IN THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE:CHENNAI

APPEAL NO. 4 of 2023 (SZ)

VasipilliNukkaraju
& another … Appellants

Versus

Union of India &others ... Respondents

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DRAWN AND FILED BY

CHENNAI
DATE: 10.04.2023

T.HEMALATHA

ADVOCATE FOR RESPONDENT NO.6

BEFORE THE NATIONAL GREEN TRIBUNAL

SOUTHERN ZONE, CHENNAI

Appeal NO. 4 OF 2023

IN THE MATTER OF:-

Vasipilli Nukaraju & another ... APPELLANTS

VERSUS

UNION OF INDIA & ORS ... RESPONDENTS

PRELIMINARY REPLY FILED ON BEHALF OF RESPONDENT NO.6

The Sixth Respondent above named respectfully submits as follows:-

1. The above appeal has been filed challenging the CRZ clearance granted to the 6th respondent on 11.01.2023 by MOEF & CC.
2. Before addressing the allegations made in the appeal the 6th respondent seeks to place the following facts for the kind consideration of this Hon'ble Tribunal

2.1. Facts About the project:

The industrial estate M/s Hetero Infrastructure SEZ Ltd is situated in Sy.Nos: 215, 286/1, 286/2, 283/1 in Ch. Lamxipuram village, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajayyapeta village, 19(part) in PedaTeenarla village, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N. Narsapuram village, Nakkapalli Mandal, Anakapalli Dist (erstwhile Visakhapatnam District) spread over an area of 139.856 ha.

M/s Hetero Labs Ltd, Unit-III is located in Sy.No: 120, 126, 150, 151 of N.Narasapuram Village Nakkapalli Mandal of Visakhapatnam Dist for manufacturing of Bulk Drugs and intermediates.

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The SEZ is designed based on required infrastructure facilities for pharmaceutical manufacturing like, road, storm water network, common utilities, storage facilities for raw materials, solvents, parking areas, pollution control facilities etc. At present three manufacturing units are in operation in SEZ area.

The complex is surrounded by open Lands & Salt lake in the South direction, Open lands in the East direction, open Lands in north direction and road connecting Upamaka village with Rajayappeta village in the West direction, The NH 16 is in the North direction at a distance of 4 km, the nearest Railway station is located at Narsipatnam at a distance of 9 km in the North direction. The nearest airport is located at a distance of 70 km in the Northeast direction at Visakhapatnam. The Bay of Bengal is on the South-eastern direction of the site at 1.2km. The area is drained by Varaha River in the Northern direction at13 Km, the Tandava River in the Southwest direction at a distance of 14km.

The total investment of the project till date is Rs 1600 crores and producing lifesaving drugs for catering the needs of India and the world. The total employment in the facility is more than 7000 people (Direct and Indirect employment). The industry is carrying CSR and welfare activities in the surrounding villages.

The water requirement of the project is being met through the Sea water Desalination Plants installed in the premises of Hetero Infrastructure SEZ ltd and is not drawing any ground water & Surface water thereby conserving the natural resources. Also, the industry is partially using the renewable energy (Power from the Hetero Wind power) and generating its own power by installing turbines to the existing boilers within the facility.

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Required facilities like Road, Parking, Water, Steam, Effluent Treatment, Sewage Treatment, Hazardous waste Management, Scrap & Detoxification facilities are provided by M/s Hetero Infrastructure SEZ Ltd (Developer Cum Service Provider).

2.2 Details of Environmental & CRZ Clearances: M/s Hetero Infrastructure SEZ Ltd and M/s Hetero Labs Ltd have obtained all necessary clearances from the Ministry of Environment, Forest, and Climate Change (MoEF&CC), Government of India, New Delhi and complying with the conditions stipulated in the same clearances. The details of the Environmental and CRZ Clearances are as below:

- Initially M/s Hetero obtained Clearances in the name of M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd, Unit-VI in the year 2006 for manufacturing of 60 TPM of Bulk drugs in each unit.
- M/s Hetero obtained CRZ Clearance for disposal treated effluent into Sea through Marine outfall in the year 2007 in the name of M/s Hetero Labs Ltd.
- Obtained Environmental & CRZ Clearance for M/s Hetero Infrastructure SEZ Ltd in the year 2010 for development of 17 industrial plots for manufacturing of bulk drugs (API) and lifesaving drugs. This project includes Sea water Desalination plant (15 MLD sea water Intake and discharge of 10 MLD reject).
- The validity of Environmental Clearance got extended for 03 years dated 13th October 2017.

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- The Environmental clearance amended on 15th June 2018 for the installation of Turbine to generate 6.1 MW power utilizing the steam from existing 45 TPH coal fired Boiler.
- Obtained Environmental Clearance for M/s Hetero Labs Ltd, Unit-III in the year 2012 for Expansion of production capacity from 60 TPM to 500 TPM with Marine disposal of Treated Effluents.
- Obtained Environmental Clearance for M/s Hetero Drugs Ltd, Unit-VI in the year 2012 for Expansion of production capacity from 60 TPM to 450 TPM with Marine disposal of Treated Effluents.
- As M/s Hetero Labs Ltd has purchased the unit M/s Hetero Drugs Ltd, Unit-VI, the industry requested the Ministry for merging Environmental Clearance of M/s Hetero Drugs Ltd, Unit-VI into M/s Hetero Labs Ltd, Unit-III. But due to various reasons, MoEF&CC has changed the name of M/s Hetero Drugs Ltd, Unit-VI to M/s Hetero Labs Ltd in the year 2020.
- Due to problems with the existing pipelines & to regularize the quantities of effluent mentioned in Environmental Clearances, M/s Hetero Infrastructure SEZ Ltd has applied for laying of new pipeline for disposal of Treated effluent and accordingly obtained CRZ Clearance for laying of new pipeline in place of existing pipelines vide LetterNo: 11-45/2022-IA.III dated 11/01/2023.

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The summary of Environmental & CRZ Clearances is as below:

Operation Unit	Clearance	Order No	Date	Permitted Effluent/ Brine (KLD)
M/s Hetero Labs Ltd., Unit-III	EC	J-11011/252/2006-IA. II (I)	22/09/2006	182.48
M/s Hetero Drugs Ltd., Unit-VI	EC	J-11011/253/2006-IA. II (I)	22/09/2006	182.48
M/s Hetero Labs Ltd	CRZ	11-54/2006.IA.III	04/01/2007	190
M/s Hetero Labs Ltd., Unit-III	EC (Expansion)	J-11011/396/2011-IA II (I)	10/09/2012	676
M/s Hetero Drugs Ltd., Unit-VI	EC (Expansion)	J-11011/398/2011-IA II (I)	10/09/2012	650
EC of M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd., Unit-VI and transferred to M/s Hetero Labs Ltd.	EC Merge + EC Transfer	J-11011/398/2011-IA II (I)	27/01/2020	676+650 **(1326)**
M/s Hetero Infrastructure SEZ Ltd	EC & CRZ	21-641/2007-IA.III	25/10/2010	1040 + 10000 (Brine)

Total permitted Quantities of wastewater for marine disposal is:

Total Quantity of Treated Effluent (1326+1040) : 2366 KLD

Brine Reject : 10000 KLD

M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd, Unit-VI obtained Environmental Clearances in the year 2012 with the option of disposal of treated effluents (1326 KLD) into Sea but there was no CRZ Clearance for the quantities mentioned in the Environmental Clearance. Hence M/s Hetero Infrastructure SEZ Ltd gone for CRZ Clearance for the Existing quantities of treated effluents and not

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increased any quantity of effluents for marine disposal. The proposed new pipeline is only replacement to the existing pipelines and on installation of new pipeline, existing pipeline will be put out of usage.

2.3. Chronology of Permissions Obtained for laying of new Marine Disposal Pipeline:

a. M/s Hetero Infrastructure SEZ Ltd applied to APPCB for No Objection Certificate (NOC) for laying of new pipeline in place of existing pipelines on 29/10/2021with all required documents and submitted additional information on 15/11/2021. APPCB issued **NOC for laying of new Marine disposal pipeline** in place of existing pipelines vide order No..**219/APPCB/CFE/RO-VSP/HO/ 2010 dated 14/12/2021.**

b. As per the conditions of NOC to get the CRZ clearance from MoEF&CC, M/s Hetero Infrastructure SEZ Ltd carried EIA studies through M/s Indomer Coastal Hydraulics and CRZ Report from Institute of Remote sensing (IRS), Anna University and then applied to APCZMA for their recommendations of No Objection for laying of new pipeline on 24/03/2022 and in reply to APCZMA letter NO. 382/CRZ/IND/2022-25 dated 13/04/2022, M/s Hetero Infrastructure SEZ Ltd submitted all clarifications with supporting documents on 02/05/2022. On detailed deliberations of the project, APCZMA issued **recommendations of No Objection for laying of new pipeline** vide its letter No. **382/CRZ/IND/2022-575 dated 09/11/2022**. The same letter has been forwarded to the Secretary, MoEF&CC for further action.

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c. After receiving the letter of recommendations of No Objection from APCZMA, M/s Hetero Infrastructure SEZ Ltd applied to MoEF&CC for CRZ Clearance with all documents like EIA, CRZ Report, CRZ Maps etc. and attended the EAC meeting on 29/11/2022. After detailed deliberations on EIA, Court Case etc. during the EAC meeting (Presentation), Committee has asked for certain details on Fish Catch, Sea water & Sediment quality, details of effluent being released at present, and details of clearances obtained for releasing enhanced quantity etc. The industry submitted all the details desired by the EAC Committee on 30/11/2022. On receipt of the details submitted by M/s Hetero Infrastructure SEZ Ltd & M/s Indomer Coastal Hydraulics Private Limited, the committee recommended to issue CRZ clearance for laying of new marine disposal pipeline in place of existing pipeline and issued **CRZ clearance vide F.No.11-45/2022-IA.III dated 11/01/2023**.

Most respectfully, this is to bring to the kind notice of Hon'ble NGT that M/s Hetero Infrastructure SEZ Ltd has not submitted any false information either to APPCB or to APCZMA or MoEF&CC for getting the CRZ clearance. Some of the important documents submitted to APCZMA & MoEF&CC are listed below:

1. NOC from APPCB (Enclosed as **Annexure-I**)
2. Letter issued by APCZMA for Recommendations of No Objection under the provisions of CRZ Notification, 2011 (Enclosed as **Annexure-**





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3. Rapid EIA Report for laying of new marine disposal pipeline in place of Existing pipelines (Enclosed as **Annexure-III**)
4. CRZ Report with Maps (Enclosed as **Annexure-IV**)
5. Status of compliance of APCZMA Recommendations of No Objection (Enclosed as **Annexure-V**)
6. PPT on the proposed project (Enclosed as **Annexure-VI**)
7. Additional Information sought by the committee (Enclosed as **Annexure-VII**)
   - Fish Catch data since 2004 (As per the available data with Andhra Pradesh Fisheries department)
   - Sea water Quality & Sediment quality since 2007 (Based on the Reports of National Institute of Oceanography)
   - Effluent Details (As per the existing Environmental Clearances)

In view of the above, this is to bring to the kind notice of the Hon'ble NGT that, the industry M/s Hetero Infrastructure SEZ Ltd has not submitted any false data which is misleading the APCZMA, MoEF&CC and APPCB for getting CRZ clearances and the allegations made by the Vasipilli Nukaraju& ANR with respect to the CRZ Clearance are false allegations only.

2.4. STATUS OF COMPLIANCE OF ENVIRONMENTAL CLERANCES AND DIRECTIONS ISSUED BY APPCB:

1. **Status of EC Compliance:** The industry M/s Hetero Infrastructure SEZ Ltd and M/s hetero Labs Ltd are complying with the conditions of Environmental Clearances issued by the MoEF&CC and all the systems

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are being upgraded from time to time for complying with the conditions of the Environmental Clearances.

The details of the EC Compliance reports are listed below:

- The industry was visited by the Director, MoEF&CC on 09/11/2013 and issued letter on statement of compliance vide letter no: **EP/12.1/505 & 544/AP/4451 dated 25/11/2013**. Copy of the letter is enclosed as **Annexure-VIII.**
- Scientist-D, Regional Office, MoEF&CC, Chennai visited the industry M/s Hetero Infrastructure SEZ Ltd for Compliance monitoring on 06/02/2017 and issued Monitoring report vide F.No. **EP/12.1/2010-11/61/AP/0433 dated 14/03/2017.** During the monitoring, the Ministry officials have found some non-compliances and issued letter. Copy of the monitoring report is enclosed as **Annexure -IX.**
- M/s Hetero Infrastructure SEZ Ltd took immediate action for complying with points mentioned in the letter dated 14/03/2017. MoEF&CC officials again visited the facility on 19/08/2017 for compliance monitoring and also to check the status of non- compliances observed during the last visit on 14/03/2017. MoEF&CC has issued Certified compliance Report for M/s Hetero Infrastructure SEZ Ltd and also status of non-compliances of last visit. Copy of Certified compliance Report issued by MoEF&CC is enclosed as **Annexure -X.**
- MoEF & CC officials visited the industry for monitoring on 19/08/2017 and issued certified copy of the compliance report to M/s Hetero Labs Ltd, Unit-III vide **F.No. EP/12.1/2012-13/23/AP/1961 dated 07/12/2017.**

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Copy of the certified copy of the compliance report is enclosed as **Annexure-XI**.

- APPCB officials visited M/s Hetero Labs Ltd, Unit-III for EC compliance verification on 26/10/2021 and issued Certified copy of compliance report to M/s Hetero Labs Ltd, Unit-III vide Letter.**No.2038/PCB/RO-VSP/2021 dated 27/10/2021.** Copy of the certified copy of the compliance report is enclosed as **Annexure-XII**.
- Copy of latest Compliance Report (Self Certified) of Environmental & CRZ Clearance of M/s Hetero Infrastructure SEZ Ltd with all enclosures is enclosed as **Annexure-XIII.**

2.5. <u>Status of Compliance of CTO and Task Force Directions issued by APPCB:</u>

The industry M/s Hetero Infrastructure SEZ Ltd and M/s Hetero Labs Ltd are operating with valid Consent for Operations (CTO) and getting them renewed from time to time. The industry is ensuring continuous compliance of the conditions of Consent issued by APPCB and complying with the Directions issued by APPCB from time to time.

The status of the compliance is as below:

- M/s Hetero Infrastructure SEZ Ltd has received directions from APPCB vide Order No: 125/APPCB/UH-II/TF/VSP/2016 dated 30.11.2016 and complied with all the directions except the condition "The SEZ shall not operate power plant of capacity 6.1 MW till they obtain EC from MoEF& CC and CFE/CFO of the Board" as the industry applied for CFE from APPCB after obtaining EC amendment order dt. 15.06.2018 from MoEF&CC, GoI, for installation of Turbine for 6.1 MW. APPCB

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officials visited the facility for monitoring the compliance of CFO & Task Force directions before issuing CFE for 6.1 MW power plant. Copy of CFE Agenda dated 06/09/2018 in which the compliance status of CFO Conditions and Task force directions are mentioned is enclosed as **Annexure – XIV.**

- M/s Hetero Labs Ltd, Unit-III has received directions from APPCB vide Order No: 753/APPCB/UH-II/TF/VSP/2017 dated 16.05.2017 (Date wrongly mentioned on the letter) and complied with all the directions except the condition "The industry shall obtain common EC from the MoEF& CC for merging of M/s. Hetero drugs Ltd., Unit –VI with Hetero Labs Ltd., Unit-III as the issue was pending with the MoEF&CC, GoI. While issuing the CFE-Expansion for the units, APPCB officials visited the facility for monitoring the compliance of CFO & Task Force directions issued to the industry. Copy of CFE Agenda dated 19/09/2019 in which the compliance status of CFO Conditions and Task force directions are mentioned is enclosed as **Annexure – XV.**
- M/s Hetero Drugs Ltd, Unit-IX has received directions from APPCB vide Order No: 782/APPCB/UH-II/TF/VSP/2016 dated 23/07/2016 and 29/06/2017 and complied with all the directions issued in both the orders. Copy of CFE Agenda dated 28/04/2022 in which the compliance status of Task force directions is mentioned is enclosed as **Annexure – XVI.** During the committee inspection, some of the scrubbers are not in operation due to maintenance and campaign production was not running. Hence the committee observed some smell near the production blocks.

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- The status of compliance of Directions issued by the APPCB, Task Force is as below:
- M/s Hetero Infrastructure SEZ Ltd dated 30/11/2016 is enclosed as **Annexure-XVII**.
- M/s Hetero Labs Ltd, Unit-III dated 16/05/2017 is enclosed as **Annexure -XVIII.**
- M/s Hetero Drugs Ltd, Unit-IX dated 23/07/2016 and 29/06/2017 is enclosed as **Annexure-XIX**.

In view of the above, most respectfully, this is to bring to the notice of Hon'ble NGT that the industry is ensuring continuous compliance of the conditions of the Environmental Clearances issued by MoEF&CC and are being updated from time to time as and when required. If found any lapses, the industry is taking immediate actions and rectifying the same.

In the appeal made by Mr. Vasipalli Nuka Raju and Anr vide Appeal No. 04 of 2023, they have extracted & produced only papers related to the observations/findings of non-compliances to the Hon'ble NGT and misleading the facts.

2.6. Desalination plant in CRZ Area:

i. **Need for Desalination plant**: Initially as per the Environmental Clearances and Consent for Establishments, the industry used Ground water for construction and other purposes. Later in the year 2010, the industry M/s Hetero Infrastructure SEZ Ltd has decided to go with Sea water Desalination plant due to following reasons:

- There are no abundant water resources surrounding the factory i.e either Ground water or Surface water.

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- To Conserve natural resources like Ground water, surface water and Energy.
- To have uniform quantity and quality of water for industrial usages etc.

ii. M/s Hetero Installed Desalination plants in CRZ area due to following reasons:

- Plant requires all foreshore facilities like Sea water Intake, Outfall, pre-treatment of Sea water etc.
- As the plant is located away from the Coast, the energy consumption is very high for pumping Sea water into the plant &reject back to sea.
- Lack of clarity on CRZ guidelines as there was no mention of desalination plants in CRZ notification 1991 and CRZ notification 2011 came into force after installation of Desalination plant in the year 2011.
- Before the land acquisition by Hetero in the year 2006-07, there were prawn aquaculture buildings, a jetty and other buildings of Vijaya marines in CRZ area.

iii. **Laying of pipelines**: EIA studies were carried for Sea water intake and outfall pipelines by National Institute of Oceanography (NIO). All pipelines have been laid as per the recommendations of National Institute of Oceanography and as mentioned in the EC & CRZ Clearance.

iv. **As per the EIA studies carried by M/s Indomer Coastal Hydraulics (P) Ltd, Chennai, the findings of the reports are:**

- The existing desalination plant do not have any direct or indirect impact on the Ecology and Biodiversity. Ecology and Biodiversity

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environment remain same for both samples collected during December 2021 and October 2022.

- Existing desalination plant do not have any direct or indirect impact on the sand dune Vegetations.
- The study on coastline stability shows that the beach and the coastal zone where Hetero desalination plant is built, remained very stable over the last 10 years and it is expected to remain the same in future. The construction of desalination plant in the CRZ area doesn't cause any impact on the beach form, coastline stability and the adjacent shoreline. As the sea doesn't reach the location of desalination plant, the operation of the desalination plant didn't have any influence on the benthic animals in the sub-tidal and intertidal regions. Also, there is no impact on the planktons, fishes and other marine organisms.

*The abstract of EIA report prepared by M/s Indomer and Coastal Stability map are enclosed as **Annexure-XX & Annexure-XXI** for your information and perusal.*

- **Effect on Ecology & Environment**: Due to installation and operation of desalination plant in the CRZ area, there are no Environmental & Ecological Damages.
- Initially, the plant installed in old existing structures (Buildings & Tanks) constructed by M/s Vijaya Marines before Hetero took over the Land.
- Minimum Construction activities were carried for setting up of Desalination Plant.
- No Excavation works were carried for setting up of the plant (only piling work carried with water jet)

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- No Disturbances to the Sand Beds of Coast etc.

v. **The environmental conditions in and around desalination plant have improved due to the following measures adopted by the industry:**

- Thick green belt development in an area of 20 Acres surrounding the plant.
- Dismantling of old permanent Structures and development of green belt in the area
- Power Saving due to setting of plant near to the Coast i.e Pumping of Sea water and Rejects to the factory premises & Back to Sea has been avoided.
- Sea Grass development at the area etc.

Images of google map of Desalination plant area of 2011 and 2021 are shown below:



Google map of 2011

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Google map of 2021

vi. **Regularization of Desalination plant in CRZ Area:** The industry has applied to APCZMA for issuing recommendations for regularization of existing Desalination plant in CRZ-III (NDZ) area on 02nd August 2022 as per the Office Memorandum of MoEF&CC vide F.NO: 19/27/2015-IA.III dated 19th February 2021 and also as recommended by the Joint Committee in its report in the OA no:23/2022 in Hon'ble NGT. This is in the process at APCZMA. Copy of Office Memorandum of MoEF&CC vide F.NO: 19/27/2015-IA.III dated 19th February 2021 regarding procedure for dealing with CRZ violation cases is enclosed as **Annexure - XXII.**

vii. **Compensatory Measures proposed by the industry for regularization of Desalination plant in CRZ area**: Though there is no damage to the Environment & Ecology due to installation of Desalination plant in CRZ area (Rather improved the Environment in the area) and there are no villages adjacent to the Desalination plant, M/s Hetero has voluntarily proposed to carry out following activities under CCP & CRAP as per MoEF&CC Office Memorandum dated 19th February 2022.

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Compensatory Conservation Plan **(CCP)**

- Setting up of solar and other non-conventional energy source at village or habitations
- Restoration of water bodies and setting up of rainwater harvesting system
- Beach cleaning and development of beach amenities etc.

Community Resource Augmentation plan **(CRAP)**

- Adaptations of nearby coastal village and providing civic amenities
- Creation of self-help group and cooperative society for marketing of local community produce.
- Identification and training of unemployed youth in the nearby villages for eventual absorption in the company.

In view of the above, most respectfully this is to bring to the notice of Hon'ble NGT that the industry did not violate any CRZ rules intentionally and no damage happened to ecology & environment in CRZ area due to installation of desalination plant. The industry is in the process of regularizing the desalination plant in CRZ area as per the MoEF&CC Office Memorandum dated 19/02/2021.

2.7. **Additional details with respect to the project:**

i. **Fish Catch**: Marine Fish catch data for Visakhapatnam District has been collected from Joint Director Fisheries, Department of Fisheries, Govt. of Andhra Pradesh for the period 2014 to 2021 and also collected data of fish catch of Nakkapalli and Payakaraopet (Narsipatnam Jurisdiction) for the year 2022 from Asst. Director Fisheries, Anakapalli District (Visakhapatnam District has been Bifurcated and now the industry area

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is Anakapalli District). As per the data of Fisheries Department, Govt. of Andhra Pradesh there is no impact on fishing due to operation of M/s Hetero Infrastructure SEZ Ltd and M/s Hetero Labs Ltd. Copy of fish catch data received from Fisheries department is enclosed as **Annexure-XXIII**.

ii. **Health:** During joint inspection of the committee constituted by the District Collector, Visakhapatnam Dist on 06/01/2022, the Asst.Professor, Community Medicine, Andhra Medical College reported that, as per the records of PHC, Godicherla, the health condition of the villagers surrounding to M/s Hetero is normal and there is no panic situation in the area. Copy of letter submitted by Medical Officer, Godicherla to The Principal, Andhra Medical College is enclosed as **Annexure-XXIV**.

iii. **Water and Soil Pollution:** As reported by the Joint Committee constituted by the Hon'ble NGT in OA No. 23/2022 in its report, there is no Ground water and soil pollution in the villages surrounding M/s Hetero Infrastructure SEZ Ltd. Summary of the Report submitted by Ground water Department, Govt. of Andhra Pradesh is enclosed as **Annexure – XXV**.

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3. **The Following is the Status of compliance/Action taken by the industry on the Recommendations of Joint Committee appointed by Hon'ble NGT in OA No23/2022**

S.NO	RECOMMENDATION	COMPLIANCE/ACTION TAKEN
1	M/s Hetero Infrastructure SEZ Ltd., shall obtain approval from MoEF&CC for operation of desalination unit in CRZ area and also shall obtain necessary amendments for operation of the desalination plant in CFO of APPCB.	As recommended by the committee, the industry is in the process of getting all permissions from MoEF&CC and APPCB and the sequence of action taken are as below: ➢ Applied to APCZMA for their recommendations to regularize the desalination plant in CRZ area on 22/07/2022 as per MoEF&CC office memorandum Ministry vide File No: 19-27/2015-IA-III dated 19th February 2021 ➢ Attended 52nd APCZMA meeting on 13/10/2022 and Committee asked for additional details. ➢ Submitted all Documents as desired by the Committee to APCZMA on 09/11/2022 and again on 18/11/2022. ➢ Again attended 55th APCZMA meeting om 08/02/2023. ➢ Waiting for the Recommendations of APCZMA to apply for MoEF&CC. The industry applied to APPCB for incorporation of Disposal of

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		Desalination plant Rejects & Source of water in the CFO.
2	M/s Hetero Infrastructure SEZ Ltd., & M/s Hetero Labs Ltd, N. Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District shall pay the Environmental compensation of Rs.6,94,95,000/- for the failure to comply with the conditions of Environmental Clearance issued by MoEF&CC and Consent issued by APPCB and same shall be paid to APPCB.	The case is with the Hon'ble NGT and industry will take necessary action on payment of Environmental Compensation after final verdict of the Hon'ble NGT.
3	M/s. Hetero Infrastructure SEZ Ltd., & M/s. Hetero Labs Ltd shall comply with the conditions issued by the MoEF&CC & APPCB.	The industry is Complying with the conditions of EC & CFO. Copies of Compliance reports are enclosed as *Annexure-I & Annexure-II* respectively.
4	M/s Hetero Infrastructure SEZ Ltd., & M/s Hetero Labs Ltd, N. Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District may be directed to comply with all the measures/studies recommended by the Joint Committee.	The industry-initiated actions for complying with the recommendations of the Joint Committee. The industry will comply with all the Measures/ Studies recommended by the joint committee in a time bound manner.
5	Conversion of single stage Scrubber to double stage scrubbers at Production Blocks to control process emissions	The industry has converted most of the single stage Scrubber into double stage scrubbers at Production Blocks to control

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	and odour nuisance.	process emissions and odour nuisance in the year 2017 & 2018 itself. The industry is continuously installing/ increasing the number of scrubbers depending on the process from time to time and still in the process of installing scrubbers. The industry has purchased more than 100 Scrubbers in Hetero Labs Ltd since 2017 and converting the single stage scrubbers into multistage scrubbers from time to time. As per the market requirement, industry is installing scrubbers for the reactors where campaign/trial products are manufactured and hence there were still some single stage scrubbers during the committee inspection. Now the industry has converted all single stage scrubbers into Multistage scrubbers in the entire premises. At present there are 70 Nos of multistage scrubbers in the plant. Details of scrubbers are enclosed as *Annexure-III*. As directed by the Board in its CTO order, Now the industry has installed online pH meters & data loggers to all scrubbers. All online

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		pH meters are being connected to APPCB website. Further as an initiative to ensure the control of process emissions the industry has installed/installing secondary scrubbers in addition to the multistage scrubbers at the production blocks by connecting the vents of scrubbers. Regarding installations the industry has submitted letter to APPCB. Copy of letter acknowledgement is enclosed as **Annexure-IV**.
6	The industry shall connect vents of the SS Reactors to the scrubbers to control fugitive emissions.	In SS Reactors, industry is using lot of solvents and chemicals for manufacturing of APIs. Out of these solvents some of the solvents are water miscible and some are not miscible in water. The best option available for controlling the process/fugitive emissions is condensing the solvent vapours. At present the industry has installed dual stage condensers to the vents of SS reactors with adequate cooling circulation to control process/ fugitive emissions and also installed Dump tanks with flame arresters by connecting the emergency (Safety relief) vents of all reactors. By considering the safety &

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		Technical aspects of manufacturing process & connecting vents of SS Reactors to Scrubbers, the industry is in the process of getting the feasibility studies done through third party expert agency M/s VESS Associates, Hyderabad for connecting the vents of the SS Reactors to the scrubbers to control fugitive emissions. Received the preliminary report and for submission of final report M/s VESS Associates asked for certain details. The industry is providing the details and depending on the outcome of studies, the industry will implement suitable technology to control process/fugitive emissions from SS Reactors. Status of which will be intimated to APPCB from time to time.
7	All approach roads should be concreted in order to arrest the re-suspension of road dust.	The industry has laid all concrete roads within the plant premises and BT road for the approach from National Highway. Concrete roads are not available in the areas where construction works (very limited) are going on. All roads concreting work will be completed immediately after completion of Construction works.

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8	The industry shall maintain all storm water drains in dry condition and shall provide dyke-wall along the storm water drain to prevent the mixing of floor washings, spillages etc.,	The industry is maintaining all storm water drains in dry condition and provided dyke-wall along the storm water drain to prevent the mixing of floor washings, spillages etc., Further the industry has provided first fore run collection sumps at the end of storm water drains to collect & pump the contaminated water (if any) to ETP for treatment & disposal.
9	The industry shall explore the possibility of recycling of treated wastewater and reducing the withdrawal of the sea water.	The industry is exploring the possibility of recycling wastewater/treated water & Usage of fresh water by way of following measures: ➢ Recycling 100% domestic wastewater to the gardening & Green belt development after treating in Sewage Treatment Plant. ➢ Part of Treated wastewater is being used for Cooling tower make up in ETP area. ➢ Fresh water RO reject is being used for Fire Hydrant system & ash quenching. ➢ To enhance the Steam condensate recovery & reuse, the industry is installing condensate polishing/ treatment plant. It will be

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		completed by the end of June 2023. With the installation of this plant, the industry is expecting more than 90% steam condensate recovery in the plant by June 2023 thereby reducing the water usage for utilities. Apart from all the above measures, Hetero R&D is working on the following: ➢ Recovery of by products from the scrubber water i.e SMBS, ➢ Recovery of Bromine water, Iodine water, H_2SO_4 etc. ➢ Usage of reactor washings for the cleaning of previous batch. ➢ Reducing the water consumption in the process itself etc.
10	The industry has developed rainwater harvesting pond in an area of 12 acres. It has been observed that the pond is adjacent to the natural canal which is connected to UpputeruCheruvu and the industry have stated that the source of the rain water harvesting pond is the natural canal. Therefore, it is required	The pond was in existence in the factory area before Hetero took over the land in 2006 from M/s Vijaya Marines through Debt Recovery tribunal. The same pond is connected to the natural drain passing through the Company and rainwater is being stored in the same pond for natural recharging of ground water in the area and for reuse in the plant (if required).

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	to approach concerned authorities viz., Central Ground Water Board/Authority, Irrigation Depart, Govt. of Andhra Pradesh for technical evaluation and permission for the same.	However, to comply with the recommendations of Joint Committee, the industry has approached Irrigation Department, Govt. of Andhra Pradesh for technical evaluation and permission (if any). Submitted a letter to irrigation Department on 25/11/2022 and waiting for the inspection of the Irrigation Department. Copy of acknowledgement is enclosed as **Annexure - V**. Also, the industry has applied to CGWB for technical evaluation and received letter from CGWB in which they have mentioned that, the issue is not in the purview of CGWB in the state of Andhra Pradesh and advised the industry to approach AP Ground water & water audit Department. Copy of letter received from CGWB is enclosed as **Annexure-VI.** On approaching the Ground water department of Andhra Pradesh, they told us to approach APWALTA, Department of Rural Development Govt. of Andhra Pradesh. Copy of letter received from Ground water Department is enclosed as **Annexure-VII.**

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		APWALTA, Govt. of Andhra Pradesh advised us to approach Irrigation department for necessary permissions. The response from irrigation department is awaited.
11	The industry shall remove the sluice gate provided at unlined pond (which claimed by the industry as rainwater harvesting pond) to prevent the discharge of water into Upputeru in view of the apprehension of the villagers on discharge of industrial wastewater into the Upputeru through unlined pond.	The industry has closed the sluice gates provided to the pond by welding the gates and constructed wall across the sluice to avoid entry of water from the pond into Upputeru. Photograph of the Sluice gate after closing with brick wall is enclosed as **Annexure-VIII.**
12	The industry shall strengthen and safeguard the natural canal which is connected to UpputeruCheruvu which is flowing adjacent and through the project area.	The industry has completed the widening work and strengthening the natural canal passing through the plant premises and connected to upputeru. The industry has requested the irrigation Department for suggestions to strengthen the natural canal through letter dated 25/11/2022 and waiting for the inspection of the Irrigation Department. The strengthening work will be completed in a couple of months after receiving the letter from Irrigation department.

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13	The industry shall make efforts to recycle and reuse the treated effluents so as to reduce the intake water quantity from the Sea.	**Please Refer Point No:9**
14	The industry shall develop multiple native species of green belt area in order to maintain Biodiversity, wherever scope is there.	The industry has developed and still developing multiple native species of green belt to maintain Biodiversity. The following species are being planted in the factory premises: ➢ Neem ➢ Peepal ➢ Banyan Tree ➢ Kanuga ➢ Coconut ➢ Jand and ➢ Acacia etc. The industry has planted medicinal & other plants in the plant premises on trial basis in 02 acres and will increase the plantation of medicinal plants if we succeed in nurturing the same plants. Photograph of the Planation area is enclosed as **Annexure-IX**.
15	M/s. Hetero Infrastructure SEZ Ltd., & M/s.Hetero Labs Ltd should establish the Piezometers with digital water level recorder at maximum number of locations in and	The industry has installed and maintaining the ground water monitoring wells within the plant premises. The monitoring is being done regularly internally and by the third party. Layout showing

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	surroundings of the industry for regular monitoring of ground water quality.	ground water monitoring wells is enclosed as *Annexure-X*. The industry will install digital piezometers/ bore wells at strategic locations in and around the factory premises to monitor ground water quality after finalizing the locations in consultation with APPCB by the end of June 2023 as there are some technical issues involved in the same. However, to comply with the recommendations of the committee, the industry has started monitoring ground water in the villages surrounding the industry i.e in Rajayyapeta, Dondawaka, Ayyannapalem and CH. Lakshmipuram villages.
16	M/s.Hetero Infrastructure SEZ Ltd., shall deposit sufficient funds to District Forest Officer, Visakhapatnam for taking up afforestation in coastal shelter belt areas for 30 Ha along as well as for taking up activities related to Marine Conservation and generation of awareness regarding Marine Ecosystem Conservation among the public, including industries, media, youth, fisher	The industry is taking up afforestation near the Coast by way of planting Coconut and casuarina plants. The industry will provide funds for creating awareness regarding Marine Ecosystem Conservation among the public, including industries, media, youth, fisher community and other sections of the society if required.

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	community and other sections of the society.	
17	The industry shall conduct long term Environmental Impact Assessment study to ascertain the impact of pollution on water, air, soil and agricultural crops within 5 Km radius of the industry through any reputed Institutes viz., NEERI, IIT, EPTRI.	The industry is regularly monitoring the water, air & soil in & around the factory premises at regular intervals. However, the industry has been requesting EPTRI and NEERI for the Techno-commercial proposal for the said studies and received proposals on 03rd April 2023. As per the proposals submitted by the EPTRI & NEERI, the study period will be 9-12 months. The industry is in the process of finalising the order and the report will be ready after May 2024.
18	The industry shall conduct impact assessment study on human health due to pollution of M/s Hetero Infrastructure SEZ Ltd., & M/s Hetero Labs Ltd if any through ICMR institute/any reputed Government institutions in 5 KMs radius in view of the apprehensions of the villagers on Health impacts due to operation of the industries.	In the report submitted by the Joint Committee constituted by the District Collector, Visakhapatnam, Assistant Professor, Department of community medicine, AMC, Visakhapatnam stated that as per the records obtained from PHC, Godicherla (PHC for the villages surrounding factory premises) there are no adverse effects on human health in the surrounding villages due to pollution from the industry. Copy of the letter issued by the Medical Officer is enclosed as **Annexure-XI**.

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		However, the industry is trying to carryout assessment study on human health due to pollution of M/s Hetero Infrastructure SEZ Ltd., & M/s Hetero Labs Ltd (if any) through ICMR institute (National Institute of Epidemiology, Chennai) or any Govt. Institute and contacting them for the said studies. As the industry is not getting response for the proposals from ICMR institute, the delay is happening. Copies of communication had with institute is enclosed as **Annexure-XII**.
19	The industry shall carry out an assessment study of the marine environment around the marine outfall point (MOP) of M/s Hetero Infrastructure SEZ Ltd., including desalination rejects discharge point through NIO.	The industry has carried "**Monitoring study around the Marine Outfall point**" of M/s Hetero Infrastructure SEZ Ltd through National Institute of oceanography in the year 2022 and submitted report to RO & ZO of APPCB. Recent study covers both MOPs (treated effluent and Desalination Rejects) Copy of the Study report is enclosed as **Annexure-XIII**.
20	The industry shall establish water plant (RO water Plant) in addition to existing water facility to supply the good quality drinking water to	Due to various reasons (Village issues), the industry has been requesting the Villagers (including Gram Panchayat) to give their consent letter for installation of

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	Rajayyapeta village people for sake of their better health and life.	RO plant and place where plant is to be installed since long. But there is no response from the Villagers/Gram Panchayat. **The industry has provided piped water supply to the Rajayyapeta village with the cost of more than Rs.1.0 Crore apart from other works under CSR activities. The industry is always ready to install water tank and RO plant in Rajayyapeta Village at any time with the consent of villagers. But the villagers are not giving their consent for installation of RO plant in the village.**
21	The industry shall carryout performance evaluation of Solvent Recovery system study by IICT.	As the industry is frequently changing the solvents in the columns for recovery and hence did not carry the performance evaluation of solvent recovery system. Now the industry has placed order for the performance evaluation of solvent recovery system. The report will be ready by July 2023. Copy of Purchase order is enclosed as **Annexure-XIV.**
22	The industry shall carryout performance evaluation of effluent treatment plant by NEERI.	The industry has carried performance evaluation of Effluent Treatment Plant through M/s SV Enviro Labs & Consultants (Recognised by

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		MoEF&CC, GOI, New Delhi and Accredited to NABL & NABET) in December 2021. Performance evaluation report has been submitted by IRO, MoEF&CC and APPCB. Copy of the report is enclosed as **Annexure-XV**.
23	The industry shall conduct medical camps in & surrounding villages twice in every month.	The industry has provided mobile medical Van equipped with Doctor Consultation Room, Pharmacy, Paramedical staff and waiting area etc. for conducting medical camps in the surrounding villages. The van is being deployed in the villages on rotation basis and the van is being made available in every village 2-3 times in a month. Photograph of the medical van and the list of villages covered by the van are enclosed as **Annexure-XVI.**

4. It is therefore clear from the above narration of facts that sixth respondent/ project proponent has been scrupulously in compliance of all rules and regulations and there is no question of furnishing any misleading information to the authorities for the purpose of obtaining any clearance including the impugned CRZ clearance dated 11.01.2023. In fact, the sixth respondent has referred to the observations made by the joint committee in O.A.No.23/22 while submitting necessary clarification required by the authorities at the

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time of issuing CRZ clearance. Therefore, the allegation contained in the appeal to the contrary are totally false and made for the purpose of this case.

5. It is strongly denied that the sixth respondent has to apply for CRZ clearance under violation category. Question of violation would arise only when the project proponent had not obtained prior Environmental Clearance. In the instant case the sixth respondent already had an environmental clearance and the present clearance is only for installation of new pipelines by replacing the existing pipelines. Therefore, the APCZMA rightly considered the proposal in its proper perspective and granted the clearance.

6. It is further submitted that the issue of levy of Environmental compensation and the correctness there of is the subject matter of O.A.No.23/22. The applicant is unnecessarily clubbing the issues that arise for consideration in the said O.A.No.23/22 with the present challenge to the CRZ clearance dated 11.01.2023 only to confuse the issue and mislead this Hon'ble Tribunal. Moreover, the APCZMA is yet to act upon the proposal for regularization of existing desalination plant in CRZ area. Therefore, grounds raised in the appeal are totally misconceived. It is to be noted that immediately after the board issued notice regarding the laying of new pipeline the sixth respondent stopped all activities and the new pipelines have been removed. The joint committee also recorded the same in the report filed in O.A.No.23/22.

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7. It is submitted that due to paucity of time, the sixth respondent is unable to file a detailed reply and therefore reserves its liberty to file a detailed reply to the appeal at a later point of time.

Under these circumstances, this Respondent prays that this Hon'ble Tribunal may be pleased to dismiss Appeal No.4 of 2023 with costs and thus render justice.

Dated at Visakhapatnam on this the 9th day of April 2023

HETERO INFRASTRUCTURE SEZ LTD HETERO N. Narasapuram

RESPONDENT NO.6

VERIFICATION

I, Sane Kullayi Reddy S/o. Sane Adinarayana Reddy aged about 52 years of M/s Hetero Infrastructure SEZ Ltd, the 6th Respondent herein do hereby verify that what are all stated above are true and correct to the best of my knowledge, information and belief.

Verified at Visakhapatnam on this the 9th day of April 2023

HETERO INFRASTRUCTURE SEZ LTD HETERO N. Narasapuram

6th Respondent

APPOINTED BY GOVERNMENT OF A.P. INDIA G. SUBBA RAO NOTARY Regd.NO. 2586/11 East Point Colony, Chinawaltair, VSP-17

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GUDIPAI LI SUBBA RAO
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CELL: 94405 42802

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ANDHRA PRADESH

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No. 33-26-14 D/2, Near Sunrise Hospital, Pushpa Hotel Centre, Chalamalavari Street, Kasturibaipet, Vijayawada –520010

Phone: 23887500
Website:www pcb.ap.gov.in

NO OBJECTION CERTIFICATE (NOC)

Order No.219 /APPCB/CFE/RO-VSP/HO/ 2010 **Dt: 14.12.2021**

Sub: **APPCB – CFE – M/s. Hetero Infrastructure SEZ Ltd., N.Narsapuram (V), Ch.Lakshmipuram (V), Rajaiahpet (V), Pedda Teernala (V) of Nakkapalli (M), Visakhapatnam District – NOC for laying new Marine Disposal Pipeline in place of existing two lines (Treated Effluent and Desalination Plant Rejects)** under Sec.25 of Water (P & C of P) Act, 1974 and Under Sec.21 of Air (P & C of P) Act, 1981 **- Issued - Reg.**

Ref:
1. CFE (Expansion) order No: 219/APPCB/CFE/RO-VSP/H0/2010 dt.15/07/2020.
2. Proponent's application for NOC of the Board on 15.11.2021.
3. R.O's inspection report dt.17.11.2021.
4. CFE Committee meeting held on 25.11.2021.

@@@@

1. In the reference 2nd cited, an application was submitted to the Board seeking **No Objection Certificate (NOC)** for laying new Marine Disposal Pipeline in place of existing two lines(Treated Effluent and Desalination Plant Rejects) in an area of 22 acres and with a project of Rs.15.0 Crores for the following reasons:

   - Treated effluent pipeline is 15 yrs old & completely buried in the seabed and chocked due to scaling & barnacle growth in the pipelines. Some of the diffusers are damaged due to fishing nets.
   - Desalination rejects pipeline is chocked due to barnacle growth in the pipelines and fishing nets are accumulated at the diffusers. The diffuser header is completely buried in the seabed and tilted. They have advised to replace the existing pipeline with new pipeline instead of going for repairs & cleaning activity.

Details of the marine outfall pipelines:

The details of proposed pipeline to be laid from HTL to discharge point in the sea as follows:

a. The proposed marine outfall discharges the following:
   - The treated effluents from CETP (both SEZ & non-SEZ) – 2366 KLD.
   - Rejects of the desalination plant- 10,000KLD.

b. 2 km pipeline from HTL to discharge point.
c. Length of marine disposal is 4.3 km out of which 2.3 km is on land and balance 2.0 km will be in the sea.
d. Duck-bill valves in place of diffusers to be proposed at a depth of 17 m in the sea.

2. As per the application, the above project originates from the existing premises located at N. Narsapuram (V), Ch. Lakshmipuram(V), Rajaiahpet (V), Pedda Teernala (V) of Nakkapalli (M), Visakhapatnam District and ends in Bay of Bengal.

3. The pipeline alignment was inspected by the Environmental Engineer, Regional office: Visakhapatnam, A.P Pollution Control Board on 16.11.2021.

4. The Board, after careful scrutiny of the application, verification report of Regional Officer: Visakhapatnam and recommendation of the CFE Committee hereby issues **NOC for laying new Marine Disposal Pipeline in place of existing two lines (Treated Effluent and Desalination Plant Rejects)** under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under.

5. This order is subject to the conditions mentioned in the annexure.

6. This order is issued from pollution control point of view only. Zoning and other regulations are not considered.

7. **This order is valid for a period of 7 years from the date of issue.**

Encl: Annexure

BATCHU SIVA PRASAD

Digitally signed by BATCHU SIVA PRASAD
DN: c=IN, o=AP Pollution Control Board, ou=APPCB, 2.5.4.20=36debc995c3a2c3b66d9f7db0f12e726400fcbe6ae4ea85534268cfd688b7b64, postalCode=520010, st=Andhra Pradesh, cn=BATCHU SIVA PRASAD
Date: 2021.12.14 15:19:40 +05'30'

CHIEF ENVIRONMENTAL ENGINEER

To

M/s. Hetero Infrastructure SEZ Ltd.,
N. Narsapuram (V), Ch.Lakshmipuram (V),
Rajaiahpet (V), Pedda Teernala (V) of Nakkapalli (M),
Visakhapatnam District.
kullayireddy.s@heterodrugs.com

Copy to: 1. The JCEE, Z.O: Visakhapatnam for information and necessary action.
2. The E.E., R.O: Visakhapatnam for information and necessary action.

Annexure

1. The existing CETP, guard ponds, monitoring facilities etc., shall be maintained properly. The treated waste water shall be stored in the guard ponds. The treated waste water after conforming to the marine discharge standards notified by the MoEF&CC, GoI, New Delhi, shall be discharged through marine outfall into Bay of Bengal under the supervision of APPCB officials.

2. **The industry shall obtain CRZ amendment from MoEF &CC, GoI, New Delhi for laying proposed single marine discharge pipeline in place of existing two marine discharge pipelines.**

3. **The industry shall construct two storages tanks above ground level with two hour storage capacity for mixing treated trade effluents and brine rejects.**

4. **The industry shall not start construction activity without obtaining CFE of the Board.**

5. **The proponent shall apply for CFE for project along with copies of CRZ clearance and EC order, before starting the construction of project.**

6. **The industry shall comply with all the SOPs issued by APPCB w.r.t. marine outfalls.**

7. The proponent shall comply with all the directions issued by the Board from time to time.

8. Concealing the factual data or submission of false information / fabricated data and failure to comply with any of the conditions mentioned in this order may result in withdrawal of this order and attracts action under the provisions of relevant pollution control Acts.

9. Notwithstanding anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec.27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under Sec.21(4) of Air (Prevention and Control of Pollution) Act, 1981 to review any or all the conditions imposed herein and to make such alternation as deemed fit and stipulate any additional conditions by the Board.

10. 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 an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate Authority) constituted under Section 28 of Water (Prevention and Control of Pollution)Act,1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.

BATCHU SIVA PRASAD

Digitally signed by BATCHU SIVA PRASAD
DN: c=IN, o=AP Pollution Control Board, ou=APPCB, 2.5.4.20=36debc995c3a2c3b66d9f7db0f12e726400fcbe6ae4ea85534268cfd688b7b64, postalCode=520010, st=Andhra Pradesh, cn=BATCHU SIVA PRASAD
Date: 2021.12.14 15:20:20 +05'30'

CHIEF ENVIRONMENTAL ENGINEER

To

M/s. Hetero Infrastructure SEZ Ltd.,
N. Narsapuram (V), Ch.Lakshmipuram (V),
Rajaiahpet (V),
Pedda Teernala (V) of Nakkapalli (M),
Visakhapatnam District.
kullayireddy.s@heterodrugs.com

सत्यमेव जयते

Andhra Pradesh Coastal Zone Management Authority (APCZMA)
Andhra Pradesh
Ministry of Environment Forests & Climate Change
Government of India
D.No.33-26-14 D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamavari Street, Kasturibaipet, Vijayawada-520010

Letter No. 382/CRZ/IND/2022 -535 **Dated:** 09/11/2022

To
The Secretary,
Ministry of Environment and Forests and Climate Change,
Indira Paryavaran Bhavan, Jorbagh Road,
New Delhi – 110 003.

Sir,

Sub:- APCZMA – CRZ – M/s. Hetero Infrastructure SEZ Ltd. at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh – Proposal for laying of new marine disposal pipeline in place of existing two lines and increase of marine discharge quantity – Recommendations of No Objection under the provisions CRZ Notification, 2011– Communicated – Reg.

Ref:
1. Proposal received from M/s. Hetero Infrastructure SEZ Ltd, Visakhapatnam on 25.03.2022.
2. T.O. lr to 13.04.2022.
3. Information furnished by the application on 02.08.2022.
4. APCZMA meeting held on 13.10.2022 at Vijayawada.

***

1. M/s. Hetero Infrastructure SEZ Ltd. at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh submitted the proposal for (i) laying of new marine disposal pipeline in place of existing two lines (Treated Effluent and desalination plant rejects); (ii) increase of marine discharge quantity from 11.230 MLD to 12.366 MLD. The cost of the project is Rs. 15 Cr for pipeline. The applicant sought clearance under the provisions of CRZ Notification 2011.

2. Earlier, M/s. Hetero Labs Limited obtained CRZ permission from MoEF&CC vide dated 04.01.2007 for marine disposal of 190 KLD through dedicated pipelines. M/s. Hetero Infrastructure SEZ Ltd. also obtained Environmental & CRZ clearance from MoEF&CC vide order dated 25.10.2010 for development of industrial plots for manufacturing of bulk drugs (API) and lifesaving drugs. This project includes 15 MLD Desalination Plant (15 MLD sea water intake and discharge of 10 MLD rejects). The quantities of sea water intake, treated effluent and rejects permitted are 15 MLD, 1040 KLD (1.04 MLD) and 10 MLD respectively. As per the Environmental & CRZ clearance issued by MoEF&CC, it is mentioned that

Desalination plant shall be installed in SEZ area and outside CRZ area. But, the existing Desalination plant is located in CRZ-III (NDZ).

3. The applicant submitted copy of the Form – I; EIA Report; Marine EIA report including mitigation measures prepared by M/s. Indomer Coastal Hydraulics (P) Ltd; HTL/LTL Demarcation Report prepared by M/s. Institute of Remote Sensing (IRS), Anna University, Chennai and copy of the NOC Obtained from APPCB dated 14.12.2021.

4. M/s. Institute of Remote Sensing (IRS), Anna University, Chennai is authorized agency of MoEF&CC was carried out demarcation of HTL, LTL and CRZ area and submitted the report vide No. IRS/AU/IRS /KSR/208-2022 Dt. 09.03.2022 with map. As per the report the details are as follows:
   - The proposed effluent pipeline originates from existing plant of M/s. Hetero Infrastructure SEZ facilities in Rajauyyapeta village and passes through various survey numbers in Rajauyyapeta and Pedateenarla village and crosses a creek. The existing marine disposal Pump house, Tank falls in Pedateenarla village Proposed landfall point falls within intertidal area and proposed outfall diffuser falls within Bay of Bengal.
   - The proposed effluent pipeline and associated facilities falls partly inside bay of Bengal, Intertidal Area and between HTL and 200m setback from HTL for Bay of Bengal, Between 200 m and 500 m setback lines from HTL as well as between HTL and 100 m setback line from HTL of creek as pr approved CZMP (Map Nos. AP 122 and 123). Hence the proposed effluent pipeline facilities falls partly inside CRZ-III, CRZ-III (NDZ), CRZ – IB, CRZ – IVA & CRZ – IVB.
   - CRZ classification of area of proposed project site is as below:

Sl. No.	CRZ – Classification	Length in Meters
1)	CRZ – IB (Sea front) – 100 m CRZ – IB (creek) – 29 m	129
2)	CRZ – III (NDZ)	821
3)	CRZ – III	346
4)	CRZ – IVA	1931
5)	CRZ – IVB	17
6)	Outside CRZ	1278
	Total	**4522**

5. The Project proposal of M/s. Hetero Infrastructure SEZ Ltd. was placed in the 52nd Andhra Pradesh Coastal Zone Management Authority (APCZMA) meeting held on 13.10.2022 at Vijayawada. The Project Proponent along with their consultants M/s. Indomer Coastal Hydraulics (p) Ltd attended the meeting and explained about the proposal:
   (1) M/s. Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two marine outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.23 MLD (0.19 MLD + 1.04 MLD) from its existing manufacturing unit.
   (2) Over the period of 12 years, both of these two marine outfall pipelines got damaged due to following reasons:
      - Chocking up of the pipelines due to barnacle growth in the pipelines,

- Entanglement of more fishing nets around the diffuser
- Some of the diffuser ports got disoriented in treated effluent pipeline
- Diffuser ports of Brine reject pipeline of desalination plant got completely buried below the seabed.

(3) Now, M/s. Hetero Infrastructure SEZ Ltd is proposing to replace the damaged two independent marine outfall pipelines into a single marine outfall pipeline of 500 mm dia. combining both the discharges of treated effluent and brine reject (mixing tank at desalination plant). The total discharge through the proposed single outfall pipeline will be 12.366 MLD and details as follows.

- Treated Effluents from CETP (both SEZ & non SEZ) - 2.366 MLD
- Brine Rejects - 10.0 MLD
- 2.0 Km pipeline from HTL to Discharge point.
- Length of marine disposal pipeline is 4.3 Km. Out of which 2.3 Km is on land and balance 2.0 Km will be in sea.
- Duck-bill valves in place of diffusers to be proposed at a depth of 17 m in the sea.

(4) The proposed pipeline passing through CRZ-IB (sea front and creek), CRZ-III (NDZ), CRZ-III, CRZ-IV A, CRZ-IV B and Outside CRZ.

(5) The Coordinates of Proposed Effluent Pipeline is as follows:

Label	Latitude	Longitude
Landfall point	17° 21' 33.3" N	82° 44' 11.5" E
Outfall Diffuser	17° 21' 01.13"N	82° 45' 10.3" E

(6) Source of water is sea water through desalination plant. The total Water requirement is 3.533 MLD (as per EC Orders dated 25.10.2010; 10.09.2012; 10.09.2012) ; 1.315 MLD (as per CFO order dt. 11.12.2017) and 1.64 (as per the CFE (Expansion) order dt. 15.07.2020). The wastewater generation is 0.535 MLD (as per CFO order dt. 11.12.2017) and 1.13 MLD (as per CFE (Expansion) dt. 15.07.2020). The effluents are treated in CETP in the premises of M/s. Hetero Infra & after treatment discharged through marine outfall in the presence of APPCB officials.

6. The Committee noted that as per the CRZ Notification, 2011 the proposed project of laying of new pipeline for marine discharge is a

Permissible activity: The proposed activity i.e., the construction directly related to waterfront and directly needing foreshore facilities is a permitted activity as per paragraph 3 (i)(a) of CRZ Notification, 2011 & Discharging of treated effluents into the water course with approval under the Water Act, 1974 is a permitted activity as per paragraph 3 (v)(a) of CRZ Notification, 2011.

Regulated activity: The proposed activity is within CRZ and requires waterfront and foreshore facilities is a regulated as per the paragraph 4(i)(a) of CRZ Notification, 2011. And Laying of pipelines for discharge of treated effluent is a regulated activity as per the paragraph 4(ii)(d) of CRZ Notification, 2011.

7. The committee noted that there is a proposal of mixing of treated effluents and desalination plant rejects before discharging into Sea and as of now there is no specific study. The CPCB has existing marine discharge standards but not having standards for mixing of both. Hence there is need to entrust a study with IICT &

NEERI to examine the mixing of treated effluents and desalination plant rejects properties, before discharge into the sea. After receiving report from the IICT & NEERI, the same needs to be examined with reference to CPCB norms. APPCB also needs to verify the SoPs for marine discharge as the proposal is to join the desalination plant rejects after guard pond near to the Sea.

8. After examination on the remarks, comments/suggestions received from the Members, the authority considered to recommend the proposal to MoEF&CC, GoI, New Delhi for **laying of new pipeline in place of old pipeline for disposal of treated effluents (2.366 MLD) through marine discharge** at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh with the following specific and general conditions:

PART A: Specific Conditions:

(i) *The proposed constructions shall conform to the norms prescribed in CRZ Notification issued by the Ministry of Environment and Forests, Government of India S. O. No. 19(E), dated 06-01-2011 and shall not affect the coastal ecology of the area.*

(ii) *No activity on ground shall be undertaken without obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India as per S. O. No. 19(E), dated 06-01-2011.*

(iii) *The treated effluent existing pipeline is to be removed, after commissioning of the new pipeline.*

(iv) *During accidental breakage of pipeline, the necessary mitigation measures like immediately attending the repair of pipeline has to be taken up. Necessary spares of pipeline segments with bends/tees and divers with experience in salvation operation irrespective of sea condition have to be kept ready always within the industrial unit*

(v) *The industry should install flow meters to record the quantities of treated effluents discharge. Regular annual monitoring of coastal waters is to be carried-out by the reputed institutions, for water quality near the proposed outfall locations*

(vi) *A Continuous monitoring system should be put in place by the applicant to find out the impact on marine life/flora/fauna, due to discharge*

(vii) *The project Proponent shall conduct the bio-assay test for the treated effluent discharges from the marine outfalls as per the MoEF&CC Guidelines. Bio-assay analysis shall be conducted every six months to establish the toxicity levels and report to be submitted to APPCB.*

(viii) *The Project Proponent shall treat the effluents before discharging into sea duly complying with the APPCB and MoEF&CC norms.*

(ix) *The activity is a continuous and every day the industry discharges for about 8-10 hours. Over a long period, the industry should ensure all the precautions mentioned and also see that this activity should not create any bacterial and virus vectors.*

(x) *No solid waste shall be disposed in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2000 and amendment thereof*

(xi) *The green belt shall be maintained to improve aesthetic value of the area.*

(xii) *The proponent shall allocate enough budget for regular maintenance in all aspects i.e., drainage, garbage, effluent discharge and other activities*

(xiii) *The proponent shall implement all the mitigation measures as mentioned in the EIA report.*

(xiv) *Groundwater shall not be tapped in the CRZ area.*

(xv) *The Project Proponent shall submit the half -yearly compliance reports of CRZ Clearance duly audited by the accredited consultants on the degree of compliance by the project proponent during and after construction of the project.*

PART - B: General Conditions:

(i) A copy of the clearance letter shall also be displayed on the website of the AP Pollution Control Board. The Clearance letter shall also be displayed at the AP Pollution Control Board Regional Office, District Industries Centre and District Collector Office/ Mandal Revenue Office for 30 days.

(ii) The funds earmarked for environmental protection measures shall be kept in separate account and shall not be diverted for other purpose. Year-wise expenditure shall be reported to the Andhra Pradesh Coastal Zone Management Authority (APCZMA) and AP Pollution Control Board Regional Office.

(iii) Concealing factual data by the project proponent, any officer on behalf of the project proponent and consultants hired by the project proponent or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.

(iv) Consent for Establishment (CFE) and Consent for Operation (CFO), as may be applicable, shall be obtained from State Pollution Control Board under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.
All waste (liquid and solid) arising from the proposed development shall be disposed of as per the norms prescribed by State Pollution Control Board. There shall not be any disposal of untreated effluent into the sea/coastal water bodies.

(v) Full co-operation shall be extended to the officials from the APCZMA, APPCB and Regional Office of MoEF&CC, during monitoring of implementation of environmental safeguards stipulated. It shall be ensured that documents/data sought pertinent is made available to the monitoring team. A complete set of all the documents submitted to APCZMA shall be forwarded to the AP Pollution Control Board Regional Office.

(vi) In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the APCZMA.

(vii) The APCZMA reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the CRZ clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.

(viii) All other statutory clearances shall be obtained, as applicable by project proponents from the respective competent authorities.

(ix) The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded CRZ Clearance and copies of clearance letters are available with the AP Pollution Control Board and may also be seen on the website of APCZMA. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the AP Pollution Control Board Regional Office.

(x) This Clearance is subject to any order passed by any Hon'ble Courts, as may be applicable to this project.

(xi) A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, ZillaParisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

(xii) The proponent shall upload the status of compliance of the stipulated conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the AP Pollution Control Board Regional Office and the APPCB, Head Office.

(xiii) The Project Proponent shall ensure that there is no destruction of mangroves, if any, during the construction as well as the operation phase of the project.

(xiv) There shall be no dressing or alteration of the sand dunes and natural features, including landscape changes for beautification, recreation and other such purpose.

(xv) No permanent labor camp, machinery and material storage shall be allowed in CRZ area

(xvi) There shall no ground water drawal within CRZ without prior approval of the State Ground Water Authority.

(xvii) Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.

9. In view of the above, Recommendations of No Objection for the proposal of M/s. Hetero Infrastructure SEZ Ltd. for laying of new marine discharge pipeline in place of old pipeline for disposal of only treated effluents (2.366 MLD) at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh, in accordance with CRZ Notification, 2011 and subject to the conditions as mentioned at Para No.8 above, is hereby communicated to the Ministry of Environment and Forests and Climate Change, Govt. of India, New Delhi for further necessary action.

Yours faithfully,

Member Secretary,
APCZMA

Encl:
1) CRZ Form I;
2) EIA Report;
3) CRZ Report;

4) Copy of the Minutes of the APCZMA Meeting.

Copy to the Sri. S. Kullayi Reddy, Associate Vice- President – EHS, M/s. Hetero Infrastructure SEZ Ltd. at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh for information.

RAPID ENVIRONMENTAL IMPACT ASSESSMENT FOR LAYING NEW MARINE DISPOSAL PIPELINE IN PLACE OF EXISTING TREATED EFFLUENT AND DESALINATION PLANT REJECT PIPELINES FOR HETERO INFRASTRUCTURE SEZ LTD., N. NARASAPURAM (VILLAGE), NAKKAPALLI MANDAL, VISAKHAPATNAM DISTRICT, ANDHRA PRADESH

PROJECT CODE: 745122122

For

HETERO INFRASTRUCTURE SEZ LTD.
N. Narasapuram (Village), Nakkapalli Mandal
Visakhapatnam Dist., Andhra Pradesh

March 2022

INDOMER COASTAL HYDRAULICS (P) LTD.
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Client	Hetero Infrastructure SEZ Limited
Project Title	Rapid Environmental Impact Assessment for Laying New Marine Disposal Pipeline in Place of Existing Treated Effluent and Desalination Plant Reject Pipelines for Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh
Project Code	745122122

Abstract

Hetero Infrastructure SEZ Limited (henceforth called *Hetero*), Hyderabad has set up Industrial Estate consisting of both SEZ and Non-SEZ exclusively for its own group of companies for manufacturing the Bulk Drugs (Active Pharmaceutical Ingredients) and its intermediates at Laxmipuram village, Rajayyapeta village, Pedateenerla village and N. Narasapuram Village of Nakkapalli Mandal Visakhapatnam District spread in an area of about 500 acres.

In order to meet the necessary water requirement Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD.

Laying of marine outfall pipeline needs CRZ clearance both from APCZMA and MoEF&CC. In order to meet the statutory requirement, the Rapid Environmental Impact Assessment study comprising of baseline data of marine environment have been taken up by Indomer Coastal Hydraulics (P) Ltd., Chennai The field studies were undertaken in December 2021 and January 2022.

This report forms as 'Environmental Impact Assessment Study'. It presents the details of the EIA & EMP studies as per the EIA Notification 2006 for laying of new single marine disposal pipeline in place of existing treated effluent and brine reject pipelines. The CRZ map has been prepared by IRS, Anna University, Chennai, which is one of the approved agencies for the demarcation of HTL/LTL.

Foreword	The materials presented in the report carry the copyright of Hetero Infrastructure SEZ Ltd. and Indomer. These data should not be altered or distorted or copied or presented in different manner by any other organizations without the written consent from Hetero Infrastructure SEZ Ltd. and Indomer.

Document type	Un controlled				
References	4900191046				
Date	Report Type	Originator	Checked by	Approved by	Approver's sign
05.03.2022	-	Mr. M. Parthiban	Dr. P. Chandramohan	Mr. J. Guru Prasath	
	Project Code	745122122		Text pages	110
	File Location	D: /745. Hetero		Tables	12
				Figures	30

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7.15 Flow Field - NE Monsoon - Spring Tide
7.16 Secondary dispersion – NE Monsoon – Spring tide
7.17 Industrial Effluent – NE Monsoon – Spring tide
7.18 Flow Field - NE Monsson - Neap Tide
7.19 Secondary dispersion – NE Monsoon – Neap tide
7.20 Industrial Effluent – NE Monsoon – Neap tide



1. INTRODUCTION

Hetero is a globally renowned vertically integrated pharmaceutical company engaged in research and development, manufacturing and marketing of high-quality chemical and biologic medicines across diverse therapeutic areas. Backed by more than 27 years of expertise in the pharmaceutical industry, Hetero's strategic business areas spread across Active Pharmaceutical Ingredients (API), Global Generics, Biosimilars and Custom Pharmaceutical Services. The company is among the largest producers of Active Pharmaceutical Ingredients (APIs) in the world.

Hetero Infrastructure SEZ Limited (henceforth called Hetero), Hyderabad has set up Industrial Estate consisting of both SEZ and Non-SEZ exclusively for its own group of companies for manufacturing the Bulk Drugs (Active Pharmaceutical Ingredients) and its intermediates at Laxmipuram village (215,286/1, 286/2, 283/1), Rajayyapeta village (312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7), Pedateenerla village (19(P) & 20) and N. Narasapuram Village (117/1 to 117/3,119/1, 119/2, 120/1,120/2, 126, 129/1 to 129/9, 142, 150, 151) of Nakkapalli Mandal Visakhapatnam District spread in an area of about 500 acres. This facility is designed to meet the best global standards for an API facility and to meet the growing demands of Bulk Drugs worldwide.

In order to meet the necessary water requirement Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Presently, the flow in the pipelines got reduced. Hetero had taken up inspection of all the three pipelines. Inspection of these marine pipelines was carried out by Skivya Agro Tech Products in the month of March 2021. They have inspected the pipelines and submitted the status report on the pipeline condition. As per the report they advised the following.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD.

Laying of marine outfall pipeline needs CRZ clearance both from APCZMA and MoEF&CC. In order to meet the statutory requirement, the Rapid Environmental Impact Assessment study comprising of baseline data of marine environment have been taken up by Indomer Coastal Hydraulics (P) Ltd., Chennai which is a NABET accredited EIA consultant vide NABET/EIA/2023/RA 0207 & 13.09.23.

The field studies were undertaken in December 2021 and January 2022.

This report forms as 'Environmental Impact Assessment Study'. It presents the details of the EIA & EMP studies as per the EIA Notification 2006 for laying of new single marine disposal pipeline in place of existing treated effluent and brine reject pipelines.

This report has been prepared in order to meet the EIA studies focusing on the requirement of CRZ clearances from Andhra Pradesh Coastal Zone Management Authority (APCZMA) and Ministry of Environmental Forest & Climate Change (MoEF&CC). However, the EIA report has been formulated as described in EIA Notification, 2006. It includes EIA component covering 10 km radius augmented with seabed investigation, dispersion modelling, design of outfall and CRZ mapping.

1.1 Purpose of the Report

As per the Coastal Regulation Zone Notification 2011 and its subsequent amendments, impose restrictions on setting up/expansion of any industry, operations or processes and manufacture or handling within the CRZ limit requires prior CRZ clearance. Hetero has asked Indomer Coastal Hydraulics (P) Ltd., Chennai which is a NABET accredited EIA consultant vide NABET/EIA/2023/RA 0207 & 13.09.23 to carry out the necessary studies and prepare Environmental Impact Assessment report.

This report has been prepared in order to meet the EIA studies focusing on the requirement of CRZ clearances from Andhra Pradesh Coastal Zone Management Authority (APCZMA) and Ministry of Environmental Forest & Climate Change (MoEF&CC). However, the EIA report has been formulated as described in EIA Notification, 2006. It includes EIA component covering 10 km radius augmented with seabed investigation, dispersion modelling and CRZ mapping.

1.2 Detail of Project and Project Proponent

Identification of project

Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining both the

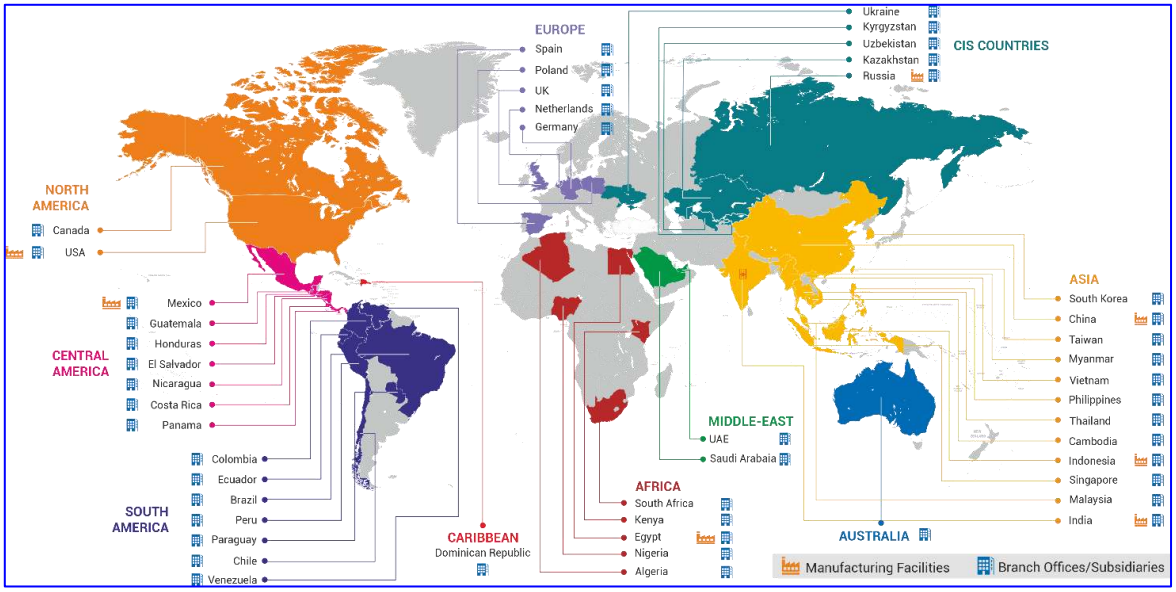
discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD. More details are given in **section 2.1.**

Identification of project proponent

Hetero is a globally renowned vertically integrated pharmaceutical player engaged in research and development, manufacturing, and marketing of high-quality chemical and biologic medicines across diverse therapeutic areas. Backed by more than 27 years of expertise in the pharmaceutical industry, Hetero's strategic business areas spread across APIs, Global Generics, Biosimilars and Custom Pharmaceutical Services. The company is among the largest producers of Active Pharmaceutical Ingredients (APIs) in the world. Hetero group employs over 21,000 people.

Since the onset of the Covid-19 pandemic, Hetero has been proactive in responding to the various challenges surrounding it. It has been the first company to launch the licensed version of generic Remdesivir under the brand name 'Covifor' in India for treating severely infected patients and followed it up with Favipiravir (Favivir) to provide succour to those affected by mild and moderate symptoms. As of today, the company is among the largest manufacturers of Remdesivir globally.

Illustrating its continuing commitment to play its part in the global fight against the pandemic, Hetero has entered into an agreement with the Russian Direct Investment Fund (RDIF) as a manufacturing partner for producing 100 million doses of the Sputnik V vaccine per year. This development also showcases Hetero's enduring spirit of collaboration and penchant for contributing to global health and well-being.



Global footprint of Hetero Pharma

1.3 Brief Description of the Project

Location of project: The project is proposed at Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh. The location map of the project region is shown in **Fig. 1.1.**

Nature of project: In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining

both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD. The combined brine outfall of desalination plant and treated effluent will be laid into the sea. The details are:

Outfall pipeline carrying 10 MLD of desalination brine reject and 2.366 MLD of treated effluents from CETP consisting of both SEZ & non-SEZ.

1.4 Coastal Regulation Zone

Based on CRZ Notification 2011, CRZ map has been prepared by the Institute of Remote Sensing (IRS), Anna University, Chennai, which is one of the approved agencies by MoEF&CC. The copy of CRZ map is shown in **Fig. 1.2.** As per the CRZ map prepared based on CRZ Notification 2011, the proposed development falls under the following categories:

As per the classification of CRZ notification 2011, the proposed development falls under:

CRZ Classification	Length of pipeline (m)
CRZ I B : Area between Low Tide Line (LTL) and High Tide Line (HTL)	129
CRZ III A : No Development Zone (HTL to 200 m)	821
CRZ III B : Area between 200 to 500 m from HTL	346
CRZ IV A : Area between LTL and 12 Nm into the sea	1931
CRZ IV B : Tidal influenced water body from mouth of the water body at the sea up to the influence of tide which is measured as 5 ppt during driest part of year	17
Outside CRZ	1278
Total	4522

Source: CRZ Report

1.5 Structure of EIA Report

Report has been prepared in accordance with the generic structure of the EIA report as per Appendix III of EIA Notification 2006. The structure of EIA report is indicated below.

Chapter 1 : Introduction
Chapter 2 : Project Description
Chapter 3 : Description of the Environment
Chapter 4 : Impact Assessment & Mitigation Measures
Chapter 5 : Analysis of Alternatives
Chapter 6 : Environmental Monitoring Program
Chapter 7 : Additional Studies
Chapter 8 : Project Benefits
Chapter 9 : Environmental Cost Benefit Analysis
Chapter 10 : Environmental Management Plan
Chapter 11 : Summary and Conclusion
Chapter 12 : Disclosure of Consultant Engaged



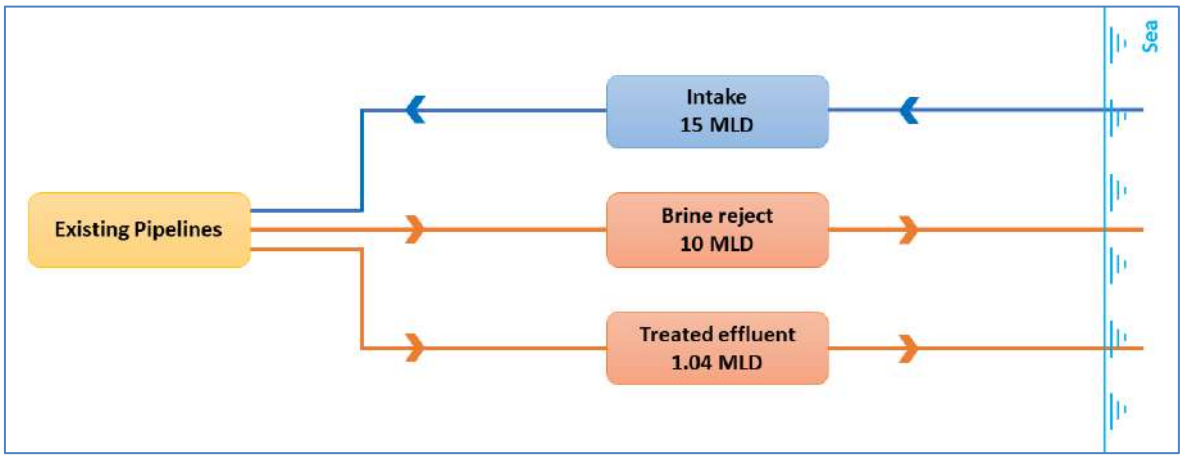
2. PROJECT DESCRIPTION

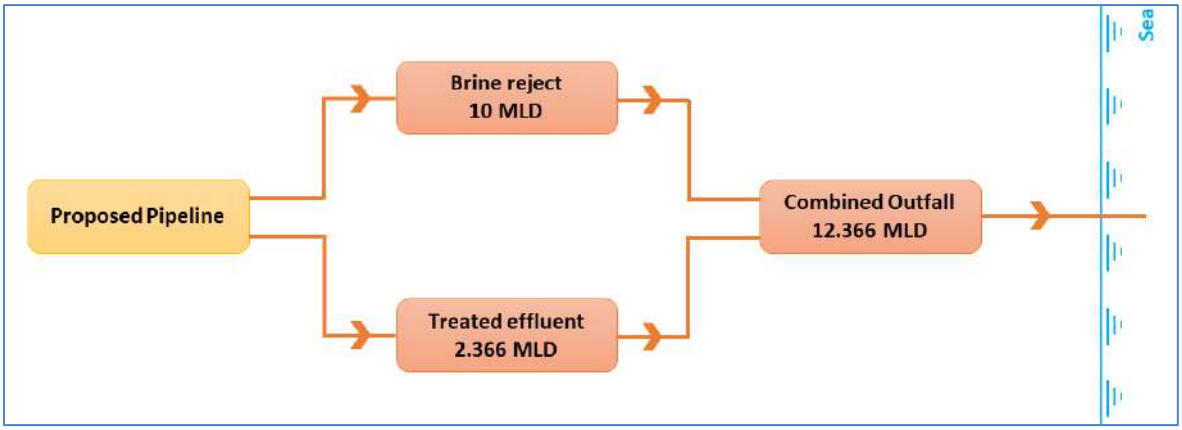
2.1 Type of Project

Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD.





2.2 Need for the Project

In order to meet the water requirement of Hetero complex, desalination plant of 5 MLD capacity with 15 MLD of intake and 10 MLD of brine reject outfall were installed in the year 2010. In this connection, National Institute of Oceanography **(NIO)** had carried Rapid Marine Environmental Impact Assessment (RMEIA) and feasibility study for proposed desalination plant and effluent outfall for getting EC & CRZ Clearances. Presently the flow in the pipelines got reduced. Hetero had taken up inspection of the all the three pipelines. They assigned work of inspection of marine pipelines to Sskivya Agro Tech Products in the month of March 2021. They have inspected the pipelines and submitted the report status on the pipeline condition**.** As per the report it is evident that:

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to overcome this problem, project proponent is planned to replace existing treated effluent and desalination plant reject pipeline into a single marine disposal pipeline.



Hetero Chemical Complex

2.3 Project Location

The proposed project site is located in the N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh. Gullipadu Railway Station is nearby railway stations located at 12.4 km west from the proposed new pipeline. The nearest airport is Visakhapatnam International Airport at 65 km in north. Proposed outfall pipeline is shown in **Fig.2.1.**

Salient features of project site

Particulars	Details
Geographical Co-ordinates (LFP of proposed outfall pipeline)	Latitude: 17°21' 33.3" Longitude: 82°44' 11.5"
Administrative location	N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh
Current land use	SEZ and Non SEZ area
Nearest Town	Narasapuram
Rivers/Streams/Creek	None
Nearest Highway	AH 45 (6 km west)
Nearest Railway station	Gullipadu Railway Station (12.4 km west)
Nearest Airport	Visakhapatnam International Airport (65 km north)
Nearest port/ Harbour	Visakhapatnam port (65 km north)
Historical/Archaeological sites	None
Ecologically Sensitive Areas	Sand dunes (2.8 km northeast)
Seismic Zone	Zone III – Moderate Risk Zone

GALLERY



Sea view of LFP



LFP



IRS Anna University CRZ study



LFP

2.4 Proposed Marine Facilities

2.4.1 Outfall pipeline

The modified marine facilities are: one combined outfall pipeline carrying 10 MLD of desalination brine reject and 2.366 MLD of treated effluents from CETP consisting of both SEZ & non-SEZ. The length of the outfall pipeline will be 4522 m from the manufacturing plant to LFP and 2000 m into the sea from LFP. The combined brine reject and treated effluent will be discharged at 14.8 m water depth. The location details are given below.

Locations of proposed pipeline coordinate

Location	Geographical Coordinates (WGS 84)		UTM Coordinates (Zone 44)	
	Latitude, N	Longitude, E	X (m)	Y (m)
LFP	17°21'33.3"	82°44'11.5"	684508	1920133
Combined Outfall diffuser (500 mm dia.) Distance from LFP = 2000 m Depth= 14.8 m CD	17°21'01.1"	82°45'10.3"	686254	1919158

The total length of outfall pipeline from manufacturing plant to discharge point is about 4522 m.

The pipeline crosses the creek through the existing canal and rest of the pipeline is buried below the ground. The existing marine disposal tank in the plant facility will be used as mixing chamber to combine the treated effluent from the ETP and brine reject from the desalination plant. By combining the above two the concentration of the brine reject will be reduced before discharging into the sea.

2.4.2 Outfall volume

The total volume of proposed discharge into the sea will be 12.366 MLD through consisting of: i) Desalination plant brine reject of 10 MLD and ii) Treated effluent of 2.366 MLD.

2.4.3 Characteristics of treated effluent and brine reject

The process of mixing both the streams i.e., treated effluent of CETP and brine reject of desalination plant will be done in mixing tank at seashore and then pumped into the sea by maintaining minimum self-cleansing velocity in the pipeline. By mixing the treated effluent with brine reject, the concentration of the brine reject will get diluted. The characteristics of individual streams (treated effluent and Desalination plant Rejects) and composite of both are enumerated below.

Parameter	Treated effluent from CETP (A)	Rejects of Desalination Plant (B)	Composite of (A)+(B)
Flow (KLD)	2366	10000	12366
pH	7-8	7-8.5	7-8
TDS (mg/l)	4000	50000	41198
COD (mg/l)	<250	<20	<64
BOD (mg/l)	<100	<5	<23

Treated Effluent discharge standards for marine/coastal areas

Sl. No	Parameters	Unit	Standards
1	Suspended Solids	mg/l	10% Above TSS of Influent
2	Particulate size of suspended solids	-	Floatable solids – max. 3 mm. Settleable solids – max. 856 microns.
3	pH	-	5.5 – 9.0
4	Temperature	-	Shall not exceed 5°C above receiving water temperature.
5	Oil and Grease	mg/l	20.0
6	Total residual chlorine	mg/l	1.0
9	Ammonical nitrogen	mg/l	50
10	Free ammonia	mg/l	5.0
11	Nitrate Nitrogen	mg/l	20
12	BOD (3 days at 27°C)	mg/l	100
13	COD	mg/l	250
14	Fluoride	mg/l	15.0
15	Sulphide	mg/l	5.0
16	Phenolic compound	mg/l	5.0
17	Arsenic as As	mg/l	0.2
18	Mercury as Hg	mg/l	0.01
19	Lead as Pb	mg/l	2.0
20	Total chromium as Cr	mg/l	2.0
21	Copper as Cu	mg/l	3.0
22	Zinc as Zn	mg/l	15.0
23	Nickel	mg/l	5.0
24	Iron	mg/l	3.0
25	Bioassay test	-	90% survival of fish after 96 hours in 100% effluent

Source: CPCB, General standards for discharge of environmental pollutants

Treated effluent from the SEZ will conform to discharge standards mentioned above and regulations from time to time.

2.5 Process Description

Desalination is a process that removes minerals from saline water. Seawater is desalinated to produce potable water suitable for human consumption. The proposed desalination plant is based on the principal competing processes that uses membranes to desalt saline water principally applying Reverse Osmosis (RO). The RO membrane processes use semi permeable membranes and applied pressure (on the membrane feed side) to preferentially induce water permeation through the membrane while rejecting salt.

Pre-Treatment System

This system pre-conditions the seawater and makes it suitable for the Reverse Osmosis (RO) membranes as per membrane manufacturer's guidelines.

The intake arrangement is planned such that strainers are provided at the suction point to handle the floating solid matter. Pre-treatment system after intake is designed to take care of remaining inlet suspended solids.

Considering that the particles in the seawater here are fine suspended matter along with discrete particles, fine filtration becomes necessary. The pre-treatment process consists of following sub-systems and equipment.

- Flash mixers
- Flocculators
- Lamella clarifiers
- Dual Media filters
- Multi Media Filters

At the intake, seawater is screened using travelling water screen for floating and larger matter. This water, after initial screening is transferred to stilling chamber through Intake pumps.

Chlorine dosing is considered in the stilling chamber. The chlorinated seawater from the stilling chamber shall be fed to Lamella clarifiers via flash mixers. Coagulant and Polyelectrolyte shall be dosed in the flash mixer at the upstream of the clarifiers. Ferric Chloride shall be used as a coagulant.

Each of the Lamella type clarifier unit is a combination of flash mixer, a flocculation chamber, and inclined plate settler all in a single unit. This unit shall consist of multiple compartments/ zones- viz- flash mixers, flocculation, pre-settling cum clarifier compartment and underflow compartment/zone.

The underflow chamber of the clarifier shall receive the sludge-laden water. Sludge gets settled and is collected in sludge pit from which it can be easily discharged.

Sludge generated is non-hazardous and non-toxic. The sludge from the bottom of the seawater clarifier is discharged to a sludge tank and then transferred to outfall tank for further disposal.
The clarified water from the clarifier shall be collected in clarified water storage tanks and fed to the dual media filters and Filters where further suspended particles are removed.

The product water from Pressure Sand Filters will be fed to SWRO system.

Filter Cartridges with a nominal pore size < 5 micron shall be provided. At the upstream of cartridge filters chemicals such as anti-scalant, antioxidant, etc. are dosed to achieve required product water quality of the RO system.

The product water from the SWRO system will be routed through lime filters to product water storage tank having 12 hours of retention time. Lime filters shall remineralize the water and make it suitable for drinking purpose.

The Reject water collected from SWRO system will be sent to outfall tank and further disposed to sea through outfall pumps.

SWRO System

The RO system of Sea Water Reverse Osmosis (SWRO) units, with recovery of 40%. The SWRO plant shall consist of following sub-equipment:

- SWRO cartridge filters
- SWRO High pressure pumps
- SWRO Trains
- ERD booster pumps
- Energy recovery unit
- Clean in place system
- Flushing water system

SWRO Cartridge Filters

Cartridge filters shall be provided at the upstream side of the HP pumps for the final protection. The cartridge filter is a guard filter for the SWRO system. This will be a 5-micron nominal filter.

SWRO High Pressure Pumps

High-pressure pumps will be provided. The high-pressure pumps will be constructed of duplex stainless steel (wetted parts). The suction piping of the pumps will be of GRP construction. High pressure piping including feed and brine piping will be of duplex stainless-steel material. Necessary low-pressure interlocks will be provided. An auto-flushing arrangement is also provided with auto on-off valves. Each SWRO high pressure pump will be operated by a variable frequency drive to modulate the inlet flow to each SWRO skid. The flow at each suction of SWRO high pressure pump will be measured by flow transmitter.

Instruments will be provided to safeguard the downstream membrane system against high temperature, high and low pH conditions, and any undesirable redox potential readings. SWRO feed water will be dumped out of the system in cases where the quality of water does not meet the required design criteria.

Product water from cartridge filters is fed to RO train, at the suction of the High-pressure feed pump. The high-pressure pump pressurizes and feeds it to the membrane assembly unit. Each train of SWRO consists of dedicated High-pressure pump, energy recovery unit and the Membrane element assembly unit.

Each HP pump with its drive motor shall be mounted on a single base frame. The energy recovery unit shall be able to discharge brine against a backpressure without the need for additional pumping equipment. At the discharge side of the HP feed pump a flow control valve shall be installed to regulate the feed flow to the membrane assembly. The pump shall be designed to operate in the entire range of operation of the feed system.

Chlorination System

Pre-chlorination injection system is provided for periodic shock chlorination, to enable system disinfection. Marine growth in the intake piping, intake sump and seawater piping system supplying raw seawater to the plant is cleared by such periodic shock chlorination.

The seawater shall be de-chlorinated prior to RO system, whenever the seawater is chlorinated as per membrane manufacturer's recommendation by dosing sodium bi-sulphite (SBS).

The chlorination and SBS systems shall be provided with chemical tanks, mixers (as applicable), dosing system to dose the desired quantity of chemicals automatically.

Treated effluents from Manufacturing activity

Wastewater generated from the manufacturing activities and associated services, viz., process effluents, wastewater from utilities, domestic wastewater etc. are subjected to segregation and treatment through an integrated network of physical, physico-chemical and biological unit treatment operations, viz, segregation, collection, wastewater pre-treatment, stripper, multi-effect-evaporation, drying, biological treatment (ETP/STP), Reverse Osmosis, etc. The treated

wastewater is then routed to guard ponds for storage and equipped with on-line monitoring systems as applicable.

Mixing treated effluent and brine reject

Treated effluent is being stored in Guard ponds and there is no mixing of Desalination brine in Guard Ponds. The existing marine disposal tank in the plant facility will be used as mixing chamber to combine the treated effluent from the ETP and brine reject from the desalination plant. By combining the above two the concentration of the brine reject will be reduced before discharging into the sea.



3. DESCRIPTION OF THE ENVIRONMENT

The marine environment of the project region has been studied for the evaluation of baseline data as per the norms stipulated by the Ministry of Environment Forest and Climate Change (MoEF&CC), Govt. of India. This chapter covers the description of baseline environmental status of the study area for marine with respect to the existing environment attributes. The baseline data collections were carried out by covering 10 km radius around the proposed project region in December 2021 to January 2022.

Physical parameters: Tides, Currents, Wind, Waves, Tsunami, Bathymetry and Storms.

Seawater quality parameters: Temperature, Salinity, pH, Turbidity, Total Suspended Solids, Total Dissolved Solids, Dissolved oxygen, Biochemical Oxygen Demand, Chlorides, Calcium, Magnesium, Total hardness, Alkalinity, Ammonia-Nitrogen, Nitrite-Nitrogen, Nitrate-Nitrogen, Total Nitrogen, Inorganic Phosphate, Total phosphorous, Sulphate, Fluoride, Boron, Potassium, Sodium, Cadmium, Chromium, Lead, Mercury, Strontium, Zinc and Phenol.

Seabed sediment quality parameters: Sediment structure, Total Organic Carbon, Total Nitrogen, Total Phosphorous, Calcium carbonate, Arsenic, Chromium, Cadmium Lead, Mercury, phenolic compounds and petroleum hydrocarbons.

Marine ecology and biodiversity: Plankton, Benthos, Microbiology, Seaweeds and Seagrass, Coastal vegetation, Mangroves, Turtles and Fisheries.

3.1 Physical Parameter

Tides: The variation of design tide levels with respect to Chart Datum for Kakinada is presented in Naval Hydrographic Chart No. 354, published by Surveyor General of India. The details are given below:

Tide	Level (m)
Mean High Water Spring (MHWS)	(+) 1.5
Mean High Water Neap (MHWN)	(+) 1.1
Mean Sea Level (MSL)	*(+) 0.9*
Mean Low Water Neap (MLWN)	(+) 0.6
Mean Low Water Spring (MLWS)	(+) 0.2

The variation of tides during 20.12.2021 to 07.01.22 of the project region is shown in **Fig. 3.1**. The tides are semidiurnal. The tidal range was 1.3 m during the spring tide and 0.4 m during the neap tide.

Currents: Based on the available data, the earlier current measurements carried out for about 24 days during December 2014 is shown in shown in **Fig. 3.2**. It shows that the current speed reached upto 0.33 m/s and the current direction was predominantly varying between 180° to 270°.

Wind: Based on the available wind data with Indomer, the annual wind rose is shown in **Fig. 3.3.** It is observed that wind speed of 4 - 10 m/s in June, 4- 8 m/s in May, 2 - 10 m/s in July, August & December, 2 - 8 m/s in March, April, September & November and 2 - 6 m/s in January, February & October. The predominant wind direction varies between 45° to 292.5° during January to December. The month wise predominant wind speed and wind direction is given below.

Month wise predominant wind speed and wind direction

Month	Wind Speed (m/s)	Wind direction (deg. w.r.t. N)
January	2 - 6	45.0° - 112.5°
February	2 - 6	135.0° - 180.0°
March	2 - 8	135.0° - 202.5°
April	2 - 8	157.5° - 202.5
May	4 - 8	157.5° - 202.5°
June	4 - 10	157.5° - 270.0°
July	2 - 10	202.5° - 270.0°
August	2 - 10	225.0° - 292.5°
September	2 - 8	202.5° - 270.0°
October	2 - 6	45.0° - 90.0°
November	2 - 8	45.0° - 90.0°
December	2 - 10	45.0° - 112.5°

Direction - from which

Waves: Based on the available data with Indomer, it is observed that the significant wave height is between 0.5 to 1.5 m during the months of April to May, August to October and 1.0 to 2.0 m during the months of June and July. Similarly, the significant wave height is less than 1 m in the month of November to December and January to March. The zero crossing wave periods varies from 3 to 5 seconds in February, from 4 to 7 seconds in January, March to April and October to December, from 5 to 8 seconds in May to September. The predominant wave direction varies between 135.0° to 180.0° in January to December. The annual wave rose is shown in **Fig. 3.4**. The month wise predominant wave characteristics are given below.

Month wise predominant wave characteristics

Months	Significant Wave Height, H_s (m)	Zero – crossing Wave Period, T_z (s)	Wave direction (deg. w.r.t. N)
January	<1	4 - 6	157.5 - 180.0
February	< 0.5	3 - 5	135.0 - 157.5
March	0.5 - 1.0	4 - 6	135.0 - 180.0
April	0.5 - 1.5	4 - 7	135.0 - 157.5
May	0.5 - 1.5	5 - 7	135.0 - 180.0
June	1.0 - 2.0	5 - 7	135.0 - 180.0
July	1.0 - 2.0	5 - 7	135.0 - 180.0

Months	Significant Wave Height, H_s (m)	Zero – crossing Wave Period, T_z (s)	Wave direction (deg. w.r.t. N)
August	0.5 – 1.5	5 - 7	135.0 - 180.0
September	0.5 - 1.5	5 - 8	135.0 - 180.0
October	0.5 - 1.5	4 - 7	135.0 - 180.0
November	0.5 - 1.0	4 - 7	135.0 -180.0
December	0.5 - 1.0	4 - 6	157.5 - 180.0

Direction - to which

Tsunami: Though the occurrence of Tsunami is a rare phenomenon particularly along the project region, still it is exposed to threat against the submarine tectonic movement of Indonesian and Indian plates. The occurrence of Tsunami on 26th December 2004 along the east coast of India had an impact of about 0.5 m run up between Visakhapatnam and Kakinada. However, any kind of worst scenario can be expected over a period of 100 to 500 years in the project region as it is critically exposed to the movement against Indonesian tectonic plate and Andaman tectonic plate. In case of such eventuality, the Tsunami run up along the project region can rise up to 2.5 m causing severe devastation into the coastal land. The ingress of Tsunami into the land can be minimized by planting Casuarinas along the coastal front.

Bathymetry survey: The bathymetry chart is prepared in WGS84 spheroid with UTM 44N coordinates supplemented by Geographical coordinates indicating the latitude and longitude. The depths are presented w.r.t. Chart Datum (CD). The bathymetry chart covering entire area of 2.5 km along the coast and 2.8 km into the sea is prepared in 1:15000 scale and presented in **Fig. 3.5.** The bathymetry chart shows the contour depth are running parallel to coastline. The nearshore is relatively steeper with 0 m and 10 m contour occurring at a distance of 600 m with gradient of 1:60 slope from the high-water line. Beyond 10 m contour till 15 m contour is relatively flatter than nearshore region and occurring at a distance 600 m and 1760 m with gradient of 1:232 slope seabed. The maximum 18 m depth was noticed end of the survey boundary. The depth vs. distance information is shown below.

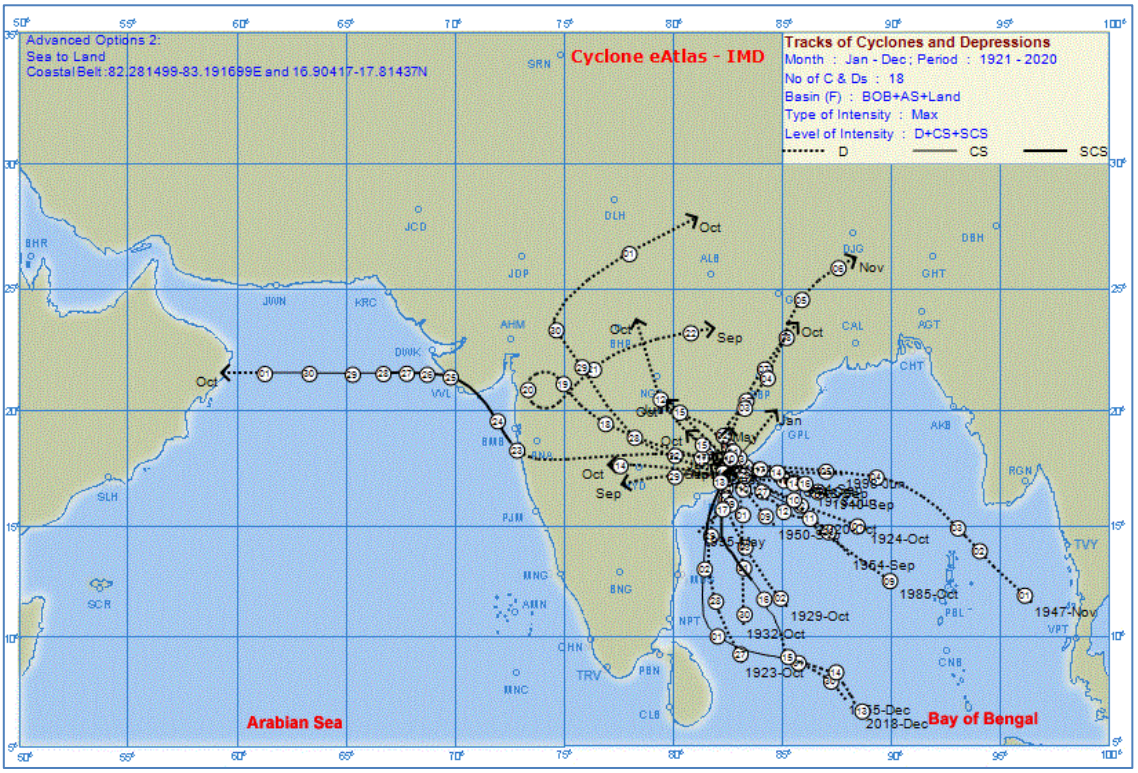
Depth vs distance

Depth (m)	Approximate distance from shoreline (m)
1	60
2	120
3	185
4	250
5	300
6	330
7	390
8	450
9	530
10	600
11	685
12	870
13	1190
14	1560
15	1760
16	2120
17	2470
18	2715

Sidescan sonar survey: The Sidescan sonar survey was conducted by Geosense surveys under Sskivya Agro Tech Products. The mosaic map based on sidescan survey data is shown in **Fig.3.6.**

Storms: Based on Tracks of Cyclones and Depression over North Indian Ocean, cyclones and depressions which have crossed the coast of project region from 1921 to 2020 (within 50 km radius) is shown below. Tracks show that totally 18 storms had passed within 50 km radius of the project region.

