2	5.0	5.4	4.9	5.2	5.1
5	BOD	mg/l	<3	<3	<3	<3	<3	<3
6	Dissolved Phosphate	mg/l	3.9	7.2	2.7	5.8	1.8	4.1
7	Ammonia	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8	Total Petroleum hydrocarbons	%	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

3.8 Stack Emission Monitoring

The power plant has stack of height 275.0-m, which is the major source of air pollution. The stack emission monitoring for Unit–I and Unit-II has been carried out and results are given in **Table-3.31 to 3.34**

TABLE-3.31
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-I	Unit-II	Unit-I	Methods of Testing
	Sampling date		08.10.22	08.10.22	04.11.2022	
1	Capacity	MW	520	520	520	-
2	Stack Height	M	275	275	275	-
3	Stack diameter	M	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	-
5	Flue gas Temperature	^oC	117	122	120	-
6	Velocity of the flue gas	m/s	22.14	22.05	22.23	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	625.43	629.23	631.35	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	33.2	35.3	36.2	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	667	628	689	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	427	408	402	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.009	0.008	0.011	USEPA 29

TABLE-3.32
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-II	Unit-I	Unit-II	Methods of Testing
	Sampling date		04.11.22	27.12.22	27.12.22	
1	Capacity	MW	520	520	520	-
2	Stack Height	M	275	275	275	-
3	Stack diameter	m	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	-
5	Flue gas Temperature	^oC	123	121	108	-
6	Velocity of the flue gas	m/s	22.17	22.3	22.1	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	625.81	616.46	598.26	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	31.6	37.0	33.5	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	651	672	644	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	417	373	342	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.008	0.010	0.007	USEPA 29

TABLE-3.33
STACK EMISSION MONITORING

Sr. No.	Parameters	UOM	Unit-I	Unit-II	Unit-I	Methods of Testing
	Sampling date		24.01.23	24.01.23	06.02.23	
1	Capacity	MW	520	520	520	-
2	Stack Height	m	275	275	275	-
3	Stack diameter	m	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	-
5	Flue gas Temperature	°C	121	124	114	-
6	Velocity of the flue gas	m/s	22.26	22.43	22.08	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	627.43	612.96	604.55	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	40.51	36.42	38.14	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	691	662	703	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	394	366	400	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.013	0.009	0.010	USEPA 29

TABLE-3.34
STACK EMISSION MONITORING RESULTS

Sr. No.	Parameters	UOM	Unit-II	Unit-I	Unit II	Methods of Testing
	Sampling date		11.02.23	20.03.23	20.03.23	
1	Capacity	MW	520	520	520	-
2	Stack Height	m	275	275	275	-
3	Stack diameter	m	6.8	6.8	6.8	-
4	Cross sectional area of the duct	m^2	36.33	36.33	36.33	-
5	Flue gas Temperature	°C	120	108	110	-
6	Velocity of the flue gas	m/s	22.21	22.18	22.07	IS: 11255(P-3) 2008
7	Gas volumetric flow rate	Nm^3/s	586.77	593.21	577.61	IS: 11255(P-3) 2008
8	Particulate Matter	mg/Nm^3	41.38	25.05	28.00	IS: 11255(P-1) 2009
9	Sulphur dioxide	mg/Nm^3	682	693	717	IS: 11255(P-2) 2012
10	Oxides of Nitrogen	mg/Nm^3	373	375	414	IS: 11255(P-7) 1985
11	Mercury	mg/Nm^3	0.015	0.008	0.011	USEPA 29

3.9 Pizeo wells Monitoring

Pizeo wells Monitoring of ground water has been carried out for 6 locations around the plant site and the Pizeo wells water level monitoring are given in **Table-3.35.**

TABLE-3.35
PIZEO WELLS MONITORING FOR GROUND WATER

Sr.No.	Location Name	Depth of Water levels (m)	
		15.12.2022	18.03.2023
1	Appikonda village	2.98	3.20
2	Palavalasa village	5.04	4.77
3	Velama Appikonda village	3.14	3.43
4	Gouruvanipalem village	3.77	3.08
5	Islampet village	4.11	3.78
6	Dasaripeta villa	4.32	2.92

3.10 Sewage Treatment Plant Outlet Water Quality (STP)

Two Sewage water samples are collected one is from Plant site and other is Colony and analyzed for various parameters. The survey analytical results are given in **Table-3.36.**

TABLE-3.36
SEWAGE OUTLET WATER QUALITY (OCTOBER 2022 TO MARCH 2023)

Sr. No	Parameter	UOM	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23
	Sampling date		19.10.22	28.11.22	15.12.22	11.01.23	07.02.23	15.03.23
1	pH	-	7.51	7.81	7.62	7.54	7.82	7.61
2	Oil & Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3	Total Dissolved Solids	mg/l	403	502	451	502	572	529
4	Total Suspended Solids	mg/l	17	28	23	31	24	28.2
5	Bio Chemical Oxygen Demand for 3 day $27^{O}C$	mg/l	11	14	18	15	12	14
6	Fecal Coliform (FC) MPN/100ml	MPN/100ml	126	205	312	414	541	463

3.11 Beach Profile Study

Hinduja National Power Corporation Limited (HNPCL) is a Hinduja Group company to realize the ambitions of the Group in Power Sector. HNPCL is setting up a 1,040 MW coal-based merchant power plant at Vizag, Andhra Pradesh. Once Through (Open Cycle) Cooling System has been recommended by MoEF for the power plant and Sea Water Intake-Outfall System has been installed.

The present study involves quarterly monitoring of shoreline and beach profile changes as part of environmental monitoring and compliance to MoEF:

1. shoreline within 3 km on either side of HNPCL Sea Water Intake-Outfall System (Jetty) and
2. beach profile at HNPCL Jetty and at 100 m, 250 m and 500 m intervals on either side of Jetty

3.11.1 Shoreline

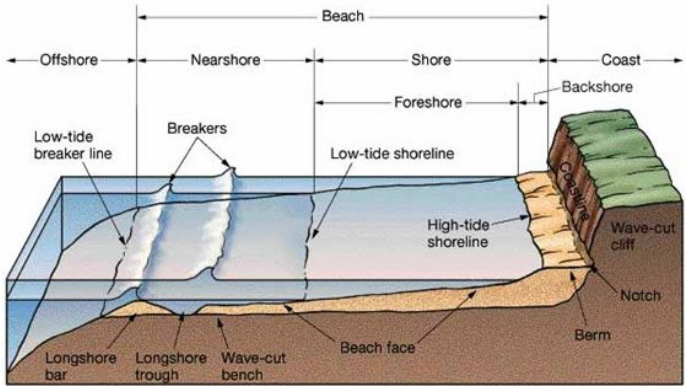
The coastal areas are always physically and ecologically changing that depends on natural and human factors. Monitoring of coastal areas is an important fact in steady development and environment maintenance. To monitor a coastal area, shoreline extraction in various times is an essential task. Shoreline is one the most important linear features on the Earth's surface showing a dynamic nature. It is important to produce shoreline map and to determine the changes for a secure shipping, resource management, environment maintenance, planning and coastal steady-development.

Remote sensing is one of the best and most reliable methods in monitoring and management off environment and resources. Since, the reflection of water in IR bands are almost zero and most of vegetation have a bigger reflection versus water, shoreline can be extracted from even one band of the image.

Cartosat 1 with improved spatial resolution capability, it will provide enhanced inputs for large scale mapping applications and stimulate newer applications in the urban and rural development, land and water resources management, coastal mapping etc. Hence, high resolution satellite data during January/February 2023 has been proposed to carry out investigation on spatial changes of shoreline monitoring. Since could free 2.5 m resolution data close to field profile study i.e., 28-February-2023 is not available Resourcesat 2A L4FMX multispectral satellite data of 5 m resolution on 23-January-2023 has been procured to draw shore lines during January 2023. The Resourcesat 2A L4FMX satellite data of 5 m resolution of 23-January-2023 obtained from NRSC is geometrically corrected with respect to Survey of India toposheet and GCPs collected from field. To carry out the geo-referencing, ground control points (GCPs) were identified on the maps and raw satellite data. The coefficients for two co-ordinate transformation equations were computed based on polynomial regression between GCPs on map and satellite data. Alternate GCPs were generated till the Root Mean Square (RMS) error was less than 0.5 pixel and then both the images were co-registered.

Shore line and High Tide Shore lines are delineated from processed Resourcesat 2A L4FMX image of 23-January-2023 using visual interpretation technique in conjunction with LTL, HTL and CRZ Map prepared by National Institute of Oceanography and field data provided by VIMTA Labs Ltd. The above-mentioned satellite data covering 3.5 km on either side of Jetty point has been used to present shore line changes. "The line on the land up to which the highest water line reaches during the spring tide" indicated by vegetation line and clear beach is delineated as Shore Line (SL). High Tide Shore Line (HTSL) is plotted following line of moisture indication along the tidal zone on the satellite image. Mapping of SL and HTSL is done on scale of 1:8000.

The observations in respect of SL and HTSL are presented in **Figure 3.2** for 23-January-2023. From the shoreline map, it is observed that there is no major change in SL and no activity or discharge around jetty. The difference in HTSL observed may be due to fluctuations caused by changes in seasonal tides/gravitational forces exerted by the moon and the sun, and the rotation of the Earth.