Tracks of Cyclones and Depressions, 1921- 2020 (50 km project radius)



Number of cyclones crossed within 50 km project radius

Month	Cyclones crossed within 50 km project radius
January	-
February	-
March	-
April	-
May	1
June	2
July	-
August	-
September	5
October	7
November	1
December	2
Total	18

Source: IMD

3.2 Seawater Quality

The seawater, seabed sediment and biological samples were collected at 10 locations (stns. SS1 to SS10), covering 10 km radius. The details of the sampling locations are shown in **Fig. 3.7** and given in **Table 3.1.** The water samples were collected at surface, mid-depth and bottom.





Seawater sample collection



Onboard testing (Temperature, pH and Salinity)

The seawater quality results are given in **Table 3.2.**

Temperature: The temperature variation is one of the factors in the coastal system, which may influence the physico-chemical characteristics and also influence the distribution and abundance of flora and fauna. The seawater temperature values varied from 25.3°C to 27.0°C with an average of 26.1°C during the study period. Temperature profile at all sampling locations were generally stable.

Salinity: Salinity is an important parameter that governs the spatial distribution of marine organisms. Normally, the salinity of seawater is about 35 PSU among world oceans. Seawater salinity ranged from 30.9 to 32.5 PSU at all sampling locations with an average of 31.6 PSU. Salinity was generally stable throughout the water column. Recorded salinity is normal for Andhra Pradesh coastal waters.

pH: Identifying pH for acidic or alkaline disturbances may help to locate zones of pollution and other quality conditions of seawater. pH ranged from 7.91 to 8.13 with an average of 8.07 during the sampling period. pH was relative stable across at all sampling locations.

Total Dissolved Solids (TDS): TDS varied from 32460 to 33540 mg/l with an average 32944 mg/l between at all sampling locations.

Turbidity: Turbidity is the measure to understand the suspended particulate matter which controls the photosynthesis in the water column. Turbidity is a measure of water clarity, which is the amount of suspended materials decreases the passage of light through the water.

Turbidity values ranged from 0.8 to 2.9 NTU with an average of 1.6 NTU, indicating relatively clear water with low concentration of suspended sediment and good light penetration. The minimum value was recorded at stns. SS9 & SS10 while the maximum was at stn. SS1.

Total Suspended Solids (TSS): Total Suspended Solids in seawater originate either from autochthonous (biological life) or allochthonous (derived from terrestrial matter) sources. TSS values varied between 1.8 and 6.4 mg/l with a mean value of 3.5 mg/l at all sampling locations.

Chlorides: Chlorides are generally present in natural water. The presence of chloride in the natural water can be attributed to suspension of salt deposits discharged of effluent from chemical industries, oil well operations sewage discharge, irrigation drainage seawater intrusion in coastal areas. The concentration of chloride ranged from 16846 to 17723 mg/l with an average of 17244 mg/l.

Dissolved oxygen (DO): Dissolved oxygen concentration varies according to many factors; the main factors are due to photosynthesis and respiration by plants and animals in water. Dissolved oxygen (DO) values ranged from 5.7 to 6.1 mg/l with an average concentration of 5.9 mg/l in the study area.

Biochemical Oxygen Demand (BOD): Rate of aerobic utilization of oxygen is a useful tool to evaluate the intensity of deterioration in an aquatic medium. The oxygen taken up for the breakup of organic matter leads to a reducing environment or in the event of release of excess nutrients, it may cause eutrophication.

BOD values ranged from 1.0 to 1.4 mg/l with an average of 1.1 mg/l in the study period. The low BOD values indicate that oxidizable organic matter brought to the near shore waters is effectively assimilated in coastal water. The range of variation in BOD values indicate that the water column is well mixed in the project area.

Alkalinity: Alkalinity in natural water is due to free hydroxyl ions and weak acids and strong bases form hydrolysis of salts. Alkalinity values serve as an index of productive potential of the water. The concentration of Alkalinity varied from 100 to 116 mg/l with an average of 107 mg/l.

Calcium: Calcium occurs normally in seawater and the approximate level is about 400 ppm. The abundance of calcium is due to its natural occurrence in the earth's crust. Most marine organisms are made up of stone building skeletons called calcium carbonate. Calcium varied from 314 to 354 mg/l with a mean of 334 mg/l.

Magnesium: The mean value of magnesium concentration was 1062 mg/l with a range of 1049 to 1114 mg/l.

Total hardness: The mean value of total hardness was 5199 mg/l with arange of 5145 to 5415 mg/l.

Nutrients: Nutrients determine the potential fertility of an ecosystem and hence it is important to know their distribution and behavior in different geographical locations and seasons. The fishery potential of an area is in turn, dependent on the availability of primary nutrients like nitrogen and

phosphorus. Enrichment of these nutrients by anthropogenic inputs in the coastal waters may result in eutrophication.

Ammonia-Nitrogen (NH_4-N): Unpolluted waters are generally devoid of ammonia and nitrite. However, coastal input by sewage and other nitrogenous organic matter and fertilizers can increase these nutrients to higher levels. In addition, ammonia in seawater can also come from various organisms as an excretory product due to the metabolic activity and the decomposition of organic matter by micro-organisms. The mean concentration was 4.4 µmol/l, with ranged from 3.4 to 5.3 µmol/l. The minimum value was recorded at stn. SS9 while the maximum was recorded at stn. SS6.

Nitrite-Nitrogen (NO_2-N): Nitrite is an important element, which occurs in seawater as an intermediate compound in the microbial reduction of nitrate or in the oxidation of ammonia. In addition, nitrite is excreted by phytoplankton especially, during plankton bloom. Nitrite varied from 0.22 to 0.61 µmol/l with an average of 0.36 µmol/l at all sampling locations.

Nitrate-Nitrogen (NO_3-N): Nitrate values are in general higher as compared to nitrite values. Nitrate is the final oxidation product of nitrogen compounds in seawater and is considered to be the only thermodynamically stable oxidation level of nitrogen in seawater. Nitrate is considered to be the micronutrient, which controls primary production in the euphotic surface layer. The concentration of nitrate is governed by several factors of which microbial oxidation of NH_3 and uptake by primary producers may be important. The mean concentration of Nitrate was 6.5 µmol/l, with ranged from 4.5 to 8.2 µmol/l during the sampling periods. The minimum value was recorded at stn. SS2 and the maximum was at stn. SS4.

Total Nitrogen: Total nitrogen varied from 9.3 to 13.1 µmol/l, with an average of 11.4 µmol/l.

Inorganic Phosphate (PO_4-P): Inorganic phosphate is also an important nutrient like nitrogen compound in the primary production of the sea. The concentration of phosphate, especially in the coastal waters is influenced by the river run off and anthropogenic activity. The mean concentration of Phosphate was 0.5 µmol/l, with range between 0.3 and 1.3 µmol/l.

Total phosphorous: Total phosphorous varied from 1.7 to 2.7 µmol/l with an average of 2.1 µmol/l at all sampling locations.

Sulphate: The mean concentration of sulfate was 1914 mg/l with a range of 1830 to 1969 mg/l. The minimum was recorded at stn. SS10 while the maximum was observed at stn. SS8.

Fluoride: The concentration of fluoride ranged from 1.38 to 1.66 mg/l with an average of 1.51 mg/l in the study area.

Boron: The Boron concentration ranged from 2.0 mg/l to 3.1 mg/l with an average 2.7 mg/l at all sampling locations.

Potassium: Potassium is found in relatively small concentrations in most natural waters mainly because of its being reconstituted into insoluble secondary minerals formed in the process of weathering. Potassium concentration varied from 310 mg/l to 332 mg/l with an average of 320 mg/l at all sampling locations.

Sodium: The mean value of sodium recorded is 11197 mg/l with values varied between 10939 and 11509 mg/l at all sampling locations.

Trace metal concentration: Knowledge of the trace metal concentration in seawater is very important from the point of view of their possible adverse effects on marine biota. Oysters by their ability to concentrate some trace metals from the environment are considered to be useful indicators of metal pollution. Many of the trace metals are adsorbed to the particulate matter and are ultimately deposited at the bottom. The relationship between gross concentration of heavy metal in solution and its ability to cause toxic effects in an organism is a complex one and is mostly decided by the speciation of metal and the condition of the organism. Whether or not a trace metal can interact with the biota depends on its "bio-availability" in the medium. Presence of other toxicants or metals can reduce or increase the additive toxicity of each element. In addition to these factors, temperature, pH, salinity, turbidity and dissolved oxygen concentration also significantly affect metal-organism interactions. The nominal presences of trace metals, which occur in seawater, are found to be necessary to promote growth of marine organisms.

Cadmium (Cd): The bioavailability and toxicity of trace metals such as Cd, Cu, and Zn are related to the activity of the free metal ion rather than the total metal concentration. For Cd it is the $CdCl_2$ complex that predominates in seawater. Therefore, salinity is the overriding factor which can alter free Cd ion activity {Cd2+}, and hence, bioavailability and toxicity in marine systems. Cadmium concentration was found to be below detectable limit (<0.1 µg/l) at all sampling locations.

Chromium (Cr): In natural waters trivalent chromium is most abundant. Chromium is a dietary requirement for a number of organisms. This however only applies to trivalent chromium. Hexavalent chromium is very toxic to flora and fauna. Chromium water pollution is not regarded as one of the major and most severe environmental problems, although discharging chromium polluted untreated wastewater in rivers has caused environmental disasters in the past. Chromium is largely bound to floating particles in water. The LC50 value for chromium in sea fish lies between 7 and 400 ppm, and for algae at 0.032- 6.4 ppm. However, during the study period, chromium concentration was found to below detectable limit (<0.1 µg/l) at all sampling locations.

Lead (Pb): Lead has been used by man for centuries and is amongst the most widely dispersed environmental contaminant. The considerably greater toxicity of organolead compounds compared to inorganic forms has led to studies whether; such compounds may be formed by natural process. Available literature suggests that alkylation of lead is purely a chemical process which may occur in organic-rich anoxic sediment. The lead concentrations in the seawater samples were estimated as lead strongly gets accumulated in marine organisms especially with benthic animals like shellfish. Lead concentration was found detectable limit (<0.1 µg/l) at all sampling locations.

Mercury (Hg): Mercury is considered as a non-essential and toxic element for living organisms. Mercury, amongst other heavy metals has attracted global concern due to its extensive use, toxicity, widespread distribution and the biomagnifications. The bio-concentrate of mercury in aquatic organisms such as oysters and mussels has been reported to be much greater than those contained in the environment in which they live. Mercury concentration was found to be below detectable limit (<0.1 µg/l) at all sampling locations.

Zinc (Zn): Zinc is an abundant element in rocks and ores, but it is present in natural water only as a minor constituent because of lack of solubility of the free metal and its oxides. Zinc may be toxic to aquatic organisms, but the degree of toxicity varies greatly depending on water quality characteristics as well as the species being considered. Zinc concentration was found between 12.7 µg/l and 14.6 µg/l at all sampling locations, with an average of 13.6 µg/l.

Strontium (Sr): the concentration of Strontium ranged from 3.1 to 4.1 mg/l with an average of 3.7 mg/l.

Phenol: The main source of phenolic compounds in seawater is through plants. Additionally, they can also be released during humification processes occurring in soil. Higher concentrations occur in industrial wastewaters. Phenols can be toxic to marine organisms and can accumulate in certain cellular components. During this study, the concentration of phenol in the study area was found to be <0.01 mg/l at all sampling locations.

Seawater quality parameters were found in the normal range and the water environment is free from pollution.

3.3 Seabed Sediment Quality

Sediment size distribution: The particle size distribution of seabed sediments is presented in **Table 3.3**.

The sediment samples were collected at 10 sampling locations as shown in **Fig. 3.7.** The collected seabed sediment sample structure is dominated by fine sand texture. Results of seabed sediment quality are given in **Table 3.4.**



Collection seabed sediment sample

Total Organic Carbon: Organic carbon varied from 0.18 to 1.62 %. **Total Nitrogen:** Total nitrogen level varied from 105 to 780 µg/g. **Total Phosphorus:** Total phosphorous concentration was varied from 26.8 to 77.4 µg/g at all sampling locations. **Calcium Carbonate:** The values of calcium carbonate varied from 6.8 to 13.3 % at all sampling locations.

Heavy Metals

Cadmium (Cd): The concentration of cadmium in the study area was found to be <0.1 µg/g. **Chromium (Cr):** The concentration of total chromium was found from 25.3 to 37.5 µg/g at all sampling locations. **Lead (Pb):** The lead concentration of the study area was found to vary from 2.9 to 4.1 µg/g at all sampling locations. **Zinc (Zn):** The concentration of Zinc ranged from 26 to 39.8 µg/g at all sampling locations. **Mercury (Hg):** The concentration of mercury was found <0.1 µg/g at all sampling locations. **Strontium (Sr):** The concentration of strontium ranged from 46 to 59.8 µg/g at all sampling locations.

Phenol: The concentration of Phenol was found to be <0.5 µg/g at all stns. SB1 to SB10 during the study period.

Seabed sediment is predominantly composed of fine sand in nature. Organic matter, Total Nitrogen, Phosphorous concentrations were found within the normal range of coastal waters. The concentrations of heavy metals and phenols showed low values indicating absence of contamination in seabed sediments.

3.4 Marine Ecology and Biodiversity

The coastal/marine environment of India plays a critical role in the economy of the nation by virtue of its resources and ecosystems such as estuaries, coral reefs, marshes, mangrove forests, lagoons, sandy and rocky beaches, seaweeds, seagrass beds, etc. These habitats are all known for their high biological productivity and to provide a wide range of habitats for many aquatic flora and fauna. The coast is divided into three zones namely subtidal zone (mostly covered with tidal water), intertidal zone (under daily influence of tidal inundation) and high tidal zone (where tidal waters inundate generally during the spring and neap tide), based on this tidal inundation.

Coastal flora can be grouped into two distinct types namely, dry, and wet coastal plant communities. The dry coastal communities are of 2 types - sandy strand vegetation and rocky strand vegetation, whereas wet coastal communities comprise of seaweeds, seagrasses, mangroves and salt marsh vegetation.

Marine fauna are highly diverse and range in size from microscopic zooplankton to the blue whale, comprising crustaceans, fishes, sharks, whales, sea snakes, dolphins, dugongs, etc. and live their entire/partial life in the ocean. Marine fauna are also animals that either enter or leave the ocean for breeding or resting purposes, such as turtles, seals and sea lions, penguins, and crabs. The seabirds can also be considered as marine fauna. While animals such as sponges and corals that are attached to the seabed are also marine fauna, they are typically considered under the benthic communities and habitats.

3.4.1 Plankton

Primary productivity: Marine primary production plays an important role in food web dynamics, in biogeochemical cycles and in marine fisheries. The estimation of primary productivity is based on the relationship between oxygen evolution and carbon fixation. Primarily, phytoplankton depends on carbon dioxide, sunlight, and nutrients for growth, but some other factors such as water depth, water temperature, wind and grazers also play a significant role. Primary productivity varies from freshwater to river mouth and from the river mouth to the marine water body. Its major components are net and gross primary production. The primary production measurement is estimated by the light and dark bottle technique.

The primary productivity values varied between 390 and 510 mgC/m^3/day from all sampling locations (**Table 3.5**). With an average value of 447 mgC/m^3/day. The higher productivity value was recorded at stn. SS8 in coastal water may be related to temperature and photoperiod, while the lower value was recorded at stn. SS1 in near shore water may be due to low transparency.

Phytoplankton: Phytoplankton are the most important primary producers of the sea; their productivity depends mostly on adequate supply of light and nutrients. Phytoplankton are non-evenly distributed both in space and time. The spatial and temporal abundance and composition is

affected by biological, hydrographical and ecological processes. The main types of phytoplankton are diatoms, dinoflagellates, green algae, cyanobacteria and coccolithophores. Phytoplankton contributes to more than 90 per cent of total marine primary production.

Species composition: The phytoplankton species composition is given in **Table 3.6.** The total number of phytoplankton species present varied considerably. Totally 71 species of phytoplankton were observed, comprising three groups viz., 51 species of diatoms (Bacillariophyta), 18 species of dinoflagellates (Pyrrophyta) and 2 species of blue-green algae (Cyanophyta).

Distribution of phytoplankton was investigated quantitatively and qualitatively. The results are given in **Table 3.6.** The phytoplankton composition in the study area was constituted mainly by Bacillariophyceae, Dinophyceae and Cyanophyceae during the sampling period.

Population density: The coastal water phytoplankton population density varied from 19400 to 30400 cells/l. Maximum abundance was observed at stn. SS8, while minimum was recorded at stn. SS6. Phytoplankton population mostly consisted of Bacillariophyceae (72.29%), Dinophyceae (23.06%) and Cyanophyceae (4.65%). *Chaetoceros lorenzianus* was the most dominant species followed by *Rhizosolenia cylindrus*, *Coscinodiscus excentricus*, *Pleurosigma directum*, *Trichodesmium erythraeum, Protoperidinium oceanicum* and *Ceratium macroceros*. The numerical abundance of phytoplankton is given in **Table 3.7.**

Shannon-Wiener's diversity: The Shannon - Wiener's diversity index (H') ranged from 5.24 to 5.50 (bits/ind.). The highest species diversity was observed at stn. SS8 and the lowest species diversity was at stn. SS6. Simpson richness ranged from 0.972 to 0.976. Pielou's Evenness index (J') ranged from 0.978 to 0.992.

Diversity indices of phytoplankton in coastal waters

Range	S	N	d	J'	H'(log)	1-Lambda'
Minimum	39	19400	3.85	0.978	5.24	0.972
Maximum	49	30400	4.65	0.992	5.50	0.976

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity Index of Phytoplankton: The similarity index of phytoplankton at all sampling locations showed that the percentage of the similarity ranged from 57.01 – 83.13%. The average similarity was 71.38% in coastal waters.

Similarity Index of Phytoplankton in coastal waters

Station	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
SS1										
SS2	58.73									
SS3	72.56	60.26								
SS4	76.77	69.96	57.01							
SS5	69.90	73.34	74.12	66.48						
SS6	64.85	68.40	66.32	71.48	59.85					
SS7	73.93	72.84	75.60	74.12	69.83	61.99				
SS8	74.46	75.62	78.11	69.26	80.13	62.30	70.24			
SS9	74.83	71.66	74.89	77.63	76.72	78.17	70.78	73.48		
SS10	76.53	77.66	70.65	72.79	78.18	62.32	74.08	83.13	69.90	

Dominant phytoplankton species


Thalassiothrix frauenfeldii

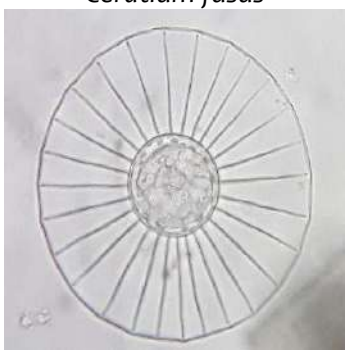

Coscinodiscus sp.


Odontella mobiliensis


Ceratium fusus


Prorocentrum micans


Trichodesmium erythraeum


Planktoniella sol


Chaetoceros affinis


Chaetoceros sp.


Ceratium furca


Ceratium macroceros


Protoperidinium oceanicum

Zooplankton

Zooplankton plays a key role in marine food web dynamics and biogeochemical cycling. Spatial distribution of zooplankton is an important factor in influencing the fish stock. Hence, any decline

in zooplankton population may affect ecosystem functioning. Zooplankton dynamics is largely controlled by different environmental factors. Hence, any change in ambient water quality will significantly affect zooplankton population, which in turn can affect larval survival and hence fishery. Seasonal plankton succession is a process mainly regulated by temperature and salinity conditions.

Species composition: The systematic account of zooplankton encountered during the study period is presented in **Table 3.8.** Totally, 47 species of zooplankton were identified in the samples from the study area. Copepods were the most diverse group containing the highest number of species, followed by Decapods, Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. Copepods not only remained as the most dominant group but also appeared in large numbers during the sampling periods.

Population density and abundance: The zooplankton abundance ranged from 94920 to 158931 individuals/100 m^3. The highest abundance was recorded at stn. SS7, while the lowest was recorded at stn. SS6. The percentage occurrence of various groups fluctuated from location to location. The zooplankton biomass at different locations varied from 54.8 to 80.1 ml/100m^3. Most dominant species recorded in the present study were *Acaria spinicauda, Oithona nana, Clausocalanus minor, Paracalanus parvus, Acrocalanus gracilis, Temora turbinata, Centropages furcatus* and *Canthocalanus pauper.*

Shannon- Wiener's diversity: Shannon - Wiener's diversity index (H') values ranged from 4.43 to 4.82 bits/ind. The highest species diversity was observed at stn. SS7 and the lowest at stn. SS1. Simpson richness ranged from 0.941 to 0.959. Pielou's Evenness index (J') ranged from 0.911 to 0.954.

Diversity indices of Zooplankton in coastal waters

Range	S	N	d	J'	H'(log)	1-Lambda'
Minimum	28	94920	2.33	0.911	4.43	0.941
Maximum	35	158931	2.88	0.954	4.82	0.959

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity Index of Zooplankton: The similarity index of zooplankton in coastal waters showed that the percentage of similarity ranged from 46.87 to 78.02%, the average similarity 67.48%.

Similarity Index of Zooplankton in coastal waters

Station	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
SS1										
SS2	46.87									
SS3	67.76	56.96								
SS4	63.00	74.79	60.55							
SS5	65.60	71.02	78.02	65.88						
SS6	59.03	68.43	69.84	69.05	66.05					
SS7	70.58	68.44	71.85	77.54	70.30	59.15				
SS8	69.03	67.42	68.24	65.80	75.44	62.93	56.45			
SS9	65.52	66.16	77.42	66.12	72.15	74.08	72.02	57.48		
SS10	55.07	73.10	71.68	73.89	69.87	69.27	74.34	70.91	61.66	

Common zooplankton dominant species



Evadne sp.



Centropages furcatus



Macrosetella sp.



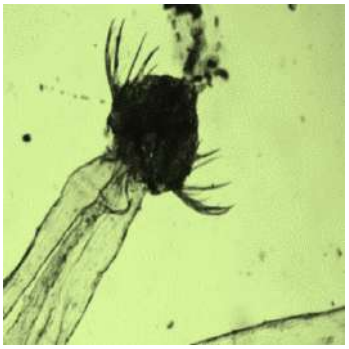
Clausocalanus minor



Eucalanus attenuatus



Corycaeus danae



Sagitta sp.



Oithona sp.



Copilia sp.



Microsetella sp.



Mysids



Lucifer sp.

3.4.2 Benthos

The macrobenthic organisms can be analyzed from a high index of biological diversity. They are represented by many animal phyla, however dominant groups are represented by polychaetes,

crustaceans, molluscs and echinoderms. Among these polychaetes form an important component of the benthic community in terms of abundance, species richness and diversity in most parts of the world Ocean. The dominant crustaceans include isopods, mysids, amphipods, ostracods and a few decapods. Molluscs are mainly represented by burrowing bivalves and a few gastropods that live in or on the surface. Echinoderms include brittle stars, sand dollars, sea cucumbers, starfish and heart urchins. Macrobenthos in marine sediments play an important role in ecosystem processes such as mineralization and mixing of sediments, the flux of oxygen into sediments, nutrients cycling, dispersion and burial and secondary production. These organisms provide key linkage between primary producers and higher trophic levels. Abundance of the subtidal and intertidal macrobenthic populations are presented in **Table 3.9.**



Collection of intertidal benthos

Numerical abundance and species diversity of subtidal benthic organisms: The density of macrobenthic organisms varied from 640 to 1040 nos./m^2 at all sampling locations of stns. SB1 to SB10. The maximum benthic organism density was found at stn. SB3 in seabed sediment, while minimum benthic organism density was found at stn. SB6. As expected, polychaetes dominated at all sampling locations over Molluscs, Arthropods and Amphioxiformes. All the sampling locations differed in the contributions of these groups. The Shannon-Wiener index H' ranged between 3.37 and 3.91 bits/individual during the study periods. Dominance index (d) was within the range between 1.51 and 2.21. Evenness index (J') fluctuated from 0.964 to 0.980.

Numerical abundance and species diversity of intertidal benthic organisms: The intertidal region is the most dynamic region governed by a large number of physicochemical factors lead by tide as a principal factor. Though intertidal regions are a highly productive region, the primary production available for benthos consumption is limited in the intertidal region. The organisms depend mostly on the deposition of materials from above, washed out from the land, sinking of phytoplankton and zooplankton from upper layers of the water column and its subsequent decomposition.

The density of macrobenthic organisms varied between 660 and 795 nos./m^2. Polychaetes dominated at all the sampling locations than the Arthropods and molluscs. The Shannon-Wiener index H' ranged from 3.60 to 3.67 bits/individual at stns. IB1 to IB3.

Diversity indices of macrobenthic organisms in seabed sediments

Range	S	N	d	J'	H'(log)	1-Lambda'
Subtidal macrobenthic organisms						
Minimum	11	640	1.51	0.964	3.37	0.899
Maximum	16	1040	2.21	0.980	3.91	0.931
Intertidal macrobenthic organisms						
Minimum	13	660	1.80	0.973	3.60	0.914
Maximum	13	795	1.85	0.990	3.67	0.920

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity index of macrobenthic organisms: The similarity index of macrobenthos in seabed sediments and intertidal benthos showed that the percentage of the similarity ranged from 6.89 – 96.81% with average similarity 46.66%.

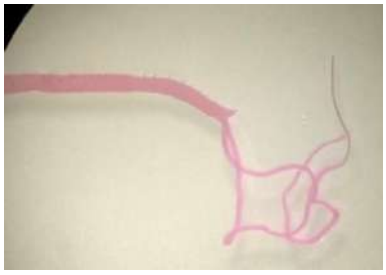
Similarity Index of Macro Benthic Organisms in seabed sediments and intertidal benthos

Station	SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10	IB1	IB2	IB3
SB1													
SB2	31.39												
SB3	57.86	36.76											
SB4	50.91	51.57	20.93										
SB5	50.26	56.86	59.84	31.75									
SB6	35.53	52.93	51.11	43.12	38.75								
SB7	66.94	41.27	56.73	42.75	63.25	6.89							
SB8	34.89	80.52	26.51	58.24	52.33	52.45	41.92						
SB9	36.14	40.87	59.81	35.72	66.38	51.87	49.66	37.40					
SB10	53.62	50.33	47.81	46.67	41.19	39.98	46.67	54.91	16.61				
IB1	42.60	54.31	58.32	29.93	39.86	42.29	44.12	36.43	28.83	46.41			
IB2	42.78	55.73	58.31	29.60	40.35	44.56	43.72	36.17	29.67	48.42	96.37		
IB3	43.11	54.95	59.25	30.48	40.10	43.73	43.86	35.75	30.13	46.86	95.98	96.81	

Common Benthic organisms



Amphioxus sp.



Prionospio pinnata



Isopod



Capitella sp.



Cossura sp.



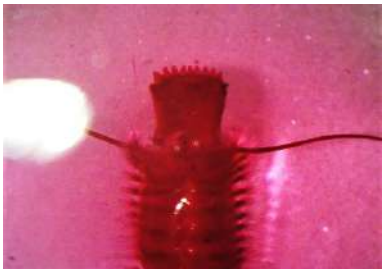
Isopod



Glycera sp.



Amphipod



Ancistrosyllis sp.

Interpretation and Ecological Status of the study area

It is always advantageous to assess the "Ecological Status" of a region before any major project is initiated so that the baseline information that was recorded can be used as a reference for future assessments. There are several statistical methods and indices to explain these changes and based on the values, people classify the ecological status. One such general method is the classification of Shannon -Weiner diversity Index.

Productivity Status	Species Diversity (Shannon - H')	Explanation
Very Low	0.0-1.5	Very highly polluted
Low	1.6-3.0	Highly polluted
Moderate	3.1-4.0	Moderately polluted
High	4.1-4.9	Transitional zone
Very High	5.0 and above	Normal/Pristine

In general, the pelagic environment presents a much larger uniformity than the benthic environment and species that inhabit it have much larger distribution areas.

Phytoplankton: Species diversity of the phytoplankton community of the coastal water is dominated by diatoms, dinoflagellates, and cyanobacteria. The most dominant phytoplankton species was *Chaetoceros lorenzianus* than the other phytoplankton species during the study period.

Zooplankton: Zooplankton biodiversity in this coastal water is mostly composed of copepods, followed by Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. The most dominant species was *Acaria spinicauda* during the study period. Among macrobenthos, polychaetes were the most diverse groups in the subtidal as well as the intertidal regions. Overall, the following is concluded:

- The diversity indices of phytoplankton and zooplankton were within the range of 4.43 to 5.50, indicating good environmental conditions (transitional zone to normal/pristine).
- The mean diversity of subtidal and intertidal benthic faunal population was 3.60 to 3.91, indicating moderate environmental conditions.

3.4.3 Microbiology

Microorganism distribution in the marine and brackish environment plays an important role in the decomposition of organic matter and its mineralization. Pathogenic bacteria which cause damage to the host invade into marine environment through human and animal excreta, river runoff, land runoff, sewage, agricultural waste and industrial waste. Hence, spatial and temporal distribution

of the Total Faecal Coliforms as well as pathogenic bacteria in water and sediment is essential to assess the sanitary conditions of water bodies.

Microbial count in surface water and sediment: Bacterial counts in the coastal water and seabed sediment are given in **Table 3.10** and **Table 3.11.** In the water samples, bacterial counts varied from 0.01 to 5.28 nos.×10^3 CFU/ml among stns. SS1 to SS10. Bacterial counts in sediment samples varied from 0.02 to 5.31 nos.×10^4 CFU/g at all sampling location SB1 to SB10. The pathogenic organisms such as Total Coliforms, faecal coliforms, *Escherichia coli* like organisms, *Salmonella* like organisms, *Vibrio* like organisms and *Pseudomonas aeruginosa* like organisms have been recorded in the study area. The counts however were low indicating the absence of gross contamination by these organisms.

3.4.4 Coastal Vegetation

Sand dune Vegetation

The sand dune vegetations comprise vital components of coastal sand dune habitats owing to their bio-engineering role in sediment accumulation, sand binding and land building processes. Beach ecosystems in India have been studied for their physical, geological and restoration aspects. The coastal sand dune ecosystems are categorized as ecologically sensitive. Coastal dune constitutes a variety of habitats essential for the maintenance of food webs and productivity. Dune vegetation harbours many economically important species of plants like, *Casuarina equisetifolia, Borassus flabellifer, Eucalyptus* sp. in the coastal regions of India.

Project region

In the project region of 10 km radius sand vegetation were observed. The sand dune species found in the project region includes *Spinifex littoreus, Ipomoea pes-caprae, Sesuvium portulacastrum, Pedalium murax, Prosopis juliflora, Casuarina* sp. and *Borassus* sp.

Some common coastal sand dune vegetation observed during the study



Sesuvium portulacastrum



Spinifex littoreus



Pedalium murax



Ipomoea pes-caprae



Borassus sp.

3.4.5 Seaweeds and Seagrass

Seaweeds

Seaweeds are group of plants that live either in marine or brackish water environments and dominate in rocky intertidal regions. Seaweed zone is one of the conspicuous and widespread biotopes in the shallow marine environment.

Seaweeds are absent within the project region

Seagrass

Seagrasses are the marine flowering plants. They are the only angiosperms that successfully grow in intertidal and subtidal marine environment. Mangrove and coral reef ecosystems are also closely associated with the seagrass ecosystem.

Seagrass is absent within the project region

3.4.6 Coral reefs

Coral reefs are one of the most diverse and dynamic ecosystems. The coral reefs not only provide a sanctuary to myriad of marine life but also play a key role in protecting the coastline from erosion.

Corals were absent within the project region

3.4.7 Sea turtles

Sea turtles of Indian waters: Five species of sea turtles viz., Leatherback turtle, Hawksbill turtle, Loggerhead, Green turtle and Olive Ridley turtle are reported from the Indian waters. All the species of sea turtles found in India are presently declared as "Endangered" and are protected by law and are included under Schedule I of the Indian Wildlife (Protection) Act, 1972. With the exception of the Olive Ridley that nests throughout the region, other species nest on select beaches.

Status of sea turtle species and populations that were published in 2020

Scientific name	Common name	Distribution	IUCN Red list status
Dermochelys coriacea	Leatherback Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Caretta caretta	Loggerhead Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Lepidochelys olivacea	Olive Ridley Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Eretmochelys imbricata	Hawksbill Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands, the coasts of Tamil Nadu, Orissa.	Critically Endangered
Chelonia mydas	Green Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Endangered

Source: IUCN Red List of Threatened Species. Version 2020-2. ISSN 2307-8235

The coastline of northern Andhra Pradesh extends from Bahuda Muhana Sagar to Godavari river mouth and is about 390 km in length. It is predominantly a rocky coast with small stretches of sandy beaches. The beach here is sandy and sand dunes are found between Vamsadhara - Nagavalli and few patches of intertidal rocks in Kalingapatnam and Visakhapatnam. The coastline of Andhra Pradesh is one of the important sporadic nesting habitats of olive ridley turtles (*Lepidochelys olivacea*) and is believed to form part of the migratory route of the turtles that nest in Orissa.

The other nesting sites reported in the East Godavari district coast are Sacramento and Hope Island. Besides Olive Ridley, three other species of sea turtles namely Hawksbill, Green and Leather back turtles also visit Hope Island in small number every year.

Already treated effluent and brine reject are discharged since 2010. Over the period of 12 years, no impact on turtles at offshore was observed due to the discharge.

Turtle nesting is absent near the project region.

3.4.8 Marine Mammals

Marine mammals are important components and occupy elevated trophic level in the oceanic environment. About 26 cetaceans (Whales, Dolphins and Porpoise) and one Sirenian, the Dugong are found in the waters of the Indian subcontinent. Marine mammals are adapted to thrive in wide variations of temperatures depths, pressure, darkness, etc. All the species are protected under Schedule I of the Wildlife (Protection) Act, 1972; six species are included in Appendix I and seven included under Appendix II of CITES.

The marine mammals were absent within the project region

3.4.9 Marine Protected Area

Marine and coastal areas are one of the highly diverse and productive ecosystems of our planet. These areas support a variety of coastal and marine habitats like mangroves, coral reefs, seagrasses, seaweeds/algae and saltmarshes. These habitats support in the production of detritus and recycling of nutrients, and thereby enrich the coastal waters and support the benthic population of the sea. They also serve as nursery grounds for the larvae and juveniles of marine denizens. These MPAs cover coastal wetlands, mangroves, coral reefs, lagoons, seagrasses beds and other biologically active resources. All the MPAs in the country are notified under the Wildlife (Protection) Act, 1972 and fall in category I and II of IUCN categories of Protected Areas (PAs). (MNP report 2019).

Protected area in Andhra Pradesh: Three sanctuaries-Krishna, Coringa and Pulicat are mainly in the marine environment. Krishna Sanctuary and Coringa Sanctuary have mangroves, estuaries, and backwater whereas Pulicat is a lagoon of brackish water and known for water birds and fishes. Pulicat lagoon is the largest brackish waterbody in the south India and the second largest saltwater lake in the country.

Sl. No.	Name of MPA	Category	Area (sq. km)	Year of establishment
1	Coringa	Sanctuary	235.7	1978
2	Krishna	Sanctuary	194.81	1989
3	Pulicat Lake	Sanctuary	500	1980

Source: ENVIS Centre on Wildlife and Protected Areas

In the proposed project area it is noticed that there are no notified/declared ecologically sensitive areas such as turtle nesting, Wildlife Protected areas, marine sanctuaries, National Parks etc. within 10 km of the project region.

3.4.10 Endangered species

Marine species were thought to be abundant and unlikely to become extinct. Exploitation of the marine resources over the years has caused the decline in many marine species population and recovery found to be much slowly than the previously understood. Studies have shown that many species have restricted distribution which makes it vulnerable to exploitation and extinction.

Endangered species are absent near the project region.

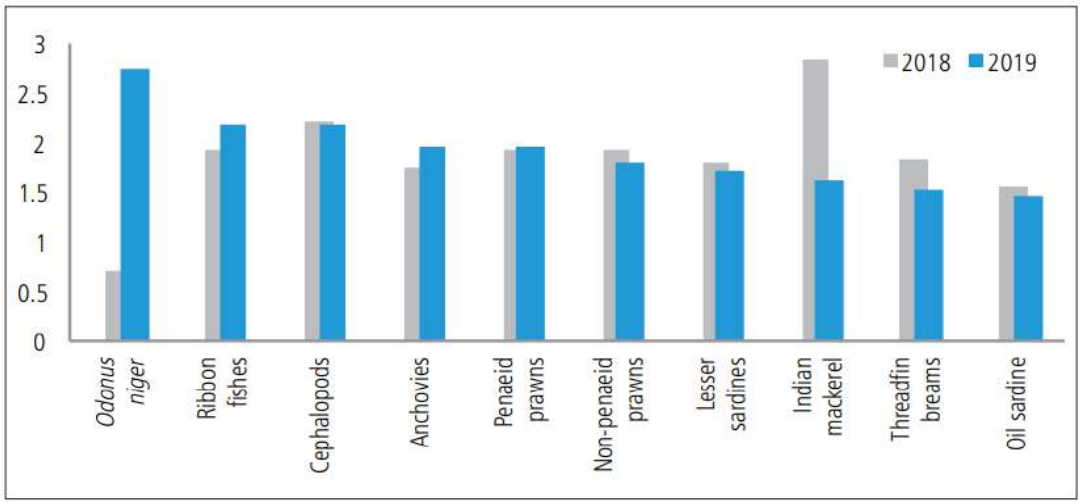
3.4.11 Fisheries

Marine fishery resources are renewable and limited, therefore management of the harvest of marine fishery resources is necessary for sustained production from the sea. Towards this, it is very much essential to have reliable and updated knowledgebase on status of marine fishery resources, fishing effort expended, number of fishing villages, number of landing centres, fisherfolk population, their educational status, occupational status, infrastructure facilities existing in fishing villages, fishing crafts, fishing gears, etc.

Indian marine fisheries

The estimate of marine fish landings in India for the year 2019 is 3.56 million tonnes compared to 3.49 million tonnes in 2018, showing a marginal increase of about 2.1%. Tamil Nadu grabbed the first place from Gujarat, which was holding the first position for the past few years, with 7.75 lakh

tonnes compared to 7.02 lakh tonnes in 2018 (10.4% increase), accounting for 21.8% of the total landings in India. An important marine fishery in 2019 is that, nationwide *Odonus niger* became the major resource in the harvests with its landings increasing to 2.74 lakh tonnes from 72,140 tonnes in 2018. The second highest landings is ribbon fishes (2.19 lakh tonnes) followed by penaeid prawns (1.95 lakh tonnes), non-penaeid prawns (1.80 lakh tonnes), lesser sardines (1.71 lakh tonnes), Indian mackerel (1.62 lakh tonnes), threadfin breams (1.53 lakh tonnes) and oil sardine (1.45 lakh tonnes). In 2019, out of the total 3.56 million tonnes landings, 1.69 million tonnes are pelagic resources, 1.20 million tonnes are demersal resources, 0.44 million tonnes are crustaceans and 0.23 million tonnes are molluscs (CMRFI 2020).



(Source: CMRF, 2020)

All India landing of Major Resources (in lakh tonnes)

Andhra Pradesh marine fisheries

Andhra Pradesh state is endowed with a long coastline of 974 Kms with a continental shelf area of 33,227 Sq. kms. As per CMFRI census, 2010, the marine fishermen population in 9 coastal districts of Andhra Pradesh estimated at 6.05 lakh with 1.63 lakh fishermen families and 1.51 lakh active fishermen. There are 546 marine fishing villages situated along the coast of Andhra Pradesh. There are about 555 fishermen villages and 349 fish landing centres scattered in 9 coastal districts viz., Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam and Nellore out of 23 districts and starts from Ichapuram in the Srikakulam district (north) and ends at Tada in Nellore district (south).

One major fishing harbour at Visakhapatnam, three minor fishing harbours at Kakinada, Machilipatnam and Nizampatnam are providing berthing facilities for 1871 mechanised fishing vessels in the state. A total number of 31,318 fishing vessels comprising 1871 mechanised, 14,648 motorised and 14,799 traditional fishing craft are involved in marine fishing activity. Fishermen are using some principle nets such as Drag nets, gill nets, trawl nets, cast nets, Hook & Line etc. for fishing operations in marine waters.

Andhra Pradesh, there were 1,341 trawlers involved in fishing in 2010. There was 26% decline in trawlers from 1,802 in 2005 to 1,341 in 2010. District wise contribution was Visakhapatnam (43%) with 579 trawlers, East Godavari district (36%) with 487 trawlers, Guntur district (11%) with 150 trawlers, Krishna district (6.3%) with 85 trawlers and Prakasam district (3%) with 40 trawlers in 2010.

Visakhapatnam District marine fisheries

Visakhapatnam District is one of the important maritime districts of Andhra Pradesh, the fishing households are busily engaged in all the sea shore- based activities like sorting, weighing, salting, drying, marketing, etc. The aim of the study of marine fishing landing centre, fishing village, fisher man families, fishing craft and fishing gear in Visakhapatnam District. The fish landing centre 66 number and fishing village 63, fisher man families 28779, traditional fisherman families 28738 and totally Fisherfolk population 113632 found at Visakhapatnam District (source: Marine Fisheries Census 2010). Details of fishing village and fisherfolk population in Nakkapalli taluk are shown **Table.3.12**.

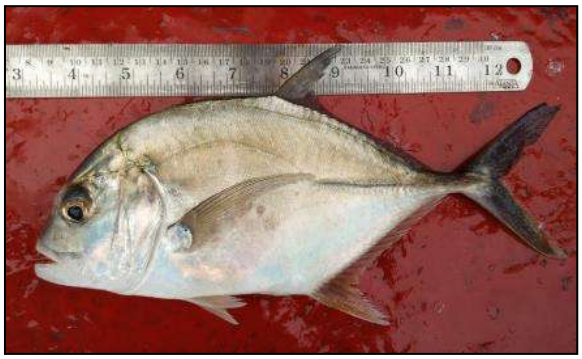
Fishing Craft: 579 nos. of Trawler, 2480 nos. of motorised craft and 4960 nos. of non-motorized craft are present at Visakhapatnam District. Totally 8019 nos. of fishing craft are available in Visakhapatnam District.

Fishing gear: Different type gears are used in Visakhapatnam District such as trawl net (84), gill net (774), drift net (41), ring seine (430), boat seine (82), bag net (57), shore seine (8), cast net (272), hooks & line (1429), troll line (37), fixed net (48), traps (2) and scoop net (12) as per Marine Fisheries Census 2010.

Common and important marine fishes in nearby project location



Pampus argenteus



Carangoides malabaricus



Leiognathus sp.



Johnius sp.



Sphyraena sp.



Decapterus sp.



Pomadasys kaakan



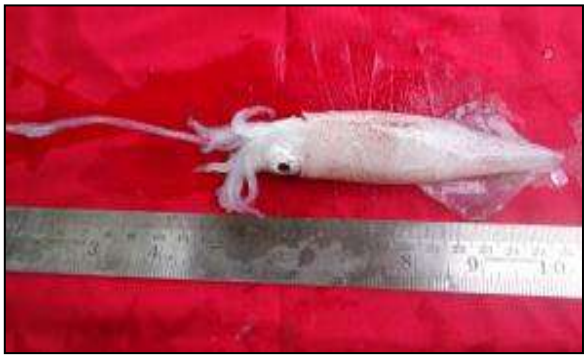
Scomberomorus guttatus



Nemipterus japonicus



Siganus canaliculatus



Loligo sp.



Penaeus monodon



Chaybdis cruciata



Portunus sanguinolentus



Sillago sihama



Stolephorus sp.



Arius sp.



Mugil cephalus



Thunnus sp.



Shark

Table 3.1. Location of seawater, seabed sediments and biological sampling locations

Station	Geographical Coordinates (WGS 84)		sample layer
	Latitude (N)	Longitude (E)	
Seawater and seabed sampling locations			
SS1 & SB1	17°21'19"	82°44'19"	S, M & B
SS2 & SB2	17°21'05"	82°44'27"	S, M & B
SS3 & SB3	17°20'36"	82°44'43"	S, M & B
SS4 & SB4	17°19'53"	82°45'07"	S, M & B
SS5 & SB5	17°19'09"	82°45'30"	S, M & B
SS6 & SB6	17°16'45"	82°46'49"	S, M & B
SS7 & SB7	17°20'36"	82°43'40"	S, M & B
SS8 & SB8	17°19'09"	82°42'54"	S, M & B
SS9 & SB9	17°21'24"	82°45'18"	S, M & B
SS10 & SB10	17°21'09"	82°46'59"	S, M & B
Intertidal benthos sampling locations			
IB1	17°22'24"	82°45'57"	Intertidal area
IB2	17°21'29"	82°44'01"	Intertidal area
IB3	17°20'17"	82°41'41"	Intertidal area

Notations: SS – seawater; SB - Seabed; IB - Intertidal Benthos; S - Surface; M - Mid-depth & B - Bottom

Table 3.2. Seawater quality

Station	Sample Layer	Temp. (°C)	Salinity (PSU)	pH	TDS (mg/l)	Turbidity (NTU)	TSS (mg/l)	Chlorides (mg/l)	DO (mg/l)	BOD (mg/l)	Alkalinity (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness (mg/l)
SS1	S	25.9	31.6	8.05	32870	1.0	2.2	17197	6.1	1.1	112	334	1049	5145
	M	25.6	31.9	8.03	32960	1.3	2.9	17372	6.0	1.2	116	324	1061	5170
	B	25.4	31.9	8.02	32980	2.9	6.4	17372	5.9	1.4	116	324	1061	5170
SS2	S	26.0	31.6	7.99	32850	1.2	2.6	17197	6.1	1.0	112	344	1049	5170
	M	25.8	31.9	7.95	32950	1.7	3.7	17372	6.0	1.2	112	334	1061	5194
	B	25.5	31.9	7.91	32960	2.8	6.2	17372	5.9	1.2	116	334	1061	5194
SS3	S	26.1	31.2	8.08	32760	1.4	3.1	17021	6.0	1.1	108	334	1049	5145
	M	25.7	31.6	8.07	32870	1.8	4.0	17197	5.9	1.1	108	324	1061	5170
	B	25.5	31.6	8.07	32870	2.5	5.5	17197	5.8	1.2	112	324	1067	5194
SS4	S	26.2	30.9	8.10	32460	1.3	2.9	16846	6.0	1.1	108	344	1061	5219
	M	25.8	31.2	8.09	32780	1.8	4.0	17021	6.0	1.1	108	354	1055	5219
	B	25.3	31.2	8.07	32780	2.4	5.3	17021	5.9	1.2	108	354	1055	5219
SS5	S	26.4	31.2	8.10	32780	1.4	3.1	17021	6.0	1.1	104	334	1073	5243
	M	26.0	31.6	8.08	32870	1.7	3.7	17197	5.8	1.1	108	344	1061	5219
	B	25.5	31.6	8.07	32870	2.2	4.8	17197	5.8	1.2	108	344	1055	5194
SS6	S	26.6	31.2	8.12	32780	1.3	2.9	17021	6.0	1.1	104	344	1061	5219
	M	26.1	31.2	8.10	32790	1.8	4.0	17021	5.9	1.1	104	334	1061	5194
	B	25.8	31.6	8.06	32870	2.1	4.6	17197	5.8	1.2	108	334	1061	5194
SS7	S	26.6	30.9	8.12	32480	1.3	2.9	16846	5.9	1.1	104	324	1061	5170
	M	26.3	31.2	8.10	32760	1.8	4.0	17021	5.9	1.1	104	324	1067	5194
	B	26.0	31.2	8.08	32780	2.0	4.4	17021	5.8	1.2	104	314	1078	5219
SS8	S	26.6	31.9	8.13	32960	1.2	2.6	17372	6.0	1.0	100	324	1073	5219
	M	26.3	31.9	8.10	32960	1.6	3.5	17372	5.8	1.1	104	334	1061	5194
	B	26.0	32.2	8.07	33450	1.9	4.2	17548	5.7	1.2	104	334	1061	5194
SS9	S	26.8	31.9	8.11	32950	0.8	1.8	17372	6.0	1.0	104	324	1067	5194
	M	26.5	31.9	8.10	32960	0.9	2.0	17372	5.9	1.1	104	334	1055	5170
	B	26.0	32.2	8.10	33460	1.0	2.2	17548	5.7	1.2	104	334	1055	5170
SS10	S	27.0	32.2	8.13	33450	0.8	1.8	17548	5.8	1.0	100	344	1055	5194
	M	26.6	32.5	8.11	33520	1.0	2.2	17723	5.8	1.1	100	334	1114	5415
	B	26.0	32.5	8.11	33540	1.0	2.2	17723	5.7	1.1	100	334	1055	5170

Contd.

Station	Sample Layer	NH_4-N (µmol/l)	NO_2-N (µmol/l)	NO_3-N (µmol/l)	Total Nitrogen (µmol/l)	PO_4 (µmol/l)	Total Phosphorus (µmol/l)	SO_4 (mg/l)	Fluoride (mg/l)	B (mg/l)	K (mg/l)	Na (mg/l)
SS1	S	4.8	0.48	6.5	11.9	0.5	1.8	1935	1.48	2.0	319	11167
	M	4.9	0.52	6.6	12.2	0.5	1.8	1936	1.43	2.1	323	11281
	B	4.9	0.61	6.7	12.3	0.5	1.8	1952	1.46	2.1	323	11281
SS2	S	4.9	0.43	4.5	10.0	1.2	2.5	1866	1.38	2.3	319	11167
	M	5.1	0.46	4.7	10.3	1.3	2.5	1905	1.46	2.3	323	11281
	B	5.1	0.48	4.8	10.4	1.3	2.7	1913	1.50	2.3	323	11281
SS3	S	4.7	0.39	5.6	10.8	0.3	2.5	1861	1.44	2.4	314	11053
	M	4.7	0.43	5.2	10.4	0.3	2.6	1896	1.45	2.4	319	11167
	B	4.8	0.46	5.1	10.5	0.3	2.6	1946	1.52	2.4	319	11167
SS4	S	3.7	0.37	8.2	12.3	0.5	2.3	1921	1.52	3.0	310	10939
	M	3.8	0.39	7.9	12.1	0.5	2.4	1925	1.43	3.1	314	11053
	B	3.7	0.39	7.7	11.8	0.5	2.4	1965	1.44	3.1	314	11053
SS5	S	4.4	0.39	7.5	12.3	0.4	1.7	1895	1.45	3.0	314	11053
	M	4.4	0.39	7.4	12.3	0.5	1.7	1888	1.47	3.1	319	11167
	B	4.5	0.37	7.2	12.1	0.5	1.7	1918	1.53	3.1	319	11167
SS6	S	5.2	0.26	7.6	13.1	0.3	1.8	1937	1.57	2.5	314	11053
	M	5.3	0.24	7.4	12.9	0.4	1.9	1941	1.62	2.6	314	11053
	B	5.3	0.24	7.2	12.8	0.4	2.0	1942	1.66	2.6	319	11167
SS7	S	4.0	0.28	7.7	12.0	0.6	2.0	1912	1.50	2.7	310	10939
	M	4.2	0.24	7.5	12.0	0.6	2.0	1945	1.58	2.7	314	11053
	B	4.3	0.22	7.4	12.0	0.7	2.1	1957	1.66	2.8	314	11053
SS8	S	3.5	0.26	6.3	10.2	0.5	1.9	1940	1.42	3.0	323	11281
	M	3.7	0.30	6.2	10.3	0.5	2.0	1946	1.66	3.1	323	11281
	B	3.7	0.30	6.0	10.1	0.5	2.1	1969	1.49	3.1	327	11395
SS9	S	3.4	0.33	5.6	9.4	0.3	2.1	1857	1.44	2.8	323	11281
	M	3.4	0.33	5.5	9.3	0.4	2.1	1863	1.54	2.9	323	11281
	B	3.7	0.33	5.3	9.4	0.4	2.1	1939	1.55	2.9	327	11395
SS10	S	4.2	0.30	7.1	11.8	0.3	2.0	1830	1.53	2.9	327	11395
	M	4.5	0.33	6.9	12.0	0.4	2.0	1852	1.52	3.0	332	11509
	B	4.5	0.33	7.0	12.2	0.4	2.1	1861	1.49	3.0	332	11509

Contd.

Station	Cadmium (µg/l)	Chromium (µg/l)	Lead (µg/l)	Mercury (µg/l)	Zinc (µg/l)	Strontium (mg/l)	Phenols (mg/l)
SS1	<0.1	<0.1	<0.1	<0.1	14.6	3.1	<0.01
SS2	<0.1	<0.1	<0.1	<0.1	12.7	3.3	<0.01
SS3	<0.1	<0.1	<0.1	<0.1	13.7	3.4	<0.01
SS4	<0.1	<0.1	<0.1	<0.1	13.4	4.0	<0.01
SS5	<0.1	<0.1	<0.1	<0.1	14.0	4.0	<0.01
SS6	<0.1	<0.1	<0.1	<0.1	13.3	3.3	<0.01
SS7	<0.1	<0.1	<0.1	<0.1	13.0	3.9	<0.01
SS8	<0.1	<0.1	<0.1	<0.1	13.6	4.1	<0.01
SS9	<0.1	<0.1	<0.1	<0.1	13.4	4.0	<0.01
SS10	<0.1	<0.1	<0.1	<0.1	13.9	4.0	<0.01

Table 3.3. Sediment size distribution

Station	Classification of Soil	D_{50} (mm)	Sand			Silt & Clay %
			Coarse %	Medium %	Fine %	
SB1	Fine Sand	0.12	0.4	0.7	96.1	2.8
SB2	Fine Sand	0.12	2.0	2.2	91.3	4.5
SB3	Medium Sand	0.36	26.9	36.4	36.6	0.1
SB4	Coarse Sand	0.52	54.2	36.0	8.8	1.0
SB5	Fine Sand	0.11	6.7	10.5	68.0	14.8
SB6	Fine Sand	0.14	9.5	12.7	71.7	6.1
SB7	Fine Sand	0.25	18.2	18.7	56.1	7.0
SB8	Medium Sand	0.28	16.5	25.7	57.7	0.1
SB9	Fine Sand	0.16	3.7	6.7	85.9	3.7
SB10	Coarse Sand	0.60	69.2	24.4	6.3	0.1

Table 3.4. Seabed sediment quality results

Station	Total Organic Carbon (%)	Total Nitrogen (µg/g)	Total Phosphorus (µg/g)	Calcium Carbonate (%)
SB1	0.67	324	47.0	7.8
SB2	0.86	410	32.9	9.3
SB3	1.07	516	27.0	9.5
SB4	0.34	248	35.3	6.8
SB5	1.29	618	65.0	9.3
SB6	1.27	614	46.5	10.5
SB7	1.62	780	77.4	8.0
SB8	1.22	584	32.4	8.4
SB9	0.98	472	32.1	13.3
SB10	0.18	105	26.8	7.4

Contd.

Station	Cadmium (µg/g)	Chromium (µg/g)	Lead (µg/g)	Zinc (µg/g)	Mercury (µg/g)	Strontium (µg/g)	Phenols (µg/g)
SB1	<0.1	29.4	2.9	39.8	<0.1	50.2	<0.5
SB2	<0.1	30.3	3.0	34.9	<0.1	51.7	<0.5
SB3	<0.1	25.9	3.2	34.7	<0.1	51.5	<0.5
SB4	<0.1	26.0	3.3	32.4	<0.1	46.0	<0.5
SB5	<0.1	31.0	3.8	33.6	<0.1	56.0	<0.5
SB6	<0.1	37.5	4.1	38.0	<0.1	54.0	<0.5
SB7	<0.1	26.1	3.4	35.8	<0.1	55.3	<0.5
SB8	<0.1	28.5	3.5	28.3	<0.1	59.8	<0.5
SB9	<0.1	27.6	3.6	27.2	<0.1	59.2	<0.5
SB10	<0.1	25.3	4.0	26.0	<0.1	59.0	<0.5

Table 3.5. Primary productivity

Station	Gross Photosynthetic activity	Net Photosynthetic activity	Primary production mgC/m³/day
SS1	1.3	0.5	390
SS2	1.5	0.6	450
SS3	1.5	0.5	450
SS4	1.6	0.7	480
SS5	1.5	0.6	450
SS6	1.4	0.4	420
SS7	1.5	0.5	450
SS8	1.7	0.8	510
SS9	1.5	0.6	450
SS10	1.4	0.5	420
Average			447

Table 3.6. Phytoplankton species wise composition*

Sl. No.	Genus / Species	Station									
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
Phylum: Heterokontophyta											
Class: Bacillariophyceae (Diatoms)											
Order: Centrales											
1	*Bacteriastrum delicatulum*	+	-	+	+	+	-	+	+	-	+
2	*Bacteriastrum hyalinum*	+	+	-	+	+	+	+	-	+	+
3	*Chaetoceros* sp.	-	+	+	-	+	-	+	+	-	+
4	*Chaetoceros affinis*	-	+	+	-	+	-	+	+	+	-
5	*Chaetoceros compressus*	+	-	+	+	+	+	-	+	+	+
6	*Chaetoceros decipiens*	+	+	-	+	+	-	+	+	+	+
7	*Chaetoceros diversus*	-	+	+	-	-	+	+	-	+	-
8	*Chaetoceros lorenzianus*	+	+	+	+	+	+	+	+	+	+
9	*Corethron criophilum*	-	+	+	-	+	-	-	+	-	+
10	*Coscinodiscus* sp.	+	-	+	-	+	-	+	+	+	+
11	*Coscinodiscus centralis*	+	+	-	+	-	+	+	-	-	+
12	*Coscinodiscus excentricus*	+	+	+	+	+	+	+	+	+	+
13	*Coscinodiscus marginatus*	-	+	+	-	+	-	+	+	+	+
14	*Coscinodiscus radiatus*	+	-	+	+	-	+	+	-	+	-
15	*Cyclotella* sp.	-	+	-	+	+	-	+	+	-	+
16	*Ditylum brightwellii*	+	-	+	-	+	+	+	+	+	-
17	*Guinardia* sp.	+	+	+	+	-	+	+	+	+	+
18	*Hemidiscus sinensis*	-	+	+	-	+	+	-	+	+	+
19	*Hemiaulus* sp.	+	-	+	+	+	-	+	+	+	+
20	*Leptocylindrus* sp.	-	+	-	+	-	+	-	-	+	-
21	*Leptocylindrus minimus*	+	-	+	+	+	-	+	+	+	+
22	*Lauderia annulata*	-	+	-	+	-	+	+	+	-	+
23	*Odontella mobiliensis*	+	+	+	+	+	+	+	+	+	+
24	*Odontella sinensis*	-	+	+	-	+	+	+	+	+	+
25	*Planktoniella sol*	+	-	+	+	-	+	+	+	+	-
26	*Rhizosolenia* sp.	-	+	-	+	+	+	-	+	+	+
27	*Rhizosolenia cylindrus*	+	+	+	+	+	+	+	+	+	+
28	*Rhizosolenia imbricata*	-	+	-	+	+	+	-	+	+	+
29	*Rhizosolenia styliformis*	+	-	+	-	+	-	+	+	-	+
30	*Surirella scalaris*	+	+	-	+	-	-	+	-	+	+
31	*Skeletonema costatum*	+	+	+	-	+	+	-	+	+	+
32	*Stephanopyxis* sp.	-	+	-	+	+	-	+	+	-	-
33	*Thalassiosira* sp.	-	+	+	+	+	-	+	+	-	-

Sl. No.	Genus / Species	Station									
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
34	*Triceratium* sp.	+	-	+	+	+	+	-	+	+	+
Order: Pennales											
35	*Amphora* sp.	+	-	+	+	-	+	-	-	+	+
36	*Asterionella japonica*	+	+	+	-	+	-	+	+	-	+
37	*Bacillaria paradoxa*	+	-	+	+	+	+	+	-	+	-
38	*Climacosphenia moniligera*	-	+	+	-	-	+	-	+	+	-
39	*Campylodiscus* sp.	+	+	-	+	+	-	+	+	-	+
40	*Entomoneis* sp.	+	-	+	+	+	+	+	-	+	+
41	*Grammatophora undulata*	-	+	+	-	-	+	+	+	-	+
42	*Navicula* sp.	+	+	+	+	+	-	+	+	+	+
43	*Navicula hennedyi*	-	+	-	+	-	+	-	+	-	-
44	*Nitzschia* sp.	+	-	+	-	+	-	+	+	+	-
45	*Nitzschia longissima*	-	+	+	+	-	+	+	-	+	+
46	*Nitzschia seriata*	+	-	+	+	-	+	-	+	+	+
47	*Pleurosigma directum*	+	+	+	+	+	+	+	+	+	+
48	*Pleurosigma elongatum*	-	+	-	+	+	+	-	+	+	-
49	*Thalassionema frauenfeldii*	+	+	+	-	+	-	+	+	-	+
50	*Thalassionema nitzschioides*	+	+	-	+	+	+	+	-	+	+
51	*Thalassiothrix longissima*	+	-	+	+	-	+	+	+	+	-
Class: Dinophyceae (Dinoflagellates)											
52	*Ceratium lineatum*	-	+	-	+	-	+	+	+	-	+
53	*Ceratium furca*	+	+	-	+	+	+	-	+	+	+
54	*Ceratium fusus*	+	+	+	+	+	+	+	+	+	+
55	*Ceratium macroceros*	-	+	+	-	+	-	+	+	-	+
56	*Ceratium tripos*	+	-	+	+	-	+	-	+	+	-
57	*Dinophysis* sp.	+	-	+	+	-	+	+	-	+	-
58	*Dinophysis caudata*	+	+	-	+	+	-	-	+	-	+
59	*Dinophysis hastata*	-	+	+	-	+	+	+	-	+	-
60	*Dinophysis schuttii*	+	+	-	+	-	-	+	+	-	+
61	*Gonyaulax* sp.	+	-	+	+	+	-	-	+	+	-
62	*Lingulodinium polyedra*	-	+	+	+	+	+	+	-	+	+
63	*Noctiluca* sp.	+	+	+	+	-	+	+	+	+	+
64	*Protoperidinium* sp.	-	+	-	+	+	-	+	-	+	-
65	*Protoperidinium divergens*	+	+	+	-	+	+	-	+	+	+
66	*Protoperidinium oceanicum*	+	+	+	+	+	+	+	+	+	+
67	*Prorocentrum micans*	-	+	-	+	-	+	+	-	+	-
68	*Pyrophacus horologium*	+	-	+	-	+	-	+	+	-	+
69	*Pyrophacus steinii*	+	+	-	+	+	+	-	+	+	-
Class: Cyanophyceae (Blue greens)											
70	*Chlorella* sp.	+	+	+	+	-	-	+	+	+	+
71	*Trichodesmium erythraeum*	+	+	+	+	+	+	+	+	+	+
Total		46	51	50	51	49	45	52	55	52	50

*Net sample

Table 3.7. Numerical abundance* of Phytoplankton (cells/L)

Sl. No.	Genus / Species	Station										Total	%
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10		
Phylum: Heterokontophyta													
Class: Bacillariophyceae (Diatoms)													
Order: Centrales													
1	*Bacteriastrum delicatulum*	400	-	600	400	500	-	300	400	-	300	2900	1.20
2	*Bacteriastrum hyalinum*	500	400	-	400	300	400	500	-	400	400	3300	1.37
3	*Chaetoceros affinis*	-	300	400	-	400	-	500	400	300	-	2300	0.95
4	*Chaetoceros compressus*	200	-	300	400	400	400	-	500	400	500	3100	1.29
5	*Chaetoceros decipiens*	400	500	-	500	400	-	400	600	300	500	3600	1.49
6	*Chaetoceros diversus*	-	300	400	-	-	300	500	-	500	-	2000	0.83
7	*Chaetoceros lorenzianus*	800	1000	1400	1800	1200	600	1400	1800	1600	1400	13000	5.39
8	*Corethron criophilum*	-	300	400	-	400	-	-	400	-	400	1900	0.79
9	*Coscinodiscus* sp.	400	-	500	-	400	-	500	400	500	600	3300	1.37
10	*Coscinodiscus centralis*	500	600	-	400	-	500	400	-	-	400	2800	1.16
11	*Coscinodiscus excentricus*	700	800	1000	1200	800	700	1200	1400	1300	1200	10300	4.27
12	*Coscinodiscus marginatus*	-	300	400	-	500	-	300	400	400	300	2600	1.08
13	*Coscinodiscus radiatus*	500	-	300	400	-	500	400	-	500	-	2600	1.08
14	*Cyclotella* sp.	-	400	-	500	400	0	400	500	-	400	2600	1.08
15	*Ditylum brightwellii*	400	0	400	-	400	400	500	400	500	-	3000	1.24
16	*Guinardia* sp.	300	400	-	500	-	400	500	500	-	400	3000	1.24
17	*Hemidiscus sinensis*	-	400	500	-	400	500	-	400	400	500	3100	1.29
18	*Hemiaulus* sp.	400	-	400	500	400	-	500	600	500	600	3900	1.62
19	*Leptocylindrus minimus*	400	-	500	400	500	-	600	700	600	500	4200	1.74
20	*Lauderia annulata*	-	400	-	400	-	400	500	600	-	500	2800	1.16
21	*Odontella mobiliensis*	500	600	800	600	500	600	700	600	500	700	6100	2.53
22	*Odontella sinensis*	-	500	400	-	500	400	600	700	600	500	4200	1.74
23	*Planktoniella sol*	400	-	500	600	-	400	500	600	500	-	3500	1.45
24	*Rhizosolenia* sp.	-	500	-	600	700	800	-	500	700	600	4400	1.82
25	*Rhizosolenia cylindrus*	800	1000	1200	800	700	800	1400	1500	1400	1300	10900	4.52
26	*Rhizosolenia imbricata*	-	800	-	600	500	700	-	600	500	400	4100	1.70
27	*Rhizosolenia styliformis*	500	-	600	-	400	-	500	600	-	700	3300	1.37
28	*Surirella scalaris*	400	300	-	400	-	-	400	-	400	300	2200	0.91
29	*Skeletonema costatum*	600	500	500	-	400	500	-	500	600	500	4100	1.70
30	*Thalassiosira* sp.	-	500	400	500	600	-	500	600	-	-	3100	1.29
31	*Triceratium* sp.	500	-	600	500	400	400	-	500	600	500	4000	1.66

Sl. No.	Genus / Species	Station										Total	%
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10		
Order: Pennales													
32	*Asterionella japonica*	500	600	400	-	500	-	500	400	-	400	3300	1.37
33	*Bacillaria paradoxa*	400	-	600	400	600	400	600	-	500	-	3500	1.45
34	*Climacosphenia moniligera*	-	400	500	-	-	300	-	500	600	-	2300	0.95
35	*Campylodiscus* sp.	500	400	-	500	600	-	500	600	500	400	4000	1.66
36	*Entomoneis* sp.	400	-	600	400	500	400	300	-	500	400	3500	1.45
37	*Grammatophora undulata*	-	400	400	-	-	400	500	400	-	300	2400	1.00
38	*Navicula* sp.	300	500	500	500	400	-	600	500	600	500	4400	1.82
39	*Nitzschia seriata*	400	-	600	400	-	500	-	600	700	600	3800	1.58
40	*Pleurosigma directum*	800	600	700	500	400	500	800	1000	1100	800	7200	2.99
41	*Pleurosigma elongatum*	-	400	-	500	500	400	-	600	500	-	2900	1.20
42	*Thalassionema frauenfeldii*	600	500	500	-	400	-	500	700	-	600	3800	1.58
43	*Thalassionema nitzschioides*	500	400	-	400	500	500	600	-	500	400	3800	1.58
44	*Thalassiothrix longissima*	400	-	600	500	-	400	500	500	300	-	3200	1.33
Class: Dinophyceae (Dinoflagellates)													
45	*Ceratium furca*	500	400	-	500	400	300	-	500	400	300	3300	1.37
46	*Ceratium fusus*	600	500	700	600	500	600	500	800	700	500	6000	2.49
47	*Ceratium macroceros*	-	400	500	-	400	-	400	500	-	400	2600	1.08
48	*Dinophysis* sp.	400	-	600	400	-	500	500	-	400	-	2800	1.16
49	*Dinophysis caudate*	500	400	-	500	400	-	-	500	300	400	3000	1.24
50	*Dinophysis hastata*	-	500	500	-	500	500	500	-	400	-	2900	1.20
51	*Dinophysis schuttii*	300	400	-	500	-	-	400	500	-	400	2500	1.04
52	*Gonyaulax* sp.	400	-	500	-	500	-	-	600	400	-	2400	1.00
53	*Lingulodinium polyedra*	-	500	500	600	400	600	600	-	500	500	4200	1.74
54	*Noctiluca* sp.	400	500	600	500	-	500	400	700	600	400	4600	1.91
55	*Protoperidinium* sp.	-	400	-	500	600	-	600	-	500	-	2600	1.08
56	*Protoperidinium divergens*	300	500	500	-	500	500	-	600	400	400	3700	1.53
57	*Protoperidinium oceanicum*	600	700	700	700	600	600	800	900	600	500	6700	2.78
58	*Prorocentrum micans*	-	400	-	400	-	500	600	-	500	-	2400	1.00
59	*Pyrophacus horologium*	400	-	600	-	500	-	500	500	-	400	2900	1.20
60	*Pyrophacus steinii*	500	400	-	400	300	600	-	400	400	-	3000	1.24
Class: Cyanophyceae (Blue greens)													
61	*Chlorella* sp.	500	700	600	400	-	-	400	600	500	600	4300	1.78
62	*Trichodesmium erythraeum*	800	600	800	600	500	700	800	800	600	700	6900	2.86
Population (cells/L)		20600	22300	25000	23100	22600	19400	26400	30400	27000	24300	241100	100
No. of species		43	45	44	43	46	39	47	49	48	46	-	-

* Bottle sample

Table 3.8. Numerical abundance of Zooplankton (Nos./100 m^3)

Sl. No.	Genus / Species	Station										Total	%
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10		
Phylum: Protozoa													
Order: Tintinnids (Ciliate groups)													
1	*Dictyocysta* sp.	2817	-	2903	4280	-	-	2813	1468	2829	1387	18496	1.42
2	*Eutintinnus tenuis*	-	1412	-	1427	1362	-	1406	-	1414	-	7022	0.54
3	*Favella* sp.	1408	-	1451	-	2725	1337	-	1468	2829	1387	12606	0.97
4	*Tintinnopsis* sp.	-	1412	-	1427	-	-	2813	-	1414	2774	9840	0.75
Phylum: Cnidaria													
5	*Diphyes* sp.	2817	-	2903	1427	1362	2674	1406	-	1414	-	14003	1.07
Phylum: Mollusca													
6	Bivalve veliger larvae	2817	-	1451	-	1362	-	1406	-	1414	-	8452	0.65
7	Gastropod veliger larvae	-	1412	-	2853	-	1337	-	1468	-	1387	8458	0.65
Phylum: Annelida													
Class: Polychaeta													
8	Polychaete larvae	1408	-	1451	1427	1362	-	1406	1468	-	1387	9911	0.76
Subphylum: Crustacea													
Suborder: Cladocera													
9	*Evadne* sp.	1408	1412	-	2853	1362	-	2813	-	1414	-	11264	0.86
Class: Copepoda													
Order: Calanoida													
10	*Acartia danae*	2817	-	4354	-	5450	2674	5626	-	4243	2774	27938	2.14
11	*Acaria spinicauda*	11268	14124	11611	9986	8174	5348	14065	17621	11315	8322	111834	8.58
12	*Acrocalanus* sp.	-	5650	2903	-	4087	-	5626	-	4243	2774	25283	1.94
13	*Acrocalanus gracilis*	11268	8475	5806	7133	8174	5348	9845	8811	11315	6935	83108	6.38
14	*Calanopia elliptica*	8451	5650	-	2853	-	2674	5626	4405	2829	-	32487	2.49
15	*Canthocalanus pauper*	5634	-	7257	8559	5450	-	7032	5874	-	4161	43966	3.37
16	*Centropages furcatus*	-	5650	7257	4280	5450	8021	5626	-	5658	5548	47489	3.64
17	*Centropages tenuiremis*	4225	-	2903	-	4087	4011	-	4405	2829	-	22460	1.72
18	*Clausocalanus* sp.	5634	-	-	5706	-	2674	5626	-	-	4161	23801	1.83
19	*Clausocalanus minor*	7042	8475	7257	8559	9537	5348	8439	11747	9901	8322	84626	6.49
20	*Eucalanus* sp.	-	2825	4354	5706	4087	2674	-	4405	5658	4161	33870	2.60
21	*Eucalanus attenuatus*	-	-	2903	1427	2725	2674	2813	-	2829	1387	16757	1.29
22	*Labidocera* sp.	2817	4237	-	4280	4087	5348	-	2937	1414	-	25120	1.93
23	*Paracalanus parvus*	7042	8475	10160	7133	5450	6684	11252	8811	11315	8322	84643	6.49
24	*Paracalanus aculeatus*	-	2825	4354	-	4087	-	5626	7342	-	5548	29782	2.28

Sl. No.	Genus / Species	Station										Total	%
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10		
25	*Pontellina plumata*	2817	-	2903	-	2725	4011	-	4405	5658	-	22518	1.73
26	*Temora discaudata*	-	5650	-	4280	-	2674	5626	-	4243	5548	28020	2.15
27	*Temora turbinata*	7042	7062	10160	7133	4087	2674	9845	7342	8487	6935	70767	5.43
28	Copepod nauplii	-	1412	-	1427	-	1337	-	4405	-	4161	12742	0.98
Order: Cyclopoida													
29	*Oithona* sp.	-	2825	4354	7133	4087	-	-	7342	-	6935	32676	2.51
30	*Oithona brevicornis*	-	4237	7257	4280	-	2674	7032	-	5658	6935	38072	2.92
31	*Oithona nana*	7042	9887	11611	8559	10899	6684	8439	11747	9901	8322	93092	7.14
Sub- order: Harpacticoida													
32	*Euterpina acutifrons*	-	4237	1451	-	2725	1337	-	2937	2829	2774	18290	1.40
33	*Macrosetella* sp.	1408	1412	-	2853	1362	-	1406	2937	-	1387	12767	0.98
34	*Microsetella* sp.	-	-	1451	1427	-	1337	1406	-	2829	-	8450	0.65
Order: Poecilostomatoida													
35	*Corycaeus danae*	-	1412	-	2853	2725	2674	-	1468	2829	4161	18122	1.39
36	*Corycaeus catus*	1408	4237	2903	-	-	1337	2813	-	2829	1387	16914	1.30
37	*Copilia vitrea*	1408	-	1451	-	1362	-	1406	1468	1414	-	8512	0.65
38	*Oncaea venusta*	1408	2825	-	1427	1362	-	2813	1468	-	-	11304	0.87
Order: Decapoda													
39	Brachyuran zoea	-	1412	-	2853	1362	-	2813	-	2829	-	11270	0.86
40	Crustacean nauplii	1408	-	-	1427	-	-	1406	1468	-	1387	7097	0.54
41	Mysid larvae	-	1412	2903	-	1362	1337	-	1468	2829	-	11312	0.87
42	Euphausid larvae	2817	-	1451	1427	-	-	1406	-	1414	-	8516	0.65
43	*Lucifer* sp.	-	2825	-	1427	2725	1337	1406	-	-	2774	12493	0.96
Phylum: Chaetognatha													
44	*Sagitta* sp.	1408	1412	2903	1427	2725	2674	2813	1468	-	2774	19604	1.50
Phylum: Urochordata													
45	*Oikopleura* sp.	1408	-	1451	-	1362	-	2813	1468	2829	4161	15493	1.19
Eggs and Larvae													
46	Fish eggs	-	2825	4354	2853	2725	2674	4219	2937	-	2774	25361	1.95
47	Fish larvae	1408	-	1451	1427	-	1337	-	-	1414	0	7038	0.54
Population (Nos./100m^3)		109859	127119	139332	135521	123978	94920	158931	136564	144272	133148	1303644	100
Biomass (ml/100m^3)		57.7	59.3	65.4	62.8	58.6	54.8	80.1	67.5	73.5	63.8	-	-
No. of species		28	30	32	35	34	30	35	29	34	32	-	-

Table 3.9. Sub-tidal and intertidal benthic population

Sl. No.	Groups	Sub tidal benthos (Nos./m²)										Inter tidal benthos (Nos./m²)		
		SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10	IB1	IB2	IB3
Phylum: Annelida														
Class: Polychaeta														
1	*Ancistrosyllis parva*	80	40	-	120	-	-	80	40	-	80	45	60	60
2	*Armandia* sp.	-	80	40	-	80	40	-	40	40	120	60	75	60
3	*Cossura* sp.	80	-	-	80	40	-	40	-	40	-	-	-	-
4	*Capitella* sp.	-	80	40	-	-	40	-	-	40	-	30	60	45
5	*Cirratulus* sp.	40	80	-	40	-	-	40	40	-	40	-	-	-
6	*Dorvillea gardineri*	-	120	80	0	80	40	-	80	40	-	-	-	-
7	*Glycera* sp.	40	-	-	80	40	40	-	-	40	-	-	-	-
8	*Lumbrineris aberrans*	80	-	80	40	-	-	40	-	-	80	45	60	60
9	*Nereis* sp.	-	40	-	40	-	80	-	40	-	-	60	75	75
10	*Perinereis* sp.	-	-	80	-	80	-	40	-	40	-	75	45	45
11	*Pisione indica*	120	-	160	80	-	40	-	-	-	40	60	60	75
12	*Prionospio pinnata*	-	80	-	-	40	-	80	40	-	-	75	45	60
Phylum: Arthropoda														
13	Amphipods	40	80	80	-	80	-	80	-	80	-	45	75	105
14	*Emerita asiatica*	-	-	-	-	-	-	-	-	-	-	75	90	60
15	Isopods	40	80	40	-	40	-	120	40	-	80	45	60	30
16	*Leucosia* sp.	-	40	-	40	-	40	-	80	40	-	-	-	-
Phylum: Mollusca														
Class: Gastropoda														
17	*Ancilla* sp.	80	-	40	-	80	-	40	-	80	-	-	-	-
18	*Cypraea* sp.	-	40	-	40	-	40	-	40	-	80	-	-	-
19	*Conus virgo*	40	-	40	-	40	-	40	-	-	40	-	-	-
20	*Lophiotoma* sp.	-	40	-	40	40	40	-	40	40	-	-	-	-
21	*Natica* sp.	80	-	40	-	-	40	-	-	-	-	30	45	30
Class: Bivalvia														
22	*Anadara granosa*	40	40	-	40	80	-	40	40	-	-	-	-	-
23	*Donax* sp.	-	40	40	-	40	40	-	-	-	80	15	45	30
24	*Sunetta* sp.	-	-	80	-	40	-	40	-	40	-	-	-	-
25	*Pholas orientalis*	40	-	40	-	-	80	-	-	-	-	-	-	-
26	*Trachycadium asiaticum*	-	40	-	80	40	-	-	80	-	40	-	-	-
27	*Volachlamys tranquebarica*	-	-	80	40	-	-	40	-	80	-	-	-	-

Sl. No.	Groups	Sub tidal benthos (Nos./m²)										Inter tidal benthos (Nos./m²)		
		SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10	IB1	IB2	IB3
Phylum: Chordata														
Order: Amphioxiformes														
28	*Amphioxus* sp.	80	-	80	-	40	80	40	80	120	80	-	-	-
Total		880	920	1040	760	880	640	760	680	720	760	660	795	735

Table 3.10. Bacterial population (x 10^3 CFU/ml) in surface water

Media	Type of Bacteria	Coastal waters									
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
Nut Agar	TVC	5.28	5.18	5.14	5.16	5.08	5.01	5.12	5.14	5.16	5.18
Mac Agar	TC	0.54	0.51	0.44	0.42	0.41	0.38	0.43	0.44	0.42	0.44
Mac Agar	FC	0.18	0.16	0.14	0.12	0.11	0.10	0.12	0.14	0.16	0.14
Mac Agar	ECLO	0.42	0.44	0.41	0.43	0.42	0.40	0.44	0.46	0.43	0.44
XLD Agar	SLO	0.14	0.16	0.17	0.15	0.13	0.11	0.15	0.16	0.15	0.17
TCBS Agar	VLO	0.42	0.42	0.44	0.40	0.38	0.36	0.41	0.42	0.41	0.43
CET Agar	PALO	0.02	0.03	0.01	0.02	0.01	0.01	0.02	0.01	0.02	0.02

Table 3.11. Bacterial population (x 10^4 CFU/g) in seabed sediment

Media	Type of Bacteria	Seabed sediment									
		SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10
Nut Agar	TVC	5.31	5.30	5.26	5.28	5.18	5.16	5.24	5.26	5.30	5.28
Mac Agar	TC	0.58	0.60	0.52	0.54	0.46	0.40	0.46	0.47	0.44	0.46
Mac Agar	FC	0.21	0.19	0.17	0.16	0.14	0.12	0.14	0.17	0.19	0.18
Mac Agar	ECLO	0.50	0.52	0.48	0.52	0.46	0.48	0.52	0.50	0.52	0.46
XLD Agar	SLO	0.19	0.21	0.22	0.18	0.19	0.17	0.18	0.2	0.18	0.21
TCBS Agar	VLO	0.46	0.45	0.48	0.46	0.41	0.40	0.43	0.45	0.42	0.45
CET Agar	PALO	0.03	0.05	0.03	0.02	0.04	0.02	0.03	0.04	0.03	0.02

TVC -Total Viable Counts; TC- Total Coliforms; FC- faecal coliforms; ECLO-*Escherichia coli* like organisms; SLO-*Salmonella* like organisms; VLO-*Vibrio* like organisms; PALO- *Pseudomonas aeruginosa* like organisms.

Table 3.12. Details of fishing villages and fisherfolk population in Nakkapalli taluk

Sl. No.	Name of Village	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
1	Amalapuram	199	199	199	672
2	Bangarampeta	495	495	495	1979
3	Boyapadu	230	230	230	1034
4	Chinatheenerla	330	330	330	1234
5	Donevaniri Laxmipuram	300	300	270	898
6	Dondavaka	285	285	285	991
7	Pedatheenerla	600	600	600	2354
8	Rajayyapeta	294	294	293	1233

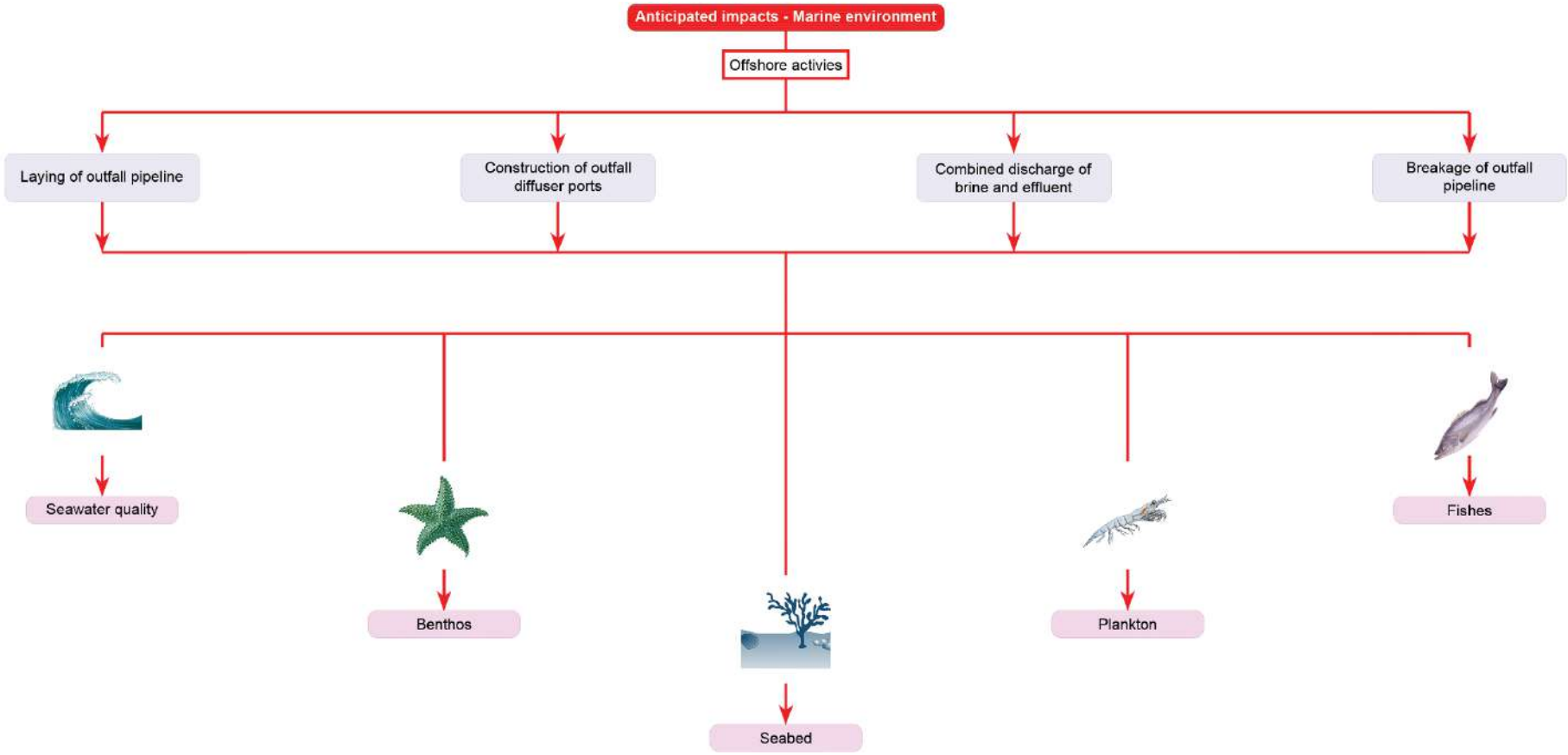


4. IMPACT ASSESSMENT AND MITIGATION MEASURES

Identification and prediction of impact will give the extent to which the proposed combined outfall pipeline may alter the existing environment. This will lead to relevant mitigation measures which have to be followed to minimize the adverse impacts on the environment. The project activities are planned only on marine segments. The laying of outfall pipeline will take place only on marine environment. Hence there is no impact on terrestrial environment.

Based on the activities involved in construction and operation phases, various anticipated impacts are listed below.

i) Impact due to laying of outfall pipelines
ii) Impact due to construction of outfall diffuser ports
iii) Impact due to combined discharge (brine reject & treated effluent)
iv) Impact on planktons
v) Impact on benthos
vi) Impact on fish and fisheries
vii) Impact on sand dunes
viii) Impact on Ecologically Sensitive Areas
ix) Impact due to breakage of pipeline

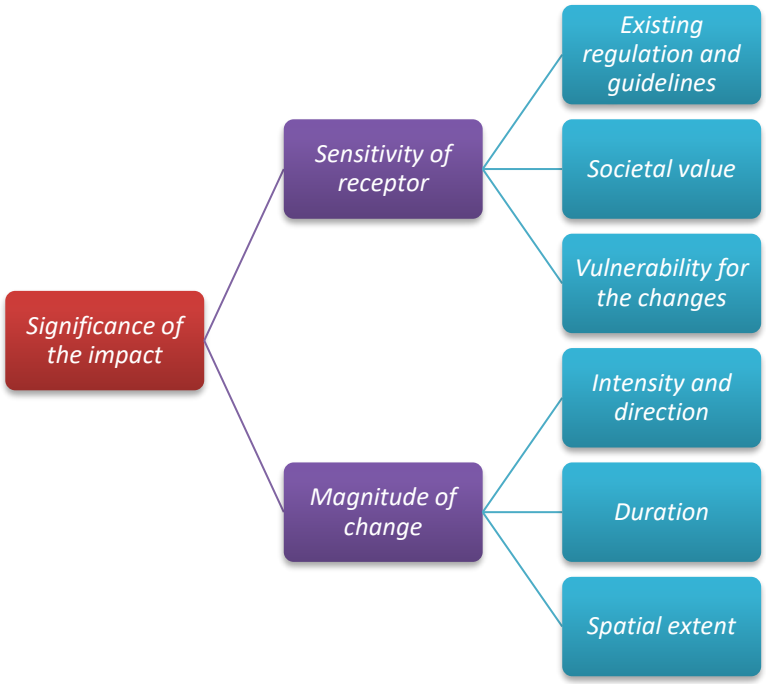

Anticipated impacts - Marine environment
Offshore activies
Laying of outfall pipeline
Construction of outfall diffuser ports
Combined discharge of brine and effluent
Breakage of outfall pipeline
Seawater quality
Benthos
Seabed
Plankton
Fishes

	Construction phase			Operation phase	
	Operation of machines	Excavation /Trenching	Laying of outfall pipeline & diffuser ports	Combined discharge of brine reject & treated effluent	Breakage of Pipeline
Physical Impacts					
Seawater quality	🟢	🟢	🟡	🟢	🟢
Seabed sediment quality	🟢	🟢	🟡	🟢	🟢
Impacts on Biology/Marine Ecology					
Plankton	🟢	🟡	🟡	🟢	🟢
Benthos	🟢	🟡	🟡	🟢	🟢
Fish and Fisheries	🟢	🟢	🟢	🟢	🟢

Significance of Impact				
	High	🔴	Low	🟢
	Medium	🟡	No Impact	○

4.1 Impacts and mitigation measures

Impact predictions help to investigate negative or positive influences an activity can have on different components of the surrounding environment by studying its spatial and temporal extent, along with the understanding of its severity and duration. The emerging information subsequently can be objectively utilized to suggest effective mitigation measures so that the predicted adverse impact can be eliminated or minimized. Assessment of significance of impacts for this project is derived.



Components of impact significance

4.1.1 Impact due to laying of outfall pipeline

The outfall pipeline installation corridor is identified based on the pre-lay survey including bathymetry, geology of seabed, tides, currents, waves and dispersion of brine & effluent during discharge. From these detailed investigations it is assessed that the pipeline corridor is clear and safe for installation with the absence of obstacles on the seabed and pipeline can be laid with minor seabed intervention.

However, laying of outfall pipelines during the construction phase will cause disturbance to the foreshore and the seabed, limited to the pipeline corridor area. The major impact will be on the benthic habitats which may be destroyed or subjected to considerable stress during the installation process.

In general, individual pipeline sections are usually fabricated by the supplier and transported to the site where they are subsequently joined together into long strings. This will require a sufficiently large and relatively flat onshore area where the pipes can be stockpiled and prepared. The project site area itself can be used for this purpose and the impacts on marine environment due to construction of pipelines are considerably minimized as this activity will be done at a fair distance inland from the high tide line.

Depending on the oceanographic conditions of site, anchor blocks are placed around the pipe to provide stability on the seabed. The pipe sections are dragged down the shore by bulldozer and capped at either end before being floated out to the sea by means of a tug. The air is released from the pipe, and as it fills with water it sinks to the bottom. To avoid exposure on the beach and nearshore area, and to avoid damage by wave forces in the surf-zone, the pipeline will be buried below the seabed.

The pipe is placed in the excavated trench and subsequently buried by earth-moving machinery using excavated sediment. Further at the offshore, excavation of trench is done, pipeline laid and buried in such a way that the top of the concrete block is 1 m below the seabed. The pipe-laying activity may be spread over a few months during which the disturbance to the seabed within the corridor is expected.

Possible impacts

- Macrofauna and coastal birds: Although the activities on the intertidal beach will be localized and confined to a hundred meters from the construction site, the beach sediments limited to the corridor will be turned over in the process and the associated macrofauna will be eliminated. Any shorebirds feeding and/or roosting in the area will also be disturbed and displaced for the duration of construction activities. However, this is considered to be a reversible impact and macrofauna would re-establish over a period of time after the constructions are completed.

- Plankton, benthos and algae: The excavation process will result in increased suspended sediments in the water column, potentially affecting light penetration and thus phytoplankton productivity and algal growth. The impact of the sediment plume, however, is expected to be relatively localized within 100 m distance and of short duration (only for the period of the trench excavation). Settlement of the suspended material on adjacent areas of seabed may result in smothering of the resident biota. However, some mobile benthic animals are capable of migrating vertically through more than 30 cm of deposited sediment. The biota that inhabited the excavated sediments will most likely perish. Once the pipeline has been laid and the trench is filled back, the affected seabed will be recolonized by the benthic macrofauna.

- Fishes: The main impact on fishes during construction will be the avoidance reaction of areas where sediment is re-suspended. The impact is reversible, local and short-term. The impacts will not reach herring spawning sites and are not likely to have a significant effect on pelagic sprat eggs.

- Organic matter and nutrients: The release of organic rich sediments during excavation can result in the localized removal of oxygen from the surrounding water. This may lead to the suffocation of marine animals and plants within the localized area. However, the removal of oxygen from water is only temporary, as tidal exchange would quickly replenish the oxygen supply. Therefore, in open coastal water excavation, the removal of oxygen has little effect on marine life. Moreover, the seabed sediment of the study area is low in organic carbon ruling out such a possibility.

Mitigation measures

Mitigation measures will include rehabilitation of the disturbed area soon following the completion of construction, by removing all temporary structures on beach / intertidal zone, clearing the area

of discarded and surplus items such as pipes, ropes, concrete blocks etc. and reshaping the beach to its original contours. Other steps taken to minimize the impact are as follows:

- Laying operation and barricading of water across surf zone will be done in the shortest duration say within 2 months.
- The technique adopted will not unduly stir up the bed material in the water body while laying of pipelines.
- During pipeline construction, full survey capacity will be available to perform any ad-hoc surveys, e.g., monitoring the pipeline touchdown point.
- Special attention will be given to nearshore beach crossings where currents and breaking waves may prevail. To avoid exposure on the beach and nearshore area, and to avoid damage by wave forces in the surf-zone, the pipeline will be buried below the scour level in the seabed with sufficient top sediment cover.
- Excavation will be carried out in a controlled manner and confined to the agreed pipeline corridor which will be properly demarcated. Fallout of activities beyond the corridor will be avoided.
- No drilling/blasting will be ensured.
- The excavated material will be used as back fill for burying the pipeline in the trench.
- Net enclosures will be considered if turbidity of high intensity persists while pipe laying.
- Monitoring of turbidity, pH and DO; the easily measurable parameters using in-situ probes, in the water column will be conducted, if necessary, in order to assess the rise in concentration due to excavation and the activity will be spaced accordingly.

Significance of impact

The impacts of construction on the seabed/seawater/ecology will be low in terms of magnitude and extent due to the limited area required for the pipeline laying. The duration of the impact will be short, reversible as the most significant impacts will be restricted to the pipeline corridor. The magnitude of change is assessed as low.

4.1.2 Impact due to outfall diffuser

Possible impacts

Presence of outfall diffuser in the sea can potentially cause restriction to the fishing using drift nets and hindrance to the boat movement.

Mitigation measures

- A marker buoy will be installed close to the outfall point as per the norms of the Directorate General of Lighthouses and Lightships. This will also help boats to avoid collision while en-route.

Significance of impact

No major threat to marine environment due to presence of outfall pipeline in the sea is anticipated. Hence, significance of impact is predicted as low.

4.1.3 Impact due to combined discharge of brine reject & treated effluent

Possible impacts

Brine waste of 10 MLD will be discharged into the sea at the proposed outfall location. Discharge of brine can have marine environmental impacts on coastal water quality, seabed quality and biological impacts due to its elevated salinity level. A Maximum salinity increase of 23 PSU from the ambient salinity of 35 PSU is envisaged from the proposed desalination operation. The effect of brine discharge on different biotic community living in the discharge area will vary depending on the nature of concentrate and dispersion pattern. Some organisms are tolerant to salinity increase of 10 PSU whereas some are sensitive to elevation by 3 to 4 PSU.

Similarly, characteristics of treated effluent is an important factor governing the occurrence and metabolic activity of the marine organism. The intensity of impact depends on how soon the concentration gets diluted in the environment.

However due to combining brine reject and treated effluent, the concentration of the brine reject gets diluted and the intensity of the anticipated impacts will be found low. The effect of combined discharge is as follows:

i) *Water quality:* The brine discharge into the sea would initially raise the salinity of the seawater in the mixing zone. Effect of salinity changes present in a complex manner depending upon the corresponding changes in the dissolved oxygen content. The residual chlorine present in the return water would affect the marine life living in the mixing zone. Prolonged exposure of aquatic organism to chlorine at concentration as low as 0.01 mg/l (or even less to very sensitive species) can be toxic. The intensity of impact would depend on how soon the high saline water and residual chlorine concentration get diluted after release. Residual chlorine present in the brine reject can have synergistic effects on the flora and fauna of the receiving water.

   The release of raw and improperly treated wastewater with high organic load can cause depletion in DO level. Depletion of DO level below 2 mg/l will lead to death of marine community. High levels of BOD and COD can cause harm to aquatic life, especially fish. High concentrations of total dissolved solids may reduce water clarity, which contributes to a decrease in photosynthesis and lead to an increase in water temperature and pH alteration. Many aquatic organisms cannot survive in high temperatures.

ii) *Seabed sediment quality:* Potential impact on quality of seabed sediments depends on how the outfall discharge gets mixed with the seawater. Since, brine is denser than seawater, due to negative buoyancy brine may settle on the seabed causing increased salinity. Thus, it may affect the chemical characteristics of the seabed sediments below the mixing zone.

   Similarly, contaminants if present in the effluent would be adsorbed onto the seabed which is available in the location of release thereby enriching the bed sediment on settling. However, due to high tidal dispersion and efficient advection by strong currents can dilute

the contaminants to optimum desired levels. Hence an increase in the concentration of contaminants in the marine sediments to levels that cause harm to biota is unlikely.

iii) *Benthic communities:* As the benthic community is sedentary in nature, they will be affected by environmental changes more than the other communities. Like other animal population, they are also sensitive to the drastic changes in saline conditions, which may affect their body physiology. However, the combined outfall will be discharged complying the norms of APPCB which would be diluted sufficiently under the influence of currents at the release point. Thus, the impact on macrobenthic organisms due to release of combined outfall would be minimum.

iv) *Primary producer:* Change in seawater quality may affect the growth and survival of primary producer. Therefore, it is advisable that the combined outfall may be discharged at a location where maximum dilution takes place within a short time of discharge so that the detrimental effect can be kept to a minimum.

v) *Intertidal fauna:* In general, intertidal fauna are resistant to environmental changes to limited extents, but large variations may affect their metabolism. They are sensitive to any change in water quality. But in the present case, the combined outfall release site is so selected that such a possibility is unlikely.

vi) *Fish:* In general, the impact of the combined outfall discharge on the fishes is seen disturbing the breeding habitats. However, in the present scenario, the quality of the effluent is confined to the norms of APPCB, and also it attains ample dilution in shorter distance and hence the impact will be minimum.

Mitigation measures

Oceanography and geomorphology of the receiving seawater environment affect the fate of the plume and also determine the nature of the biological communities potentially affected by the discharge. Hence, prime task in mitigating the effects of combined outfall discharge is identification of suitable discharge location through bathymetry, geology of seabed, waves, currents and tides as well as the dispersion pattern after release.

These tasks are studied in detail as explained in **Chapter 7.2** to identify the combined discharge location.

i. Discharge strategies to achieve acceptable dispersion of the combined outfall discharge are the following:

- For effective dispersion, 5 nos. x 160 mm dia. diffuser ports with duckbill valves will be provided at the discharge point.
- Selection of discharge sites with high ambient mixing and advection will be considered.
- Discharge site without seabed undulation will be selected as suggested in the report by avoiding bathymetric depressions or barriers along the pipeline corridor and the diffuser location.
- Sufficient distance will be ensured between the seawater intake and brine outfall sites to avoid recirculation of brine in the intake.
- The discharge site will be located at a sufficient distance from the shore to ensure the combined outfall does not reach the shore and cause contamination.
- Minimum mixing zone/near field shall be verified at selected location using dispersion modelling.

- Marine discharge of combined outfall will comply with the APPCB standards.
- Regular monitoring of the discharge may be carried out by water sampling.

The criteria for selection of outfall location for appropriate brine dispersion after release to the sea are listed.

The selection of outfall location for marine discharge of combined outfall has to adhere the following norms.

Sl. No	Factors	Significance	Remarks
1	Waves	Smaller waves result in less mixing in bottom boundary layer of shoaling zone, weaker oscillatory vortices shed from discharge riser, weaker wave-induced currents, and consequently, less near-bottom dilution	Project site has wave dominant coast. Significant wave height may be 0.5 m to 2.0 m.
2	Currents	Weaker currents result in less advection and less offshore dilution	The current speed reaches upto 0.35 m/s in the project vicinity.
3	Tide levels	Lower tide levels result in less dilution volume in the nearshore and consequently lower dilution rates	Spring and neap tidal range of study area is 1.3 m and 0.4 m respectively which are significant.
4	Seabed	Seabed undulation, presence of shallow reefs etc. block dispersion pattern.	Major undulations or rocky outcrops are not present.

All the above factors support the identified outfall location so as to cause minimum impact on the marine environment.

ii) Multiport diffuser

Diffuser ports with 6" duckbill valves will be used to discharge the combined wastewater i.e., treated effluent and brine reject. The diffuser will have multiple ports of 5 nos. x 160 mm dia. The ports will be placed 1 to 2 m above the seafloor. The optimum port discharge would result in high exit velocity resulting in mixing of potential contaminants in the effluent to ambient levels with maximum dilution.

iii) Dispersion modelling

MIKE 21 HD-AD modelling study is conducted to verify the effectiveness of the outfall location in diluting and dispersing the 12.366 MLD combined outfall discharge to a satisfactory level. The outcome of this study has predicted a mixing zone of 190 m for fair weather - neap tide (worst case scenario).

Significance of impact

Marine vulnerability for change due to the combined outfall discharge is predicted as moderate considering the mitigation measures proposed. Magnitude of impact on marine environment due to brine environment is also assessed as moderate.

4.1.4 Impact on planktons

Possible impacts

- The impact on planktons can happen due to increase in turbidity during excavation for outfall pipeline.

- The impact on planktons during the operational phase can be due to discharge of combined outfall through the outfall diffuser.

Mitigation measures

- Excavation will be carried out in a controlled manner for outfall pipeline corridor.
- Excavation, laying of pipeline and refilling the trench will be carried out within a short time as planned and time overruns will be avoided.
- Monitoring on the turbidity, DO and pH in the water column will be carried out to and depending on the results, the work schedule will be modified.
- Appropriate screen will be provided at the entrance of the intake before connecting to the sump.

4.1.5 Impact on benthos

Possible impacts

- Benthos inhabiting the pipeline corridor will be largely eliminated due to excavation combined outfall pipeline.

- During the operation stage, benthos and seabed characteristics can be affected due to improper mixing of combined outfall discharge leading to settling of contaminants along the seabed.

Mitigation measures

- Excavation will be carried out in a controlled manner for outfall pipeline corridor taking care that the sediment outside the corridor area is not unduly disturbed.
- Excavation, laying of pipelines and refilling the trench will be carried out within a short time and as planned.
- Monitoring of turbidity, DO and pH in the water column will be conducted to record the water quality during excavation.

4.1.6 Impact on fishes and fisheries

Possible impacts

- The seabed disturbance will directly bear the impact on the water column and on the seabed. A zone of physical disturbance at either side of the pipeline will occur during the construction works (maximum of 100 m on either side of the pipeline corridor). Hence, during construction stage local impact on fishes are possible from trenching/pipe laying. Turbidity affects the movement of fish though it is less likely to be lethal. However, the impact is reversible, local and short-term.

- Impact on fishes in the mixing zone of combined outfall discharge.

The laying of outfall pipeline will have least bearing on the day to day life of the fisher folk. The outfall diffuser will be sitting on the sea floor and projecting above the sea floor. The outfall location will be marked with the marker buoy with lighted beacon so that the fishermen can avoid fishing in this zone.

Mitigation measures

- Fishes are known to move away from the areas of high turbulence and hence impact on them during construction stage is expected to be low. Nevertheless, turbidity control measures will be used if necessary and installation of pipeline during rough sea conditions will be avoided.

4.1.7 Impact on Ecologically Sensitive Areas

The coastline at project site is with wide sandy beach with formation of scattered coastal dunes, which do not support the growth of mangroves, seagrass and seaweeds and coral reefs. No sightings of endangered species and marine mammals are observed in the project coast and its surroundings. Also, the project region does not have any turtle nesting grounds, mudflats which are biologically active, salt marshes, Horse shoe crabs habitats, nesting grounds of birds, and areas or structures of archaeological importance & heritage sites.

Sand dunes are identified at 2.8 km east and 4 km west of LFP which are far away and does not have any direct nor indirect impact due to the proposed project activities during both construction and operation phases.

4.1.8 Impact due to breakage of pipeline

Possible impacts

- Pipeline can be damaged due to natural hazards like storm, earthquake, extreme waves, scouring on the foreshore and tsunami.

- It can also get damaged due to manmade causes like fishing, trawling and intentional damage. In case of any damage leading to breakage caused on the outfall pipeline, the brine water will gush out at shorter distance from the shoreline and would affect the marine environment.

Mitigation measures

- Necessary mitigation measures like immediately attending to the repair of the pipeline will be taken up.

- Necessary spares of pipeline segments with bends/Tees will be kept in ready stock within the plant. Divers with experience in salvation operation irrespective of sea condition will be contracted to be available if such an emergency arises.

4.2 Quantification of impact

Impact assessment study reveals that the impact due to the laying of the outfall pipeline is mainly limited to the marine environment. During pipeline laying, plankton, benthos, fishes etc. may be disturbed especially due to introduction of turbidity near the pipeline corridor. However, duration of impact due to construction activities will be short-lived as the most significant impact will be restricted to the pipeline corridor.

The impacts on the seabed will mainly be targeted at the pipeline construction phase. This is when fine fractions of the seabed sediment are suspended into the water column for a limited period of time and eventually in part may settle elsewhere. The suspension phase will, however, only last for a relatively short period of time, and the turbidity impact will not be very significant. Although there may be temporary impacts, the overall significance of the impacts during the construction and laying of the pipelines can be regarded as low.

To limit the impact of laying pipelines, outfall system with minimum entrainment and impingement are planned. Brine and effluent discharge location and the mode of release through a number of ports would ensure sufficient mixing/dilution of the effluent to minimize the impact on marine life during its operational phase.

Despite various initial impacts on the environment, the benefits due to this project outweigh such initial adverse impacts since the project would prove extremely beneficial for Hetero SEZ and non SEZ.

Quantification summary of impacts on the marine environment due to construction activities after considering the mitigation measures is summarized.

Effect	Factors of magnitude			Overall magnitude	Sensitivity/ vulnerability	Overall significance of impact
	Scale	Duration	Intensity			
Seabed						
Physical alteration due to pipe-laying and anchor handling	Local	Short term	Low	Low	Low	Low (reversible)
Water column						
Increase in turbidity by seabed intervention works	Local	Short term	Low	Low	Low	Low (reversible)
Increase in turbidity from pipe-laying and anchor handling	Local	Short term	Low	Low	Low	Low (reversible)
Release of contaminants due to seabed intervention works	-*	-	-	-	-	No impact/ Insignificant*

Effect	Factors of magnitude			Overall magnitude	Sensitivity/ vulnerability	Overall significance of impact
	Scale	Duration	Intensity			
Release of nutrients due to seabed intervention works	-	-	-	-	-	No impact/ Insignificant

**Contaminants absent in seabed sediment*
Short term - Effects occurring within construction phase
Local - Effects occurring mainly within or close proximity to the proposed desalination plant site

Quantification of impacts on the marine ecology due to construction and operational activities after considering the mitigation measures is summarized.

Effect	Factors of magnitude			Overall magnitude	Sensitivity/ vulnerability	Overall significance of impact
	Scale	Duration	Intensity			
Plankton						
Suspended matter	Local	Short term	Low-Moderate	Low	Medium	Moderate (reversible)
Brine and effluent discharge	Local	Long term	Low-Moderate	Moderate	Moderate	Moderate
Benthos						
Increase in turbidity pipe-laying	Local	Short term	Low	Low	Low	Low (reversible)
Physical loss of seabed habitats pipe-laying	Local	Short term	Low-Moderate	Low	Moderate	Moderate (reversible)
Brine and effluent discharge	Local	Long term	Low	Low	Low	Low
Fish						
Suspended matter	Local	Short term	Low	Low	Low	Low
Brine ad effluent discharge	Local	Long term	Low	Low	Low	Low
Environmental Sensitive Areas						
Nearshore disturbance (pre-lay activities) and laying of pipeline	-	-	-	-	-	No ESA in project site

Short term - Effects occurring within construction phase
Long term - Effects occurring during operation of desalination plant

4.3 Salient mitigation measures

- Any material storages should be away from the CRZ and are to be covered with tarpaulin.
- The dust generation if any should be controlled by sprinkling water.
- Groundwater should not be tapped for consumption and construction.

- Pipelines should be stockpiled within enclosed area. All fabrication should be restricted within the fenced fabrication yard located away from the CRZ.
- Laying of pipeline should not interfere with fishermen fiber boat beach landing areas.
- Pipelines with concrete blocks are to be totally buried both on land and below the seabed.
- Laying operation should be done within 2 months. Barricading across the surf zone should be avoid.
- Pipeline laying to be done with the assistance of good survey techniques to make record of the pre alignment of corridor and post alignment of the pipeline and to show the extent of burial.
- Lighted marker buoy is to be anchored near the outfall diffuser.
- Multiport diffusers of 5 nos. of each 160 mm dia. With duckbill valves are to be provided to ensure optimum dilution.
- The combined outfall discharge should comply within CPCB Marine discharge standards.
- The marine discharge has to be released only after monitoring by APPCB officer.
- Periodic monitoring has to be taken place for every 6 months at the discharge location.



5. ANALYSIS OF ALTERNATIVES

The proposed project is to replace existing outfall pipelines of brine reject and treated effluent into a combined outfall marine disposal pipeline for Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh.

The proposed project site consists of both SEZ and Non SEZ area. Also, the site is devoid of any ecological sensitivity, such as mangroves, corals, mudflats, salt marshes, turtle nesting ground, horseshoe crab habitat, sea grass beds, nesting ground for birds and heritage sites. Thus, the proposed project is picked through full review of the site, without leaving out any alternatives



6. ENVIRONMENTAL MONITORING PROGRAM

The primary objective of post-project monitoring program is to develop site specific monitoring plan for environmental parameters likely to be affected by the proposed project activity. Post-project monitoring will be undertaken to determine the environmental effects if any, of operational activities, and secondarily to increase understanding of cause effect relationships between project activity and environmental change.

A well framed environment monitoring program would also aid in assessing the effectiveness of implemented mitigation measures and for updating mitigation measures if necessary. A periodic review of post project monitoring program will be conducted by the Environment Management Cell (EMC) to identify the effectiveness of mitigation measures suggested in this report and subsequently implemented.

The Environment Management Cell (EMC) will be responsible for conducting environment monitoring, compilation and review of monitoring data, filling up the statutory forms/returns, record maintenance on hazardous waste, environment awareness activities, submission of compliance report to the statutory authorities.

6.1 Post Project Monitoring Program

Monitoring program is suggested to identify the variation in the environmental parameters due to the operation of the desalination plant. Monitoring program will be undertaken during the construction and the operational phases of the project, at periodic intervals. Frequency of monitoring after a period depends on the output of monitoring results in the initial years of operation. The monitoring will be organized with qualified and experienced environmental team. Standard procedure will be followed in sample collection and analysis.

Assessment shows that, the impact due to the operation of the desalination plant and discharge of brine reject will be mainly on the local marine environment. Therefore, special attention will be given to the marine environment during post project monitoring. Half yearly monitoring of seawater quality and marine ecology will be conducted near intake, outfall and in immediate vicinity. Based on outcome of monitoring further program can be taken up in consultation with APPCB. The parameters to be monitored during the post project monitoring are listed below.

6.2 Parameters to be monitored

Seawater quality: Sampling will be carried out at 3 stations. Monitoring location will cover proposed outfall location and 500 m on either side of outfall location. The parameters which are to be analysed are: pH, turbidity, salinity, chloride, dissolved oxygen, BOD, residual chloride, nitrate, nitrite and ammonia, phosphate and pathogenic bacteria.

Seabed sediment quality: Sampling will be carried out at 3 stations. The parameters which are to be analysed are: total organic carbon, total phosphorus, total nitrogen, cadmium, mercury, lead, chromium and phenols.

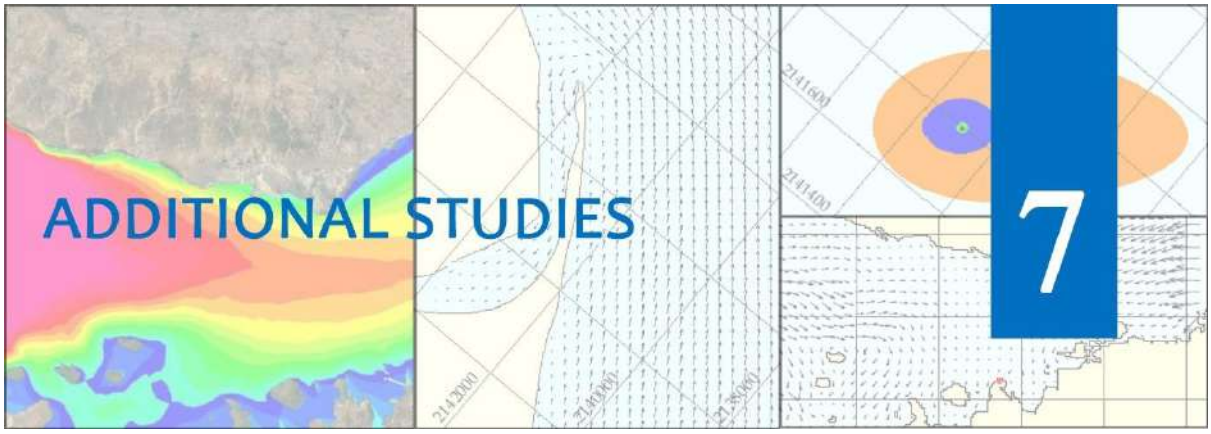
Biological parameters: Samples appropriately collected will be analysed for population and diversity of phytoplankton, population and diversity of zooplankton, population and diversity of benthic fauna near the outfall sites.

Details of post project monitoring plan

Purpose	Parameter	Number and location of sampling stations	Frequency
Seawater & Sediment quality			
To monitor impacts on seawater and sediment quality.	Seawater: pH, Turbidity, Salinity, Chloride, Dissolved Oxygen, BOD, Residual Chloride, Nitrate, Nitrite, Ammonia, Phosphate and pathogenic bacteria Seabed sediments: Total Organic Carbon, Total Phosphorus, Total Nitrogen, Cadmium, Mercury, Lead, Chromium and Phenols	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*
Planktons			
To determine whether the community structure, habitat has been altered	Population and Diversity of Phytoplankton, Population and Diversity of Zooplankton	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*
Benthos			
To determine whether the community structure, habitat has been altered	Benthic faunal composition and diversity	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*

6.3 Post Project Monitoring Budget

Based on the modification in the baseline quality after operation of project, the frequency of monitoring and parameters to be monitored can further be decided. The project proponent will allocate required amount to conduct post project monitoring.



7. ADDITIONAL STUDIES

7.1 Disaster Management Plan

Emergency/ disaster is an undesirable occurrence of events of such magnitude and nature that adversely affect operations, cause loss of human lives and property as well as damage to the environment. Coastal infrastructure is vulnerable to various kinds of natural and manmade disasters. Examples of natural disaster are Flood, Cyclone, Tsunami, Earthquake etc., and manmade disasters like major fire, explosion, sudden heavy leakage of toxic/ poisonous gases, etc. An effective disaster management plan helps to minimize the losses in terms of human lives, assets and environmental damage. Typical disaster management strategy which can be followed to contour the event of any disaster is detailed in this section.

7.1.1 Disaster Management Objectives

- To protect and minimize the loss of lives and property/infrastructure from disasters.
- To minimize the suffering of people due to disasters.
- To minimize the disaster risk and vulnerability of people and infrastructure in the State.
- Promote a culture of prevention and mitigation through curriculum revision.
- Information Education Communication (IEC) awareness campaign, DM plans at all levels, mock drills, communicating hazards, risk and vulnerability at community level and streamlined and institutional techno-legal framework.
- Develop efficient disaster response/relief mechanism in the district.
- To provide clarity on roles and responsibilities for all stakeholders concerned with disaster management.
- To ensure co-ordination and promoting productive partnership with all other agencies related to disaster management.

Commence recovery programme as an opportunity to build better in case of a future disaster by incorporating community in the program

7.1.2 Disaster Identification

A disaster occurs when a hazard such as cyclone, earthquake or tsunami coincides with a vulnerable situation. Based on geography and environmental setting of the study area and available information following natural hazards have been identified which may possibly lead to disaster.

7.1.2.1 Cyclone

Revenue Department in the District takes responsibility for monitoring and directing measures for organizing rescue, relief and rehabilitation. All other concerned Departments should extend full cooperation in all matters pertaining to the management of the Cyclone disaster whenever it occurs. Departments like Revenue, Police including Transport, Ports & Fisheries, R & B, Power, Finance, Information and Broadcasting etc. shall have a major role in emergency response during occurrence of Cyclone.

In case of cyclones, 72 hours advance warning of various levels of certainty are provided by the IMD. This system is well established, and the District Administrations will attend the emergency operations soon after the first warning is received. The typical sequence of cyclone early warnings are as follows:

- IMD's INSAT satellite-based Cyclone Warning Dissemination System (CWDS) is one of the best currently in use in India to communicate cyclone warnings from IMD to community and important officials in areas likely to be affected directly and quickly.

- After getting information from IMD, and State Government the Revenue Department is responsible for disseminating cyclone warnings to the public and Line Departments.

- On receiving an initial warning, the Revenue Department sends the warning to all Line Departments. Warning messages are transmitted though wireless to all districts and talukas. District Collectors are provided with satellite phones and a Ham-radio to maintain effective communication, even if terrestrial and cell-phone communication fails.

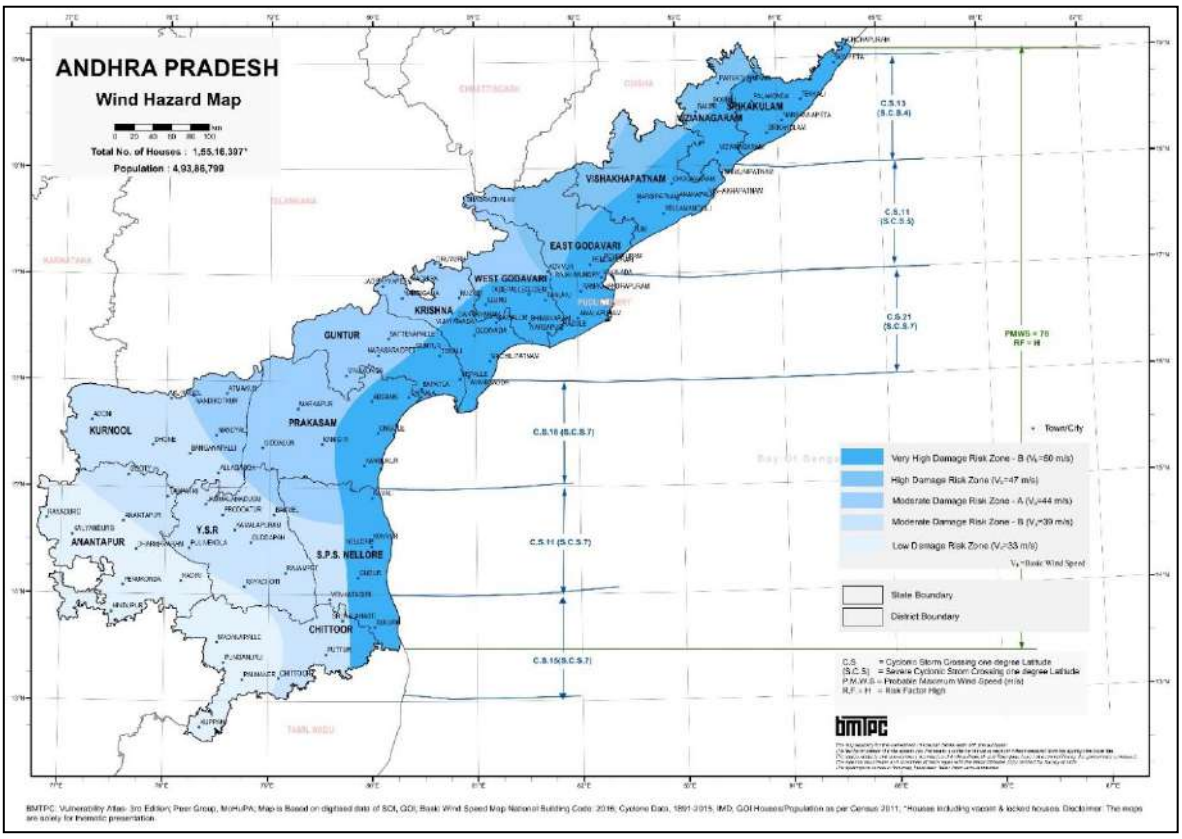
Timely responsibilities

Time frame	Task
0 – 72 hrs	Warning receipt and dissemination
0 – 48 hrs	Review of situation and reporting
0 hrs	Disaster declaration
Before 24 hrs	Mobilization and deployment

Relief measures

- Search, rescue and medical assistance.
- Department of Roads and Buildings to evolve a mechanism for clearing access routes in order to facilitate search and rescue operations.
- Mobilization of specialized equipments and machinery to affected areas.
- Cordoning of affected areas with control of entry and exit.
- Police Department to evolve a mechanism for providing security of properties of government and public in the affected areas.

- Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements, essential medicines and temporary shelters.
- Deployment of mobile hospitals in affected areas for treatment of victims.
- Separate Cell to be established at District/Mandal level to coordinate with the NGOs and outside donor/aid agencies.



Wind hazard map

7.1.2.2 Earthquake

As per the history, the Visakhapatnam District have not experienced any major earthquakes above the magnitude 6. However, in the event of earthquake, to minimize the adverse impacts action plan with the following activities has been prepared.

- Declaration of earthquake disaster
- Affective Mechanism on receiving the report of occurrence of an earthquake

An earthquake of magnitude 5 or more is likely to cause deaths and injuries to human beings and also causes damages to all kinds of properties. Unfortunately, warning systems for future earthquakes are not available. Therefore, planning should cater for a quick response at all levels to reduce the effects of the earthquake to the minimum.

The Revenue Department will be formulating, controlling, monitoring and directing measures for earthquake preparedness, organizing rescue, relief and rehabilitation. All other concerned departments should extend full cooperation in all matters pertaining to the management of the earthquake disaster whenever it occurs.

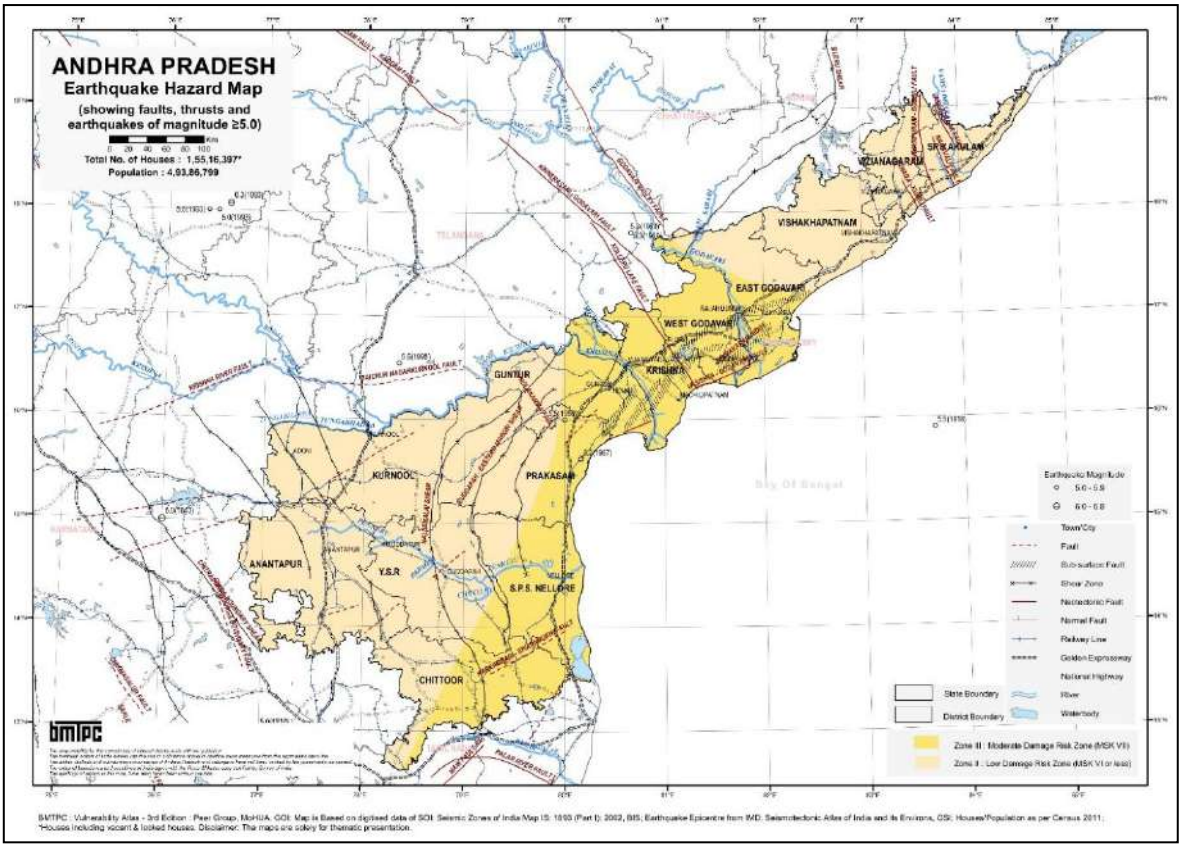
The occurrence of an earthquake will be reported by the Indian Meteorological Department (IMD), National Geophysical Research Institute (NGRI) and Institute of Seismological Research (ISR). On receipt of the information, the District Administration will inform the real situation to concerned authorities.

Response mechanism

- Contact all Line Departments to inform about the venue and time of first meeting to assess the situation and decide the course of action to be adopted by the State government.
- Issue instructions to all departments to ensure that all state government employees to report for duty immediately in order to execute their responsibilities.
- Instruct all line departments to ensure their duty officers to remain available round the clock in with full updated information of the activities of their departments.
- Prepare and submit daily situation report to the Government.
- Request the Government to mobilize additional manpower from the departments to the district for supporting the relief operation. They should be provided task force action Plans of the concerned district prepared earlier.
- Management of media (Press/TV Channels/Government Press Notes) with special emphasis on rumor control.

Relief measures

- Restoration of lines of communications, transportation and essential services.
- Implementation of search and rescue.
- Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements, essential medicines and temporary shelters.
- Deployment of mobile hospitals in affected areas for treatment of victims.



Earthquake hazard map

7.1.2.3 Tsunami

A state-of-the-art early warning centre is established at INCOIS with all the necessary computational and communication infrastructure that enables reception of real-time data from all the sensors, analysis of the data, generation and dissemination of tsunami advisories following a standard operating procedure.

Seismic and sea-level data are continuously monitored in the Early Warning Centre using a custom-built software application that generates alarms/alerts in the warning centre whenever a pre-set threshold is crossed. Tsunami warnings/watches are then generated based on pre-set decision support rules and disseminated to the concerned authorities for action.

Dissemination

- The National Early Warning Centre will generate and disseminate timely advisories to the Control Room of the Ministry of Home Affairs for further dissemination to the Public.

- On receiving an initial warning at DDMA, sends the warning to all Line Departments, the District administration who are likely to be affected by different communication means explained before.

Relief measures

- The first priority in the aftermath of a disaster is to minimize loss of lives by undertaking rescue efforts for the affected people and providing medical treatment. People who are trapped

under destroyed buildings or are isolated due to any disaster need immediate assistance.

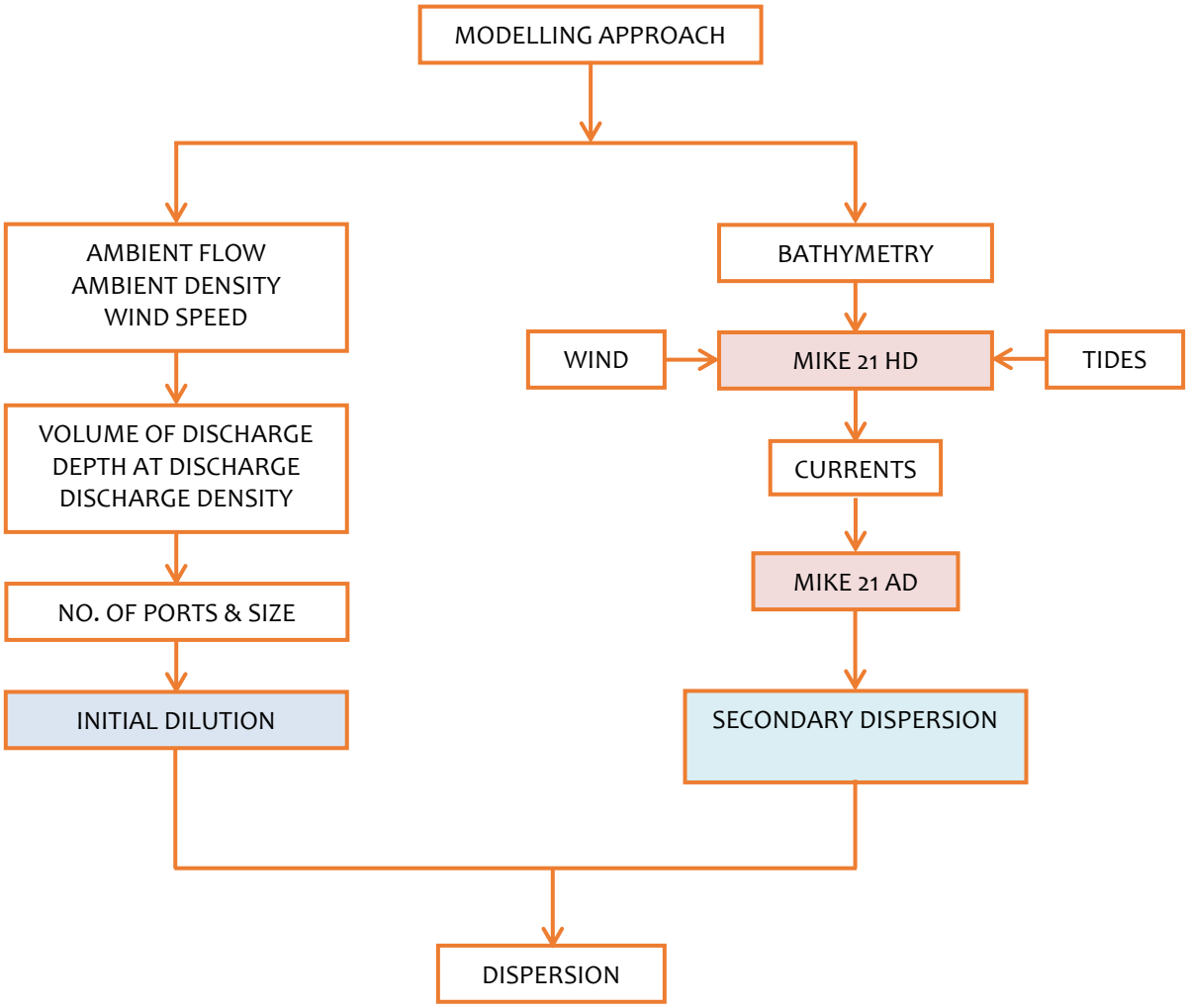
- For earthquake and most of the man-made disasters prediction cannot be done so the response activities are initiated immediately after its occurrence.

- The DDMA in conjunction with local authorities will be responsible for the search and rescue operations in an affected region.

7.2 Modelling studies

7.2.1 Modelling approach

The initial dilution, hydrodynamics and secondary dispersion study for the proposed combined discharge (Treated Effluent of 2.366 MLD + Brine Reject of 10 MLD) were studied using CORMX and DHI - MIKE 21 suite comprising of the modules on *Hydrodynamic-HD, Secondary Dispersion-AD.* MIKE models have been developed by Danish Hydraulic Institute (DHI), Denmark, and are being used worldwide for many coastal engineering applications. Indomer possess the license for using these models. The flow chart of the model describing the approach followed in the present study is presented below.



The dilution of any return water released in a natural water body takes place in 2 stages, viz., i) initial dilution due to jet mixing, and ii) secondary dispersion due to turbulence. The extent of initial dilution is controlled by the engineering design of the diffuser. For a proposed design of the diffuser port the behaviour of the return water jet plume is designed and estimated using ***CORMIX*** model. Once the return water rises to the water surface as the water moves away from the outfall location the subsequent dilution takes place by larger scale turbulence in the horizontal direction. This second stage is controlled by the prevailing currents and turbulence that exist in the coastal region. Such secondary dispersion is estimated using ***DHI-MIKE 21 HD and AD*** model.

7.2.2 CORMIX model

The Cornell Mixing Zone Expert System (CORMIX) is a software tool for the analysis, prediction, and design of aqueous toxic or conventional pollutant discharges into diverse water bodies. It is a widely accepted and recommended analysis tool in US and other countries on granting permission for industrial, municipal, thermal and other point source discharges into receiving waters either river or sea. It is used to predict the geometry and dilution characteristics of the initial mixing zone and also the behaviour of the discharge plume at near – far field.

The highly user interactive CORMIX system is organized with three subsystems: (i) CORMIX1 - for the analysis of submerged single port discharges, (ii) CORMIX2 - for the analysis of submerged multiport diffuser discharges and (iii) CORMIX3 - for the analysis of buoyant surface discharges. Several post-processing options are available like, CORJET (the Cornell Buoyant Jet Integral Model) for the detailed analysis of the near-field behaviour of buoyant jets, FFLOCATR (the Far-Field Plume Locator) for the far-field delineation of discharge plumes in non-uniform river or estuary environments, and CMXGRAPH, a graphics package for plume plotting.

Hydrodynamic Mixing Processes: The mixing behaviour of any brine reject discharge is governed by the interplay of ambient conditions in the receiving water body and by the discharge characteristics. The ***ambient conditions*** in the receiving water body are described by the water body's geometric and dynamic characteristics such as: plan shape, vertical cross-sections, and bathymetry, especially in the discharge vicinity. Dynamic characteristics are given by the velocity and density distribution in the water body, again primarily in the discharge vicinity. The ***discharge conditions*** relate to the geometric and flux characteristics of the submerged outfall installation. For a single port discharge the port diameter, its elevation above the bottom and its orientation provide the geometry; for multiport diffuser installations the arrangement of the individual ports along the diffuser line, the orientation of the diffuser line, and construction details represent additional geometric features; and for surface discharges the cross-section and orientation of the flow entering the ambient watercourse are important. The distinction between near-field and far-field is made purely on hydrodynamic grounds and it is unrelated to any regulatory mixing zone definitions.

7.2.2.1 Port design and initial dilution

The total discharge will be 10 MLD. The deign water depth at the disposal location will be 14.8 m. Using the Cormix model, it shows that outfall diffuser should have multiple ports of 4 numbers of each 250 mm diameter. The Cormix model output is shown below. The ports need to be oriented 60° to the horizontal in order to have a long submerged dense plume and to attain the maximum dilution before the plume starts decelerating. During construction, the diffuser ports have to be positioned at 1 m above the seafloor. The various input parameters to the CORMIX model to determine the behaviour of the brine reject jet plume around the proposed diffuser port are given below.

CORMIX SESSION REPORT: SUMMARY OF INPUT DATA:

----------AMBIENT PARAMETERS:

Average depth	HA	= 14.8 m
Depth at discharge	HD	= 14.8 m
Bottom slope (single slope only)	SLOPE	= 0.49 deg
Ambient velocity	UA	= 0.2 m/s
Surface density	RHOAS	= 1022.4 kg/m^3
Bottom density	RHOAB	= 1022.4 kg/m^3

DISCHARGE PARAMETERS: Submerged Multiport Diffuser Discharge

Contraction ratio		= 1
Total area of openings	TAo	= 0.963 m^2
Discharge velocity	Uo	= 0.73 m/s
Total discharge flowrate	Qo	= 0.1431 m^3/s
Number of Ports	N	= 4
Diameter of Port	d	= 0.25 m
Discharge port height	Ho	= 1 m
Nozzle arrangement	BETYPE	= unidirectional without fanning
Diffuser alignment angle	GAMMA	= 90 deg
Vertical discharge angle	THETA	= 60 deg
Actual Vertical discharge angle	THEAC	= 60 deg
Horizontal discharge angle	SIGMA	= 0 deg
Relative orientation angle	BETA	= 90 deg
Discharge density	RHOo	= 1037.87 kg/m^3
Density difference	DRHO	= -15.4700 kg/m^3
Discharge concentration	Co	= 23000 mg/l

NON-DIMENSIONAL PARAMETERS:

Port densimetric Froude number	FRo	= 3.79
Velocity ratio	R	= 3.65

CORMIX PREDICTION FILE:

FLOW CLASSIFICATION

X-Y-Z Coordinate system:

ORIGIN is located directly at the LEFT bank/shore.
X - axis points downstream,
S - hydrodynamic average (bulk) dilution

X (m)	S
0	1
50	65
100	71
150	79
200	92

7.2.2.2 Initial Dilution

The study on CORMIX model shows the mixing zone will extend up to 200 m from the diffuser port location. Within this jet mixing zone of 200 m radius, it undergoes dilution of the order of 92 times in 3.5 minutes. Thereafter, once the plume ceases from undergoing the initial dilution, the process of secondary dispersion take places in the sea due to advection-diffusion process by turbulence induced by the wind and tide driven currents and the waves.

7.2.3 Secondary dispersion – MIKE 21 model

The dispersion patterns of the return water discharged into the coastal waters are simulated using the DHI - MIKE 21 Advection-Dispersion (AD) module. The flow pattern in coastal water required as input to this model is derived from the MIKE 21 Hydrodynamic (HD) module. These MIKE 21 modules have been developed by Danish Hydraulic Institute (DHI), Denmark, and are being used worldwide in many coastal engineering applications.

Units

Units of all parameters and variables in the model study are according to international SI conventions. Coordinate system: The coordinate system used for model grid generation and other horizontal positioning was based on UTM on WGS 84 spheroid. Vertical reference level: The depth information used in the tidal flow models is relative to Mean Sea Level (MSL); depths below MSL are defined negative.

Directions

Current – Ocean current directions refer to the direction towards which the flow is taking place. Directions of the flow are always given clockwise with respect to North; the Unit is degrees, where 360 degrees cover the circle. Wind – Wind directions refer to the direction from which the wind is approaching. Directions of the wind are always given clockwise with respect to North; the Unit is degrees, where 360 degrees cover the circle.

7.2.3.1 Hydrodynamic model - MIKE 21 HD

This module is a two-dimensional hydrodynamic flow simulation model, which solves shallow-water equations for given boundary conditions to compute non-steady free-surface flow fields in response to a variety of environmental forcing and processes in natural water bodies. The environmental forcing and processes include: bottom shear stress, wind shear stress, barometric pressure gradients, Coriolis force, momentum dispersion, sources and sinks, evaporation, flooding and drying and wave radiation stresses. This module is applicable for the simulation of flow fields in natural water bodies, such as lakes, estuaries, bays, coastal areas and seas, wherever stratification can be neglected. The MIKE 21-Flow model can be used to simulate Tide, wind and Wave-driven currents.

This module uses an Alternate Direction Implicit (ADI) Finite Difference Method on staggered orthogonal grids; this module also has the option to use Finite Element Method. The basic shallow-water equations in the Cartesian co-ordinate system solved in the MIKE 21 HD flow module are:

Continuity equation:

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial X} + \frac{\partial q}{\partial Y} = S - e$$

Momentum equations in x- and y- directions:

$$\frac{\partial p}{\partial t}+\frac{\partial}{\partial X}\left[\frac{p^2}{h}\right]+\frac{\partial}{\partial Y}\left[\frac{p\,q}{h}\right]+gh\frac{\partial \zeta}{\partial X}+F_{bx}-K_a W W_X-\frac{h}{\rho_W}\frac{\partial p_a}{\partial X}-\Omega\, q-F_{EX}=S_{iX}$$

$$\frac{\partial q}{\partial t}+\frac{\partial}{\partial X}\left[\frac{p\,q}{h}\right]+\frac{\partial}{\partial Y}\left[\frac{q^2}{h}\right]+gh\frac{\partial \zeta}{\partial Y}+F_{by}-K_a W W_Y-\frac{h}{\rho_W}\frac{\partial p_a}{\partial Y}+\Omega p-F_{EY}=S_{iY}$$

$$F_{EX}=\left[\frac{\partial}{\partial X}\left[\varepsilon_X h\frac{\partial u}{\partial X}\right]+\frac{\partial}{\partial Y}\left[\varepsilon_Y h\frac{\partial u}{\partial Y}\right]\right]$$

$$F_{EY}=\left[\frac{\partial}{\partial X}\left[\varepsilon_X h\frac{\partial u}{\partial X}\right]+\frac{\partial}{\partial Y}\left[\varepsilon_Y h\frac{\partial u}{\partial Y}\right]\right]$$

$$F_{bx} = \frac{g}{C^2}\sqrt{\frac{p^2}{h^2}+\frac{q^2}{h^2}}\,\frac{p}{h}$$

$$F_{by} = \frac{g}{C^2}\sqrt{\frac{p^2}{h^2}+\frac{q^2}{h^2}}\,\frac{q}{h}$$

Where,

ζ (x, y, t)	-	Water surface level above datum (m)
p(x, y, t)	-	flux density in the x-direction ($m^3/s/m$)
q(x, y, t)	-	flux density in the y-direction ($m^3/s/m$)
h(x, y, t)	-	water depth (m)
S	-	source magnitude per unit horizontal area ($m^3/s/m2$)
S_{iX} , S_{iY}	-	source impulse in x and y-directions (m3/s/m2.m/s)
e	-	evaporation rate (m/s)
g	-	gravitational acceleration (m/s^2)
C	-	Chezy resistance No. ($m^{1/2}/s$)
Ka	-	$C_w \frac{\rho_{air}}{\rho_{Water}}$
Cw	-	wind friction factor
W, WX, $WY_{(x, y, t)}$	-	wind speed and its components in x- and y-directions (m/s)
pa (x, y, t)	-	barometric pressure ($Kg/m/s^2$)
ρw	-	density of water (kg/m^3)
Ω	-	Coriolis coefficient (latitude dependent) (s-1)
ε(x, y)	-	eddy or momentum dispersion coefficient (m^2/s)
x, y	-	space coordinates (m)
t	-	time (s)

Boundary conditions

The coarse resolution model is forced by the tidal water level variations along the open sea boundaries. For the generation of these boundary conditions, the DHI Global tide data base can be used. These boundary conditions for the coarse resolution model are prescribed as time series of tidal water level variations along the open boundaries of the model. If the tidal constituents along the boundaries of the coarse resolution model are available, then the boundary conditions are represented by:

$$h_t = A_0 + \sum_{i=1}^{n} f_i A_i \cos(\omega_i t + (v_0 + u)i - g_i)$$

Where,

h_t	=	water level at time t
A_o	=	mean value of the signal
A_i	=	amplitude of component i
f_i	=	nodal amplitude factor of component i
ω_i	=	angular frequency of component i
$(v_o+u)_i$	=	astronomic argument of component i
g_i	=	phase lag of component i

For the model domain, the Global tides were applied along the southern boundary and on the northern boundary. Along the eastern boundary, the tide levels linearly interpolated between the south and north boundaries have been imposed.

7.2.3.2 Advection and Dispersion model - MIKE 21 AD

The advection-dispersion (AD) module of the MIKE 21 model suite simulates dispersion of return water in natural water bodies under the influence of the fluid transport and associated natural dispersion process. The dispersing substance may be conservative or non-conservative, inorganic or organic: e.g. salt, heat, dissolved oxygen, inorganic phosphorus, nitrogen and other such water quality parameters. Applications of the MIKE 21 AD module are in principle essential for two types of investigations, viz., i) cooling water recirculation studies for power plants and salt recirculation studies for desalination plants, and ii) water quality studies connected with sewage outfalls and non-point pollution sources.

This module determines the concentration of the dispersing substance by solving the equation of conservation of mass for both dissolved and suspended substances. The concentration of the substance is calculated at each point of a rectangular grid covering the area of interest using a two-dimensional finite difference scheme. Information on currents and water depths at each point of the grid, are provided by the MIKE 21 HD module. Other data required in the model include effluent volume discharged, the concentration of the pollutant, and the initial & boundary conditions.

The MIKE 21 AD module solves the advection-dispersion equation for dissolved or suspended substances in two dimensions. This is the mass-conservation equation of substances discharged at source and sink points considering their decay rates,

$$\frac{\partial}{\partial t}(hc) + \frac{\partial}{\partial x}(uhc) + \frac{\partial}{\partial y}(vhc) = \frac{\partial}{\partial x}\left[hD_x \frac{\partial C}{\partial x}\right] + \frac{\partial}{\partial y}\left[hD_y \frac{\partial C}{\partial y}\right] - Fhc + S$$

Symbol list

C	-	compound concentration (arbitrary units)
u, v	-	horizontal velocity components in the x, y directions (m/s)
h	-	water depth (m)
D_x, D_y	-	dispersion coefficients in the x, y directions (m^2/s)
F	-	linear decay coefficient (1/s)
S	-	Qs . (Cs – C)
Q_s	-	Source / sink discharge per unit horizontal area ($m^3/s/ m^2$)

C_s - concentration of compound in the source / sink discharge.

Information on u, v and h at each time step is provided by the MIKE 21 HD module.

Model setup

The model domain was setup for the study region to include the finer details of the local geometry, bathymetry and other site specific conditions in the model. The details are shown in **Fig. 7.1.** The finer resolution grid covers an area of approximately 22.5 km x 22.5 km with the grid spacing of 50 m in both x and y directions. The grid comprised of approximately 2,02,500 computational points.

Depth Schematization: Depth schematization has been made from MIKE-CMAP, a worldwide electronic chart database. This database on bathymetric data over the ocean has been developed jointly by DHI, Denmark and C-MAP, Norway. The extracted bathymetry data from CMAP have been corrected with the depths presented in Indian Naval Hydrographic Charts and the bathymetry data collected by Indomer specific to the study area.

Input on mass of discharge: The volume of combined discharge (Treated Effluent of 2.366 MLD + Brine Reject of 10 MLD) into the sea will be 12.366 MLD (515.25 m^3/hour ≈ 0.1431 m^3/s). The salinity of the brine reject will be 58 ppt, which will have the difference of 23 ppt above the ambient salinity of 35 ppt of the seawater.

Input on wind: For the flow simulation, to represent the fair weather, it is assumed as low wind with a value of 1 m/s coming from southwest direction. In case of southwest monsoon season, higher wind speed of 10 m/s from southwest direction has been introduced. For northeast monsoon period, moderate with speed of 7 m/s from west direction has been introduced.

Model Calibration

The HD model is calibrated using the predicted tides applicable to the project location. A good agreement was observed between the simulated and predicted tides (**Fig. 7.2**). Similarly, a reasonable agreement was observed between the simulated and measured currents.

Simulation

In these regions, the tide and wind induced flow fields over the study area for one lunar month (28 days) were simulated for three different seasons representing fair weather period (March), southwest monsoon (July) and northeast monsoon (November).

7.2.3.3 Results

Fair weather

Spring tide: *Flow:* The tide induced flow fields on a *spring tidal day*, when the wind effect is low in case of flooding and ebbing tides are shown in **Fig. 7.3.** During the flood tide, the direction of flow is towards west. The magnitude of tide induced currents is observed as 0.12 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards east. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.4.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) at 135 m from the outfall. *Treated Effluent:* The dilution of the treated

effluent during the flood and ebb tides are shown in **Fig. 7.5.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times at 150 m distance from the outfall.

Neap tide: Flow: The tide induced flow fields on a *neap tidal day*, when the wind effect is low in case of flooding and ebbing tides are shown in **Fig. 7.6.** During the flood tide, the direction of flow is towards west. The magnitude of tide induced currents is observed as 0.10 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards east. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.7.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) at 170 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.8.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times at 190 m distance from the outfall.

SW monsoon

Spring tide: *Flow:* The wind and tide induced flow fields on a *spring tidal day*, when the wind effect is maximum during southwest monsoon in case of flooding and ebbing tides are shown in **Fig. 7.9.** During the flood tide, the direction of flow is towards northeast. The magnitude of tide induced currents is observed as 0.25 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards northeast. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.10.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.11.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Neap tide: *Flow:* The wind and tide induced flow fields on a *neap tidal day*, when the wind effect is maximum during southwest monsoon in case of flooding and ebbing tides are shown in **Fig. 7.12.** During the flood tide, the direction of flow is towards northeast. The magnitude of tide induced currents is observed as 0.22 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards northeast. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.13.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.14.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

NE monsoon

Spring tide: *Flow:* The wind and tide induced flow fields on a *spring tidal day*, when the wind effect is maximum during northeast monsoon in case of flooding and ebbing tides are shown in **Fig. 7.15.** During the flood tide, the direction of flow is towards southwest. The magnitude of tide induced currents is observed as 0.21 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards southwest. The current magnitude remains nearly the same as

those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.16.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.17.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Neap tide: *Flow:* The wind and tide induced flow fields on a neap *tidal day*, when the wind effect is maximum in northeast monsoon are shown in case of flooding and ebbing tides in **Fig. 7.18.** During the flood tide, the direction of flow is towards southwest. The magnitude of tide induced currents is observed as 0.19 m/s near the outfall point. Similarly, it is observed that during the ebb tide, the current direction is towards southwest. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.19.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.20.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Dilution zone radius of brine reject to salinity of 0.5 PPT

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	135 m	< 50 m	<50 m
Neap Tide	170 m	< 50 m	<50 m

Dilution zone radius of treated effluent to reach 100 times dilution

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	150 m	< 50 m	<50 m
Neap Tide	190 m	< 50 m	<50 m



8. PROJECT BENEFITS

The proposed project to replace the two existing pipelines discharging treated effluent and brine reject into a combined single marine disposal pipeline has the following various advantages:

- Combining of both effluent and brine reject will help to reduce the concentration of brine reject.

- Laying of single pipeline instead of two pipelines will help to minimize impact on the environment.



9. ENVIRONMENTAL COST BENEFIT ANALYSIS

Evaluation of cost-benefit is conducted to measure the risks of continuing with a project against the benefits that would derive from it. However, this chapter is recommended only at the scoping stage. Contents stating for cost benefit analysis will not be required for the replacement of outfall pipelines.



10. ENVIRONMENT MANAGEMENT PLAN

10.1 Introduction

The proposed project involves laying of combined outfall and effluent pipelines and outfall diffuser. The impacts due to construction and operation of these facilities are described in Chapter 4. To address the anticipated impacts and to implement the mitigation measures the Environment Management Plan (EMP) needs to be formulated. EMP identifies the approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with the project development. It is intended to reduce the negative impact of the proposed project and to enhance the positive benefits to the society. As part of the project, the proponent is committed to excel in environmental and social performance by ensuring the following:

- Fulfil environmental, social and other conditions associated with the project approvals.
- Promote environmental awareness and understanding among employees and contractors through training, identification of roles and responsibilities towards environmental management.
- Encourage an understanding of social and cultural sensitivities in local communities and the importance of minimizing project impacts on local lifestyles and culture.
- Work with local communities and project affected stakeholders (if any) to ensure that they benefit because of the project development.

The EMP provides an outline of environmental management measures developed for construction and operational phases of the desalination plant to ensure environmental safeguards are in place to minimize and mitigate the identified impacts.

10.2 Impacts and mitigation measures

The details of the impacts due to the proposed project activities during its construction and operation as well as respective mitigation measures are discussed in detail in Chapter 4. Based on suggested mitigation measures EMP will be implemented.

10.3 Environment monitoring

A detailed environment monitoring program is provided in Chapter 6. Suggested monitoring plan will be followed and any gross deviation in results from the baseline status will be communicated by the Environment Manager of the Environment Management Cell, to the Head, Desalination Plant for taking corrective measures as required.

10.4 Environment Management Cell (EMC)

An Environment Management Cell (EMC) will be formed, which will be responsible for monitoring the environment status during the construction and the operation phases of the desalination plant. EMC will also organize the implementation of the aforesaid mitigation measures/ Environment Monitoring Plan.

Composition of the Environment Management Cell and responsibilities of its various members

Roles and Responsibilities of EMC	
Designation	Proposed Responsibility
Environment Manager	▪ Review of EMP performance and implementation of correction actions, or stop work procedures, in the event of breaches of EMP conditions, that may lead to serious impacts on local communities, or affect the reputation of the project. ▪ Ensure effective communication and explanation of the content and requirements of the EMP to contractors and subcontractors. ▪ Provide appropriate and adequate resources allocated to allow for the effective implementation and maintenance of the EMP. ▪ Conduct periodic reviews of environmental performance. ▪ Report any major environmental incidents that may have a significant impact on the surrounding environment to the senior management.
Site Engineer	▪ Prepare and implement Environmental Supervision Plan during construction. ▪ Prepare and implement Environmental Monitoring Plan during construction and operation ▪ Report any incident or non-compliance with the EMP to the superior. ▪ Ensure adequate training and education to all staff involved in environmental supervision.

10.5 Communication and Reporting

Communication

Information with respect to any untoward incidences during the construction and operation of the desalination plant will be communicated to local village workers, employees and other project-related individuals. Environmental issues will be communicated to the concerned Govt. agencies such as APPCB, Forest and Environment Department, District Collector etc.

Reporting

The EMC will be responsible for conduct environment monitoring, compilation and review of monitoring data, filling up the statutory forms/returns, maintain of records regarding hazardous waste, environment awareness activities, submission of compliances to State Pollution Control Board and six months compliance to MoEF&CC, regional office.

10.6 Implementation of EMP

Overall implementation of EMP will be the responsibility of EMC.

Various implementation items, description, and appropriate time to implement EMP

Implementation item	Description	When to implement
Formation of an Environment Management Cell (EMC)	An Environmental Management Cell will be formed to implement the EMP based on baseline environment conditions.	Two months before preparation of construction site for the main work.
Contractor	The construction contractor to ensure that the intent of EMP is communicated and understood by the construction workers. Make sure that all environmental safeguards and precautions are in place. Ensure that all equipment used is properly serviced and that all precautions are in place to prevent unanticipated likelihood of an environmental impact. Be responsible for construction and worker management plan and safety of workers.	Before commencing construction work.
Workers	Be aware of the EMP and the reason for implementing. Report all environmental incidents to the contractor /manager as soon as practicable, but within 24 hr of them occurring.	-

10.7 EMP Budget

The adequate budget allocation to operate EMP is necessary to make resource available for its effective implementation. Based on the EMP for the proposed desalination plant discussed in above, the budget allocation required is estimated to be about ₹ 25,00,000. The break-up of the proposed budget is given below.

S. No.	Environment Management Plan	Cost/year (₹.)
1	Environmental Monitoring Programme	10,00,000
2	Environment Management Cell	10,00,000
3	Labour, Safety and Cleanliness Management	2,00,000
4	Legal & Statutory Fees	3,00,000
Total		25,00,000



11. SUMMARY AND CONCLUSION

11.1 Introduction

Hetero Infrastructure SEZ Limited (henceforth called *Hetero*), Hyderabad has set up Industrial Estate consisting of both SEZ and Non-SEZ exclusively for its own group of companies for manufacturing the Bulk Drugs (Active Pharmaceutical Ingredients) and its intermediates at Laxmipuram village, Rajayyapeta village, Pedateenerla village and N. Narasapuram Village of Nakkapalli Mandal Visakhapatnam District spread in an area of about 500 acres.

In order to meet the necessary water requirement Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD.

Laying of marine outfall pipeline needs CRZ clearance both from APCZMA and MoEF&CC. In order to meet the statutory requirement, the Rapid Environmental Impact Assessment study comprising of baseline data of marine environment have been taken up by Indomer Coastal Hydraulics (P) Ltd., Chennai The field studies were undertaken in December 2021 and January 2022.

Location of project: The project is proposed at Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh. The location map of the project region is shown in **Fig. 1.1.**

Nature of project: In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500 mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed

single outfall pipeline will be 12.366 MLD. The combined brine outfall of desalination plant and treated effluent will be laid into the sea. The details are:

Outfall pipeline carrying 10 MLD of desalination brine reject and 2.366 MLD of treated effluents from CETP consisting of both SEZ & non-SEZ.

11.2 Coastal Regulation Zone

Based on CRZ Notification 2011, CRZ map has been prepared by the Institute of Remote Sensing (IRS), Anna University, Chennai, which is one of the approved agencies by MoEF&CC. The copy of Daft CRZ map is shown in **Fig. 1.2.** As per the CRZ map prepared based on CRZ Notification 2011, the proposed development falls under the following categories:

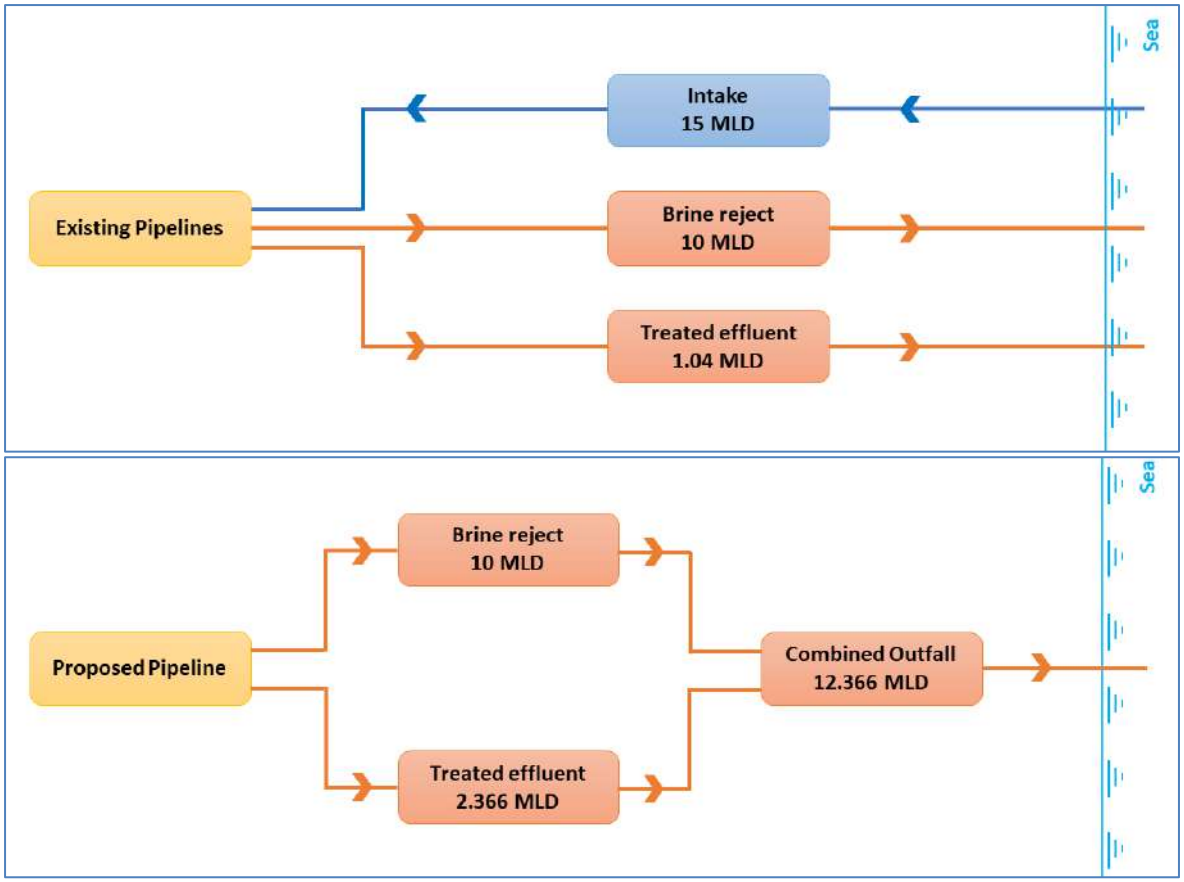
CRZ I B : Area between Low Tide Line (LTL) and High Tide Line (HTL)
CRZ III A : No Development Zone (HTL to 200 m)
CRZ III B : Area between 200 to 500 m from HTL
CRZ IV A : Area between LTL and 12 Nm into the sea
CRZ IV B : Tidal influenced water body from mouth of the water body at the sea up to the influence of tide which is measured as 5 ppt during driest part of year.

11.3 Type of Project

Hetero had set up a 5 MLD seawater desalination plant in 2010. In the year 2010, Hetero had laid one seawater intake pipeline of 560 mm dia. to draw 15 MLD seawater and also laid two outfall pipelines i.e. i) 355 mm dia. for discharging 10 MLD brine reject from the desalination plant and ii) 200 mm dia. for discharging treated effluent of 1.04 MLD from its existing manufacturing unit.

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to set right the discharge norms, Hetero is proposing to replace the damaged two independent outfall pipelines into a single outfall pipeline of 500mm dia. combining both the discharges of treated effluent and brine reject. The total discharge through the proposed single outfall pipeline will be 12.366 MLD



11.4 Proposed Marine Facilities

The modified marine facilities are: one combined outfall pipeline carrying 10 MLD of desalination brine reject and 2.366 MLD of treated effluents from CETP consisting of both SEZ & non-SEZ. The length of the outfall pipeline will be 4522 m from the manufacturing plant to LFP and 2000 m into the sea from LFP. The combined brine reject and treated effluent will be discharged at 14.8 m water depth. The location details are given below.

Locations of proposed pipeline coordinate

Location	Geographical Coordinates (WGS 84)		UTM Coordinates (Zone 44)	
	Latitude, N	Longitude, E	X (m)	Y (m)
LFP	17°21'33.3"	82°44'11.5"	684508	1920133
Combined Outfall diffuser (500 mm dia.) Distance from LFP = 2000 m Depth= 14.8 m CD	17°21'01.1"	82°45'10.3"	686254	1919158

The total length of outfall pipeline from manufacturing plant to discharge point is about 4522 m.

11.5 Description of the environment

The marine environment of the project region has been studied for the evaluation of baseline data as per the norms stipulated by the Ministry of Environment Forest and Climate Change (MoEF&CC), Govt. of India. This chapter covers the description of baseline environmental status of the study area for marine with respect to the existing environment attributes. The baseline data collections

were carried out by covering 10 km radius around the proposed project region in December 2021 to January 2022.

Seawater quality: Seawater quality parameters were found in the normal range and the water environment is free from pollution.

Seabed sediment quality: Seabed sediment is predominantly composed of fine sand in nature. Organic matter, Total Nitrogen, Phosphorous concentrations were found within the normal range of coastal waters. The concentrations of heavy metals and phenols showed low values indicating absence of contamination in seabed sediments.

Phytoplankton: Species diversity of the phytoplankton community of the coastal water is dominated by diatoms, dinoflagellates, and cyanobacteria. The most dominant phytoplankton species was *Chaetoceros lorenzianus* than the other phytoplankton species during the study period.

Zooplankton: Zooplankton biodiversity in this coastal water is mostly composed of copepods, followed by Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. The most dominant species was *Acaria spinicauda* during the study period. Among macrobenthos, polychaetes were the most diverse groups in the subtidal as well as the intertidal regions. Overall, the following is concluded:

- The diversity indices of phytoplankton and zooplankton were within the range of 4.43 to 5.50, indicating good environmental conditions (transitional zone to normal/pristine).

- The mean diversity of subtidal and intertidal benthic faunal population was 3.60 to 3.91, indicating moderate environmental conditions.

11.6 Quantification of impact

Impact assessment study reveals that the impact due to the laying of the outfall pipeline is mainly limited to the marine environment. During pipeline laying, plankton, benthos, fishes etc. may be disturbed especially due to introduction of turbidity near the pipeline corridor. However, duration of impact due to construction activities will be short-lived as the most significant impact will be restricted to the pipeline corridor.

The impacts on the seabed will mainly be targeted at the pipeline construction phase. This is when fine fractions of the seabed sediment are suspended into the water column for a limited period of time and eventually in part may settle elsewhere. The suspension phase will, however, only last for a relatively short period of time, and the turbidity impact will not be very significant. Although there may be temporary impacts, the overall significance of the impacts during the construction and laying of the pipelines can be regarded as low.

To limit the impact of laying pipelines, outfall system with minimum entrainment and impingement are planned. Brine and effluent discharge location and the mode of release through a number of ports would ensure sufficient mixing/dilution of the effluent to minimize the impact on marine life during its operational phase.

Despite various initial impacts on the environment, the benefits due to this project outweigh such initial adverse impacts since the project would prove extremely beneficial for Hetero SEZ and non SEZ.

11.7 Salient mitigation measures

- Any material storages should be away from the CRZ and are to be covered with tarpaulin.
- The dust generation if any should be controlled by sprinkling water.
- Groundwater should not be tapped for consumption and construction.
- Pipelines should be stockpiled within enclosed area. All fabrication should be restricted within the fenced fabrication yard located away from the CRZ.
- Laying of pipeline should not interfere with fishermen fiber boat beach landing areas.
- Pipelines with concrete blocks are to be totally buried both on land and below the seabed.
- Laying operation should be done within 2 months. Barricading across the surf zone should be avoid.
- Pipeline laying to be done with the assistance of good survey techniques to make record of the pre alignment of corridor and post alignment of the pipeline and to show the extent of burial.
- Lighted marker buoy is to be anchored near the outfall diffuser.
- Multiport diffusers of 5 nos. of each 160 mm dia. With duckbill valves are to be provided to ensure optimum dilution.
- The combined outfall discharge should comply within CPCB Marine discharge standards.
- The marine discharge has to be released only after monitoring by APPCB officer.
- Periodic monitoring has to be taken place for every 6 months at the discharge location.

11.8 Post Project Monitoring Program

Details of post project monitoring plan

Purpose	Parameter	Number and location of sampling stations	Frequency
Seawater & Sediment quality			
To monitor impacts on seawater and sediment quality.	Seawater: pH, Turbidity, Salinity, Chloride, Dissolved Oxygen, BOD, Residual Chloride, Nitrate, Nitrite, Ammonia, Phosphate and pathogenic bacteria Seabed sediments: Total Organic Carbon, Total Phosphorus, Total Nitrogen, Cadmium, Mercury, Lead, Chromium and Phenols	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*
Planktons			
To determine whether the community structure, habitat has been altered	Population and Diversity of Phytoplankton, Population and Diversity of Zooplankton	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*
Benthos			
To determine whether the community structure, habitat has been altered	Benthic faunal composition and diversity	3 stations Near outfall, 500 m on either side of brine discharge	*Half yearly*

11.9 Advection and Dispersion model - MIKE 21 AD

Fair weather

Spring tide: *Flow:* The tide induced flow fields on a *spring tidal day*, when the wind effect is low in case of flooding and ebbing tides are shown in **Fig. 7.3.** During the flood tide, the direction of flow is towards west. The magnitude of tide induced currents is observed as 0.12 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards east. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.4.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) at 135 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.5.** From the dilution pattern, it is

observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times at 150 m distance from the outfall.

Neap tide: Flow: The tide induced flow fields on a *neap tidal day*, when the wind effect is low in case of flooding and ebbing tides are shown in **Fig. 7.6.** During the flood tide, the direction of flow is towards west. The magnitude of tide induced currents is observed as 0.10 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards east. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.7.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) at 170 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.8.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times at 190 m distance from the outfall.

SW monsoon

Spring tide: *Flow:* The wind and tide induced flow fields on a *spring tidal day*, when the wind effect is maximum during southwest monsoon in case of flooding and ebbing tides are shown in **Fig. 7.9.** During the flood tide, the direction of flow is towards northeast. The magnitude of tide induced currents is observed as 0.25 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards northeast. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.10.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.11.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Neap tide: *Flow:* The wind and tide induced flow fields on a *neap tidal day*, when the wind effect is maximum during southwest monsoon in case of flooding and ebbing tides are shown in **Fig. 7.12.** During the flood tide, the direction of flow is towards northeast. The magnitude of tide induced currents is observed as 0.22 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards northeast. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.13.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.14.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

NE monsoon

Spring tide: *Flow:* The wind and tide induced flow fields on a *spring tidal day*, when the wind effect is maximum during northeast monsoon in case of flooding and ebbing tides are shown in **Fig. 7.15.** During the flood tide, the direction of flow is towards southwest. The magnitude of tide induced currents is observed as 0.21 m/s near the outfall point. Similarly, it is observed that during ebb tide, the current direction is towards southwest. The current magnitude remains nearly the same as those during flood tide. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb

tides in the nearshore region is shown in **Fig. 7.16.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.17.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Neap tide: *Flow:* The wind and tide induced flow fields on a neap *tidal day*, when the wind effect is maximum in northeast monsoon are shown in case of flooding and ebbing tides in **Fig. 7.18.** During the flood tide, the direction of flow is towards southwest. The magnitude of tide induced currents is observed as 0.19 m/s near the outfall point. Similarly, it is observed that during the ebb tide, the current direction is towards southwest. *Brine Reject:* The mixing pattern of the brine reject during flood and ebb tides in the nearshore region is shown in **Fig. 7.19.** The brine (ΔS=23 PPT) discharged in the nearshore waters undergoes dilution, it reaches the salinity of 0.5 PPT (ΔS=23 PPT) within 50 m from the outfall. *Treated Effluent:* The dilution of the treated effluent during the flood and ebb tides are shown in **Fig. 7.20.** From the dilution pattern, it is observed that the effluent is found to spread radially around the outfall point. The effluent gets diluted to the order of 100 times within 50 m distance from the outfall.

Mixing zone radius of brine reject to salinity of 0.5 PPT

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	135 m	< 50 m	<50 m
Neap Tide	170 m	< 50 m	<50 m

Mixing zone radius of treated effluent to reach 100 times dilution

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	150 m	< 50 m	<50 m
Neap Tide	190 m	< 50 m	<50 m

11.10 PROJECT BENEFITS

- Combining of both effluent and brine reject will help to reduce the concentration of brine reject.
- Laying of single pipeline instead of two pipelines will help to minimize impact on the environment.

11.11 Environmental Management Plan

To address the anticipated impacts and to implement the mitigation measures the Environment Management Plan (EMP) needs to be formulated. EMP identifies the approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with the project development. It is intended to reduce the negative impact of the proposed project and to enhance the positive benefits to the society.

The adequate budget allocation to operate EMP is necessary to make resource available for its effective implementation. Based on the EMP for the proposed desalination plant discussed in above, the budget allocation required is estimated to be about ₹ 25,00,000. The break-up of the proposed budget is given below.

S. No.	Environment Management Plan	Cost/year (₹.)
1	Environmental Monitoring Programme	10,00,000
2	Environment Management Cell	10,00,000
3	Labour, Safety and Cleanliness Management	2,00,000
4	Legal & Statutory Fees	3,00,000
Total		25,00,000

DISCLOSURE OF CONSULTANTS ENGAGED

12

12. DISCLOSURE OF CONSULTANT ENGAGED

Indomer Coastal Hydraulics (P) Ltd. is NABET-QCI accredited EIA consultant appointed for the proposed project *"Rapid Environmental Impact Assessment for Laying New Marine Disposal Pipeline in Place of Existing Treated Effluent and Desalination Plant Reject Pipeline for Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh"*.

Indomer is an ISO 9001:2008 certified company with QCI – NABET Accreditation for Sector 27: Oil & gas transportation pipeline (crude and refinery/petrochemical products), passing through National Parks/sanctuaries/coral reefs/ecologically sensitive Areas including LNG Terminal and Sector 33: Ports, Harbours, jetties, marine terminals, breakwaters and dredging. Certificate of accreditation is given below.

All data are collected at site using the latest technology, equipment and analysis was done by Indomer inhouse laboratory Chennai, which is accredited laboratory by NABL. The report is prepared with involvement of EIA coordinator and Functional Area Expert (FAE). Based on the impacts identified, appropriate mitigation measures and EMP were suggested. We stand on the authenticity of data submitted in this EIA report.

J Guru Prasath

Mr. J. Guru Prasath
(Director)

Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

Indomer Coastal Hydraulics (P) Ltd.

63, Gandhi road, Alwarthirunagar, Chennai 600087

The organization is accredited as Category-A under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

Sl. No.	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Oil & gas transportation pipeline (crude and refinery/ petrochemical products), passing through national parks/ sanctuaries/coral reefs / ecologically sensitive areas including LNG terminal	27	6 (a)	A
2.	Ports, harbours, break waters and dredging	33	7 (e)	A

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC and Supplementary MoM dated Jan 27, 2021, and June 08, 2021 respectively posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no. QCI/NABET/ENV/ACO/21/1784 dated June 29, 2021. The accreditation needs to be renewed before the expiry Indomer Coastal Hydraulics (P) Ltd. following due process of assessment.

Sr. Director, NABET
Dated: June 29, 2021

Certificate No.
NABET/EIA/2023/RA 0207

Valid till
Sept 13, 2023

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to QCI-NABET website.

QCI – NABET Accreditation Certificate

Annexure I - Method of sample collection and analysis

1. Seawater

Collection

The samples were collected at 10 locations. The water samples were collected at two different depths i.e., surface, and bottom. Van Dorn water samplers was used for collecting the sub-surface water samples.

Samples for dissolved oxygen were collected in 125 ml capacity DO bottles immediately after the sampler was hauled up. The bottles were rinsed with the same water sample. DO was fixed immediately with Winkler reagents by adding 2 ml of manganese chloride and 2 ml of alkaline potassium iodide (KI). The stopper was then inserted, and the bottle shaken vigorously for about 1 minute to bring each molecule of dissolved oxygen in contact with manganese (II) hydroxide. After fixation of oxygen, the precipitate was allowed to settle. The DO bottles were kept in dark and transported to the laboratory for analysis. Samples for Biochemical Oxygen Demand (BOD) were also collected in the similar fashion as described for DO in 300 ml glass BOD bottles. Winkler A and Winkler B were added after 5 days of incubation at 20°C in a BOD incubator and analysed for balance dissolved oxygen.

Water samples for salinity, total suspended solids, and nutrients were collected and stored in PVC bottles directly from the water sampler, after rinsing the same with the water sample. For heavy metal analysis, water samples were stored in PVC bottles adding Nitric acid <2 pH as preservative. The samples were then transported to the laboratory in an ice box. Water samples for petroleum hydrocarbons were collected separately in amber coloured glass bottles. The sample for Phenol was collected in a pre-cleaned 1 litre plastic container.

Analysis

The analyses of the samples were carried out as given below:

Sl. No	Parameters	Protocol
1	Temperature	IS 3025: Part 35
2	Turbidity	IS 3025: Part 10
3	Total Suspended Solids (TSS)	IS 3025: Part 17
4	pH	IS 2720: Part 26
5	Salinity	IS 3025: Part 34
6	Dissolved Oxygen	IS 3025: Part 38
7	BOD	IS 3025: Part 44
8	Ammonia	APHA 4500-NH_3 (F)
9	Nitrite	IS 3025: Part 34
10	Nitrate	IS 3025: Part 34
11	Total Nitrogen	IS 3025: Part 34
12	Dissolved phosphate	IS 3025: Part 31
13	Total Phosphorous	IS 3025: Part 31
14	Cadmium	IS 3025: Part 41
15	Lead	IS 3025: Part 47
16	Chromium	IS 3025: Part 52
17	Mercury	IS 3025: Part 48
18	Phenolic Compounds	IS 3025: Part 43
19	Petroleum Hydrocarbons	TNRCC method 1055
20	Oil and grease	APHA 5520

2. Seabed Sediment

Collection

Seabed sediment samples were collected at 10 locations using a van Veen grab. After collection, the scooped sample was transferred to a polythene bag, labelled and stored under refrigerated conditions.

Analysis

The analyses of the samples were carried out as given below:

Sl. No.	Parameter	Protocol
1	Soil texture	IS :2720: Part 4
2	Total Organic Carbon	IS : 2720: Part 22
3	Total Nitrogen	IS : 14684: Part 23
4	Total Phosphorous	IS : 10158 - 1982
5	Calcium carbonate	IS : 2720: Part 23
6	Cadmium	USEPA 3050 B
7	Lead	USEPA 3050 B
8	Chromium	USEPA 3050 B
9	Mercury	USEPA 3050 B
10	Phenolic Compounds	USEPA 8041 & 3545 A
11	Petroleum Hydrocarbons	TNRCC method 1055

3. Marine Biological Parameters

Primary Productivity: Primary production was estimated at 10 locations. From the water sampler, the samples were immediately transferred to 125 ml DO bottles (two light bottles and one dark bottle). The sample in the first bottle was used immediately to determine the initial level of dissolved oxygen (DO) content following the Winkler method. The light and dark bottles were incubated under water for a period of 6 hr and then dissolved oxygen was again measured. Primary productivity was calculated by oxygen method. Oxygen values were converted to carbon values by applying the standard equation.

Phytoplankton: Phytoplankton samples were collected from 10 locations for both qualitative and quantitative analyses.

For quantitative analyses of phytoplankton, surface water was collected in a 1 litre plastic container and preserved with Lugol's iodine solution. The analysis of phytoplankton samples include initial concentration of water sample to 15 ml volume based on settling and siphoning procedure. Quantitative estimation of phytoplankton was done by counting in Sedge wick-Rafter cell counter. It involved calculation of the number of cells of each species of phytoplankton in one litre of seawater.

For the qualitative analysis, phytoplankton samples were collected using a circular standard plankton net (60µ mesh and 60 cm mouth diameter). The net was towed at subsurface for 5 min. After the collection, samples were preserved in 4% buffered formaldehyde and analyzed under an inverted microscope following the standard literature (R. Subrahmanyan, 1946; C.P. Gopinathan, 1976 and Thomas, 1997).

Zooplankton: Zooplankton samples were collected using a circular zooplankton net (300 µ mesh and 60 cm mouth diameter). The samples were collected during the day time to calculate their biomass, population and species composition. The net was towed for 5 min. After the collection, samples were preserved in 5% buffered formaldehyde. The biomass value of zooplankton was calculated using the displacement volume method. The faunal composition and the relative abundance of different zooplankton taxa were sorted out and identified from aliquots upto species level as far as possible. All taxonomic observation and measurements were made on preserved samples. Specimens were identified based on the standard manuals (Kasturirangan, 1963; and Conway et al. 2003). The estimated abundance (density) for the different groups was expressed as nos. /100m^3.

Flowmeter: Digital Flowmeter (model - 2030R) duly calibrated by the company was used for estimating the volume of flow into the net towed for 5 min for the collection of phytoplankton and zooplankton. The flow meter consists of an impeller and a counter. The impeller is directly connected to the counter which records each revolution of the impeller. The flow meter was attached to the mouth region of the plankton net.



Macro Benthos: Seabed sediment samples were collected using Van Veen grab from 8 locations. The intertidal benthic samples were collected from 4 locations (IB1, IB2, IB3 & IB4) along the shore. The benthic organisms were separated by sieving through 500 micron mesh and preserved using formaldehyde and Rose Bengal stain. The samples were sorted and identified upto groups/genera level using stereo microscope. The wet weight was taken to calculate the biomass of benthic organisms.

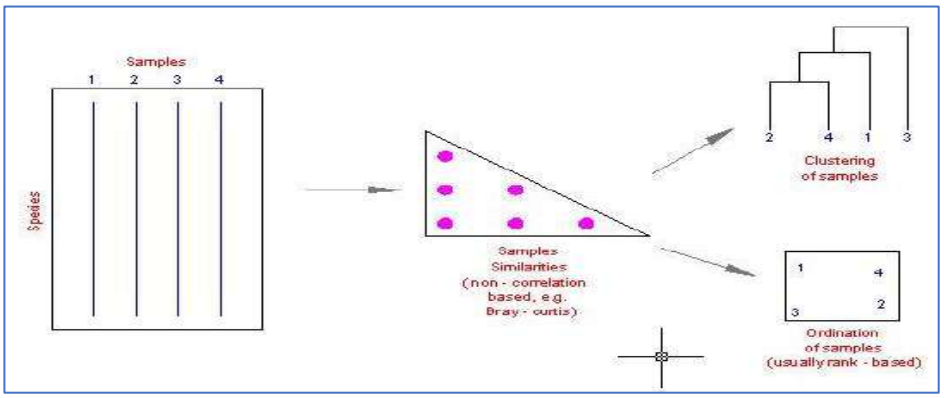
Microbiology: The microbiological samples were collected from 10 locations (SS1 to SS10). The total coliform from each location were identified by membrane filter technique (APHA 9060 A & B). Samples were collected clean, sterile and non-reactive glass or plastic bottles. Microbial analysis started as soon as possible after collection to avoid unpredictable changes. Spread plate method was used to culture the microorganisms. The agar media used for analysis were: Nutrient agar, MacConkey agar, Thiosulphate Citrate Bile Sucrose agar, Xylose Lysine Deoxycholate agar, M-Enterococcus agar and Cetrimide agar. Plates were incubated at 37° C for 48 hrs. After incubation, the colonies were counted and identified based on their colour characteristics.

Fisheries: The information on fisheries were collected from local fishing villages and also from the Commissioner of Fisheries, Department of Fisheries, Government of Andhra Pradesh.

Coastal sand dune vegetation: Coastal plants, in this study are considered as those higher plants other than the mangroves, which are directly influenced by the sea. These plants present in the intertidal and supratidal region. Those plants which are rooted in the substrate near the shore, which is saline and contains a very high content of marine sediments, are also included.

Statistical Analyses: Statistical analyses were performed for phytoplankton, zooplankton and macro benthos. All statistical calculations and graphs were generated using computer software package PRIMER V.6.1.9. Its scope is the analysis of data arising in community ecology and environmental science which is multivariate in character (many species, multiple environmental variables). Sample data were compiled into square matrix (species x samples) and square root transformed to counter act the weight of dominant species without severely diminishing their importance. The transformed species - by - sample was then converted into a triangular sample-by-sample similarity matrix by calculating the Bray - Curtis similarity index between all samples - pairs, based on joint species abundance, and presence and absence. Ecological data were then

analysed for similarity of population using agglomerative hierarchical cluster analysis based on the Bray - Curtis similarity index and an average linkage Dendrogram were produced.



Stages in a multivariate analysis based on similarity coefficients

Diversity measures were calculated from the untransformed data for each sample. Indices calculated were: Margalef's species evenness coefficient (J'), the Shannon-Wiener diversity coefficient (H') and Simpson's diversity index (1-λ). The cumulative dominance plot was also constructed to compare the biodiversity between the samples.

RESTRICTED DOCUMENT NO.IRS/AU/IRS/KSR/208-2022 DT 09.03.2022

Preparation of Local Level CRZ Map for the Proposed Effluent Pipeline facilities of M/s. Hetero Infrastructure SEZ Limited, Nakkapalli, Andhra Pradesh by Superimposing on Approved CZMP as per CRZ Notification 2011

FOR

M/s. Hetero Infrastructure SEZ Limited
Hetero Complex, 7-2-A2, Industrial Estate
Sanath Nagar, Hyderabad - 500 018

Through

Indomer Coastal Hydraulics (P) Ltd.
63, Gandhi Road, Alwarthirunagar, Chennai



Prepared by

INSTITUTE OF REMOTE SENSING
ANNA UNIVERSITY, CHENNAI-25

MARCH 2022

Project Data Sheet

Title	Preparation of Local Level CRZ Map for the Proposed Effluent Pipeline facilities of M/s. Hetero Infrastructure SEZ Limited, Nakkapalli, Andhra Pradesh by Superimposing on Approved CZMP as per CRZ Notification 2011
Project Ref No.	AU/IRS/KSR/208-2022 Dt 09.03.2022
Funded by	M/s. Hetero Infrastructure SEZ Limited, Hetero Complex, 7-2-A2, Industrial Estate, Sanath Nagar, Hyderabad - 500 018 through Indomer Coastal Hydraulics P Ltd, Chennai
Principal Consultant	Dr. K.Srinivasa Raju,Professor
Field Survey & Mapping	Mr.S.Sathishkumar, IRS, AU Mr.R.M.Balakumaran, IRS, AU Mr.J.Premkumar, IRS, AU
Report Preparation	Dr. K.Srinivasa Raju, Professor
Quality Assessment Team	Dr.R.Murugasan Professor Dr.M.Shanmugam, Associate Professor Dr.R.Kanmani Shanmuga Priya, Assistant Professor

The Quality Assessment Committee for consultancy projects has scrutinized the CRZ map and corresponding text report of the above project on 04.03.2022. The principal consultant of the project has presented the approach adopted, findings of the study to the committee. The committee has evaluated the CRZ Map and the report for different parameters against the standards prescribed for the mapping. The positional accuracy, attribute accuracy, completeness, semantic accuracy of the output were assessed and found satisfactory. The committee recommends the approval of the map and associated report

Dr. K.Srinivasa Raju
(Principal Consultant)

Dr.R.Murugasan	**Dr.M.Shanmugam**	**Dr.R.Kanmani Shanmuga Priya**
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Executive Summary

Institute of Remote Sensing, Anna University, Chennai has taken up the task of preparing a local level Coastal Regulation Zone (CRZ) map in the vicinity of the proposed effluent pipeline in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district, Andhra Pradesh on the request of M/s. Hetero Infrastructure SEZ Limited, Hetero Complex, 7-2-A2, Industrial Estate, Sanath Nagar, Hyderabad - 500 018 through M/s Indomer Coastal Hydraulics P Ltd, Chennai. The objective of the project is to superimpose the proposed facilities on approved CZMP (Sheet Nos. AP 122 and 123) published by APCZMA for Visakhapatnam District. The satellite imagery of the project area was analysed for geomorphic characteristics in the vicinity of the project site The proposed effluent pipeline are proposed in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district falls in the vicinity of Bay of Bengal, Creek as per the details provided by the client and fall partly inside CRZ as per approved CZMP published by APCZMA.

The client, M/s. Hetero Infrastructure SEZ Limited, Hyderabad was requested to identify the significant points along the proposed faciliteis and to provide the details of the proposed effluent pipeline facilities and existing marine disposal pump house & tank with drawings. Project location is shown in Annexure I. The HTL, LTL, ecologically sensitive areas indicated in approved CZMP with setback lines as per CRZ Notification 2011 were superimposed onto the georeferenced cadastral map to prepare a local level CRZ map at 1:4,000 scale. The coordinates of the HTL derived from approved CZMP at 1:25,000 scale in the WGS84 system are presented in Annexure-II. The location of the project area and layout of proposed and existing facilities as provided by the client were superimposed on the CRZ map (Annexure-III). The proposed and existing facilities are superimposed on the approved CZMP of Visakhapatnam district (Annexure-IV). The proposed effluent pipeline facilities falls partly in CRZ-III, CRZ-III (NDZ), CRZ-IB, CRZ-IVB and CRZ-IVA with remaining portions outside CRZ as per approved CZMP.

1.0 INTRODUCTION

1.1 Coastal Regulation Zone

The coastal zone is the area of interaction between land and sea. The coastal zone of Andhra Pradesh has a very high concentration of population along with ecologically sensitive areas like sand dunes, mangroves etc., There is a spurt of developmental activities arising from huge residential colonies, new industries and tourism centres along the coast and in the coastal zone. There is a need to protect the coastal environment while ensuring continuing production and development. This zone is extremely vulnerable and has to be managed judiciously striking a balance between ecological and developmental needs.

The Ministry of Environment and Forest in the CRZ Notification, 2011 declared the following areas as CRZ and imposed with effect from the date of the notification the restrictions on the setting up and expansion of industries, operations or processes and the like in the CRZ. The areas that are defined as CRZ as per CRZ Notification, 2011 are

(i) The land area from High Tide Line (HTL) to 500 m on the landward side along the seafront.

(ii) CRZ shall apply to the land area between HTL to 100 meters or width of the creek whichever is less on the landward side along the tidally influenced water bodies that are connected to the sea and the distance up to which development along such tidal influenced water bodies is to be regulated shall be governed by the distance up to which the tidal effects are

experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Coastal Zone Management Plans.

(iii) The land area falling between the hazard line and 500m from HTL on the landward side, in case of seafront and between the hazard line and 100m line in case of tidal influenced water body the word 'hazard line' denotes the line demarcated by Ministry of Environment and through the Survey of India taking into account tides, waves, sea-level rise and shoreline changes.

(iv) Land area between HTL and Low Tide Line (LTL) which will be termed as the intertidal zone.

(v) The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank of tidal influenced water bodies.

The Classification of the CRZ is also modified for the purpose of conserving and protecting the coastal areas and marine waters as CRZ – I, CRZ – II, CRZ – III and CRZ – IV. The CRZ – I include the areas that are ecologically sensitive and the geomorphological features which play a role in maintaining the integrity of the coast like (a) Mangroves(b) Corals and coral reefs and associated biodiversity (c) Sand Dunes (d) Mudflats which are biologically active (e) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas (f) Salt Marshes (g) Turtle nesting grounds (h) Horseshoe crabs habitats (i) Seagrass beds (j) Nesting

grounds of birds (k) Areas or structures of archaeological importance and heritage sites and the area between Low Tide Line and High Tide Line. The CRZ-II includes areas that have been developed up to or close to the shoreline. The CRZ-III includes areas that are relatively undisturbed and those do not belong to either CRZ-I or II, which include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built up. The CRZ-IV includes the water area from the Low Tide Line to twelve nautical miles on the seaward side and the water area of the tidal influenced water body from the mouth of the water body at the sea up to the influence of tide which is measured as five parts per thousand during the driest season of the year.

The Ministry of Environment and Forest has also provided guidelines for demarcation of High Tide Line in the CRZ Notification, 2011. As per the guidelines, Cadastral (village) maps in 1:3960 or the nearest scale shall be used as the base maps. HTL and LTL will be demarcated by NCSCM, Chennai is used for superimposition on the cadastral map based on physical verification using coastal geomorphological signatures or features in accordance with the CZMP Maps approved by the Central Government.

In order to facilitate the classification of Coastal Regulation Zones, the Government of India has approved a few agencies/institutions across the Country vide Lr. No. J17011/8/92-1A III, dated 10.05.1999 of the Ministry of Environment and Forests. Institute of Remote Sensing, Anna University being one of them, has been carrying out HTL and LTL mapping following the

guidelines issued by the Ministry of Environment & Forests, Government of India.

1.2 Background

M/s. Hetero Infrastructure SEZ Limited, Hetero Complex, Hyderabad - 500 018 has requested Institute of Remote Sensing, Anna University to prepare local level CRZ Map by superimposing proposed effluent pipeline facilities, in Pedateenarla and Rajauyyapeta villages along with HTL, LTL for the Sea/Bay/tidal influenced water bodies and ecologically sensitive areas on 1:4,000 scale cadastral map in the vicinity of project site. The proposed project site falls adjacent to Bay of Bengal and creek, which carries tidal waters. It is in this context, the project site and proposed effluent pipeline and facilities needs to be evaluated to assess whether they fall under regulations of CRZ Notification, 2011. Hence IRS has taken up the work of superimposing the project site and proposed pipeline and facilities on approved CZMP prepared by NCSCM.

1.3 Objectives

The objective of the present study is to examine the project site and proposed effluent pipeline facilities in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district with reference to CRZ Notification, 2011. Keeping in view of the requirements of notification, Institute of Remote Sensing, Anna University under took the project with following agreed scope of work:

- Transfer of HTL, LTL for Bay of Bengal, Creek as indicated in approved CZMP (Map Nos. AP 122 and AP 123) in the vicinity of the project site by digitization from approved CZMP at 1:25,000 scale.
- Digitisation of ecologically sensitive entities such as Mangroves, Sand dunes, Turtle breeding grounds as indicated on approved CZMP in the vicinity of project site
- Superimposition of HTL, LTL, Ecologically Sensitive Areas along with the project site and proposed effluent pipeline and associated facilities on to the georeferenced cadastral map
- Preparation of local level CRZ map at 1:4000 scale for the project site in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district, Andhra Pradesh.

1.4 Data Products

CZMP prepared as per CRZ Notification 2011 and approved by MOEF, New Delhi were collected from the client/authority and used as reference for transfer of HTL, LTL and ecologically sensitive areas in the vicinity of project site onto local level CRZ map. The data products used for the study and mapping include approved CZMP published by APCZMA (Map Nos. AP 122 and AP 123) vide CRZ Notification 2011 and cadastral maps of Pedateenarla and Rajauyyapeta villages provided by on approved CZMP.

1.5 Methodology

The cadastral maps of the Pedateenarla and Rajauyyapeta villages from approved CZMP have been used for the preparation of local level CRZ map. Coastal geomorphological features and the existence of permanent

vegetation identified from the satellite imagery were used to transfer the HTL demarcated by NCSCM on approved CZMP. The approved CZMP was georeferenced using graticules available on the maps.

The cadastral maps of the Pedateenarla and Rajauyyapeta villages, Andhra Pradesh were digitized to create a vector dataset of survey polygons in the vicinity of project location. The same is superimposed on satellite imagery to identify the proposed project location. The HTL, LTL and ecologically sensitive areas in the vicinity of the project location are digitized from georeferenced approved CZMP. 100m, 200m, 500m setback lines from HTL for the Bay of Bengal and creek are generated using the buffering tool available in GIS. The zones between LTL, HTL and setback lines are delineated to corresponding CRZ as per CRZ Notification 2011.

2.0 STUDY AREA

2.1 Description of Study Area

The proposed project site of M/s Hetero Infrastructure SEZ Limited, Nakkapalli is located in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district, Andhra Pradesh. The proposed effluent pipeline originates from existing plant of M/s Hetero Infrastructure SEZ facilities in Rajauyyapeta village and passes through various survey numbers in Rajauyyapeta and Pedateenarla village and crosses a creek. The existing marine disposal Pump house, Tank falls in Pedateenarla village Proposed landfall Point falls within intertidal area and proposed outfall diffuser falls within Bay of Bengal as per the details provided by the client through M/s Indomer Coastal Hydraulics (P) Ltd. Chennai.