East of HNPCL Jetty

West of HNPCL Jetty

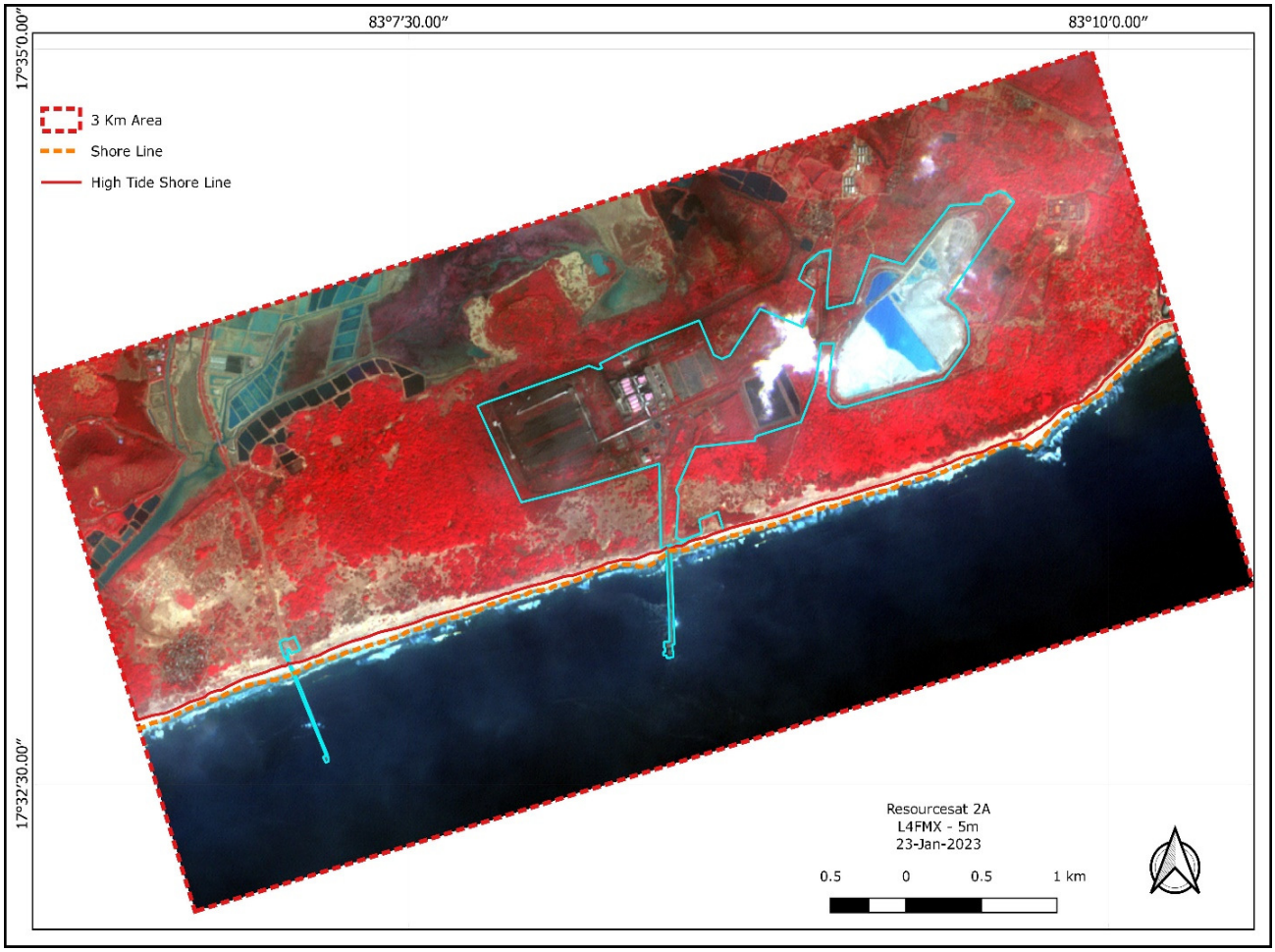


FIGURE-3.2
SHORELINE SATELLITE IMAGERY OF HTSL, RESOURCESAT 2A L4FMX-5M (23 JANUARY 2023)

3.11.2 Beach Profiles

Measuring beach profiles is an ideal activity for science-based assessments and science fair projects. Beach size often changes so quickly – in a matter of days – those interesting results can be guaranteed in short time period. Furthermore, the information gathered may also be useful for environmental management and planning.

The monitoring consists of surveying the beach profile from a fixed point set up behind the beach. The fixed point is called the reference mark and is the starting point for the measurement. The reference mark is usually painted on a permanent feature like wall or tree or a pillar established. In the absence of any permanent features here, 1'x1'x3' pillar stones are installed (at 7.1 m, 100 m, 250 m & 500 m towards east of Jetty and 8.1 m, 100 m, 250 m & 500 m towards west of Jetty) as reference marks and painted with profile identification numbers. Reference marks, profile sections and profile line along the beach are shown in **Figure 2**. Beach profile measurements are run from the installed reference marks at right angles across the beach on 28.02.2023. Beach profile measurements are done using an Abney Level & Clinometer placing ranging poles at each break of slope and ensuring the line of profile follows the fixed orientation. The measurements are continued for a few meters into the sea water beyond low tide.

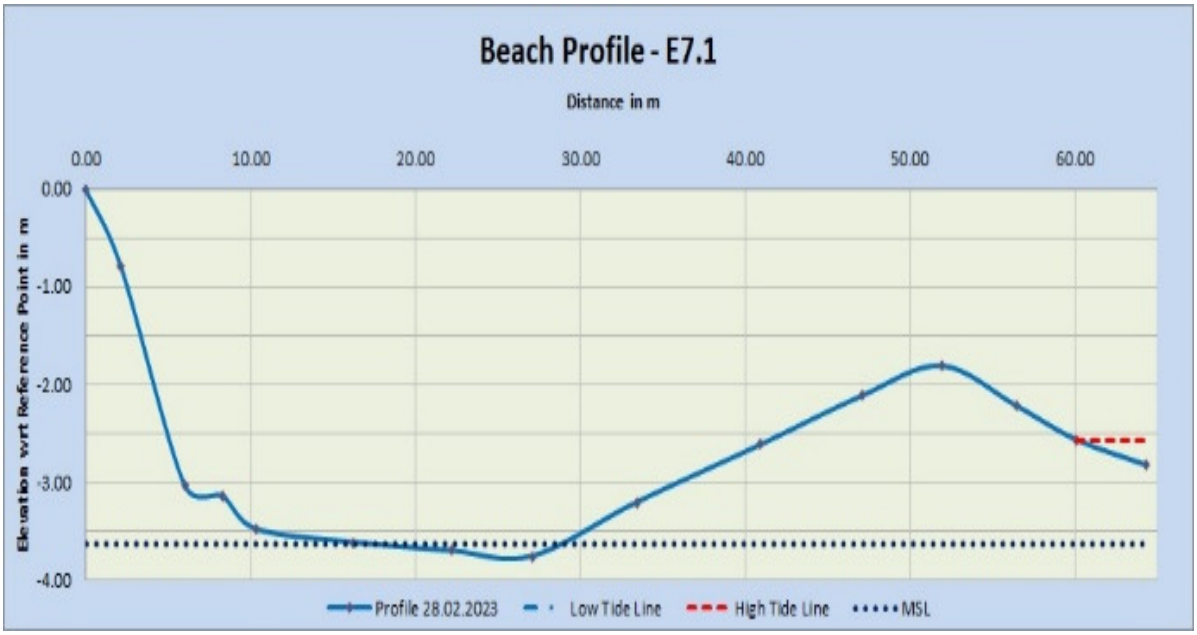
FIGURE-3.3
HNPCL JETTY AND PROFILE LOCATIONS ON GOOGLE EARTH MAP

High and low tide levels are measured as observed on the day and time of measurements considering the moisture indication and current tide level respectively. Summary of profiles carried out giving the details of length, vertical drop w.r.t reference mark and area of profile are presented in **Table 3.37** and individual profiles are presented in **Figure 3.4 to 3.7**.

Total length of profiles ranges from 28.19 m at E100 to 94.87 m at W100 from the reference mark in to the offshore with vertical drop w.r.t reference mark ranging from 2.822 m to 4.759 m and sectional profile area ranging from 68.53 sq m to 289.32 sq m.