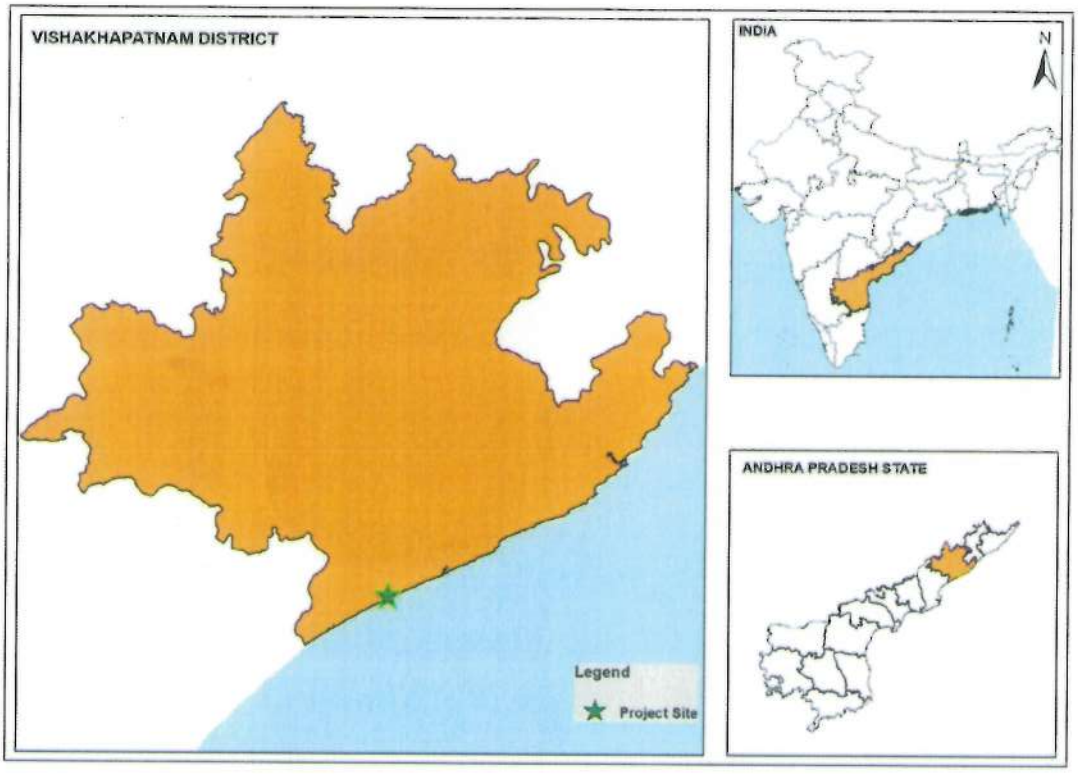


Fig. 1. Location Map of Project Area

The coordinates of the proposed effluent pipeline as per field observations using dual frequency GPS and client are presented in Table 1

Table 1 Coordinates of Proposed Effluent Pipeline as per GPS survey

Label	Latitude	Longitude
Landfall Point	17° 21' 33.3"N	82° 44' 11.5"E
Outfall Diffuser	17° 21' 01.1"N	82° 45' 10.3"E

2.2 Status as per Approved CZMP prepared by NCSCM, Chennai

The proposed effluent pipeline and associated facilities in Pedateenarla and Rajauyyapeta villages, Nakkapalle Mandal, Visakhapatnam district, Andhra Pradesh falls party inside Bay of Bengal, Intertidal Area and Between HTL and 200m setback from HTL for Bay of Bengal, between 200m and 500m setback lines from HTL as well as between HTL and 100m setback line from HTL of Creek as per approved CZMP (Map Nos. AP 122 and AP 123). Hence, the proposed effluent pipeline facilities falls partly inside CRZ-III, CRZ-III (NDZ), CRZ-IB, CRZ-IVB, and CRZ-IVA as per approved CZMP map prepared by NCSCM, Chennai vide CRZ Notification 2011.

3.0 RESULTS AND CONCLUSIONS

3.1 Results

The cadastral maps of Pedateenarla and Rajauyyapeta villages in Nakkapalle Mandal, Visakhapatnam district, Andhra Pradesh were georeferenced using tic points available on approved CZMP of Visakhapatnam District. The HTL, LTL for Bay of Bengal, Creek as indicated in approved CZMP were superimposed onto a georeferenced cadastral map along with ecologically sensitive areas in the vicinity of the project site. Setback lines for 100m, 200m, 500m from HTL for Bay of Bengal and 100m setback line from HTL of Creek as indicated in approved CZMP were superimposed onto georeferenced base map to prepare local level CRZ map (Annexure III). The satellite imagery of the project site is enclosed for reference (Annexure I). The coordinates of points on HTL line derived from approved CZMP are presented in Annexure II. The project site and proposed effluent pipeline superimposed onto approved CZMP is shown in Annexure IV.

3.2 Conclusions

- The proposed effluent pipeline facilities in Pedateenarla and Rajauyyapeta villages, Visakhapatnam district, Andhra Pradesh of M/s. Hetero Infrastructure SEZ Limited, Hyderabad falls partly in CRZ-III, CRZ-III (NDZ), CRZ-IB, CRZ-IVB and CRZ-IV A as per approved CZMP (Map Nos. AP 122, 123).
- The Landfall point proposed falls within intertidal area (CRZ-I B) and the Outfall diffuser falls within Bay of Bengal (CRZ-IV A)

PRINCIPAL CONSULTANT

DIRECTOR, IRS

Director
Institute of Remote Sensing
Anna University
Chennai - 600 025.

- No Sand Dunes, Mangroves or Mudflats are present in the Project site as per approved CZMP
- The length of Proposed Effluent Pipelines in various coastal regulation zones is presented in Table 2.

Table 2 Length of Proposed Effluent Pipeline in various CRZ zones

Sl.No	CRZ - Classification	Length in Metres
1	CRZ - IB (Seafront) - 100 m CRZ - IB (creek) - 29 m	129
2	CRZ-III (NDZ)	821
3	CRZ - III	346
4	CRZ - IVA	1931
5	CRZ - IVB	17
6	Outside CRZ	1278
Total		**4522**

- Coastal Regulation Zone map of the site is prepared considering approved CZMP as per CRZ Notification 2011 of MoEF, GoI
- Superimposition of approved CZMP is subject to scale and generalisation error
- The DGPS Survey was carried out specific to the referred project site boundary only hence, validation of HTL and CRZ Boundary is limited to the clearance of the same.

PRINCIPAL CONSULTANT

DIRECTOR, IRS

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Anna University,
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ANNEXURE I

Satellite Imagery of project site



(courtesy: Google Earth)

ANNEXURE II

Coordinates of HTL Reference Points

HTL Point	Latitude	Longitude
1	17° 20' 57.8" N	82° 42' 57.6" E
2	17° 21' 07.0" N	82° 43' 16.1" E
3	17° 21' 15.5" N	82° 43' 33.3" E
4	17° 21' 25.1" N	82° 43' 52.6" E
5	17° 21' 35.2" N	82° 44' 13.8" E
6	17° 21' 45.3" N	82° 44' 34.4" E
7	17° 22' 04.4" N	82° 44' 38.1" E
8	17° 22' 07.6" N	82° 44' 14.3" E
9	17° 22' 02.3" N	82° 43' 57.7" E
10	17° 22' 02.5" N	82° 43' 42.2" E
11	17° 21' 54.2" N	82° 43' 26.6" E
12	17° 21' 48.6" N	82° 43' 12.0" E
13	17° 21' 55.1" N	82° 43' 00.8" E
14	17° 22' 06.3" N	82° 42' 59.8" E
15	17° 22' 14.9" N	82° 43' 00.9" E
16	17° 22' 27.5" N	82° 43' 08.5" E
17	17° 22' 22.9" N	82° 43' 29.4" E
18	17° 22' 17.1" N	82° 43' 52.6" E
19	17° 22' 05.5" N	82° 44' 03.3" E
20	17° 22' 17.6" N	82° 44' 13.1" E
21	17° 22' 01.9" N	82° 44' 39.4" E
22	17° 21' 48.2" N	82° 44' 40.4" E
23	17° 21' 53.8" N	82° 44' 53.9" E
24	17° 22' 02.2" N	82° 45' 11.0" E

(Source: Approved CZMP – Map Nos. AP 122 and AP 123)

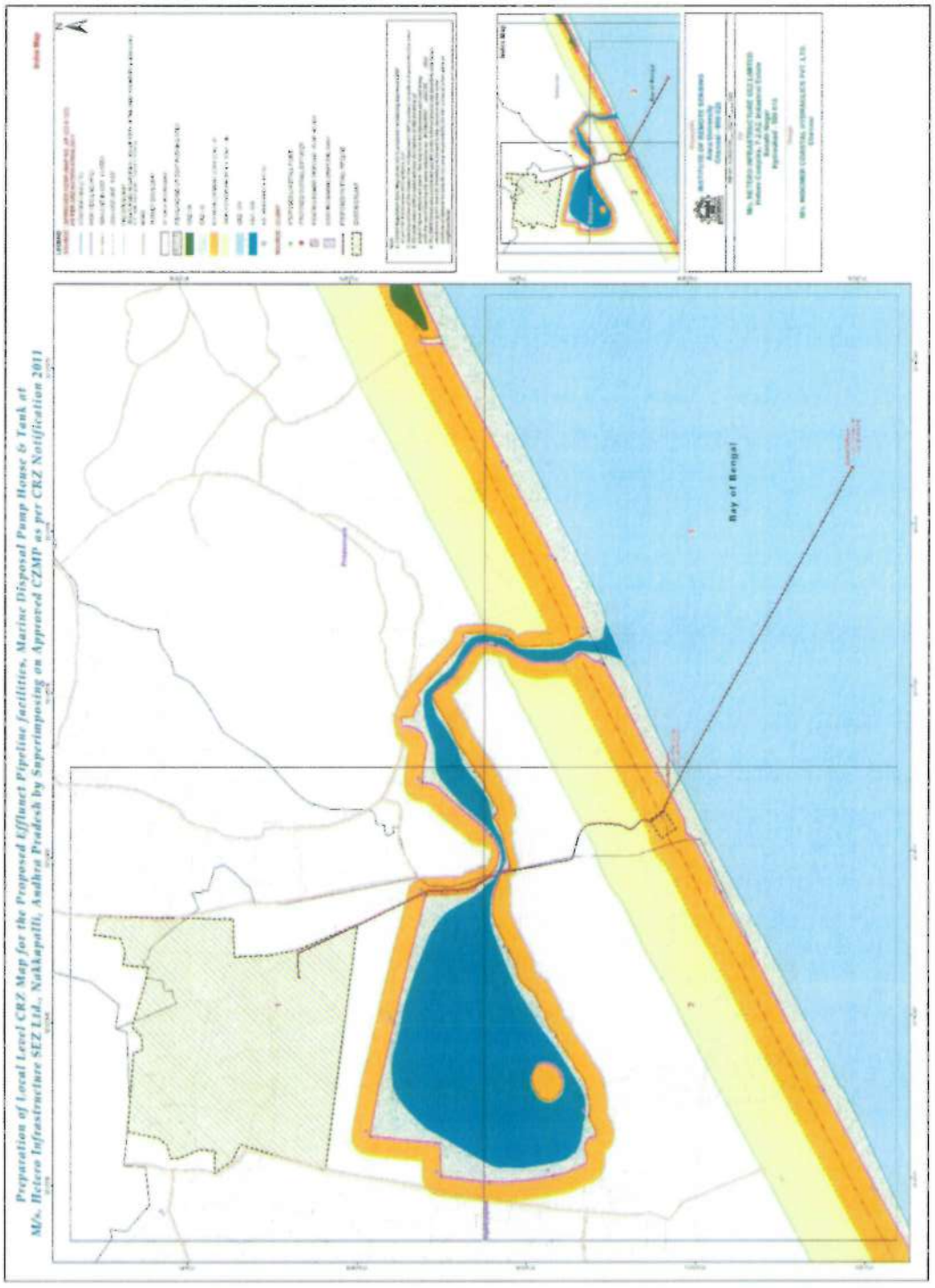
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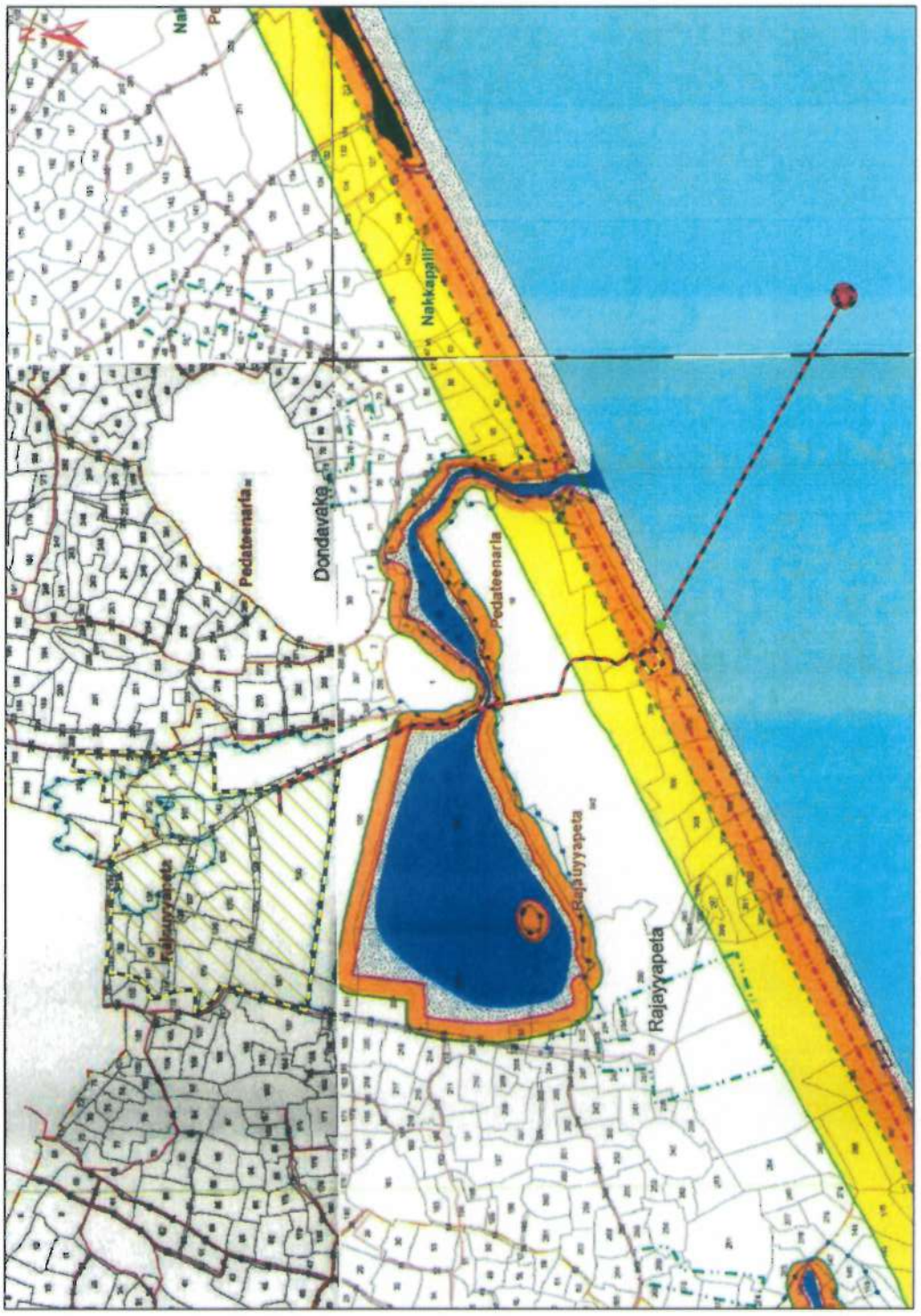
ANNEXURE III

Local Level CRZ Map for the Proposed Effluent Pipeline facilities of M/s. Hetero Infrastructure SEZ Limited, Hyderabad



ANNEXURE IV

Proposed Effluent Pipeline facilities Superimposed on Approved CZMP



Source: Approved CZMP – Map Nos. AP 122 and AP 123

HETERO INFRASTRUCTURE SEZ LTD

Status/Reply of APCZMA Recommendations of No Objection under the provisions of CRZ Notification 2011 vide Letter NO: 382/CRZ/IND/2022-575 dated 09/11/2022

S.NO	Conditions	Status/Reply
PART-A: Specific Conditions		
(i)	The proposed constructions shall conform to the norms prescribed in CRZ- Notification issued by the Ministry of Environment and Forests, Government of India S.O.No.19(E), dated 06/01/2011 and shall not affect the coastal ecology of the area.	All constructions will be done as per the norms prescribed in CRZ- Notification issued by the Ministry of Environment and Forests, Government of India S.O.No.19(E), dated 06/01/2011 and will ensure no damage to the coastal ecology of the area.
(ii)	No Activity on ground shall be undertaken without obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India S.O.No.19(E), dated 06/01/2011	**Will be complied.** Activities related to new pipeline will be undertaken after obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India S.O.No.19(E), dated 06/01/2011
(iii)	The treated effluent existing pipeline is to be removed, after commissioning of the new pipeline.	The existing pipeline will be discarded after commissioning the new pipeline i.e by removing diffusers, Cutting of pipeline etc.
(iv)	Due to accidental breakage of pipeline, the necessary mitigation measures like immediately attending the repair of pipeline has to be taken up. Necessary spares of pipeline segments with bends/tees and divers with experience in salvation operation irrespective of Sea condition have to be kept ready always within the industrial unit.	All spares will be maintained in stock for taking care of repairs of accidental breakage of pipeline.
(v)	The industry should install flow meters to record the quantities of treated effluents discharge. Regular annual monitoring of coastal waters is to be carried-out by the reputed institutions, for water quality near the proposed outfall locations.	Complied. The industry installed flow meters to record the quantities of treated effluents discharged into Sea. Regular annual monitoring of coastal waters will be carried-out by the reputed institutions, for water quality near the proposed outfall locations.
(vi)	A continuous monitoring system should be put in place by the applicant to find out the impact on marine life/flora/fauna, due to discharge	A continuous monitoring system will be installed after completion of the work to find out the impact on marine life/flora/fauna, due to discharge
(vii)	The project proponent shall conduct the bioassay test for the treated effluent discharges from the marine outfalls as per the MoEF&CC Guidelines. Bio-assay analysis shall be conducted every six months to establish the toxicity levels and report to be submitted to APPCB.	The industry is carrying Bioassay test for the treated effluent discharges from the marine outfalls as per the MoEF&CC Guidelines through National Institute of Oceanography (NIO). Placed order for one year studies and Now work is going on.

(viii)	The project proponent shall treat the effluents before discharging into sea duly complying with the APPCB and MoEF&CC Norms.	The effluents are being treated to comply with the APPCB and MoEF&CC Norms. Disposal is being carried in presence of APPCB officials after meeting the standards.
(ix)	The activity is continuous and every day the industry discharges for about 8-10 hours. Over a long period, the industry should ensure all the precautions mentioned and also see that this activity should not create any bacterial and virus vectors.	Continuous monitoring will be done on yearly basis through reputed agencies and will ensure all the precautions mentioned and also see that this activity should not create any bacterial and virus vectors.
(x)	No soild waste shall be disposed in the Coastal Regulatory Zone area. The solid waste shall be properly collected. Segregated and disposed as per the provisions of solid waste (Management and Handling) Rules 2000 and amended thereof.	Solid waste is being disposed as per the conditions mentioned in Hazardous waste authorization issued by APPCB and as per solid waste (Management and Handling) Rules 2000 and amended thereof.
(xi)	The green belt shall be maintained to improve aesthetic value of the area.	Thick green belt is being maintained in and around the factory premises. More than 40% of project area is covered with Green belt.
(xii)	The proponent shall allocate enough budget for regular maintenance in all aspects i.e, drainage, garbage, effluent discharge and other activities.	The industry has allocated enough budget for regular maintenance of drainage, garbage, effluent discharge and other activities
(xiii)	The proponent shall implement all the mitigation measures as mentioned in EIA Report.	All the mitigation measures as mentioned in EIA Report will be implemented in a time bound manner.
(xiv)	Ground water shall not be tapped in the CRZ area.	No ground water is used for the project. The total water requirement of the project will be met through Desalination Plants.
(xv)	The project proponent shall submit the half yearly compliance reports of CRZ clearance duly audited by the accredited consultants on the degree of compliance by the project proponent during and after construction of the project.	Will be submitted.
PART-B: General Conditions		
(i)	A copy of the clearance letter shall also be displayed on the website of the AP Pollution Control Board. The clearance letter shall also be displayed at the AP Pollution Control Board, Regional Office, District Industries Center and District Collector Office / Mandal Revenue Office for 30 days	Will be displayed at all locations as mentioned.
(ii)	The funds earmarked for environmental protection measures shall be kept in	The funds earmarked for environmental protection measures will be kept in

	separate account and shall not be diverted for other purpose. Year – wise expenditure shall be reported to the Andhra Pradesh Coastal Zone Management Authority (APCZMA) and A.P. Pollution Control Board Regional Office	separate account and will not be diverted for other purpose. Year – wise expenditure will be reported to the Andhra Pradesh Coastal Zone Management Authority (APCZMA) and A.P. Pollution Control Board Regional Office
(iii)	Concealing factual data by the project proponent, any officer on behalf the project proponent and consultants hired by the project proponent or submission of false / fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986	Noted and agreed upon.
(iv)	Consent for Establishment (CFE) and Consent for Operation (CFO), as may be applicable, shall be obtained from Station Pollution Control Board under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974. All waste (liquid and solid) arising from the proposed development shall be disposed of as per the norms prescribed by Station Pollution Control Board. There shall not be any disposal of untreated effluent into the Sea / costal waster bodies.	CFE & CFO will be obtained from APPCB under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974. All waste (liquid and solid) arising from the proposed development will be disposed of as per the norms prescribed by Station Pollution Control Board The industry will ensure that there will not be any disposal of untreated effluent into the Sea / costal waster bodies
(v)	Full co-operation shall be extended to the officials from the APCZMA, APPCB and Regional Office of MoEF&CC, during monitoring of implementation of environmental safeguards stipulated. It shall be ensured that documents / data sought pertinent is made available to the monitoring team. A complete set of all the documents submitted to APCZMA shall be forwarded to the A.P. Pollution Board Regional Office.	Noted and Agreed upon.
(vi)	In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by the APCZMA.	Noted and will be followed.
(vii)	The APCZMA reserves the right to add additional safeguard measures subsequently, if found necessary, and to	Noted and agreed upon.

	take action including revoking of the CRZ clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound any satisfactory manner	
(viii)	All other statutory clearance shall be obtained, as applicable by project proponents from the respective competent authorities.	All statutory clearances will be obtained, as applicable from the respective competent authorities
(ix)	The project proponent should advertise in at least two local newspapers widely circulated in the regional, one of which shall be in the vernacular language informing that the project has been accorded CRZ clearance and copies of clearance letters are available with the AP Pollution Control Board and may also be seen on the website of APCZMA. The advertisement should be made within Seven days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the A.P Pollution Control Board Regional Office.	Noted and will be advertised in at least two local newspapers widely circulated in the region and one national news paper after getting CRZ clearance.
(x)	This Clearance is subject to any order passed by any Hon'ble Courts, as may be applicable to this project.	Noted and agreed upon.
(xi)	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parishad / Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions / representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	A copy of the clearance letter will be sent to concerned Panchayat, Zilla Parishad after getting Clearance.
(xii)	The proponent shall upload the status of compliance of the stipulated conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the AP Pollution Control Board, Regional Office and the APPCB Head Office.	Will be complied. The industry will upload the status of compliance of the stipulated conditions, including results of monitored data on their website and shall update the same periodically. The same will be sent to the AP Pollution Control Board, Regional Office and the APPCB Head Office.
(xiii)	The project proponent shall ensure that there are no destructions of mangroves,	Not Applicable.

	if any, during the construction as well as the operation phase of the project	There are no mangroves in the project area.
(xiv)	There shall be no dressing or alteration of the sand dunes and natural features, including landscape changes for beautification, recreation and other such purpose.	Only pipeline laying is involved in the project and hence There will be no dressing or alteration of the sand dunes and natural features, including landscape changes for beautification, recreation and other such purpose.
(xv)	No permanent labour camp, machinery and material storage shall be allowed in CRZ area	Not Required, Only pipeline laying is involved and hence there is no requirement of permanent labour camps.
(xvi)	There shall no ground water drawl within CRZ without prior approval of the State Ground Water Authority	Not Applicable. Total water requirement of the project is being met through the Desalination plants.
(xvii)	Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority	Noted and will be followed.

315th MEETING OF EXPERT APPRAISAL COMMITTEE

DATE: 29.11.2022

CRZ CLEARANCE FOR LAYING OF NEW EFFLUENT PIPELINE IN PLACE OF OLD EFFLUENT PIPELINE FOR DISPOSAL OF ENHANCED TREATED EFFLUENT THROUGH MARINE DISCHARGE AT N. NARASAPURAM (VILLAGE), NAKKAPALLI MANDAL, ANAKAPALLI DISTRICT, ANDHRA PRADESH

FOR

HETERO

EIA CONSULTANT

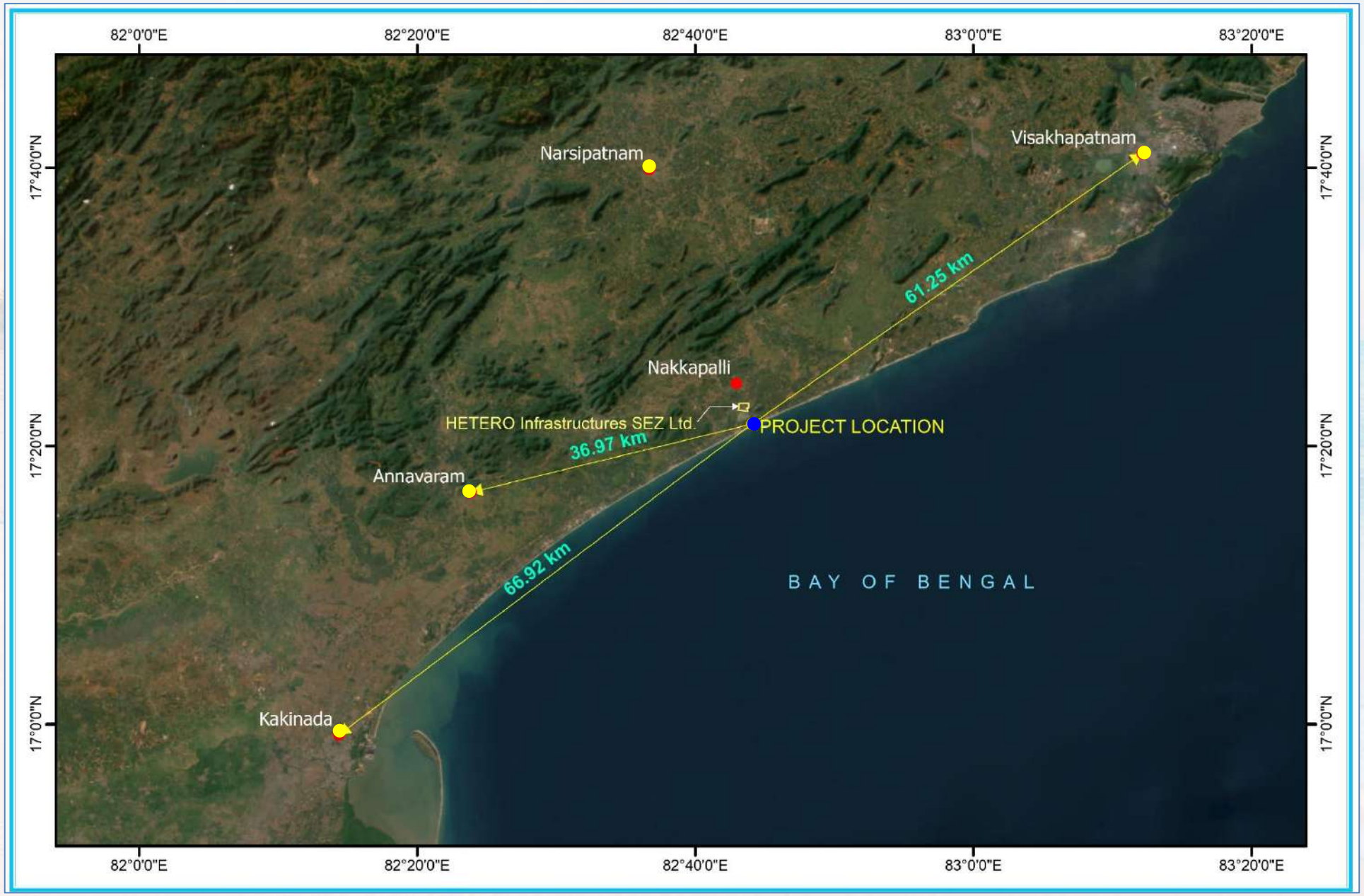
INDOMER COASTAL HYDRAULICS (P) LTD.

NABET/EIA/2023/SA 0170 & 13.09.2023 Sectors: 27 & 33

PROJECT DETAILS

➢ Proposed Project	Laying of New Effluent Pipeline in place of Old Effluent pipeline for disposal of Enhanced treated effluent (2.366 MLD) through marine discharge.
➢ EIA Consultant	Indomer Coastal Hydraulics (P) Ltd. (NABET/EIA/2023/SA 0170 & 13.09.2023 - Sectors: 27 & 33)
➢ Client	Hetero Infrastructure SEZ Limited.
➢ Project Location	N. Narasapuram (Village), Nakkapalli Mandal, Anakapalli District, Andhra Pradesh.
➢ Project Cost	15 crores
➢ CRZ Mapping agency	IRS Anna University

PROJECT LOCATION



EXISTING PIPELINES

Pipeline	Quantity (MLD)	Length (in m) from LFP	Diameter (in mm)	Depth of termination (in m)	Installed year
Treated effluent of Hetero Infrastructure SEZ Ltd.	1.04 (Treated Effluent)	981	200	13.3	2007
Sea water intake (desalination plant)	15 (intake)	682	560	12.9	2010
Brine reject outfall of desalination plant	10 (Brine)	1155	355	14.6	2010

EC Merge + Transfer of 2.366 MLD was obtained vide letter No. J-11011/398/2011-IA II (I) on the 27/01/2020

NEED FOR THE PROJECT

Over the period of 12 years, both outfall pipelines got damaged due to following reasons:

- Chocking up of the pipelines due to barnacle growth in the pipelines.
- Entanglement of nets around the diffuser.
- Wear and tear of diffuser ports.
- Diffuser ports got completely buried below the seabed.



Broken diffuser port



Fishing net around diffuser port



Barnacles on diffuser port

Pipeline inspection was carried out from 1st to 3rd November 2020.

PROPOSED TO APCZMA

Proposal to APCZMA					
Pipeline	**Quantity (MLD)**	Length (in m)	Diameter (in mm)	Depth (in m)	Proposed to APCZMA
Sea water intake of desalination plant	**15**	**682**	**560**	**12.9**	**Will remain same**
Brine reject outfall of desalination plant	**10**	**1155**	**355**	**14.6**	**Combined Brine reject with effluent pipeline**
Treated effluent of Hetero Infrastructure SEZ Ltd.	**1.04 (Enhanced to 2.366 MLD)**	**981**	**200**	**13.3**	

RECOMMENDATION BY APCZMA

During 52nd APCZMA the meeting help on 13.10.2022.

Committee examined the proposal and recommended that:

- The committee noted that mixing of treated effluent and brine reject before discharging into sea and as of now there is no specific study. The CPCB has existing marine discharge standards but not having standard for mixing both. Hence there is need to entrust a study with IICT (Indian Institute of Chemical Technology) & NEERI to examine the mixing of treated effluent and brine reject before discharging into sea.

- After examination APCZMA committee recommended the proposal to MoEF&CC for laying of a new pipeline in place of old pipeline for disposal of treated effluent (2.366 MLD) through marine discharge.

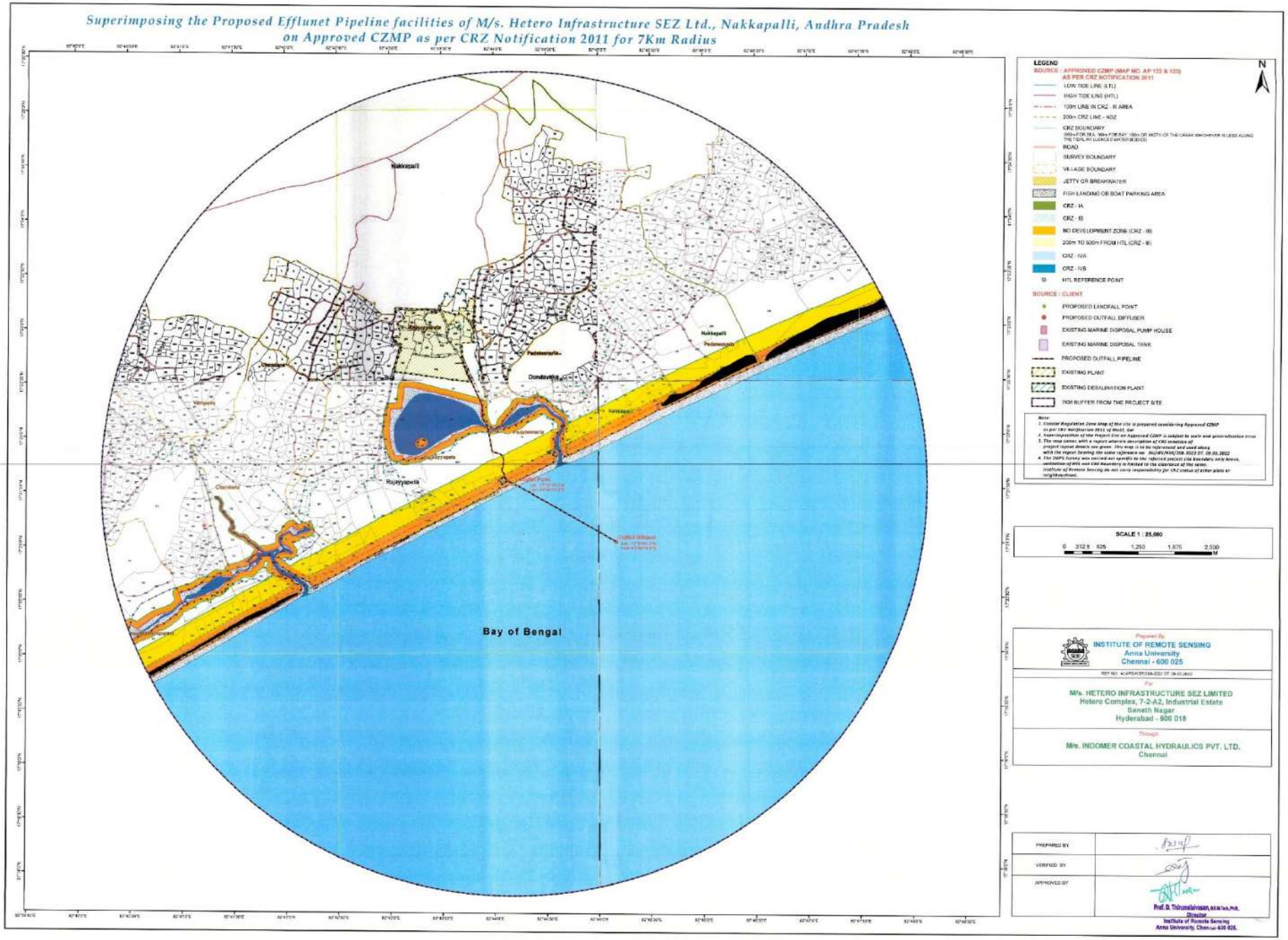
RECOMMENDED BY APCZMA

Existing Pipeline					
Pipeline	**Quantity (MLD)**	Length (in m)	Diameter (in mm)	Depth (in m)	APCZMA Recommendation
Sea water intake of desalination plant	15	682	560	12.9	**Will remain same**
Brine reject outfall of desalination plant	10	1155	355	14.6	**Combined Brine reject with effluent pipeline (to be studies by IICT & NEERI)**
Treated effluent of Hetero Infrastructure SEZ Ltd.	1.04 **(Enhanced to 2.366 MLD)**	981	200	13.3	

Recommended by APCZMA					
Pipeline	**Quantity (MLD)**	Length (in m)	Diameter (in mm)	Depth (in m)	APCZMA Recommendation
Treated effluent of Hetero Infrastructure SEZ Ltd.	**2.366**	**2000**	**500**	**14.8**	**Recommend by APCZMA to discharge only treated effluent**

CRZ MAP

1:25000



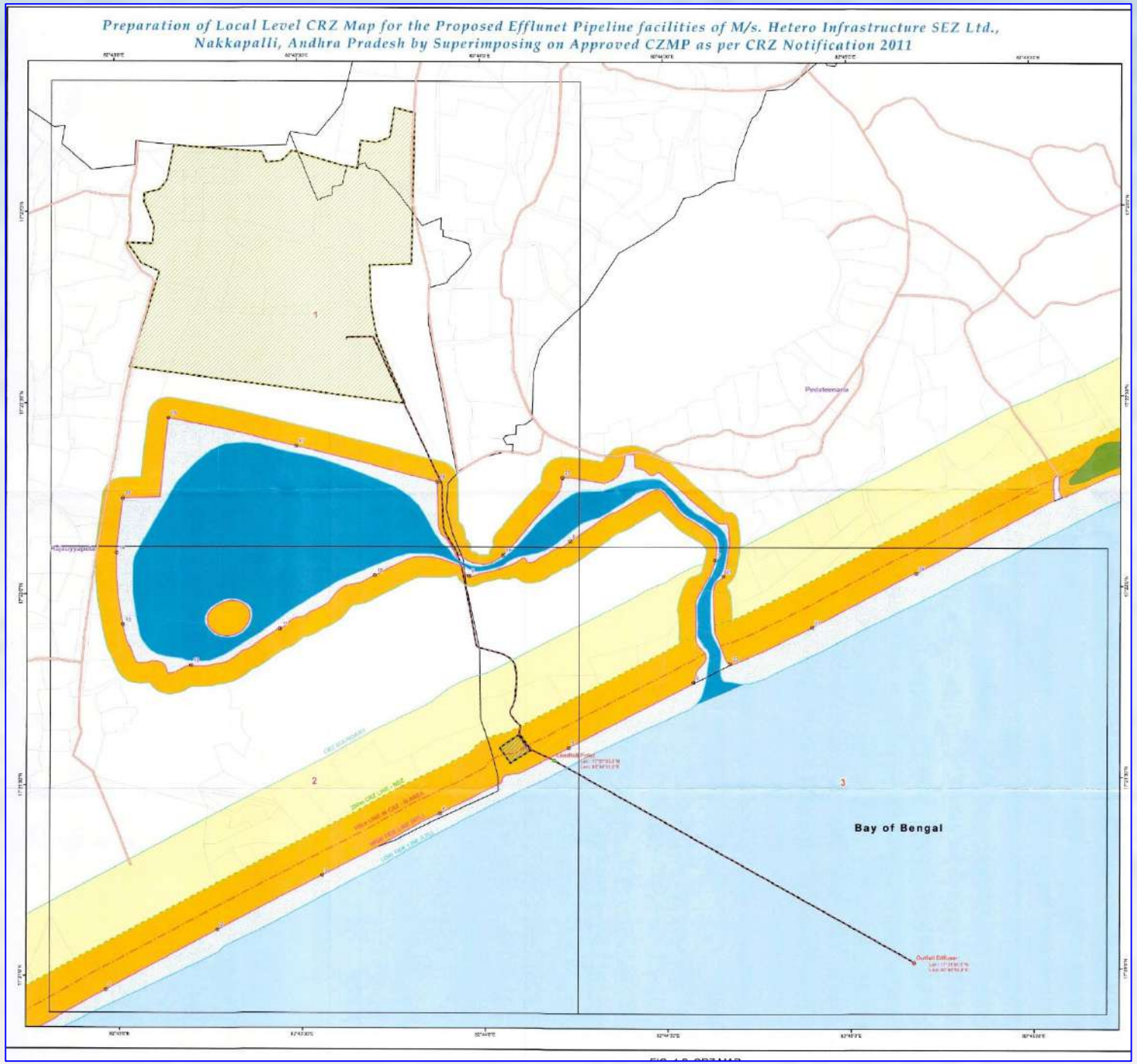
PIPELINE IN CRZ AREA (EXTRACTED FROM CRZ REPORT BY ANNA UNIVERSITY)

CRZ Classification			Length of pipeline (m)
CRZ I B (HTL)	:	Area between Low Tide Line (LTL) and High Tide Line	129.37
CRZ III A	:	No Development Zone (HTL to 200 m)	821.37
CRZ III B	:	Area between 200 to 500 m from HTL	346.12
CRZ IV A	:	Area between LTL and 12 Nm into the sea	1930.64
CRZ IV B	:	Tidal influenced water body from mouth of the water body at the sea up to the influence of tide which is measured as 5 ppt during driest part of year	17.35
Outside CRZ			1277.59
Total			4522.44

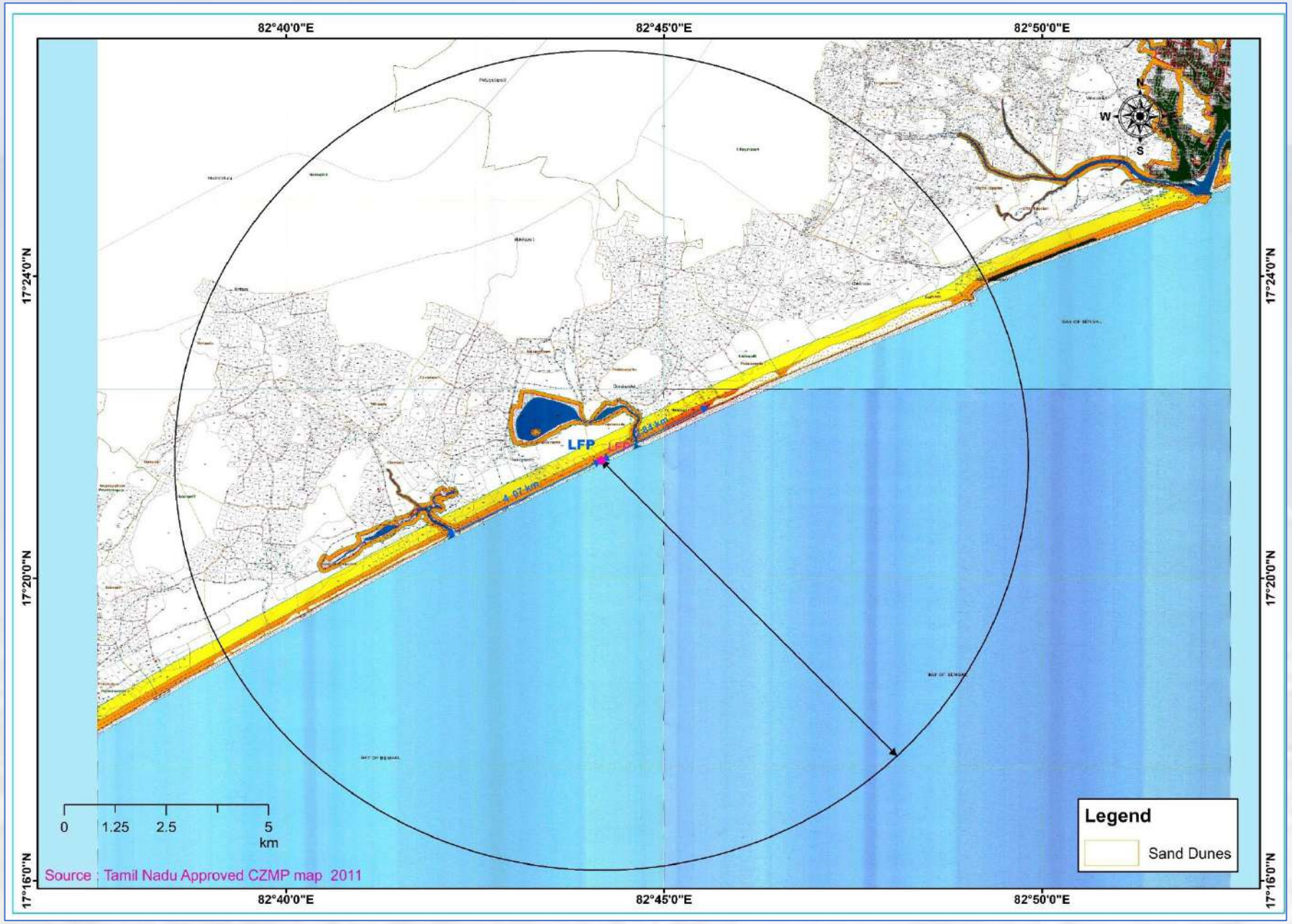
Pipeline length of 3244 m falls in CRZ area and 1278 m in non CRZ area.

There is no CRZ IA in the project region.

CRZ MAP (1:4000)



ECOLOGICALLY SENSITIVE AREA MAP



Small patch of sand dunes – 2.8 km (N) & 4 km (S)

LOCATION OF OUTFALL



SITE







MODELLING OF DISPERSION

INITIAL DILUTION - *CORMIX*

- Initial Mixing Zone
- Hydrodynamic Mixing Process
- Discharge Condition
- Near Field Process

SECONDARY DISPERSION - *MIKE 21*

- Flow - AD & HD Model
- 3 Seasons

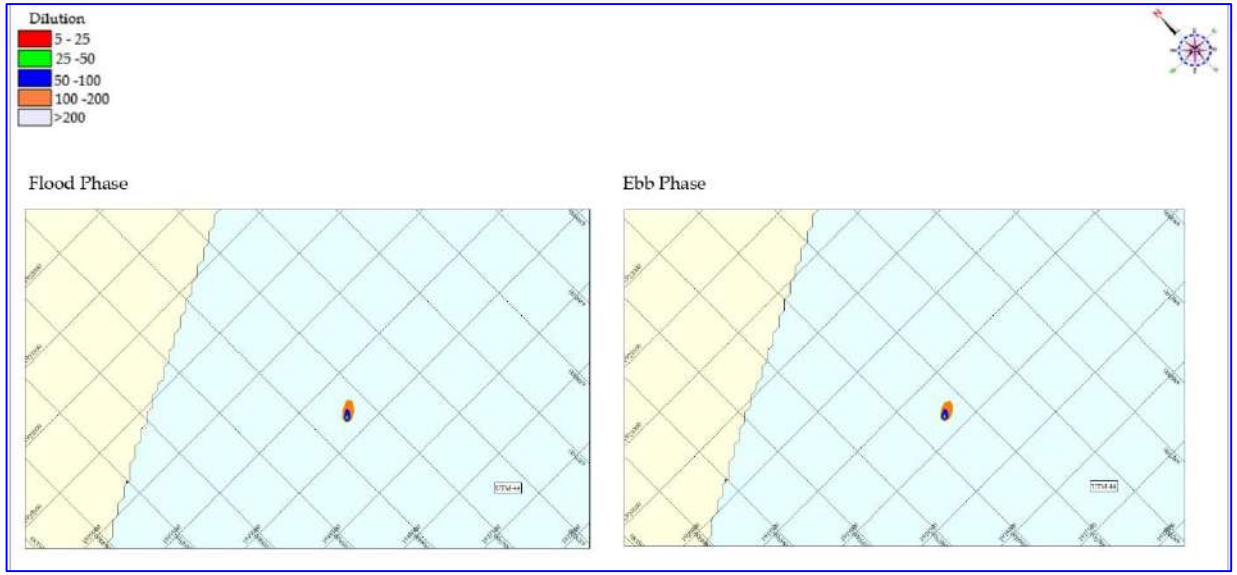
DETAILS OF OUTFALL

Volume of treated effluent	2.366 MLD
No. of Ports	4 Nos.
Diameter of Ports	Each 250 mm
Initial Dilution	92 times in 3.5 minutes

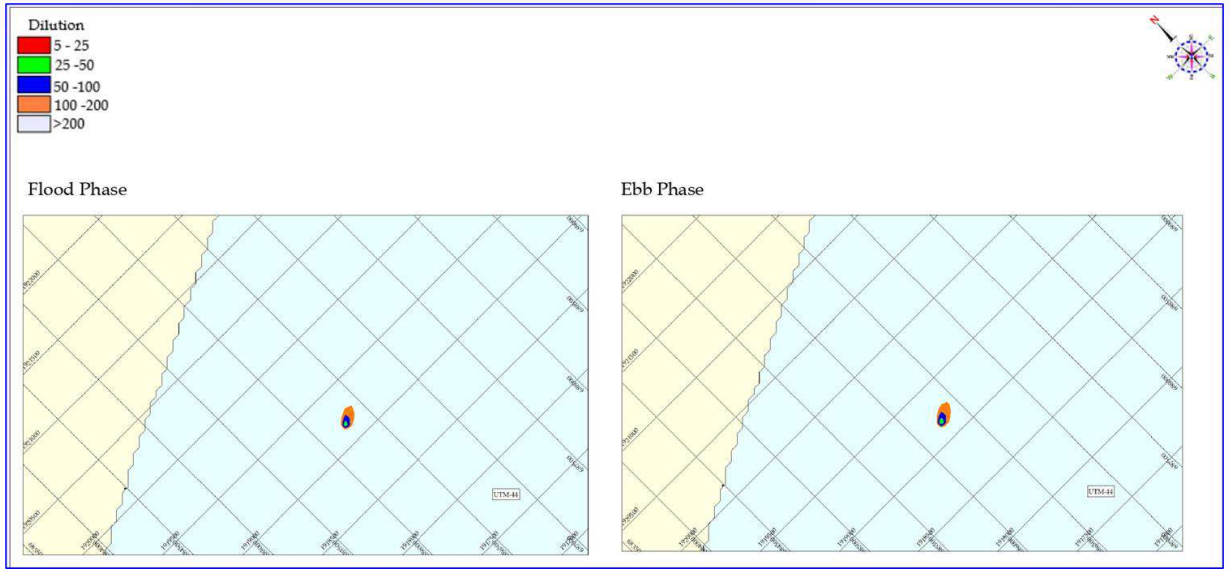
Dilution zone radius of treated effluent to reach 100 times dilution

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	150 m	< 50 m	<50 m
Neap Tide	190 m	< 50 m	<50 m

INDUSTRIAL EFFLUENT - SW

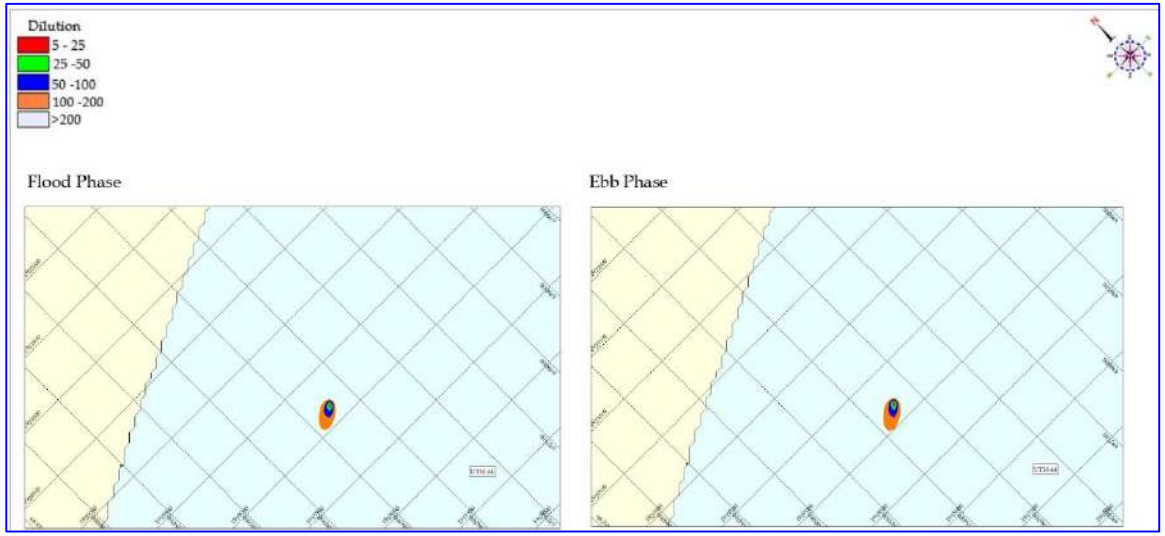


Spring tide

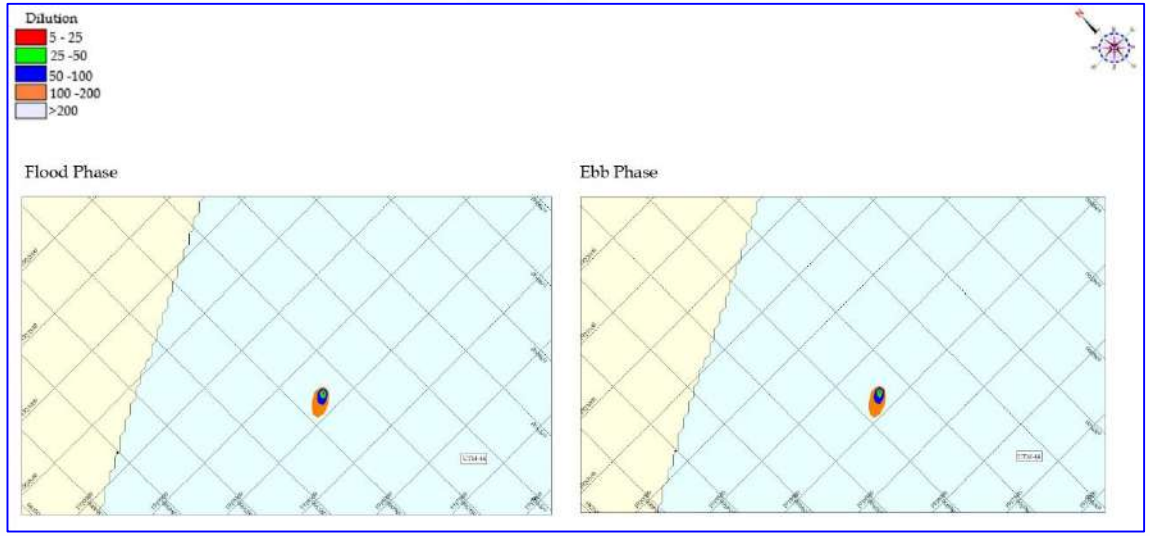


Neap tide

INDUSTRIAL EFFLUENT - NE



Spring tide

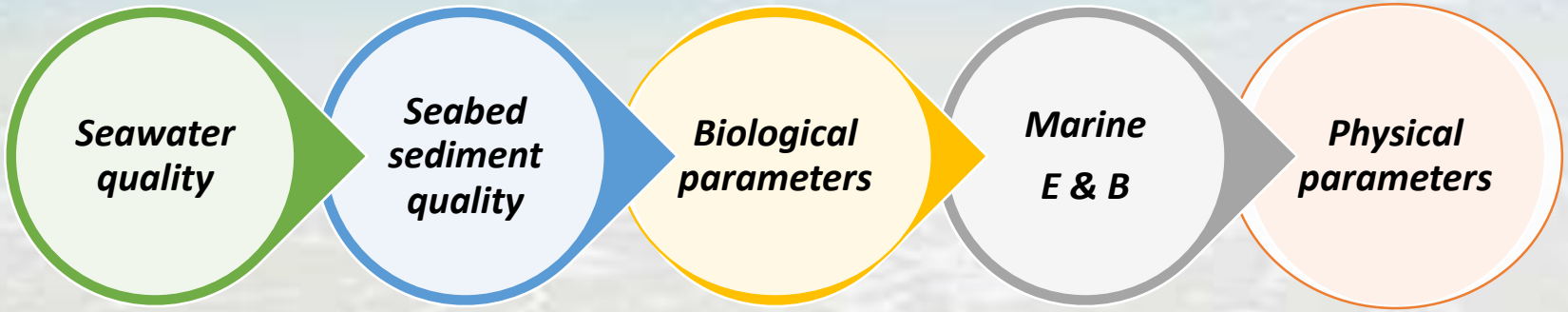


Neap tide

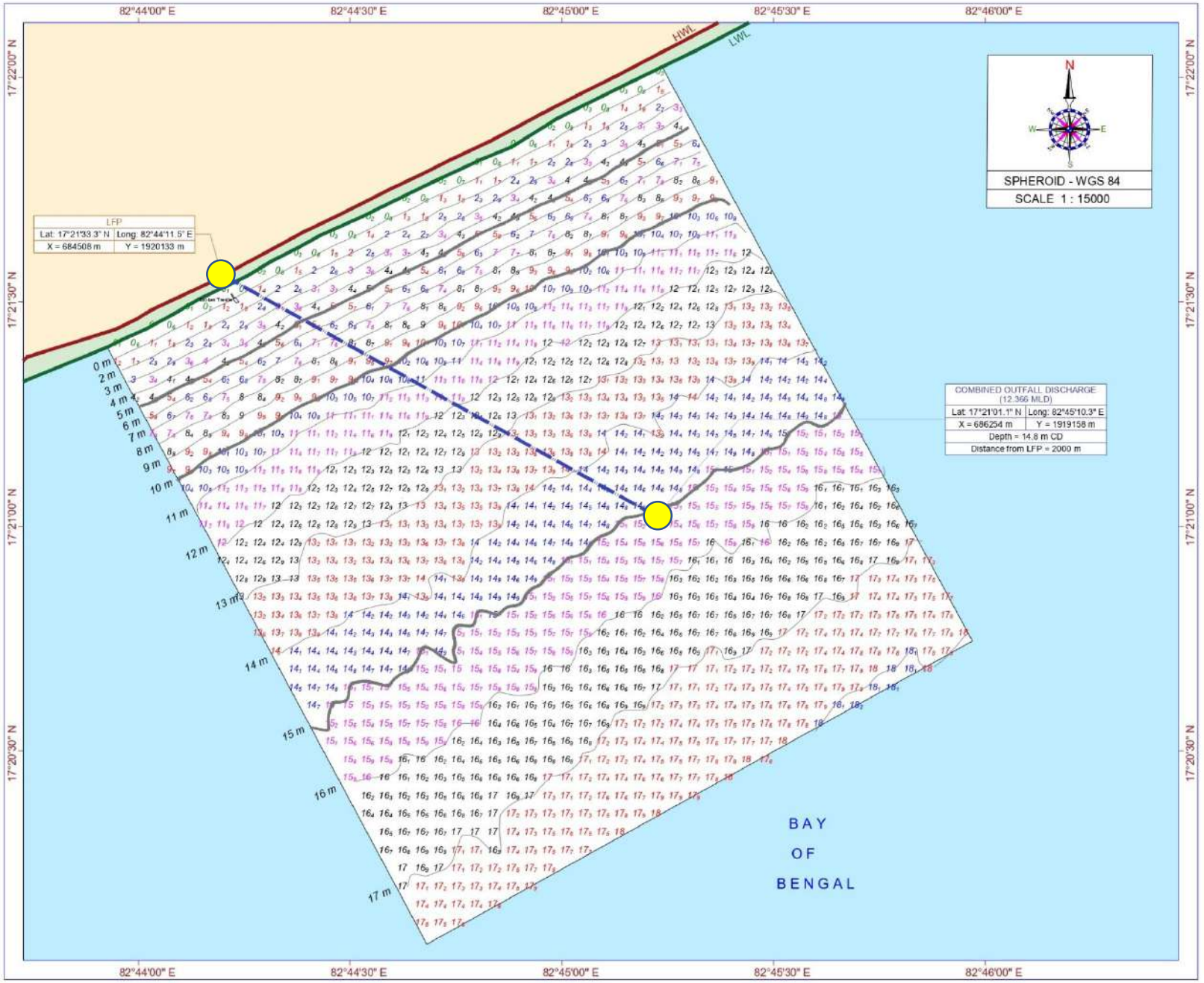
EIA - BASELINE DATA COLLECTION

- Collected baseline data on Marine Environment
- Baseline data were collected during December 2021- February 2022 covering 10 km radius

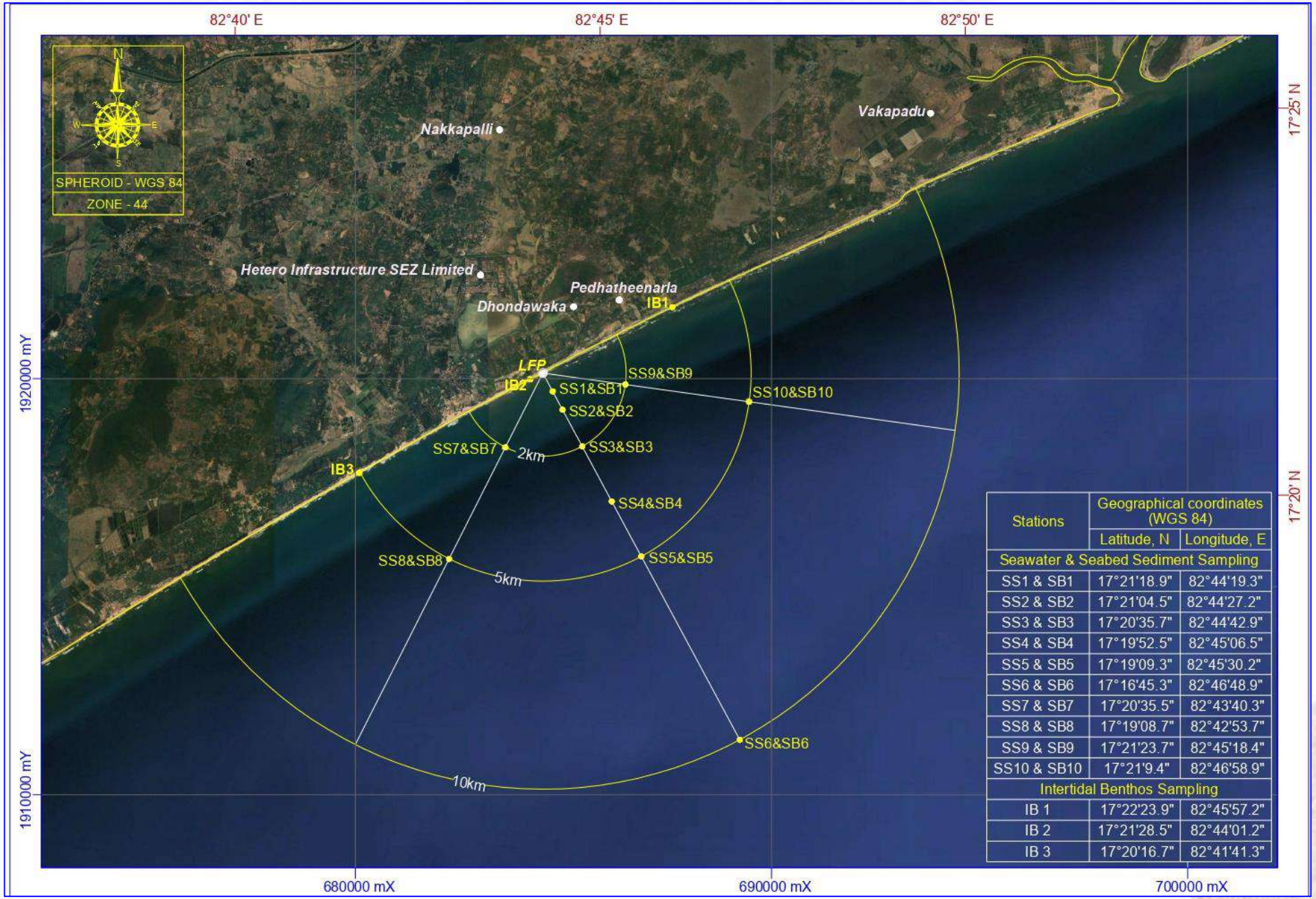
Marine environment



BATHYMETRY MAP



Location of seawater, seabed sediment and biological sample collection



Stations	Geographical coordinates (WGS 84)	
	Latitude, N	Longitude, E
Seawater & Seabed Sediment Sampling		
SS1 & SB1	17°21'18.9"	82°44'19.3"
SS2 & SB2	17°21'04.5"	82°44'27.2"
SS3 & SB3	17°20'35.7"	82°44'42.9"
SS4 & SB4	17°19'52.5"	82°45'06.5"
SS5 & SB5	17°19'09.3"	82°45'30.2"
SS6 & SB6	17°16'45.3"	82°46'48.9"
SS7 & SB7	17°20'35.5"	82°43'40.3"
SS8 & SB8	17°19'08.7"	82°42'53.7"
SS9 & SB9	17°21'23.7"	82°45'18.4"
SS10 & SB10	17°21'9.4"	82°46'58.9"
Intertidal Benthos Sampling		
IB 1	17°22'23.9"	82°45'57.2"
IB 2	17°21'28.5"	82°44'01.2"
IB 3	17°20'16.7"	82°41'41.3"

Station	Geographical Coordinates (WGS 84)		Sample layer
	Latitude (N)	Longitude (E)	
Seawater and seabed sampling locations			
SS1 & SB1	17°21'19"	82°44'19"	S, M & B
SS2 & SB2	17°21'05"	82°44'27"	S, M & B
SS3 & SB3	17°20'36"	82°44'43"	S, M & B
SS4 & SB4	17°19'53"	82°45'07"	S, M & B
SS5 & SB5	17°19'09"	82°45'30"	S, M & B
SS6 & SB6	17°16'45"	82°46'49"	S, M & B
SS7 & SB7	17°20'36"	82°43'40"	S, M & B
SS8 & SB8	17°19'09"	82°42'54"	S, M & B
SS9 & SB9	17°21'24"	82°45'18"	S, M & B
SS10 & SB10	17°21'09"	82°46'59"	S, M & B
Intertidal benthos sampling locations			
IB1	17°22'24"	82°45'57"	Intertidal area
IB2	17°21'29"	82°44'01"	Intertidal area
IB3	17°20'17"	82°41'41"	Intertidal area

FISHING VILLAGES

Sl. No.	Name of Village	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
1	Amalapuram	199	199	199	672
2	Bangarampeta	495	495	495	1979
3	Boyapadu	230	230	230	1034
4	Chinatheenerla	330	330	330	1234
5	Donevaniri Laxmipuram	300	300	270	898
6	Dondavaka	285	285	285	991
7	Pedatheenerla	600	600	600	2354
8	Rajayyapeta	294	294	293	1233

LIST OF IMPACTS

- Impact due to laying of outfall pipelines
- Impact due to construction of outfall diffuser ports
- Impact due to discharge of treated effluent
- Impact on planktons
- Impact on benthos
- Impact on fish and fisheries
- Impact on sand dunes
- Impact on Ecologically Sensitive Areas
- Impact due to breakage of pipeline

IMPACTS & MITIGATION

Activity	Impact	Mitigation
Impact due to laying of outfall pipeline	<u>Possible impacts</u> • Macrofauna and coastal birds • Plankton, benthos and algae • Fishes • Organic matter and nutrients	• Laying operation and barricading of water across surf zone will be done in the shortest duration say within 2 months. • During pipeline construction, full survey capacity will be available to perform any ad-hoc surveys, e.g., monitoring the pipeline touchdown point. • Special attention will be given to nearshore beach crossings where currents and breaking waves may prevail. • Excavation will be carried out in a controlled manner • No drilling/blasting will be ensured. • The excavated material will be used as back fill for burying the pipeline in the trench. • Net enclosures will be considered if turbidity of high intensity persists while pipe laying. • Monitoring of turbidity, pH and DO

Activity	Impact	Mitigation
Impact due to outfall diffuser	Presence of outfall diffuser in the sea can potentially cause restriction to the fishing using drift nets and hindrance to the boat movement.	A marker buoy will be installed close to the outfall point as per the norms of the Directorate General of Lighthouses and Lightships. This will also help boats to avoid collision while en-route.
Impact due to discharge of treated effluent	• Water quality • Seabed sediment quality • Benthic communities • Primary producer • Intertidal fauna • Fish	• For effective dispersion, 4 nos. x 250 mm dia. diffuser ports with duckbill valves will be provided at the discharge point. • The discharge site will be located at a sufficient distance from the shore to ensure the outfall does not reach the shore and cause contamination. • Marine discharge of combined outfall will comply with the APPCB standards. • Regular monitoring of the discharge may be carried out by water sampling.

Activity	Impact	Mitigation
Impact due to breakage of pipeline	• Pipeline can be damaged due to natural hazards like storm, earthquake, extreme waves, scouring on the foreshore and tsunami. • It can also get damaged due to manmade causes like fishing, trawling and intentional damage. In case of any damage leading to breakage caused on the outfall pipeline, effluent will gush out at shorter distance from the shoreline and would affect the marine environment.	• Necessary mitigation measures like immediately attending to the repair of the pipeline will be taken up. • Necessary spares of pipeline segments with bends/Tees will be kept in ready stock within the plant. Divers with experience in salvation operation irrespective of sea condition will be contracted to be available if such an emergency arises.

Activity	Impact	Mitigation
Impact on planktons	Due to increase in turbidity during excavation for outfall pipeline. During the operational phase due to discharge of combined outfall through the outfall diffuser.	Excavation will be carried out in a controlled manner for outfall pipeline corridor. Appropriate screen will be provided at the entrance of the intake before connecting to the sump.
Impact on benthos	Benthos inhabiting the pipeline corridor will be largely eliminated due to excavation combined outfall pipeline. During the operation stage, benthos and seabed characteristics can be affected due to improper mixing of combined outfall discharge leading to settling of contaminants along the seabed.	Excavation will be carried out in a controlled manner for outfall pipeline corridor taking care that the sediment outside the corridor area is not unduly disturbed. Excavation, laying of pipelines and refilling the trench will be carried out within a short time and as planned. Monitoring of turbidity, DO and pH

Activity	Impact	Mitigation
Impact on fishes and fisheries	Turbidity affects the movement of fish though it is less likely to be lethal. However, the impact is reversible, local and short-term. Impact on fishes in the mixing zone of combined outfall discharge.	Fishes are known to move away from the areas of high turbulence and hence impact on them during construction stage is expected to be low. Nevertheless, turbidity control measures will be used if necessary and installation of pipeline during rough sea conditions will be avoided.

Ecologically Sensitive species at project location	Presence	Remarks
Mangroves	X	-
Coastal vegetation	Not in the project site	-
Seagrass	X	-
Seaweeds	X	-
Turtles	X	
Endangered species	X	-
Coral reefs	X	-
Marine mammals	X	-

EMP BUDGET

S. No.	Environment Management Plan	Cost/year (₹.)
1	Environmental Monitoring Programme	10,00,000
2	Environment Management Cell	10,00,000
3	Labour, Safety and Cleanliness Management	2,00,000
4	Legal & Statutory Fees	3,00,000
Total		25,00,000

SUMMARY

- Baseline study on marine environment shows normal.
- Proposed facilities have been designed not to disturb the marine environment.
- Most ideal location has been chosen for outfall leading to higher dilution.
- Implementation of suggested mitigation measures and environment management plan shall ensure impacts to minimum.
- All Specific and General conditions motioned in APCZMA recommendation letter will be strictly followed.

CHRONOLOGY OF THE CLEARANCE OBTAINED

Operation Unit	Clearance	Order No	Date	Effluent/Brine allowed
M/s Hetero Labs Ltd.,	CRZ	11-54/2006-IA.III	04/01/2007	190 KLD/Day of treated effluent
M/s Hetero Infrastructure SEZ Ltd. for Desalination Plant	EC+ CRZ	21-641/2007-IA.III	25/10/2010	1040 KL/day of treated effluent + 10000 KL/day of Desalination plant rejects
M/s Hetero Labs Ltd., Unit-III	EC	J-11011/396/2011-IA II (I)	10/09/2012	676 KL/day
M/s Hetero Drugs Ltd., Unit-VI	EC	J-11011/398/2011-IA II (I)	10/09/2012	650 KL/day
EC of M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd., Unit-VI and transferred to M/s Hetero Labs Ltd.	EC Merge + EC Transfer	J-11011/398/2011-IA II (I)	27/01/2020	676+650 KL/day

Hon'ble NGT vide order 21.02.2022 → **Committee site inspection – 29.03.2022 to 30.03.2022** → **Proposal to APCZMA** → **To regularize desalination plant**

Proposal to APCZMA → **Recommend laying of pipeline to discharge treated effluent**


THANK YOU

BACKUP SLIDES

SALIENT FEATURES

Particulars	Details
Geographical Co-ordinates (LFP of proposed outfall pipeline)	Latitude: 17°21' 33.3” Longitude: 82°44' 11.5”
Administrative location	N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh
Current land use	SEZ and Non SEZ area
Nearest Town	Narasapuram
Rivers/Streams/Creek	None
Nearest Highway	AH 45 (6 km west)
Nearest Railway station	Gullipadu Railway Station (12.4 km west)
Nearest Airport	Visakhapatnam International Airport (65 km north)
Nearest port/ Harbour	Visakhapatnam port (65 km north)
Historical/Archaeological	None

EXISTING PIPELINES DETAILS

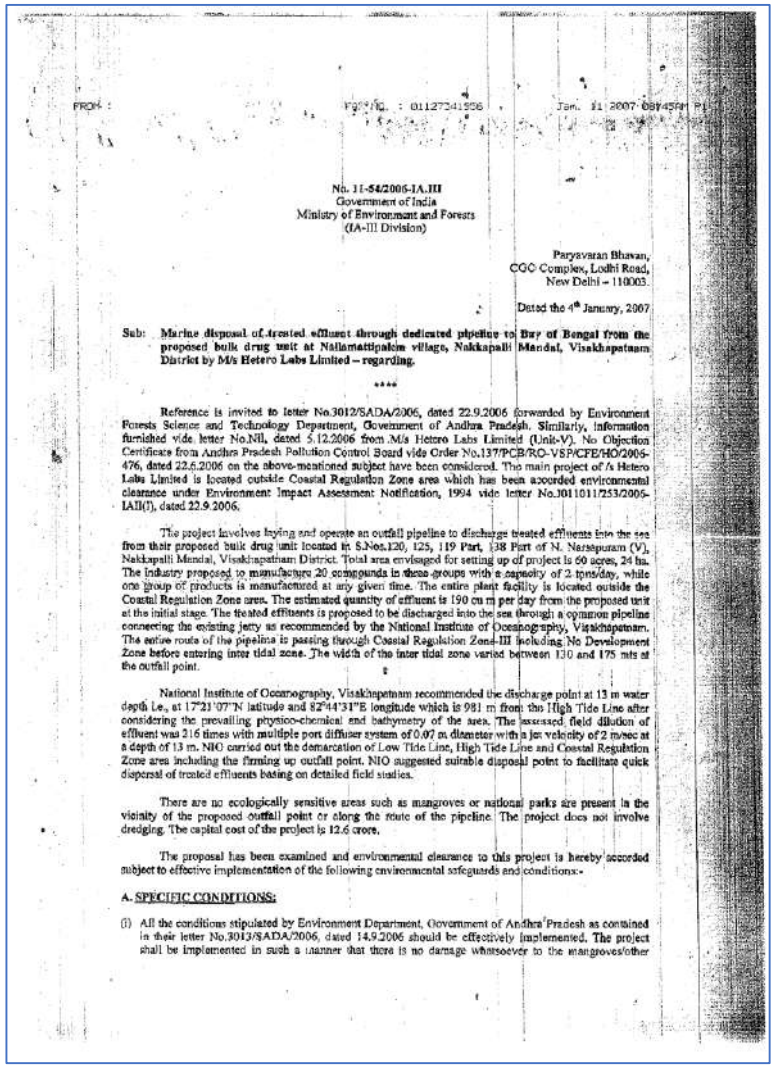
Location	Geographical Coordinates	
	Latitude, N	Longitude, E
Intake Depth= 6 m Distance from LFP = 682 m Volume = 15 MLD	17°21'12"	82°44'04"
Brine Reject Outfall Distance from LFP = 1155 m Volume = 10 MLD	17°21'04"	82°44'36"
Effluent Outfall Depth= 13 m Distance from LFP = 981 m Volume = 1040 KLD	17°21'07"	82°44'31"

LOCATIONS OF PROPOSED PIPELINE COORDINATE

Location	Geographical Coordinates (WGS 84)		UTM Coordinates (Zone 44)	
	Latitude, N	Longitude, E	X (m)	Y (m)
LFP	17°21'33.3"	82°44'11.5"	684508	1920133
Outfall pipeline (500 mm dia.) Distance from LFP = 2000 m Depth= 14.8 m CD	17°21'01.1"	82°45'10.3"	686254	1919158

CRZ CLEARANCE OBTAINED

CRZ clearance was obtained on 4th January 2007, for disposal of 190 KLD of treated effluent outfall pipeline in the name of Hetero Labs Ltd.



FROM : FAX NO. : 01127341956 Jan. 11 2007 08:45AM P1

No. 11-54/2006-IA.III
Government of India
Ministry of Environment and Forests
(IA-III Division)

Paryavaran Bhavan,
CGO Complex, Lodhi Road,
New Delhi – 110003.

Dated the 4th January, 2007

Sub: **Marine disposal of treated effluent through dedicated pipeline to Bay of Bengal from the proposed bulk drug unit at Nallamattipalem village, Nakkapalli Mandal, Visakhapatnam District by M/s Hetero Labs Limited – regarding.**

****

Reference is invited to letter No.3012/SADA/2006, dated 22.9.2006 forwarded by Environment Forests Science and Technology Department, Government of Andhra Pradesh. Similarly, information furnished vide letter No.Nil, dated 5.12.2006 from M/s Hetero Labs Limited (Unit-V). No Objection Certificate from Andhra Pradesh Pollution Control Board vide Order No.137/PCB/RO-VSP/CFE/HO/2006-476, dated 22.6.2006 on the above-mentioned subject have been considered. The main project of /s Hetero Labs Limited is located outside Coastal Regulation Zone area which has been accorded environmental clearance under Environment Impact Assessment Notification, 1994 vide letter No.J011011/253/2005-IA.II(I), dated 22.9.2006.

The project involves laying and operate an outfall pipeline to discharge treated effluents into the sea from their proposed bulk drug unit located in S.Nos.120, 125, 119 Part, 138 Part of N. Narsapuram (V), Nakkapalli Mandal, Visakhapatnam District. Total area envisaged for setting up of project is 60 acres, 24 ha. The industry proposed to manufacture 20 compounds in three groups with a capacity of 2 tons/day, while one group of products is manufactured at any given time. The entire plant facility is located outside the Coastal Regulation Zone area. The estimated quantity of effluent is 190 cu m per day from the proposed unit at the initial stage. The treated effluents is proposed to be discharged into the sea through a common pipeline connecting the existing jetty as recommended by the National Institute of Oceanography, Visakhapatnam. The entire route of the pipeline is passing through Coastal Regulation Zone-III including No Development Zone before entering inter tidal zone. The width of the inter tidal zone varied between 130 and 175 mts at the outfall point.

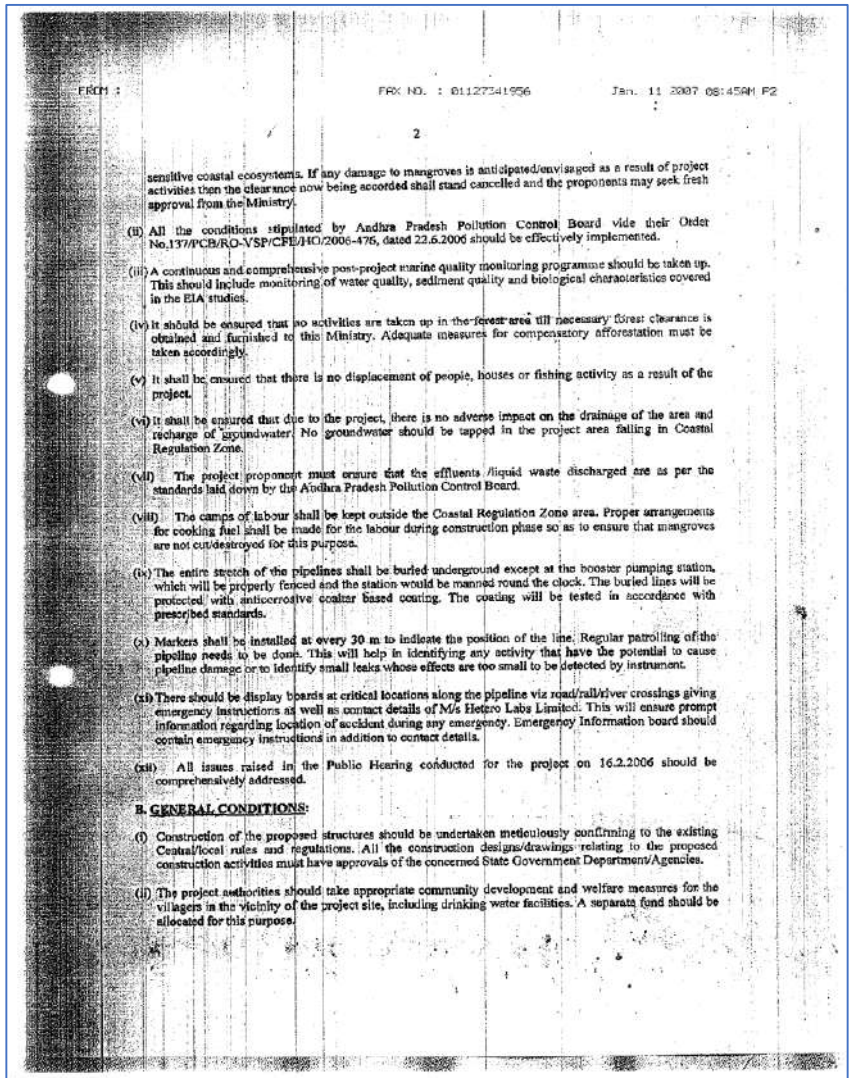
National Institute of Oceanography, Visakhapatnam recommended the discharge point at 13 m water depth i.e., at 17°21'07"N latitude and 82°44'31"E longitude which is 981 m from the High Tide Line after considering the prevailing physico-chemical and bathymetry of the area. The assessed field dilution of effluent was 216 times with multiple port diffuser system of 0.07 m diameter with a jet velocity of 2 m/sec at a depth of 13 m. NIO carried out the demarcation of Low Tide Line, High Tide Line and Coastal Regulation Zone area including the firming up outfall point. NIO suggested suitable disposal point to facilitate quick dispersal of treated effluents basing on detailed field studies.

There are no ecologically sensitive areas such as mangroves or national parks are present in the vicinity of the proposed outfall point or along the route of the pipeline. The project does not involve dredging. The capital cost of the project is 12.6 crore.

The proposal has been examined and environmental clearance to this project is hereby accorded subject to effective implementation of the following environmental safeguards and conditions:-

A. SPECIFIC CONDITIONS:

(i) All the conditions stipulated by Environment Department, Government of Andhra Pradesh as contained in their letter No.3013/SADA/2006, dated 14.9.2006 should be effectively implemented. The project shall be implemented in such a manner that there is no damage whatsoever to the mangroves/other



FROM : FAX NO. : 01127341956 Jan. 11 2007 08:45AM P2

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sensitive coastal ecosystems. If any damage to mangroves is anticipated/envisaged as a result of project activities then the clearance now being accorded shall stand cancelled and the proponents may seek fresh approval from the Ministry.

(ii) All the conditions stipulated by Andhra Pradesh Pollution Control Board vide their Order No.137/PCB/RO-VSP/CFE/HO/2006-476, dated 22.6.2006 should be effectively implemented.

(iii) A continuous and comprehensive post-project marine quality monitoring programme should be taken up. This should include monitoring of water quality, sediment quality and biological characteristics covered in the EIA studies.

(iv) It should be ensured that no activities are taken up in the forest area till necessary forest clearance is obtained and furnished to this Ministry. Adequate measures for compensatory afforestation must be taken accordingly.

(v) It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.

(vi) It shall be ensured that due to the project, there is no adverse impact on the drainage of the area and recharge of groundwater. No groundwater should be tapped in the project area falling in Coastal Regulation Zone.

(vii) The project proponent must ensure that the effluents /liquid waste discharged are as per the standards laid down by the Andhra Pradesh Pollution Control Board.

(viii) The camps of labour shall be kept outside the Coastal Regulation Zone area. Proper arrangements for cooking fuel shall be made for the labour during construction phase so as to ensure that mangroves are not cut/destroyed for this purpose.

(ix) The entire stretch of the pipelines shall be buried underground except at the booster pumping station, which will be properly fenced and the station would be manned round the clock. The buried lines will be protected with anticorrosive coaltar based coating. The coating will be tested in accordance with prescribed standards.

(x) Markers shall be installed at every 30 m to indicate the position of the line. Regular patrolling of the pipeline needs to be done. This will help in identifying any activity that have the potential to cause pipeline damage or to identify small leaks whose effects are too small to be detected by instrument.

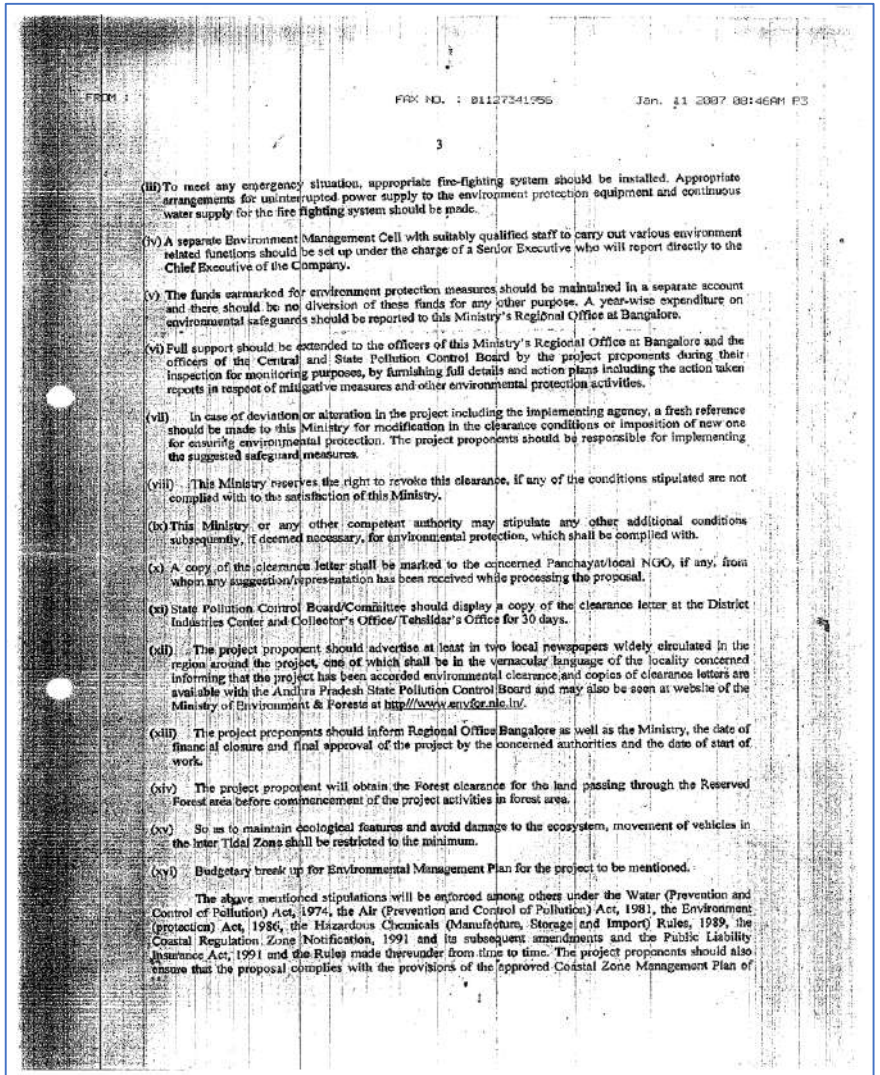
(xi) There should be display boards at critical locations along the pipeline viz road/rail/river crossings giving emergency instructions as well as contact details of M/s Hetero Labs Limited. This will ensure prompt information regarding location of accident during any emergency. Emergency information board should contain emergency instructions in addition to contact details.

(xii) All issues raised in the Public Hearing conducted for the project on 16.2.2006 should be comprehensively addressed.

B. GENERAL CONDITIONS:

(i) Construction of the proposed structures should be undertaken meticulously confirming to the existing Central/local rules and regulations. All the construction designs/drawings relating to the proposed construction activities must have approvals of the concerned State Government Department/Agencies.

(ii) The project authorities should take appropriate community development and welfare measures for the villagers in the vicinity of the project site, including drinking water facilities. A separate fund should be allocated for this purpose.



FROM : FAX NO. : 01127341956 Jan. 11 2007 08:46AM P3

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(iii) To meet any emergency situation, appropriate fire-fighting system should be installed. Appropriate arrangements for uninterrupted power supply to the environment protection equipment and continuous water supply for the fire fighting system should be made.

(iv) A separate Environment Management Cell with suitably qualified staff to carry out various environment related functions should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.

(v) The funds earmarked for environment protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose. A year-wise expenditure on environmental safeguards should be reported to this Ministry's Regional Office at Bangalore.

(vi) Full support should be extended to the officers of this Ministry's Regional Office at Bangalore and the officers of the Central and State Pollution Control Board by the project proponents during their inspection for monitoring purposes, by furnishing full details and action plans including the action taken reports in respect of mitigative measures and other environmental protection activities.

(vii) In case of deviation or alteration in the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new one for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.

(viii) This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.

(ix) This Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which shall be complied with.

(x) A copy of the clearance letter shall be marked to the concerned Panchayat/local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.

(xi) State Pollution Control Board/Committee should display a copy of the clearance letter at the District Industries Center and Collector's Office/ Tehsildar's Office for 30 days.

(xii) The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in the vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the Andhra Pradesh State Pollution Control Board and may also be seen at website of the Ministry of Environment & Forests at http://www.envfor.nic.in/.

(xiii) The project proponents should inform Regional Office Bangalore 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 work.

(xiv) The project proponent will obtain the Forest clearance for the land passing through the Reserved Forest area before commencement of the project activities in forest area.

(xv) So as to maintain ecological features and avoid damage to the ecosystem, movement of vehicles in the Inter Tidal Zone shall be restricted to the minimum.

(xvi) Budgetary break up for Environmental Management Plan for the project to be mentioned.

The above mentioned stipulations will 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 Hazardous Chemicals (Manufacture, Storage and Import) Rules, 1989, the Coastal Regulation Zone Notification, 1991 and its subsequent amendments and the Public Liability Insurance Act, 1991 and the Rules made thereunder from time to time. The project proponents should also ensure that the proposal complies with the provisions of the approved Coastal Zone Management Plan of

CLEARANCE OBTAINED

EC & CRZ clearance was obtained on 25th October 2010, for 5 MLD desalination plant and 1040.6 KLD of treated effluent outfall pipeline from Hetero SEZ.

No. 21-641/2007-IA.III
Government of India
Ministry of Environment & Forests
(IA-III Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110 003

Dated: 25th October, 2010

To,
M/s Hetero Infrastructures SEZ Ltd,
H.No.8-3-166/7/1
Hetero House, Erragadda
Hyderabad – 500 018

Subject: Environmental & CRZ Clearance for the development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Sy. No. 215, 286/1, 286/2, 283/1, in Ch. Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19(qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125,126, 129/1 to 129/9, 138, 142, 150, 215 N. Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s. Hetero Infrastructure SEZ Ltd. – Reg.

Sir,

This has reference to your application No. Nil dated 26.6.2007 and letter no. SEIAA/AP/VSP-14/2008-1234 dated 4.8.2008 and subsequent letters dated 2.3.2009, 20.8.2009, 5.9.2009, 15.12.2009, 22.2.2010, 9.4.2010 and 17.5.2010 seeking prior Environmental and CRZ Clearance for the above project under the EIA Notification, 2006 and CRZ Notification 1991. The proposal has been appraised as per prescribed procedure in the light of provisions under the EIA Notification, 2006 as amended in 2009 and CRZ Notification 1991 on the basis of the mandatory documents enclosed with the application viz., the Questionnaire, EIA, EMP, recommendations of SCZMA and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meetings held on 3.3.2009, 15.4.2009, 6-7th October, 2009, 27-29th January, 2010, 25-26th February, 2010 & 28-29th June, 2010 & 21-23rd September,2010.

2. It is, interalia, noted that the project involves the development of SEZ for Pharmaceutical and Chemical manufacturing units on a total plot area is 138.51 ha. It is proposed to develop 17 plots, which include 4 plots for which EC was already issued earlier. All the units will be manufacturing bulk drungs (API) and chemicals (Life saving drugs). The total built-up area proposed is 1,12,942.50 sq. m. The total water requirement is 1.644 MLD (Source-YLBC Canal). The total effluent will be 1130.6 KLD (trade effluent – 1040.6 KLD and domestic effluent – 90 KLD). The treated waste water to be used for boilers – 290 KLD, AC cooling -424 KLD and washings -175 KLD.

Total solid waste generation will be 96 T/day. The power requirement is 10 MW. The total area proposed for parking is 19,200 sq.m. Total cost of the project is Rs 126.00 Crores.

3. The proposed Special Economic Zone (SEZ) is located outside the CRZ area. The industry proposed to utilize the existing effluent discharge pipeline of M/s Hetero Drugs Limited for the discharge of treated effluent of SEZ into the sea near Dondawaka (V) near Rajaiahpet village, Nakkapalli Mandal, Visakhapatnam District. The estimated quantity of effluent is 1040 cu.m. per day.

The National Institute of Oceanography (NIO), Visakhapatnam, a notified agency of Government of India has carried out the demarcation of LTL/HTL and CRZ area including the firming up of outfall point. The entire route of pipeline is passing through CRZ-III INCLUDING No Development Zone (NDZ) before entering inter tidal zone i.e. the area lying in between HTL and LTL which is classified as CRZ-I (ii). The NIO also carried out field studies to generated baseline and site specific data and also suggested suitable disposal point to facilitate quick dispersal of treated effluent. The width of the inter tidal zone varied between 130m to 175 mtr. at this stretch. The National Institute of Oceanography, Visakhapatnam after considering the prevailing physico-chemical and bathymetry of the study area, recommended the discharge point at 13 mtr. water depth i.e. at 17°21' 07" N latitude and 82° 44' 31" E longitude which is 981 M from the HTL. The NIO assessed the filed dilution of effluent was more than 100 times with one port diffuser system of 0.11 m. diameter with a jet velocity of 2 m/sec. at a depth of 13 m. The dilution can be enhanced to more than 200 times by using a 2 port diffuser of 0.07 m. diameter. The NIO recommended the diffuser system with Jet velocity of 2.0 m/sec. to avoid bio fouling and accumulation of the particulate matter inside the pipeline.

The proposal also includes 15 MLD desalination plant located within the SEZ area and outside the CRZ. The National Institute of Oceanography (NIO) firmed up the intake and outfall locations. Two separate pipelines are proposed each for intake of sea water of about 15 MLD and the estimated discharge of plant reject of about 10 MLD. The suggested length of intake pipeline is about 1.20 Km. from HTL and discharge pipeline is about 2.0 Km. The NIO suggested the intake location at 17° 21' 12" N latitude and 82° 44' 04" E longitude to draw 15 MLD sea water which is about 980 m. from the HTL at a depth of 6 m. The discharge location is indicated at 17° 21' 07" N latitude and 82° 44' 31 E longitude which is about more than 2 Km. from the HTL. The distance between the intake point and outfall point is maintained around 1.0 Km The discharge point provides for 30 times dilution by using a diffuser of 5 port with a velocity of 3 m/s at each port and the corresponding rise in salinity will be about 1 ppt above the ambient at release site. It is indicated in the RMEIA report that the ports will be separated by 3 m. distance and each port will make 45° angle with horizontal plane with a raise of to 2-3 m. above the bed to increase the dilutions. The salinity of treated water is indicated as 65 ppt. No ecologically sensitive areas such as mangroves or national parks are present in the vicinity of the proposed land fall point or along the route of the pipeline.

4. The proposal was examined by the Andhra Pradesh Coastal Zone Management Authority ON 13-05-2010 and opined that the pipeline passes through areas classified as CRZ-III followed by CRZ-I (ii) i.e. inter tidal zone before entering into the marine zone and recommended the proposal vide letter no. 1617/CZMA/2010 dt. 21-05-2010.

5. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for the grant of Environmental & CRZ Clearance for the project mentioned above. Accordingly, the Ministry hereby accord environmental & CRZ clearance as per the provisions of Environmental Impact Assessment Notification – 2006 and CRZ Notification 1991 its subsequent amendments, subject to strict compliance of the terms and conditions as follows:

PART A - SPECIFIC CONDITIONS

I. Construction Phase

(i) "Consent for Establishment" shall be obtained from Andhra Pradesh 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.

(ii) Sufficient dilution shall be ensured to meet the ambient parameters within 50 m. distance from the outfall.

(iii) Regular Independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through a authorized agency and submitted along with six monthly monitoring report to the Ministry.

(iv) Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in to the system.