TABLE-3.37
DETAILS OF PROFILES ON 28.02.2023

Sr.No.	Profile ID	Latitude	Longitude	Elevation at Ref. Mark (m amsl)	Total Length (m)	Vertical Drop w.r.t Ref. Mark (m)	Profile Area (sq m)
1	E7.1	17 ^{0} 33' 17.7''N	83 ^{0} 08' 26.3''E	3.62	64.37	-2.822	180.19
2	E100	17 ^{0} 33' 18.6''N	83 ^{0} 08' 29.2''E	3.31	28.19	-4.470	68.53
3	E250	17 ^{0} 33' 20.2''N	83 ^{0} 08' 34.0''E	5.32	67.53	-4.637	210.63
4	E500	17 ^{0} 33' 22.2''N	83 ^{0} 08' 42.4''E	3.31	65.36	-4.465	201.65
5	W8.1	17 ^{0} 33' 17.6''N	83 ^{0} 08' 24.9''E	4.54	80.95	-4.759	289.32
6	W100	17 ^{0} 33' 16.5''N	83 ^{0} 08' 21.9''E	4.40	94.87	-3.990	114.32
7	W250	17 ^{0} 33' 15.2''N	83 ^{0} 08' 16.9''E	3.60	65.46	-3.666	138.37
8	W500	17 ^{0} 33' 13.0''N	83 ^{0} 08' 08.6''E	3.50	47.06	-3.647	99.53



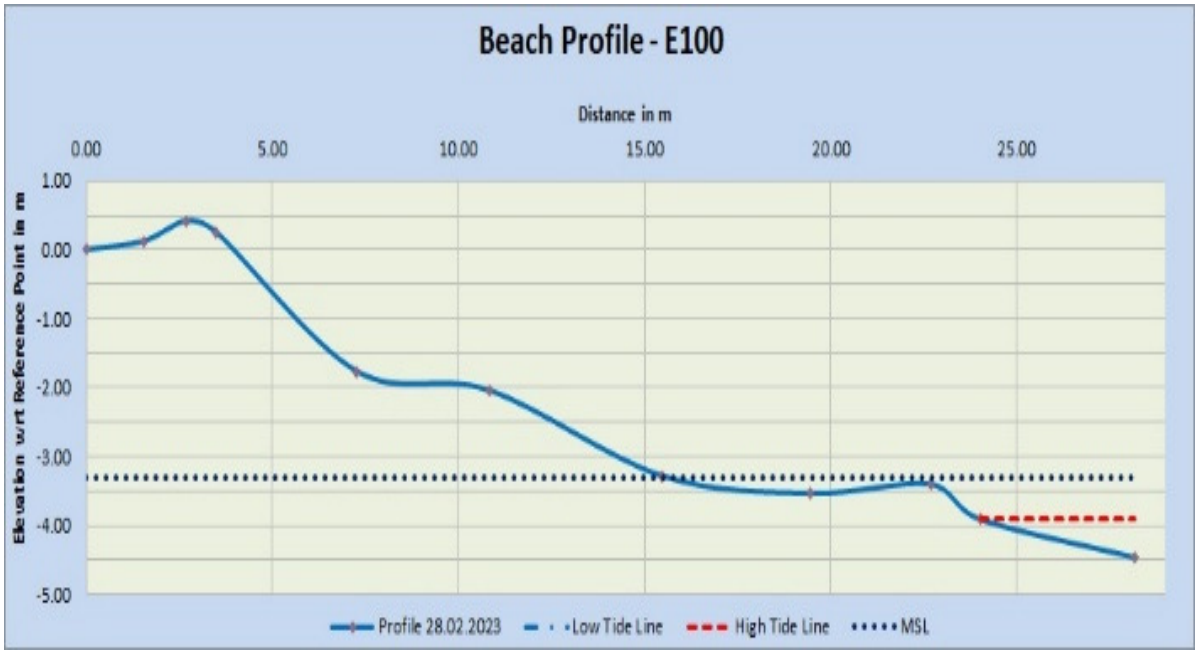
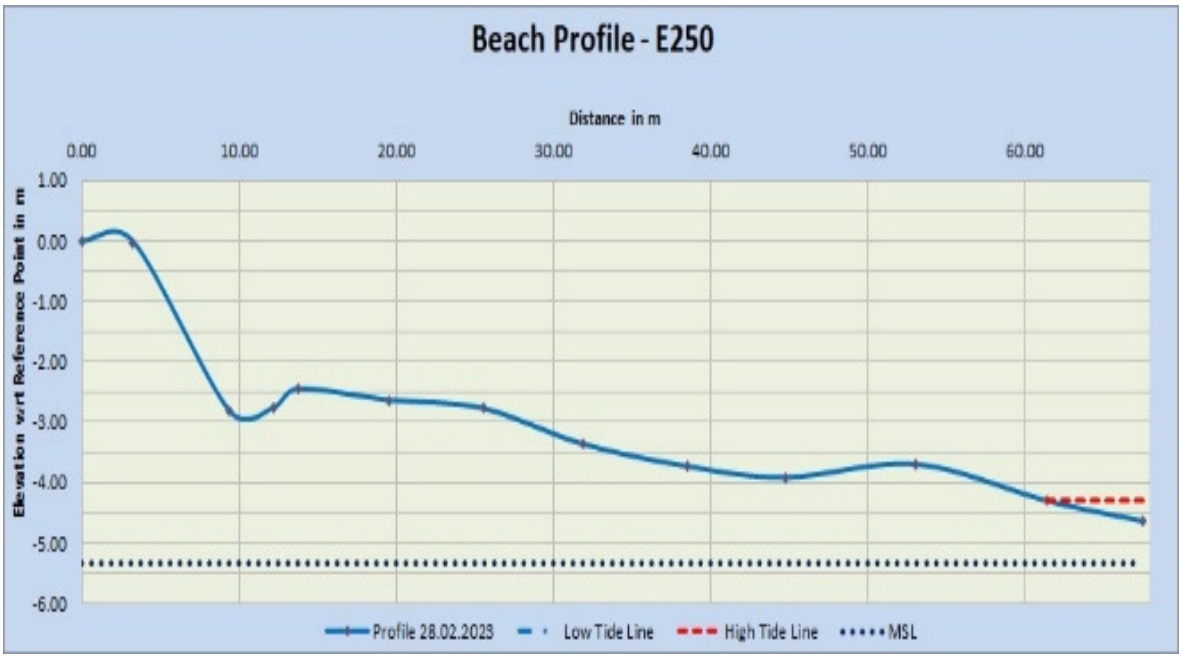


FIGURE-3.4
BEACH PROFILE – EAST 7.1 & EAST 100 METERS FROM JETTY 28.02.2023



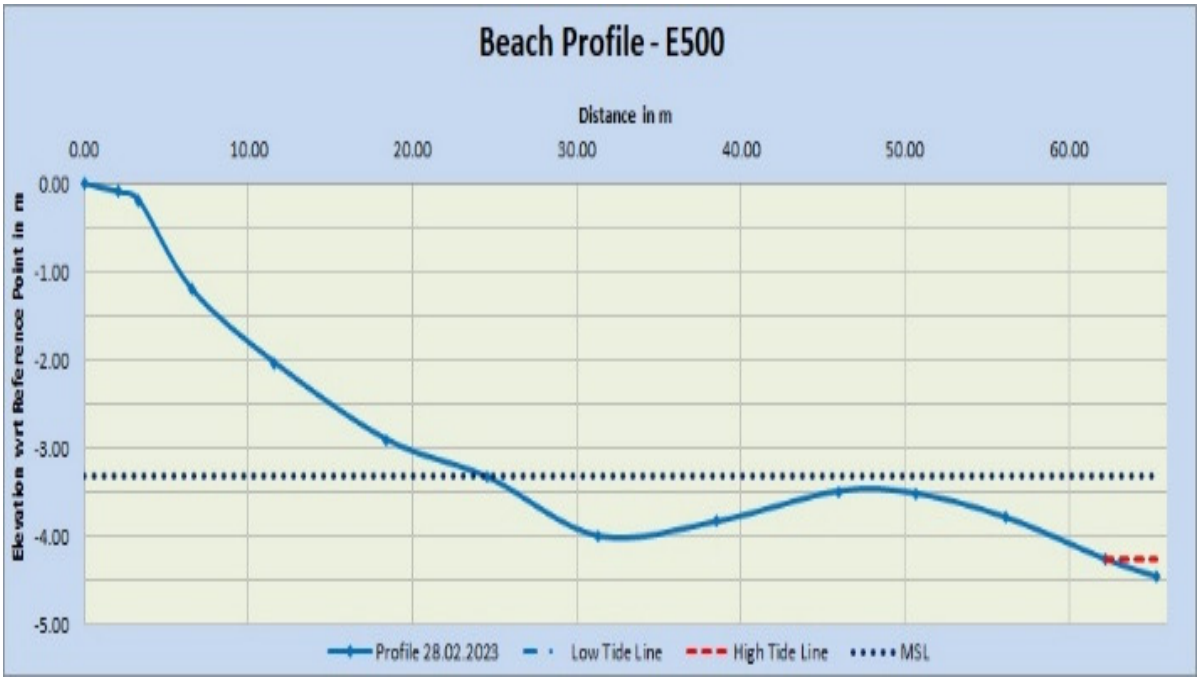
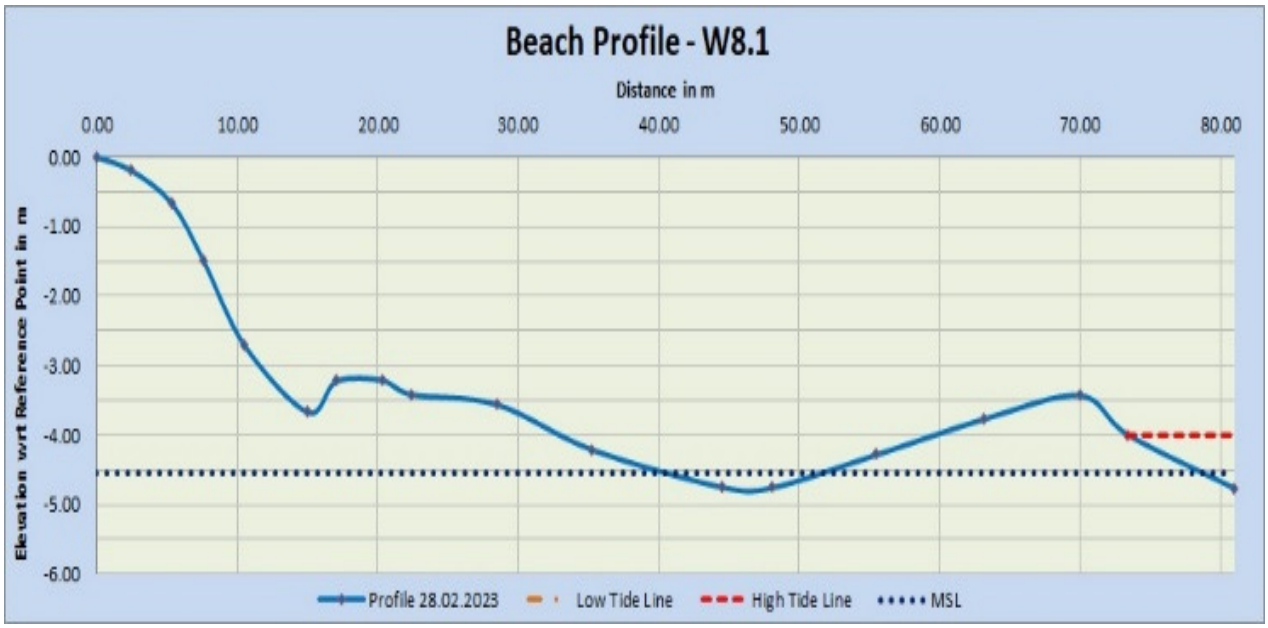


FIGURE-3.5
BEACH PROFILE – EAST 250 & EAST 500 METERS FROM JETTY 28.02.2023



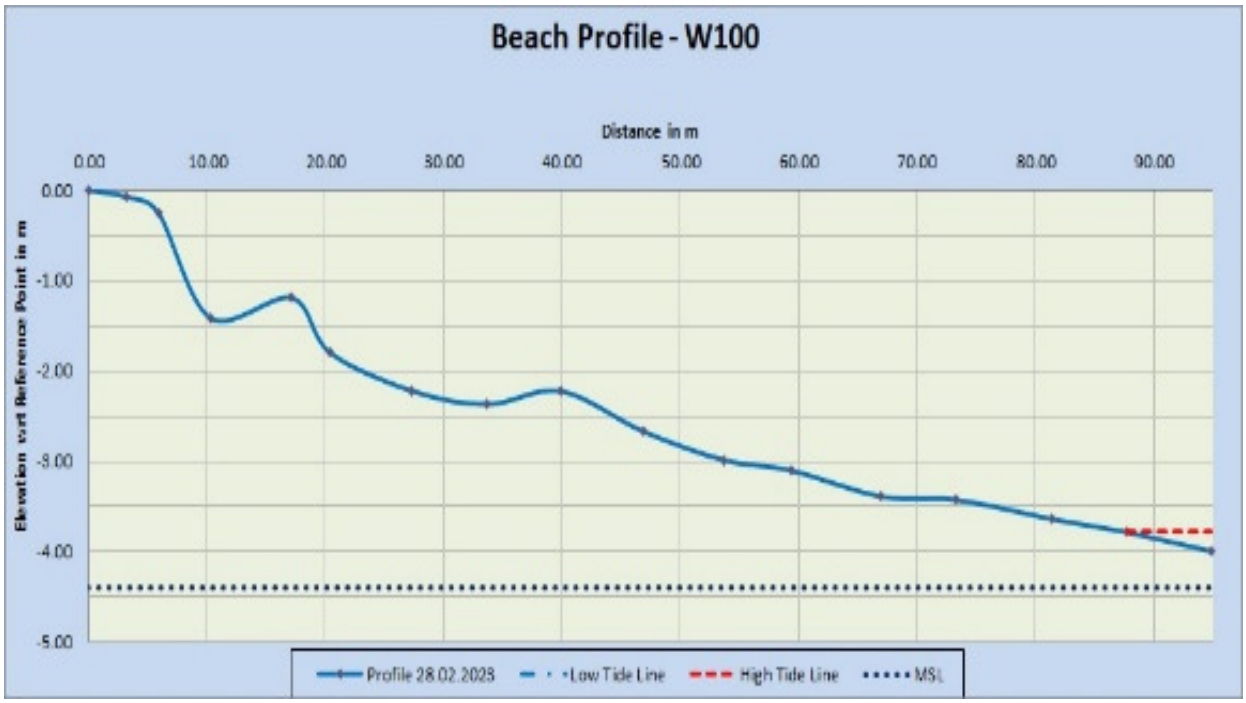
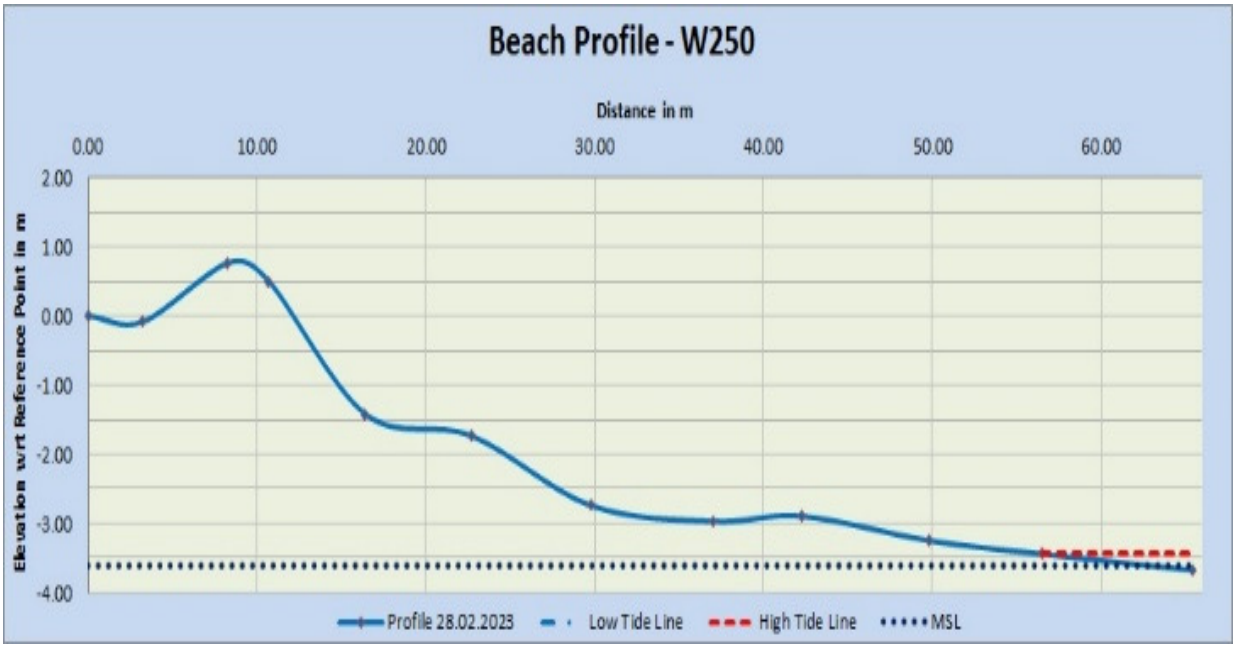