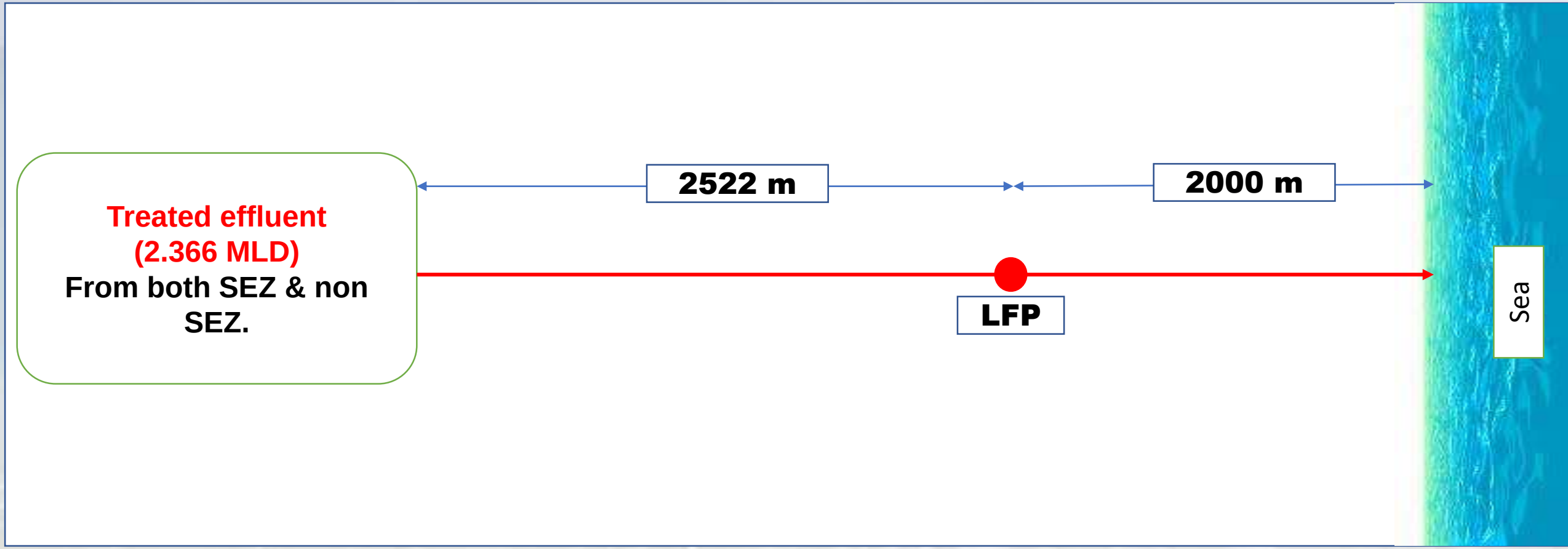
(v) All the recommendations of EIA and DMP shall be strictly complied with.

(vi) Lighted buoys shall be provided at intake and out fall locations as indicators

(vii) The pipeline shall be buried at least 2 m depth in the onshore area and 4 mts. in the offshore area. Necessary permission with regard to the pipeline burial and laying shall be obtained from Maritime Board to ensure that the pipeline route does not fall in the navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.

(viii) The pipeline shall not pass through any Sand dunes/mangroves. The project shall be implemented in such a manner that there is no damage whatsoever to the mangroves/ other sensitive coastal

PROPOSED PIPELINE



**Increasing effluent from 1.04 MLD to 2.366 MLD

CHARACTERISTIC OF THE EFFLUENT

Sl. No.	Parameters	Unit	Result	Standard
1	pH	-	7.58	5.5-9.0
2	Suspended solids	mg/l	18.0	100
3	Total dissolved solids	mg/l	1465	-
4	Chemical Oxygen Demand	mg/l	174	250
5	BOD 3d 27°C	mg/l	61.0	100
6	Chlorides	mg/l	390	1000
7	Oil & Grease	mg/l	2.1	10
8	Sulphides	mg/l	0.22	2.0
9	Phenolic Compounds	mg/l	0.05	1.0
10	Cyanide	mg/l	BDL	0.2
11	Hexavalent Chromium	mg/l	BDL	0.1
12	Lead	mg/l	BDL	0.1

Treated effluent are withing PCB standards.

CHARACTERISTIC OF THE EFFLUENT

SV ENVIRO LABS & CONSULTANTS Environmental
Engineers & Consultants in Pollution Control
Enviro House,B-1, Block - B, IDA
Autonagar, Visakhapatnam
Phone: 9440338628
Email:info@svenvirolabs.com
(Recognized by GOI, Ministry of Environment & Forests)
(An ISO 9001 Certified and NABET Accredited for EIA)

Ref Code	: SVELC/HISEZL/22-10/001	**Date : 14-11-2022**
Name and Address	: **M/s. HETERO INFRASTRUCTURE SEZ LIMITED,** N.Narasapuram Village, Nakkapally Mandal, Visakhapatnam (Dt).	
Sample Particulars	: Effluent Analysis	
Source of Collection	: ETP OUTLET	
Sample Code	: SVELC/22/EFF/1319	
Date of Collection	: 28-10-2022	
Date of Receipt	: 28-10-2022	

TEST REPORT

S No	Parameter	Unit	Result	Method	Standard
1	pH	-	7.58	APHA 4500-H+B, 23rd Ed,2017	5.5-9.0
2	Suspended Solids, SS	mg/l	18.0	APHA 2540-D, 23rd Ed,2017	100
3	Total Dissolved Solids, TDS	mg/l	1465	APHA,2540-C,23rd Ed, 2017	-
4	Chemical Oxygen Demand(COD)	mg/l	174	APHA 5220-B, 23rd Ed,2017	250
5	BOD 3d 27°C	mg/l	61.0	IS 3025 Part 44	100
6	Chlorides as Cl-	mg/l	390	APHA,4500-Cl B,23rd Ed, 2017	1000
7	Oil & Grease	mg/l	2.1	APHA,5520-D,5-38,23rd Ed, 2017	10
8	Sulphide as S	mg/l	0.22	APHA,4500S^{2} D, 23rd Ed,2017	2.0
9	Phenolic compounds (C_6H_5OH)	mg/l	0.05	APHA,5530-C, 23rd Ed,2017	1.0
10	Cyanide as CN	mg/l	BDL	APHA,4500-CN- E , 23rd Ed,2017	0.2
11	Hexavalent chromium as Cr^{+6}	mg/l	BDL	APHA,3500-Cr B , 23rd Ed,2017	0.1
12	Lead as Pb	mg/l	BDL	APHA,3120-B , 23rd Ed,2017	0.1

Note: BDL denotes Below Detectable Level

ANALYZED BY

SV ENVIRO LABS & CONSULTANTS

RECOMMENDATION BY APCZMA

Andhra Pradesh Coastal Zone Management Authority (APCZMA)
Andhra Pradesh
Ministry of Environment Forests & Climate Change
Government of India
D.No.33-26-14 D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamavari Street, Kasturibaipet, Vijayawada-520010

Letter No. 382/CRZ/IND/2022 - 595 Dated: 09/11/2022

To
The Secretary,
Ministry of Environment and Forests and Climate Change,
Indira Paryavaran Bhavan, Jorbagh Road,
New Delhi – 110 003.

Sir,

Sub:- APCZMA – CRZ – M/s. Hetero Infrastructure SEZ Ltd. at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh – Proposal for laying of new marine disposal pipeline in place of existing two lines and increase of marine discharge quantity – Recommendations of No Objection under the provisions CRZ Notification, 2011– Communicated – Reg.

Ref:
1. Proposal received from M/s. Hetero Infrastructure SEZ Ltd, Visakhapatnam on 25.03.2022.
2. T.O. lr to 13.04.2022.
3. Information furnished by the application on 02.08.2022.
4. APCZMA meeting held on 13.10.2022 at Vijayawada.

***

1. M/s. Hetero Infrastructure SEZ Ltd. at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh submitted the proposal for (i) laying of new marine disposal pipeline in place of existing two lines (Treated Effluent and desalination plant rejects); (ii) increase of marine discharge quantity from 11.230 MLD to 12.366 MLD. The cost of the project is Rs. 15 Cr for pipeline. The applicant sought clearance under the provisions of CRZ Notification 2011.

2. Earlier, M/s. Hetero Labs Limited obtained CRZ permission from MoEF&CC vide dated 04.01.2007 for marine disposal of 190 KLD through dedicated pipelines. M/s. Hetero Infrastructure SEZ Ltd. also obtained Environmental & CRZ clearance from MoEF&CC vide order dated 25.10.2010 for development of industrial plots for manufacturing of bulk drugs (API) and lifesaving drugs. This project includes 15 MLD Desalination Plant (15 MLD sea water intake and discharge of 10 MLD rejects). The quantities of sea water intake, treated effluent and rejects permitted are 15 MLD, 1040 KLD (1.04 MLD) and 10 MLD respectively. As per the Environmental & CRZ clearance issued by MoEF&CC, it is mentioned that

NEERI to examine the mixing of treated effluents and desalination plant rejects properties, before discharge into the sea. After receiving report from the IICT & NEERI, the same needs to be examined with reference to CPCB norms. APPCB also needs to verify the SoPs for marine discharge as the proposal is to join the desalination plant rejects after guard pond near to the Sea.

8. After examination on the remarks, comments/suggestions received from the Members, the authority considered to recommend the proposal to MoEF&CC, GoI, New Delhi for **laying of new pipeline in place of old pipeline for disposal of treated effluents (2.366 MLD) through marine discharge** at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teernala (V), of Nakkapalli (M), Visakhapatnam District, Andhra Pradesh with the following specific and general conditions:

PART A: Specific Conditions:

(i) The proposed constructions shall conform to the norms prescribed in CRZ Notification issued by the Ministry of Environment and Forests, Government of India S. O. No. 19(E), dated 06-01-2011 and shall not affect the coastal ecology of the area.

(ii) No activity on ground shall be undertaken without obtaining Environmental Clearance from the Ministry of Environment and Forests, Government of India as per S. O. No. 19(E), dated 06-01-2011.

(iii) The treated effluent existing pipeline is to be removed, after commissioning of the new pipeline.

(iv) During accidental breakage of pipeline, the necessary mitigation measures like immediately attending the repair of pipeline has to be taken up. Necessary spares of pipeline segments with bends/tees and divers with experience in salvation operation irrespective of sea condition have to be kept ready always within the industrial unit

(v) The industry should install flow meters to record the quantities of treated effluents discharge. Regular annual monitoring of coastal waters is to be carried-out by the reputed institutions, for water quality near the proposed outfall locations

(vi) A Continuous monitoring system should be put in place by the applicant to find out the impact on marine life/flora/fauna, due to discharge

(vii) The project Proponent shall conduct the bio-assay test for the treated effluent discharges from the marine outfalls as per the MoEF&CC Guidelines. Bio-assay analysis shall be conducted every six months to establish the toxicity levels and report to be submitted to APPCB.

(viii) The Project Proponent shall treat the effluents before discharging into sea duly complying with the APPCB and MoEF&CC norms.

(ix) The activity is a continuous and every day the industry discharges for about 8-10 hours. Over a long period, the industry should ensure all the precautions mentioned and also see that this activity should not create any bacterial and virus vectors.

(x) No solid waste shall be disposed in the Coastal Regulation Zone area. The solid waste shall be properly collected, segregated and disposed as per the provision of Solid Waste (Management and Handling) Rules, 2000 and amendment thereof

CHARACTERISTIC OF TREATED EFFLUENT & BRINE REJECT

- The process of mixing both the streams i.e., treated effluent of CETP and brine reject of desalination plant will be done 2 storage tank inside the desalination plant with 2 hours storage capacity.

- By mixing the treated effluent with brine reject, the concentration of the brine reject will get diluted.

Parameter	Treated effluent from CETP (A)	Rejects of Desalination Plant (B)	Composite of (A)+(B)
Flow (KLD)	3000	10000	13000
pH	7-8	7-8.5	7-8
TDS (mg/l)	4000	50000	41198
COD (mg/l)	<250	<20	<64
BOD (mg/l)	<100	<5	<23

Both the effluent and brine reject will fulfill the discharge standards from time to time.

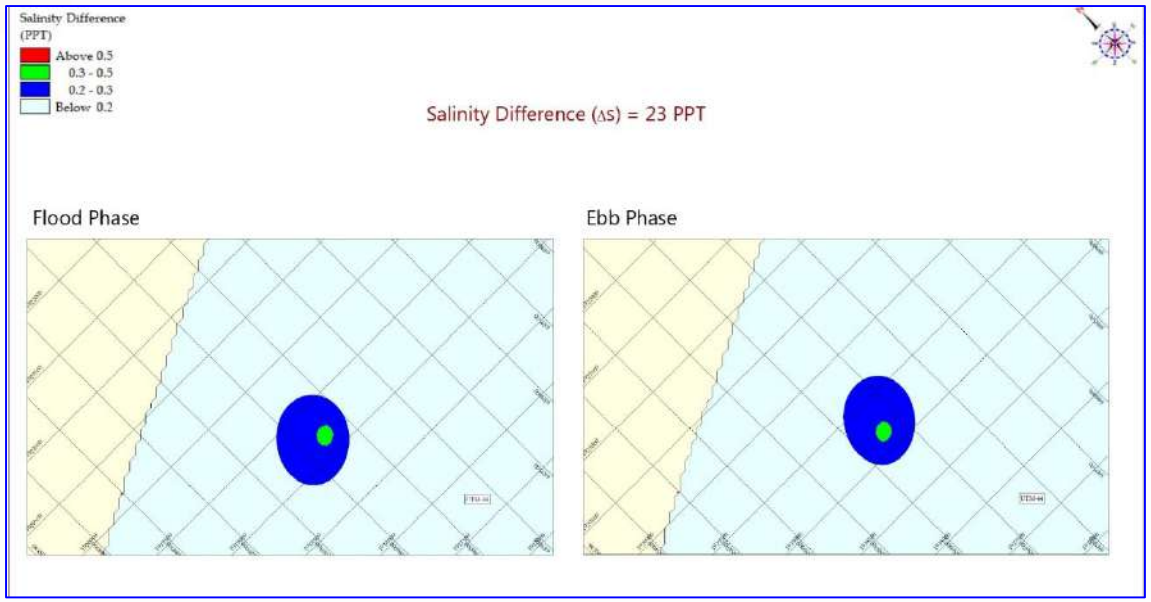
ADVANTAGES OF COMBINED BRINE AND EFFLUENT OUTFALL

- Treated effluent of 2.366 MLD mix with brine reject of 10 MLD. So, it will get diluted 5 times more which comes out with minimum concentration.
- Brine reject of 10 MLD with salinity of 58 PPT when mix with treated effluent of 2.366 MLD, salinity will be reduced to 51 PPT.
- Laying of single pipeline instead of two pipelines will help to minimize impact on the environment.

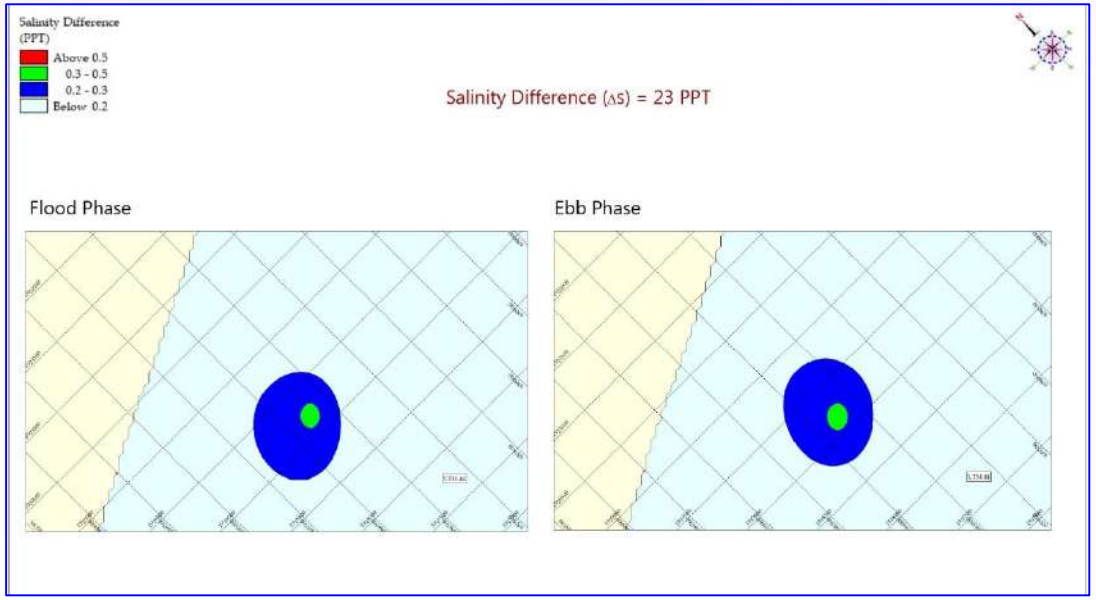
Dilution zone radius of brine reject to salinity of 0.5 PPT

Tidal Phase	Fair Weather	SW Monsoon	NE Monsoon
Spring Tide	135 m	< 50 m	<50 m
Neap Tide	170 m	< 50 m	<50 m

SECONDARY DISPERSION- FW

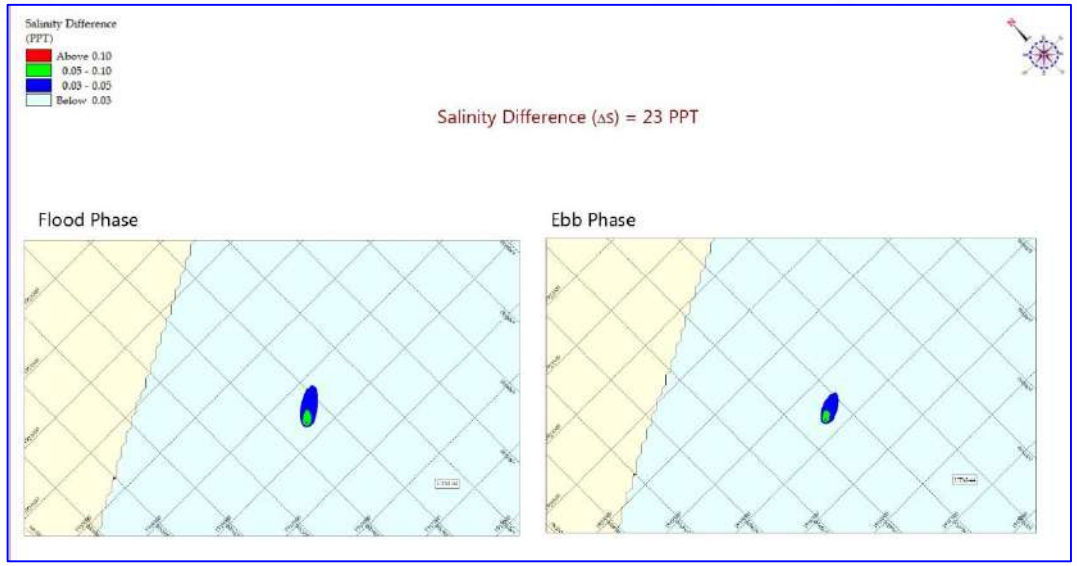


Spring tide

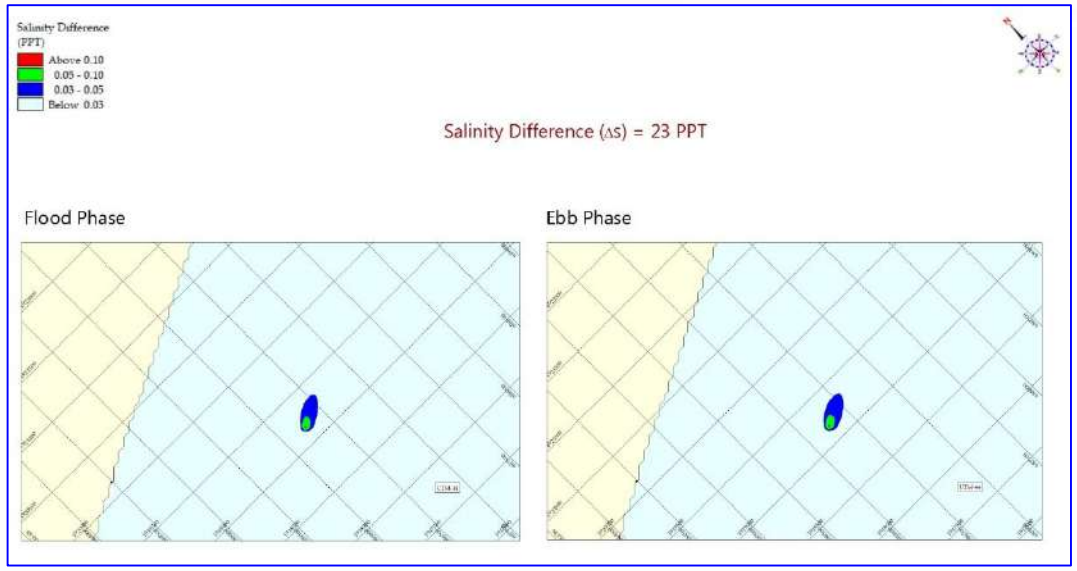


Neap tide

SECONDARY DISPERSION- SW

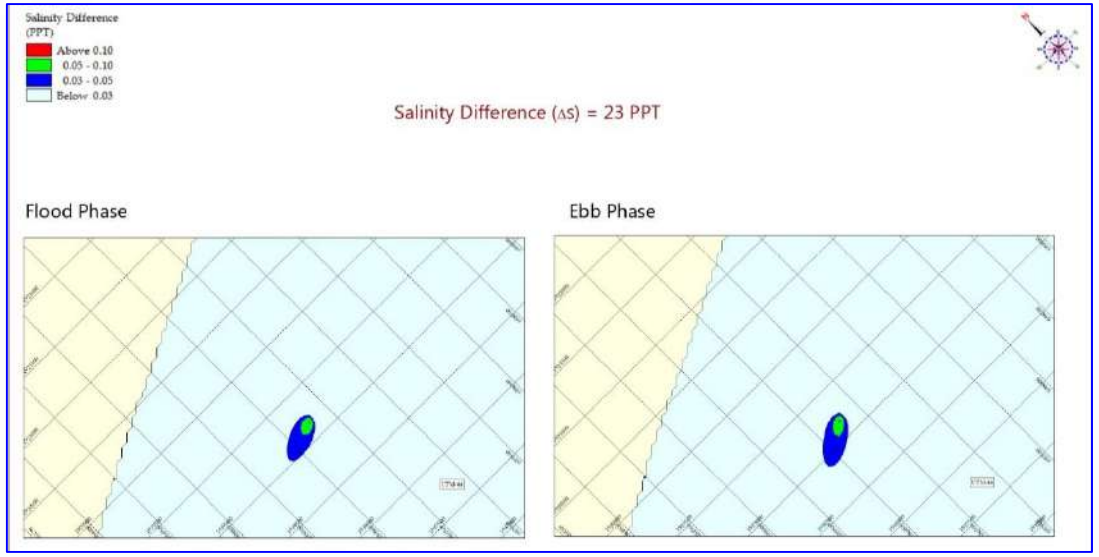


Spring tide

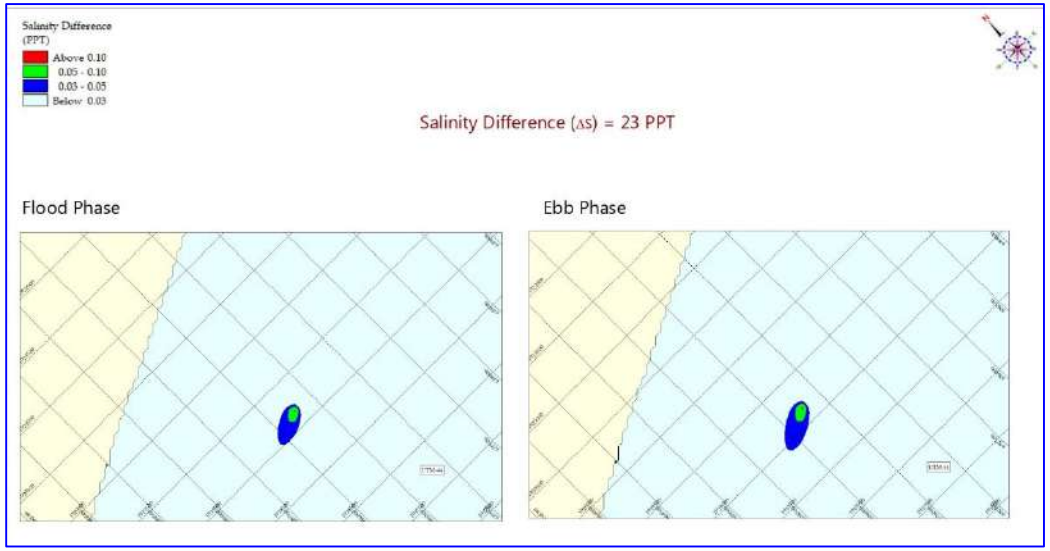


Neap tide

SECONDARY DISPERSION- NE

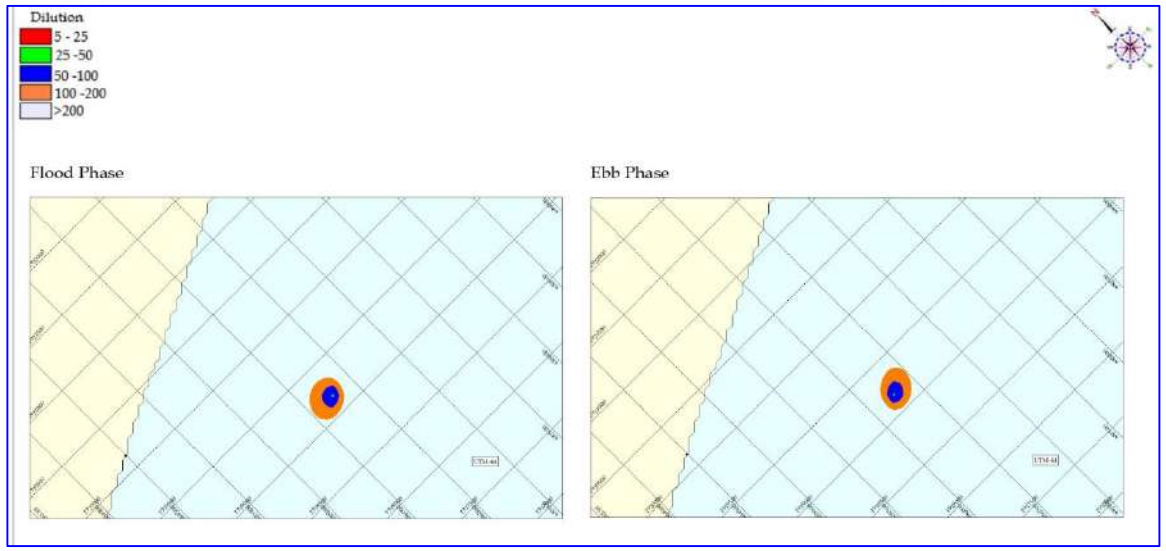


Spring tide

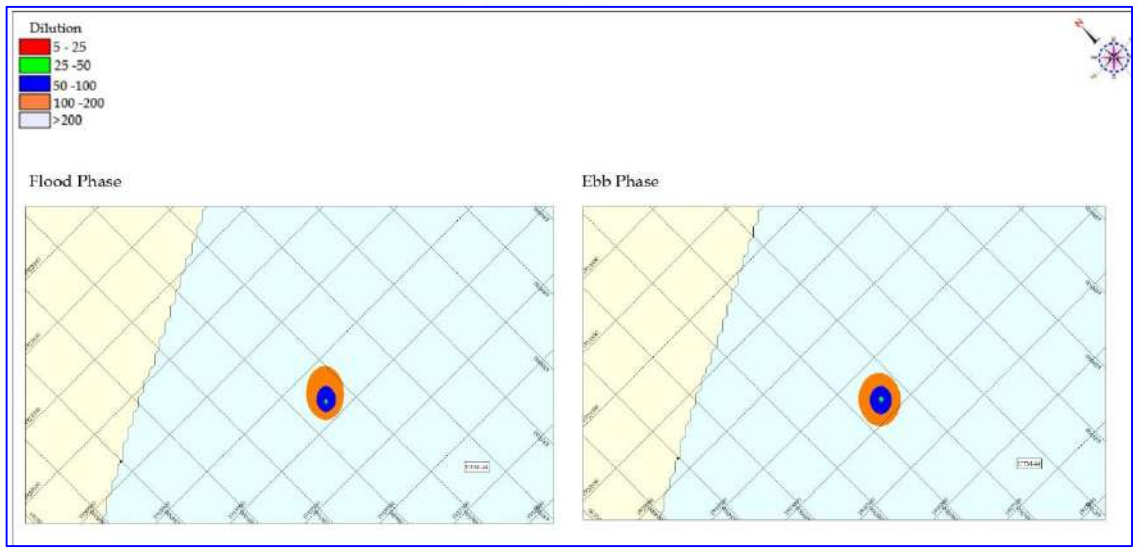


Neap tide

INDUSTRIAL EFFLUENT - FW

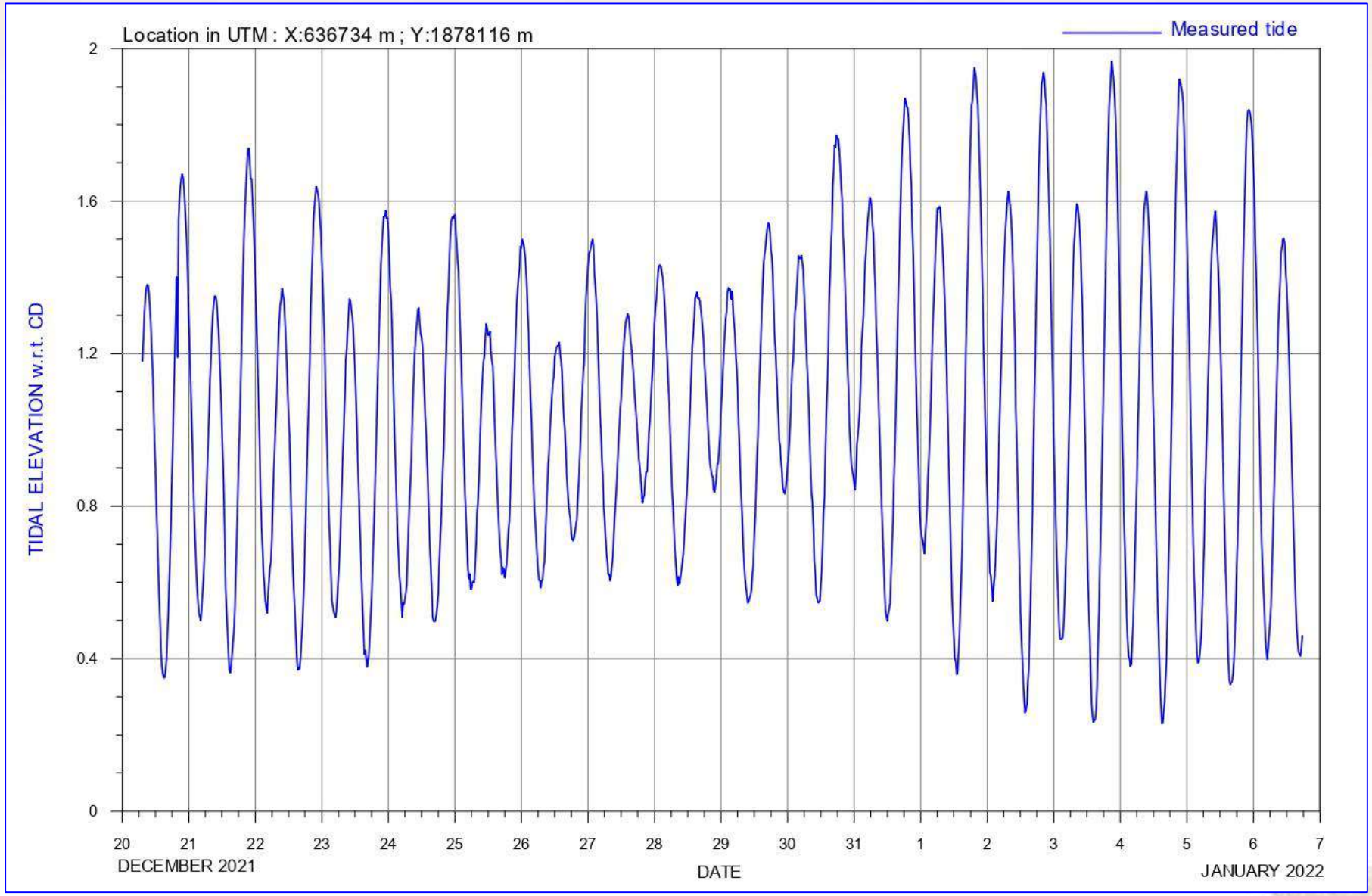


Spring tide

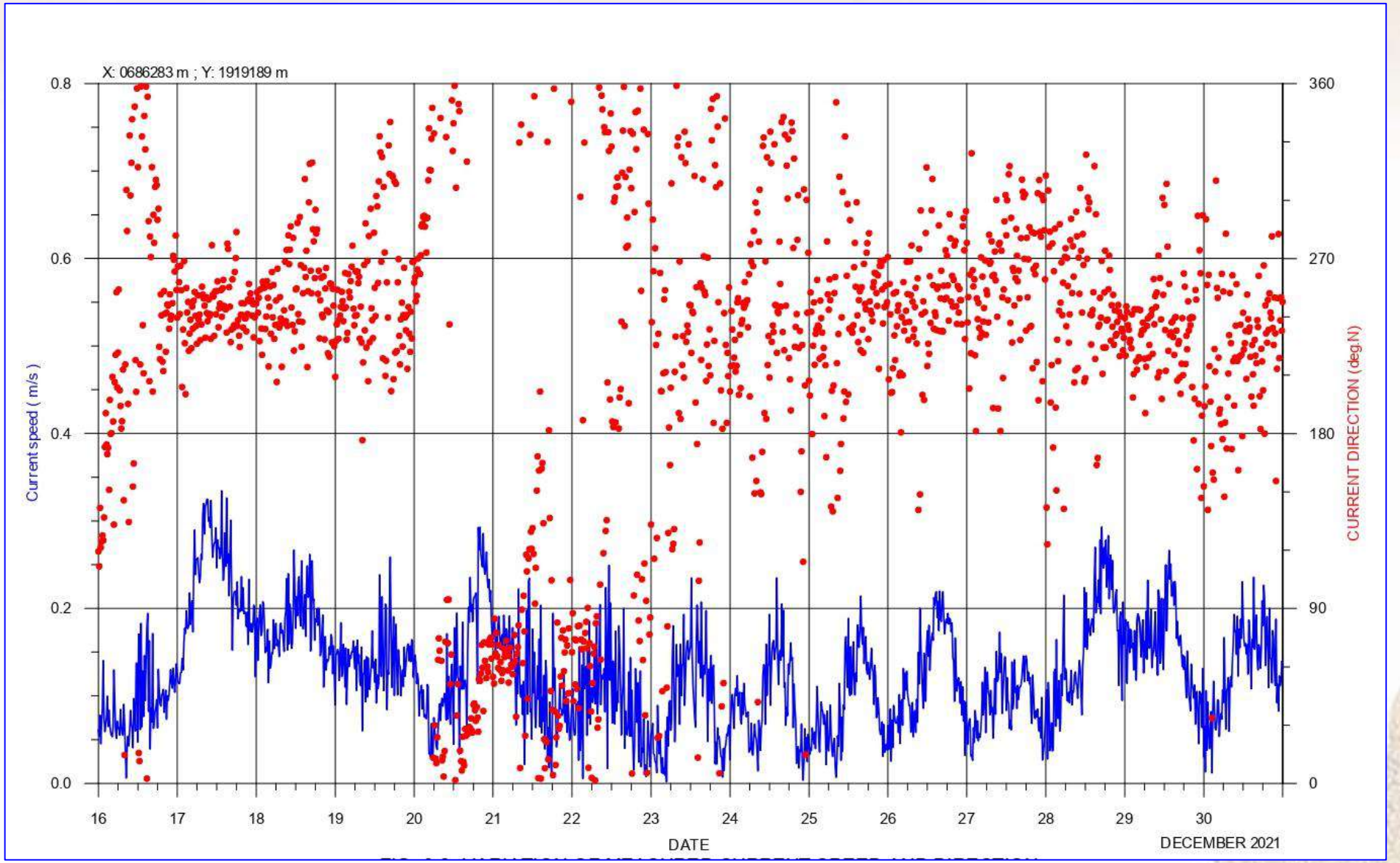


Neap tide

VARIATION OF MEASURED TIDE



VARIATION OF MEASURED CURRENT



SEAWATER SAMPLE COLLECTION





Seawater quality parameters were found in the normal range and the water environment is free from pollution.

SEABED SEDIMENT SAMPLE COLLECTION





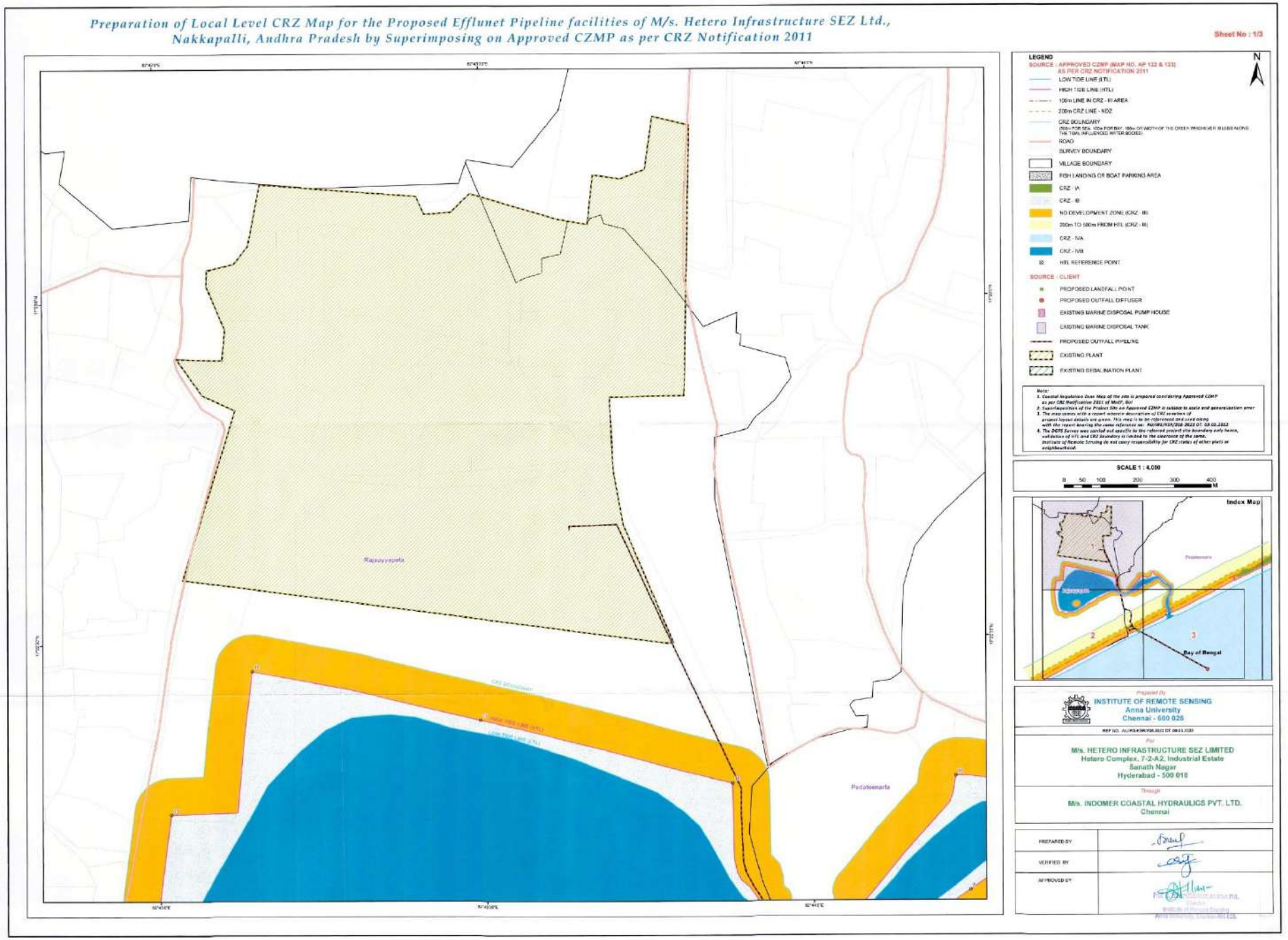
- Seabed sediment is predominantly composed of fine sand in nature.
- Organic matter, Total Nitrogen, Phosphorous concentrations were found within the normal range of coastal waters.
- The concentrations of heavy metals and phenols showed low values indicating absence of contamination in seabed sediments.

- **Phytoplankton:** Species diversity of the phytoplankton community of the coastal water is dominated by diatoms, dinoflagellates, and cyanobacteria. The most dominant phytoplankton species was *Chaetoceros lorenzianus* than the other phytoplankton species during the study period.

- **Zooplankton:** Zooplankton biodiversity in this coastal water is mostly composed of copepods, followed by Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida.

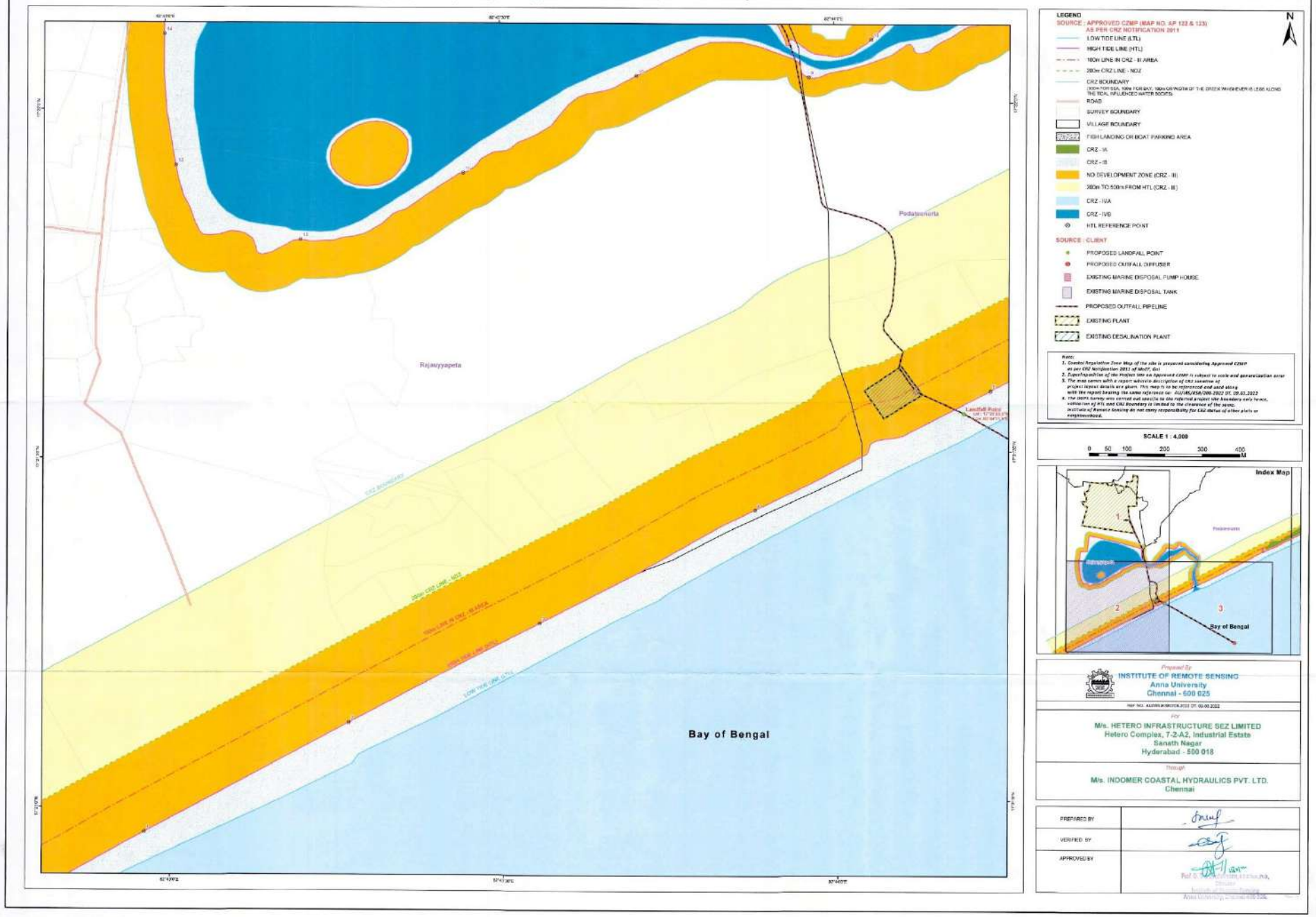
- **Sand dune Vegetation:** There is no sand dune vegetation in project site but in the project region of 10 km radius sand vegetation were observed.

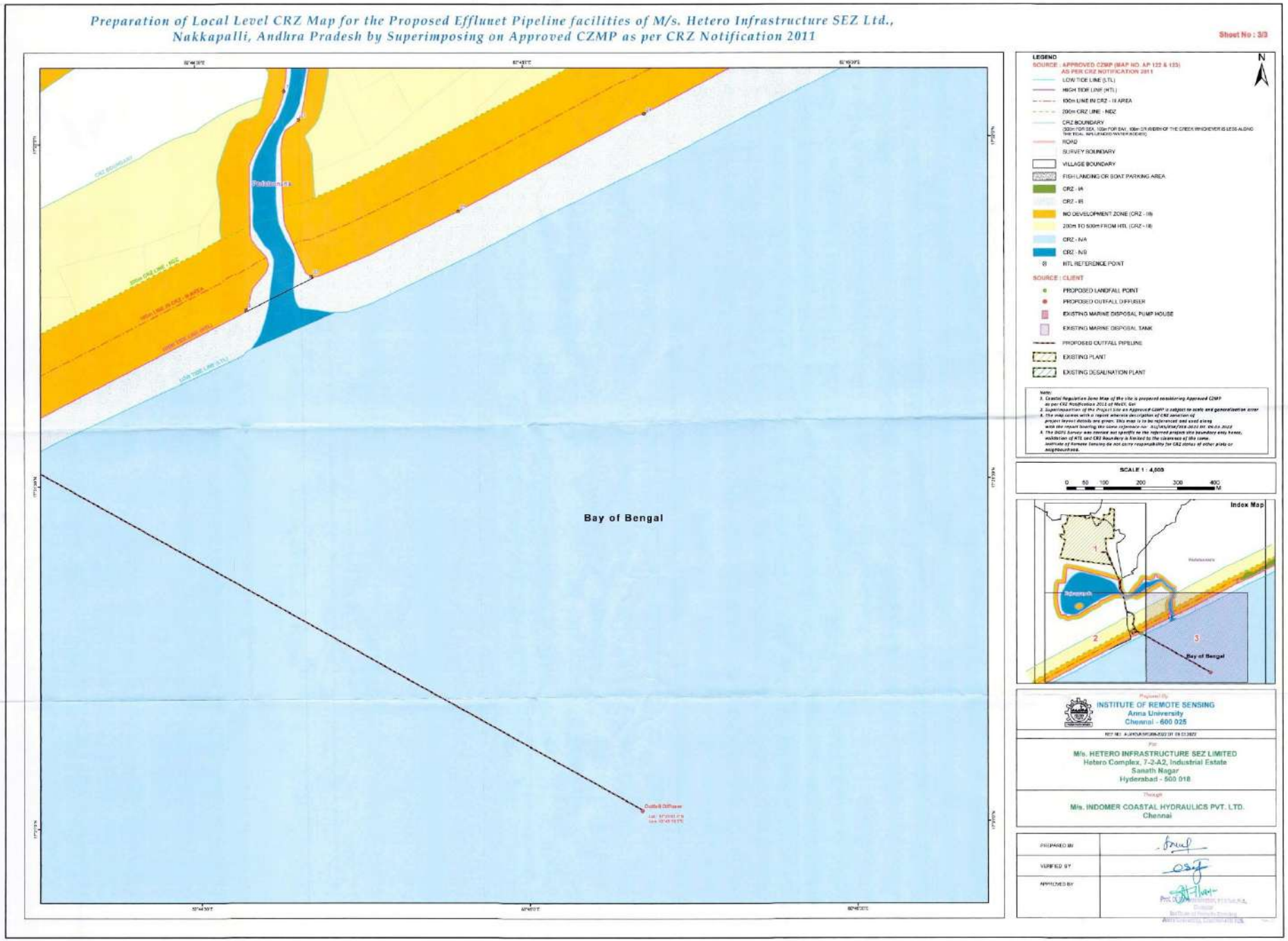
- Endangered species are absent near the project region


Preparation of Local Level CRZ Map for the Proposed Efflunet Pipeline facilities of M/s. Hetero Infrastructure SEZ Ltd.,
Nakkapalli, Andhra Pradesh by Superimposing on Approved CZMP as per CRZ Notification 2011
Sheet No : 1/3
LEGEND
SOURCE : APPROVED CZMP (MAP NO. AP 122 & 123) AS PER CRZ NOTIFICATION 2011
LOW TIDE LINE (LTL)
HIGH TIDE LINE (HTL)
100m LINE IN CRZ - III AREA
200m CRZ LINE - NDZ
CRZ BOUNDARY
ROAD
SURVEY BOUNDARY
VILLAGE BOUNDARY
FISH LANDING OR BOAT PARKING AREA
CRZ - IA
CRZ - IB
NO DEVELOPMENT ZONE (CRZ - III)
200m TO 500m FROM HTL (CRZ - III)
CRZ - IVA
CRZ - IVB
HTL REFERENCE POINT
SOURCE : CLIENT
PROPOSED LANDFALL POINT
PROPOSED OUTFALL DIFFUSER
EXISTING MARINE DISPOSAL PUMP HOUSE
EXISTING MARINE DISPOSAL TANK
PROPOSED OUTFALL PIPELINE
EXISTING PLANT
EXISTING DESALINATION PLANT
SCALE 1 : 4,000
0 50 100 200 300 400 M
Index Map
Bay of Bengal
Rajuvyapeta
Pedateenarla
INSTITUTE OF REMOTE SENSING
Anna University
Chennai - 500 025
M/s. HETERO INFRASTRUCTURE SEZ LIMITED
Hetero Complex, 7-2-A2, Industrial Estate
Sanath Nagar
Hyderabad - 500 018
M/s. INDOMER COASTAL HYDRAULICS PVT. LTD.
Chennai
PREPARED BY
VERIFIED BY
APPROVED BY

Preparation of Local Level CRZ Map for the Proposed Effluent Pipeline facilities of M/s. Hetero Infrastructure SEZ Ltd., Nakkapalli, Andhra Pradesh by Superimposing on Approved CZMP as per CRZ Notification 2011

Sheet No : 2/3




Preparation of Local Level CRZ Map for the Proposed Effluent Pipeline facilities of M/s. Hetero Infrastructure SEZ Ltd.,
Nakkapalli, Andhra Pradesh by Superimposing on Approved CZMP as per CRZ Notification 2011
Sheet No : 3/3
Bay of Bengal
LEGEND
SOURCE : APPROVED CZMP (MAP NO. AP 122 & 123) AS PER CRZ NOTIFICATION 2011
LOW TIDE LINE (LTL)
HIGH TIDE LINE (HTL)
100m LINE IN CRZ - III AREA
200m CRZ LINE - NDZ
CRZ BOUNDARY
ROAD
SURVEY BOUNDARY
VILLAGE BOUNDARY
FISH LANDING OR BOAT PARKING AREA
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NO DEVELOPMENT ZONE (CRZ - III)
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HTL REFERENCE POINT
SOURCE : CLIENT
PROPOSED LANDFALL POINT
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EXISTING MARINE DISPOSAL PUMP HOUSE
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PROPOSED OUTFALL PIPELINE
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EXISTING DESALINATION PLANT
SCALE 1 : 4,000
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INSTITUTE OF REMOTE SENSING
Anna University
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M/s. HETERO INFRASTRUCTURE SEZ LIMITED
Hetero Complex, 7-2-A2, Industrial Estate
Sanath Nagar
Hyderabad - 500 018
M/s. INDOMER COASTAL HYDRAULICS PVT. LTD.
Chennai
PREPARED BY
VERIFIED BY
APPROVED BY

Response to the suggestions made by the Expert Committee during 315th meeting of Expert Appraisal Committee (EAC-CRZ) for projects related to Coastal Regulation Zone held on 29th November 2022 and submission of additional data

Details of the Project are as below:

Proposal No : **IA/AP/CRZ/407123/2022 (F.No: 11/45/2022-IA.III)**

Agenda No : **3.5**

Proposal : **Laying of new marine disposal pipeline in place of existing two lines and increase of marine discharge quantity at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teemala (V), of Kakkapalli (M), Visakhapatnam District Andhra Pradesh M/s Hetero Infrastructure SEZ Ltd – CRZ Clearance**

Submitted For

HETERO INFRASTRUCTURE SEZ LTD.
N. Narasapuram (Village), Nakkapalli Mandal
Visakhapatnam Dist., Andhra Pradesh

By

INDOMER COASTAL HYDRAULICS (P) LTD.
(ISO 9001: 2015 CERTIFIED, QCI-NABET, NABL AND CDC - MoST ACCREDITED)
63, GANDHI ROAD, ALWARTHIRUNAGAR, CHENNAI 600 087.
Tel: + 91 44 2486 2482 to 84 Fax: + 91 44 2486 2484
Web site: www.indomer.com, E-mail:ocean@indomer.com

1 INTRODUCTION

In order to discharge the treated effluent produced in the various Hetero manufacturing units, Hetero had laid effluent outfall pipeline in the year 2007. In addition, to meet the necessary water requirement Hetero had set up a 5 MLD seawater desalination plant with intake pipeline to draw 15 MLD seawater and outfall pipeline to discharge 10 MLD brine reject from the desalination plant. Over the period of 12 years, the outfall pipelines got damaged and Hetero has planned to replace the pipeline. Accordingly the industry has approached the Ministry for CRZ Clearance after getting recommendations from APCZMA.

The details of the Existing and proposed pipelines are as shown below:



Based on the 315th meeting of EAC – CRZ for the proposal 'Laying of new marine disposal pipeline in place of existing two lines and increase of marine discharge quantity at N. Narasapuram (V), Ch. Lakshmipuram (V), Rajaihpeta (V), Peda Teemala (V), of Kakkapalli (M), Visakhapatnam District Andhra Pradesh M/s Hetero Infrastructure SEZ Ltd.' vide agenda no. 3.5 held on November 29, 2022 the committee suggested to submit report on the details of fish catch and comparison of Sea water quality and seabed sediment characteristics near the discharge of existing effluent outfall.

The response to the point wise suggestions made by the Expert appraisal committee as follows:

Query 1 : The committee wanted to understand the impact on fish catch in the district (if any) due to the installation of the effluent pipeline. The client was asked to present the fish catch data from the period 2006 (Pre - installation of the effluent pipeline) to the present, using available secondary sources of data.

Response

Comparison on the marine fishery catch statistics for the period from 2006 (i.e., before effluent pipeline was commissioned) to recent available data to evaluate the impact on marine fisheries due to discharge of treated effluent has been presented below.

Marine fisheries catch data for Andhra Pradesh State was collected from Andhra Pradesh Fisheries Department website for the period 2004 to 2019 presented in **Table 1** and shown in **Fig. 1.**

Table 1. Marine Fish Production in Andhra Pradesh

Year	Marine Fish Production (in thousand tonnes)
2004 - 2005	1815.81
2005 - 2006	1920.67
2006 - 2007	2071.12
2007 - 2008	2188.15
2008 - 2009	2449.24
2009 - 2010	2465.44
2010 - 2011	2518.26
2011 - 2012	3264.72
2012 - 2013	3515.85
2013 - 2014	3733.38
2014 - 2015	4062.49
2015 - 2016	4082.36
2016 - 2017	5002.25
2017 - 2018	5052.65
2018 - 2019	5088.48

Source: Department of Fisheries, Government of Andhra Pradesh

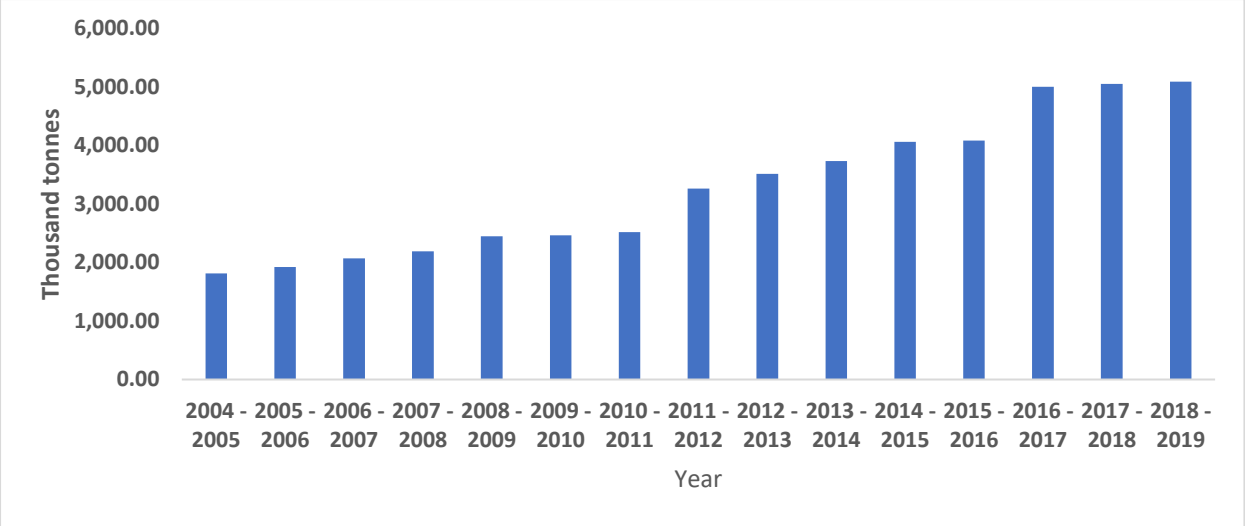


Fig. 1. Marine Fish Production in Andhra Pradesh

Marine Fish catch data for Visakhapatnam District was sourced from Department of Fisheries, Andhra Pradesh. Data for the period 2007 to 2018 were collected and given in **Table 2** and shown in **Fig. 2.**

Table 2. Marine Fish Production in Visakhapatnam District

Year	Marine Fish Production (in Tonnes)
2007-08	49448
2008-09	54777
2009-10	52578
2010-11	59037
2011-12	69982
2012-13	73523
2013-14	78585
2014-15	85620
2015-16	89084
2016-17	105441
2017-18	106704

Source: Department of Fisheries, Government of Andhra Pradesh

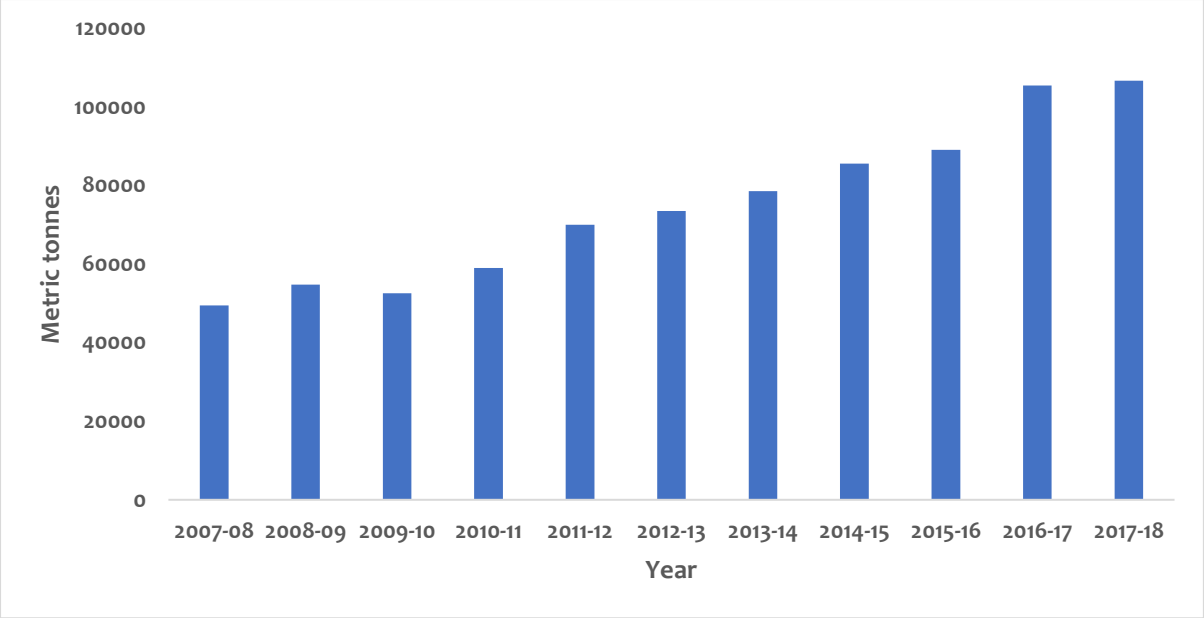


Fig. 2. Marine Fish Production in Visakhapatnam

The following coastal villages in Visakhapatnam District are located within 10 km radius of the project site.

- Amalapuram
- Bangarampeta
- Boyapadu
- Chinatheenerla
- Donevaniri Laxmipuram
- Dondavaka
- Pedatheenerla
- Rajayyapeta

Conclusion

From Tables 1 & 2, it can be inferred that there has been no major impact in fish production for the last 15 years in Andhra Pradesh state. The same trend is followed in the district wise fish production statistics also.

QUERY 2: The committee asked the Project Proponent to present the comparative study on seawater condition as sampled near the present effluent outfall pipeline location

Response

National Institute of Oceanography (NIO), Visakhapatnam has been entrusted with the work of routine sampling and analysis of seawater quality results at 10 stations. This data has been submitted regularly as per requirements. The data pertaining to the location near the present effluent outfall pipeline over the period of time is presented below for reference

Table 3. Comparision of seawater qaulity results

Parameter	NIO – 2007	NIO – 2010	NIO - 2012	NIO - 2014	NIO - 2017	INDOMER - 2022	CPCB Standards Coastal areas
DO (mg/l)	5.09-6.65	3.24-5.58	5.64-7.58	2.26-5.22	2.7-6.0	5.9-6.1	*
BOD (mg/l)	0.29-1.16	0.13-1.54	0.06-0.86	0.07-0.55	0.06-0.42	1.0-1.2	30-100 mg/L
pH	7.9-8.1	8.0-8.1	8.1-8.2	7.4-8.0	7.4-8.0	7.91-7.95	5.5 - 9.0
TSM (mg/l)	10.6-35.2	34.2-69.6	19.0-32.8	16.4-48.8	16.8-45.6	2.6-6.2	*
No2-N (µg/l)	0.6-4.3	1.4-10.4	0.6-6.8	8.2-17.8	1.6-8.5	19.7-22.08	*
NO3-N (µg/l)	--	--	--	--	21.3-62.7	279- 297	*
NH4-N (µg/l)	13.8- 52.4	4.90- 41.02	12.1- 34.0	22.4- 35.6	6.0- 45.9	88 -92	50 mg/L
PO4-P(µg/l)	8.37-40.46	2.88-33.28	27.6-75.3	42.8-131.8	14.3-47.2	113- 123	*
SiO4-S (µg/l)	23-156	20-202	101-381	289-406	139-438	-	*

Conclusion: *Based on the observation there is no detoriation of water quality near the present effluent discharge location.*

QUERY 3: The committee suggested the PP/Consultant to submit the seabed sediment quality near the effluent pipeline location in order to understand any impact from discharge of effluents.

Response

National Institute of Oceanography (NIO), Visakhapatnam has been entrusted with the work of routine sampling and analysis of seabed sediment quality results at 10 stations. This data has been submitted regularly as per requirements.

Grain size of seabed sediments are analysed and provided in the monitoring reports. It is observed that the sediment compostion of sand, silt and clay remained similar without any major changes over the period of time. The seabed sediment samples were collected and analysed as part of baseline data collections carried out by covering 10 km project radius during December 2021 to January 2022. The samples were analysed for Sediment structure, Total Organic Carbon, Total Nitrogen, Total Phosphorous, Calcium carbonate, Cadmium, Chromium, Lead, Zinc, Mercury, Stronium and Phenols.

Table 4. Sediment size distribution

Station	Classification of Soil	D_{50} (mm)	Sand			Silt & Clay %
			Coarse %	Medium %	Fine %	
SB1	Fine Sand	0.12	0.4	0.7	96.1	2.8
SB2	Fine Sand	0.12	2.0	2.2	91.3	4.5
SB3	Medium Sand	0.36	26.9	36.4	36.6	0.1
SB4	Coarse Sand	0.52	54.2	36.0	8.8	1.0
SB5	Fine Sand	0.11	6.7	10.5	68.0	14.8
SB6	Fine Sand	0.14	9.5	12.7	71.7	6.1
SB7	Fine Sand	0.25	18.2	18.7	56.1	7.0
SB8	Medium Sand	0.28	16.5	25.7	57.7	0.1
SB9	Fine Sand	0.16	3.7	6.7	85.9	3.7
SB10	Coarse Sand	0.60	69.2	24.4	6.3	0.1

Table 5. Seabed sediment quality results

Station	Total Organic Carbon (%)	Total Nitrogen (µg/g)	Total Phosphorus (µg/g)	Calcium Carbonate (%)
SB1	0.67	324	47.0	7.8
SB2	0.86	410	32.9	9.3
SB3	1.07	516	27.0	9.5
SB4	0.34	248	35.3	6.8
SB5	1.29	618	65.0	9.3
SB6	1.27	614	46.5	10.5
SB7	1.62	780	77.4	8.0
SB8	1.22	584	32.4	8.4
SB9	0.98	472	32.1	13.3
SB10	0.18	105	26.8	7.4

Contd.

Station	Cadmium (µg/g)	Chromium (µg/g)	Lead (µg/g)	Zinc (µg/g)	Mercury (µg/g)	Strontium (µg/g)	Phenols (µg/g)
SB1	<0.1	29.4	2.9	39.8	<0.1	50.2	<0.5
SB2	<0.1	30.3	3.0	34.9	<0.1	51.7	<0.5
SB3	<0.1	25.9	3.2	34.7	<0.1	51.5	<0.5
SB4	<0.1	26.0	3.3	32.4	<0.1	46.0	<0.5
SB5	<0.1	31.0	3.8	33.6	<0.1	56.0	<0.5
SB6	<0.1	37.5	4.1	38.0	<0.1	54.0	<0.5
SB7	<0.1	26.1	3.4	35.8	<0.1	55.3	<0.5
SB8	<0.1	28.5	3.5	28.3	<0.1	59.8	<0.5
SB9	<0.1	27.6	3.6	27.2	<0.1	59.2	<0.5
SB10	<0.1	25.3	4.0	26.0	<0.1	59.0	<0.5

SB3 is the nearest location to the treated effluent outfall.





Collection seabed sediment sample

Conclsuion: ***Based on the observation there is no major deterioration of seabed sediment quality (SB3) which is near the present treated effluent outfall location.***

QUERY 4: The committee suggested to present the details of effluent being released by client at present and details of clearances obtained for releasing enhanced quantity. Committiee also suggested to present the details of brine discharge.

Response

The earlier clearances obtained to discharge treated effluent from various Hetero units are as follows.

Table 6. Clearances obtained to discharge treated effluent

Operation Unit	Date	Discharge quantity of treated effluent in KLD
M/s Hetero Labs Ltd.,	04.01.2007	190
M/s Hetero Infrastructure SEZ Ltd.	25.10.2010	1040
M/s Hetero Labs Ltd., Unit-III	10.09.2012	676
M/s Hetero Drugs Ltd., Unit-VI	10.09.2012	650
EC of M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd., Unit-VI and transferred to M/s Hetero Labs Ltd.	27.01.2020	676+650

At present totally 2.366 MLD of treated effluent is discharged into sea.

The total quantity of effluent proposed is 2.366 MLD with new pipeline of 500 mm diameter with 2000 m in length and depth of 14.8 m CD. Post clearance the following will be the scenario of the pipelines:

- Seawater intake for desalination plant - 15 MLD (Remain same and no changes)
- Brine reject outfall for desalination plant - 10 MLD (Remain same and no changes)
- New treated effluent pipeline – 2.366 MLD (After clearance)
- Existing pipeline to be removed as per the APCZMA special condition.

Apart from above data this is to bring to the kind notice of the committee that, National Institute of Oceanography (NIO) is carrying following studies on monthly basis on the treated effluents before discharging into sea to have better monitoring on the treated effluent & marine environment and also to comply with the monitoring protocols issued by APPCB from time to time.

- **Bioassay test**
- **Trace metal composition in the Effluent before discharging into Sea**
- **Organic compounds present in the treated effluent.**

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भारत सरकार
पर्यावरण एवं वन मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
क्षेत्रीय कार्यालय (दक्षिण वलय)
Regional Office (Southern Zone)
Kendriya Sadan, 4th Floor, E&F Wings, 17th Main Road,
2nd Block, Koramangala, Bangalore - 560 034.

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दूरभाष :
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Fax : 080 - 25577484

EP/12.1/505 & 544/AP
Date: 25.11.2013

To,
Shri. Gandhi Reddy
General Manager - EHS
M/s Hetero Labs Ltd,
No. 8-3-166/7/1, Hetero House,
Erragadda, Hyderabad -500 018.

Sub :- Bulk Drug unit (Unit –V) at N.Narasaouram, Nakkapally, Visakhapatnam Andhra Pradesh by M/s Hetero Drugs Ltd., **(now Unit-III).**
Ref :- J-11011/252/2006-IA.II(I), Dt:25.9.2006.
&
Sub :- Bulk Drug unit (Unit –V) at N.Narasaouram, Nakkapally, Visakhapatnam Andhra Pradesh by M/s Hetero Drugs Ltd., **(now Unit-VI).**
Ref :- J-11011/253/2006-IA.II(I), Dt:22.9.2006.

Sir,

Please recall our discussion during my visit on 09-11-2013. Please look into the following issues and inform this office regarding corrective action take at your end.

i) There is a storm water collection system for tapping 1.2 lack M^3 in monsoon season. This water also partly utilized. There are many migratory birds seen in the area. This pond may be developed to make this a habitation for migratory birds.

ii) Leachate collection pits at hazardous storage area to be covered, so that the set up is not disturbed during rainy season.

iii) The garbage disposal system to be reviewed to convert food waste into manure. At present the garbage along with the plastic is dumped indiscriminately. House keeping must be improved by making the area free of plastic waste.

iv) Approach road to ETP and desalination plant to be made pucca to reduce dust pollution.

Yours faithfully,

(Dr.S.K.SUSARLA)
Director

Copy to :-

1. The Member Secretary, Andhra Pradesh Pollution Control Board, Paryavarana Bhavan, A-3, Sanath Nagar, Hyderabad – 500 018.
2. The Environmental Engineer, APPCB, Madhavadhara Main Road, VUDA Colony, Visakhapatnam – 530018.

(Dr.S.K.SUSARLA)
Director

STATEMENT OF COMPLIANCE

Sub :- CRZ clearance for the development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Sy.No. 215, 286/1, 286/2, 283/1, in Ch. Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajalahpetm 19 (part) in Pedda Teemala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215 N. Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s. Hetero Infrastructure SEZ Ltd – reg.,

Ref :- 21-641/2007-IA.III, Dated: 25.10.2010.

There are two complexes in the area one is called Hetero non-regulated units (NR) (unit-III & unit-VI) and the other one Hetero SEZ. In the Hetero SEZ area 17 units are proposed of which two were constructed.

The ETP was commissioned in July 2010. The waste water from the present and future drug units is proposed to be treated in the common effluent treatment plant meant for the entire complex.

The land details are as follows:-

	Hetero (NR)	Hetero SEZ
Total area	56.0 Ha	138.51 Ha
Total built-up area	39.0 Ha	98.0 Ha
Total green-belt	17.0 Ha	40.5 Ha

The present ETP is now serving two units (Unit-III & Unit – VI) and has the capacity of 460 KLD.

The present waste water generation is as follows.

	Hetero (NR)	Hetero SEZ
Process & washing	130-140 KLD	80-90 KLD
Boiler blow down & Cooling tower bleed	30 KL	10 KLD
Domestic (recycled)	50 KL	20 KLD

Present water consumption is 230 KLD.

There is a desalination plant of capacity 1000 M^3/day catering to the present water requirement. The desalination plant is located in CRZ area with due permission from MoEF.

Ambient air and stack monitoring are in vogue.
1000x6 KVA (6 DG sets) are installed with acoustic enclosures.

The company has adopted energy conservation methods.

Third party monitoring of the ambient air, VOC (toluene and n-hexane), stack and water quality is in vogue.

The company has also undertaken many socio economic activities.

Disaster management plan was made and submitted to Ministry.

Further improvements to be made are as follows :-

i) There is a storm water collection system for tapping 1.2 lack M^3 in monsoon season. This water also partly utilized. There are many migratory birds seen in the area. Project authorities may develop this pond to make this a habitation of migratory birds.

ii) Leachate collection pits at hazardous storage area are to be covered, so that the set up is not disturbed during rainy season.

iii) The garbage disposal system to be reviewed to convert food waste into manure. At present the garbage along with the plastic is dumped indiscriminately near the rain water harvest pond. House keeping must be improved by making the area free of plastic waste.

iv) Approach road to ETP and desalination plant to be made pucca to reduce dust pollution.

v) Company does not have their own website facility for uploading the compliance reports / clearance letters.

SL. No	CONDITIONS	COMPLIANCE
Part-A, Specific Conditions		
Construction Phase:-		
(i)	Consent for Establishment" shall be obtained from Andhra Pradesh Pollution Control Board under Air and Water Act and a shall be submitted to the Ministry before start of any construction work at the site.	The industry obtained Consent for Establishment from AP Pollution Control Board.
(ii)	Sufficient dilution shall be ensured to meet the ambient parameters within 50m distance from outfall.	Out fall pipeline has been reportedly laid as per NIO recommendations and the dilution is more than 500 times at the point of disposal.
(iii)	Regular independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through an authorized agency and submitted along with six monthly monitoring report to the ministry.	Being followed. The industry is using the expertise of NIO for conducting the studies once in a year i.e pre monsoon period & post monsoon period. The report is submitted to Regional Office.
(iv)	Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in the system.	Provided strainers at the intake point to prevent fish entry into the system.
(v)	All the recommendations of EIA and DMP shall be strictly complied with.	The recommendations of EIA & DMP have been implemented and the DMP is being upgraded based on the recommendations of Factories Department, Govt. of Andhra Pradesh.
(vi)	Lighted buoys shall be provided at intake and out fall location as indicators.	Marker Buoys have been installed at the intake & Outfall points as indicators.
(vii)	The pipe line shall be buried at least 2 m depth in onshore area and 4 mts. In the offshore area. Necessary permission with regard to the pipeline burial and laying shall be obtained from maritime Board to ensure that the pipeline route does not fall in the	Pipeline has been laid as per the recommendations made by NIO i.e, pipeline has been buried at 4 meters depth in offshore area and the diffusers have been installed at a depth of 13 meters from the surface of the sea.

	navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.	
(viii)	The pipeline shall not pass through any sand dunes/mangroves. The project shall be implemented in such a manner that there is not damage whatsoever to the mangroves/other sensitive coastal ecosystem. If any damage to mangroves is anticipated/envisaged as a result of project activates then the clearance shall stand cancelled and the proponents shall seek fresh approval from the Ministry.	There are no mangroves and sand dunes in the area where pipeline has been laid. The industry is taking all precautions to avoid damage to the marine environment.
(ix)	The reject shall meet the standards prescribed by Andhra Pradesh Pollution Control Board before disposal.	The rejects are meeting the standards laid down by APPCB as the project authorities are using Hypo & Ferric Chloride only as and when required depending on Sea water quality. Qualities of the rejects are in the following range. Parameter: pH — Value: 6.5-9.0 — Limit: 7.5 -8.5 TDS — 50000-60000 mg/l — NA TSS — BDL — 500 COD — 10-50* — 250 * Indicates the COD of 10 – 50 mg/l is only at the time of back wash. During normal operations it is less than 10 mg/l
(x)	A continuous and comprehensive post project marine quality monitoring programmed shall be taken up. This shall include monitoring of water quality sediments quality and biological characteristics and report submitted every 6 months to Ministry's Regional Office at Bangalore.	Being followed. The industry is taking expertise of NIO and has completed the studies for the year 2011-12. The study includes water quality, sediments quality & biological characteristics of the water. As per the report, there is no degradation of sea water quality due to the disposal of treated effluents. Copy of final report is submitted to Regional Office.
(xi)	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	There is no displacement of people, houses or fishing activity as it was a vacant land being used for aquaculture in the past.
(xii)	There shall be display boards at critical locations along the pipeline Viz. road / rail/ river crossing giving emergency instructions. This will ensure prompt information regarding locations of accident during any Emergency. Emergency information Board shall contain emergency instruction in addition to contact details. Proper lighting shall be provided all along the road.	Boards have been displayed at critical locations. Emergency contact details are available in the ECC & also at Security. Proper lighting has been provided all along the roads.
(xiii)	There shall be no withdrawal of ground water in CRZ area for this project.	The industry is not drawing any ground water in CRZ area. Regular water requirement for the project is being completely met through Desalination plant.

(xiv)	No other activities except the permissible actions under CRZ Notification 1991 shall be carried out with CRZ areas.	Industry is adhering to the conditions stipulated. The industry is not performing any activities other than Desalination in the said area.
(xv)	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contamination.	Conducting the analysis of soil & ground water periodically to check the contamination. As per the reports there is no contamination of ground water and soil.
(xvi)	Construction spoils, including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such material must be secured so that they should not leach into the ground water.	The industry is not using any bitumen for construction of roads as all the roads are made of concrete. Hazardous material is being disposed to TSDF regularly.
(xvii)	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approval of the Andhra Pradesh state Pollution Control Board.	In the Hetero SEZ area 17 units are proposed of which two were constructed.
(xviii)	The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.	The industry is using only low sulphur diesel for operation of DG sets.
(xix)	The diesel required for operation DG sets shall be stored in underground tanks and required clearance from Chief Control of Explosives shall be taken.	The industry is storing diesel in dedicated above ground storage tanks in the storage yard. They have obtained necessary clearance from Chief Controller of Explosives.
(xx)	Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non peak hours	All vehicles are reportedly in good condition and having pollution check certificates. The vehicle movement in the premises is restricted to day time only.
(xxi)	Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/SPCB	The industry is regularly monitoring Ambient noise levels and the results are conforming to the residential standards. At present there are no major construction activities at site other than repair works. At present construction of Honour Lab Ltd, Unit-III at Plot No:4 of Hetero Infrastructure SEZ Ltd is in progress. All DG sets are equipped with acoustic enclosures.
(xxii)	Fly ash should be used as building material in the construction as per the provision of Fly ash Notification of september,1999 and amended as on 27th August,2003	The industry is using fly ash Bricks & also using fly ash in Ready Mix concrete for the construction.
(xxiii)	Ready mixed concrete must be used in building construction	Ready mix concrete is being used for the construction of buildings.
(xxiv)	Storm water control and its re use as per CGWB and BIS standards for various applications.	Dedicated storm water drains are constructed surrounding to the plant and is being collected in the pond created by the industry and the

		same is being reused for construction activities, utilities. The total area of the pond is 16 acres and the storage capacity of the pond is 1.2 lakh m^3. This water also partly utilized. **There are many migratory birds seen in the area. Project authorities may develop this pond to make this a habitation of migratory birds.**
xxv	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred	The industry is using Ready mix concrete for the construction and also using curing chemicals for curing purpose.
xxvi	Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.	The industry is not drawing any ground water. The source of the water is desalination plant established by the company.
xxvii	Regular supervision of the above and other measure for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.	Reportedly complied and Agreed to comply.
xxviii	Under the provisions of Environment (protection)Act,1986,legal action shall be initiated against the project proponent if it was found that construction of the project has started without obtaining environmental clearance	Construction commenced after the Environmental Clearance was issued.
II. OPERATION PHASE		
i	The installation of the Effluent Treatment Plant (ETP) should be certified by an independent expert and a report in this regard should be submitted to the Ministry before the project is commissioned for operation. Treated effluent emanating from ETP shall be Recycled/ Reused to the maximum extent possible.	Constructed full-fledged ETP for the treatment of Effluents at a cost of Rs.60.00 Cores. At present the project authorities are planning to have performance evaluation of ETP in next six months by the third party. The industry is taking all possible measures to recycle the waste water being generated.
ii	The solid waste generated should be properly collected and segregated. Wet garbage should be composed and dry/inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material	Dedicated storage shed with leachate collection pits has been provided for storing solid waste. **Leachate collection pits at hazardous storage area are to be covered, so that the set up is not disturbed during rainy season.** Installed Vermi-compost plant for disposing vegetable waste & Agricultural waste. **The garbage disposal system to be reviewed to convert food waste into manure. At present the garbage along with the plastic is dumped indiscriminately near the rain water harvest pond. House keeping must be improved by making the area free of plastic waste.** Inorganic salts being disposed to TSDF Visakhapatnam whereas the organic wastes are being disposed to cement plants for co-generation.

iii	Diesel power generating sets proposed as sources of backup power for elevators and common area illumination during operation phase should be of enclosed type and conform to rules made under the environment (protection) Act,1986.The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use low sulphur diesel. The location of the DG sets may be decided with in consultation with Andhra Pradesh State Pollution Control Board.	The Diesel generators are having acoustic enclosures and the stack height of the same is as per the norms. The project authorities are using only low sulphur diesel for operation of the DG sets.
iv	Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of the periphery of the plot shall be restricted to the permissible levels to comply with the prevalent regulations.	The Industry is taking all possible measures to control the noise pollution i.e providing acoustic enclosures for all the DG sets, using slow speed motors, VFDs for all the major equipments etc. Regular monitoring of the noise levels show that the values are well within the norms. Industry is also providing suitable Personnel protective equipments for the workers working in the noise generating areas.
v	The green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	The industry has planted around 500000 saplings in and around the premises. Total green-belt area is 17.0 Ha in non regulated area and 40.5 Ha in SEZ area.
vi	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period	Well designed drainage system has been provided for the premises for draining rain water during monsoon period. Holes have been provided in the compound walls below plinth beam for drainage of rain water during rainy season.
vii	Rain water harvesting for roof run-off, as plan submitted should be implemented. Before recharging the surface run off, pre-treatment must done to remove suspended matter.	Complete rain water is being collected in a pond created by the industry and the same is being reused for utilities. The total area of the pond is 16 acres and the storage capacity of the pond is 1.2 lack M^3. This water is also partly utilized. **There are many migratory birds seen in the area. Project authorities may develop this pond to make this a habitation of migratory birds.** The project authorities have stated that the land where industry is located is not suitable for direct recharging of ground water.
viii	The ground water level and its quality should be monitored regularly in consultation with Central ground water authority	At present the industry is monitoring ground water through third party at two places i.e. one inside the premises and the other one outside the premises. The values are normal.
ix	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided.	There is no traffic congestion near entry & exist points. The industry is using its own parking area and no public space is being utilized.

	Parking should be fully internalized and no public space should be utilized	
x	A report on the energy conservation measures confirming to energy conservation norms finalized by Bureau of Energy should be prepared incorporating details about building materials & technology &. Factors etc and submit to the Ministry in three months time.	The study has been done and report is in place. The major recommendations of the study are: • Using CFL/TFL to the maximum possible extent. • VFD for all major equipments. • Auto Cut offs etc. • Further the industry is exploring the possibility of installation of solar lights in the premises. Status would be intimated to RO, MoEF. The company is in the process of implementing the recommendations.
xi	Energy conservation measure like installation of CFLs/TFLs for the lighting the areas outside the building should be integral part of the project design and should in place before project commissioning. Use CFL and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoided mercury contamination. Use of solar panels may be done to the extent possible.	Using CFLs/TFLs for the lighting area and these are the integral part of the project. The industry is planning to go for LED lights for general lighting purpose in and around the premises.
PART-B, GENERAL CONDITIONS		
i	The environmental safe guards contained in the EIA report should be implemented in letter and spirit.	Being implemented.
ii	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (hard copies as well as by e -mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	EC compliance reports are regularly submitted once in six months.
6.	Officials from the Regional Office of MoEF, Bangalore who would be monitoring the implementation of environment safeguards should be given full cooperation, facilities and documents /data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional Office of MoEF, Bangalore.	Co-operation was extended to the visiting officials and required data / reports are submitted.
7.	In the case of any change(s)in the scope of the project, the project would require a fresh appraisal by this Ministry	No changes are noted in the scope of the project.

8.	The ministry reserves the right to added additional safeguard measures subsequently if found necessary, and to take action including revoking of the environment clearance under provisions of the environmental (protection)Act,1986, ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	Agreed to comply.
9.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of explosive, Fire Department, Civil Aviation department, forest Conservation Act 1980 and Wildlife (Protection) Act 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	All the statutory approvals are in place and are being regularly renewed from time to time.
10.	These stipulation would be enforced among others under the provisions of Water (prevention and Control of pollution) Act 1974,the Air(Prevention and control)act1981 the Environment (protection) Act 1986 ,the public Liability insurance)Act 1981 and EIA Notification,2006.	Agreed to comply.
11.	The project proponent should advertise in at least two local News papers widely circulated in the region one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Kerala Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forest at http:// www.envfor.nic.in The advertisement should be within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.	Reportedly complied. No proof was given regarding the advertisement in local news papers.
12.	Environmental clearance is subject to final order of the Hon'ble supreme court of India in the matter of Goa Foundation V/s Union of India in Writ petition (Civil) No.460 of 2004 as may be applicable to this project.	Agreed to comply.
13.	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, with a period of 30 days as prescribed under section 11 of the National Environment Appellate Act,19987	No appeal was made.

14.	A copy of the clearance letter shall be sent by the proponent to concerned panchayat, Zillaparishad/Municipal Corporation, Urban Local Body and the Local NGO, if any from whom suggestions/representation ,if any were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent	Clearance letter has been submitted to the Panchayat. Company does not have their own website facility for uploading the compliance reports / clearance letters.
15.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically .It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sect oral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Compliance of EC conditions are received in MoEF, RO regularly. **Company does not have their own website facility for uploading the compliance reports / clearance letters.** Monitoring data is being submitted regularly to SPCB on monthly basis. Installed CAAQM station in the premises and the data will be displayed at Main Gate through Digital/LED display. It will be reportedly established by 15th Dec 2013.
16.	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment(protection)Rules,1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail	The project authorities have submitted from the year 2012 as they have started the production activities in this year.

(Dr.S.K.SUSARLA)
Director

भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण ,वन एवं जलवायु परिवर्तन मंत्रालय
MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
Regional Office (South Eastern Zone),
1st & 2nd floor, HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai - 600034

F.No. EP/12.1/2010-11/61/AP/0433
Dated: 14th March, 2017

To

Shri S. Kullayi Reddy
General Manager –EHS
M/s Hetero Labs Ltd
N. Narasapauram –Village
Nakkapalli Mandal
Visakhapatnam.
Mobile: 9490793284
Email: KullayiReddy.S@heterodrugs.com

Subject: Environmental & CRZ clearance for the development of SEZ for pharmaceutical and chemical manufacturing units, intake and outfall and for desalination plant at Sy.No. 215, 286/1, 286/2, 283/1, in Ch.Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19 (qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N.Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s Hetero Infrastructure SEZ Limited

Reference: MoEF&CC letter no. 21-641/2007-IA-III dated 25/10/2010

Sir,

The aforesaid project was monitored by the undersigned on 6.2.2017 and observed that stipulated EC conditions are not complied which inter-alia include the following:

i. Monitoring of soil samples quality needs to be undertaken by the PP in consultation with APPCB (**Specific condition no. xv).**
ii. Action plan shall be submitted to the Regional Office of the MoEF&CC to comply with the recommendations suggested by the third party regarding the performance evaluation of the ETP. Approach road to ETP and desalination plant shall be made pucca to reduce dust pollution (**Specific condition no. i).**
iii. Treated effluent from the ETP is being sent for marine disposal and not being recycled/reused to the maximum extent possible (**Specific condition no. i).**
iv. Monitoring of ground water level has not been undertaken in consultation with the CGWA (**Specific condition no. viii).**
v. No paper advertisement has been given regarding the accord of environmental clearance by the Ministry (**Para no. 11).**
vi. Project proponent has not uploaded the environment clearance letter on the company's website (**Para no. 14).**

vii. Six monthly compliance reports along with the monitored environment data (AAQ/Stack/Noise) have not been uploaded on the company's website (**Para no. 15).**

viii. Environmental statement has not been uploaded on the company's website as stipulated in the EC condition and also not submitted to the Regional Office of the MoEF&CC (**Para no. 16).**

You are requested to take necessary corrective actions to comply with the above and send action taken report on the implementation within a month.

This is approved by the Addl.PCCF (Central), RO-Chennai vide diary no.350 dated 14.3.2017.

Yours faithfully,

R. Sundar 14/3/17

(Sundar .R.)
Scientist 'D'

MONITORING REPORT

PART I

DATA SHEET

F.No. EP/12.1/2010-11/61/AP

1	Project Type River valley / Mining / Industry / Thermal / Nuclear / Other Specify	:	Infrastructure
2	Name of the project	:	Environmental & CRZ clearance for the development of SEZ for pharmaceutical and chemical manufacturing units, intake and outfall and for desalination plant at Sy.No. 215, 286/1, 286/2, 283/1, in Ch.Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19 (qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N.Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s Hetero Infrastructure SEZ Limited
3	Clearance letter(s) / OM No. and dated	:	21-641/2007-IA-III dated 25/10/2010
	Consent Order for Establishment	:	Order No.219/PCB/CFE/RO-VSP/HO/2010-2355 dated 13/12/2010
	Consent Order for Operation	:	CFO renewal order has been obtained from APPCB vide order no. APPCB/VSP/VSP/219/CFO/HO/2015-1630 dated 16.2.2015 and is valid up to 31/12/2017.
4	Locations	:	
a.	Taluk(s) District	:	N.Narasapuram village, Nakkapalli Mandal, Visakhapatnam
b.	State (s)	:	Andhra Pradesh
c.	Latitudes / Longitudes	:	$17^{O}41'$ North / $83^{O}18'$ East
5	Address of correspondence		
a.	Address of concerned project Chief Engineer (with Pin Code & telephone / telex / fax numbers		Shri S. Kullayi Reddy General Manager –EHS M/s Hetero Labs Ltd N. Narasapauram –Village Nakkapalli Mandal Visakhapatnam. Mobile: 9490793284 Email: KullayiReddy.S@heterodrugs.com
b.	Address of Executive Project Engineer/ Manager (with Pin Code/fax numbers)	:	-do-
6	Salient features:		

	a.	Salient features of the project	:	• Project involves development of SEZ for pharmaceutical and chemical manufacturing units on a total plot area of 138.51 Ha. Hetero SEZ consists of total 17 plots.
		Present status of the project		• Out of 17 plots, 9 plots have been developed so far wherein 3 units [M/s Honor Labs Limited – Unit III, M/s Hetero Labs Limited – Unit IX and M/s Hetero Drugs Limited – Unit IX] are under operation.
	b.	Environmental management plans	:	• Full-fledged Effluent Treatment Plant (ETP) consisting of Stripper, Multiple Effect Evaporator (MEE), Agitated Thin Film Drier (ATFD) & biological system for treatment of high TDS & low TDS effluent. • STP for treatment of domestic wastewater. • Green belt development. • Monitoring of marine environment quality and ambient environmental parameters (AAQ/Noise/Stack emissions). • Installation of online stack monitoring and continuous ambient air quality monitoring equipment.
7		Breakup of the project area:		
	a	Project area	:	138.51 ha **(As per the EC accorded)**
8		Break up of project affected population with enumeration of those losing houses / dwelling units only, agricultural land only, both dwelling units and agricultural land and landless labourers / artisans		Nil
	a	SC,ST/Adivasis	:	Not applicable.
	b	Others	:	Not applicable.
9		Financial Details:		
	a	Project cost as originally planned and subsequent revised estimates and the years of price reference	:	Rs. 126 crores **(As per the EC accorded)**
	b	Allocations made for environmental management plans, with item wise and year wise breakup	:	Details not made available.
	c	Benefit cost ratio / internal rate of return and the years of assessment	:	Details not made available.
	d	Whether (c) includes the cost of environmental management as shown in (b) above	:	Details not made available.
	e	Total expenditure on the Project so far	:	Rs. 126 crores **(As per the project proponent)**
	f	Actual expenditure incurred on the environmental management plans so far	:	Rs. 80 crores **(As per the project proponent)**
10		Forest land requirement:	:	Nil

	a	The status of approval for a diversion of forest land for non-forestry use	:	Not Applicable
	b	The status of compensatory afforestation, if any	:	Not Applicable
	c	The status of clear felling	:	Not Applicable
	d	Comments on the viability and sustainability of compensatory afforestation programme in the light of actual field experience so far	:	Not Applicable
11		The status of clear felling in non-forest area (such as submergence area of reservoir, approach road), if any, with quantitative information	:	Not Applicable
12		Status of construction:		
	a.	Date of commencement		December, 2010
	b.	Date of completion (actual and / or planned)		Till now, 9 plots have been developed wherein 3 units [M/s Honor Labs Limited – Unit III, M/s Hetero Labs Limited – Unit IX and M/s Hetero Drugs Limited – Unit IX] are under operation.
13		Reasons for the delay if the project is yet to start.	:	Nil
14		Date of site visit:		
	a	The dates on which the project was monitored by the Regional Office on previous occasions, if any	:	9/11/2013
	b	Date of site visit for this monitoring report		6/02/2017

The above project was monitored by the undersigned on 6.2.2017 along with the following representatives of M/s Hetero Infrastructure SEZ Limited [herein after referred as Project Proponent (PP)].

i. Shri S. Kullayi Reddy, General Manager –EHS
ii. Shri Ashok Kumar, General Manager – Corporate EHS.

The status of compliance on the stipulated conditions contained in the Environment Clearance cited above is given below in **Part II & Part III**.

This is approved by the Addl.PCCF (Central), RO-Chennai vide diary no.350 dated – 14.3.2017.

R. Sundar 14/3/17

(Sundar.R.)
Scientist 'D'

DESCRIPTIVE REPORT ON STATUS OF COMPLIANCE TO THE CONDITIONS OF THE ENVIRONMENTAL CLEARANCE AND ENVIRONMENTAL MANAGEMENT

Subject: Environmental & CRZ clearance for the development of SEZ for pharmaceutical and chemical manufacturing units, intake and outfall and for desalination plant at Sy.No. 215, 286/1, 286/2, 283/1, in Ch.Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19 (qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N.Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s Hetero Infrastructure SEZ Limited

Reference: 21-641/2007-IA-III dated 25/10/2010

S.No.	Conditions	Compliance status
Part-A: Specific Conditions		
I. Construction Phase		
(i)	"Consent for Establishment" shall be obtained from Andhra Pradesh 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.	Partly complied. Consent Order For Establishment has been obtained from the Andhra Pradesh Pollution Control Board vide order no. 219/PCB/CFE/RO-VSP/HO/2010-2355 dated 13/12/2010 and a copy was reportedly submitted to the Ministry. However, document in this regard has not been made available during the visit.
(ii)	Sufficient dilution shall be ensured to meet the ambient parameters within 50 m distance from outfall.	Reportedly complied. It was informed that outfall pipeline has been reportedly laid as per NIO recommendations and the dilution is more than 500 times at the point of disposal.
(iii)	Regular Independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through an authorized agency and submitted along with six monthly monitoring report to the ministry.	Complied. The marine water quality at the outfall point is being monitored periodically once in a year by National Institute of Oceanography (NIO), Goa and reports are being submitted regularly to the Regional Office of the MoEF&CC along with the six monthly compliance report. Marine water quality report provided during the visit does not show any anomaly.
(iv)	Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in the system.	Complied. PP has provided strainers at the intake point to prevent fish entry into the system.
(v)	The recommendations of EIA and DMP shall be strictly complied with.	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied. Further, informed that DMP is being updated periodically based on the recommendations of the Factories Department, Govt. of Andhra Pradesh.
(vi)	Lighted buoys shall be provided at intake and out fall location as indicators.	Complied. Marker Buoys have been installed at the intake & outfall points as indicators.

<table>
<tr><th>S.No.</th><th>Conditions</th><th>Compliance status</th></tr>
<tr><td>(vii)</td><td>The pipe line shall be buried at least 2 m depth in onshore area and 4 mts. In the offshore area.

Necessary permission with regard to the pipeline burial and laying shall be obtained from Maritime Board to ensure that the pipeline route does not fall in the navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.</td><td>Reportedly complied.
Pipeline has been reportedly laid as per the recommendations made by NIO i.e. pipeline has been buried at 4 meters depth in offshore area and the diffusers have been installed at a depth of 13 meters from the surface of the sea as informed.