FIGURE-3.6
BEACH PROFILE – WEST 8.1 & WEST 100 METERS FROM JETTY 28.02.2023



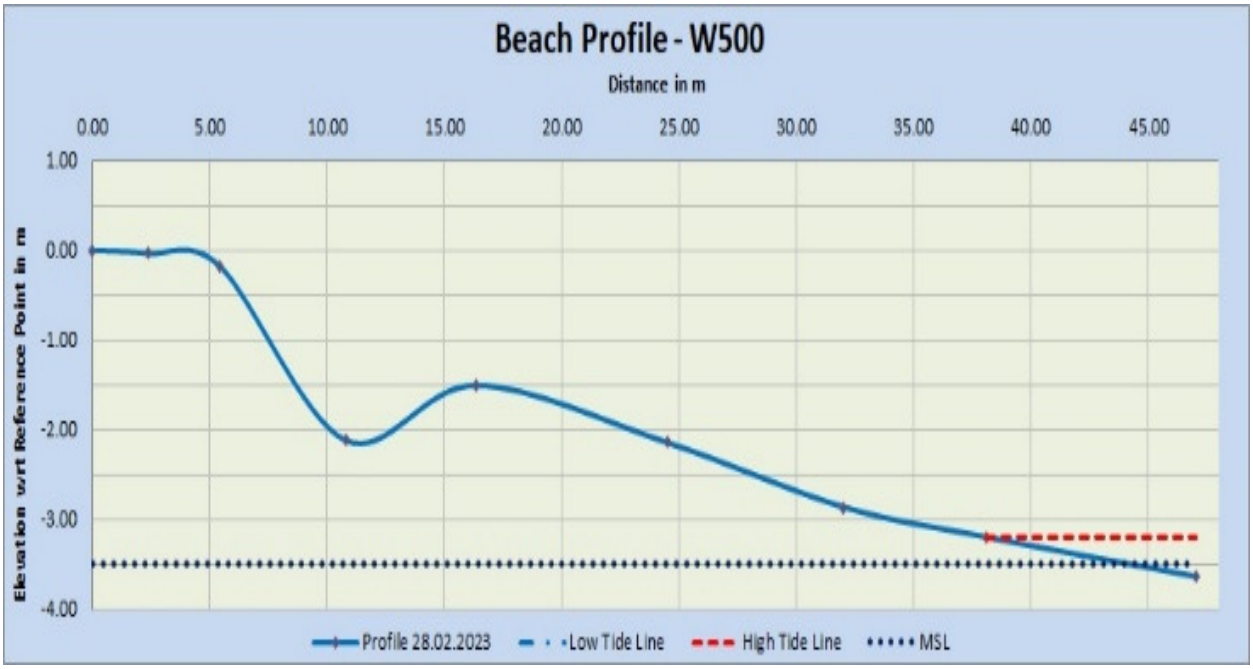


FIGURE-3.7
BEACH PROFILE – WEST 250 & WEST 500 METERS FROM JETTY 28.02.2023

3.12 Biological characteristics

3.12.1 Phytoplankton

Phyto-pigments: Phyto-pigments such as Chlorophyll-a / Chlorophyll-b Chlorophyll-c, Carotenoids / Phaeopigments.

3.12.1.1The Genetic diversity of the Phyto-planktons is presented in the **Table-3.38.**

TABLE-3.38
PHYTOPLANKTON GENETIC DIVERSITY

Phytoplankton Genetic Diversity		
Chlorophyaceae		**Genetic Diversity**
1	*Cosmarium*	13
2	*Chara*	25
3	*Cladophora*	21
4	*Chlorilla*	15
5	*Chlamydomonas*	26
6	*Volvox*	31
7	*Hydrodicto*	19
8	*Spirodictiona*	23
9	*Spirozyra*	20
10	*Zygenema*	14
Cyanophyaceae		
11	*Spirulina*	22
12	*Anabaena*	13
13	*Nostoc*	30
Bacillariophyaceae		
14	*Pinnularia*	21
15	*Navicula*	26
Shannon Wiener Diversity Index for Species Diversity		2.67
Species Richness		15

Population of biomass comprises of 15 species of phyto-planktons.

3.123.1.2 The genetic diversity of the Zooplankton is given in the **Table-3.39**

TABLE-3.39
ZOOPLANKTON GENETIC DIVERSITY

Zooplankton Genetic Diversity		
Copepoda		**Genetic Diversity**
1	*Cyclops* sp	11
2	*Nauplius* larvae	23
Rotifera		
1	*Brachionus* sp	25
2	*Allonella* sp	15
3	*Moina* sp	10
Protozoa		
1	*Pinnularia* sp	19
Shannon Wiener Diversity Index for Species Diversity		1.74
Species Richness		6

3.12.2 Benthos

3.12.2.1 Meiobenthos

Community of Benthos are represented by Meiobenthos and Macro benthos. The Meiobenthos communities are represented such as Copepods, and turbellarians, Listed in **Table-3.40.**

TABLE-3.40
MEIOBENTHIC GROUP

Sr. No.	**Meiobenthos**	**Genetic Diversity**
1	*Copepods*	13
2	*Nematodes*	28
3	*Turbellarians*	13
4	*Nemertins*	9
5	*Foraminifera*	23
6	*Kinorynchs*	18
7	*Halacarids*	27
Shannon Wiener Diversity Index - Species Diversity		1.88
Species Richness		7

3.12.2.2 Macro benthos

Represented by *Polychaetes*, *Molluscs*, *Amphipods*, *Isopods*, *Cnidarians*, listed in **Table-3.41.**

TABLE-3.41
MACROBENTHIC GROUP

Sr. No.	Macrobenthos	Genetic Diversity
1	*Polychaetes*	24
2	*Molluscs*	20
3	*Cumceans*	18
4	*Amphipods*	21
5	*Isopods*	27
6	*Cnidarians*	30
7	*Oligochaetes*	18
8	*Tanaidacea*	8
Shannon Wiener Diversity Index - Species Diversity		2.03
Species Richness		8

Fishes

The list of fish found near the study area, near the plant site listed in **Table-3.42.**

TABLE-3.42
LIST OF FISHES IN THE STUDY AREA

Sr. No	Name of the Species	Number of Individuals	Common Name
Fishes			
1	*Rasterliger kanagurta*	36	Indian Mackerel
2	*Sarinella longiceps*	26	Indian Oil Sardine
3	*Canos charios*	12	White Mullet
Shannon Wiener Diversity Index - Species Diversity		1.01	
Species Richness		3	

Thus indicating the Genetic diversity of Phytoplankton, *Meiobenthos* and *Macrobenthos* and fishes in the study area.