It was informed during the visit that the pipeline route does not fall in the navigation channel and permission has not been taken as there was no maritime board in the State of Andhra Pradesh.</td></tr>
<tr><td>(viii)</td><td>The pipeline shall not pass through any sand dunes/mangroves. The project shall be implemented in such a manner that there is no damage whatsoever to the mangroves/other sensitive coastal ecosystem. If any damage to mangroves is anticipated/envisaged as a result of project activities then the clearance shall stand cancelled and the proponents shall seek fresh approval from the Ministry.</td><td>Complied.
During the visit, it is observed that there are no mangroves and sand dunes in the area where the pipeline has been laid. PP is conducting post project marine quality monitoring through NIO once in a year. PP is taking all precautions to avoid damage to the marine environment.</td></tr>
<tr><td>(ix)</td><td>The reject shall meet the standards prescribed by Andhra Pradesh Pollution Control Board before disposal.</td><td>Complied.
The rejects are meeting the standards laid down by APPCB as PP is using Hypo & Ferric Chloride only as and when required depending on sea water quality. Qualities of the rejects are in the following range.
<table>
<tr><th>Parameter</th><th>Value</th><th>Limit</th></tr>
<tr><td>pH</td><td>7.5- 8.5</td><td>5.5 – 9.0</td></tr>
<tr><td>COD</td><td>10-50</td><td>250</td></tr>
<tr><td>TDS</td><td>50000 – 60000 mg/lit</td><td>NA</td></tr>
</table></td></tr>
<tr><td>(x)</td><td>A continuous and comprehensive post project marine quality monitoring programmed shall be taken up. This shall include monitoring of water quality sediments quality and biological characteristics and report submitted every 6 months to Ministry's Regional Office at Bangalore.</td><td>Complied.
PP is conducting post project marine quality monitoring through NIO once in a year. PP has completed the study and submitted the report for the year 2015. PP informed that study for the year 2016 has been completed and the report is expected to be submitted to the Ministry by July, 2017. The study includes water quality, sediments quality & biological characteristics of the water. Marine quality monitoring report is being submitted to the Regional Office of the MoEF&CC along with the six monthly compliance report.</td></tr>
<tr><td>(xi)</td><td>It shall be ensured that there is no displacement of people, houses or</td><td>Reportedly complied.
Condition pertains to the construction</td></tr>
</table>

S.No.	Conditions	Compliance status
	fishing activity as a result of the project.	phase. PP informed during the visit that this condition has been reportedly complied. Further, informed that the site was a vacant land and used for aquaculture activity in the past.
(xii)	There shall be display boards at critical locations along the pipeline Viz. road / rail/ river crossing giving emergency instructions. This will ensure prompt information regarding locations of accident during any Emergency. Emergency information Board shall contain emergency instruction in addition to contact details. Proper lighting shall be provided all along the road.	Complied. Display boards at the critical locations including the pipeline route have been kept. Emergency contact details are available in the ECC & also at the Security gate. Proper lighting has been provided all along the roads.
(xiii)	There shall be no withdrawal of ground water in CRZ area for this project.	Complied. PP is not drawing any ground water in CRZ area. Regular water requirement for the project is being completely met through desalination plant.
(xiv)	No other activities except the permissible actions under CRZ Notification 1991 shall be carried out with CRZ areas.	Complied. PP is adhering with the condition stipulated. The industry is not performing any activity other than desalination plant in the said area.
(xv)	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contamination.	Partly complied. PP informed that monitoring of ground water quality is being undertaken by the third party (MoEF&CC recognized laboratory) at two locations on monthly basis. Report provided during the visit indicates that the ground water quality is within the permissible limits. It is observed that **monitoring of soil samples quality needs to be undertaken by the PP in consultation with APPCB.**
(xvi)	Construction spoils, including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such material must be secured so that they should not leach into the ground water.	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied. Further informed that the industry is not using any bitumen for construction of roads as all the roads are made of concrete only.
(xvii)	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approval of the Andhra Pradesh state Pollution Control Board.	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied.
(xviii)	The diesel generator sets to be used during construction phase should be	Reportedly complied. Condition pertains to the construction

S.No.	Conditions	Compliance status
	low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.	phase. PP informed during the visit that this condition has been reportedly complied.
(xix)	The diesel required for operation DG sets shall be stored in underground tanks and required clearance from Chief Control of Explosives shall be taken.	Complied. PP informed that they are storing diesel in dedicated underground storage tanks and got permission from Chief Controller of Explosives, Nagpur which is valid up to 31/12/2024.
(xx)	Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non-peak hours	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied. Further, informed that vehicles are hired only if they have a valid PUC certificate. All vehicles have been checked for registration, renewal and allowed to operate only during day time.
(xxi)	Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/SPCB.	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied. However, environmental monitored data (ambient air/noise) collected during the construction phase has not been made available during the visit.
(xxii)	Fly ash should be used as building material in the construction as per the provision of Fly ash Notification of september,1999 and amended as on 27th August,2003	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied. However, document in this regard has not been made available during the visit.
(xxiii)	Ready mixed concrete must be used in building construction	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied.
(xxiv)	Storm water control and its re use as per CGWB and BIS standards for various applications.	Complied. Dedicated storm water drains are constructed surrounding to the plant and its being collected in the pond having approximate capacity of 2.5 lakh cubic metre. The collected water is being reused for green belt development and dust suppression as informed during the visit.
(xxv)	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that

S.No.	Conditions	Compliance status
	practices referred	this condition has been reportedly complied.
(xxvi)	Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.	Refer below. Condition pertains to the construction phase. PP informed during the visit that they have not drawn ground water and the water requirement during the construction phase was reportedly met from desalination plant established by the company.
(xxvii)	Regular supervision of the above and other measure for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that this condition has been reportedly complied.
(xxviii)	Under the provisions of Environment (protection)Act,1986,legal action shall be initiated against the project proponent if it was found that construction of the project has started without obtaining environmental clearance	Reportedly complied. Condition pertains to the construction phase. PP informed during the visit that construction activity was reportedly started during December, 2010 after getting environmental clearance and consent for establishment from MoEF&CC and APPCB respectively.
II. Operation Phase		
i	The installation of the Effluent Treatment Plant (ETP) should be certified by an independent expert and a report in this regard should be submitted to the Ministry before the project is commissioned for operation. Treated effluent emanating from ETP shall be Recycled/ Reused to the maximum extent possible.	Partly complied. PP informed during the visit that they have installed full-fledged Effluent Treatment Plant (ETP) [Capacity:450 KLD] consisting of Stripper, Multiple Effect Evaporator (MEE), Agitated Thin Film Drier (ATFD) & biological system for treatment of high TDS & low TDS effluent at a cost of Rs.80.00 Cores. After the commissioning of the ETP, performance evaluation of the ETP was undertaken by a third party in collaboration with Andhra University and the report was submitted to the Regional Office of the MoEF&CC during January, 2017 wherein several mitigation measures have been recommended. **PP has been advised to submit the action plan to the Regional Office to comply with the recommendations suggested by the third party. PP has also been advised that approach road to ETP and desalination plant shall be made pucca to reduce dust pollution.** **Treated effluent from the ETP is being sent for marine disposal and not being recycled/reused to the maximum extent possible.**

S.No.	Conditions	Compliance status
ii	The solid waste generated should be properly collected and segregated. Wet garbage should be composed and dry/inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material	Complied. The solid wastes are being properly collected and segregated. Dedicated covered sheds with leachate collection systems have been provided for the storage of solid wastes. Installed organic waste converter & vermi-compost plant for treatment of wet garbage and canteen waste. The hazardous waste such as ETP sludge, processed solid waste and MEE ash and being disposed of to the TSDF at Parawada, Visakhapatnam district for secured land filling. The other hazardous waste such as solvent residue and spent carbon are being sent to the authorized cement plants for co-processing /TSDF at Parawada, Visakhapatnam district for incineration. Authorization in this regard has been obtained from APPCB and is valid up to 31/12/2017. Photographs depicting the waste storage are given below: 
iii	Diesel power generating sets proposed as sources of backup power for elevators and common area illumination during operation phase should be of enclosed type and conform to rules made under the environment (protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use low sulphur diesel. The location of the DG sets may be decided with in consultation with	Complied. PP informed during the visit that DG sets with a capacity of 6710 KVA (2x2030 KVA, 2x1165 KVA & 1x320KVA) have been installed at 5 locations in consultation with APPCB as a backup power source for the complex. Acoustic enclosures and adequate stack height as per the CPCB norms have been provided to the DG sets. Further, informed that they are using only low sulphur diesel for operation of the DG sets.

S.No.	Conditions	Compliance status
	Andhra Pradesh State Pollution Control Board.	
iv	Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of the periphery of the plot shall be restricted to the permissible levels to comply with the prevalent regulations.	Complied. Silencers and acoustic enclosures were provided to the noise generating sources. Ambient noise level (day time and night time) is being monitored by a third party (MoEF&CC recognized laboratory) at 10 locations including the boundary of the periphery of the plot on monthly basis. Report provided during the visit indicates that the ambient noise levels are within the permissible limits.
v	The green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	Complied. Total area is 138.51 ha. Out of 138.51ha, PP informed that 50 ha have been covered under the green belt development by planting about 500000 saplings in and around the SEZ complex. It was informed that local species have been chosen for the green belt development. Plantation work is satisfactory and survival rate is observed to be about 75%.
vi	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period	Complied. Well-designed drainage system has been provided for the premises for draining rain water during monsoon period. Holes have been in the compound walls below plinth beam for drainage of rain water during rainy season.
vii	Rain water harvesting for roof run-off, as plan submitted should be implemented. Before recharging the surface run off, pre-treatment must done to remove suspended matter.	Partly complied. The rain water collected is being sent to the pond created by the company within the SEZ complex which helps to recharge the ground water. The collected water is also being reused for utilities without any pre-treatment. The total area of the pond is 24 acres and the capacity is 2.5 lakh m^3 as informed.
viii	The ground water level and its quality should be monitored regularly in consultation with Central ground water authority	Partly complied. PP informed that monitoring of ground water quality is being undertaken by the third party (MoEF&CC recognized laboratory) at two locations on monthly basis. Report provided during the visit indicates that the ground water quality is within the permissible limits. **However, monitoring of ground water level has not been undertaken in consultation with the CGWA.**
ix	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and	Complied. There is no traffic congestion near entry & exist points. The industry is using its own parking area and no public space is being

S.No.	Conditions	Compliance status
	no public space should be utilized	utilized.
x	A report on the energy conservation measures confirming to energy conservation norms finalized by Bureau of Energy should be prepared incorporating details about building materials & technology & Factors etc and submit to the Ministry in three months' time.	Complied. PP informed that study on energy conservation measures has been done by a third party and report has been provided during the visit. The major recommendations of the study are: • VFD for all major equipment. • Using CFL/TFL to the maximum extent possible. • Auto cut offs etc. The afore-mentioned recommendations are being implemented by the PP.
xi	Energy conservation measure like installation of CFLs/TFLs for the lighting the areas outside the building should be integral part of the project design and should in place before project commissioning. Used CFL and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoided mercury contamination. Use of solar panels may be done to the extent possible.	Complied. Using CFLs/TFLs for the lighting area and these are the integral part of the project. Agreed upon. PP informed that this condition is noted and assured to abide by this condition.
PART-B - GENERAL CONDITIONS		
i	The environmental safe guards contained in the EIA report should be implemented in letter and spirit.	Complied. The environmental safeguard measures contained in the EIA report are being implemented.
ii	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (hard copies as well as by e -mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	Complied. Six monthly compliance reports (both hard and soft copy) along with the monitored data are being submitted to the Regional Office of the MoEF&CC/APPCB/CPCB.
6.	Officials from the Regional Office of MoEF, Bangalore who would be monitoring the implementation of environment safeguards should be given full cooperation, facilities and documents /data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional Office of MoEF, Bangalore.	Complied. Extended full co-operation during the visit. A complete set of documents have been reportedly submitted to the Regional Office of the MoEF&CC. However, document in this regard has not been made available during the visit.
7.	In the case of any change(s)in the scope of the project, the project would require a fresh appraisal by this Ministry	Agreed upon. It was submitted that this condition is noted and assured to abide by this condition.

S.No.	Conditions	Compliance status
8.	The ministry reserves the right to added additional safeguard measures subsequently if found necessary, and to take action including revoking of the environment clearance under provisions of the environmental (protection)Act,1986, ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	Agreed upon. It was submitted that this condition is noted and assured to abide by this condition.
9.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of explosive, Fire Department, Civil Aviation department, forest Conservation Act 1980 and Wildlife (Protection) Act 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	Complied. PP informed that all other applicable mandatory clearances such as CFE, CFO & its renewal and permission for storage of diesel have been obtained from the respective departments.
10.	These stipulation would be enforced among others under the provisions of Water (prevention and Control of pollution) Act 1974,the Air(Prevention and control)act1981 the Environment (protection) Act 1986 ,the public Liability insurance)Act 1981 and EIA Notification,2006	Partly complied. Consent & Authorization under the Air Act, Water Act and Hazardous Waste (MH & TM) Rules, 2008 have been obtained which is valid up to 31/12/2017. Insurance under the provisions of the PLI Act, 1991 has been obtained and is valid up to 10/11/2017.
11.	The project proponent should advertise in at least two local Newspapers widely circulated in the region one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Kerala Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forest at http;// www.envfor.nic.in The advertisement should be within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.	Not complied. PP informed that no paper advertisement has been given regarding the accord of environmental clearance by the Ministry.
12.	Environmental clearance is subject to final order of the Hon'ble supreme court of India in the matter of Goa Foundation V/s Union of India in Writ petition (Civil) No.460 of 2004 as may be applicable to this project.	Refer below. PP informed that there is no wildlife sanctuary/critically polluted area/ecologically sensitive zone within 10km from the boundary of the SEZ area. In view of this, PP has been advised to seek amendment in this EC condition from the Competent Authority.
13.	Any appeal against this Environmental Clearance shall lie with the National	Agreed upon. It was informed that no appeal has been

S.No.	Conditions	Compliance status
	Environment Appellate Authority, if preferred, with a period of 30 days as prescribed under section 11 of the National Environment Appellate Act,19987	made within 30 days and submitted that the condition is "Noted" and assured to abide by the condition.
14.	A copy of the clearance letter shall be sent by the proponent to concerned panchayat, Zilla parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any from whom suggestions/representation ,if any were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent	**Partly complied.** PP informed that they have exhibited the clearance letter in local offices and no representations are received. **However, environmental clearance letters have not been uploaded on the company's website.**
15.	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	**Partly complied.** **Six monthly compliance reports along with the monitored environment data (AAQ/Stack/Noise) have not been uploaded on the company's website.** Six monthly compliance reports (both hard and soft copy) along with the monitored data are being submitted to the Regional Office of the MoEF&CC/APPCB/CPCB. Criteria pollutant levels (ambient levels as well as stack emissions) have been displayed at the main gate of the company.
16.	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment(protection)Rules,1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail	**Partly Complied.** It was informed that the environmental statement for each financial year is being regularly submitted to the APPCB. **However, environmental statement has not been uploaded on the company's website as stipulated in the EC condition and also not submitted to the Regional Office of the MoEF&CC.**

Comments and End note:-

1. **Status of implementation of stipulated conditions:-** It is inferred from above that following are the non-compliances observed against the stipulated conditions of the Environmental Clearances:-

i. Monitoring of soil samples quality needs to be undertaken by the PP in consultation with APPCB (**Specific condition no. xv).**
ii. Action plan shall be submitted to the Regional Office of the MoEF&CC to comply with the recommendations suggested by the third party regarding the performance evaluation of the ETP. Approach road to ETP and desalination plant shall be made pucca to reduce dust pollution (**Specific condition no. i).**
iii. Treated effluent from the ETP is being sent for marine disposal and not being recycled/reused to the maximum extent possible (**Specific condition no. i).**
iv. Monitoring of ground water level has not been undertaken in consultation with the CGWA (**Specific condition no. viii).**
v. No paper advertisement has been given regarding the accord of environmental clearance by the Ministry (**Para no. 11).**
vi. Project proponent has not uploaded the environment clearance letter on the company's website (**Para no. 14).**
vii. Six monthly compliance reports along with the monitored environment data (AAQ/Stack/Noise) have not been uploaded on the company's website (**Para no. 15).**
viii. Environmental statement has not been uploaded on the company's website as stipulated in the EC condition and also not submitted to the Regional Office of the MoEF&CC (**Para no. 16).**

2. **Housekeeping:** Housekeeping in the premises is satisfactory.

3. **With regard to issuance of show cause/closure notices/directions:-** It was informed by the PP that there was no issuance of Show Cause/directions/closure notices in the last two years by the APPCB.

This is approved by the Addl.PCCF (Central), RO-Chennai vide diary no.350 dated – 14.3.2017.

(Sundar .R.) 14/3/17
Scientist 'D'

Certified Copy of the Compliance Report

Subject: Environmental & CRZ Clearance for the development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Sy.No. 215, 286/1, 286/2, 283/1, in Ch. Lakshmi Puram, 312/1 to 312/5, 132/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19(qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215 N. Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s. Hetero Infrastructure SEZ Ltd. – Reg.

Reference: No: 21-641/2007-IA. III, Dated the 25th October, 2010.

Present Status of the Project:

They have established the infrastructure facilities.

Date of Monitoring: 19.08.2017

A - Specific Conditions:

I. Construction Phase		
S.No.	**Condition**	**Compliance**
(i)	Consent for Establishment" shall be obtained from Andhra Pradesh Pollution Control Board under Air and Water Act and a shall be submitted to the Ministry before start of any construction work at the site.	Complied with. The industry has obtained Consent for Establishment from AP Pollution Control Board. Copy of the same has been already submitted to this office. The details of Consent for Establishment is as below: No: 219/PCB/CFE/RO-VSP/HO/2010-2355 Issue date:13/12/2010
(ii)	Sufficient dilution shall be ensured to meet the ambient parameters within 50 m distance from outfall.	Complied with. Out fall pipeline has been laid as per NIO recommendations including for sufficient dilution.
(iii)	Regular Independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through an authorized agency and submitted along with six monthly monitoring report to the ministry.	Being followed. The industry is availing expertise of NIO for conducting the marine water quality including temperature and salinity studies and are carried out on yearly basis.

(iv)	Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in the system.	Complied with. The PA has provided strainers at the intake point to prevent fish entry into the system.
(v)	The recommendations of EIA and DMP shall be strictly complied with.	Complied with. The PA informed that the recommendations of EIA and DMP are strictly complied with
(vi)	Lighted buoys shall be provided at intake and out fall location as indicators.	Complied with. Marker Buoys have been installed at the intake & Outfall points as indicators.
(vii)	The pipe line shall be buried at least 2 m depth in onshore area and 4 mts. In the offshore area. Necessary permission with regard to the pipeline burial and laying shall be obtained from maritime Board to ensure that the pipeline route does not fall in the navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.	Complied. The PA informed that pipeline has been laid as per the recommendations made by NIO.
(viii)	The pipeline shall not pass through any sand dunes/mangroves. The project shall be implemented in such a manner that there is not damage whatsoever to the mangroves/other sensitive coastal ecosystem. If any damage to mangroves is anticipated/envisaged as a result of project activates then the clearance shall stand cancelled and the proponents shall seek fresh approval from the Ministry.	Not applicable. The PA informed that there are no mangroves and sand dunes in the area where pipeline has been laid and the industry is taking all precautions to avoid damage to the marine environment.
(ix)	The reject shall meet the standards prescribed by Andhra Pradesh Pollution Control Board before disposal.	Complied with. The rejects are meeting the standards laid down by APPCB as they are using Hypo & Ferric Chloride only as and when required depending on Sea water quality. Qualities of the rejects are in the following range. pH : 7.5- 8.5 TDS : 50000 – 60000 mg/Lt COD : 10 – 50 mg/l

(x)	A continuous and comprehensive post project marine quality monitoring programmed shall be taken up. This shall include monitoring of water quality sediments quality and biological characteristics and report submitted every 6 months to Ministry's Regional Office at Bangalore.	Being followed. The industry is conducting post project marine monitoring through NIO once in a year. This includes monitoring of water quality, sediments quality and biological characteristics. Monitoring reports are submitted once in six months to Ministry's Regional Office.
(xi)	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	Complied with. The PA informed that there is no displacement of people, houses or fishing activity and it is a vacant land used for aquaculture in the past.
(xii)	There shall be display boards at critical locations along the pipeline Viz. road / rail/ river crossing giving emergency instructions. This will ensure prompt information regarding locations of accident during any Emergency. Emergency information Board shall contain emergency instruction in addition to contact details. Proper lighting shall be provided all along the road.	Complied with. Boards have been displayed at critical locations. Emergency contact details are available in the ECC& also at Security. Proper lighting has been provided at all along the roads.
(xiii)	There shall be no withdrawal of ground water in CRZ area for this project.	Complied with. The industry is not drawing any ground water in CRZ area. Regular water requirement for the project is being completely met through Desalination plant installed in the premises of the Hetero Infra SEZ.
(xiv)	No other activities except the permissible actions under CRZ Notification 1991 shall be carried out with CRZ areas.	Complied with. Industry is adhering with the conditions stipulated.
(xv)	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contamination.	Complied with. PA conducting the analysis of soil & ground water periodically to check the contamination.
(xvi)	Construction spoils, including bituminous material and other	Complied with. The industry is not using any bituminous

	hazardous materials must not be allowed to contaminate water courses and the dump sites for such material must be secured so that they should not leach into the ground water.	for construction of roads as all the roads are made of concrete only. Hazardous material is being disposed to TSDF regularly. The industry is taking all precautions to avoid ground water contamination by way of transferring the solvents through pipelines, making bunds around the tanks, keeping spill control kits at strategic locations and conducting continuous training to the working personnel.
(xvii)	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approval of the Andhra Pradesh state Pollution Control Board.	Complied The PA informed that hazardous wastes generated during construction phase were disposed off as per applicable rules and norms with necessary approval of the Andhra Pradesh state Pollution Control Board.
(xviii)	The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.	Complied with. The PA informed that low sulphur diesel is being used in the diesel generator sets.
(xix)	The diesel required for operation DG sets shall be stored in underground tanks and required clearance from Chief Control of Explosives shall be taken.	Complied with. The industry is storing diesel in dedicated storage tanks above the ground and for that they have obtained clearance from Chief Controller of Explosives, Nagpur for various units located in Hetero Infra SEZ Ltd.
(xx)	Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non-peak hours	Complied. Vehicles hired for brining construction materials were in good condition and were having pollution check certificates as informed. The vehicle movement in the premises was restricted to day time only and also non peak-hours.
(xxi)	Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored	Complied with. The PA informed that noise levels were monitored during day and night times and the levels were within the limits at the time of construction. All DG sets are

	during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/SPCB	equipped with acoustic enclosures.
(xxii)	Fly ash should be used as building material in the construction as per the provision of Fly ash Notification of september,1999 and amended as on 27th August,2003	Complied with. As informed that the industry used fly ash bricks for the construction.
(xxiii)	Ready mixed concrete must be used in building construction	Complied with. Ready mix concrete was used for the construction of buildings as informed.
(xxiv)	Storm water control and its re use as per CGWB and BIS standards for various applications.	Complied with. Dedicated storm water drains have been constructed surrounding the plant and rain water is being collected in the pond created by the industry for usage (as per the requirement).
(xxv)	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred	Complied with. The industry used Ready mix concrete for the construction and also used curing agents and other best practices referred.
(xxvi)	Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.	Refer below The industry is not drawing any ground water and using water from Sea water desalination plant for its usage.
(xxvii)	Regular supervision of the above and other measure for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.	Complied with. The PA informed that regular supervision of the above and other measure for monitoring were in place all through the construction phase, so as to avoid disturbance to the surroundings
(xxviii)	Under the provisions of Environment (protection)Act,1986,legal action shall be initiated against the project proponent if it was found that construction of the project has started without obtaining environmental clearance	Complied with. The PA informed that the construction activities were started after obtaining the Environmental Clearance only.
II. Operation Phase		

S.No.	Conditions	Compliance
(i)	The installation of the Effluent Treatment Plant (ETP) should be certified by an independent expert and a report in this regard should be submitted to the Ministry before the project is commissioned for operation. Treated effluent emanating from ETP shall be Recycled/ Reused to the maximum extent possible.	Complied with. The ETP design was certified by independent agency and a report was submitted to the Ministry. The PA has constructed full-fledged ETP for the treatment of Effluents at a cost of Rs.80.00 Cores ETP performance monitoring has been done by the third party and the copy of report has been submitted to RO, MoEF & CC along with earlier compliances..
(ii)	The solid waste generated should be properly collected and segregated. Wet garbage should be composed and dry/inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material	Complied with. PA established dedicated places for storing solid waste. They have installed Organic Waste Converter &Vermi-compost plant for disposing and handling wet garbage and canteen waste. Inorganic salts are being disposed to TSDF Visakhapatnam whereas the organic wastes are being disposed to cement plants for co-incineration (Alternate Fuel).
(iii)	Diesel power generating sets proposed as sources of backup power for elevators and common area illumination during operation phase should be of enclosed type and conform to rules made under the environment (protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use low sulphur diesel. The location of the DG sets may be decided with in consultation with Andhra Pradesh State Pollution Control Board.	Complied with. Diesel power generating sets proposed are as sources of backup power. The Diesel generators are having acoustic enclosures and the stack height of the same is as per the norms prescribed by the Board. PA using only low sulphur diesel for operation of the DG sets.
(iv)	Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of	Complied with. Regular monitoring of the noise levels in & around the factory during date time and in night time was monitored and as

	the periphery of the plot shall be restricted to the permissible levels to comply with the prevalent regulations.	per the reports the levels are within the limit. The Industry is taking all possible measures to control the noise pollution.
V	The green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	Complied with. The PA informed that about 5,00,000 saplings are planted in and around factory.
vi	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period	Complied with. Weep holes are provided in the compound wall for natural drainage of rain water during monsoon period. In addition to this well-designed drainage system also has been provided for the premises.
vii	Rain water harvesting for roof run-off, as plan submitted should be implemented. Before recharging the surface run off. pre-treatment must done to remove suspended matter,	Complied with. Rain water is being collected in a pond created by the industry and the same is being reused for utilities. Further before recharging in the surface run off pre-treatment facilities such as settling ponds are provided.
viii	The ground water level and its quality should be monitored regularly in consultation with Central ground water authority	Complied with. The PA is not drawing any ground water for the usage of the industry. Ground water quality is being monitored on monthly basis through third party in consultation with central ground water authority.
ix	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized	Complied with. There is no traffic congestion near entry & exist points. The industry is using its own dedicated parking area internally and no public space is being utilized.
x	A report on the energy conservation measures confirming to energy conservation norms finalized by Bureau of Energy should be prepared incorporating details about building materials & technology & Factors etc and submit to the Ministry in three months time.	Complied with. The study has been done and report is in place.

xi	Energy conservation measure like installation of CFLs/TFLs for the lighting the areas outside the building should be integral part of the project design and should in place before project commissioning. Use CFL and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoided mercury contamination. Use of solar panels may be done to the extent possible.	Complied with. Using CFLs/TFLs for the lighting area and these are the integral part of the project. At present the industry is in the process of replacing CFL/TFL with LED lights for lighting purpose in and around the premises.
B. General Conditions:		
S.No.	**Conditions**	**Compliance**
i	The environmental safe guards contained in the EIA report should be implemented in letter and spirit.	Complied with. The PA informed that the environmental safe guards contained in the EIA report is being implemented in letter and spirit.
ii	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (hard copies as well as by e -mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	Complied with. EC compliance report both soft and hard copies are being submitted to Regional Office. MoEF & CC once in six months regularly and to APPCB on monthly basis.
iii	Officials from the Regional Office of MoEF, Bangalore who would be monitoring the implementation of environment safeguards should be given full cooperation, facilities and documents /data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional Office of MoEF, Bangalore.	Complied with. The PA had extended full co operation during the visit and also provided required documents. A complete set of all the documents submitted to MoEF were forwarded to the Regional Office of MoEF, Bangalore.
iv	In the case of any change(s)in the scope of the project, the project would require a fresh appraisal by this Ministry	Agreed to comply. The PA informed that there is no change in the scope of the project. The PA has agreed to approach the Ministry in case if there is a change in the scope of the

		project.
v	The Ministry reserves the right to added additional safeguard measures subsequently if found necessary, and to take action including revoking of the environment clearance under provisions of the environmental (protection)Act,1986, ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	Agreed to comply.
vi	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of explosive, Fire Department, Civil Aviation department, forest Conservation Act 1980 and Wildlife (Protection) Act 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	Complied with. The PA informed that all other required statutory clearances such as approval for storage of Diesel in the individual units of SEZ from Chief Controller of explosive, Fire Department were obtained.
vii	These stipulation would be enforced among others under the provisions of Water (prevention and Control of pollution) Act 1974,the Air(Prevention and control)act1981 the Environment (protection) Act 1986 ,the public Liability insurance)Act 1981 and EIA Notification,2006	Agreed to comply.
viii	The project proponent should advertise in at least two local Newspapers widely circulated in the region one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Kerala Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forest at http;// www.envfor.nic.in The advertisement should be within 10 days from the date of receipt of the	Complied. The PA had given advertisements into two local newspapers and submitted a copy of the same to RO.

	Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.	
ix	Environmental clearance is subject to final order of the Hon'ble supreme court of India in the matter of Goa Foundation V/s Union of India in Writ petition (Civil) No.460 of 2004 as may be applicable to this project.	Agreed to comply.
x	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, with a period of 30 days as prescribed under section 11 of the National Environment Appellate Act,19987	Refer below The PA informed that there was no appeal made against this environmental clearance.
xi	A copy of the clearance letter shall be sent by the proponent to concerned panchayat, Zilla parishad /Municipal Corporation, Urban Local Body and the Local NGO, if any from whom suggestions/representation ,if any were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent	Complied with. The PA informed that the copy of the environmental clearance letter was submitted to the concerned Panchayat.
xii	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically .It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sect oral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	Complied with. EC Letter & Its compliance status has been uploaded on the Company's website www.heteroworld.com. after last visit. Compliance reports on EC conditions are being sent to Regional Office, MoEF& CC regularly. Monitoring data is being submitted regularly to SPCB on monthly basis. They have installed three CAAQM station in the premises and the data is being displayed at Main gate through Digital/LED display.

xiii	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment(protection)Rules,1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail	Complied with. The industry is regularly submitting Environmental statement to APPCB before 30th September of every year and has been uploaded on the Company's website www.heteroworld.com. .

This has the approval of the Addl. PCCF(C) vide diary no.1578 dated: 02.11.2017.

(Dr.C.Kaliyaperumal)
Director(S)

Dr. C. KALIYAPERUMAL, M.E., PhD
Director (S)
Government of India
Ministry of Environment, Forests & Climate Change
Regional Office (South Eastern Zone)
HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam. Chennai-600 034.

Observation made on the Points raised by the Regional Office during the last Monitoring

Ref: EC No: 21-641/2007-IA, III, dated: 25th October 2010.

S.No.	Condition	Compliance
(i)	Monitoring of Soil samples quality needs to be undertaken by the PP in consultation with APPCB (Specific condition no. xv).	As directed by this office after last monitoring, the Project Authority (PA) started monitoring of soil samples from April 2017 onwards in consultation with Andhra Pradesh Pollution Control Board (APPCB) through an approved external Laboratory. Latest analysis reports of soils samples are enclosed as *Annexure – I.*
(ii)	Action plan shall be submitted to the Regional Office of the MOEF & CC to comply with the recommendation suggested by the third party regarding the performance evaluation of the ETP. Approach road to ETP & Desalination Plant shall be made pucca and reduce dust pollution (Specific Condition no. i).	ETP performance evaluation was carried out before the RO visit through third party in collaboration with Andhra University and an action plan was prepared and submitted to the RO after the monitoring on 04/04/2017. vide their letter no: HIS/EHS/MoEF/2016-17/03. An approach road i.e., cement concrete road was made partly to ETP and the remaining works are under progress. They are planning to complete the works by Dec.2017/Jan.2018. For desalination plant Govt. of AP has formed a tar road to a length of 4 km from Rajjayapetta village to Dondavaka village which is adjacent to desalination plant and the project authorities also using the same road.
(iii)	Treated effluent from the ETP is being sent for marine disposal and not being recycled/reused to the maximum extent possible. (Specific Condition no. i).	The project authority (PA) has been allowed by the Ministry vide EC letter No. J-11011/396/2011-IA.II (I) dt 10.09.2012 to dispose the treated effluent in to the marine and the PA following the same. However, the waste water is being recycled to the maximum possible extent by following ways as informed:

		➢ Complete domestic water of the Industry is being treated in Sewage Treatment Plant of 300 KLD capacity and is recycled back to Gardening purpose for developing green belt in & around factory premises. ➢ The rejects of RO plants is being recycled for civil works & other domestic purposes. The industry is disposing only treated process Effluent into the Sea and the post project monitoring is being carried through NIO. As per the report there is no impact of Sea water due to disposal of treated effluent informed.
(iv)	Monitoring of ground water level has not been undertaken in consultation with the CGWA (Specific Condition no. viii).	As informed that the industry is fully depending on Sea Water Desalination plant to meet the water requirement of the units and is not at all using any surface water or ground water. Hence the ground water levels have not been monitored. However, they are monitoring the quality of ground water through External Laboratory approved by MoEF & CC. Copy of latest report is enclosed as *Annexure -III* for information.
(v)	No paper advertisement has been given regarding the accord of Environmental clearance by the Ministry (Para no.11).	Paper Advertisements has been given regarding the accord of Environmental clearance by the Ministry after getting the Environmental Clearance. But the same paper Advertisement has been misplaced somewhere during shifting of their offices. After thorough checking they found the paper advertisement in Telugu Newspaper. Copy of paper advertisement and Bill is enclosed as *Annexure – IV* for information and reference.
(vi)	Project proponent has not uploaded the environment clearance letter on the company's website (Para no.14).	The Company has uploaded the Environmental Clearance letter on their website www.heteroworld.com .

(vii)	Six monthly compliance reports along with the monitored environment data (AAQ/Stock/Noise) have not been uploaded on company's website (Para no.15).	The Company has uploaded six monthly compliance reports along with monitoring data on their website www.heteroworld.com.
(viii)	Environmental statement has not been uploaded on the company's website as stipulated in the EC condition and also not submitted to the Regional Office of the MOEF & CC (Para no.16)	The Company has uploaded the Environmental statement on their website www.heteroworld.com.

This has the approval of the Addl. PCCF(C) vide diary no.1578 dated: 02.11.2017.

Dr.C.Kaliyaperumal
Director(S)

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भारत सरकार

GOVERNMENT OF INDIA

पर्यावरण ,वन एवं जलवायुपरिवर्तन मंत्रालय

MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE

Regional Office (South Eastern Zone),
1st & 2nd floor, HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai - 600034

F.No. EP/12.1/2012-13/23/AP/1961
07.12.2017

To,
Dr. Nobi. E.F.,
Research Officer,
IA Division,
Ministry of Environment, Forest & Climate Change,
Indira Paryavaran Bhawan, Jorbagh Road,
New Delhi – 110 003

Subject: Transfer of Environmental Clearance of M/s. Hetero Drugs Limited, Unit VI village Nallamattipalem, Mandal Nakkapally, Visakhapatnam (Andhra Pradesh) M/s. Hetero Labs Limited, Unit III (Formerly Unit – V) at Narasaraopuram, Nakkapally Visakhapatnam (Andhra Pradesh) – Reg.

Reference: 1) Letter No.: J-11011/396/2010-IA II (I), dated: 07-08-2017.

Sir,

With reference to the above mentioned subject, the project was visited by the undersigned on 19.08.2017. The proposal submitted by the Project Authority is for merging of EC issued to M/s. Hetero Drugs (Unit – VI) into M/s. Hetero Labs (Unit – III) only. After merging, the EC will be in the name of M/s. Hetero Labs Limited (Unit – III). The certified copy of the compliance reports are also enclosed along with the observations made by the Regional Office during the earlier visit for your further necessary action. This has been approved by the Addl.PCCF(C) vide diary no. 1578 dated: 02.11.2017.

Yours faithfully,

(Dr.C.Kaliyaperumal)
Director (S)

Encl: As above.

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Certified Copy of the Compliance Report

Subject: Expansion of the Bulk Drugs by enhancement of Product Mix (60 TPM to 500 TPM) at Narasaraopuram, Nakkapally, Visakhapatnam, Andhra Pradesh by M/s. Hetero Labs Limited – Unit – III (Formerly Unit-V) – Environmental Clearance – Reg.

Reference: No. J-11011/396/2011-IA.II (I), Dated 10th September 2012.

Present Status of the Project:

The Project Authority (PA) has initially obtained Environmental Clearance in 2006 vide EC NO: J-11011/253/2006-IA. II(A) Dated 22.09.2006 for manufacturing 20 products and also obtained Consent for Establishment in 2006 vide no: 137/PCB/VSP/RO-VSP/CFE/HO/2006-476. Again the PA has gone for CFE for Change of Product Mix of 67 products vide CFE No: 137/PCB/CFE/RO-VSP/HO/2010-1893 DATED 21/10/2010. Further in 2012 the PA has gone for an expansion from 60 TPM to 500 TPM vide EC NO: J-11011/396/2010-IA.II(I) Dated 10th September2012 for 67 products and subsequently obtained CFE for 67 products vide CFE No: 137/PCB/VSP/RO-VSP/CFE/HO/2013-4157 Dated 11th September 2013.
Now the PA has applied for CFE for Change of product mix of 134 products and it is under process by Andhra Pradesh Pollution Control Board (APPCB).

Date of Monitoring: 19.08.2017

A. Specific Conditions:

S.No.	Conditions	Compliance
i.	All the specific conditions and general conditions specified in the environmental clearance letter accorded vide ministry no. J-11011/352/2003-la.II (I) dated 25th September, 2006 shall be implemented.	Complied The PA informed that all conditions stipulated in the Environmental Clearance vide Ministry's letter no. J-11011/253/2006-lA.II (I) dated 22ndSeptember, 2006 have been implemented.
ii.	National Emission standards for organic chemicals manufacturing Industry issued by the ministry vide G.S.R.608 (E) dated 21st July, 2010 and amended time to time shall be followed by the unit.	Complied with. The PA informed that the National Emission Standards are being followed. The Emissions levels are monitored by the PA as well as third party and as per the reports the levels are within the limit.
iii.	Permission and recommendation shall be obtained from the state forest department regarding the impact of the proposed expansion on the surrounding reserve forests (2 Nos.)	Complied with. There is no reserve forest in the surrounding area.

iv.	Multi-cyclone followed by bag filter shall be provided to the boiler to control particulate emissions within permissible limit. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/APPCB guidelines.	Complied with. Multi cyclone followed by Bag filter is installed for Boilers to control the emissions. The Stack Height is provided as per the CPCB/APPCB guidelines. ESP has been provided for their newly installed Boiler of 45 TPH Capacity.
v.	Adequate scrubbing system shall be provided to the process vents to control process emissions. The scrubbing media shall be sent to effluent treatment plant (ETP) for treatment. Efficiency of scrubber shall be monitored regularly and maintained properly. At no time, the emission levels should go beyond the prescribed standards. Scrubbers vent shall be provided with on-line detection and alarm system to indicate higher than permissible value of controlled parameters.	Complied with. The PA informed that an adequate scrubbing system has been provided to the reactors where acidic reactions are being carried out. The scrubbed material is sent to ETP. Further the PA informed that at no time the levels have not gone beyond the prescribed standards. Scrubbers vent are provided with on-line detection and alarm system to indicate higher than permissible value of controlled parameters. In house regular monitoring of the scrubbers is being carried and records are being maintained.
vi.	Ambient air quality data shall be controlled as per NAAQES standards notified by the ministry vide G.S.R. No. 826(E) 16th September, 2009. The levels of PM_{10}, SO2, NOX, CO and VOC shall be monitored in the Ambient air and emissions from the stacks and displayed at a convenient location near the main gate of the company and at important public places. The company shall upload the results of monitored data on its website and shall update the same periodically. It shall simultaneously be sent to the regional office of MOEF, the respective Zonal office of CPCB and the AP Pollution Control Board (APPCB).	Complied with The PA has installed 03 numbers of Continuous Ambient Air Quality Monitoring stations (CAAQMS) at site and data is being displayed at the Main Gate. Also Ambient air quality is being monitored manually by third party and the records are being maintained. The company has uploaded the results of monitored data on their website after the last inspection of this office and they are submitting the monitored data to MoEF RO, APPCB and CPCB.
vii.	To Eliminate/reduce odour problem, the effluent before going to ETP shall be treated in stripper for removal of VOC. VOC shall be monitored in ETP area.	Complied with. Stripper has been installed before sending effluent to ETP to remove VOC. VOC is being monitored in ETP area by

		portable instruments and records are being maintained.
viii.	Specific VOC to be monitored for the specific solvents using proper sampling and analysis protocols.	Complied with. At present VOC is being monitored through portable meters and records are being maintained. Further the industry has installed online VOC analysers at the facility for continuous monitoring.
ix.	In plant control measures for checking fugitive emissions from all the vulnerable sources shall be provided. Fugitive emissions Controlled by providing closed storage, closed handling & conveyance of chemicals/materials, multi cyclone separator and water sprinkling system. Dust suppression system including water sprinkling system shall be provided at loading and unloading areas to control dust emissions. Fugitive emissions in the work zone environment, product, raw materials storage area etc. shall be regularly monitored. The emission shall conform to the limits stipulated by the APPCB.	Complied with. The industry is taking all possible precautions for controlling fugitive emissions from all sources by way of: • Storing solvents in closed tanks with vent condensers. • Transfer of solvents & chemicals through closed pipelines. • Vents of reactor are connected to scrubbers in which acidic reactions are being carried out and multi cyclone separator is provided. • Water sprinkler system to Ammonia storage & solvent storage yard. • Fugitive emissions in the work zone environment, product, raw materials storage area etc. regularly monitored. • Fugitive emissions are being regularly monitored and records are in place. • Dust suppression system including water sprinkling system are provided at loading and unloading areas to control dust emissions
x.	For further control of fugitive emissions, following steps shall be followed: 1. Closed handling system shall be provided for chemicals.	Complied with. The following control measures are provided to control the fugitive emissions: 1. All chemicals & solvents are being transferred through closed pipelines.

	2. Reflux condenser shall be provided over reactor. 3. System of leak detection and repair of pump/pipeline based on preventive maintenance. 4. The acids shall be taken from storage tanks to reactors through closed pipeline. Storage tanks shall be vented through trap receiver and condenser operated on chilled water. 5. Cathodic protection shall be provided to the underground solvent storage tanks.	2. Reflux condensers have been provided over the reactors 3. Preventive maintenance of all major equipments is in place and is being followed. 4. Acids are being transferred through closed pipeline from storage to reactors. The vents of storage tanks are connected to the scrubber. 5. There are no underground storage tanks in the factory as informed.
xi.	The gaseous emissions from DG set shall be dispersed through adequate stack height as per CPCB standards. Acoustic enclosure shall be provided to the DG sets to mitigate the noise pollution.	Complied with. All DG sets are provided with adequate stack height as per CPCB guidelines and also provided with Acoustic Enclosures.
xii.	Solvent management shall be carried out as follows: i. Reactor shall be connected to chilled brine condenser system. ii. Reactor and solvent handling pump shall have mechanical seals to prevent leakages. iii. The condensers shall be provided with sufficient HTA residence time so as to achieve more than 95% recovery. iv. Solvents shall be stored in a separate space specified with all safety measures. v. Proper earthing shall be provided in all the electrical equipment wherever solvent handling is done. vi. Entire plant shall be flame proof. The solvent storage tanks shall be provided with	The following solvent management measures are carried out: i. All reactors vents are connected to the Chilled brine condenser system. ii. All Reactors and solvent handling pumps are provided with Mechanical Seals. iii. All condensers are provided with sufficient HTA residence time so as to achieve maximum recovery of more than 95%. iv. All solvents are stored in a separate space with all safety precautions. v. Ensured double earthing for all the equipments installed in the factory. vi. All electrical fittings inside the factory are Flame proof

	breather valve to prevent losses. vii. All the solvent storage tanks shall be connected with vent condensers with chilled brine circulation.	only. All solvent storage tanks are provided with Flame arresters. vii. All vents of low boiling solvent storage tanks have been provided with vent condensers with chilled brine circulation.
xiii.	Total fresh water requirement from desalination plant will be 958 m^3/day after expansion and prior permission shall be obtained from the concerned authority. No ground water shall be used.	Complied with. The PA informed that the industry is running only 30% capacity and because of this the water requirement is 400 to 500 KLD. Complete water demand of the Industry is being met through Sea Water Desalination Plant only and no ground water is used.
xiv.	Trade effluent shall be segregated into high COD/TDS and low COD/TDS effluent streams. High COD/TDS shall be passed through stripper followed by MEE and agitated thin film drier (ATFD). Low TDS effluent stream shall be treated in ETP and then passed through RO system. The unit will have common effluent treatment facilities to treat the effluent generated from two units by name Hetero Labs Ltd. Unit-III and Hetero Drugs Ltd. Unit-VI in the neighbouring SEZ owned by a group company. The treated effluent shall be disposed off to marine outfall after conforming to the standards prescribed for the effluent discharge and obtaining permission from the APPCB. Water quality of treated effluent shall be monitored regularly and monitoring report shall be submitted to the APPCB. No process effluent shall be discharged in and around the project site. Sewage shall be treated in sewage treatment plant.	Complied with. All High TDS/COD effluents are being sent to Stripper followed by Multiple Effective Evaporator (MEE) and Agitated Thin Film Drier (ATFD), and high condensate of MEE is further treated in Bio tower followed by Dual stage aerobic treatment plant. All Low TDS/COD streams are being treated in Biological System along with condensate of MEE. The factory is having common effluent treatment facilities to treat the effluent generated from two units by name Hetero Labs Ltd. Unit-III and Hetero Drugs Ltd. Unit-VI in the neighbouring SEZ owned by a group company. The treated effluent is being regularly monitored and the reports are being submitted to APPCB regularly on monthly basis. The treated effluents are being disposed into Sea in the supervision of APPCB Officials. No process effluent is discharged in and around the project site Sewage is being treated in Sewage treatment plant of 300 KLD Capacity.

xv.	The effluent containing solvent going to bioreactor (ETP) shall be removed by steam stripping. Unit shall ensure that no solvent enters the biological ETP; there it is toxic to the biomass.	Complied with. The industry is removing solvents from the effluents in the stripper itself. For more effective separation of solvents, the industry has installed one additional stripper in series with the existing stripper.
xvi.	The treated effluent having TDS above 7000-8000 mg/lt shall be passed through separate RO. Permeate of RO shall be reused/recycled in the process.	Refer below As informed the TDS levels are ranging between 2000 and 3000 mg/li. The Industry has got Environmental Clearance with Marine disposal of Effluents after treatment and not with recycling option. At present treated effluent is being discharged into the sea under the super vision of APPCB officials after treatment.
xvii.	Treated industrial effluent shall be passed through guard pond. The guard pond shall have online pH, TOC analyser and flow meter and data shall be online transmitted to the APPCB website.	Complied with. The industry is passing its effluent through guard ponds and it is having online Effluent monitoring system for Flow, pH, TSS, TOC, and BOD& COD. Complete data has been connected to CPCB website.
xviii.	Hazardous chemicals shall be stored in tanks, tank farms, drums, carboys etc. Flame arresters shall be provided on tank farm. Solvent transfer shall be by pumps.	Complied with. All solvents are being stored in the Tanks and the tanks are provided with Flame arresters. Solvents are being transferred through pumps from solvent yard to Production area.
xix.	As proposed, process organic residue and spent carbon shall be sent to cement industries. ETP sludge process inorganic & evaporation salt shall be disposed off to the TSDF. The ash from boiler shall be sold to brick manufacturers.	Complied with. The industry is disposing hazardous wastes as per the guidelines of MOEF & APPCB as mentioned below. • Inorganic Process salts are being disposed to TSDF, Ramky, at Parawada, Visakhapatnam. • organic residue and spent carbon is being sent to either TSDF or cement factory as per latest CFO conditions • Boiler ash to brick manufactures.

xx.	Waste organic residue having very high calorific value which is being sent to cement plant for co processing requires complete audit. The study shall include how waste are fed into the kiln and other associated problems. The study report shall be submitted to ministry's regional office at Bangalore, APPCB and CPCB within three months.	Complied with. The industry has carried audit at one cement industry and the report has already been submitted to the Ministry.
xxi.	The salt from drier contains 3-4% organic matter. A study shall be carried out to treat it in a rotary kiln (above 800^0C) to remove organics and utilization of salt shall be explored. The study report shall be submitted to ministry's regional office at Bangalore, APPCB and CPCB within six months.	Refer below The industry has initiated action for the recycling of salt in the paper industry. For the same purpose, the industry has supplied salt to some vendors and the vendors are refusing to take salts because of unknown reasons as informed. Hence they are sending these salts to TSDF for disposal purpose.
xxii.	The company shall obtain authorization for collection storage and disposal of hazardous waste under the hazardous waste (management, handling& trans boundary movement) rules, 2008 and amended as on date for management of hazardous wastes and prior permission from APPCB shall be obtained for disposal of solid/hazardous waste in the TSDF. Measures shall be taken for fire fighting facilities in case of emergency.	Complied with. The Industry has obtained an authorization for collection, storage and disposal of hazardous waste under the hazardous waste (management, handling& trans boundary movement) rules, 2008 and amended as on date for management of hazardous wastes from APPCB. Measures are taken for fire fighting facilities in case of emergency.
xxiii.	The company shall strictly comply with the rules and guidelines under manufacture, storage and import of hazardous chemicals (MSIHC) rules 1989 as amended time to time. All transportation of hazardous chemicals shall be as per the motor vehicle act (MVA), 1989.	Complied with. The PA informed that all the rules and guidelines under MSHIC rules 1989 as amended from time to time are being implemented.
xxiv.	Fly ash shall be stored separately as per CPCB guidelines so that it shall not adversely affect the air quality becoming air borne by wind or water regime during rainy season by flowing along with the storm water. Direct exposure of workers to fly ash & dust	Complied with. The Fly ash is stored in silos and given to brick manufacturing industries. Personal protective equipments are issued to the workers and are using.

	shall be avoided.	
xxv.	The company shall under take following waste minimization measures: a. Metering and control of quantities of active ingredients to minimize waste. b. Reuse of by –products from the process as raw materials or as raw material substitutes in other processes. c. Use of automated filling to minimize spillage. d. Use of close feed system into batch reactors. e. Venting equipment through vapor recovery system. f. Use of high pressure hoses for equipment clearing to reduce wastewater generation.	The company under taking the following waste minimization measures: a. Having control of quantities of active ingredients. b. Using distilled solvents as raw material in processes as substitutes. c. Closed system for filling is being followed d. Closed filling into tanks/ receivers and feeding system to batch reactors is in place. e. Venting of vapors through condensers only f. Using high pressure jet pumps with hoses for cleaning.
xxvi.	The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire fighting system shall be as per the norms.	Complied with. The industry has provided an adequate fire fighting systems as per the norms by way of : • Installing Fire hydrant network • Providing adequate number of portable fire extinguishers • In house fire tender etc.,
xxvii.	Occupational health surveillance (OHS) of the workers shall be done on a regular basis and records maintained as per the Factories Act.	Complied with. The industry is conducting OHS for all the workers on a regular basis and maintaining a record as per Factory's Act.
xxviii.	The recommendation of the study conducted by NIO should be implemented in a time bound manner.	Complied with. The PA informed that all recommendations of NIO are implemented in a time bound manner.
xxix.	All the issues raised during the public hearing/consultation meeting held on 19thMay, 2011 shall be satisfactorily implemented.	Complied with. The PA informed that all the issues raised during the public hearing/consultation meeting held on 19thMay, 2011 were implemented.
xxx.	As proposed, green belt shall be developed in 20 acres out of total land	Complied with. The PA informed that an area of 30

	60 acres. Selection of plant species shall be as per the CPCB guidelines.	Acres is brought under green belt development so far in consultation with the local forest department.
xxxi.	As for CSR Activity, two ponds near temple shall be upgraded.	Refer below The industry has prepared proposals for development of two ponds near the temple. In the first phase as per the request of the villagers the industry has constructed two temples adjacent to the ponds. The development proposal includes: • Temples construction • Green belt development around the pond including lawns/ flowering plants. • Development road etc. But after preparation of proposals, they came to know that the complete Temple has been taken over by Tirumala Tirupati Devasthanams (TTD). The budget allocated for the purpose has been diverted for other CSR activities.
xxxii.	Provision shall be made for the housing for the construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile sewage treatment plant, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project. All the construction wastes shall be managed so that there is no impact on the surrounding environment.	Complied with. The PA informed that provision such as housing for labour with cooking fuel, drinking water, medical, toilets etc. were provided to the labour during the construction time. The housing were in form of temporary and removed after completion of the construction works. All construction waste were managed properly not to create any negative impact on the surrounding as stated.

B. General Conditions:

S.No.	Conditions	Compliance
i.	The project authorities shall strictly adhere to the stipulations made by the Andhra Pradesh State Pollution Control Board.	Complied with. The project authorities informed that all the stipulations made by the Andhra Pradesh State Pollution Control Board are being implemented.
ii.	No further expansion or modifications in the plant shall be carried out without	Complied with. The PA informed that all the

	prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to the Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	expansions are carried out with the approval of the Ministry only.
iii.	The locations of ambient air quality monitoring stations shall be decided in consultation with the state pollution control board(SPCB)and it shall be ensured that at least one station is installed in the upwind and down wind direction as well as where maximum ground level concentrations are anticipated.	Complied with. As informed that the locations of ambient air quality monitoring stations were decided in consultation with the State Pollution Control Board(SPCB)and in that one station is installed in the upwind and down wind direction as well as where maximum ground level concentrations are anticipated.
iv.	The overall noise level in and around the plant area shall be kept well within the standards (85 dBA) by providing noise controlling measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall confirm to the standards prescribed under EPA rules, 1989 viz. 75 dBA (daytime) and 70 dBA (night time)	Complied with. The PA has provided noise controlling measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. Noise levels are being monitored regularly during day and night time by the PA and the levels are within the limits.
v.	The company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.	Complied with. Rain Water Collecting facilities including the roof top collection are made. They have created rain water harvesting ponds for improving ground water level in the area. The same water is being recycled for their process where ever required.
vi.	Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be under taken on regular basis. Training to all employees on handling of chemicals shall be imparted.	Complied with. Trainings have been imparted to all the employees on various safety and health aspects including handling of hazardous chemicals. Pre-employment and routine periodical medical examinations for all employees are under taken on regular basis and records are maintained.

vii.	Usage of personnel protection equipments (PPEs) by all employees/ workers shall be ensured.	Complied with. The industry has provided PPE's to all employees/workers working in the factory and are using.
viii.	The company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the ministry. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing relating to the project shall be implemented.	Being implemented. The PA informed that all the environmental protection measures and safeguards proposed in the documents submitted to the Ministry are being implemented. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing relating to the project are also being implemented.
ix.	The company shall under take all relevant measures for improving the socio-economic conditions of the surrounding area.CSR activities shall be under taken by involving local villages and administration.	Complied with. The PA informed that the industry is carrying out CSR activities in the nearby villages by way of: • Providing safe drinking water by installing RO plants • Conducting Medical Camps • Water supply to few villages. • Construction of temples/ community halls. • School bags, Stationary etc. To all school going children in the nearby villages. • Providing Study material for 10th class students • Helping the public during any natural calamities etc. • Provided vision center for eye operations & giving spectacles in surrounding villages • Provided plants& LED lights to nearby villages. • Adopted animal as a part of biodiversity.
x.	The company shall under take eco-development measures including community welfare measures in the project area for the overall improvement of the environment.	Refer below. Plan has been prepared and is under implementation.
xi.	A separate environmental management cell equipped with full-fledged laboratory facilities shall be set-up to	Complied with. The industry is having separate environmental management cell with

	carry out the environmental management and monitoring functions	qualified persons and laboratory facilities.
xii.	As proposed, the company shall earmark adequate funds towards capital cost and recurring cost to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/pollution control measures shall not be diverted for any other purpose.	Complied with. An amount of Rs. 140 Cr. has been earmarked and spent for environmental management activities for the Hetero Units.
xiii.	A copy of clearance letter shall be sent by the project proponent to concerned panchayat, zilla parisad/municipal corporation, urban local body and the local NGO, if any, from who suggestions /representations, if any were received while processing the proposal.	Complied with. The PA informed that a copy of the EC was sent to local Panchayat.
xiv.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MOEF, the respective Zonal office of CPCB and the A.P. pollution control board. A copy of environmental clearance and six monthly compliance status reports shall be posted on the website of the company.	Complied with. The industry is submitting compliance reports on six monthly basis to Regional Office, MoEF and APPCB. The industry is uploading its six monthly EC compliance reports on their website www.heteroworld.com .
xv.	The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned state pollution control board as prescribed under the environment(protection) rules,1986, as amended subsequently, shall also be put on the website of the company and shall also be sent to the respective Regional Office of MOEF	Complied with. The industry is regularly submitting Environmental statement to APPCB before 30th September of every year. The same has been uploaded on the company's website www.heteroworld.com

	by e-mail.	
xvi.	The project proponent shall inform the public that the project has been accorded Environmental Clearance by the Ministry and copies of the clearance letter are available with the SPCB/ Committee and may also be seen at website of the Ministry at http://envfor.nic.in. this shall be advertised within the seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forward to the concerned regional office of the Ministry.	Complied with. The PA had given the advertisements in two local news papers and submitted the copies of the same to MoEF, RO.
xvii.	The project authorities shall inform the regional office as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the Project.	The PA informed that the industry is using their own funds and hence there Is no financial Closure. The project has been started in the month of April 2007.

This has the approval of the Addl. PCCF(C) vide diary no.1578 dated: 02.11.2017.

(Dr.C.Kaliyaperumal)
Director(S)

Dr. C. KALIYAPERUMAL, M.E., PhD
Director (S)
Government of India
Ministry of Environment, Forests & Climate Change
Regional Office (South Eastern Zone)
HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam. Chennai-600 034.

Observation made on the Points raised by the Regional Office during the last Monitoring

F.NO. EP/12.1/2012-13/22/AP/0462 Dated 21/03/2017

Reference : MoEF& CC Letter No: J-11011/398/2010-IA.II (I) dated 10.09.2012		
S.No.	**Conditions**	**Compliance**
i.	Permission and recommendation has not been obtained from the state forest department regarding the impact of the proposed expansion on the surrounding reserve forests. (Specific Condition no. iii)	There is no forest land in the project area and also in the vicinity of the project area.
ii.	The result of monitored environment data (AAQ/Stack/Noise) have not been uploaded on the company's website (Specific Condition no. vi)	The results of monitored environment data (AAQ) have been uploaded on the company's website www.heteroworld.com. after last monitoring.
iii.	Separate Reverse Osmosis System has not been provided for the treated effluent (Specific Condition no. xvi)	The company has obtained EC for setting up of industry with marine disposal option and as per the Consent for Operation issued by APPCB there is no limit of TDS. Hence they have not installed RO and they are disposing the treated effluent into Sea in the presence of APPCB officials.
iv.	PP has not carried out the study regarding treatment and utilization of salt from drier and the report has not been submitted to the Regional Office of the MOEF & CC/APPCB/CPCB (Specific Condition no. xxi)	As informed that they have tried to reuse the salts after drying in their production but they couldn't succeed because of various reasons. The reports of QC and R&D are attached as Annexure -I for information. Also they have tried to reuse the salts in paper mills and accordingly they have supplied to some paper mills and they didn't get any proper response from the same Paper Mills.
v.	Only 30 acres area has been brought under green belt development in place of 45 acres area. Green belt development in the remaining 15 acres area need to be under taken by PP and the action plan in this regarding shall be submitted to the Regional Office of the MOEF & CC (Specific Condition no. xxix)	The industry has already developed green belt more than 45% of the area.
vi.	Project proponent has not uploaded the environment clearance letter on the company's website. Further, six	The industry has uploaded Environmental Clearance letter, Six monthly compliance report and monitored environment data on

	monthly compliance reports along with the monitored environment data (AAQ/Stack/Noise) have not been uploaded on the company's website (General Condition no. xiv).	their website www.heteroworld.com.
vii.	Environmental statement has not been uploaded on the company's website as stipulated in the EC condition and also not submitted to the Regional Office of the MOEF & CC (General Condition no. xv).	The industry has uploaded Environmental statement on the company website www.heteroworld.com
viii.	No paper advertisement has been given regarding the accord of the environmental clearance by the Ministry (General Condition no. xvi).	Paper Advertisements has been given regarding accord of Environmental Clearance on November 1st 2012 in Sakshi (Telugu Daily) and The Hindu (English News Paper). The copies of advertisement has already been submitted to RO, MoEF& CC. Copies of the same are enclosed for information and ready reference as *Annexure –II.*
ix.	Date of financial closure and final approval of the project by the concerned authorities and the date of start of the project has not been informed to the Regional Office (General Condition no. xvii).	It is an existing operating industry. They have informed about all the approvals obtained through their six monthly reports. Date of start works was Dec.2007.
A. Letter No: J-11011/253/2006-IA.II (I) dated 22.09.2006.		
i.	Six monthly compliance report (both hard and soft copy) along with the environmental monitored data have not been submitted to the Regional Office of the MOEF & CC, CPCB and APPCB (General condition no. x)	Six monthly compliance reports (both hard and soft copy) along with the environmental monitored data was submitted to the Regional Office of the MOEF & CC after last visit, CPCB and APPCB.
ii.	Date of financial closure and final approval of the project by the concerned authorities and the date of start of the project has not been informed to the Regional Office (General Condition no. xii).	It is an existing operating industry. They have informed about all the approvals obtained through their six monthly reports. Date of start works was Dec.2007.

This has the approval of the Addl. PCCF(C) vide diary no.1578 dated: 02.11.2017.

Dr.C.Kaliyaperumal
Director(S)

Dr. C. KALIYAPERUMAL, M.E., PhD
Director (S)
Government of India
Ministry of Environment, Forests & Climate Change
Regional Office (South Eastern Zone)
HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai-600 034.

ANDHRA PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE, VISAKHAPATNAM
D.No.39-33-20/4/1,MadhavadharaVuda Colony, Visakhapatnam - 530018,
Phone: 0891 -2755356

Lr. No.2038/PCB/RO-VSP/2021 - **Date:27.10.2021**

To
The Member Secretary,
A.P. Pollution Control Board,
Board Office,
Vijayawada.

Sir,

Sub: APPCB – RO VSP – SEIAA, A.P. – M/s. Hetero Labs Ltd., Unit – III, N. Narsapuram (V), Nakkapalli (M), Visakhapatnam District - EC Compliance report – Submitted-- Reg.

Ref:
1. EC Order No. J-11011/396/2010-ia ii (i) dt: 10.09.2012.
2. CFO Order No.APPCB/VSP/VSP/CFO/HO/137/2017, dt: 11.12.2017.
3. CFO Amendment Order No: APPCB/VSP/VSP/45/CFO/HO/2019, dt:25.06.2019.
4. E-mail received from the Board Office on 28.09.2021.

***

It is to submit that M/s. Hetero Labs Ltd., Unit – III, N. Narsapuram (V), Nakkapalli (M), Visakhapatnam District has obtained Environmental Clearance vide reference 1st cited for the expansion of the bulk drugs by enhancement of Product Mix(60 TPM to 500 TPM).

The Board issued CFO to industry vide reference 2nd cited for the total production shall be 13,000 Kg/day(i.e., 11,816.67 Kg/day from 15 no. of products out of 35 regular products and 1183.33 Kg/day from 27 no. products out of 99 campaign products) at any point of time with certain conditions and is valid up to 31.12.2022.

This office has received representation of the proponent from Board Office with a request for issue of Certified Compliance of earlier EC Order conditions.

The Board vide reference 4th cited directed to submit point-wise compliance report on the EC Order conditions. In this regard, official from this office on 26.10.2021 and the compliance report on the conditions stipulated in the EC order Dt. 10.09.2012 is as follows:

A. Specific Conditions

SNo	Conditions	Compliance
i.	All the specific conditions and general conditions specified in the environmental clearance letter accorded vide ministry no. J-11011/352/2003-la.II (I) dated 25th September, 2006 shall be implemented.	The industry submitting the compliance report on the conditions stipulated in EC & CFO to the Board regularly.
ii.	National Emission standards for organic chemicals manufacturing Industry issued by the ministry vide G.S.R.608 (E) dated 21st July, 2010 and amended time to time shall be followed by the unit.	The industry has installed 03 No's of Continuous Ambient Air Quality Monitoring System in the premises for monitoring ambient air quality and also monitoring conducted by 3rd party consultant.
iii.	Permission and recommendation shall be obtained from the state forest department regarding the impact of the	---

	proposed expansion on the surrounding reserve forests (2 Nos.)	
iv.	Multi-cyclone followed by bag filter shall be provided to the boiler to control particulate emissions within permissible limit. The gaseous emissions shall be dispersed through stack of adequate height as per CPCB/APPCB guidelines.	The industry is drawing stream from the boilers of M/s.Hetero Infrastructure SEZ limited for which ESP followed by 53 m stack provided to 45 TPH coal fired boiler and bag filters with 30 m individual stacks provided to 20 TPH & 2 X 6 TPH coal fired boilers to control air pollution.
v.	Adequate scrubbing system shall be provided to the process vents to control process emissions. The scrubbing media shall be sent to effluent treatment plant (ETP) for treatment. Efficiency of scrubber shall be monitored regularly and maintained properly. At no time, the emission levels should go beyond the prescribed standards. Scrubbers vent shall be provided with on-line detection and alarm system to indicate higher than permissible value of controlled parameters.	The industry has provided scrubbers to all the reactors where acidic reactions are being carried. During inspection, industry was directed to provide scrubbers to all the reactors not only for the reactors where acidic reactions being carried. The industry has not provided online detection systems.
vi.	Ambient air quality data shall be controlled as per NAAQES standards notified by the ministry vide G.S.R. No. 826(E) 16th September, 2009. The levels of $PM_{10,}$ SO2, NOX, CO and VOC shall be monitored in the Ambient air and emissions from the stacks and displayed at a convenient location near the main gate of the company and at important public places. The company shall upload the results of monitored data on its website and shall update the same periodically. It shall simultaneously be sent to the regional office of MOEF, the respective Zonal office of CPCB and the AP Pollution Control Board (APPCB)	The industry has installed 03 No's of Continuous Ambient Air Quality Monitoring System in the premises for monitoring ambient air quality and also monitoring conducted by authorized consultant. The industry has not connected the VOC system to the website.
vii.	To Eliminate/reduce odour problem, the effluent before going to ETP shall be treated in stripper for removal of VOC. VOC shall be monitored in ETP area.	The industry has provided stripper to recover the solvents if any before sending the HTDS effluents to the MEE of ETP to control odour during operation MEE & ATFD. The industry is monitoring the VOCs with the portable VOC instrument and maintaining the records.
viii.	Specific VOC to be monitored for the specific solvents using proper sampling and analysis protocols.	The industry has installed VOC analyzer in CAAQM system and not connected to the VOC system to the APPCB website. The industry has not provided separate VOC meter for specific solvents.
ix.	In plant control measures for checking fugitive emissions from all the vulnerable sources shall be provided.	The industry is taking the following fugitive emissions systems to control to fugitive emissions:

	Fugitive emissions Controlled by providing closed storage, closed handling & conveyance of chemicals/materials, multi cyclone separator and water sprinkling system. Dust suppression system including water sprinkling system shall be provided at loading and unloading areas to control dust emissions. Fugitive emissions in the work zone environment, product, raw materials storage area etc. shall be regularly monitored. The emission shall conform to the limits stipulated by the APPCB	• Storing solvents in closed tanks with vent condensers in dedicate area. • Transfer of solvents & chemicals through closed pipelines. • Vents of reactor in which acidic reactions are being carried are connected to scrubbers • Dual stage condensers are provided to the vents of all reactors, ANFDs and Solvent Recovery units. • Water sprinkler system to Ammonia storage & solvent storage yard. • Fugitive emissions are being regularly monitored and records are in place.
x.	For further control of fugitive emissions , following steps shall be followed: 1. Closed handling system shall be provided for chemicals. 2. Reflux condenser shall be provided over reactor. 3. System of leak detection and repair of pump/pipeline based on preventive maintenance. 4. The acids shall be taken from storage tanks to reactors throughclosed pipeline. Storage tanks shall be vented through trap receiver and condenser operated on chilled water. 5. Cathodic protection shall be provided to the underground solvent storage tanks.	1. All chemicals & solvents are being transferred through closed pipelines. 2. Dual stage Reflux condensers are provided over the reactors 3. Preventive maintenance of all major equipments is in place and is being followed. 4. Acids are being transferred through closed pipeline from storage to reactors. The vents of storage tanks are connected to the scrubber. 5. There are no underground storage tanks in the factory. Regarding Leak detection and repairs, the industry has entrusted the work to the third party to carry LDAR studies. The EHS, Manger has informed that they will submit the reports by the end of November 2021.
xi.	The gaseous emissions from DG set shall be dispersed through adequate stack height as per CPCB standards. Acoustic enclosure shall be provided to the DG sets to mitigate the noise pollution.	Complied.
xii.	Solvent management shall be carried out as follows: i. Reactor shall be connected to chilled brine condenser system.	i. All reactors vents are connected to the dual stage Chilled brine condenser system.

	ii. Reactor and solvent handling pump shall have mechanical seals to prevent leakages. iii. The condensers shall be provided with sufficient HTA residence time so as to achieve more than 95% recovery. iv. Solvents shall be stored in a separate space specified with all safety measures. v. Proper earthing shall be provided in all the electrical equipment wherever solvent handling is done. vi. Entire plant shall be flame proof. The solvent storage tanks shall be provided with breather valve to prevent losses. vii. All the solvent storage tanks shall be connected with vent condensers with chilled brine circulation.	ii. All Reactors and solvent handling pumps are provided with Mechanical Seals. iii. All condensers are provided with sufficient HTA residence time to achieve maximum recovery. The installed condensers are designed based on the flow of vapour quantity due to specific reactions. iv. All solvents are stored in a separate space (Premises approved by the Department of Explosives) with all safety precautions. v. Ensured double earthing for all the equipments installed in the factory. vi. All electrical fittings inside the factory are Flame proof only. All solvent storage tanks are provided with Flame arresters. vii. All vents of low boiling solvent storage tanks have been provided with vent condensers with chilled brine circulation.
xiii.	Total freshwater requirement from desalination plant will be 958 m^3/day after expansion and prior permission shall be obtained from the concerned authority. No ground water shall be used.	The industry is using water as per the CFO issued by APPCB and the fresh water is getting from Desalination Plant by drawing sea water.
xiv	Trade effluent shall be segregated into high COD/TDS and low COD/TDS effluent streams. High COD/TDS shall be passed through stripper followed by MEE and agitated thin film drier (ATFD). Low TDS effluent stream shall be treated in ETP and then passed through RO system. The unit will have common effluent treatment facilities to treat the effluent generated from two units by name Hetero Labs Ltd. Unit-III and Hetero Drugs Ltd. Unit-VI in the neighbouring SEZ owned by a group company. The treated effluent shall be disposed off to marine outfall after conforming to the standards prescribed for the effluent discharge and obtaining permission from the APPCB. Water quality of treated effluent shall be monitored regularly and monitoring report shall be submitted to the APPCB. No process effluent shall be discharged in and around the project site. Sewage shall be treated in sewage treatment plant.	Complied. All High TDS/COD effluents are being treated in Stripper, MEE and ATFD and the condensate of MEE is further treated in biological treatment plant. All Low TDS/COD streams are being treated in Biological treatment System along with condensate of MEE. The treated effluents are being disposed into Sea under the supervision of Zonal Office, APPCB, VSP and there is no discharge of effluents around the project site. Sewage is being treated in Sewage treatment plant of 300 KLD Capacity.

xv	The effluent containing solvent going to bioreactor (ETP) shall be removed by steam stripping. Unit shall ensure that no solvent enters the biological ETP; there it is toxic to the biomass.	The industry is removing all low boiling solvents from the effluents in the stripper itself. For more effective separation of solvents, the industry has installed one additional stripper in series with the existing stripper. After stripping the HTDS effluent is going to MEE and the condensate of MEE is sending to Biological treatment plant.
xvi	The treated effluent having TDS above 7000-8000 mg/lt shall be passed through separate RO. Permeate of RO shall be reused/recycled in the process.	The Industry got Environmental Clearance with Marine disposal of Effluents after treatment and not with recycling option. At present the treated effluent is being discharged into the sea under the supervision of Zonal Office, APPCB, VSP after treatment and meeting the standards. Now, the industry has proposed to increase the generation quantity of wastewater during expansion, hence, the industry may be directed to increase the pipeline of length of 2 Kms & above to maintain depth of outfall point from surface of water at least 19 m for dispersion of the effluents more effectively into the sea in view of no. of Fishermen families depends on the fishing activity in surrounding areas as the nearby industrial parks are already proposed / provided the same for which marine outfall connected to common ETP, at present M/s.Hetero Labs is having marine pipeline of 0.98 Kms with depth of outfall point of 13 mts.
xvii	Treated industrial effluent shall be passed through guard pond. The guard pond shall have online pH, TOC analyser and flow meter and data shall be online transmitted to the APPCB website.	The industry is passing its effluent through guard ponds and it is having online Effluent monitoring system for Flow, pH, TSS, TOC, BOD& COD and the data is connected to CPCB&APPCB websites.
xviii	Hazardous chemicals shall be stored in tanks, tank farms,drums, carboys etc. Flame arresters shall be provided on tank farm. Solvent transfer shall be by pumps.	All solvents are being stored in the Tanks and the tanks are provided with Flame arresters. Hazardous solid chemicals are being stored in drums, Carboys etc in solid raw material warehouses. Solvents are being transferred through pumps from solvent yard to Production area.
xix	As proposed, process organic residue and spent carbon shall be sent to	The industry is disposing hazardous wastes as mentioned below.

	cement industries. ETP sludge, process inorganic & evaporation salt shall be disposed off to the TSDF. The ash from boiler shall be sold to brick manufacturers.	• Inorganic Process salts are being disposed to TSDF, Ramky, Visakhapatnam. • Organic residue and spent carbon are being sent to either TSDF or cement Industries for incineration purpose as per latest CFO conditions • Boiler ash is being sent to brick manufacturers.
xx	Waste organic residue having very high calorific value which is being sent to cement plant for co processing requires complete audit. The study shall include how waste are fed into the kiln and other associated problems. The study report shall be submitted to ministry's regional office at Bangalore, APPCB and CPCB within three months.	The industry has carried audit at one cement industry i.e., M/s Sagar Cement Industries and submitted the report to APPCB.
xxi	The salt from drier contains 3-4% organic matter. A study shall be carried out to treat it in a rotary kiln (above 800^0C) to remove organics and utilization of salt shall be explored. The study report shall be submitted to ministry's regional office at Bangalore, APPCB and CPCB within six months.	The industry has informed that they have initiated action for recycling of salt in the paper industry and they are sending salts to some of the vendors, but the vendors are refused to take salts. Hence, at present the industry is sending these salts to TSDF for disposal purpose.
xxii	The company shall obtain authorization for collection storage and disposal of hazardous waste under the hazardous waste (management, handling& trans boundary movement) rules, 2008 and amended as on date for management of hazardous wastes and prior permission from APPCB shall be obtained for disposal of solid/hazardous waste in the TSDF. Measures shall be taken for firefighting facilities in case of emergency.	The industry obtained authorization for collection, storage, and disposal of hazardous waste under the Hazardous waste (Management, handling& trans boundary movement) rules, 2016 and amended as on date for management of hazardous wastes from APPCB. The industry has provided firefighting facilities in the above area.
xxiii	The company shall strictly comply with the rules and guidelines under manufacture, storage and import of hazardous chemicals (MSIHC) rules 1989 as amended time to time. All transportation of hazardous chemicals shall be as per the motor vehicle act (MVA), 1989.	The industry is directed to comply with all the rules and guidelines under MSHIC rules 1989 as amended from time to time and also direct to comply the rule while transportation of hazardous chemicals as per Motor Vehicle Act 1989.
xxiv	Fly ash shall be stored separately as per CPCB guidelines so that it shall not adversely affect the air quality becoming air borne by wind or water regime during rainy season by flowing along with the storm water. Direct exposure of workers to fly ash & dust shall be avoided.	The industry has provided fly ash silo to collect the fly ash directly. The industry is supplying PPEs to the workers working in Boiler area.

xxv	The company shall under take following waste minimization measures: a. Metering and control of quantities of active ingredients to minimize waste. b. Reuse of by –products from the process as raw materials or as raw material substitutes in other processes. c. Use of automated filling to minimize spillage. d. Use of close feed system into batch reactors. e. Venting equipment through vapor recovery system. f. Use of high pressure hoses for equipment clearing to reduce wastewater generation.	a. The industry is follow the specific systems to control of quantities of active ingredients to minimize the waste. b. Using the distilled solvents as raw material in processes as substitutes. c. Closed system for filling is being followed d. Closed filling into tanks/ receivers and feeding system to batch reactors is in place. e. Venting of vapors through condensers only f. Using high pressure jet pumps with hoses for cleaning.
xxvi	The unit shall make the arrangement for protection of possible fire hazards during manufacturing process in material handling. Fire fighting system shall be as per the norms.	The industry has provided adequate fire fighting systems as per the norms prescribed by the AP State Disaster Response and Fire services department. Fire NOC obtained 09.06.2020 is valid for three years and PESO License is valid 31.12.2024. Some of the fire protection equipment's installed at the facility are as below: • Fire hydrant network with Jackey pump, Main electrical Pump & Diesel driven pump. • About 400 nos. of portable fire extinguishers. • Sprinkler systems for all reactors, solvent storage tanks. • In house fire tenders (02 Nos) etc.
xxvii	Occupational health surveillance of the workers shall be done on a regular basis and records maintained as per the factories act.	The industry is conducting medical check-ups to the employees periodically and maintaining the records of medical examinations as per the Factories Act.
xxviii	The recommendation of the study conducted by NIO should be implemented in a time bound manner.	Directed the industry to implement.
xxix	All the issues raised during the public hearing/consultation meeting held on 19thMay, 2011 shall be satisfactorily implemented.	Directed the industry to implement.
xxx	As proposed, green belt shall be developed in 20 acres out of total land 60 acres. Selection of plant species shall be as per the CPCB guidelines.	Complied
xxxi	As for CSR Activity, two ponds near temple shall be upgraded.	During inspection, the management has informed the following:

		The industry has prepared proposals for development of two ponds near the temple. In the first phase as per the request of the villagers the industry has constructed two temples adjacent to the ponds. The development proposal includes: • Temples construction • Green belt development around the pond including lawns/ flowering plants. • Development road etc. But after preparation of proposals, it came to our notice that the Temple has been taken over by Tirumala Tirupati Devasthanams (TTD). The budget allocated for the purpose is diverted for other CSR activities for the villages situated in and around the factory premises. .
xxxii	Provision shall be made for the housing for the construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile sewage treatmentplant,safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project. All the construction wastes shall be managed so that there is no impact on the surrounding environment.	---

B. General Conditions

S.No	Description of Condition	Compliance Status
i.	The project authorities shall strictly adhere to the stipulations made by the Andhra Pradesh State Pollution Control Board.	Directed the industry to comply
ii.	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to the Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	Now, the industry has proposed to expand the production and applied for EC for expansion of the project.
iii.	The locations of ambient air quality monitoring stations shall be decided in consultation with the state pollution control board(SPCB)and it shall be ensured that at least one station is installed in the upwind and down wind	The industry has installed Ambient air quality stations in three directions.

	direction as well as where maximum ground level concentrations are anticipated.	
iv.	The overall noise level in and around the plant area shall be kept well within the standards (85 dBA) by providing noise controlling measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall confirm to the standards prescribed under EPA rules, 1989 viz. 75 dBA (daytime) and 70 dBA (night time)	Noise levels are being monitored regularly and as per the records, noise levels are within the norms stipulated.
v.	The company shall harvest rainwater from the roof tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.	The industry has constructed one pond to Collect rain water in the premises to recharge the ground water level.
vi.	Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be under taken on regular basis. Training to all employees on handling of chemicals shall be imparted.	The industry is conducting training programmes to all the employees on various safety and health aspects including handling of hazardous chemicals.
vii.	Usage of personnel protection equipments (PPEs) by all employees/ workers shall be ensured.	The industry is providing PPE's to all employees/workers working in the factory. During inspection, the management was directed to ensure that all the employees / workers are wearing the PPEs while working in the factory.
viii.	The company shall also comply with all the environmental protection measures and safeguards proposed in the documents submitted to the ministry. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing relating to the project shall be implemented.	Directed the industry to comply.
ix.	The company shall under take all relevant measures for improving the socio-economic conditions of the surrounding area.CSR activities shall be under taken by involving local villages and administration.	The management has informed that they are carrying the following activities under CSR programme in the nearby villages: • Providing safe drinking water by installing RO plants • Conducting Medical Camps • Water supply to few villages. • Construction of temples/ community halls. • School bags, Stationary etc. to all school going children in the nearby villages.
x.	The company shall under take eco-development measures including community welfare measures in the project area for the overall improvement of the environment.	

		• Helping the public during any natural calamities etc. • Provided plants& LED lights to nearby villages.
xi.	A separate environmental management cell equipped with full-fledged laboratory facilities shall be set-up to carry out the environmental management and monitoring functions	The industry is having separate environmental management cell with laboratory facilities.
xii.	As proposed, the company shall earmark adequate funds towards capital cost and recurring cost to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/pollution control measures shall not be diverted for any other purpose.	Directed the industry to comply.
x	A copy of clearance letter shall be sent by the project proponent to concerned panchayat, zilla parisad/municipal corporation, urban local body and the local NGO, if any, from who suggestions /representations, if any were received while processing the proposal.	The industry has informed that they have submitted the EC copy to Panchayat and District administration after obtaining from MoEF&CC.
xiv	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated environmental clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MOEF, the respective Zonal office of CPCB and the A.P. pollution control board. A copy of environmental clearance and six monthly compliance status reports shall be posted on the website of the company.	Complied
xv	The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the concerned state pollution control board as prescribed under the environment(protection) rules,1986, as amended subsequently, shall also be put on the website of the company and shall also be sent to the respective Regional Office of MOEF by e-mail.	Complied.
xvi	The project proponent shall inform the public that the project has been accorded Environmental Clearance by the Ministry and copies of the clearance letter are available with the SPCB/	Complied

	Committee and may also be seen at website of the Ministry at http://envfor.nic.in. this shall be advertised with in the seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forward to the concerned regional office of the ministry	
xvii	The project authorities shall inform the regional office as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the Project.	The industry has informed that they are spending own Funds and hence there is no date of financial closure

Submitted for favour of information and necessary action.

Yours faithfully,

ENVIRONMENTAL ENGINEER

Copy submitted to the Joint Chief Environmental Engineer(UH–IV), A.P. Pollution Control Board, Board Office, Vijayawada for favour of information and taking necessary action.

COMPLIANCE REPORT TO CONDITIONS OF ENVIRONMENTAL & CRZ CLEARANCE F.NO: 21-641/2007-IA, III Dated. 25th October 2010

<table>
<tr><th>S.No.</th><th>Condition</th><th>Compliance</th></tr>
<tr><td colspan="3">Part-A, Specific Conditions</td></tr>
<tr><td colspan="3">Construction Phase</td></tr>
<tr><td>(i)</td><td>Consent for Establishment" shall be obtained from Andhra Pradesh Pollution Control Board under Air and Water Act and a shall be submitted to the Ministry before start of any construction work at the site.</td><td>Complied.

The industry has obtained Consent for Establishment from AP Pollution Control Board vide Order No: 219/PCB/CFE/RO-VSP/HO/2010-2355, date:13/12/2010 and is being updated/Amended from time to time.

The details of the CFE's are as below:
<table>
<tr><th>CTE Order No</th><th>Date of issue</th></tr>
<tr><td>219/PCB/CFE/RO-VSP/HO/2010-2355</td><td>13.12.2010</td></tr>
<tr><td>219/APPCB/CFE/RO-VSP/HO/2010</td><td>14.09.2018</td></tr>
<tr><td>219/APPCB/CFE/RO-VSP/HO/2010</td><td>15.07.2020</td></tr>
</table></td></tr>
<tr><td>(ii)</td><td>Sufficient dilution shall be ensured to meet the ambient parameters within 50 m distance from outfall.</td><td>Complied.

Out fall pipeline has been laid as per NIO recommendations for having sufficient dilution at the point of outfall. .</td></tr>
<tr><td>(iii)</td><td>Regular Independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through an authorized agency and submitted along with six monthly monitoring report to the ministry.</td><td>Complying.

The industry is taking expertise of NIO for conducting the studies and conducting the studies on yearly basis. The report is being submitted to APPCB (RO & ZO) and IRO, MoEF&CC, Vijayawada. Copy of the latest report and mail acknowledgement are enclosed as Annexure-I.</td></tr>
<tr><td>(iv)</td><td>Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in the system.</td><td>Complied by the industry.

Strainers are provided at the intake point to prevent fish entry into the system. Photographs of the strainers installed at the sea water intake point are enclosed as Annexure-II.</td></tr>
<tr><td>(v)</td><td>The recommendations of EIA and DMP shall be strictly complied with.</td><td>Complied.

The industry has followed all recommendation of EIA & DMP. The detailed report on the EIA recommendations is enclosed as Annexure-III.</td></tr>
</table>

(vi)	Lighted buoys shall be provided at intake and out fall location as indicators.	**Complied and please refer below.** Marker Buoys which were installed at the intake & Outfall points as indicators have been damaged due to various reasons. Now the industry is in the process of replacing the same during annual maintenance in Feb & March 2023. Copy of PO released for Maintenance of pipelines is enclosed as **Annexure-IV** and the contractor is starting the job of maintenance by 15th March 2023.
(vii)	The pipeline shall be buried at least 2 m depth in onshore area and 4 mts in the offshore area. Necessary permission with regard to the pipeline burial and laying shall be obtained from maritime Board to ensure that the pipeline route does not fall in the navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.	**Complied by the industry.** Pipeline has been laid as per the recommendations made by NIO. The industry is paying annual charges for pipelines to Maritime Board regularly. The payment made to maritime Board is enclosed as **Annexure-V**. The pipeline route is not falling in the navigation channel and the routing of the pipeline is enclosed as **Annexure-VI.**
(viii)	The pipeline shall not pass through any sand dunes/mangroves. The project shall be implemented in such a manner that there is not damage whatsoever to the mangroves/other sensitive coastal ecosystem. If any damage to mangroves is anticipated/envisaged as a result of project activates then the clearance shall stand cancelled, and the proponents shall seek fresh approval from the Ministry.	**Not applicable.** There are no mangroves and sand dunes in the area where pipeline has been laid. The industry is taking all precautions to avoid damage to the marine environment.
(ix)	The reject shall meet the standards prescribed by Andhra Pradesh Pollution Control Board before disposal.	**Please Refer below.** There are no specific CPCB/APPCB standards for Desalination rejects. Copy of latest analysis report of Rejects is enclosed as **Annexure -VII.**
(x)	A continuous and comprehensive post project marine quality monitoring programmed shall be taken up. This shall include monitoring of water quality sediments quality and biological characteristics and report submitted every 6 months to	**Being followed.** The industry is conducting post project marine monitoring through NIO regularly for water quality, sediments quality and biological characteristics.

	Ministry's Regional Office at Bangalore.	Copy of the latest report is enclosed as **Annexure-I** and the same has been submitted to IRO, Vijayawada
(xi)	It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.	**Complied by the industry.** The Land of the project used to be a vacant land & used for aquaculture in the past. There is no displacement of people, houses or fishing activity as a result of the project. The details of the fish catch data given by the Joint Director-Fisheries; Govt. of AP in Visakhapatnam is enclosed as **Annexure-VIII**
(xii)	There shall be display boards at critical locations along the pipeline viz. road / rail/ river crossing giving emergency instructions. This will ensure prompt information regarding locations of accident during any Emergency. Emergency information Board shall contain emergency instruction in addition to contact details. Proper lighting shall be provided all along the road.	**Complied by the industry.** The pipeline is completely laid in M/s Hetero Infrastructure SEZ Ltd area and only one crossing is there (Creek & Village Road) along the pipeline. Industry has taken all necessary precautions at the crossing. 24x7 security surveillance is in place all along the pipeline and Emergency contact details are available in the ECC & also at Security. Lighting has been provided all along the roads.
(xiii)	There shall be no withdrawal of ground water in CRZ area for this project.	**Complied by the industry.** The total water requirement of the facility is being met through Sea water Desalination plants and not drawing ground water for any purpose.
(xiv)	No other activities except the permissible actions under CRZ Notification 1991 shall be carried out with CRZ areas.	The industry has installed Desalination plant in the existing buildings of Ex. Vijaya Marines due to lack of awareness & clarity on CRZ notifications. Now the industry has applied for regularization of Desalination plant in CRZ area as per Office Memorandum of MoEF&CC vide F.No:19-27/2015.IA.III dated 19th February 2021.
(xv)	Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contamination.	**Complied.** The industry is conducting the analysis of soil & ground water periodically to check the contamination (if any). Copy of latest Analysis report is enclosed as ***Annexure – IX***.

(xvi)	Construction spoils, including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such material must be secured so that they should not leach into the ground water.	**Complied.** The industry is not using any bitumen for construction of roads as all the roads are made of concrete only. There are no dump sites for waste material around the factory premises.
(xvii)	Any hazardous waste generated during construction phase should be disposed off as per applicable rules and norms with necessary approval of the Andhra Pradesh state Pollution Control Board.	**Complying.** The industry has followed Hazardous waste generated during construction phase was disposed as per applicable rules and norms of APPCB. At present there are no major construction activities at site.
(xviii)	The diesel generator sets to be used during construction phase should be low Sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.	**Complied.** The industry is using only low Sulphur diesel for operation of DG sets and all DG sets are provided with acoustic enclosures to control noise.
(xix)	The diesel required for operation DG sets shall be stored in underground tanks and required clearance from Chief Control of Explosives shall be taken.	**Please Refer below:** As such there is no diesel storage in the premises of Hetero Infrastructure SEZ Ltd and the units which are located in SEZ area are storing the diesel in above ground storage tanks as approved by the Chief Controller of Explosives Copies of Explosive Licenses of SEZ units are enclosed as **Annexure-X** for your information and perusal.
(xx)	Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non-peak hours	**Complied by the industry.** All vehicles hired by the company are in good condition and having pollution check certificates. The vehicle movement in the premises is restricted to daytime only.
(xxi)	Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform	**Complied.** At present there are no major construction activities at site The industry is monitoring the noise levels in house and through third party regularly and the records are being maintained. As

	to the stipulated standards by CPCB/SPCB	per records noise levels found to be within limits. Copy of the latest report is enclosed as **Annexure-XI** for your information.
(xxii)	Fly ash should be used as building material in the construction as per the provision of Fly ash Notification of september,1999 and amended as on 27th August,2003	**Complied.** The industry utilized & using fly ash Bricks & also using fly ash in Ready Mix concrete for the construction purposes.
(xxiii)	Ready mixed concrete must be used in building construction	**Complied.** Ready mix concrete was used for the construction of buildings during construction phase. At present RMC plant installed by the industry though there are no major construction activities at site.
(xxiv)	Storm water control and its re use as per CGWB and BIS standards for various applications.	**Please refer below:** The industry has approached CGWB, Irrigation Department, Got. Of AP and APWALTA (Department of Rural Development) etc. for technical suggestions & permissions (if any) for storm water control & its reuse. But no department is giving clarity on the same and finally APWALTA informed us to approach irrigation department for necessary approvals. Copies of communication had with Govt. departments is enclosed as **Annexure - XII**.
xxv	Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred	**Complied.** The industry used Ready mix concrete for the construction and used curing chemicals for curing purpose. At present there are no major construction activities at site.
xxvi	Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.	**NOT APPLICABLE** The industry is not drawing any ground water and using water from Sea water desalination plant for its usage.
xxvii	Regular supervision of the above and other measure for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.	**Complied.** Regular supervision is being done by the Environment Department head to avoid

		disturbance to the surroundings. There are no villages adjacent to the project site.
xxviii	Under the provisions of Environment (protection) Act,1986, legal action shall be initiated against the project proponent if it was found that construction of the project has started without obtaining environmental clearance	**Agreed and accepted.** The industry has started construction activities after getting Environmental Clearance only.
II. Operation Phase		
I	The installation of the Effluent Treatment Plant (ETP) should be certified by an independent expert and a report in this regard should be submitted to the Ministry before the project is commissioned for operation. Treated effluent emanating from ETP shall be Recycled/ Reused to the maximum extent possible.	**Complied.** The industry has constructed full-fledged ETP for the treatment of Effluents at a cost of Rs.80.00 Cores. The ETP design was certified by the third party at the time of installation. Now the industry got the ETP performance evaluation done through the third party and the copy of ETP performance evaluation report is enclosed as **Annexure-XIII** for your information.
ii	The solid waste generated should be properly collected and segregated. Wet garbage should be composed and dry/inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material	**Complied.** Dedicated places have been provided for storing solid waste. Installed Organic Waste Converter & Vermi-compost plant for disposing wet garbage and canteen waste. Photograph of the Vermi Compost plant and its design capacity is enclosed as **Annexure-XIV**. Inorganic salts are being disposed to TSDF Visakhapatnam whereas the organic wastes are being disposed to cement plants for co-incineration (Alternate Fuel) as per the conditions stipulated by the APPCB in CTO. Types of hazardous waste and its mode of disposal is enclosed as **Annexure-XV.**
Iii	Diesel power generating sets proposed as sources of backup power for elevators and common area illumination during operation phase should be of enclosed type and conform to rules made under the environment (protection) Act,1986. The height of stack of DG sets should be equal to the height needed for the	**Complied by the industry.** The Diesel generators are provided with acoustic enclosures and the stack height of the same is as per the norms prescribed by the Board. Using only low Sulphur diesel for operation of the DG sets.

	combined capacity of all proposed DG sets. Use low sulphur diesel. The location of the DG sets may be decided with in consultation with Andhra Pradesh State Pollution Control Board.	
Iv	Noise should be controlled to ensure that it does not exceed the prescribed standards. During nighttime the noise levels measured at the boundary of the periphery of the plot shall be restricted to the permissible levels to comply with the prevalent regulations.	**Complied.** The industry is regularly monitoring the noise levels in & around the factory premises and found values are well within the norms. The industry is taking all possible measures to control the noise pollution. Noise levels monitored by the industry are enclosed as **Annexure-XVI**.
V	The green belt of adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.	**Complied.** The industry has planted more than 500000 saplings in and around the premises. Photographs of the Green belt is enclosed as **Annexure-XVII**.
vi	Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period	**Complied by the industry.** Weep holes are provided in the compound walls to ensure natural drainage of rainwater in the catchment area during the monsoon period. In addition to that Well-designed drainage system is in place for the entire premises.
vii	Rain water harvesting for roof run-off, as plan submitted should be implemented. Before recharging the surface run off. pre-treatment must done to remove suspended matter,	**Please refer below:** The rainwater of the entire premises is being collected in a pond within the industry for naturally recharging the ground water and the same is being reused for utilities (if requirement arises). Photograph of the pond within the premises is enclosed as **Annexure-XVIII.**
viii	The ground water level and its quality should be monitored regularly in consultation with Central ground water authority	**Complied by the industry.** Industry has provided 04 piezo wells within the factory premises for monitoring the Ground water Levels and quality. These wells are being monitored on quarterly basis through third party (MoEF&CC approved Laboratory). Layout of piezo wells and copy of ground water report is enclosed as ***Annexure -XIX*** and **Annexure-XX** respectively.

ix	Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized	**Complied.** There is no traffic congestion near entry & exist points. The industry is using its own Road & parking area and no public space is being utilized. Road marking in Google map and parking area is enclosed as **Annexure-XXI** and **Annexure-XXII** respectively.
x	A report on the energy conservation measures confirming to energy conservation norms finalized by Bureau of Energy should be prepared incorporating details about building materials & technology & Factors etc and submit to the Ministry in three months' time.	**Complied.** The study has been done on energy conservation measures and report is in place. The industry has appointed one expert energy auditor on permanent roles of the Company for Energy management & auditing. Regular reports will be generated from now onwards.
xi	Energy conservation measure like installation of CFLs/TFLs for the lighting the areas outside the building should be integral part of the project design and should in place before project commissioning. Use CFL and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/rules of the regulatory authority to avoided mercury contamination. Use of solar panels may be done to the extent possible.	**Complied.** CFLs/TFLs for the lighting area was an integral part of the project and the industry has replaced all CFL/TFL s with LED lights for lighting purpose in and around the premises. Electrical and electronic waste is being disposed to Recyclers Authorized by APPCB. Copy of recent disposal of Electrical & electronic waste is enclosed as **Annexure-XXIII**.
PART-B, GENERAL CONDITIONS		
i	The environmental safeguards contained in the EIA report should be implemented in letter and spirit.	**Complied.** The industry has implemented the environmental safeguards contained in the EIA report. Copy of compliance report is enclosed as **Annexure -III**
ii	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (hard copies as well as by e -mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.	**Complied.** The industry is regularly submitting the condition wise EC compliance reports to Regional Office to MoEF & CC. The same report is being submitted to APPCB.
iii	Officials from the Regional Office of MoEF, Bangalore who would be	**Noted and is being followed.**

	monitoring the implementation of environment safeguards should be given full cooperation, facilities and documents /data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional Office of MoEF, Bangalore.	
iv	In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by this Ministry	**Agreed to comply.** There are no changes in the project. The industry will approach the Ministry in case of any changes in the scope of the project.
v	The ministry reserves the right to added additional safeguard measures subsequently if found necessary, and to take action including revoking of the environment clearance under provisions of the environmental (protection) Act,1986, ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	**Noted and agreed to comply.**
vi	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of explosive, Fire Department, Civil Aviation department, forest Conservation Act 1980 and Wildlife (Protection) Act 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.	**Complied.** The industry obtained the approval for storage of Diesel in the individual units of SEZ and Fire NOC from AP State Disaster Response and Fire Services Department for Hetero Infrastructure SEZ Ltd & also individual units of Hetero SEZ. Copy of PESO Licenses of SEZ units are enclosed as **Annexure-X** and Fire NOC of Hetero Infrastructure is enclosed as **Annexure-XXIV** for your information.
vii	These stipulation would be enforced among others under the provisions of Water (prevention and Control of pollution) Act 1974,the Air(Prevention and control)act1981 the Environment (protection) Act 1986 ,the public Liability insurance)Act 1981 and EIA Notification,2006	**Noted and will be followed.** The industry is having public liability insurance policy which is valid up to 10/11/2023. Copy of PLI policy is enclosed as **Annexure-XXV**.
viii	The project proponent should advertise in at least two local Newspapers widely circulated in the region one of which shall be in the	**Noted and complied.** The industry has advertised about Environmental clearance in in two local

	vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Kerala Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forest at http;// www.envfor.nic.in The advertisement should be within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.	newspapers and the copies already submitted to the Regional Office. As informed earlier, we couldn't find/ misplaced the advertisement published in English paper due to shifting of the office several times since 2010. Copy of the Paper advertisement is enclosed as **Annexure -XXVI**.
ix	Environmental clearance is subject to final order of the Hon'ble supreme court of India in the matter of Goa Foundation V/s Union of India in Writ petition (Civil) No.460 of 2004 as may be applicable to this project.	**Noted and agreed.**
x	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, with a period of 30 days as prescribed under section 11 of the National Environment Appellate Act,19987	**Noted and accepted**
xi	A copy of the clearance letter shall be sent by the proponent to concerned panchayat, Zilla parishad/Municipal Corporation, Urban Local Body and the Local NGO, if any from whom suggestions/representation ,if any were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent	**Complied.** The industry has submitted Copy of Environmental Clearance letter to the concerned Village Panchayat.
xii	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically .It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sect oral parameters, indicated for the project	**Complied.** EC Letter & Its compliance status is available in the Company website www.hetero.com. Compliance of EC conditions are being sent to Regional Office, MoEF & CC regularly. Monitoring data is being submitted regularly to SPCB on monthly basis.

	shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.	The industry has Installed 03 No CAAQM stations in the premises and the data is being displayed at the Main Gate through Digital/LED display.
xiii	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment(protection) Rules,1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail	**Complying.** The industry is regularly submitting Environmental statement to APPCB before 30th September of every year and is uploaded in Company website www.hetero.com. Copy of latest Environmental statement is enclosed as **Annexure-XXVII.**

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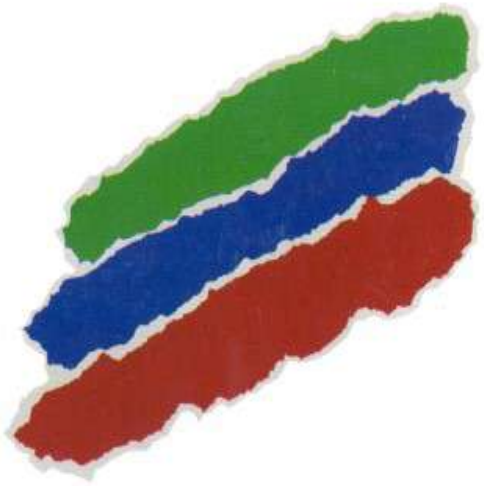
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Monitoring Study around the marine outfall point of Hetero Infrastructure SEZ Ltd. in the coastal waters off Nallamattipalem

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February 2023

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PR E F A C E

M/s. Hetero Infrastructure SEZ limited, Rajayyapeta village, Nakkapalli Mandal, Visakhapatnam district approached CSIR-National Institute of Oceanography (CSIR-NIO), Regional Centre at Visakhapatnam to carry out the post project monitoring of marine environment at its marine outfall point (MOP) to know the impacts, if any on the ecology, water and sediment quality due to the release of treated effluent from Hetero chemical complex. In this connection, CSIR-NIO received a service order (No. 4900198745) from Hetero Infrastructure SEZ Limited on 29th April 2022. CSIR-NIO conducted a field campaign on 7th May 2022 in the marine outfall region of M/s Hetero Chemical Complex for *in-situ* observations and sample collection for the comprehensive study on water quality, biological, microbiological and sediment characteristics of the region. The following studies were carried out:

- Monitoring of physico-chemical, biological, micro-biological and sedimentological parameters in the marine environment to assess the present status of marine ecology.
- Toxicological studies to know the survival rate of the test species with the treated effluent from the guard pond of M/s Hetero Infrastructure SEZ Limited.