Annexure-I

Ambient Air Quality Levels

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ1 - Palavalasa village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	10.10.2022	23.6	55.2	12.8	14.6	242	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	11.10.2022	32.8	51.6	11.8	15.2	283	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	20.10.2022	25.6	58.2	13.3	17.1	312	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	21.10.2022	29.9	53.4	14.2	18.4	297	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	25.10.2022	25.8	50.8	15.2	19.2	304	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	26.10.2022	26.4	52.1	12.7	16.2	279	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	03-11-2022	25.1	55.3	14.0	17.4	256	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	04-11-2022	26.3	50.2	12.9	15.7	243	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	10-11-2022	24.4	59.2	14.3	16.3	271	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	11-11-2022	26.1	52.9	15.4	19.0	256	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	14-11-2022	27.5	57.8	15.2	20.3	214	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	15-11-2022	30.2	52.2	12.1	16.9	317	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	24-11-2022	29.5	53.8	14.1	17.6	201	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	26-11-2022	26.1	50.0	12.6	14.7	222	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	29-11-2022	33.2	52.2	14.2	17.5	243	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	30-11-2022	26.7	55.4	11.9	14.6	261	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	07-12-2022	28.0	47.2	15.3	19.1	279	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	08-12-2022	24.1	56.2	14.2	17.4	266	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	12-12-2022	27.2	52.3	15.6	18.0	308	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	13-12-2022	23.9	50.1	16.7	21.5	279	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	22-12-2022	29.1	55.0	16.5	19.3	237	9.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	23-12-2022	28.0	49.4	13.4	18.6	331	8.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	26-12-2022	27.3	51.0	15.4	19.3	224	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	27-12-2022	23.9	47.2	13.9	16.4	245	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	05.01.2023	26.4	49.3	16.1	20.3	298	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	06.01.2023	22.5	58.3	15.0	18.6	285	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	09.01.2023	25.6	54.4	16.4	19.2	327	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	10.01.2023	22.3	52.2	17.5	22.7	298	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	19.01.2023	27.5	57.1	17.3	20.5	256	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	20.01.2023	26.4	51.5	14.2	19.8	350	9.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	23.01.2023	25.7	53.1	16.8	20.5	243	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	24.01.2023	22.3	48.6	14.7	17.6	264	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	02.02.2023	31.5	57.3	14.4	23.1	253	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	03.02.2023	30.6	62.7	13.3	18.5	266	9.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	06.02.2023	27.5	60.7	15.3	21.3	308	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	07.02.2023	26.3	53.0	14.8	17.1	315	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	16.02.2023	31.7	60.6	13.2	18.3	221	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	17.02.2023	29.3	55.0	12.5	22.4	287	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	20.02.2023	26.3	62.3	15.1	23.6	328	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	21.02.2023	32.7	58.7	14.6	21.7	281	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	03.03.2023	49.5	79.3	13.8	25.7	302	10.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	04.03.2023	48.6	84.7	15.8	21.1	271	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	07.03.2023	53.2	78.2	12.7	24.1	292	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	08.03.2023	42.7	75.0	13.7	19.7	332	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	16.03.2023	52.7	82.6	15.7	20.9	205	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	17.03.2023	47.3	77.0	15.0	22.6	271	10.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	20.03.2023	44.3	84.3	14.3	20.7	283	9.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	21.03.2023	50.7	80.7	13.2	24.3	265	11.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	30.03.2023	38.5	69.3	15.7	22.8	228	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	31.03.2023	51.6	76.3	14.8	23.7	241	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**22.3**	**47.2**	**11.8**	**14.6**	**201**	**5.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**53.2**	**84.7**	**17.5**	**25.7**	**350**	**11.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**31.3**	**59.0**	**14.5**	**19.4**	**273**	**7.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**52.7**	**84.3**	**17.3**	**24.3**	**332**	**10.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ2 - Appikonda village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	13.10.2022	24.9	50.8	11.6	14.8	232	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	14.10.2022	26.3	52.4	12.1	13.4	244	4.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	17.10.2022	23.4	53.2	12.4	14.0	234	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	18.10.2022	22.5	48.9	13.5	16.7	254	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	28.10.2022	25.7	48.3	14.0	17.4	208	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	29.10.2022	27.8	52.4	13.6	16.1	202	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	31.10.2022	23.4	49.8	12.2	15.3	221	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	01-11-2022	27.8	52.3	14.4	17.8	277	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	07-11-2022	25.2	56.3	13.4	15.8	274	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	08-11-2022	29.7	52.6	14.6	18.2	287	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	17-11-2022	32.0	55.6	12.3	17.2	288	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	18-11-2022	29.8	51.2	13.4	18.4	264	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	21-11-2022	28.5	56.0	14.3	17.1	266	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	22-11-2022	31.4	55.6	12.7	15.6	258	6.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	01-12-2022	29.7	50.2	15.7	18.9	296	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	02-12-2022	27.1	54.2	14.7	16.9	243	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	05-12-2022	31.6	50.5	15.9	19.3	248	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	06-12-2022	33.9	53.5	13.6	18.3	269	4.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	15-12-2022	31.7	49.1	14.7	19.5	283	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	16-12-2022	30.4	53.9	15.6	18.2	285	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	19-12-2022	33.3	53.5	14.0	16.7	277	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	20-12-2022	27.3	48.2	12.4	15.3	272	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	29-12-2022	30.1	53.1	11.8	13.7	248	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	30-12-2022	25.7	50.8	13.6	14.8	291	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	02.01.2023	28.4	52.4	16.8	20.8	319	6.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	03.01.2023	25.8	56.4	15.6	17.7	266	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	12.01.2023	30.3	52.7	17.0	21.2	271	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	13.01.2023	32.6	55.7	14.7	20.2	292	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	16.01.2023	30.7	51.3	15.8	21.4	306	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	17.01.2023	29.1	56.1	16.7	20.1	308	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	27.01.2023	32.0	55.7	15.1	18.6	300	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	28.01.2023	26.0	50.4	13.5	17.2	295	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	30.01.2023	28.8	55.3	12.9	15.6	271	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	31.01.2023	24.4	53.0	14.2	16.7	314	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	09.02.2023	29.4	57.7	16.6	17.4	298	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	10.02.2023	33.1	54.9	12.8	19.5	245	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	13.02.2023	31.8	56.3	15.2	19.6	250	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	14.02.2023	27.5	51.4	13.8	15.7	271	6.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	23.02.2023	34.6	53.1	14.8	18.6	285	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	24.02.2023	30.4	50.5	15.0	19.3	255	5.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	27.02.2023	28.4	58.3	14.7	17.4	279	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	28.02.2023	32.8	56.8	13.8	16.3	264	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	09.03.2023	46.2	75.7	14.8	20.1	274	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	10.03.2023	43.2	72.9	11.0	21.4	257	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	13.03.2023	47.2	74.3	13.4	18.4	262	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	14.03.2023	48.5	78.3	12.0	17.6	284	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	23.03.2023	50.6	71.1	13.0	20.5	297	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	24.03.2023	51.4	65.3	13.2	21.2	301	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	27.03.2023	39.2	76.3	12.9	19.3	291	9.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	28.03.2023	49.1	74.8	12.0	18.2	276	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**22.5**	**48.2**	**11.0**	**13.4**	**202**	**4.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**51.4**	**78.3**	**17.0**	**21.4**	**319**	**10.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**31.8**	**56.4**	**14.0**	**17.8**	**271**	**7.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**50.6**	**76.3**	**16.8**	**21.4**	**314**	**9.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ3 - Devada village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	13.10.2022	26.1	48.9	11.5	13.2	246	5.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	14.10.2022	22.7	50.2	10.8	12.6	251	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	17.10.2022	21.8	45.2	12.1	14.1	266	4.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	18.10.2022	26.4	47.3	10.8	13.2	236	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	28.10.2022	25.5	51.8	12.6	14.7	217	4.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	29.10.2022	24.1	47.8	11.8	12.9	220	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	31.10.2022	22.6	43.2	12.2	13.9	217	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	01-11-2022	22.1	49.1	14.2	15.8	255	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	07-11-2022	24.7	47.3	15.0	16.6	281	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	08-11-2022	21.3	50.7	13.2	16.1	276	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	17-11-2022	27.6	47.9	14.2	17.1	291	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	18-11-2022	24.4	51.7	10.3	13.6	234	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	21-11-2022	23.3	53.2	12.7	16.1	265	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	22-11-2022	25.8	46.5	10.9	15.1	246	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	01-12-2022	24.0	47.2	15.5	16.9	274	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	02-12-2022	26.6	45.2	13.4	17.7	300	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	05-12-2022	23.2	48.6	12.4	14.7	295	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	06-12-2022	29.5	45.8	15.5	18.2	310	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	15-12-2022	26.3	49.6	11.6	14.7	253	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	16-12-2022	25.2	51.1	14.0	17.2	284	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	19-12-2022	27.7	44.4	12.2	16.2	265	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	20-12-2022	23.4	50.3	14.1	14.2	251	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	29-12-2022	26.1	47.3	11.6	17.0	273	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	30-12-2022	22.8	44.1	13.7	13.6	255	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	02.01.2023	22.7	49.4	14.5	18.8	297	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	03.01.2023	25.3	47.4	16.2	19.6	323	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	12.01.2023	21.9	50.8	13.5	16.6	318	9.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	13.01.2023	28.2	48.0	16.6	20.1	333	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	16.01.2023	25.0	51.8	12.7	17.4	276	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	17.01.2023	23.9	53.3	15.1	19.1	307	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	27.01.2023	26.4	46.6	13.3	18.1	288	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	28.01.2023	22.1	52.5	15.7	16.5	274	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	30.01.2023	24.8	49.5	12.7	18.3	296	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	31.01.2023	21.5	46.3	14.8	15.5	278	6.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	09.02.2023	23.8	55.1	14.1	16.2	287	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	10.02.2023	28.1	51.0	12.5	16.4	302	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	13.02.2023	24.2	49.2	13.1	17.8	244	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	14.02.2023	25.3	51.6	12.8	15.4	247	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	23.02.2023	28.1	56.2	15.3	17.3	255	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	24.02.2023	26.2	56.9	12.2	15.2	286	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	27.02.2023	24.3	47.2	11.7	16.3	267	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	28.02.2023	29.6	50.8	13.2	17.7	253	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	09.03.2023	44.8	73.1	12.3	18.1	267	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	10.03.2023	49.1	69.0	10.7	14.8	251	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	13.03.2023	45.2	67.2	14.2	19.7	281	9.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	14.03.2023	36.7	69.6	11.0	17.3	259	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	23.03.2023	49.1	74.2	13.5	19.2	267	9.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	24.03.2023	47.2	66.4	10.4	17.1	270	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	27.03.2023	39.5	70.1	13.2	18.2	279	9.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	28.03.2023	50.6	68.8	11.4	19.6	265	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**21.3**	**43.2**	**10.3**	**12.6**	**217**	**4.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**50.6**	**74.2**	**16.6**	**20.1**	**333**	**9.8**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**28.1**	**52.5**	**13.1**	**16.4**	**271**	**7.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**49.1**	**73.1**	**16.2**	**19.7**	**323**	**9.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-4 Cheepurupalle village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	13.10.2022	30.2	52.8	15.1	18.0	276	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	14.10.2022	25.3	60.4	13.4	16.4	286	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	17.10.2022	30.7	48.7	16.2	19.5	337	9.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	18.10.2022	32.6	60.3	14.5	16.0	282	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	28.10.2022	25.6	52.3	13.8	15.7	328	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	29.10.2022	29.4	62.8	15.2	18.1	301	10.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	31.10.2022	28.3	58.3	14.2	16.8	281	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	01-11-2022	27.6	48.2	14.6	17.2	286	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	07-11-2022	26.3	45.3	11.4	14.5	294	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	08-11-2022	21.7	48.8	14.4	16.0	277	9.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	17-11-2022	24.0	47.0	16.1	15.4	275	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	18-11-2022	24.2	49.2	12.4	12.5	263	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	21-11-2022	25.5	48.5	10.8	14.0	240	6.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	22-11-2022	23.7	44.7	9.7	13.1	243	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	01-12-2022	24.3	46.1	15.9	18.3	305	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	02-12-2022	28.2	43.2	12.7	15.6	313	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	05-12-2022	23.6	46.7	15.7	17.1	296	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	06-12-2022	25.9	44.9	17.4	16.5	294	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	15-12-2022	26.1	47.1	13.7	20.2	282	10.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	16-12-2022	27.4	46.4	12.1	15.1	259	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	19-12-2022	25.6	42.6	11.0	14.2	262	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	20-12-2022	27.1	45.2	13.4	17.3	306	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	29-12-2022	24.5	50.6	15.2	16.4	277	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	30-12-2022	26.1	46.7	16.3	19.3	285	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	02.01.2023	23.5	48.3	17.0	20.2	328	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	03.01.2023	26.9	45.4	13.8	17.5	336	9.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	12.01.2023	22.3	48.9	16.8	19.0	319	11.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	13.01.2023	24.6	47.1	18.5	18.4	317	10.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	16.01.2023	27.3	49.3	14.8	22.1	305	10.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	17.01.2023	26.1	48.6	13.2	17.0	282	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	27.01.2023	24.3	44.8	12.1	16.1	285	8.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	28.01.2023	25.8	47.4	14.5	19.2	329	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	30.01.2023	23.2	52.8	16.3	18.3	300	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	31.01.2023	24.8	43.4	17.4	21.2	308	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	09.02.2023	25.9	60.2	16.4	19.4	261	9.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	10.02.2023	27.6	53.8	17.9	20.8	298	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	13.02.2023	31.4	48.3	14.9	18.3	302	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	14.02.2023	30.8	50.7	15.5	19.6	296	9.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	23.02.2023	24.5	61.4	12.5	14.7	284	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	24.02.2023	31.5	52.2	15.0	18.2	261	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	27.02.2023	26.9	45.6	10.8	16.3	308	9.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	28.02.2023	28.1	62.3	13.9	17.2	267	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	09.03.2023	46.9	78.2	14.6	23.6	294	11.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	10.03.2023	48.6	71.8	16.1	22.7	310	9.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	13.03.2023	52.4	66.3	13.1	20.2	327	9.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	14.03.2023	51.8	68.7	13.7	21.5	311	11.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	23.03.2023	53.1	79.4	10.7	16.6	296	10.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	24.03.2023	52.5	70.2	13.2	20.4	273	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	27.03.2023	47.9	85.2	13.2	18.2	255	11.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	28.03.2023	49.1	80.3	12.1	19.3	307	9.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**21.7**	**42.6**	**9.7**	**12.5**	**240**	**5.6**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**53.1**	**85.2**	**18.5**	**23.6**	**337**	**11.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**30.2**	**53.9**	**14.3**	**17.8**	**292**	**8.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**52.5**	**80.4**	**17.9**	**22.7**	**336**	**11.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-5 Dasaripeta village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	10.10.2022	25.1	45.8	11.8	13.2	236	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	11.10.2022	21.8	48.2	13.2	15.0	254	6.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	20.10.2022	23.7	50.3	14.5	16.2	263	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	21.10.2022	26.3	49.5	12.5	15.2	228	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	25.10.2022	22.6	50.2	10.1	14.1	255	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	26.10.2022	25.5	46.3	13.1	15.4	240	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	03-11-2022	24.6	54.3	11.5	16.4	280	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	04-11-2022	21.7	51.0	12.5	14.1	274	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	10-11-2022	25.9	45.3	14.0	16.7	249	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	11-11-2022	29.5	54.6	13.0	14.4	252	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	14-11-2022	24.9	50.0	14.6	15.6	232	4.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	15-11-2022	26.3	52.7	11.8	14.5	247	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	24-11-2022	28.6	50.3	14.2	16.4	244	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	26-11-2022	27.9	46.1	13.6	15.9	217	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	29-11-2022	24.1	54.0	11.7	14.3	225	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	30-11-2022	25.8	49.4	12.9	15.2	246	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	07-12-2022	27.1	51.5	12.8	18.1	256	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	08-12-2022	24.1	48.2	13.8	15.8	297	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	12-12-2022	23.7	50.5	11.6	18.4	272	5.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	13-12-2022	27.3	51.8	14.3	16.1	251	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	22-12-2022	22.7	47.2	15.9	17.3	293	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	23-12-2022	24.1	52.5	13.1	16.2	270	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	26-12-2022	26.4	47.5	12.3	18.1	267	4.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	27-12-2022	23.6	43.3	14.9	17.6	240	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	05.01.2023	28.7	53.6	13.7	19.6	275	6.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	06.01.2023	25.7	51.4	14.7	17.3	316	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	09.01.2023	25.3	52.6	12.5	19.9	291	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	10.01.2023	28.9	53.9	15.2	17.6	270	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	19.01.2023	24.3	49.3	16.8	18.8	312	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	20.01.2023	25.7	54.6	14.0	17.7	289	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	23.01.2023	28.0	49.6	13.2	19.4	286	5.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	24.01.2023	25.2	45.4	15.8	18.2	259	6.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	02.02.2023	28.4	57.1	12.0	17.4	256	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	03.02.2023	23.8	46.7	13.0	15.3	292	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	06.02.2023	29.1	56.7	10.8	14.9	286	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	07.02.2023	26.2	57.4	13.5	18.4	251	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	16.02.2023	26.6	48.6	14.3	17.4	289	6.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	17.02.2023	28.4	55.1	10.8	14.3	270	5.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	20.02.2023	30.3	53.8	11.5	17.3	236	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	21.02.2023	27.5	47.8	14.6	16.4	240	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	03.03.2023	49.4	80.1	13.7	19.2	285	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	04.03.2023	44.8	69.7	14.7	17.1	276	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	07.03.2023	50.1	79.7	12.5	16.7	296	9.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	08.03.2023	52.5	80.4	15.2	20.2	235	5.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	16.03.2023	47.6	71.6	11.7	19.2	273	7.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	17.03.2023	49.4	78.1	12.5	16.1	254	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	20.03.2023	51.3	76.8	13.2	19.1	301	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	21.03.2023	48.5	70.8	11.6	18.2	270	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	30.03.2023	51.8	68.3	14.2	17.3	288	9.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	31.03.2023	47.4	81.5	12.7	15.9	247	6.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**21.7**	**43.3**	**10.1**	**13.2**	**217**	**4.1**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**52.5**	**81.5**	**16.8**	**20.2**	**316**	**9.4**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**30.6**	**55.6**	**13.2**	**16.8**	**265**	**6.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**51.8**	**80.4**	**15.9**	**19.9**	**312**	**9.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-6 Islampeta village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	10.10.2022	22.8	42.7	13.2	15.0	230	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	11.10.2022	23.2	46.2	11.7	12.8	224	4.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	20.10.2022	25.7	45.3	13.1	14.2	253	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	21.10.2022	22.8	47.3	12.9	13.3	242	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	25.10.2022	25.0	43.5	13.3	14.9	234	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	26.10.2022	21.4	44.8	12.2	15.1	224	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	03-11-2022	27.6	56.9	15.1	17.8	321	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	04-11-2022	29.7	51.0	13.7	16.7	319	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	10-11-2022	25.8	52.2	15.1	18.7	330	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	11-11-2022	31.1	66.1	17.7	19.5	308	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	14-11-2022	27.7	55.8	14.0	16.3	311	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	15-11-2022	31.5	61.1	15.9	17.5	283	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	24-11-2022	34.5	63.9	14.2	16.7	273	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	26-11-2022	26.7	61.9	11.9	14.9	281	5.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	29-11-2022	28.6	57.5	15.3	18.4	303	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	30-11-2022	33.8	50.2	13.8	16.8	316	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	07-12-2022	25.4	51.4	13.2	14.4	287	4.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	08-12-2022	30.1	48.2	15.0	18.4	271	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	12-12-2022	27.3	55.6	12.4	15.2	264	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	13-12-2022	28.9	51.4	15.8	17.2	278	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	22-12-2022	33.1	53.0	14.2	18.0	264	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	23-12-2022	29.3	58.3	16.3	17.3	272	4.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	26-12-2022	31.8	54.3	15.5	18.4	224	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	27-12-2022	24.5	56.4	13.2	16.6	244	6.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	05.01.2023	27.0	53.5	14.1	15.9	306	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	06.01.2023	31.7	50.3	15.9	19.9	290	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	09.01.2023	28.9	57.7	13.3	16.7	283	9.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	10.01.2023	30.5	59.6	16.7	18.7	297	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	19.01.2023	34.1	55.1	15.1	19.5	283	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	20.01.2023	30.9	60.4	17.2	18.8	291	6.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	23.01.2023	33.4	56.4	16.4	17.3	243	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	24.01.2023	26.1	58.5	15.6	18.1	263	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	02.02.2023	30.6	51.9	10.4	14.7	277	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	03.02.2023	25.1	45.2	13.7	17.4	238	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	06.02.2023	33.0	51.8	11.6	15.0	264	5.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	07.02.2023	28.0	56.3	12.2	16.3	278	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	16.02.2023	32.4	51.6	13.4	17.4	264	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	17.02.2023	27.5	55.3	11.9	14.3	272	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	20.02.2023	30.9	48.2	10.9	15.2	254	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	21.02.2023	33.0	55.3	13.9	16.8	244	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	03.03.2023	38.2	74.9	12.1	16.5	261	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	04.03.2023	46.1	68.2	10.8	14.2	222	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	07.03.2023	36.8	74.8	13.3	16.8	248	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	08.03.2023	42.3	79.3	13.5	15.3	262	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	16.03.2023	48.7	74.6	11.8	14.9	248	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	17.03.2023	48.5	78.3	13.6	16.1	256	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	20.03.2023	38.2	71.2	12.6	17.0	238	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	21.03.2023	45.1	78.3	11.3	14.8	228	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	30.03.2023	39.2	75.3	13.8	15.3	251	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	31.03.2023	35.9	72.8	12.8	16.1	260	7.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**21.4**	**42.7**	**10.4**	**12.8**	**222**	**4.3**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**48.7**	**79.3**	**17.7**	**19.9**	**330**	**9.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**31.4**	**57.8**	**13.7**	**16.5**	**268**	**7.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**48.5**	**78.3**	**17.2**	**19.5**	**321**	**9.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-7 Pittavanipalem village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C_6H_6**
1	13.10.2022	24.8	54.8	13.2	15.5	240	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	14.10.2022	21.9	48.3	12.5	15.3	259	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	17.10.2022	28.3	60.5	13.7	14.8	255	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	18.10.2022	31.1	57.1	14.1	16.1	282	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	28.10.2022	26.4	55.3	12.8	14.6	249	6.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	29.10.2022	28.1	61.9	13.2	15.0	238	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	31.10.2022	25.8	59.8	11.8	13.7	241	5.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	01-11-2022	25.6	59.4	13.5	18.3	277	7.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	02-11-2022	27.6	55.4	12.5	16.1	312	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	11-11-2022	26.6	59.8	13.6	15.2	291	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	15-11-2022	28.3	55.0	15.1	17.3	318	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	16-11-2022	25.2	52.9	12.3	13.5	281	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	25-11-2022	27.9	54.5	14.2	18.5	283	9.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	26-11-2022	25.5	57.8	12.5	16.6	268	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	01-12-2022	28.1	57.3	14.8	19.4	296	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	02-12-2022	25.5	53.3	13.8	17.2	278	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	05-12-2022	28.5	57.7	14.9	16.3	310	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	06-12-2022	30.2	52.9	16.4	18.4	281	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	15-12-2022	27.1	50.8	13.6	14.6	300	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	16-12-2022	29.8	52.4	15.5	19.6	302	5.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	19-12-2022	27.4	55.7	13.8	17.7	287	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	20-12-2022	24.3	51.6	11.6	13.6	256	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	29-12-2022	28.1	56.3	14.5	15.7	304	5.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	30-12-2022	25.4	52.6	12.6	16.3	265	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	02.01.2023	26.8	59.5	15.9	21.3	319	9.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	03.01.2023	24.2	55.5	14.9	19.1	301	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	12.01.2023	27.2	60.2	16.0	18.2	333	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	13.01.2023	30.1	56.1	17.5	20.3	304	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	16.01.2023	25.8	53.0	14.7	16.5	323	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	17.01.2023	28.5	54.6	16.6	21.5	325	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	27.01.2023	26.1	57.9	14.9	19.6	310	8.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	28.01.2023	23.0	53.8	12.7	15.5	279	9.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	30.01.2023	26.8	58.5	15.6	17.6	327	6.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	31.01.2023	23.9	54.8	13.7	18.7	288	8.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	09.02.2023	32.8	65.3	13.2	18.4	298	7.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	10.02.2023	34.2	59.1	11.9	15.4	255	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	13.02.2023	29.5	63.8	13.6	19.4	246	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	14.02.2023	35.2	59.7	11.5	17.4	283	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	23.02.2023	31.4	60.2	14.3	17.7	255	9.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	24.02.2023	32.9	57.3	15.3	18.3	277	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	27.02.2023	28.4	61.5	14.4	17.7	243	9.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	28.02.2023	31.8	63.2	11.8	16.7	279	5.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	09.03.2023	48.2	83.3	11.4	15.3	266	9.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	10.03.2023	53.6	77.1	10.1	17.3	241	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	13.03.2023	50.5	81.8	11.8	15.0	258	9.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	14.03.2023	46.2	77.7	10.7	14.0	269	8.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	23.03.2023	52.4	78.2	12.5	14.8	281	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	24.03.2023	47.8	75.3	13.5	17.3	266	10.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	27.03.2023	49.4	79.5	12.6	15.8	255	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	28.03.2023	52.8	81.2	10.0	18.6	247	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**21.9**	**48.3**	**10.0**	**13.5**	**238**	**5.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**53.6**	**83.3**	**17.5**	**21.5**	**333**	**10.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**31.3**	**60.4**	**13.6**	**16.9**	**280**	**7.5**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**52.8**	**81.8**	**16.6**	**21.3**	**327**	**9.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