This report describes the results of the above studies and provides recommendations to M/s Hetero Infrastructure SEZ limited to maintain the sea water quality and health of the ecosystem in the coastal waters off Rajayyapeta.

Station: Visakhapatnam (**M S KRISHNA**)

Date: 06.02.2023 (Project Leader)

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Executive Summary

CSIR-National Institute of Oceanography (CSIR-NIO) received a work order from M/s Hetero Infrastructure SEZ Limited to conduct post project monitoring study of the marine environment around its marine outfall point (MOP) in the coastal waters of Rajayyapeta. Accordingly, CSIR-NIO carried out a field campaign in the coastal waters off Rajayyapeta on 7th May 2022 for *in-situ* observations and sample collection for physico-chemical, biological, microbiological and sedimentological parameters. Eco-toxicology (bioassay) test was conducted for four days on the treated effluent collected directly from the guard pond of M/s Hetero Infrastructure SEZ Limited using zebra fish following CPCB norms. The salient features of our investigations in this study are given below.

- ✓ The range of values observed for temperatures and salinities of the study region is normal and consistent with coastal waters of east coast of India.
- ✓ The range of concentrations observed for chemical parameters such as dissolved inorganic nutrients (nitrite, nitrate, phosphate and silicate) is normal and is concurrent with the coastal waters along the east coast of India.
- ✓ The range of values observed for pH and total suspended matter in the study region is normal and are well within the values reported for coastal waters of east coast of India. However, the range of total petroleum hydrocarbons (TPHC) found in the surface and bottom waters of this study (10.0-22.1 µg/L and 2.1-37.4 µg/L, respectively) are relatively higher than those found in the previous monitoring study conducted in this region in 2017 (1.3-10.5 µg/L and 1.7-4.7 µg/L, respectively), indicating that there is a slight increase in recent years in the TPHC input from local sources into the coastal waters of Rajayyapeta.

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✓ Mean dissolved oxygen (DO) concentrations in the surface (6.1±0.2 mg/L) and bottom (5.8±0.5 mg/L) waters of the study region are well above the threshold limit of DO concentrations for good quality of seawater (5.0 mg/L), indicating that coastal waters of this region are healthy with respect to DO concentrations.

✓ Mean values of biochemical oxygen demand for three days (BOD_3) in the surface and bottom waters of this study (1.9±0.7 mg/L and 2.1±1.0 mg/L, respectively) are well within the reported BOD_3 values for east Indian coastal waters. The BOD_3 values found in this study indicate that there is no significant pollution of labile organic matter from external sources in this region during the study period.

✓ Phytoplankton biomass, in terms of Chlorophyll-a (chl-a), varied from 0.23 to 0.56 mg/m^3 (mean: 0.37 mg/m^3) and it is considerably lower than those found in this region in 2017 monitoring study (1.2 to 7.44 mg/m^3). Mean phytoplankton abundances found in the surface and bottom waters of this study (4646 Nos./L and 5675 Nos./L, respectively) are considerably lower than those reported in the previous monitoring study conducted in this region in 2017 (10860 Nos./L and 10698 Nos./L, respectively), indicating that decreased primary production in the study region when compared to 2017. However, phytoplankton diversity increased as the range of number of phytoplankton genera recorded in surface waters of this study (15-27) is considerably higher than those reported in 2017 (12-19). Though the diatoms are the most predominant contributors to the total phytoplankton abundance, their mean contribution to the total phytoplankton decreased to ~60% in this study compared to ~97% in 2017. On other hand, dinoflagellate contribution increased from ~4% in 2017 to ~23% in the present study. Cynobacterial contribution to the total phytoplankton abundance is 4.2% only. Dominant and consistently occurring species were *Chaetoceros sp., Skeletonema sp., Rhizosolenia sp., Cyclotella sp., Nitschia sp.,*

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Navicula sp., Ceratium sp., Gymnodinium sp., Trichodesmium sp., Cyanobacteria*, Thalassiothrix sp*., etc.

✓ Meso-zooplankton abundance in the present study (mean: 395 Nos./m^3) is less than one-fourth of the zooplankton abundance reported in previous monitoring study (1776 Nos./m^3) conducted in this region in 2017. Copepods are predominant in the total zooplankton abundance, with a mean contribution of 89.2% (range: 79.5-94.3%). Chaetognatha contributes from 0.7% to 9.4% (mean: 3.4%) to the total zooplankton abundance. Decapod larve are the third dominant groups in the total zooplankton abundance, with a mean contribution of 1.8% (range: 0.4-4.9%). The lowest abundant groups that contribute <1% to the total zooplankton abundance are Bivalve larvae (mean: 0.8%), Cladocerans (mean: 0.6%) and Thaliacea (0.4%).

✓ The range of macro faunal density found in this study (2650 to 3200 ind/m^2) is comparable to those found in surface sediments of east coast of India. A total of 20 fauna was found and is dominated by families of Polychaeta, with a mean contribution of ~68.3% to the total abundance. In particular *Nephteidae, Orbinidae, Eunicidae, Tereellidae, Opheliidae, Nereidae* and *Spionidae* families are common in all stations. The second largest group was Arthropoda and it was dominated by Amphipoda and Isopoda. Sipancula and Nematoda were present at all the stations. The wet weight of biomass was in the range of 4.05 to 11.27 g/m^2. The meiofauna represent the intermediate size group among the benthos. A total of 7 taxa were identified in the study area and the meio fauna was dominated by nematode, harpacticoid copepod, polychaeta, turbellaria, foraminifera, ostracoda and nauplii of crustacean group.

✓ The range of TVC found in the surface (2.9-24.6 x 10^3 CFU/mL) and bottom (0.9-34.8 x 10^3 CFU/mL) waters of this study are comparable with those

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reported in the previous monitoring study conducted in this region in 2017 (5.6-13.6x10^3 CFU/mL and 3.2-33.0 x10^3 CFU/mL, respectively). However, total coliform counts in this study (1.4-8.4 x10^3 CFU/mL in surface and 0.01-10.0 x10^3 CFU/ mL in bottom water) are considerably higher than those reported in the previous monitoring study conducted in 2017 (0.3-0.8 x10^3 CFU/ mL and 0.2-1.2 x10^3 CFU/ mL, respectively). The range of *Escherichia coli* like organisms (ECLO) found in this study (NG to 3.2 x10^3 CFU/ mL and NG to 3.1 x10^3 CFU/ mL, respectively) is comparable with those found in the previous monitoring study conducted in 2017 (1.5-3.7 x10^3 CFU/ mL and 0.7-7.4 x10^3 CFU/ mL, respectively). The *Enterococcus faecalis* like organism counts were NG to 22.9 x10^3 CFU/ mL in surface water and NG to 1.6 x10^3 CFU mL in bottom water. The *Vibrio* like organism (VLO) counts were NG to 3.0 x10^1 CFU/ mL in surface water and NG to 1.0 x10^1 CFU/ mL in bottom water. *Vibrio cholerae* like organism (VCLO) counts were NG to 3.0 x10^1 CFU/ mL in surface water and NG to 1.0 x10^1 CFU/ mL in bottom water. There is no growth of *Vibrio parahaemolyticus* like organism (VPLO) in both surface and bottom waters.

- ✓ ECLO and EFLO counts were observed in most of the stations which showed the influence of anthropogenic activities such as domestic and industrial discharge, recreational activities, open defecation in coastal (beach) regions (in villages), fisherman activities etc. The counts were higher than the reported from the coastal waters and as per standards of coastal recreational waters. VLO and VCLO counts were observed only in two stations out of the 12 stations sampled in the coastal waters off Rajayyapeta.
- ✓ Eco-toxicology (bioassay) test was conducted for four days (96 hrs) on the treated effluent collected from M/s Hetero Infrastructure SEZ Limited using zebra

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fish. During the test period of 96 hours, no mortality was observed in the control treatment and the effluent concentrations of 10%, 20% and 30%. The effluent of 50% concentrations recorded 5% mortality during the last 24 hours. Whereas, 60% effluent concentration recorded 5% mortality during the last 48 hours. The 90% effluent recorded 10% mortality while the 100% effluent recorded 25% mortality during the test time of 96 hours. These results indicate that the treated effluent collected from the guard pond of M/s Hetero Infrastructure SEZ Limited did not fulfill the CPCB norms for the bio-assay test, i.e., 90% of survival of zebra fish in 100% of treated effluent after the test time of 96 hours.

- ✓ Based on the median lethal concentrations (LC_{50}), the acute toxicity unit (TUa) of the treated effluent of M/s Hetero Infrastructure SEZ Limited was determined as 0.56 (range: 0.35 to 0.71) for zebra fish. Therefore, the quality of the treated effluent from M/s Hetero Infrastructure SEZ Limited is graded as Limited Toxic (TUa: <1).
- ✓ Based on the results of investigations carried out in the coastal waters of Rajayyapeta (large variability in the abundances of phytoplankton and zooplankton), it is recommended to carry out yearly monitoring study in the coastal waters of Rajayyapeta for next couple of years
- ✓ Based on the observations and eco-toxicology test results, it is recommended to prevent the extensive growth of algae in guard ponds of the industry in eco-friendly manner to improve the quality of treated effluent in order to comply with the CPCB norms of bioassay test for the treated effluent.

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Chapter 1
INTRODUCTION

1.1 Background information

M/s. Hetero Infrastructure SEZ Limited is a bulk drugs manufacturing company situated at Rajayyapeta village in Nakkapalli Mandal of Visakhapatnam District, Andhra Pradesh (Fig. 1.1). This plant is producing bulk drugs and their intermediates for the past few years. The industry is discharging the treated effluents into the sea through a marine disoposal pipeline at a distance of 980 m from the coast, a safe disposal point for quick dispersion, as recommended by the National Institute of Oceanography in their Rapid Marine Environmental Impact Assessment report of 2006. As per the conditions of Environmental Clearance (EC) issued by MoEF&CC, Govt. of India and consent for operation issued by APPCB, the industry is carrying regular post-project monitoring studies in the marine environment and bioassay tests for the treated effluents as a mandatory for a coastal based industry. Accordingly, CSIR-National Institute of Oceanography (CSIR-NIO), Regional Centre, Visakhapatnam has carried out post project monitoring studies in 2010, 2012, 2014 and 2017 to know the impacts if any due to the discharge of treated effluents on the seawater quality and health of the ecosystem. As part of the post project monitoring of the marine environment, once again M/s Hetero Infrastructure SEZ Limited approached CSIR-NIO, Regional Centre, Visakhapatnam for these studies to know the cumulative effects, if any, on the ecology, water quality and sediment quality due to the discharge of treated effluents into the marine environment in April 2022. After examining the proposal, CSIR-NIO agreed to carry out the study to generate one time site-specific data on oceanographic parameters and bioassay studies on the treated effluents as part of the post project monitoring.

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Fig. 1.1.: Hetero chemical complex

1.2 Objectives and scope of the Study

The generation of site-specific environmental data base is a prerequisite for the assessment of probable impact of any coastal based industry. The main objective of the study is to understand the cumulative impact, if any, on the ecosystem in the coastal waters off Rajayyapeta due to the release of treated effluent from M/s Hetero Infrastructure SEZ Limited. Hence, the scope of the present study includes the generation of reliable data, at least one time, in respect of physico-chemical, biological, micro biological and sedimentological parameters to understand the water quality and sediment quality at and around the marine out fall point (MOP; discharge point) covering 12 stations. Since the toxicological studies are important to assess the survival rate of test species in the treated effluent, the scope of the work also includes to carry out the bioassay test for four days (96 hours) on the treated effluent collected from the guard pond of M/s Hetero Infrastructure SEZ Limited using pink zebra fish as test species. The results of the monitoring study

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conducted in the coastal waters off Rajayyapeta on 7th May 2022 and the toxicological studies conducted on the treated effluent are given in this report.

1.3 Company Profile

M/s Hetero Infrastructure SEZ Limited is a Bulk Drug Manufacturing Complex with four units situated at N. Narasapuram, Nakkapalli Mandal, Visakhapatnam district of Andhra Pradesh. Out of four units, one unit is in the non-Special Economic Zone (SEZ) and the other three units are in the SEZ. M/s Hetero-Infrastructure SEZ Ltd is providing utilities & common facilities like Water, Steam, Effluent Treatment, Sewage Treatment, Scrap Yard, Hazardous waste handling etc. to all the manufacturing units located in this area.

The industrial estate is situated in Sy. Nos: 215, 286/1, 286/2, 283/1 in Ch. Laxmipuram village, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajayyapeta village, 19(part) in Peda Teenarla village, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N. Narsapuram village, Nakkapalli Mandal, Visakhapatnam District spread over an area of 139.856 ha. The various units which are working at present are as below:

- Hetero Labs Limited, Unit-III (Non SEZ)
- Hetero Drugs Limited, Unit-IX (SEZ)
- Hetero Labs Limited, Unit-IX (SEZ)
- Honour Lab Ltd, Unit-III
- Hetero Infrastructure SEZ Ltd (common facilities)

The Hetero complex (Fig. 1.2) is surrounded by open lands & salt lake in the south direction, open lands in the east direction, open lands in north direction and road connecting Upamaka village with Rajayyapeta village in the West direction, The NH 16 is in the north direction at a distance of 4 km, the nearest railway station is located at

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Narsipatnam at a distance of 9 km in the north direction. The nearest airport is located at a distance of 70 km in the north east direction at Visakhapatnam. The Bay of Bengal is in the south eastern direction of the site at a distance of 1.2km. The area is drained by the Varaha River in the northern direction up to a distance of 13km, and the Tandava River in the south west direction at a distance of 14km.



Fig. 1.2: Synoptic view of the Hetero Complex

The capital cost of the project is Rs 1500 Crores. The SEZ is designed on the basis of required infrastructure for pharmaceutical manufacturing facilities like, road, storm water network, common utilities, storage facilities for raw materials, solvents, parking areas, pollution control facilities etc.

The water requirement of the project is being met with the sea water desalination plants (Fig. 1.3) installed in the premises of Hetero Infrastructure SEZ Ltd. Vermi Compost and sewage treatment plants (Figs. 1.4 and 1.5) are provided to treat the waste water and effluent treatment plant, containing different stages of treatment (Figs. 1.6 to

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1.11) for industrial waste water. Water conservation measures were incorporated in the plumbing designs. Water recycling / reuse were adopted by way of using treated sewage for green belt development. The storm water from the site is collected in a storage tank and the same is reused for various purposes (as and when required), while the over flow is let out into the natural drain adjacent to the site. The required power is drawn from the AP TRANSCO and adopted energy efficient design for lighting and utility systems to optimize the energy requirement. Construction material was drawn from local sources. The industry installed a 6.1 MW Captive power plant for the generation of power and uses power from Hetero Wind Power.

Amenities and utilities:

A number of amenities and utilities were implemented during the operation phase to provide common infrastructure and pollution control facilities.



Fig. 1.3: Desalination plant in the Hetero Premises

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Fig. 1.4: Vermi Compost Plant



Fig. 1.5: Sewage Treatment Plant (STP)

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Fig. 1.6: Stripper and MEE (I & II)



Fig. 1.7: ATFD Connected to MEE I & II

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Fig. 1.8: HTDS Tanks covered with Hoods and connected to Scrubbers



Fig. 1.9: Biological system for LTDS & Condensate of MEE & ATFD

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Fig. 1.10: Guard ponds for storage of treated Effluent



Fig. 1.11: Aeration tanks

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Baseline environment:

The baseline environment of the project impact areas (PIA) spread over 25km radius from the site was studied for air, water, soil, noise, ecological and social economic status. The baseline status is found to be within the prescribed limits in all respects except the noise levels which are found to be above the prescribed limits during day time in the PIA.

1.4 Major Products:

Table 1.1: Hetero Labs Limited (UNIT – III) – regular products

S. No	Name of the Product	Quantity (Kg/Day)
1	Abacavir sulphate	166.67
2	Capecitabine	133.33
3	Cefidinir	166.67
4	Cefixime Trihydrate	1000
5	Cefoxitin Sodium	333.33
6	Cefpodoxime Proxetil	666.67
7	Cefuroxime Axetil	666.67
8	Citicoline Sodium	100
9	Darunavir	250
10	Dolutegravir Sodium	167
11	Domperidone	166.67
12	Efavirenz	333.33
13	Fluconazole	166.67
14	Folic acid	100
15	Gliclazide	166.67
16	Hydralazine Hydrochloride	200
17	Irbesartan	166.67
18	Lamivudine	2333.33
19	Levetiracetam	1500
20	Losartan Potassium	866.67
21	Nevirapine	1000
22	Omeprazole	166.67
23	Pamidronate sodium	166.67
24	Phenylephrine.HCl	166.67
25	Pioglitazone Hydrochloride	166.67
26	Quetiapine fumarate	333.33
27	Ritonavir	100
28	Rosiglitazone maleate	166.67

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29	Rosuvastatin calcium	100
30	Telmisartan	100
31	Tenofovir Disproxil fumerate	666.67
32	Terbinafine HCl	166.67
33	Tranexamic acid	100
34	Valsartan	500
35	Zidovudine	1166.67
Total Production capacity worst case scenario		**11816.67 Kg/day**

Table 1.2: Hetero Labs Limited (UNIT – III) – Campaign Products

S.No	Name of the Product	Quantity (Kg/Day)
1	Acyclovir	33.33
2	Alendronate Sodium Trihydrate	3.33
3	Alfuzosin Hydrochloride	26.67
4	Aliskiren Hemifumarate	6.67
5	Amlodipine Besylate	25
6	Anastrozole	1
7	Aripiprazole	33.33
8	Atazanavir Sulphate	33.33
9	Atomoxetine HCl	33.33
10	Atorvastatin Calcium Trihydrate	33.33
11	Benazepril HCl	3.33
12	Benfotiamine	66.67
13	Bicalutamide	66.67
14	Butenafine Hydrochloride	0.67
15	candesartan cilexetil	16.67
16	Cefditoren pivoxil	66.67
17	Cilazapril Monohydrate	3.33
18	Cilostazol	25
19	Citalopram Hydrobromide	66.67
20	Clopidogrel Hydrogen Sulfate	26.67
21	Daclatasvir	13.33
22	Deflazacort	1.67
23	Desloratadine	1.67
24	Didanosine	3.33
25	Dorzolamide HCl	5
26	Duloxetine HCl	25
27	Eletripton	16.67
28	Emtricitabine	33.33
29	Eplerenone	1.67
30	Eprosartan Mesylate	16.67
31	Erlotinib Hydrochloride	16.67

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32	Escitalopram Oxalate	16.67
33	Esomeprazole Megnesium	33.33
34	Etoricoxib	25
35	Ezetimibe	16.67
36	Famciclovir	26.67
37	Febuxostat	16.67
38	Fosamprenavir Calcium	66.67
39	Fosinopril Sodium	33.33
40	Glimpiride	26.67
41	Indinavir	16.67
42	Itraconazole	25
43	Lacosamide	33.33
44	Lansoprazole	33.33
45	Ledipasvir Premix	16.67
46	Letrozole Intermediate	33.33
47	Levo Milnacipran	16.67
48	Levofloxacin	25
49	Lisinopril Dihydrate	20
50	Lopinavir	66.67
51	Loratadine	6.67
52	Maraviroc	16.67
53	Methyl Cobalamin	16.67
54	Mifepristone	3.33
55	Miglitol	1.67
56	Milnacipran	16.67
57	Milnacipran HCl	1.67
58	Montelukast sodium	25
59	Moxifloxacin	26.67
60	Moxonidine	16.67
61	Nadifloxacin	0.67
62	Nelfinavir	3.33
63	Olanzapine	33.33
64	Oseltamivir phosphate	25
65	Ozagrel HCl	3.33
66	Pantoprazole Sodium	25
67	Perindopril	16.67
68	Phthalazinone	33.33
69	Posaconazole	33.33
70	Rabeprazole Sodium	25
71	Raltegravir	50
72	Ramipril	33.33
73	Ranolazine di HCl	16.67
74	Rasagiline Mesylate	3.33
75	Residronate Sodium	3.33
76	Rifaximin	33.33
77	Roflumilast	3.33
78	Rufinamide	20

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79	Rupatadine fumarate	3.33
80	Sequinavir Mesylate	26.67
81	Sertaconazole	16.67
82	Sertraline HCl	25
83	Simvastatin	66.67
84	Sofosbuvir	50
85	Stavudine	16.67
86	Sumatriptan Succinate	3.33
87	Tazarotene	1.67
88	Tegaserod Maleate	1.67
89	Temozolomide	2.67
90	Tiagabine	23.33
91	Tioconazole	26.67
92	Topiramate	16.67
93	Torsemide	2.67
94	Valacyclovir	50
95	Velpatasvir	16.67
96	Venlafaxine	16.67
97	Voriconazole	27.33
98	Zonisamide	33.33
99	Voglibose	1.66
Total Production capacity worst case scenario		**1183.33 Kg/day**

The total Production Capacity Per Month is 390T

Table 1.3: Hetero Labs Limited (UNIT – IX) – Regular Products

S.No	Name of the Product	Quantity (Kg/Day)
1	Abacavir Sulphate	333.34
2	Atorvastatin Calcium	333.33
3	Darunavir	333.33
4	Dextromethorphan	333.33
5	Diltiazem	150
6	Dolutegravir Sodium	666.67
7	Efavirenz	666.67
8	Emtricitabine	333.33
9	Irbesartan	100
10	Lamivudine	3333.34
11	Levetiracetam	1333.34
12	Lopinavir	166.7
13	Losartan potassium	666.7
14	Naproxen	100
15	Nevirapine	500
16	Olmesartan	333.34
17	Quetiapine Hemifumerate	333.34

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18	Stavudine	1000
19	Telmisartan	666.67
20	Tenofovir disproxil fumerate	666.67
21	Trazodone	333.34
22	Valsartan	666.67
23	Zidovudine	666.67
	Total Production capacity worst case scenario	**7666.69Kg/Day**

Table 1.4: Hetero Labs Limited (UNIT – IX) – Campaign Products

S.No	Name of the Product	Quantity Kg/Day
1	Aripiprazole	16.67
2	Atazanavir Sulphate	33.34
3	Atomoxetine HCL	33.34
4	Butenafine HCL	16.66
5	Candesartan CilexetilL	33.34
6	Cilazapril Monohydrate	16.67
7	Desloratadine	16.67
8	Didanosine	8.33
9	Entacapone	33.34
10	Escitalopram Oxalate	33.34
11	Etoricoxib	100
12	Etravin	8.33
13	Ezitamibe	33.34
14	Finasteride	20
15	Fosampravior	10
16	Hydralazine HCL	20
17	Levodopa	100
18	Loratadine	33.34
19	Merviroc	33.34
20	Milanacipron	8.33
21	Moxanidine	0.033
22	Nelfinavir Mesylate	8.3
23	Osaltavir Phosphate	100
24	Pioglitazone HCL	66.67
25	Ramipril	33.34
26	Rilpivirine	8.33
27	Ritonavir	66.67
28	Saquanavir Mesylate	8.33
29	Simvastatin	33.34
30	Spironolactone	33.34
31	Terbinafine	200
32	Toresemide	33.34
33	Verapamil	66.67

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34	Voricanazole	16.66
35	Zonisamide	66.67
Total Production capacity worst case scenario		**866.7Kg/Day**

Table 1.5: Hetero Drugs Limited (UNIT – IX) – Regular Products

S.No	Name of the Product	Qty per Day in Kgs
1	Acyclovir	333.33
2	Bupropion	500
3	Celecoxib	333.33
4	Citaloparm hydro bromide	133.33
5	Diclofenac Diethyl amine	333.33
6	Diclofenac Potassium	333.33
7	Diclofenac Sodium	800
8	Diolat-12	150
9	Divalproex sodium	333.33
10	Esomeprazole Magnesium Di Hydrate	133.33
11	EsomeprazoleMagnesium Tri Hydrate	233.33
12	Fenofibrate	333.33
13	Fexofenadine	300
14	Gabapentine	400
15	Metaxalone	166.67
16	Nabimitone	100
17	Pregabalin	200
18	RitanovirPremix Amorphous &Form)	666.67
19	Sevelamer Carbonate	100
20	Sertraline HCl Form-I & II	600
21	Topiramate	200
Total Production capacity worst case scenario		**3166.66Kg/day**

Table 1.6: Hetero Drugs Limited (UNIT – IX) – Campaign Products

S.No	Name of the Product	Quantity per day (in Kgs)
1	Carbidopa	20
2	Cinacalcet	16.66
3	Dabigatran Etexilate Mesylate	33.33
4	Eletripan Hydrobromide	16.67
5	Febuxostat	33.33
6	Fesoterodine	6.67
7	Ivacaftor(Premix)	10
8	Lacosamide	50
9	Levodopa	33.33
10	Lopinavir	66.67
11	Lurasidone	40
12	Mamantine HCL	33.33

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13	Mexiletine Hydrochloride	80
14	Mirabegron Alpha	20
15	Mirabegron Beta	33.33
16	Pitavastatin	16.67
17	Prasugrel Hydrochloride	17
18	Relaxifene Hydro chloride	33.33
19	Risidronate Sodium	16.67
20	Rilpivirine Hydrochloride	16.67
21	Rivastigmine Base	50
22	Rizatriptan	16.67
23	Rosuvastin	50
24	Rufinamide Premix	30
25	Rufinamide	33.33
26	Silodosin	6.67
27	Sodium Zirconium Cyclosilicate	50
28	Valgaciclovir	33.33
29	Zafirlukast (Amorphous)	10
30	Zolmitriptan	10
31	2-Acetoxy ethyl acetoxymethylethe	2000
32	Validation batches for Samples	100
Total Production capacity worst case scenario		**366.66Kg/day**

Table 1.7: Effluent generation per day

S. No.	Unit	HTDS & HCOD (KLD)	LTDS & LCOD (KLD)	RO Rejects (KLD)	Domestic (KLD)	Total Effluent Generation (KLD)
1	HDL - IX	62.16	2.5		25	89.66
2	HLL - IX	101.1	4		25	130.1
3	HLL - III	261	32		60	353
4	Honour	30.87	5.35		10	46.22
5	Hetero Infra	--	35.504	30	8	73.504
Total		**455.7**	**79.354**	**30**	**128**	**692.484**

Table 1.8: Water Consumption as per Consents

S. No.	Unit	PURPOSE (KLPD)				Total Water Consumption (KLPD)
		Process & washings	Cooling	Domestic	Additional Water to RO	
1	HDL - IX	62.79	50	25	0	137.79
2	HLL - IX	101.13	70	25	0	246.13

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3	HLL-III	261	161	70	0	492
4	Honour	32.23	80	10	0	122.23
5	Hetero Infra	--	--	10	107	447

Table 1.9: Details of boilers

S. No.	Capacity
1	20 TPH
2	1x 45 TPH
3	1 x 20 TPH
4	1x 12 TPH

1.5 Green Belt Development

Green belt is recommended as one of the major components of the Environmental Management Plan. The existing industry has green belt and the management emphasizes the development of further greening of the site to enhance environmental quality through mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, consumption of treated effluent, prevention of soil erosion, and creation of the aesthetic environment. The greenbelt is in an area of 124.5 acres. The enhancement of the green belt involved the plantation of small species. Proper attention and management are being taken up by the firm to maintain the survival rate of the planted species. For plantation of the small plants digging pits are very important for preparing the soil environment near the roots of the plants. The size of the pit will be optimum enough to supply required nutrients to the roots of the plant. The usual method is to dig a pit of required size three to four months before planting of the species, which is generally done at the break of the monsoon. The pits of 45 cm x 45 cm x 45 cm size in the case of hardier spices like Eucalyptus, Shisham, Acacia etc., but larger pit size is preferred for fruit yielding trees like mango, Jamun etc. 1m x 1m x 1m pits may be used for plantation of other trees. The

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soils of the plant side will be mixed with 1/3 farmyard manure before refilling about a week prior to planting.

M/s. Hetero Labs Ltd. units are having good environment management plan and made this as part of their corporate policies. The firm has considered Safety, Health and Environmental protection as an integral part of their business. As a part of the environmental management plan the firm established and developed a green belt in and around each block of the plant (Figs. 1.13 to1.18).



Fig. 1.12: Green Belt inside the factory

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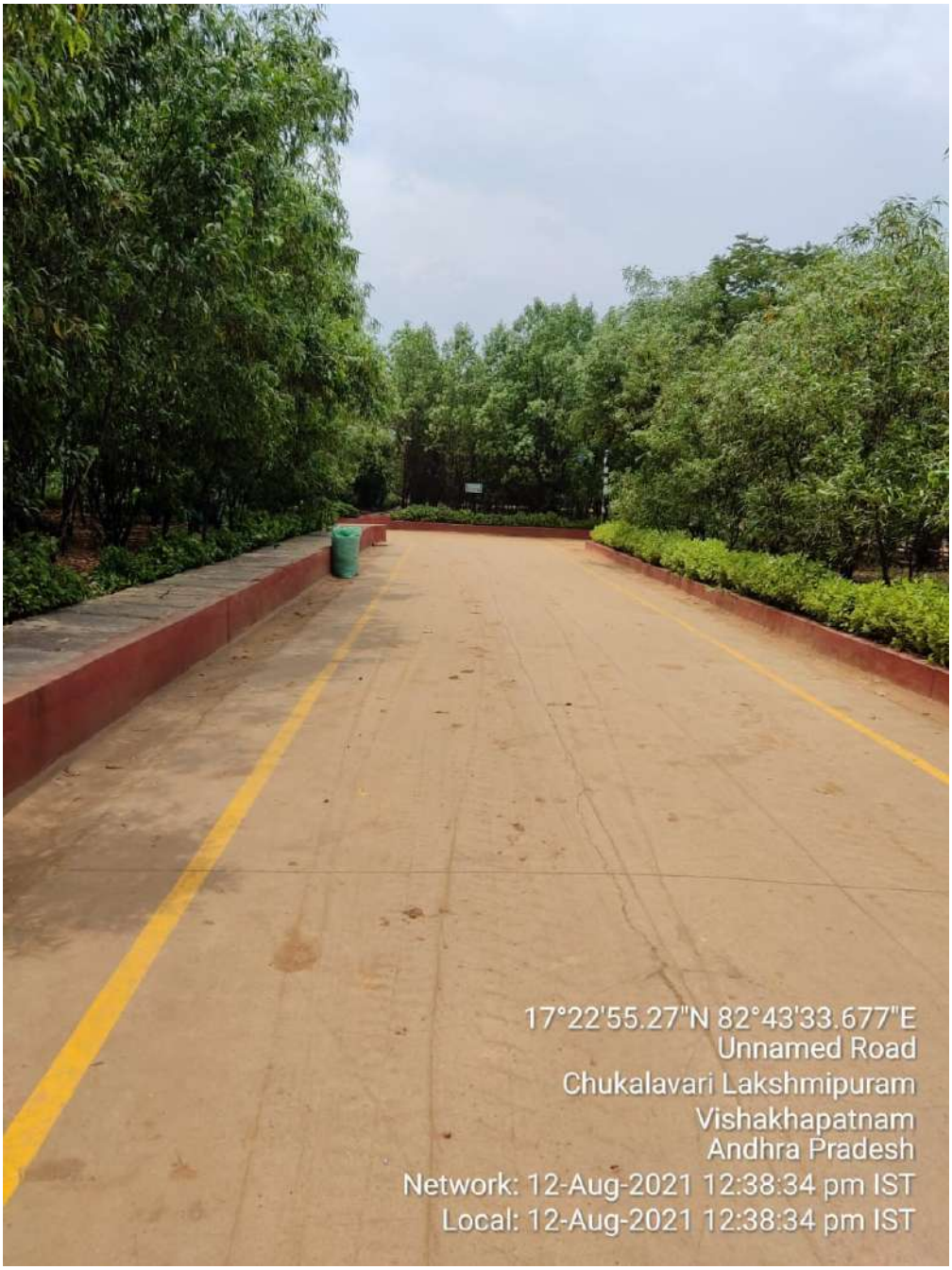


Fig. 1.13: Green Belt within the factory

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Fig. 1.14: Green Belt in ETP area



Fig. 1.15: RCC Road connected to Boilers with Green Belt

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Fig. 1.16: Green Belt in the Hetero premises

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Fig. 1.17: Green Belt inside the company

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Chapter 2

SAMPLING AND METHODS

1.1. Sample collection

A field campaign for in-situ observations and sample collection in the coastal waters of Nallamattipalem was conducted on 7th May 2022 on a mechanized fishing boat. Samples for physico-chemical, biological, microbiological and sedimentological parameters were collected at selected 12 stations following Paris Commission Guidelines. Stations were fixed in all four directions with a distance of 0.5 km, 1.0 km and 2.0 km from the marine outfall point (MOP) (Fig. 2.1; Table 2.1). Details of the station locations such as latitude, longitude and water column depth were provided in Table 2.1. Treated effluent was collected directly from the guard pond of M/s Hetero Chemical Complex to conduct bio-assay (eco-toxicity) tests and to examine the concentration levels of heavy metals in the treated effluent

A Niskin water sampler (10L, plate. 2.1) was used to collect water samples from surface and near bottom in coastal waters off Nallamattipalem at all stations shown in Figure 2.1. Water samples were collected in pre-cleaned glass/plastic bottles as soon as the water sampler was brought onto the deck (Plates 2.2 and 2.3). The samples in duplicate were fixed immediately for dissolved oxygen (DO) after collection on deck. Samples for phytoplankton were collected in narrow mouth self-sealed 1 litre PVC bottles and added Lugols Iodine (10%) solution as a preservative. Phytoplankton samples were collected in both surface and bottom waters at each station. Meso zooplankton from the surface waters was collected by towing the bongo net fixed with a flow meter. Zooplankton samples collected in the bucket that was fixed at the end of the bongo net were removed and transferred the sampled into a PVC jar as depicted in plates 2.4 and 2.5. The volume of

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water filtered through the bongo net was calculated from the flow meter reading. Formalin was added as a preservative to the zooplankton sample and brought to the shore laboratory for further analysis. Surface sediment collected using Van Veen grab sampler (Plate 2.6) and sieved for benthic organisms through the benthic sieve (Plate 2.7). Benthic organisms (both macro and meio-fauna) were separated from surface sediment by washing the sediment sample on the benthic sieve with a gentle flow of water to remove clay and silt particles. Benthic organisms retained on the sieve were transferred to a PVC jar and added Rose Bengal as a preservative. Collection and laboratory analysis of phytoplankton, zooplankton and benthic fauna were given in the methodology section (Section 2.2.2).

For Biochemical Oxygen Demand (BOD) samples were collected in air-tight glass bottles and kept in the BOD incubator for five days. After five days, samples were fixed with Winklers A and B reagents for the determination of DO in the sample. Samples for dissolved inorganic nutrients were collected in plastic bottles and kept frozen until the samples reached the shore laboratory. Samples were preserved in a -20^{o}C deep freezer at the shore laboratory until the analysis is performed. Standard methods have been employed to analyse chemical constituents in seawater samples collected for this study. The collection of water samples from Niskin sampler was shown in plates 2.2 and 2.3, and towing of zooplankton (bongo) net and collection of zooplankton sample from net-bucket were shown in plates 2.4 and 2.5. Surface sediments were collected using Van Veen grab sampler (Plate 2.6) and benthic organisms from surface sediment were separated using benthic sieve (Plate 2.7).

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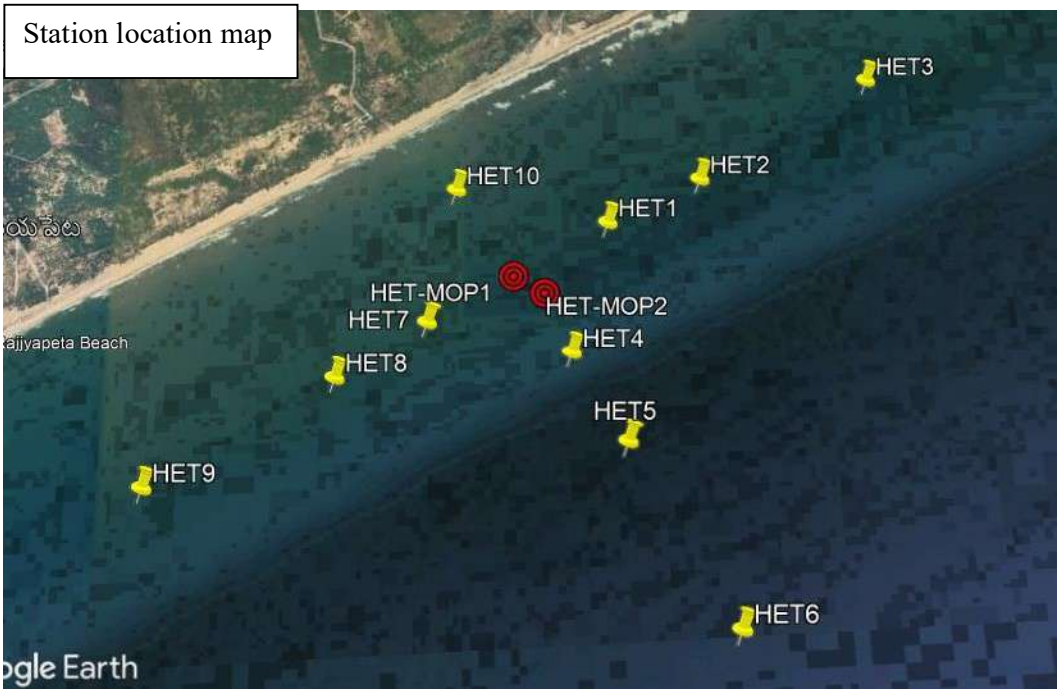


Fig. 2.1: A map showing station locations in the study area, i.e. coastal waters off Nallamattipalem. Red circles show the MOPs of M/s Hetero Chemical Complex. Yellow pins show the stations fixed in all four directions of the MOP with distances of 0.5 km, 1.0 km and 2.0 km from MOP.



Plate. 2.1: Niskin sampler (10L) used for collection of water samples

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Plate 2.2: Collection of samples onboard fishing trawler



Plate 2.3: Collection of waters samples from Niskin sampler

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Plate: 2.4: Towing of bongo net in surface waters for zooplankton and removal of bucket from bongo net to collect zooplankton sample



Plate: 2.5: Collection of zooplankton sample

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Plate 2.6: Van Veen grab sampler



Plate 2.7: Benthic sieve

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Table 2.1: Sampling locations in coastal waters off Rajayyapeta

Station Name	Latitude (′′N)	Longitude (′′E)
HET 1	17°21'13.56"N	82°44'45.84"E
HET 2	17°21'20.16"N	82°45'1.44"E
HET 3	17°21'35.94"N	82°45'30.66"E
HET 4	17°20'52.56"N	82°44'39.18"E
HET 5	17°20'38.22"N	82°44'47.58"E
HET 6	17°20'9.72"N	82°45'3.48"E
HET 7	17°20'58.62"N	82°44'16.02"E
HET 8	17°20'50.34"N	82°44'1.26"E
HET 9	17°20'34.86"N	82°43'31.44"E
HET 10	17°21'20.28"N	82°44'21.00"E
Hetero- MOP1	17°21'7.00"N	82°44'31.00"E
Hetero- MOP2	17°21'04.0"N	82°44'36.0"E

Table 2.2: Names of scientific and technical personnel participated in the field campaign

S. No.	Name of Personnel	Designation
1	Dr. TNR Srinivas	Senior Scientist
2	Mr. I Dhanunjaya Rao	Project Associate
3	Mr. Shrish Vashishth	Project Associate
4	Mr. Joseph Ignitiuous	Project Associate

2.2. Methodology

2.2.1. Physico-chemical characteristics

The Physico-chemical parameters were analysed through the standard procedures following Carrit and Carpenter (1966), Grashoff (1974), Suzuki and Ishimaru (1990) and

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Grassoff et al. (1992). The detailed methodology of each parameter is given below, and the instruments used in this study were given in Table 2.3. Temperature and salinity were obtained from CTD (SBE-19plus; Sea-Bird Electronics, USA) profiler.

a) pH

pH of the seawater sample collected in air-tight glass bottle (60ml) was measured using a Metrohm pH analyzer (Titrando 865). Standard buffer solutions (Merck, Germany) were used for calibration of the instrument. Based on the repeated analysis of aliquots of standards and samples, the precision of the analysis for pH is 0.002 units.

b) Dissolved Oxygen (DO)

Winkler's method was adopted for the determination of DO concentrations. A measured volume of water sample was fixed immediately after collection with the reagents Winkler's A (manganous chloride) and Winkler's B (alkaline potassium iodide). Standard titration with sodium thiosulphate (standardized with potassium Iodate, KIO_3) was adopted for the analysis purpose. Concentration of DO was expressed in mg/l. The precision of analysis, expressed as standard deviation with this method was ±0.07%.

c) Biochemical Oxygen Demand (BOD)

Samples for the determination of biochemical oxygen demand were collected in triplicate. The dissolved oxygen concentration was determined using one of the triplicate samples according to Winkler's method, as detailed above. The remaining bottles were kept in the BOD incubator for three days at 20ºC. Dissolved oxygen in these samples was determined after fixing the samples on completion of three days of incubation. BOD_3 was computed from the initial DO concentrations and expressed in mg/l.

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d) Ammonium - Nitrogen (NH_4^+ - N)

Ammonical - Nitrogen in seawater samples was determined with the indophenol blue method using trione. Care was taken for the analysis of ammonium and ammonia free distilled water was used for analysis to avoid any contamination as ammonia is highly soluble in water. The absorbance of the coloured complex was measured at 630 nm in Spectrophotometer against a standard. NH_4 - N is expressed in µmol/l and the precision of analysis, in terms of standard deviation, is ±0.02 µM

e) Nitrite - Nitrogen (NO_2^- - N)

Nitrite was determined by the method of Bend Schneider and Robinson whereby the nitrite in the water sample was diazotised with sulphanilamide and coupling with N-1-Naphthyl ethylene diamine dihydrochloride. The absorbance of the resultant azo-dye was measured at 543 nm against a standard solution. Concentrations of NO_2^-- N in seawater is expressed in µmol/l.

f) Nitrate - Nitrogen (NO_3^- - N)

Nitrate in the seawater sample was first reduced to nitrite using heterogeneous reduction by passing the buffered seawater samples through an amalgamated cadmium column and the resultant nitrite was determined as above. The measured absorbance was due to initial nitrite present in the sample and nitrite obtained by reduction of nitrate in the sample. Necessary correction was therefore applied for any nitrite initially present in the sample. Concentrations of NO_3^-- N in seawater were expressed in µmol/l. The precision of analysis for both nitrite and nitrate, in terms of standard deviation, is ±0.02 µmol/l

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g) Phosphate - Phosphorus (PO_4^{3-}-P)

Inorganic phosphate was measured by the method of Murphy and Riley in which the samples were made to react with acidified molybdate reagent and then reduced using ascorbic acid. The absorbance of the resultant phosphorous molybdenum blue complex was measured at 880 nm against a standard. Concentrations of PO_4^{3-}- P in seawater were expressed in µmol/l. The precision of analysis, in terms of standard deviation, is ±0.01 µmol/l

h) Silicate - Silicon (SiO_4^{2-} - Si)

Silicate - silicon was also estimated by reaction with acid - molybdate and ascorbic acid in the presence of oxalic acid. The interference of phosphate is prevented by addition of oxalic acid. The absorbance of the resultant silico - molybdenum blue complex was measured at 810 nm in Spectrophotometer against a standard. Concentration of SiO_4^{2-}- Si in seawater was expressed in µmol/l. The precision of analysis, expressed as standard deviation, is ±0.02 µmol/l

i) Total Phosphorus (TP)

The seawater sample was autoclaved with alkaline potassium persulphate in a closed bottle. The solution was neutralized and then estimated for phosphate as described above for phosphate – phosphorous. The total phosphorus is expressed in µmol/l.
µmol/l. The precision of analysis, expressed as standard deviation, is ±0.02 µmol/l

j) Total nitrogen (TN)

Aliquot of the seawater samples were analyzed for total nitrogen (TN) on TOC and TN analyzer (Elementar).

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k) Total suspended matter (TSM)

One litre of seawater sample was filtered through a pre-weighed Polycarbonate filter (0.22 µm; Millipore) and after filtration the filter was dried for about 2 days at 60°C. The dried filter was weighed and noted down the reading. The filter was dried again and took the weight measurement. This procedure was continued until the weight loss of the filter due to drying is zero. The weight of the material retained on the filter was considered as TSM concentration and was expressed as mg/L.

l) Petroleum Hydrocarbons (PHC)

Total petroleum hydrocarbons (TPHC) concentrations in seawater samples were determined by a standard liquid-liquid extraction method (LLE, EPA method 3510) (Morries, 2013; Ahmed et al., 2015) using Ultra Violet Spectrofluorometric (UVF) detection technique (Greason, 2009) which is more efficient and reliable for TPHC determination in water samples (Adeniji et al., 2017). Seawater sample (500ml) was extracted with HPLC grade n-hexane (20ml) three times and the combined extract was dried over anhydrous sodium sulphate to remove moisture content. Fluorescence of the extract was measured at an emission wave length of 360 nm (excitation wave length 310 nm) using spectrofluorometer (Cary Eclipse, Varian). Blanks prepared by following the same procedure which was employed for sample collection were used to correct the fluorescence of the samples. PHC concentrations in seawater were calculated from the multi-point calibration established by chrysene as a standard. Results of TPHC concentrations in seawater samples are expressed as chrysene equivalents. Repeated analysis of aliquots of samples and standards yielded ±4% of the precision for the TPHC measurements.

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2.2.2. Biological Characteristics

All analyses were conducted as per the NIO methodology manual for biological parameters, an in-house compilation based on internationally used published methods

a) Phytoplankton

1-2 litre of the water samples were collected with the help of a Niskin sampler from the surface and bottom. The collected samples were preserved with lugols iodine (10%) and few drops of 2.5 % buffered formalin. In the laboratory, phytoplankton samples were allowed to settle for 24-48 hrs. in one litre measuring jars. After the gravity settlement, the samples were concentrated into 10ml from which 1ml samples were taken and phytoplankton cells were enumerated using a Sedgwick Rafter counting chamber following a standard protocol (UNESCO, 1978). Phytoplankton cells were identified into the genus/species levels using the Olympus inverted microscope (model: IX 71) with the aid of standard taxonomic literatures of Diatoms, Dinoflagellates and Blue-green algae (Subrahmanyam, 1946).

b) Zooplankton

Zooplankton samples were collected through horizontal hauls of HT net (49.5 cm diameter and 200 µm mesh) attached with the calibrated digital flow meter to measure the amount of water filtered through the net. At each station, the net was operated for 5 minutes as shown in Plate 2.4 and the sample remained in the bucket (Plate 2.5) after filtering the seawater through the 200 µm mesh was collected in a pre-cleaned PVC bottle. The excess waters were removed using bolting paper. Zooplankton biomass was measured through the displacement method (Postel et al., 2000). After the biomass measurements, zooplankton samples were preserved in 4-5% buffered formaldehyde for further analysis. In the laboratory, 25-50% of subsamples were taken using Folsom's

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plankton splitter the subsamples were analyzed in detailed for quantitative analysis. Zooplankton samples were sorted into group levels using the standard literatures of the Conway et al., 2000 and their abundances were represented in m^3.

c) Benthos

Samples for benthos i.e., bottom living organisms, were collected using a Van Veen grab (Plate 2.6), covering an area of $0.04m^2$ and a penetration depth of 10 cm. Biota (organisms) contained in the sediment were separated by wet sieving (Plate 2.7).

(i) **Meio-fauna**

Sub-samples for meiofauna were collected from the Van Veen grab using a hand core (3 cm diameter) and preserved in formalin-Rose Bengal solution. Samples were passed through a set of two sieves; 0.5 mm and 0.045 mm mesh sieve. The material retained on the finer mesh was used for the analysis of meiofauna. All organisms were sorted and counted under binocular stereoscope microscope in the laboratory. An average of three replicates was taken for the population count and expressed as number per 10 cm^2.

(ii) **Macro fauna**

The sediment samples for macro fauna was washed through a 0.5 mm mesh size sieve and the retained samples were preserved in 10% seawater formalin containing Rose-Bengal stain. In the laboratory, the macro faunal samples were again washed through 0.5 mm mesh sieve in running water to clear adhering sediments. All stained animals were picked and preserved in 5% formaldehyde. Later organisms were sorted and counted group wise under a stereoscope zoom binocular microscope. Wet weight of major macro faunal taxa was recorded on a single pan balance. Fauna was identified as far as possible.

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2.2.3. Microbiological parameters

About 100 ml of the sample was sub-sampled into a pre-sterilized bottle for bacterial analysis. All samples were collected with precautions required for microbiological analysis.

Sample serially diluted to 3 times of 10^{-1} to 10^{-3} with sterile salt water. Heterotrophic bacterial counts were determined using R2A agar. Around 100 µl of each serially diluted water samples is plated on R2A agar plates and spread with sterile glass rod and incubated at 37 ^{o}C for 48-72 hours. The colonies formed on the plates are counted using the colony counter and represented as a number of colony forming units (CFU) per ml of water sample after considering dilution factor. Total coliform counts were obtained by plating water samples on MacConkey agar. The colonies formed on the plates are counted using the colony counter and represented as number of colony forming units per ml of water sample after considering the dilution factor. The colonies of pink-red colour and with bile precipitate are counted as ECLO on MacConkey agar plates. The colonies of colourless to pale pink are counted as EFLO on MacConkey agar plates. PALO counts were obtained by plating water samples on Cetrimide agar. The colonies exhibiting fluorescence at 250nm and a blue green pigmentation are considered PALO. VLO counts were obtained by plating water samples on TCBS agar. The colonies formed on the TCBS agar plates are counted as VLO. The colonies of yellow colour are counted as VCLO on TCBS agar plates. The colonies of bluish-green colour are counted as VPLO on TCBS agar plates.

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Table 2.3: List of instruments used for this study

S. No.	Name of the instrument	Make & Model	Parameter
1.	CTD Profiler	Sea-Bird Electronics, USA, SBE-19 plus	Temperature and salinity
2.	pH meter	Metrohm, Switzerland Titrando 830	pH
3.	DO titrator	Titrando 835; Metrohm, Switzerland	DO and BOD
4.	Spectrophotometer	Shimadzu, UV-1800	Ammonium
5.	Spectrofluorometer	Turner Designs	Chlorophyll-*a*.
7.	BOD incubator	Tempo Instrument Pvt. Ltd.; TI 500	BOD (incubation)
8.	Auto Analyzer	Skalar, The Netherlands	Nitrite, nitrate, phosphate, silicate
9.	Diaphragm pumps	KNF and Merk Millipore	Separation of particulate matter
10.	Flow Cam	Fluid Imaging Technologies, VSIV	Phytoplankton and Zooplankton
11.	Fluorescence microscope	Olympus (BX51), Nikon (Eclipse80i)	Phytoplankton and Bacteria
12.	Inverted microscope	Olympus, IX 71	Zooplankton
13.	Stereo zoom microscope	Nikon (SMZ 25)	Benthic organisms
14	Precision balance	Sartorius, Cubis	Total suspended matter

2.2.4. Bio-assay (toxicity) test

Discharges into the aquatic environment of contaminated wastewater from various industries represent a major source of aquatic pollution. Aquatic organisms are exposed to a number of pollutants emanating from various types of industries. Concern for the impact of chemical pollution on the quality of aquatic ecosystems has stimulated over 30 years of research on the biological effects of pollutants. Quantifying the ecotoxicological effects of pollutants is critical to the protection of aquatic ecosystems. Determination of water quality criteria for aquatic life is similar to the solving of most biological problems in which experimental data are obtained under controlled laboratory conditions in order to predict effects that might occur under natural conditions.

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Physico-chemical parameters are generally used for the evaluation of effluent quality. However, monitoring of these parameters alone cannot provide a measurable quantity in the toxicity assessment. Furthermore, in some cases, the quality of waste water in terms of physico-chemical parameters may conform to the permissible limits, and the wastewater may be toxic to the aquatic flora and fauna. Therefore, toxicity evaluation through bioassays forms an important and cost-effective tool in wastewater quality monitoring programmes.

Acute toxicity tests (bioassays) are generally performed to evaluate the toxicant and other materials used in the coastal environment to determine the relative sensitivity of different living organisms and permissible effluent discharge dose. It is a procedure in which the responses of aquatic organisms are used to detect or measure the presence or effect of one or more substances, in a particular ecosystem. Median lethal concentration (LC_{50}) of a toxicant is the concentration that results in the mortality of a specified portion of the population within a definite period of time. Median lethal concentration (LC_{50}) of a toxicant in an environmental medium which results in 50% mortality of test organisms within a definite period of exposure periods (such as 24 hrs, 48 hrs, 72 hrs and 96 hrs) is called LC_{50}. The LC_{50} values in turn represent the median lethal concentration or median tolerance limit.

In this study, Acute toxicity tests conducted on treated effluents were carried out using Whole Effluent Toxicity (WET) methods of USEPA to assess the potential toxicity of effluents using the zebrafish specimens of 30-35mm in length as test species, as suggested by central pollution control board (CPCB). The results of these tests can be used for a variety of functions including resource consent monitoring and compliance, toxicity identification evaluations and evaluation of effluent treatment processes. WET tests were

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performed to determine the actual impacts of effluents on organisms residing in receiving waters where the effluents were discharged.

2.2.4.1 Whole Effluent Toxicity (WET) Testing

The establishment of toxicity-based limits relies on the use of standardized laboratory toxicity tests that can assess the potential effect of effluents on aquatic life in the receiving system. Since effluents often contain complex mixtures of chemicals that are poorly characterized, a suite of acute and chronic toxicity tests (termed whole effluent toxicity, or WET, testing) is used to measure the aggregate toxicity of chemicals in an effluent (US-EPA, 1991). Whole Effluent Toxicity (WET) testing is a term used to describe the adverse effects or toxicity to a population of aquatic organisms caused by exposure to an effluent. This toxicity can be experimentally determined in the laboratory by exposing sensitive organisms to effluents using WET tests. Responses assessed usually include survival, growth, and/or reproduction. This type of test can be used to evaluate the toxicity of effluents, storm-water, or ambient surface waters. WET testing is used to assess and regulate the combined effects of all constituents of a complex effluent rather than the conventional methods of controlling the toxicity of single chemicals or constituents.

WET testing exposes laboratory populations of aquatic organisms such as fish, invertebrates, and algae to diluted and undiluted effluent samples under controlled conditions in order to estimate the environmental toxicity of that sample. The information is used to prevent the discharge of toxic amounts of pollutants to surface waters. The standardized procedures of WET tests allow one to determine the actual environmental exposure of aquatic life to effluent or ambient water without knowledge of the chemical, physical, and biological characteristics of that discharge or ambient water. Whole Effluent Toxicity (WET) testing is an important component of the US Environmental Protection

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Agency's (USEPA's) integrated approach for detecting and addressing toxicity in surface waters.

Aquatic test organisms are placed in test containers that usually contain a series of concentrations of a sample. Tests usually include 100% sample and sample mixed with various amounts of dilution water (control water containing no sample) to form a series of sample dilutions. Observations of the organism's response, such as mortality, are made at specific time intervals. The duration of the test ranges from periods as short as 40 minutes up to 7 days depending on the organisms used and whether acute or chronic effects are of interest. At the end of the test, the results are used to estimate the toxicity of the sample. Control survival must be 90% or greater for an acceptable test. The test "passes" if survival in the control and effluent concentration equals or exceeds 90%. The test "fails" if survival in the effluent is less than 90%, and is significantly different from control survival (which must be 90% or greater), as determined by hypothesis testing.

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2.2.4.2 Test Species

Acute toxicity test (bioassays) of treated effluent was carried out using the locally available zebrafish specimens of 30-35mm in length as test organisms, as suggested by CPCB (method IS:6582-1971).

Zebrafish (Danio Rerio, F. Hamilton, 1822)

The fish species selected for bioassay experiments were zebra fish, *disambiguation* (Danio rerio). The taxonomic position of the test species is given below:

Phylum: Chordata
Class: Actinopterygli
Order: Cypriniformes
Family: Cyprinidae
Subfamily: Danioninae
Genus: *Danio*
Species: *D. rerio*

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The test organism selected for toxicity tests was freshwater fish belonging to the minnow family, Cyprinidae, often called as tropical fish. It is a vertebrate model organism that is widely used in scientific research. This fish is also largely available in private ponds in different varieties. Zebra fish of pink variant was used in this study for bio-assay test on treated effluent.



Plate 2.8: Zebrafish (*Danio rerio*)

A large number (~6000) of healthy zebra fish of pink variety were procured from local commercial sources (Visakhapatnam) and transported to the Laboratory of CSIR-National Institute of Oceanography (CSIR-NIO), Regional Centre, Visakhapatnam in oxygenated polythene bags. After the arrival to the Laboratory, zebrafish were acclimatized by keeping them in large tanks with continuous aeration for a minimum period of two weeks before being subjected to bioassay experiments.

During the acclimatization period, zebra fish were fed with artificial pellet feed twice a day. Before the start of bioassay experiments, the length of the test animals was observed and found to be having a length in the range of 30-35 mm. Physico-chemical parameters of seawater in the acclimation tanks fell within the recommended optimum

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levels for the rearing of zebrafish: water temperature, (30.3±0.5 ºC), dissolved oxygen (6.8±0.2 mg/l), pH (7.6±0.2) and NH_3/NH_4 (<0.5 mg/l).

2.2.4.3 Experimental Set-up

Ground water was used throughout the experiment for the acclimatization of fish, control tank and as diluent. All the experiments were conducted at room temperature of 28 °C, with a maximum day and night variation of 2 °C. No Feed was given to test animals 48 hrs prior to the experiments or during the experiments. Different concentrations of test solutions of effluent were chosen for the following sets of experiments, under slow continuous aeration. Dissolved oxygen in the experimental and control tanks was always maintained at >5 mg/l throughout the exposure study using artificial aeration. Each set of experiment was accompanied by a Control with three replicates. Appropriate volumes of effluent concentration prepared as above were added to containers tanks containing zebrafish (*Danio rerio*) of the pink variety.

The test containers were inspected at regular intervals for recording mortality at different exposure periods of 1 hr, 6 hrs, 12 hrs and 24 hrs during the first day of the experiment followed by every 12 hrs till completion of the experiment (i.e., 96 hrs) for calculating the LC_{50} values. The dead organisms were removed immediately from tanks in order to avoid any type of bacterial contamination. Records were also maintained for any abnormal behaviour of the test animals. At the end of each test, the organisms were transferred to a clean tank for observing their recovery. The average percent mortality recorded at different test solutions in triplicate test containers during the four exposure periods was determined. The median lethal concentration (LC_{50}) values in the percentage of toxicant for zebra fish exposed to different concentrations of effluent were calculated based on the mortality rates.

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2.2.4.4. Data analysis

Mortality of test organisms for different effluent samples over different exposure periods are presented in the Results Section. The mortality values of different effluent water samples for different exposure periods (24 hrs, 48 hrs, 72 hrs and 96 hrs) were calculated following the method of log-probit transformation for time and dose-mortality curves suggested by Finney's method (1971) using LDP line software (http://embakr.tripod.com/ldpline).

Table 2.4: Summary of conditions and acceptability criteria for WET acute Toxicity Test with zebra fish as test species

Type	Comment
Test condition	Static non-renewal
Test duration	96 hrs
Temperature	>28 °C
Photoperiod	12 hrs light: 12 hrs dark
Test chamber size	25 Litres
Age of test organisms	30 Day Post Larvae
No. organisms per test chamber	30 animals
No. replicate chambers per concentration	Three
Feeding	None
Test solution aeration	Yes, >5 mg l^{-1}
Dilution water	Groundwater
Test concentrations	07 effluent concentrations and a control
Dilution series	Effluents: ±0.5 dilution series
Endpoint	Effluents: Mortality
Sample volume	Nil
Test acceptability criterion	90% survival in 100% effluent after 96 hrs

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2.2.4.5 Acute Toxicity of treated effluents with a WET test

Acute toxicity of treated effluents with whole effluent toxicity test expressed in terms of median lethal concentrations (LC_{50}) was evaluated by subjecting the acclimatized zebra fish of pink variety exposed to four exposure periods (24 hrs; 48 hrs; 72 hrs and 96 hrs) with seven different concentrations (% v/v) of effluent test solutions. Experiments were conducted under static conditions and all experimental tanks had a triplicate and each experimental set included a Control (0%). The average percent mortality recorded at different test solutions in triplicate test containers during the four exposure periods was determined.

Data on average mortality of test animals (in percentage) in different test concentrations of treated effluent collected from M/s Hetero Infrastructure SEZ Limited over four exposure periods is presented in Table 3.23. The median lethal concentration (LC_{50}) of treated effluent to test species at different exposure periods is shown in Table 3.24. No mortality was observed in control treatment during the exposure period of 96 hrs.

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Chapter 3

RESULTS AND DISCUSSION

3.1. Physico-chemical characteristics

Physical parameters such as salinity and temperature in the surface and bottom waters of the station locations were provided in Table 3.1. The results of biogeochemical parameters such as pH and Chlorophyll-*a* were provided in Table 3.2, while the concentrations of dissolved inorganic nutrients were given in Table 3.4.

Temperature ranged from 29.14 to 29.98 ºC in the surface and from 28.96 to 29.66ºC in the bottom waters of the study region (Table 3.1), with mean values of 29.59±0.23 ºC and 29.25±0.18 ºC, respectively, during the sampling period.

Table 3.1: Temperature (ºC) and salinity in the surface (SUR) and bottom (BOT) waters at the sampling stations in the study region

Station Name	Depth (m)	Temperature		Salinity	
		SUR	BOT	SUR	BOT
H1	13.7	29.98	29.20	33.43	33.38
H2	14	29.81	29.24	33.40	33.42
H3	14.1	29.75	29.29	33.40	33.38
MOP1	13.2	29.73	29.27	33.43	33.40
MOP2	14	29.63	29.38	33.45	33.37
H4	14.6	29.62	29.22	33.03	33.40
H5	17.1	29.70	28.99	33.43	33.47
H6	18.8	29.54	28.96	33.69	33.43
H7	13.1	29.14	29.36	33.69	33.40
H8	13.4	29.36	29.31	33.50	33.40
H9	13.5	29.39	29.15	33.56	33.43
H10	8.5	29.46	29.66	33.18	33.41

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Sea surface salinity in the study region varied from 33.03 to 33.69 PSU (Table 3.1), with a mean salinity of 33.43±0.18 PSU. In the bottom waters, salinity ranged between 33.37 and 33.47 PSU (Table 3.1), with a mean salinity of 33.41±0.034 PSU during the study period. The range of salinity values observed in this study are close to those reported previously from this region during April-May.

pH of the study region ranged from 8.18 to 8.28 in the surface and from 7.77 to 8.28 in the bottom (Table 3.2; Fig. 3.1), with mean values of 8.24±0.03 and 8.21±0.14, respectively. These values are concurrent with the range of pH values observed in the coastal waters off Visakhapatnam and Kakinada in the western coastal Bay of Bengal. However, the pH values found in this study are higher when compared to the pH values reported from this region in 2017 (7.4-8.0 and 7.5-8.0 in the surface and bottom waters, respectively). Phytoplankton biomass, expressed in terms of Chlorophyll-*a* (Chl-*a*) concentration, ranged from 0.23 mg/m^3 to 0.42 mg/m^3 in the surface and from 0.31 mg/m^3 to 0.56 mg/m^3 (Table 3.2; Fig. 3.1) in the bottom waters during the study period. Mean Chl-*a* concentrations in the study region are 0.32±0.1 mg/m^3 in the surface and 0.41±0.1 mg/m^3 in the bottom waters. The Chl-*a* values found in this study are remarkably lower than those reported in 2018 from this region both in surface (range: 2.43-7.44 mg/m^3) and in the bottom waters (range: 1.2-5.86 mg/m^3). The range and mean concentrations of Chl-*a* found in this study are considerably lower than those values observed in the coastal waters off Kakinada and Yanam, and in the nearby coastal location in the western coastal Bay of Bengal. Considerably lower phytoplankton biomass (Chl-*a*) in this study may be due to either lower biological production and/or higher grazing pressure.

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Table 3.2: pH and Chlorophyll-*a* in the surface (SUR) and bottom (BOT) waters at the sampling stations.

Station Name	Depth (m)	pH		Chl-*a* (mg/m^3)	
		SUR	BOT	SUR	BOT
H1	13.7	8.235	8.256	0.24	0.36
H2	14	8.281	8.228	0.28	0.56
H3	14.1	8.271	8.234	0.36	0.45
MOP1	13.2	8.247	7.769	0.25	0.31
MOP2	14	8.24	8.286	0.23	0.32
H4	14.6	8.27	8.244	0.33	0.32
H5	17.1	---	8.242	0.34	0.42
H6	18.8	8.23	8.238	0.36	0.43
H7	13.1	8.284	8.23	0.42	0.42
H8	13.4	8.245	8.283	0.31	0.38
H9	13.5	8.186	8.283	0.32	0.47
H10	8.5	8.221	8.257	-	-

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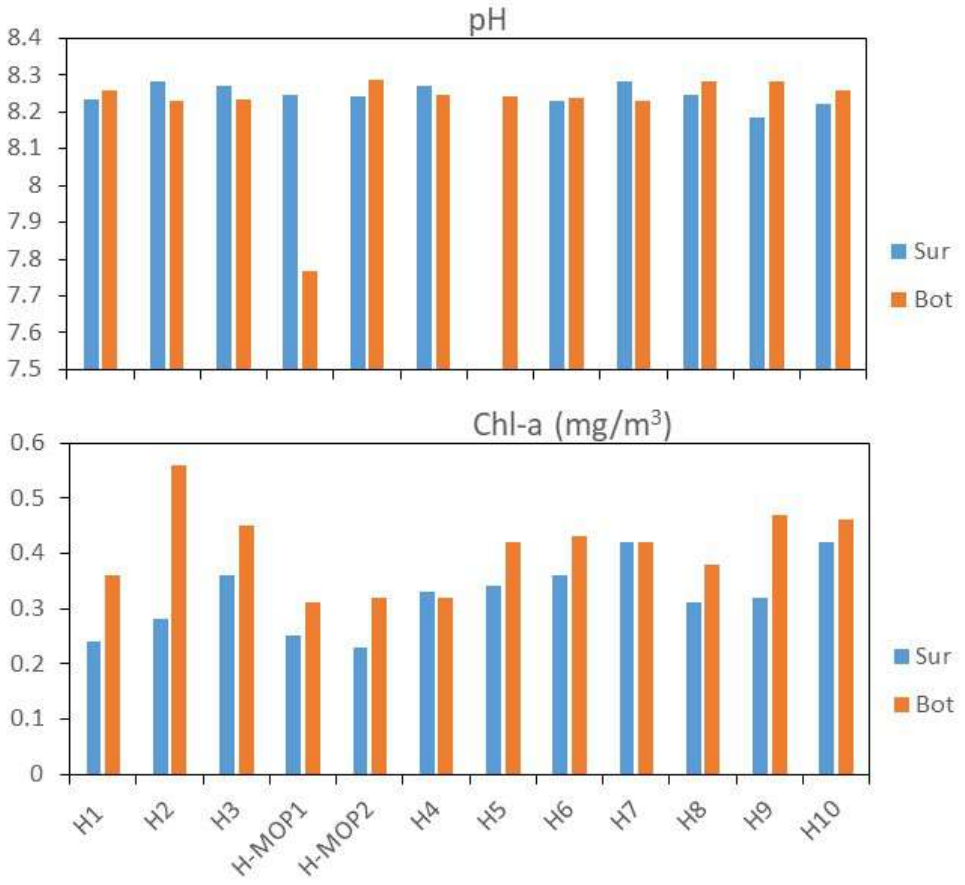


Fig 3.1: Spatial variability of (a) pH and (b) chlorophyll-a (mg/m^3) in the coastal waters off Rajayyapeta during the study period

Dissolved oxygen (DO) concentrations varied from 5.6 to 6.4 mg/L in the surface and from 4.6 to 6.3 mg/L in the bottom waters of the study region (Table 3.3; Fig. 3.2). The mean DO concentrations were 6.1±0.2 mg/L and 5.8±0.5 mg/L in the surface and bottom waters, respectively. DO concentrations found in this study are considerably higher than those found in both surface and bottom waters of this region in 2017 (2.7 – 6.0 mg/L and 3.3-5.9 mg/L, respectively). The DO concentrations found in this study are relatively higher than those found during 2010, 2014 and 2017 monitoring studies conducted in this region and more or less similar to those found during 2007 and 2012 monitoring studies conducted in this region. No significant deviation in DO concentration was found at the

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MOP locations compared to the nearby locations around the MOPs in the coastal waters of Rajayyapeta. The mean DO concentrations observed in the surface (6.1±0.2 mg/L) and bottom (5.8±0.5 mg/L) waters of the study region are above the thresh hold limit of 5.0 mg/L for healthy coastal waters. Nevertheless, the observed DO concentrations in this study are comparable to or slightly higher than those reported in the base line data (EIA report of this project) of this region, indicating that no significant change in the DO concentrations of the marine environment. Biochemical oxygen demand for three days (BOD_3) ranged from 0.6 to 3.2 mg/L in the surface and from 0.8 to 4.1 mg/L in the bottom waters during the study period (Table 3.3; Fig. 3.2). The range of BOD_3 values found in this study is relatively higher than the range of values reported from this region in 2017 (0.4-2.75 mg/L and 0.3-2.10 mg/L in the surface and bottom waters, respectively), indicating that increased input of biodegradable organic matter from local sources to this coastal region in recent years. However, mean BOD_3 values in the surface and bottom waters of this study (1.9±0.7 mg/L and 2.1±1.0 mg/L, respectively) indicates no significant pollution of organic matter in this region during the study period.

Concentrations of dissolved inorganic nutrients such as phosphate, silicate, nitrite, and nitrate in the surface and bottom waters of the study region were given in Table 3.4 and Fig. 3.3. Phosphate concentrations ranged from 0.2 to 0.9 µM in the surface and from 0.2 to 1.1 µM in the bottom waters (Table 3.4), with mean phosphate concentrations of 0.5±0.2 µM and 0.5±0.3 µM, respectively. Phosphate concentrations found in this study are slightly lower than those reported in 2017 from this region in both surface (range: 0.45 to 1.39 µM) and bottom (range: 0.85 to 1.47 µM) waters. Dissolved inorganic silicate concentrations during the study period ranged from 6.7 to 28.0 µM and from 4.6 to 25.9 µM in the surface and bottom waters (Table 3.4), with mean silicate concentrations of 13.4±5.8 µM and 13.5±5.9 µM, respectively. In contrast to that of phosphate, silicate

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concentrations are relatively higher than those observed from this region in 2017 both in the surface (range: 4.9-8.9 µM) and bottom (range: 7.4 – 15.5 µM) waters.

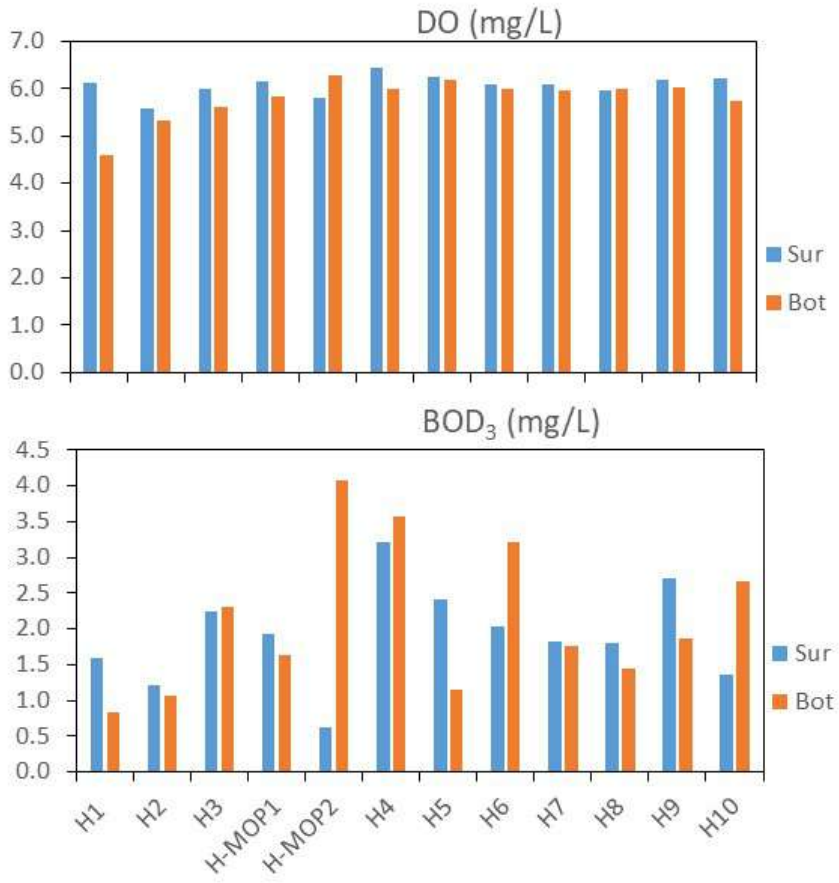


Fig. 3.2: Spatial variability of DO and BOD at various stations in the surface and bottom waters of the study region

Nitrite concentrations varied between 0.02 and 0.52 µM in the surface (mean: 0.13±0.1 µM) waters and between ND and 0.78 µM (mean: 0.23±0.2µM)) in the bottom waters. The range of nitrite concentrations observed in this study in the surface (0.02-0.52 µM) and bottom (ND-0.78 µM) waters are close to the range of values observed in 2017 from this region (0.1-0.6 µM and 0.1-0.5 µM in the surface and bottom waters, respectively). Nitrate concentrations ranged from 8.1 to 23.4 µM in the surface, with a mean nitrate concentration of 15.6±5.1 µM. These concentrations are remarkably higher than those observed in surface waters of this region in 2017 (range: 1.5 – 4.5 µM),

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whereas, in the bottom waters nitrate concentrations ranged from 5.7 to 19.9 µM, with a mean concentration of 13.0±4.4 µM. Similar to that of the surface waters, bottom waters of this study also recorded significantly higher nitrate concentration compared to those observed in the bottom waters of this region in 2017 (range: 1.5 – 3.8 µM) Both silicate and nitrate concentrations in this study are higher than those reported in 2017 from this region, whereas phosphate concentrations in this study are slightly lower than those reported in 2017 from this region. Nevertheless, nitrate concentrations in this study are relatively higher than those found in this region in 2017 and in coastal waters of the western coastal Bay of Bengal, indicating increased input of nitrate from local sources to this coastal region in recent years.

Table 3.3: Dissolved oxygen (DO; mg/L) and biochemical oxygen demand for three days (BOD_3; mg/L)) in the surface (SUR) and bottom (BOT) waters at the sampling stations.

Station	DO (mg/L)		BOD_3 (mg/L)	
Name	SUR	BOT	SUR	BOT
H1	6.1	4.6	1.6	0.8
H2	5.6	5.3	1.2	1.1
H3	6.0	5.6	2.2	2.3
MOP1	6.2	5.8	1.9	1.6
MOP2	5.8	6.3	0.6	4.1
H4	6.4	6.0	3.2	3.6
H5	6.3	6.2	2.4	1.1
H6	6.1	6.0	2.0	3.2
H7	6.1	5.9	1.8	1.8
H8	5.9	6.0	1.8	1.5
H9	6.2	6.0	2.7	1.9
H10	6.2	5.7	1.3	2.7

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Table 3.4: Dissolved inorganic phosphate (µM), silicate (µM), nitrite (µM) and nitrate (µM) concentrations in the surface (SUR) and bottom (BOT) waters at the sampling stations.

Station	Phosphate		Silicate		Nitrite		Nitrate	
	SUR	BOT	SUR	BOT	SUR	BOT	SUR	BOT
H1	0.5	0.3	8.3	11.5	0.06	0.08	11.9	9.1
H2	0.7	0.3	14.8	14.3	0.04	0.06	11.6	19.4
H3	0.3	0.4	28.0	13.2	0.52	0.56	12.7	17.2
MOP1	0.8	1.1	6.7	25.9	0.20	0.78	8.1	5.7
MOP2	0.2	0.3	14.3	15.5	0.26	0.20	22.2	8.8
H4	0.3	0.2	12.6	9.5	0.06	0.26	23.4	9.7
H5	0.5	0.7	11.5	17.8	0.06	0.14	17.9	19.9
H6	0.9	0.5	10.5	9.5	0.20	0.14	14.6	14.0
H7	0.3	0.2	16.8	0.6	0.12	0.12	10.3	14.3
H8	0.4	0.5	18.1	8.0	0.04	0.02	21.4	10.8
H9	0.4	0.6	7.9	18.8	0.02	0.18	19.6	12.5
H10	0.7	0.8	11.2	4.6	0.02	ND	13.9	14.5

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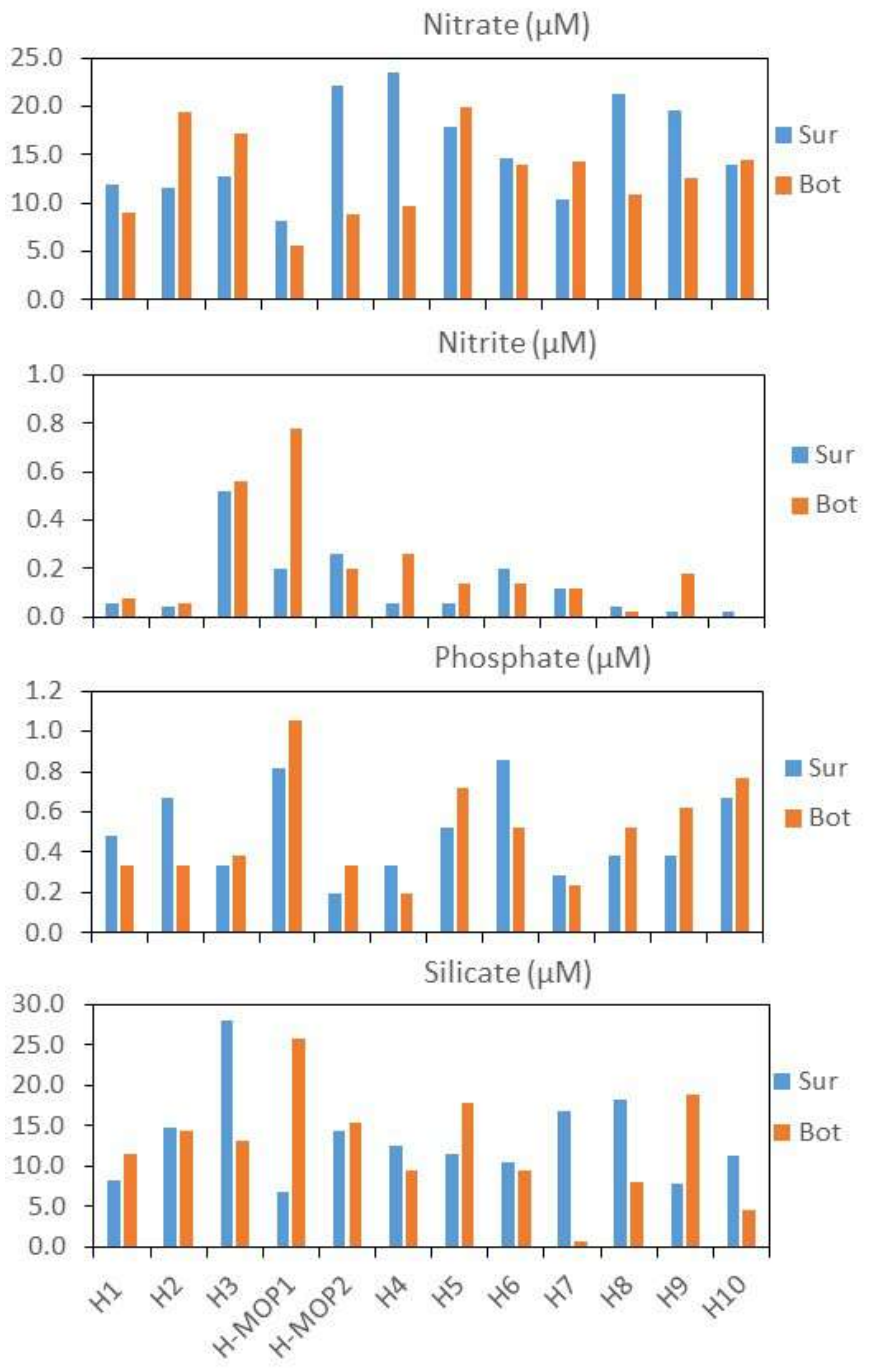


Fig 3.3: Spatial variability of dissolved inorganic nutrients (a) nitrate (µM), (b) nitrite (µM), (c) phosphate (µM) and (d) silicate (µM) in the coastal waters off Rajayyapeta during the study period

Total suspended matter (TSM) concentrations ranged from 20 to 52.3 mg/L (Table 3.5), with a mean value of 33.1±11.5 mg/L in the surface waters of the study region. Bottom

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waters recorded TSM concentrations between 24 and 51.8 mg/L (mean: 35.4±8.6 mg/L) during the study period. Both surface and bottom waters recorded similar mean TSM concentrations. TSM concentrations found in this study (range: 20–52.3 mg/L; mean: 34.2 mg/L) are consistent with the range of values reported in the previous monitoring studies conducted in this region during 2010, 2014 and 2017, whereas, relatively higher when compared to the values reported during 2007 and 2012 monitoring studies conducted in this region. Total petroleum hydrocarbon (TPHC) concentrations varied from 10.0 to 22.1 µg/L in the surface waters (Table 3.5), with a mean concentration in the study region of 14.9±4.0 µg/L. In the bottom waters, TPHC concentrations varied broadly from as low as 2.1 µg/L to as high as 37.4 µg/L (Table 3.5), with a mean concentration of 16.0±10.2 µg/L. Compared to the TPHC concentrations reported in the previous monitoring study conducted in this region in 2017 (1.3-10.5 µg/L and 1.7-4.7 µg/L in the surface and bottom waters, respectively), TPHC concentrations found in this study (10.0-22.1 µg/L and 2.1-37.4 µg/L, respectively) are relatively higher, indicating a slight increase in the TPHC input from local sources into the coastal waters of Rajayyapeta in recent years. Overall, the concentrations of physico-chemical parameters found in this study are within the range of values reported from the coastal Bay of Bengal.

Table 3.5: Total suspended matter (mg/L) and total petroleum hydrocarbon (TPHC) concentrations in the surface (SUR) and bottom (BOT) waters at the sampling stations.

Station	TSM (mg/L)		TPHC (µg/L)	
	SUR	BOT	SUR	BOT
H1	21.3	37.7	22.1	15.0
H2	20.0	24.0	10.9	---

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H3	27.2	29.6	13.7	16.1
MOP1	34.0	30.8	10.0	31.1
MOP2	31.2	35.0	14.2	14.0
H4	21.8	33.0	14.8	17.4
H5	25.8	25.2	18.0	2.1
H6	26.3	32.3	13.7	6.6
H7	52.3	51.8	21.4	12.8
H8	50.5	49.5	12.1	9.5
H9	44.5	41.0	16.7	37.4
H10	42.3	34.3	11.1	14.0

Table 3.6: Comparison of chemical constituents in the coastal waters off Rajayyapeta during different monitoring studies

Parameter	2007	2010	2012	2014	2017	2022
DO (mg/L)	5.1-6.7	3.2-5.6	5.6-7.6	2.3-5.2	2.7-6.0	4.6-6.4
BOD_5 (mg/L)	0.29-1.16	0.13-1.5	0.3-4.3	0.4-2.75	0.3-2.1	0.6-4.1
pH	7.9-8.1	8.0-8.1	8.1-8.2	7.4-8.0	7.4-8.0	7.77-8.29
TSM (mg/L)	10.6-35.2	34.2-69.6	19.0-32.8	16.4-48.8	16.8-45.6	20.0-52.3
NO_2—N (µM)	0.04-0.31	0.1-0.74	0.04-0.49	0.58-1.27	0.11-0.61	ND – 0.78
NO_3—N (µM)					1.5-4.5	5.7-23.4
PO_4^{3-}—P (µM)	0.3-1.4	0.1-1.1	0.9-2.5	1.4-4.4	0.5-1.6	0.2-1.1
SiO_4^{2-}—Si (µM)	0.8-5.6	0.7-7.2	3.6-13.6	10.3-14.5	5.0-15.6	4.6-28.0

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3.2 Biological Characteristics

4.2.1 Chlorophyll-*a*:

Chlorophyll *a* pigment in surface water ranged between 0.2 mg/m^3 and 0.4 mg/m^3 in the surface and between 0.3 mg/m^3 and 0.6 mg/m^3 in the bottom waters, with mean concentrations of 0.32±0.1 mg/m^3 and 0.41±0.1 mg/m^3, respectively (Table 3.2). The range of Chl-*a* concentrations found in this study is similar when compared to the Chl-*a* concentrations observed in the coastal waters off Kakinada and Yanam, east coast of India.

4.2.2. Phytoplankton

The detailed results of phytoplankton cell count in surface waters of the study region at all stations are given in (Table 3.9). Phytoplankton abundance in surface waters varied from as low as 3200 Nos./L to as high as 6200 Nos./L, with a mean abundance of 4646 Nos./L. The range of phytoplankton abundance found in this study is considerably lower than the range of phytoplankton abundance reported from this region in the year 2017 (range: 5430 – 15390 Nos./L; mean: 10860 Nos./L; Table 3.7). A total of 29 phytoplankton genera were recorded (Table 3.9) in this study. The number of genera recorded at various stations ranged from 15-27 which is relatively higher than the range of genera reported (12-19) in the previous monitoring study conducted in this region in 2017. Predominant species groups and their contribution to the total phytoplankton abundance were shown in Fig. 3.4. Diatoms are the most predominant in the total phytoplankton abundance at all stations (Fig. 3.5). Diatom contribution to the total phytoplankton varied from 53.3% to 76.7% (Table 3.10), with a mean contribution of 61.7% to the total phytoplankton abundance. The contribution of diatoms to the total phytoplankton in this study is relatively lower when compared to those reported in 2017 from this region. Contribution from dinoflagellates to the total phytoplankton abundance ranged from 16.3% to 27.9 %, with an average contribution of 20.8% which is significantly higher than

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those reported in 2017 from this region (3.8%). Cynobacteria appeared in all stations, except at MOP1 station, and its contribution to the total phytoplankton abundance varied from 1.5% to 8.5% only (mean: 4.2%). Average contribution of different phytoplankton groups to the total phytoplankton abundance was shown in Fig. 3.5. Dominant and consistently occurring species were Chaetoceros sp., Skeletonema sp., Rhizosolenia sp., Cyclotella sp., Nitschia sp., Navicula sp., Ceratium sp., Gymnodinium sp., Trichodesmium sp., Cyanobacteria, Thalassiothrix sp., etc. The species present in samples but in low abundances were *Coscinodiscus sp., Pinnularia sp., Cochlodinium sp., Chroococcus sp.* etc.

Phytoplankton abundance in bottom waters varied from as low as 4100 Nos./L to as high as 7200 Nos./L, with a mean abundance of 5675 No./L (Table 3.11) and it is exceptionally lower than those reported in 2017 monitoring study conducted in this region (5820-18480 Nos./L; mean: 10698 Nos./L). Phytoplankton abundance in the bottom waters (mean: 5675 Nos./L) is more or less similar compared to that of the surface waters (4646 Nos./L) of the study region. In this study, a total of 29 phytoplankton genera were recorded in the bottom waters (Table 3.11) with a range of 14-24, and it is comparable with the range of genera reported in the previous monitoring study conducted in this region in 2017 (15-22). Predominant species groups and their contribution to the total phytoplankton abundance was shown in Fig. 3.6. Diatoms are the most dominant taxa followed by dinoflagellates at all stations (Table 3.12). Diatoms contribution to total phytoplankton abundance ranged from 32.4% to 70.8%, with a mean contribution of 56.8% (Table 3.12; Fig. 3.7) and it is considerably lower than those found in 2018 in this region (mean: 89.1%).

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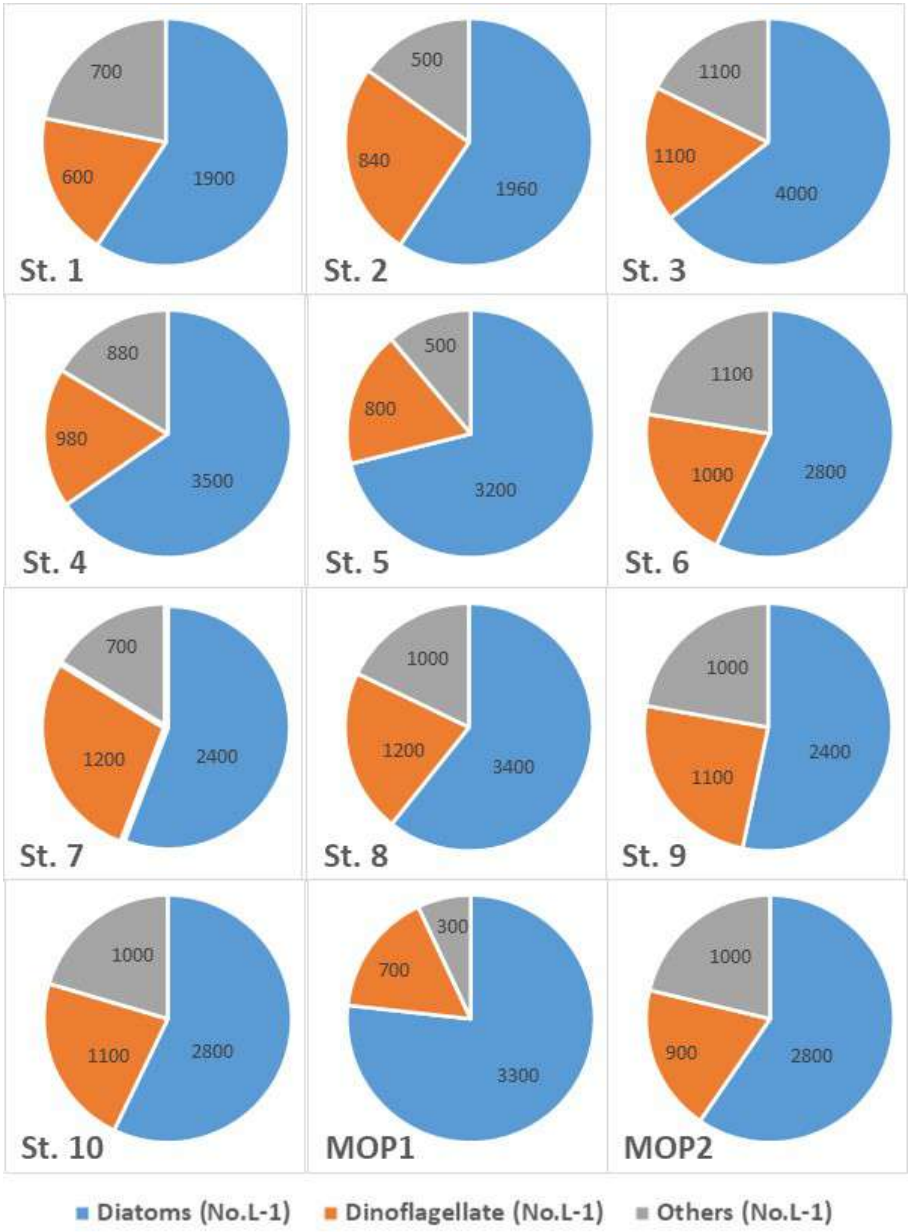


Fig. 3.4: Abundance (No/L) of diatoms and dinoflagellates in the total phytoplankton in the surface waters of the study region

Dinoflagellate's contribution to total phytoplankton abundance varied from as low as 16.7% to 39.7%, with a mean contribution of 25.0% and it is considerably higher than those reported in 2018 (range: 1.5%-5.8%, mean: 4.0%). Cynobacteria contribution to the total phytoplankton is minor as was observed in the surface waters. Compared to surface

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waters, dinoflagellate's contribution to the total phytoplankton abundance was slightly higher in the bottom waters. Predominant species present in bottom waters are *Skeletonema* sp., Rhizosolenia sp., Nitschia sp., Chaetoceros sp., Cyclotella sp., Thalassiosira sp., Cymbella sp., Peridinium sp., Gymnodinium sp., Cochlodinium sp. The average contribution of diatoms and dinoflagellates to the total phytoplankton in the bottom waters was shown in Fig. 3.7

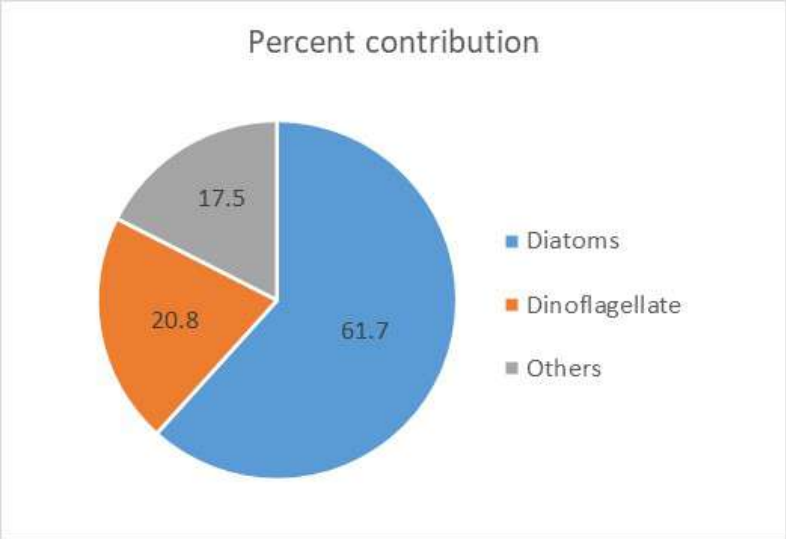


Fig. 3.5: Percent contribution of diatoms and dinoflagellates to the total phytoplankton abundance in the surface waters of the study region

Table 3.7: Comparison of the range of No. of phytoplankton genera and phytoplankton abundance (No./L) during different monitoring studies

Year	No. of Genera (range)		Cell counts (Nos./L)	
	Surface	Bottom	Surface	Bottom
2012	11-17	7-14	200-4800	100-2900
2014	6-20	7-13	2400-16600	3600-18000
2017	12-19	15-22	5430-15390	5820-18330
2022	15-27	14-24	3200-6200	4100-7200

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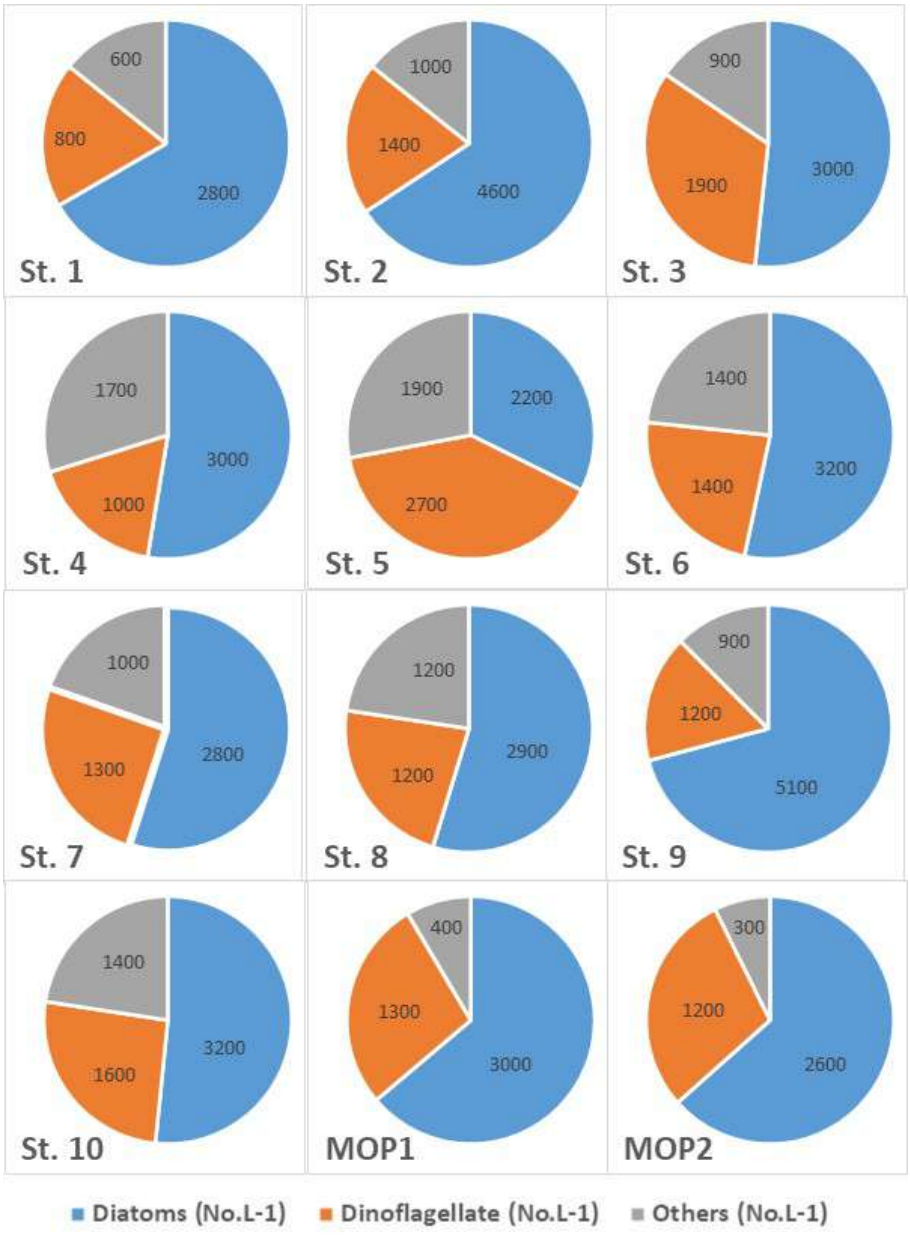


Fig. 3.6: Abundance (No/L) of diatoms and dinoflagellates in the total phytoplankton in the bottom waters of the study region

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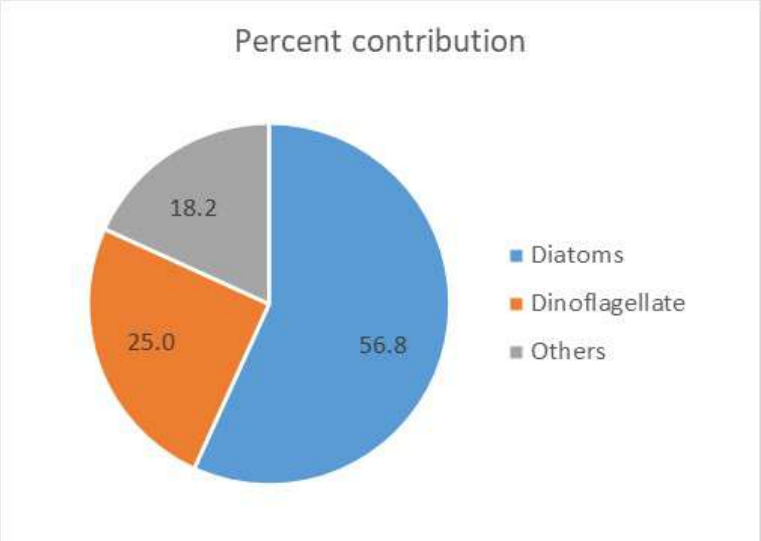


Fig. 3.7: Percent contribution of diatoms and dinoflagellates to the total phytoplankton abundance in the bottom waters of the study region

4.2.3. Zooplankton

The secondary production is the standing stock of zooplankton which feeds on phytoplankton. The seasonal average of zooplankton biomass for the Bay of Bengal (BoB) is 0.43 ml/m^3 in pre-monsoon, 0.24 ml/m^3 in monsoon and 0.99 ml/m^3 in post-monsoon season (Desai & Bhargava, 1998). According to Goswami (1999), the standing stock biomass (ml/m^3) of zooplankton in the Bay of Bengal shows wide variation in space and time in the shelf as well as in the oceanic ecosystems.