ANNEXURE-I
AMBIENT AIR QUALITY LEVELS

AAQ-8 Kalapaka village													
Sr.No	**Monitoring Date**	**PM2.5**	**PM10**	**SO_2**	**NO_2**	**CO**	**O_3**	**NH_3**	**Pb**	**As**	**Ni**	**Bap**	**C6H6**
1	10.10.2022	27.1	53.2	13.2	16.3	236	4.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
2	11.10.2022	24.4	47.6	11.9	14.1	277	5.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
3	20.10.2022	27.4	52.2	13.9	13.7	264	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
4	21.10.2022	24.3	55.8	12.7	16.8	298	8.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
5	25.10.2022	26.1	53.2	12.7	11.6	246	6.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
6	26.10.2022	23.9	50.4	11.6	16.1	291	7.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
7	03-11-2022	26.1	60.8	11.9	14.8	265	8.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
8	04-11-2022	23.4	54.3	15.6	17.1	264	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
9	10-11-2022	25.3	63.0	12.6	16.4	296	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
10	11-11-2022	27.0	67.1	11.8	13.9	253	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
11	14-11-2022	27.2	65.1	13.6	16.1	261	5.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
12	15-11-2022	35.1	62.3	11.2	12.3	250	5.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
13	24-11-2022	33.1	65.6	13.3	14.7	253	3.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
14	26-11-2022	28.9	59.8	10.9	13.4	226	6.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
15	29-11-2022	30.5	62.4	14.3	16.4	296	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
16	30-11-2022	31.9	59.2	13.9	16.0	252	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
17	07-12-2022	23.9	53.3	13.2	16.5	241	6.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
18	08-12-2022	27.3	63.3	11.9	14.8	287	4.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
19	12-12-2022	24.1	58.2	12.2	15.9	255	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
20	13-12-2022	33.6	60.3	13.1	16.3	276	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
21	22-12-2022	25.0	65.3	14.9	15.4	284	4.0	<20	<1.0	<1.0	<1.0	<0.01	<0.01
22	23-12-2022	32.9	59.5	12.5	14.0	273	4.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
23	26-12-2022	30.9	57.2	14.6	16.4	276	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
24	27-12-2022	26.7	62.1	12.2	15.1	249	4.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
25	05.01.2023	25.5	55.4	14.1	18.0	260	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
26	06.01.2023	28.9	65.4	12.8	16.3	306	5.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
27	09.01.2023	22.3	60.3	13.1	17.4	274	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
28	10.01.2023	29.8	62.4	14.0	17.8	295	7.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
29	19.01.2023	26.6	67.4	15.8	16.9	303	5.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
30	20.01.2023	29.3	61.6	13.4	15.5	292	5.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
31	23.01.2023	27.4	59.3	15.5	17.9	295	8.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
32	24.01.2023	28.3	64.2	11.9	16.6	268	5.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
33	02.02.2023	29.4	63.6	12.4	20.1	241	7.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
34	03.02.2023	30.1	61.8	11.1	16.3	262	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
35	06.02.2023	33.5	63.8	13.6	15.7	255	8.7	<20	<1.0	<1.0	<1.0	<0.01	<0.01
36	07.02.2023	36.3	58.3	12.3	18.0	276	6.3	<20	<1.0	<1.0	<1.0	<0.01	<0.01
37	16.02.2023	28.9	59.8	14.1	16.8	285	6.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
38	17.02.2023	32.5	65.1	11.7	17.6	273	6.8	<20	<1.0	<1.0	<1.0	<0.01	<0.01
39	20.02.2023	29.7	62.8	13.8	15.5	276	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
40	21.02.2023	27.4	67.7	10.2	18.7	249	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
41	03.03.2023	50.4	74.3	14.1	17.5	225	8.9	<20	<1.0	<1.0	<1.0	<0.01	<0.01
42	04.03.2023	46.3	78.2	12.8	18.1	246	7.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
43	07.03.2023	37.2	70.4	11.7	17.5	239	9.2	<20	<1.0	<1.0	<1.0	<0.01	<0.01
44	08.03.2023	46.3	61.8	14.0	16.4	260	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
45	16.03.2023	49.9	75.3	11.5	18.6	269	7.4	<20	<1.0	<1.0	<1.0	<0.01	<0.01
46	17.03.2023	45.9	78.3	13.4	15.4	257	8.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
47	20.03.2023	50.7	70.6	12.8	17.3	260	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
48	21.03.2023	48.4	78.3	11.9	16.9	233	7.5	<20	<1.0	<1.0	<1.0	<0.01	<0.01
49	30.03.2023	43.5	77.3	13.2	17.4	247	6.6	<20	<1.0	<1.0	<1.0	<0.01	<0.01
50	31.03.2023	50.8	68.3	10.8	19.1	266	8.1	<20	<1.0	<1.0	<1.0	<0.01	<0.01
Minimum value		**22.3**	**47.6**	**10.2**	**11.6**	**225**	**3.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Maximum value		**50.8**	**78.3**	**15.8**	**20.1**	**306**	**9.2**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
Average value		**32.0**	**62.9**	**12.9**	**16.3**	**266**	**6.7**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**
98th Percentile		**50.7**	**78.3**	**15.6**	**19.1**	**303**	**8.9**	**<20**	**<1.0**	**<1.0**	**<1.0**	**<0.01**	**<0.01**

All the above values are expressed in $\mu g/m^3$ except Pb,As,Ni and Bap are ng/m^3

Annexure-II

Water Balance Diagram

ANNEXURE-II
WATER BALANCE DIAGRAM