Meso-zooplankton abundance in the present study ranged from 208 to 552 No./m^3 with a mean abundance of 395 No./m^3 (Table 3.13; Fig. 3.8). The zooplankton abundance found in this study is considerably lower than the abundance of zooplankton reported in 2017 from this region (range: 500 to 3239 No./m^3; mean: 1776 No./m^3). Also, the range and mean values of zooplankton abundance found in this study are significantly lower than those reported in the coastal waters off Kakinada. However, zooplankton abundance found

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in this study is considerably higher than those reported in the previous monitoring studies conducted in this region during 2012 (57 No./m^3) and 2014 (98 No./m^3). These results indicate that zooplankton productivity has decreased in the present study region during recent years. Altogether 17 faunal groups were found in the study region. Copepods are predominant in the total zooplankton abundance (Table 3.14; Fig. 3.9) with a mean contribution of 89.2% (range: 79.5%–94.3%) (Table 3.14). Chaetognatha is the second dominant group that contributes 0.7% to 9.4% to the total zooplankton abundance, with a mean contribution of 3.4% (Table 3.14). Decapod larvae are the third dominant groups in the total zooplankton abundance, with a mean contribution of 1.8% (range: 0.4% to 4.9%) (Table 3.14). The zooplankton groups that contribute >1% to the total zooplankton abundance are Appendicularians (mean: 1.6%). The lowest abundant groups that contribute <1% to the total zooplankton abundance are Bivalve larvae (mean: 0.8%), Cladocerans (mean: 0.6%) and Thaliacea (0.4%).

Table 3.8: Comparison of the range and mean of zooplankton abundance (No./m^3) during different monitoring studies.

Year	Zooplankton abundance (No./m^3)	
	range	mean
2012	24-132	57
2014	34-169	98
2017	500-3239	1776
2022	208-552	395

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Table 3.9: Phytoplankton abundance (No./L) at the sampling stations in the surface waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP1	MOP2
Diatoms												
Chaetoceros sp.,	200	200	200	100	0	100	0	100	300	100	100	100
Skeletonema sp.,	200	100	2000	600	400	200	100	100	200	200	800	900
Rhizosolenia sp.,	400	200	0	200	200	400	400	200	300	100	500	300
Coscinodiscus sp.,	0	0	0	100	0	100	0	0	100	200	300	0
Cyclotella sp.,	200	160	200	400	600	200	400	300	0	0	400	200
Thalassiosira sp.,	100	100	0	200	200	100	200	200	400	100	100	200
Hemidiscus sp.,	0	0	0	100	100	200	400	400	200	400	0	200
Leptocylindrus sp.,	0	0	100	100	0	0	0	100	0	100	0	0
Pleurosigma sp.,	100	100	100	100	200	100	200	200	0	0	0	0
Pinnularia sp.,	0	100	0	0	0	0	0	100	0	100	0	0
Striatella sp.,	0	100	200	100	0	0	0	100	0	200	0	100
Nitschia sp.,	200	200	200	200	600	400	300	400	400	600	600	300
Synedra sp.,	100	100	0	100	200	200	0	100	0	100	0	0
Cymbella sp.,	0	100	0	300	200	200	100	200	300	100	100	200
Navicula sp.,	200	200	200	400	200	100	200	400	0	100	300	0
Thalassiothrix sp.,	100	200	800	400	200	100	0	100	0	0	100	100
Amphiprora sp.,	100	100	0	100	100	400	100	400	200	400	0	200
Dinoflagellate												
Prorocentrum sp.,	0	200	200	100	100	100	0	100	200	100	100	200
Ceratium sp.,	300	100	300	200	300	200	100	200	300	200	300	100
Peridinium sp.,	0	0	200	100	100	100	400	400	0	100	0	0
Gymnodinium sp.,	300	100	100	200	200	200	400	100	300	200	0	400
Noctiluca sp.,	0	40	0	100	0	0	0	0	0	100	0	0
Protoperidinium sp.,	0	100	100	80	100	200	200	100	0	100	0	100
Dinophysis sp.,	0	100	100	100	0	100	0	0	0	100	0	0

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Cochlodinium sp.,	0	0	0	40	0	0	100	200	300	0	300	100
Podolampas sp.,	0	200	100	60	0	100	0	100	0	200	0	0
Cyanobacteria	100	100	100	80	100	200	100	400	200	400	0	400
Chroococcus	0	0	0	0	0	0	0	0	0	0	200	0
Trichodesmium sp.,	600	400	1000	800	400	900	600	600	800	600	100	600
Total Abundance (No.L-1)	**3200**	**3300**	**6200**	**5360**	**4500**	**4900**	**4300**	**5600**	**4500**	**4900**	**4300**	**4700**

Table 3.10: Percent contribution of diatoms and dinoflagellates to the total phytoplankton abundance at the sampling stations in surface waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP1	MOP2
Diatoms	59.4	59.4	64.5	65.3	71.1	57.1	55.8	60.7	53.3	57.1	76.7	59.6
Dinoflagellate	18.8	25.5	17.7	18.3	17.8	20.4	27.9	21.4	24.4	22.4	16.3	19.1
Others	21.9	15.2	17.7	16.4	11.1	22.4	16.3	17.9	22.2	20.4	7.0	21.3

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Table 3.11: Phytoplankton abundance (No./L) at the sampling stations in the bottom waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP1	MOP2
Diatoms												
Chaetoceros sp.,	200	100	200	100	100	200	100	200	100	200	200	200
Skeletonema sp.,	600	1600	600	400	100	400	100	300	1600	400	400	600
Rhizosolenia sp.,	400	400	0	200	200	200	400	200	200	600	200	0
Coscinodiscus sp.,	0	200	200	100	200	200	200	400	300	100	0	0
Cyclotella sp.,	200	300	300	400	400	400	600	100	400	400	400	200
Thalassiosira sp.,	200	100	100	0	600	200	100	200	400	0	300	0
Hemidiscus sp.,	0	0	200	200	0	0	0	0	0	0	0	200
Leptocylindrus sp.,	0	200	100	100	0	100	200	0	600	200	400	200
Pleurosigma sp.,	100	200	200	100	200	400	0	100	400	0	0	0
Pinnularia sp.,	0	0	0		0	0	200	100	0	100	200	0
Striatella sp.,	0	100	200	0	0	0	0		0	200	0	200
Nitschia sp.,	600	200	200	600	200	600	200	400	400	200	400	800
Synedra sp.,	0	0	0	100	0	200	200	200	200	100	0	0
Cymbella sp.,	200	0	0	0	0	100	0	100	0	0	200	100
Navicula sp.,	200	200	200	400	200	100	0	200	200	400	0	0
Thalassiothrix sp.,	0	800	400	100	0	0	400	300	100	200	200	100
Amphiprora sp.,	100	200	100	200	0	100	100	100	200	100	100	0
Dinoflagellate												
Prorocentrum sp.,	0	200	100	100	100	200	0	200	0	600	200	200
Ceratium sp.,	0	300	400	100	600	400	200	400	600	400	200	200
Peridinium sp.,	200	200	200	200	800	100	0	100	0	0	0	0
Gymnodinium sp.,	200	200	1000	200	600	200	800	200	600	200	200	400
Noctiluca sp.,	0	0	0	0	100	100	0	0	0	100	0	200
Protoperidinium sp.,	0	0	200	100	200	100	200	200	0	100	200	0
Dinophysis sp.,	0	100	0	0	0	100	0	100	0	100	300	100
Cochlodinium sp.,	400	200	0	200	200	200	0	0	0	0	0	0

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Podolampas sp.,	0	200	0	100	100	0	100	0	0	100	200	100
Cyanobacteria	0	0	100	100	100	200	400	200	200	400	100	100
Chroococcus	0	0	0	0	0		0	100	100	200	100	0
Trichodesmium sp.,	600	1000	800	1600	1800	1200	600	900	600	800	200	200
Total Abundance (No.L-1)	**4200**	**7000**	**5800**	**5700**	**6800**	**6000**	**5100**	**5300**	**7200**	**6200**	**4700**	**4100**

Table 3.12: Percent contribution of diatoms and dinoflagellates to the total phytoplankton abundance at the sampling stations in bottom waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP1	MOP2
Diatoms	66.7	65.7	51.7	52.6	32.4	53.3	54.9	54.7	70.8	51.6	63.8	63.4
Dinoflagellate	19.0	20.0	32.8	17.5	39.7	23.3	25.5	22.6	16.7	25.8	27.7	29.3
Others	14.3	14.3	15.5	29.8	27.9	23.3	19.6	22.6	12.5	22.6	8.5	7.3

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Table 3.13: Total zooplankton abundance (No./m^3) at the sampling stations in the surface waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP 1	MOP 2
Hydromedusae	0.7	0.1	0	0.2	0.3	0.1	0	1.1	1.7	1.8	0.2	0.4
Siphonophore	0.2	0.7	0.5	0.1	0.4	0.4	0.4	2.1	0	1.6	0.4	1.2
Ctenophora	0.3	0.7	0.1	1.7	0.4	0.4	0.8	1.7	1.3	1.6	0.4	0.6
Chaetognatha	7.5	20.4	18.3	12.9	9.1	6.6	9.16	2.5	35.41	8.3	28.7	4.2
Copepods	326	404	388	359	322	390	442	333	493	374	258	165
Cladocerans	4.2	6.12	0.8	1.6	1.4	0.4	0.8	0.7	0.1	0.4	3.2	4.1
Ostracods	0.2	0.3	0.7	0.1	0.4	0.6	0.9	0.6	0.2	0.3	0.1	0.8
Lucifers	1.3	8.6	1.3	1.7	1.3	2	3.4	1.9	1.6	1.6	3.2	1.4
Thaliacea	1.1	0.7	0.9	0.8	0.8	0.7	0.7	0.4	0.6	0.6	3.12	5.1
Appendicularians	11.2	2.1	1.9	16.6	7.5	2	12.5	4.6	4.3	9.1	0.6	4.1
Polychaete larvae	0.8	0	0.4	0	0.8	0.4	0	0	0	0	0	3.2
Decapod larvae	6.2	8.1	6.4	7.1	9.3	6.4	8.7	5.8	2	1.7	4.1	10.1
Bivalve larvae	5.8	0	4.2	0	6.4	1.2	0	8.5	0.8	0.8	2.3	3.1
Gastropod larvae	0.4	0	0	0.9	0	0	3.1	0	4.3	0	0	4.1
Fish Eggs	0.2	0.3	0.4	0.4	1.1	1.6	1.6	2.5	6.6	1.1	0.1	0.1
Fish larvae	0	1.3	0	0.6	0.8	0.7	0.1	0.3	0	0.4	0.1	0.2
Total (No./m^3)	**366**	**454**	**423**	**404**	**362**	**414**	**484**	**366**	**552**	**403**	**304**	**208**

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Table 3.14: Percent contribution of various groups to the total zooplankton abundance at different sampling stations in the surface waters of the study region

	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	MOP 1	MOP 2
copepods	89	89	92	89	89	94	91	91	89	93	85	80
appendicularians	3.1	0.5	0.4	4.1	2.1	0.5	2.6	1.3	0.8	2.3	0.2	2.0
Decapod larvae	1.7	1.8	1.5	1.8	2.6	1.5	1.8	1.6	0.4	0.4	1.3	4.9
Bivalve larvae	1.6	0.0	1.0	0.0	1.8	0.3	0.0	2.3	0.1	0.2	0.8	1.5
Chaetognatha	2.0	4.5	4.3	3.2	2.5	1.6	1.9	0.7	6.4	2.1	9.4	2.0
Cladocerans	1.1	1.3	0.2	0.4	0.4	0.1	0.2	0.2	0.0	0.1	1.1	2.0
Thaliacea	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	1.0	2.5
Appendicularians	3.1	0.5	0.4	4.1	2.1	0.5	2.6	1.3	0.8	2.3	0.2	2.0

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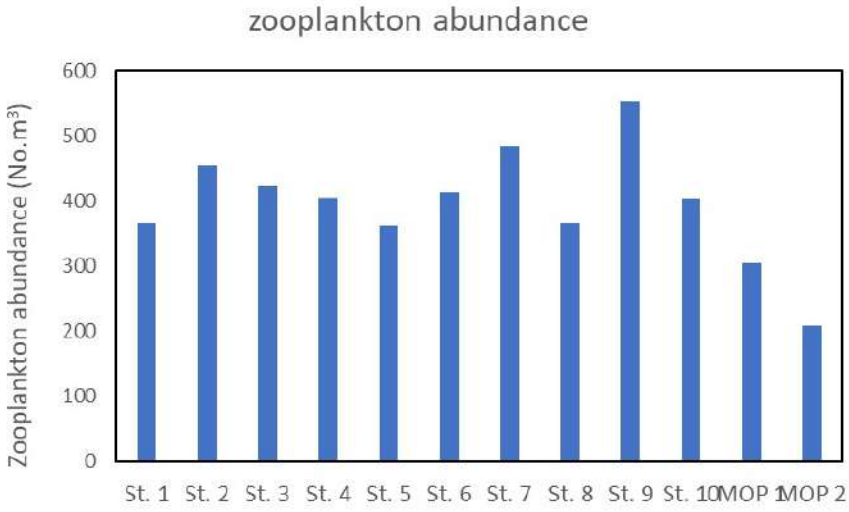


Fig. 3.8: Abundance (No/m^3) of zooplankton in surface waters of the study region

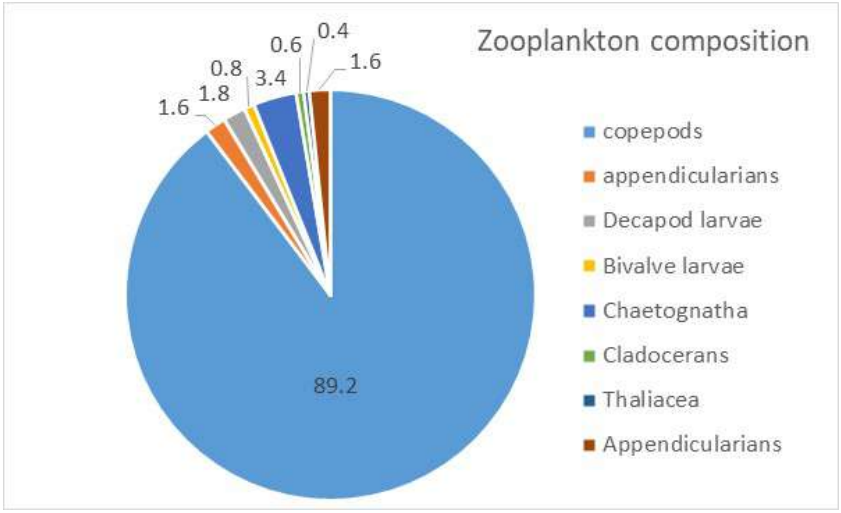


Fig. 3.9: Percent contribution of various groups to the total zooplankton abundance at different stations in the study region

3.2.3. Benthos

Benthos, the seafloor biota, contributes substantially to the secondary production of potential and sustainability of demersal or near bottom living fishable resources. The distribution of biomass production of benthos in the seas surrounding India is reported by

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Parulekar et al (1982). A number of comparative studies on benthos of various ecosystems of the seas around India are available and a resume of published results on the standing crop and production of benthos from Bay of Bengal are given in Table 3.15.

Table 3.15: Reported standing crop and production of benthos in the Bay of Bengal

	REGION	BAY OF BENGAL
Biomass (g/m^2)	**Shelf**	<0.1-98.8 (4.9)
	Slope	0.1-60.2 (4.6)
	Deep	0.1-5.2. (2.3)
Productivity ($gC/m^2/y$)	Shelf	0.6-3.1 (1.2)
	Slope	0.1-2.4 (0.8)
	Deep	0.4-1.0 (0.8)

4.2.4.1. Macro and meiofauna:

Benthic macro fauna is basically comprised of sedentary and sessile organisms, dominated by polychaete worms and Arthropods. The macro faunal density of the study area ranged from 1950 to 3500 No./m^2 (Table 3.16; Fig. 3.10). The macrofaunal density range found in this study is slightly lower than those reported in a previous monitoring study conducted in this region in 2017 (900-4650 No./m^2), but higher than those reported in 2012 (400-2575 No./m^2) and comparable with those reported in 2014 (125-3325 No./m^2) from this region (Table 3.16). A total of 27 fauna were found in this study (Table 3.17). Contribution from various groups to the macrofaunal density ranged from 1.6% to 48.2% (Table 3.18). The fauna was dominated by families of polychaeta and their contribution was in the range of 16.1% - 48.2%, with a mean contribution of 30.6% to that of the total abundance (Figs. 3.11 and 3.12). Foraminifera is the second largest group that was contributed to total density of macrofauna and its contribution ranged from 17.9% to

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37.7%, with a mean contribution of 24.1% (Fig. 3.12). Mollusca is the third largest group in the total macrofauna and it contributes 22.6% (range: 8.9% to 37.3%) to the total density of the macrofauna in the study region (Fig. 3.12).

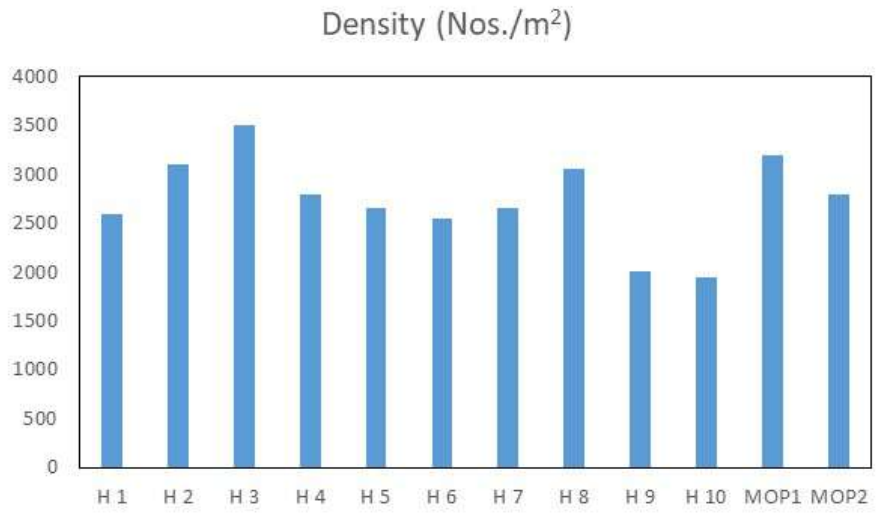


Fig. 3.10: Density of macrofauna in the surface sediments at different stations in the study region

The macro faunal density of the study area found in various previous monitoring studies was given in Table 3.16 and compared with the macro faunal density found in this study.

Table 3.16: Comparison of macrofaunal density in the study region during monitoring studies conducted in different years

Year of monitoring	Macrofaunal density (No./m^2)
2012	400 - 2575
2014	125 - 3325
2017	900 - 4650
2022 (This study)	1950 - 3500

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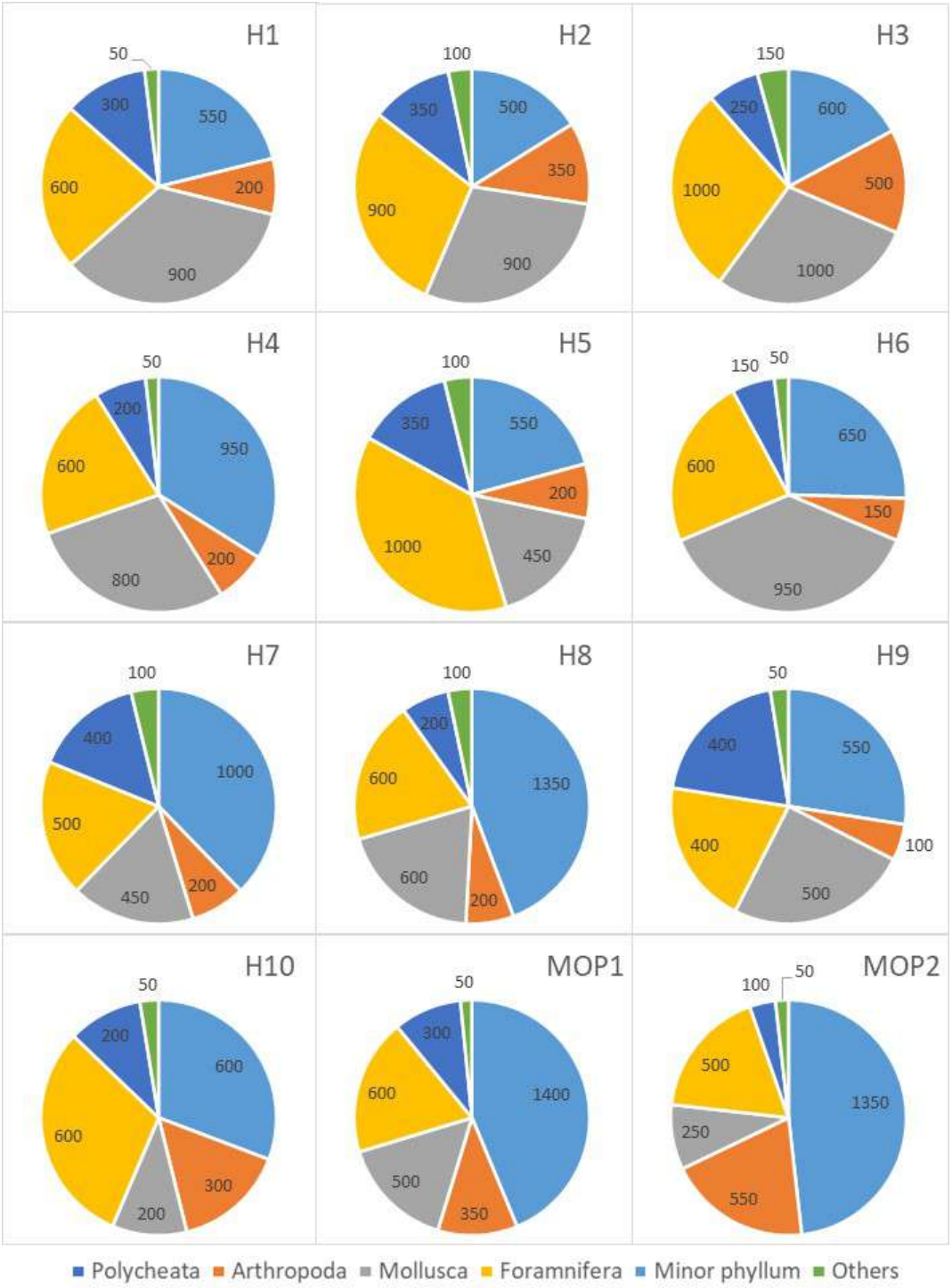


Fig. 3.11: Abundance of various groups (No./m^2) contributed to the total macrofaunal density in the surface sediments at different stations in the study region

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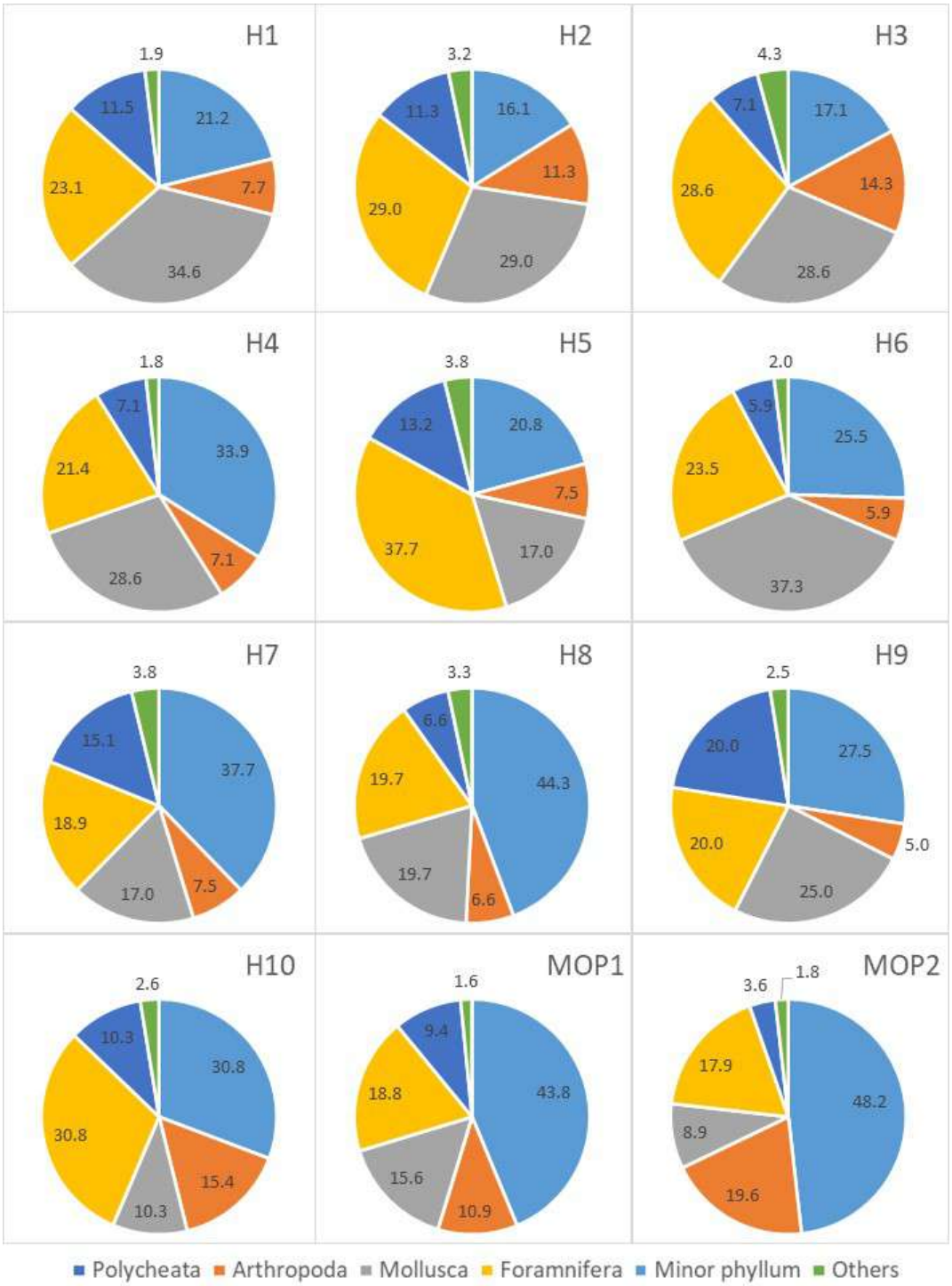


Fig. 3.12: Percent contribution of polychaeta, arthropoda, Mollusca, foraminifera, minor phylum and others to the total macrofaunal density in the surface sediments at different stations in the study region

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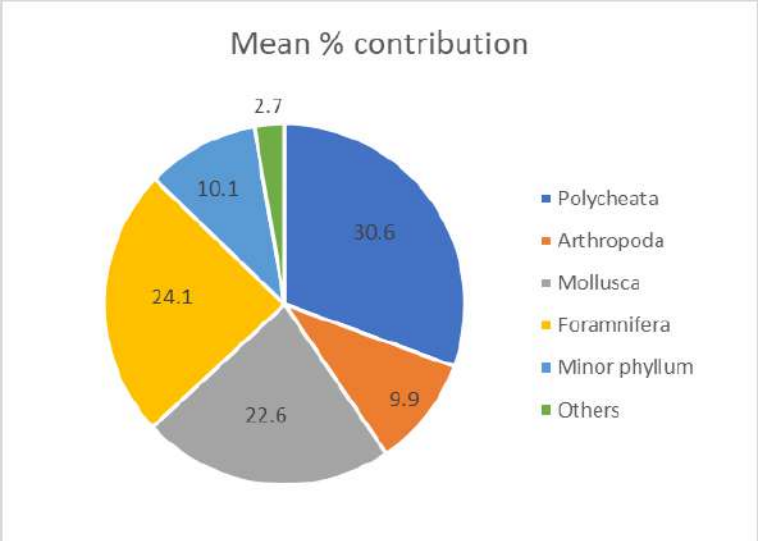


Fig. 3.13: Mean percent contribution of polychaeta, arthropoda, Mollusca, foraminifera, minor phylum and others to the total macrofaunal density in the surface sediments of the study region

The abundance of meio fauna varied from 346 No./10cm^2 to 870 No./10cm^2, with an average abundance of 539 No./10cm^2. Mean abundance of various meio faunal groups is shown in Fig. 3.14 and their percent contributions are shown in Fig. 3.15. The range of values of meio faunal density found in this study is slightly lower than those observed in a previous monitoring study conducted in this region in 2017 (416-1006 No./10cm^2) Abundance of Nematoda in this study varied from 100 to 291 No./10cm^2 (mean: 186.6 No./10cm^2) and this range is also comparatively lower than those reported in the 2017 monitoring study (311-710 No./10cm^2). Although, Nematoda are the major contributors to the total meio fauna abundance their contribution is lower in this study (34.6%) compared to the previous monitoring study (>80%), indicating increased biodiversity. Foraminiera is the second largest contributors with an average contribution of 16.6 % to the total meio faunal density. Turbellaria is the third largest contributor with a mean contribution of 8.1%. A total of 11 meio faunal groups were found in this study.

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Fig. 3.14: Mean abundance of various groups of meio-fauna in the surface sediments of the study region

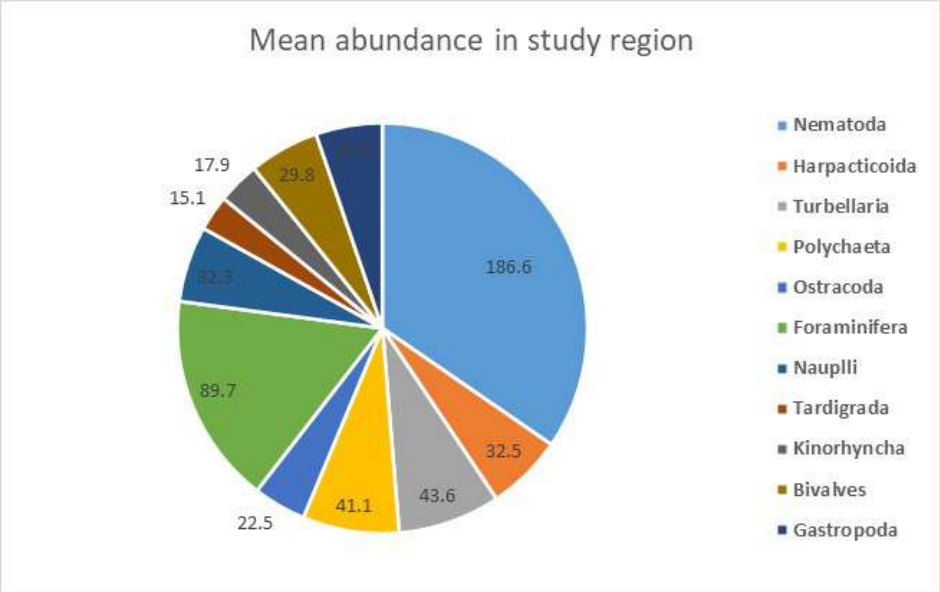
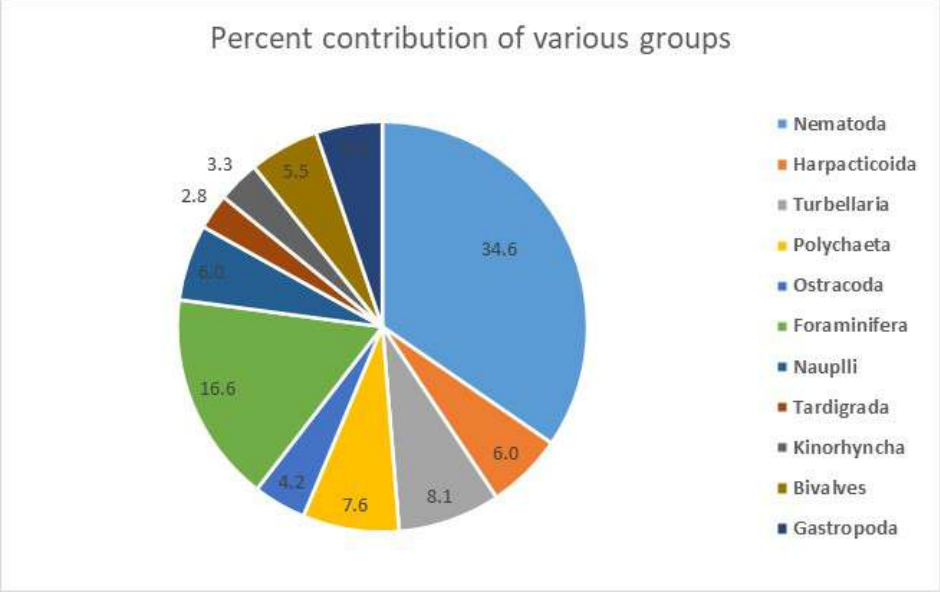


Fig. 3.15: Mean percent contribution of various groups to the total meio-faunal density in the surface sediments of the study region



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Table 3.17: Macrobenthos abundances (No/m^2) in surface sediments of the study region

SI.NO	Taxa	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H-MOP	H13
						Polychaeta							
1	Nephtyidae sp.	50	50	0	100	50	50	200	100	0	200	200	200
2	Orbinidae sp.	0	0	0	50	0	0	0	50	0	0	0	0
3	Spionidae sp.	50	50	50	100	0	50	100	100	50	100	0	100
4	Opheliidae sp.	0	50	0	100	0	0	100	100	100	0	0	0
5	Glyceridae sp.	50	0	100	0	100	50	50	50	50	50	400	400
6	Nereidae sp.	50	50	0	100	0	0	0	0	0	0	0	0
7	Pilardigae sp.	0	50	0	50	50	0	50	100	50	0	0	200
8	Aphroditidae sp.	100	0	0	0	0	100	0	200	0	0	0	0
9	Cossuridae sp.	0	0	0	0	0	100	100	0	50	50	100	0
10	Cirratulidae sp.	50	0	100	100	0	0	100	200	100	0	0	200
11	Terebellidae sp.	0	0	50	0	0	0	0	0	0	0	200	0
12	Syllidae sp.	50	50	0	50	100	0	100	50	50	0	0	0
13	Maldanidae sp.	0	0	0	0	0	50	50	0	50	50	0	0
14	Capitellidae sp.	0	0	50	0	0	50	0	0	0	0	200	100

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15	Pisionidae sp.	50	50	0	200	200	50	0	100	0	0	0	0
16	Eunicidae sp.	50	50	50	0	0	0	0	0	0	100	0	50
17	Sabellidae sp.	0	0	0	0	0	50	50	200	50	0	200	0
18	Unidentified	50	100	200	100	50	100	100	100	0	50	100	100
	Arthropoda												
19	Amphipoda sp.	50	150	300	100	100	100	100	50	50	150	50	300
20	Tanaidacea	100	200	100	50	50	50	100	150	50	100	300	200
21	Isopoda sp.	50	0	50	0	50	0	0	0	0	50	0	50
22	Cumacean sp.	0	0	50	50	0	0	0	0	0	0	0	0
	Mollusca												
23	Gastropoda	500	400	600	200	250	450	250	200	200	100	300	100
24	Bivalvia	400	500	400	600	200	500	200	400	300	100	200	150
25	Foramnifera	600	900	1000	600	1000	600	500	600	400	600	600	500
	Minor phyllum												
25	Sipunculus	100	50	150	100	50	50	100	0	100	100	0	0
26	Nematoda	200	300	100	100	300	100	300	200	300	100	300	100
27	others	50	100	150	50	100	50	100	100	50	50	50	50
	Density no/m²	**2600**	**3100**	**3500**	**2800**	**2650**	**2550**	**2650**	**3050**	**2000**	**1950**	**3200**	**2800**

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Table 3.18: Percent contribution of various groups to the total macrobenthos abundances (No/m^2) in surface sediments of the study region.

SI.NO	Taxa	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	HMOP	H13	Mean
1	Nephtyidae sp.	21.2	16.1	17.1	33.9	20.8	25.5	37.7	44.3	27.5	30.8	43.8	48.2	**30.6**
2	Orbinidae sp.	7.7	11.3	14.3	7.1	7.5	5.9	7.5	6.6	5.0	15.4	10.9	19.6	**9.9**
3	Spionidae sp.	34.6	29.0	28.6	28.6	17.0	37.3	17.0	19.7	25.0	10.3	15.6	8.9	**22.6**
4	Opheliidae sp.	23.1	29.0	28.6	21.4	37.7	23.5	18.9	19.7	20.0	30.8	18.8	17.9	**24.1**
5	Glyceridae sp.	11.5	11.3	7.1	7.1	13.2	5.9	15.1	6.6	20.0	10.3	9.4	3.6	**10.1**
6	Nereidae sp.	1.9	3.2	4.3	1.8	3.8	2.0	3.8	3.3	2.5	2.6	1.6	1.8	**2.7**

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3.3 Microbiological parameters

Certain aquatic microbes serve as excellent indicators of pollution. Microbes, in particular, bacteria react quickly to changes in environmental conditions. An assessment of the microbial activity is possible by the determination of the microbial biomass (total viable count). Therefore, the total viable counts imply an indirect measure of *in situ* activity in contrast to several specific indicator microbes, and this has been used as one of the principal criteria of pollution in natural water. Besides the pollution indicator bacteria such as total coliforms (TC), *Escherichia coli* like organisms (ECLO) and *Enterococcus faecalis* like organisms (EFLO) occurring in the coastal waters have also been included. These indicator bacteria will presumably show that sewage discharge with human faecal matter is present, which also indicates the possible presence of pathogenic bacteria in the water samples. Apart from that some pathogenic bacteria such as *Vibro cholerae* like organisms (VLO) and *Vibro parahaemolyticus* like organisms (VPLO) abundance was also studied. Water samples from the surface and bottom were collected at each station with the help of a Niskin sampler. All the samples were stored in ice immediately after collection and transferred to the laboratory for the enumeration of different groups of bacteria. Standard microbiological methods were followed for dilution, spread plating and incubation.

Seawater samples collected from the study area were analyzed for the following microbiological parameters:

1. Total viable count (TVC) – R2A Agar seawater medium,
2. Total Coliform (TC) – Mac Conkey's Agar,
3. *Escherichia coli* like organisms (ECLO) – Hichrome Universal Agar,
4. *Enterococcus faecalis* like organisms (EFLO) – Hichrome Universal Agar,
5. *Vibro* like organisms (VLO) – TCBS Agar,

6. *Vibrio cholerae* like organisms (VCLO) – TCBS Agar,
7. *Vibrio parahaemolyticus* like organisms (VPLO) – TCBS Agar,

The counts of different groups of bacteria recorded in the water column are presented in Table 3.19. The values of TVC in the surface water were in the range of 2.9 to 24.6 x 10^3 CFU/ml. The values for the bottom water were 0.9 to 34.8 x 10^3 CFU/ml. These counts are comparable with those reported in the previous monitoring study conducted in this region in 2017 (5.6-13.6x10^3 CFU/ml and 3.2-33.0 x10^3 CFU/ml in surface and bottom waters, respectively). The total Coliform count was 1.4 to 8.4 x10^3 CFU/ml in surface water and 0.01 to 10.0 x10^3 CFU/ml in bottom water. The coliform count found in this study are considerably higher than those reported in the previous monitoring study conducted in this region in 2017 (0.3-0.8 x10^3 CFU/ml and 0.2-1.2 x10^3 CFU/ml in the surface and bottom waters, respectively). Similarly, the *Escherichia coli* like organism (ECLO) counts were NG to 3.2 x10^3 CFU/ml in surface water and NG to 3.1 x10^3 CFU/ml in bottom water. The range of ECLO found in this study is comparable with those found in the previous monitoring study conducted in this region in 2017 (1.5-3.7 x10^3 CFU/ml and 0.7-7.4 x10^3 CFU/ml in the surface and bottom waters, respectively). The *Enterococcus faecalis* like organism counts were NG to 22.9 x10^3 CFU/ml in surface water and NG to 1.6 x10^3 CFU/ml in bottom water. The *Vibrio* like organism (VLO) counts were NG to 3.0 x10^1 CFU/ml in surface water and NG to 1.0 x10^1 CFU/ml in bottom water. Similarly, the *Vibrio cholerae* like organism (VCLO) counts were NG to 3.0 x10^1 CFU/ml in surface water and NG to 1.0 x10^1 CFU/ml in bottom water. There is no growth of *Vibrio parahaemolyticus* like organism (VPLO) in both surface and bottom waters.

Wide variation in TVC is observed spatially both in surface and bottom waters. ECLO and EFLO counts were observed in most of the stations and were high in the few

samples but a large variation was observed, which showed the influence of anthropogenic activities such as domestic and industrial discharge, recreational activities, open defecation in coastal (beach) regions (in villages), fisherman activities etc. The counts were higher than the reported from the coastal waters and as per standards of coastal recreational waters. VLO and VCLO counts were observed only in two stations out of the 12 stations sampled in the coastal waters off Rajayyapeta.

Table 3.19: Abundance (CFU/ml) of various bacterial populations in the water column of the study region

Station	Depth	TVC ($x10^3$)	TC ($x10^3$)	ECLO ($x10^3$)	EFLO ($x10^3$)	VLO ($x10^1$)	VCLO ($x10^1$)	VPLO ($x10^3$)
HET1	**SUR**	8.8 [3]	4.0	0.7	1.2	3.0	3.0	NG
	BOT	21.6	9.0	2.4	NG	NG	NG	NG
HET 2	**SUR**	15.2	5.6	1.6	0.2	NG	NG	NG
	BOT	5.6	6.2	NG	1.1	NG	NG	NG
HET 3	**SUR**	8.3	8.0	2.9	0.1	NG	NG	NG
	BOT	3.4	9.5	3.1	0.1	NG	NG	NG
HET 4	**SUR**	3.4	2.0	0.1	0.2	NG	NG	NG
	BOT	34.8	10.0	NG	0.2	NG	NG	NG
HET 5	**SUR**	11.8	7.2	NG	22.9	NG	NG	NG
	BOT	20.4	1.5	NG	0.1	NG	NG	NG
HET 6	**SUR**	12.2	6.0	1.5	0.5	NG	NG	NG
	BOT	18.0	9.0	NG	1.6	NG	NG	NG
HET7	**SUR**	15.6	7.5	1.9	0.3	NG	NG	NG
	BOT	3.1	0.4	NG	NG	1.0	1.0	NG
HET 8	**SUR**	4.8	5.7	1.8	NG	NG	NG	NG
	BOT	8.8	3.0	NG	0.1	NG	NG	NG
HET 9	**SUR**	2.9	8.4	3.2	8.4	NG	NG	NG
	BOT	0.9	1.7	0.4	NG	NG	NG	NG
HET 10	**SUR**	11.4	1.4	0.4	NG	NG	NG	NG
	BOT	5.1	1.1	0.1	0.1	NG	NG	NG
MOP1	**SUR**	18.6	6.9	1.2	0.6	NG	NG	NG
	BOT	3.1	0.01	NG	NG	NG	NG	NG
MOP2	**SUR**	24.6	3.0	0.8	0.1	NG	NG	NG
	BOT	4.0	1.5	0.3	0.1	NG	NG	NG

TVC	Total Viable Count
TC	Total Coliform Count
ECLO	*Escherichia coli* like organism Count
EFLO	*Enterococcus faecalis* like organism Count
VLO	*Vibrio* like organism Count
VCLO	*Vibrio cholerae* like organism Count
VPLO	*Vibrio parahaemolyticus* like organism Count
NG	No Growth

3.4.1 Eco-toxicity of treated effluent

The toxicity of the effluents can be evaluated by employing several tests. Bioassay is one of the important tests among them and it is used to test the sensitivity of the organisms on exposure to a toxicant. Bioassay is defined as the test in which a living tissue, organism or group of organisms are used as a reagent for the determination of the potency of any physiologically active substance of unknown activity. In this experiment, a test species either a larva or adult is exposed to different concentrations of toxicant in a given time in order to know the nature and degree of response. During acute toxicity experiments, the tolerance response of the organism is evaluated by exposing it to the specified toxicant for a short period of time. In general, the level of tolerance of any organism to the toxicant is observed for a period of 96 hrs. in acute toxicity experiments. Static bioassay is widely used as a short-term response experiment for acute toxicity experiments and this is one of the best methods to provide the results very fast and accurately. In this experiment, the response of a toxicant to the organism is measured in terms of mortality or lethality.

The physico chemical characteristics of the treated effluent collected from M/s Hetero Infrastructure SEZ Limited are given in Table 3.20. Test conditions and test acceptable criteria for whole effluent toxicity of treated effluent with pink zebra fish are presented in Table 3.21. Acute toxicity of treated effluent collected from the guard pond of M/s Hetero Infrastructure SEZ Limited with whole effluent toxicity test expressed in terms of median lethal concentrations (LC_{50}) was evaluated by subjecting the acclimatized pink zebrafish (*D. rerio*) exposed to different exposure periods (24 hrs; 48 hrs; 72 hrs. and 96 hrs.) with eight different concentrations (%, v/v) of treated effluent test solutions.

Table 3.20: **Physico-chemical characteristics of the treated effluent and dilution water used for preparing test solutions**

Parameter	Treated effluent	Dilution water
pH	7.4±0.1	7.06±0.4
Salinity (ppt)	0.8±0.2	0.6±0.1
Nitrite-Nitrogen (mg/L)		<0.03
Ammonium (mg/L)	32.1±0.7	<0.01
Nitrate-nitrogen (mg/L)	2.7±0.4	2.5±0.4
DO (mg/L)	6.48±0.2	7.01±0.1
BOD_5 (mg/L)	1.23 mg/L	0.2±0.1
TSM (mg/L)	20.7±1.2	1.5±0.1

Table 3.21: Summary of conditions and acceptance criteria for WET acute Toxicity Test with pink zebra fish as test species

Type	Comment
Test condition	Static non-renewal
Test duration	96 hrs.
Temperature	>28 °C
Photoperiod	12 hrs. light: 12 hrs. dark
Test chamber size	12 Litres
Length of test organisms	30±5 mm
No. fishes per test chamber	20 fishes
No. replicate chambers per Conc.	Three
Feeding	None
Test solution aeration	Yes, >6 mg l^{-1}
Dilution water	0 ± 1 ‰ salinity
Test concentrations	effluent conc. and a control
Dilution series	10%, 20%, 30%, 50%, 60%, 90% and 100% treated effluent
Endpoint	Mortality of fishes
Test acceptability criterion	90% survival in 100% effluent after 96 hours

Experiments were conducted under static conditions and all experimental tanks had a triplicate and each experimental set included a Control (0%). The test containers were inspected at regular intervals for recording mortality at different exposure periods of 12 hrs, 24 hrs, 36 hrs, 48 hrs, 60 hrs, 72 hrs and 96 hrs for calculating the LC_{50} values. The dead organisms were removed immediately from tanks in order to avoid any type of bacterial contamination. At the end of each test, the organisms were transferred to a clean tank for observing their recovery. The average percent mortality recorded at different test solutions in triplicate test containers during the four exposure periods was determined. The median lethal concentration (LC_{50}) values in the percentage of toxicant for zebra fish exposed to different concentrations of effluent were calculated based on the mortality rates. The average percent mortality recoded at different test solutions in triplicate test containers during the four exposure periods was determined.

The mortality of test organisms (pink zebra fishes) for effluent samples over different exposure periods are presented in Table 3.22. The mortality values of effluent water samples for different exposure periods (24 hrs, 48 hrs, 72 hrs and 96 hrs) were calculated following the method of log-probit transformation for time and dose-mortality curves suggested by Finney's method (1971) using LDP line software (http://embakr.tripod.com/ldpline).

Data on the average mortality of test animals (in %) recorded in different test concentrations of treated effluent from Hetero Infrastructure SEZ Limited over four exposure periods is presented in Table 3.23. The median lethal concentrations (LC_{50}) of treated effluent from Hetero Infrastructure SEZ Limited at different exposure periods are shown in Table 3.24.

Table 3.22: The survival rate of zebra fish exposed to different concentrations of treated effluent to different exposure periods

Exposure Time	Control	Effluent Concentration						
	0%	10%	20%	30%	50%	60%	90%	100%
1 hr.	100	100	100	100	100	100	100	100
6 hrs.	100	100	100	100	100	100	100	100
12 hrs.	100	100	100	100	100	100	100	95
24 hrs.	100	100	100	100	100	100	95	95
36 hrs.	100	100	100	100	100	100	95	95
48 hrs.	100	100	100	100	100	100	95	90
60 hrs.	100	100	100	100	100	95	95	90
72 hrs.	100	100	100	100	100	95	95	85
84 hrs.	100	100	100	100	95	95	90	75
96 hrs.	100	100	100	100	95	95	90	75

Table 3.23: Cumulative mortality of test (pink zebra) fish at different exposure periods in the 96-hour long experiment with treated effluent

Effluent conc. (% v/v)	Cumulative Mortality (%) of zebra fish during exposure periods			
	24 hrs	48 hrs	72 hrs	96 hrs
0%	0	0	0	0
10%	0	0	0	0
20%	0	0	0	0
30%	0	0	0	0
50%	0	0	0	5
60%	0	0	5	5
90%	5	5	5	10
100%	5	10	15	25

Table 3.24: Median Lethal concentrations (LC_{50}) of treated effluent from Hetero Infrastructure SEZ limited at different exposure periods

Exposure period (hrs.)	Median Lethal concentration (LC_{50}), %
24	-
48	-
72	326.7
96	187.6

Experimental setup used for 96 hrs. LC_{50} of Hetero Infrastructure Limited effluent with pink zebra fish was shown Fig. 3.16. Dose-Mortality curves generated from the LDP Line software for median Lethal Concentrations (LC_{50}) during different exposure periods were shown in Fig. 3.17

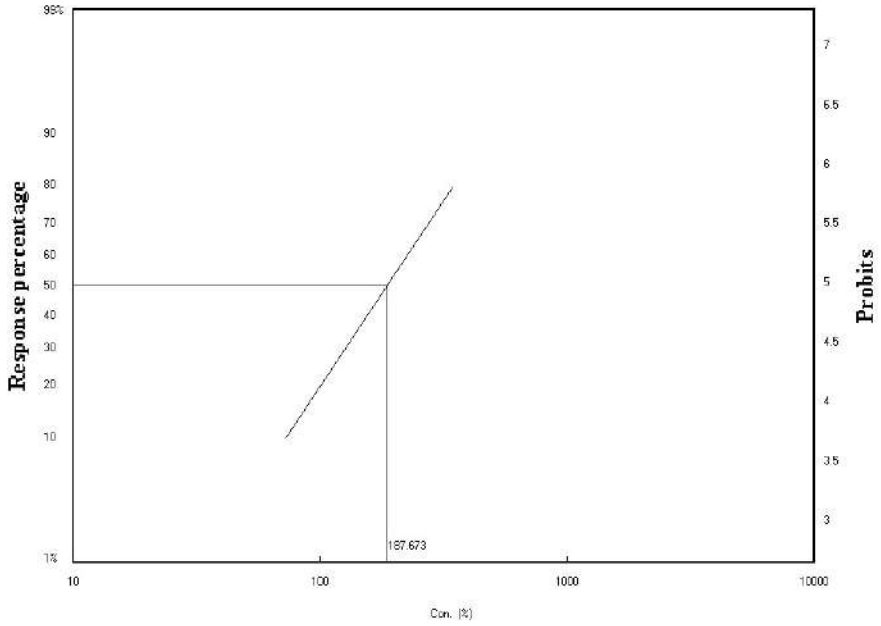
During the 96 hrs. exposure period, no mortality was observed in control treatment. No mortality was found during the test time (96 hrs.) in the effluent concentrations of 10%, 20% and 30%. Effluent of 50% concentrations recorded 5% mortality during the last 24 hours. Whereas, 60% effluent recorded 5% mortality during the last 48 hours. The 90% effluent recorded 10% mortality while the 100% effluent recorded 25% mortality during the test time of 96 hours. These results indicate that the treated effluent collected from the guard pond of M/s Hetero Infrastructure SEZ Limited does not fulfill the test acceptability criterion. The results of this 4-day long bio-assay experiment revealed that the treated effluent of M/s Hetero Infrastructure SEZ Limited did not fulfil the CPCB norms for the bio-assay test, i.e. 90% of survival of zebra fish in 100% of treated effluent during the test time of 96 hours.

Fig. 3.16: Experimental set up for the bio-assay test



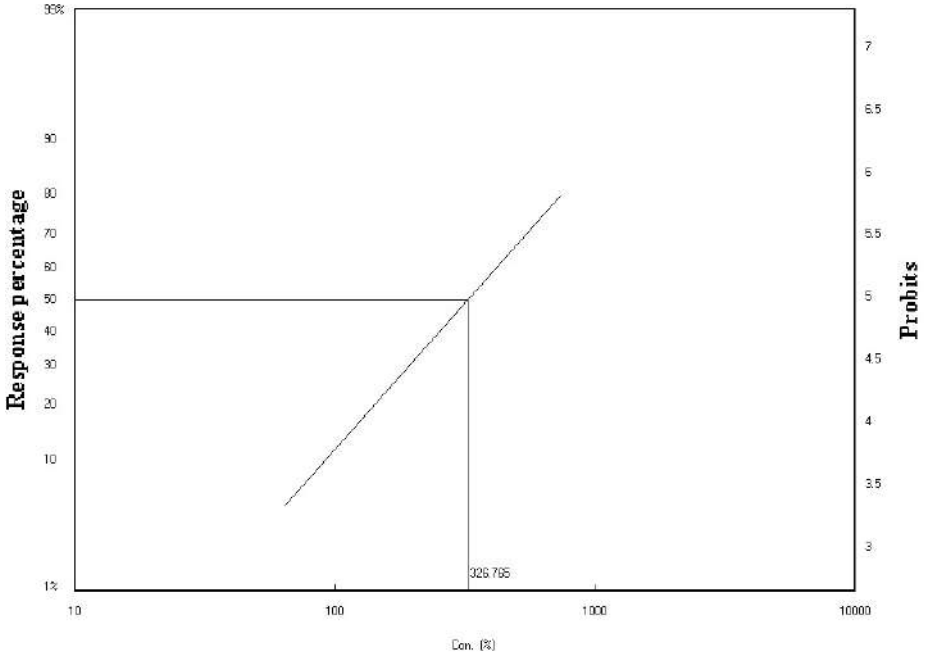
Fig. 3.17: Dose-Mortality curves generated from LDP Line software for median lethal concentration (LC_{50}) of zebra fish to the treated effluent during the exposure periods of (a) 72 hrs. and (b) 96 hrs.

(a)



72 Hrs.

(b)



96 Hrs.

Furthermore, an assessment of acute eco-toxicity of the treated effluent collected from M/s Hetero Infrastructure SEZ Limited was made in terms of Acute Toxicity Units (TUa). Recently, various industrial effluents that require discharge permits are assessed through the 'TUa' ($TUa=100/LC_{50}$ %v/v). It is a specified criterion used for discharge monitoring permits routinely used by the US-EPA. For each test performed the toxicity unit was calculated as 100% (full-strength effluent expressed as percentage) divided by the LC_{50} values. Acute toxicity units (TUa) obtained for treated effluents from M/s Hetero Infrastructure SEZ Limited is 0.56 (range: 0.35 to 0.71) for zebra fish.

The following criteria (Table 3.25) used by Pool et al (2009) were used to assess the level of eco-toxicity of treated effluents for zebra fish.

Table 3.25: Acute Toxicity Grading of treated effluents based on Toxicity Units (TUa)

Toxicity Unit (TUa)	Category
< 1.0	**Limited/or not acutely toxic**
1 - 2	**Negligibly acute toxic**
2- 10	**Mildly acute toxic**
10 – 100	**Acutely toxic**
>100	**Highly acutely toxic**

Based on the above criterion, the treated effluent from M/s Hetero Infrastructure SEZ Limited is graded as **Limited Toxic**.

3.4.2. Trace metals in the treated effluent

Trace element concentrations in the treated effluent were determined by the ICP-MS analysis. Concentrations of all the elements measured in the treated effluent fulfil the norms of the Central Pollution Control Board (CPCB) (Table 3.26) set for treated effluent for sea discharge.

Table 3.26: Trace metal concentrations in the treated effluent collected from the guard pond

Element	Concentration (µg/L)	Standard Limit Max. (µg/L)
Al	162.8	-
V	8.6	200
Cr	13.9	2000
Mn	160.2	2000
Fe	274.3	3000
Co	3.5	-
Ni	11.5	2000
Cu	87.5	3000
Zn	494.7	5000
As	1.4	200
Se	9.7	50
Cd	2.7	50
Pb	29.5	100

Chapter 4
SUMMARY AND CONCLUSION

1. The quality of waters around the marine outfall point during the observational period is similar to that of a typical coastal environment. The results of the present study are comparable to those obtained in earlier monitoring studies conducted in 2012 and 2014 in the same region. Relatively high nutrients and less dissolved oxygen in the bottom waters than that of the surface are due to the consumption of nutrients by phytoplankton in the surface and the release of nutrients and consumption of oxygen during the heterotrophic decomposition of organic matter in the bottom waters.
2. The concentration ranges of all chemical constituents in the vicinity of marine outfall are well within the ambient levels of a healthy coastal environment and would not pose a threat to marine biota.
3. The normal range of microbial flora such as total viable bacterial counts (TVC), total coliform and *E. coli* like organisms (ECLO) in the surface waters (5.6 -13.6x10^3, 0.3-0.8x10^3 and 1.5-3.7x10^3 CFU/ mL respectively) and bottom waters (3.2-33.0x10^3, 0.2-1.2x10^3 and 0.7-7.4x10^3 CFU/ mL respectively) suggest that the marine environment the vicinity of the outfall location is healthy and no significant microbial contamination is evident in the region.
4. A total number of phytoplankton genera recorded in the surface water varied from 12-19 in the surface and 15-22 in the bottom waters. The majority of the phytoplankton taxa are diatoms. The important genera of phytoplankton in the region are *Cheatocerus, Nitzschia* sp*., Pseudo-nitzschia*, *Rhizosolenia* sp., *Skeletonema, Navicula Thalassionema Thalassiosira Thalassiothrix Coscinodisus and Guinarida*.

5. A total of 15 different taxa including larvae were recorded for zooplankton. The numerical counts of different taxa recorded in the study area varied between 500 and 3239 Nos/m^3 while the biomass was in the range of 0.03 - 0.41 mL /m^3. The most dominant taxa recorded was the copepod, with a contribution of 75.8 to 94.3% to the total abundance. The overall picture of the zooplankton in the study area suggests that the composition and biomass were moderately high and attributed to inter annual variations.
6. The population density of macrofauna ranged from 900 to 4650 Nos/m^2. The total wet weight of biomass was in the range of 1.22–8.99 g/m^2. Polychaetes are the major contributor to the wet weight of biomass.
7. The total count of meiofauna was in the range of 416-1006 No/10cm^2 with a mean value of 661$\pm$186/10cm^2. Nematodes were the most dominant group with numerical density of 311-710/10cm^2 and percent composition of >80% at all stations
8. A comparison of biological data of the present study with the results of previous monitoring studies conducted in 2012, 2014 and 2017 revealed that the abundance of both phytoplankton and zooplankton were relatively low in this study compared to those found in 2017 but comparable with those found in 2012 and 2014. Therefore, relatively low abundance of phyto- and zooplankton may be due to inter annual variability associated with inter annual variability in physical and biogeochemical processes
9. Bioassay tests conducted on treated effluent collected from the guard of M/s Hetero Infrastructure SEZ Limited using zebrafish revealed that the treated effluent did not fulfill the CPCB norms for bioassay test of treated effluent for sea discharge,,i.e., 90% survival in 100% effluent during the test time of 96 hours. Only 75% survival of zebra fish was found in the 100% effluent after 96 hours, suggesting that it is required to

improve the quality of effluent before releasing it into the sea. Extensive algal growth in the guard ponds, due to the availability of nutrients such as nitrate, phosphate and silicate, may be suppressed in eco-friendly manner.

Chapter 5
RECOMMENDATIONS

Based on in-situ observations and results on laboratory analysis of samples collected during the field work the following recommendation are given to improve the quality of treated effluent and to maintain the health of the ecosystem in the coastal waters of Nallamattipalem.

1. Due to the decrease in the abundance of phytoplankton and zooplankton in this study compared to the previous study conducted in 2017, it is recommended to monitor the marine environment continuously for the next three years during the pre-SW monsoon season of each year.
2. Sludge should be removed from the guard ponds on regular time intervals, at least quarterly time scales
3. Extensive algal growth found in the guard ponds caused by the availability of plenty of nutrients such as nitrate, phosphate and silicate, should be suppressed. Algal growth suppression should be achieved in eco-friendly manner, such as continuous mixing of effluent in the guard pond using air blowers.

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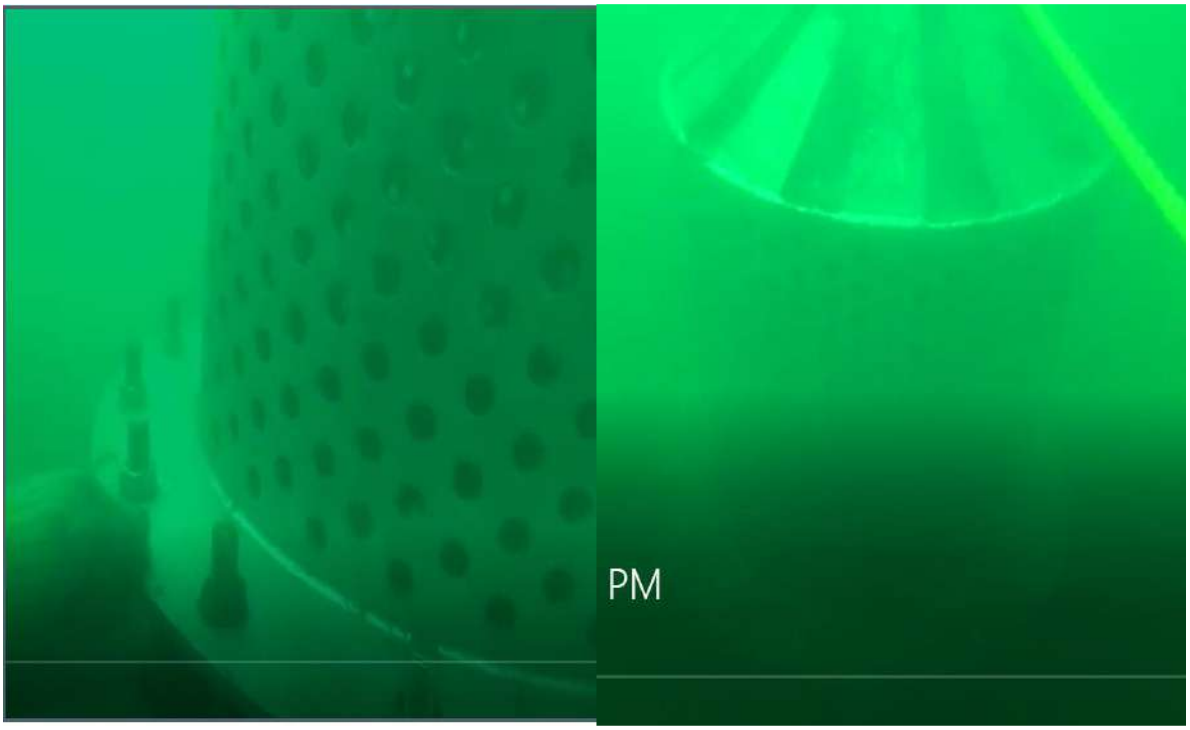
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STRAINERS INSTALLED AT INTAKE POINT





HETERO INFRASTRUCTURE SEZ LTD

COMPLIANCE REPORT ON THE RECOMMENDATIONS/ MITIGATION MEASURES MENTIONED IN THE EIA REPORT

ENVIRONMENTAL ISSUES/ IMPACTS (As per EIA)	ENHANCEMENT/ MITIGATION MEASURES (As per EIA)	MANAGEMENT ACTION/COMPLIANCE
Reduction of trees in the site: cutting of 25 trees	• Initiate and complete the process of compensatory trees plantation. Number of trees to be planted 25000.	This is to bring to your kind notice that, the total site was used for aquaculture farms in the past and hence there was no greenery/trees in the site while starting the project. However, the industry has planted more than 5.0 Lac plants in & around the industry site. The species used are as below: ➢ Ganuga ➢ Neem ➢ Acacia ➢ Pinto farm ➢ Kona Carpus ➢ Coconut and ➢ Medicinal plants The photographs of the green belt in and around the industry premises are enclosed as ***Annexure-I*** for your information.
Soil Erosion during construction and sediment load on the Storm water drains	• Earth works specifications to include provision for silt fence. • Construction during non-monsoon season	The industry has ensured that there is no soil erosion during the construction of industry and ensuring there is no sediment load on the storm water drains. The industry is cleaning/desilting the storm water drains regularly to avoid sediment deposition in the storm water drains. The natural drain which is passing adjacent to the industry premises is being cleaned regularly to avoid stagnations in the catchment area.
Sanitation facilities during construction	• Proper availability of drinking water and Sanitation facilities	During construction phase, the industry has provided labour sheds for the construction labour, adequate drinking water points and sanitation facilities. Photographs of the labour sheds and drinking water points are enclosed as **Annexure-II** for your information.

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Fire Prevention during construction	• Adopt safe work practise and have adequate firefighting facilities.	The industry has adopted and being adopted the safe work practices during the construction. Some of the safety practices followed are as below: ➢ Provisioning of Personal Protective Equipment ➢ Provisioning of fall protection equipment ➢ Regular Medical check-ups etc. The industry has provided adequate firefighting facilities in the industry. Details of firefighting facilities provided in the industry are enclosed as ***Annexure-III.***
Pollution of land, ground water and surface water arising from sanitary and other wastes and Spillages	• During Construction it will be ensured that contractor does not dispose off debris in water bodies.	This is to bring to your notice that, all the contractors are advised to dispose the debris in such a way that, it should not enter the water bodies. There are no water bodies in and around the project site.
	• Soil laden run off will not be diverted to water bodies.	Not Applicable. There are no water bodies to divert overloaded soil into the water bodies.
	• Vehicle maintenance and refuelling will be confines to areas under construction yard to trap discarded lubricant and fuel spills.	Regular vehicle maintenance and refuelling is being done outside the site in an authorised workshops and petrol pumps. In case of emergency maintenance of vehicles, the waste is disposed to Incineration along with other wastes.
	• Sanitation waste from will not be diverted to construction water bodies.	Sanitation waste is being collected separately and disposed to either incineration or to the treatment as applicable.
	• Contractor's to prepare, for the works sites, which make adequate provision for safe disposal of all wastes and prevention of spillages, leakage of polluting materials etc.	The contractors are advised to dispose the waste properly to avoid nuisance to the surroundings and also advised to not to use polluting materials like Bitumen, Waste oils etc in the construction.
	• Contractor to be required to pay all costs associated with cleaning up any pollution caused by their activities and to pay full compensation to those affected.	Major construction works have been completed and only few modifications works & repair works are going on at site. Till now there are issue associated with pollution caused due to the activities of contractors.

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Groundwater abstraction for construction activities	• Contractor to ensure optimisation of water abstraction.	During major construction, the industry has used curing chemical, ready mix concrete etc. for optimum usage of water in construction. Photograph of the Ready-mix concrete plant working in the factory premises is enclosed as **Annexure-IV** for your information.
Construction traffic causing pavement and structure damage due to overloading, increasing congestion and increased road safety hazards on the Nakkapalli-Rajayyapeta road.	• Contractors to use appropriate vehicles and to comply with legal gross vehicle and axle load limits. • Contractors to repair damage at own expense. • Contractors to minimise road safety hazards and inconvenience to other road users by taking appropriate measures.	The industry has laid own road to the factory from National Highway and hence there is no traffic congestion, inconvenience to the other public and road safety issues. Drawing and Photographs of the Road are enclosed as **Annexure-V.**
Air Pollution from batch mix plants, construction yard due to movement of mechanical compactor and other vehicles.	• Trucks carrying construction material will be covered with tarpaulin to avoid spilling.	Instructed all truck owners to cover the trucks with tarpaulins and is being followed strictly.
	• Water Sprinkling will be carried out in mornings and evenings on haul roads and compact surface.	Industry used to sprinkle water on the roads during initial stages of construction and at present all roads are either concreted or black top,
	• Vehicles and construction machinery will be maintained to conform emission standards specified by SPCB.	Maintaining Vehicles and construction machinery in good working condition so that it will meet the emission standards specified by APPCB
	• Stock piled sand and stone will be wetted before loading. • Construction debris shall be disposed only at designated sites.	• There is no sand stocks at the site. • Construction debris is being disposed at designated places only.
Noise Levels	• Construction yard will be located at 500m away from habitation.	There is no construction yard near to the habitation.
	• All equipment will be maintained in good working order, properly designed engine enclosures and intake silencers.	All vehicles are provided with silencers and maintaining in good working condition. All DG sets are provided with acoustic enclosures. Photographs o the DG sets are enclosed as **Annexure -VI.**
Water Logging and cross Drainage.	• Storm water drain on the North Eastern side of the site connecting to the	Storm water drain on the eastern side of the factory is being maintained in good condition so that

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	creek and drains within the site.	there will not be nay water logging in the catchment area. Drawings of the storm water drain on the eastern side of the factory is enclosed as **Annexure-VII**.
Negative impact on flora due to Flora due to cutting of trees.	• To compensate for 25 number of trees to be cut, 25000 number of trees will be planted.	Industry has planted more than 500000 plants in the premises. Photographs of the green belt are enclosed as **Annexure-VIII.**
Occupational Safety and Health	• Construction workers be provided with personal protective equipment (PPE) such as earplugs, helmets, safety shoes, gloves, etc.	All workers are being provided with suitable PPE like Shoes, Helmet, Goggles Gloves, Ear plugs etc. depending on the work. The PPE Matrix and protocols are enclosed as **Annexure-IX** for your information
Environmental monitoring during construction phase	• Ambient Air Quality to be measured once in a season (except monsoon) at location specified in monitoring plan	Ambient air quality monitoring is done continuously through 03 Nos of CAAQM stations. Conducting ambient air quality monitoring through third party once in a month and reports are being submitted to RO, APPCB, Visakhapatnam.
	• Water Quality (ground and surface) to be monitored once in a season (except monsoon season) at locations specified in monitoring plan.	The industry has provided 04 nos of piezo wells in the factory premises for monitoring the ground water quality and is being monitored once in 03 months. Reports are being submitted to MoEF&CC along with compliance reports. Layout of piezo wells installed in the plant is enclosed as **Annexure-X.**
	• Noise levels to be monitored once in a season at locations specified in monitoring plan.	Regular noise monitoring is being done internally and records are being maintained,
	• Soil quality to be monitored once a year .	Soil quality is being monitored once in six months and the reports are being submitted to MoEF&CC along with compliance reports,
	• Monitoring of Construction sites for arrangements made for protection measures at storage areas, and drainage.	Regularly monitoring the construction sites for arrangements made.
Occupation Phase		
Air Pollution From Boilers	• Effective stack heights and bag filters.	The industry is having 04 nos of boilers and the details are as below:



		<table><tr><td>Capacity of Boiler</td><td>Stack Height</td><td>APCD</td></tr><tr><td>45 TPH</td><td>53 m</td><td>Electrostatic Precipitator (ESP)</td></tr><tr><td>20 TPH</td><td>33 m</td><td>Dust collector followed by Bag filter</td></tr><tr><td>12 TPH</td><td>30 m</td><td>Bag filters</td></tr><tr><td>10 TPH</td><td>30 m</td><td>Bag filters</td></tr></table>
Air Pollution From DG sets	• Effective stack heights as per CPCB Formula	All DG sets are provided with adequate stack height as per the CPCB formula.
Air Pollution from Incinerator	• Provision of Scrubbers.	No Hazardous waste Incinerator is installed at site.
Diffuse emissions from, reactors, multiple effect evaporators, strippers etc.	• Provision of vent condensers.	• All reactors are provided with dual stage condensers to avoid process emissions entry into the atmosphere • All reactor vents in which acidic reactions are being carried are connected to scrubbers. • Stripper vent is connected to dual stage condensers.
Fugitive Emissions from accidental spills	• Containment measures like dykes for bulk solvent storage, periodic maintenance.	All solvent storage tanks are provided with sufficient dykes (110% of tank capacity) and provided Dump tanks in all solvent storage yards to control the spills. Photographs of the solvent yard is enclosed as **Annexure-XI**.
Water Resources	• Source: YLB Canal supply.	As per EC, the industry has installed Sea water Desalination plant for meeting the water requirements of the industry.
Effluents from Process:		
Organic Wastes	• Incinerator • Stripper followed by distillation or incineration.	Sending to cement Industries, pre-processing units for incineration purpose as directed by the Board.
High TDS Effluents	• Evaporator followed by Filter Press condensate From Evaporator for Biological treatment followed by tertiary treatment and marine disposal .	HTDS effluents are being treated in Multiple Effect Evaporator (MEE) followed by biological treatment and tertiary treatment before disposing into the Sea.
Low COD and Low TDS Effluents	• Activated Sludge process followed by tertiary treatment and marine disposal.	All LTDS effluents along with MEE Condensate is being treated in Bio-tower followed by Dual stage activated sludge process and then to RO plant before disposing into the Sea. Details and photographs of the Stripper/MEE/ATFD & Biological Treatment are enclosed as **Annexure -XII.**

Effluents from utilities	• Primary treatment followed by marine disposal.	Effluents from utilities is being treated along with LTDS effluents.
Domestic Effluents	• Sewage treatment plant and treated water for on Land Irrigation.	Domestic effluents are being treated in sewage treatment plant of 300 KLD capacity and treated sewage is recused for gardening purpose. Details of STP and photograph are enclosed as **Annexure-XIII**.
Solid Wastes		
Coal ash from Boiler	• Supply to Brick manufacturers and Cement Manufacturers	Sending to Brick manufacturing units.
Garbage	a) Biodegradable for vermicomposting and Reuse for horticulture development b) Recyclable Wastes Like Paper, plastic to recyclers. c) Non-Biodegradable for disposal to local authorities. d) STP Sludge for compost and reuse as manure.	a) Installed organic waste converter for converting the biodegradable waste into manure. b) LDPE paper and plastic waste is being sent to recyclers. c) Non-Biodegradable waste is being disposed as per the guidelines. d) Using STP sludge in Vermi compost plant to maintain moisture and then for gardening purpose as manure. Photograph of the vermi-compost plant is enclosed as **Annexure-XIV**.
Hazardous wastes		
a) Forced Evaporation salts b) Solvent Residues c) Process residues d) ETP sludge e) Waste Oils f) Used Batteries g) Waste Containers	• Temporary Storage Facility with 3 Months storage capacity And Sent To TSDF, Visakhapatnam sent to authorized recyclers Detoxification resultant effluent to ETP and sold to authorised vendor.	Hazardous wastes are being disposed as per the conditions stipulated by APPCB in the **CTO**. Minimum stocks are being maintained in the Hazardous waste storage yard. Detoxification of containers/Liners is being done in Detoxification yard and wash water is being routed to ETP for treatment. Hazardous waste and mode of disposal specified by the APPCB in **CTO** is enclosed as **Annexure-XV**.
Noise Pollution from DG Sets, Motors, Compressors etc.	• Provision of Acoustic enclosures for DG Sets provision of noise absorption pads at the foundation levels Green Belt.	All DG sets are provided with Acoustic enclosures and thick green belt is being maintained in & around the factory premises for minimising the noise.

Green Belt	• Provision of Avenue plantation and 50 m wide green belt all around the estate	Thick green belt is being maintained in & around the factory premises.
Occupational safety	• Provision of PPE, and Health centre. • Periodic Health Check-ups. • Occupational Safety training.	• The industry has provided 02 no's of Occupational health centres with ambulances (mini trauma) within the industry premises. Full time doctors are deployed in the OHC and Round the clock male nurses/ paramedical staff are available in the factory for taking care of health issues of employees/emergencies. • Periodical medical examination of the employees is being carried as per the Factories Act. • Occupational safety training is the part of Safety induction training and also during regular trainings.
Community Development	• Extension of Medical facilities by way of health camps, Improvement of educational facilities, Empowerment of Women in Surrounding villages.	The industry is extending medical support to the nearby villagers by way of: ➢ Conducting medical camps in the nearby villages regularly through mobile medical van of the Company and giving free medicines. ➢ Established Eye hospital at Nakkapalli for the eye care of the nearby villagers. This includes free testing, providing goggles, medicines, Cataract surgeries etc. ➢ Financial assistance to the people suffering with health ailments. ➢ Sanitation facilities during calamities. For education, the industry is carrying following activities: ➢ Providing the infrastructure to all nearby Govt. schools like construction of toilets, Compound walls, classrooms etc. ➢ Providing furniture to the Govt Schools. ➢ Providing Study material for school going children ➢ Drinking water facilities (RO Plants) in the schools. ➢ Rewards for the meritorious students.

		➢ Celebration of national events in schools ➢ Providing lighting & sport kits to the schools etc. For women empowerment, the industry is providing jobs to the women and promoting them to take self-decisions both at home and workplace by way of providing training to the women employees. The details are enclosed as **Annexure-XVI**

Submitted to the IRO, MoEF&CC, Vijayawada for information and perusal.

For Hetero Infrastructure SEZ Ltd

Date :23/12/2022

S. Kullayi Reddy
Associate Vice President -EHS

Annexure-I

GREEN BELT PHOTOS









ANNEXURE-II

LABOUR SHED & DRINKING WATER





Drinking Water





ANNEXURE-III

Hetero Complex Safety Equipment's				
S. No	**Name of the Equipment**	**Capacity / UoM**	**Total Quantity**	**Photograph**
1	Fire Extinguishers	Nos	2238	
2	ARFFF (Foam)	Lts	47960	
3	Fire hydrant points	Nos	462	
4	Fire hose cabinet	Nos	436	
5	First aid hose reel	Nos	176	
6	Fire hydrant monitors	Nos	74	
7	Fire hydrant gate valves	Nos	314	
8	Fire blanket	Nos	148	
9	Eye & Body wash unit	Nos	105	

10	Personal protective Equipment in Blocks	Nos	74	
11	Eye wash bottle	Nos	327	
12	SCBA	Nos	38	
TYPE OF FIRE EXTINGUISHER				
1	CO2	2 kg	96	
2		4.5 kg	567	
3		5 kg	10	
4		22.5 kg	275	
5		45 kg	91	
6	Foam	9Lts	112	
7		50Lts	373	
8	DCP	9Kg	78	
9		10Kg	120	
10		25Kg	282	
11		50Kg	81	

12	D-Type	9Kg	4	
13		10 Kg	27	
14		25 Kg	15	
15		50 Kg	11	
16	ABC	2Kg	80	
17	DCP / Clean Agent Modular	10 Kg	672	

HETERO COMPLEX FIRE HYDRANT PUMP HOUSE DETAILS



PUMP HOUSE NO →	PUMP HOUSE –I			PUMP HOUSE-II			PUMP HOUSE-III		
PUMP DESCRIPTION	JOCKEY PUMP	MAIN PUMP	DIESEL PUMP	JOCKEY PUMP	MAIN PUMP	DIESEL PUMP	JOCKEY PUMP	MAIN PUMP	DIESEL PUMP
PUMP HEAD (Mt)	88	88	88	88	88	88	95.1	88	88
PUMP FLOW (m3/hr)	25	410	410	25	410	410	61	273	273
PUMP HP	25	215	231	25	215	231	20	150	133
PUMP RPM	2900	2900	1800	2900	1480	1800	2920	1480	1800
PUMP LPM	416	6833	6833	416	6833	6833	1000	4550	4550
AUTO START (Kg/cm2)	5	5	5	5	4	2	5	4	Manual shut off
AUTO SHUT OFF (Kg/cm2))	7	Manual shut off	Manual shut off	7	Manual shut off	Manual shut off	7	Manual shut off	Manual shut off
Water Storage Capacity	600 KL			1200 KL			1000 KL		

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HIGH PRESSURE WATER MIST FIRE TENDER		
UNIT	Fire Engine -1	Fire Engine-2
Engine model	EICHER 10.95	EICHER 10.95
Water tank capacity	3500ltrs	2000ltrs
Foam Tank capacity	350L	400L
Foam Water monitor capacity	2000Lpm@100bar	1000Gpm@7kG/cm2
DCP Tank capacity	….	250 Kgs
High pressure pump	150Lpm @ 100bar	150Lpm @ 100bar
High pressure hose pipe (60mtrs length)	02 no's	02 no's
Type	Advances water mist and Foam type	Advanced water Mist, Foam and Dry Chemical Powder



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ANNEXURE-IV

READY-MIX CONCRETE PLANT







HETERO INFRASTRUCTURE SEZ LTD

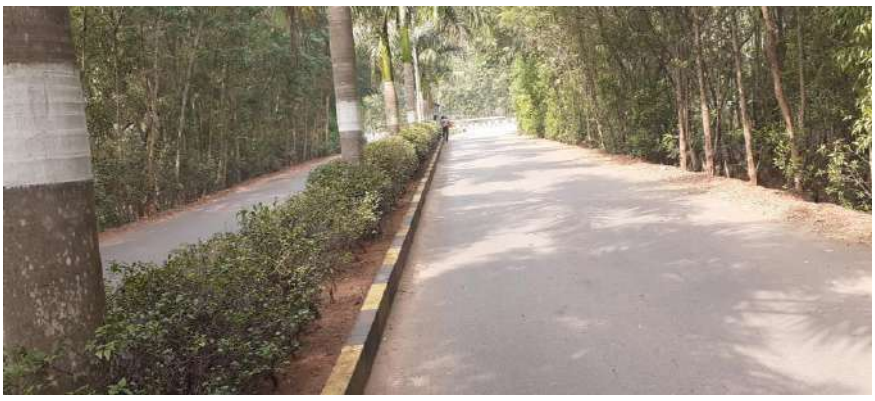
ANNEXURE – V

HETERO COMPLEX ROAD









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ANNEXURE – VI

DG SETS







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ANNEXURE – VII

STORM WATER DRAIN POINT







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ANNEXURE – VIII

GREEN BELT PHOTOS









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ANNEXURE – IX

PPE MATRIX

Area/Activity	PPEs REQUIRED BEFORE STARTING ACTIVITY				Area/Activity	PPEs REQUIRED BEFORE STARTING ACTIVITY			
PPE mandatory before entering in to any work Areas.	Safety Shoes		Nose Mask		Flammable Gas handling like Hydrogen etc.	Safety Shoes		FR Suit with Hood	
	Safety Goggles					Safety Goggles		Nitrile Hand glove	
	Safety Helmet					Safety Helmet		SCBA	
Handling of Flammable Solvents with Proper Earthing and bonding	Safety Shoes		FR Suit with Hood		Boiler house	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Nitrile Gloves			Safety Goggles		Heat Resistant glove	
	Safety Helmet		PAPR			Safety Helmet		Ear Plug/Muff	
	Full Face Mask					Dust Masks			
Toxic Material Handling (Like NH3, bromine etc)	Safety Shoes		PVC Air Line Suit		Opening of Pipe lines	Safety Shoes		FR Suit with Hood	
	Safety Helmet		PVC Hand Gloves			Safety Goggles		Hand Gloves	
	Full Face Mask		PAPR			Safety Helmet		Nose Mask	
Charging/ Handling of corrosive chemical (NaOH, H_2SO_4)	Safety Shoes		PVC Apron		Utility and DG Set areas	Safety Shoes		Hand gloves	
	Safety Goggles		PVC Hand Gloves			Safety Goggles		Ear Plug/Mug	
	Safety Helmet		PAPR			Safety Helmet		FR Suit	
	Full Face Mask		Other			Nose Mask			
Charging/Handling powder (powder Milling, sifting, dispensing and charging in to reactor Etc)	Safety Shoes		FR Suit with Hood		Working at effluent sumps, water, sumps, cooling towers, aeration tanks, etc.	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Nitrile Gloves			Safety Goggles		Safety Belts	
	Safety Helmet		PAPR			Safety Helmet		Hand gloves	
	Dust Mask					Nose Mask		Life Buoys	
Hot material handling, Abrasive material handling	Safety Shoes		FR Suit /Apron		Working at heights, painting, and Civil constructions.	Safety Shoes		Life Lines	
	Safety Goggles		Heat Resistant glove			Safety Goggles		Safety Belts	
	Safety Helmet					Safety Helmet		Hand gloves	
	Nose Mask					Nose Mask			
Rescue operation in Fire	Safety Shoes		Fire Proximity Suit		Hot Works like welding, cutting , grinding , heating , chipping etc.	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Fire Proximity Glove			Safety Goggles		Safety Belts	
	Safety Helmet					Safety Helmet		Hand gloves	
	Full Face Mask		SCBA			Nose Mask			
Rescue operation in toxic, corrosive atmosphere.	SCBA		PVC hand Gloves		Confined Space Entry	Safety Shoes		Safety Belt/Ladder	
	PVC Suit/Apron		Safety Helmet			Safety Goggles			
	Safety Gum Shoe					Safety Helmet			
Laboratory works	Safety Shoes		FR Suit with Hood		Working on MCC, SFU, Isolator, capacitors underground cable	Insulative Shoe		Arc Suit	
	Safety Goggles		Lab Apron			Safety Goggles		Electrical Resistance Gloves	
	Nose Mask					Safety Helmet			
Detoxification Works	Safety Shoes		PVC Suit		Excavation work	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Hand Gloves			Safety Goggles		Hand Gloves	
	Safety Helmet		PAPR			Safety Helmet			
Monitoring activities in plant and warehouse	Safety Shoes		FR Suit with Hood		Gas cylinder Handling	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Nose Mask			Safety Goggles		Hand Gloves	
	Safety Helmet					Safety Helmet		Face Shield	
Road Tanker Sampling and Unloading	Safety Shoes		FR Suit with Hood		Powder Handling	Safety Shoes		FR Suit with Hood	
	Safety Goggles		Safety Belts			Safety Goggles		Nitrile Hand gloves	
	Safety Helmet		Nitrile Hand glove			Safety Helmet		PAPR	
	Full Face Mask					Nose Mask			

HETERO INFRASTRUCTURE SEZ LTD

ANNEXURE – X

LAYOUT OF PIEZO WELLS



FIRST FORERUN COLLECTION SUMPS LOCATIONS



HETERO INFRASTRUCTURE SEZ LTD

ANNEXURE – XI

SOLVENT YARD









HETERO INFRASTRUCTURE SEZ LTD

ANNEXURE – XII

STRIPPER/MEE/ATFD & BIOLOGICAL TREATMENT



Multiple effect evaporator



Stripper

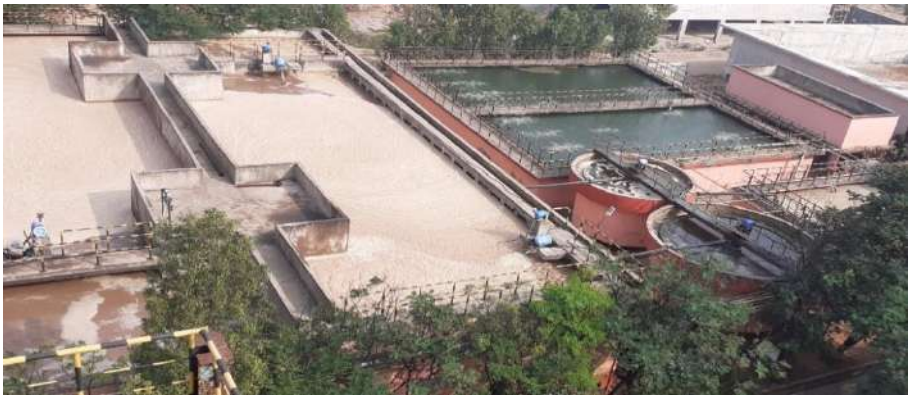


ATFD

HETERO INFRASTRUCTURE SEZ LTD



Biological treatment



HETERO INFRASTRUCTURE SEZ LTD

ANNEXURE – XIII

SEWAGE TREATMENT PLANT









HETERO INFRASTRUCTURE SEZ LTD

ANNEXURE – XIV

VERMI COMPOST PLANT







HETERO INFRASTRUCTURE SEZ LTD

Annexure-XV

HAZARDOUS WASTE AND MODE OF DISPOSAL

Hazardous wastes are being disposed as per the conditions stipulated by APPCB in the CTO. Minimum stocks are being maintained in the Hazardous waste storage yard.

Hazardous waste and mode of disposal specified by the APPCB in CTO is mentioned below:

S.No	Details of waste	Mode of Disposal
1	Process Solid waste	To TSDF, Parawada, Anakapalli Dist. for secured Land filling
2	MEE/ Forced Evaporation Salt	
3	Incineration Ash	
4	ETP Sludge	
5	Solvent Residue/Organic Residue	Shall be incinerated to sent to Cement industries for Co-incineration/Co-processing/ Pre-processing units
6	Spent Carbon	
7	Damage or Rejected APIs/products	
8	Damaged or Expired Raw materials	
9	Used PPEs	Shall be incinerated in in-house incinerator or sent to Cement industries for incineration.
10	Used Oils	To Re-processing units authorized by APPCB
11	Used Batteries	Shall be sent to suppliers on buy back basis
12	e-Waste/ electrical waste	Sent to Authorized Recyclers approved by APPCB/CPCB.
13	Empty Drums/ Containers/ Liners contaminated with Hazardous chemicals/waste	To outside agencies after complete detoxification.
14	Empty barrels / containers / liners contaminated with hazardous chemicals / wastes	
15	LDPE Paper	To authorized Recyclers/ outside agencies
16	Coal Ash from Boilers	To Brick manufacturing units
17	Spent Solvents	Shall be recycled within the units of Hetero Infrastructure SEZ Ltd or sold to outside agencies
18	Recovered Solvents	

A Brief Report of CSR activities in Nakkapalli plant areas

December 2022

About Hetero

Hetero is one of India's leading generic pharmaceutical companies and is one of the world's largest producers of anti-retroviral drugs for the treatment of HIV/AIDS. With more than 20 years of expertise in the pharmaceutical industry, Hetero's strategic business areas include APIs, generics and biosimilars. Hetero also offers custom pharmaceutical services to its partners around the world. The company is recognized for its strengths in Research and Development, manufacturing, and commercialization of a wide range of products.

Hetero is the first company in India to launch the generic version of Remdesivir injection, COVIFOR, in India, which is used to treat hospitalization cases of COVID-19.

Corporate Social Responsibility

At Hetero, we value health and prosperity for all. Our passion for improving quality of life extends beyond our business and transcends everything we do. While we work towards making medicines affordable and accessible to society at large, we also continuously seek opportunities to help the society through our corporate social responsibility initiatives. Since its inception, Hetero has been directly supporting with healthcare programmes, drinking water & sanitation, educational and welfare activities in communities surrounding the company's factories. The company also extends its support beyond its operational vicinities depending on the community needs and emergencies.

As a Hetero group we will focus on the following thematic areas to implement CSR activities in Nakkapally Region. Following activities have been implemented in 26 number of villages with an outreach of 16,800 households, 32 schools 31 Anganwadi centers etc.

1. Quality Education
2. Health Care Services
3. Village Infrastructure.
4. Drinking Water & Sanitation

1. Quality Education

Quality Education is one of the flagship programs for Hetero Company. We are working in 32 Schools & 31 Anganwadi Centers. Goal is to address the root causes of education quality challenges. We identified several challenges among the marginalised students studying especially in govt schools.

To provide quality education:

- Supported **32 vidya volunteers** in schools to balance the student teacher ratio. Purpose of vidya volunteers is to address the root causes of lack of required teaching staff in select schools. Vidya volunteers are well trained on various participatory didactic learning/teaching methods. Vidya volunteers help the school students through language and numeracy improvement. Also helps in various behavioural change trainings to students.





- Provided **uniforms, bags, stationery, notebooks & furniture** to schools to bring the uniformity among the students (till the year 2019). The intent of providing the above is to enable children studying in the schools to have a better access to learning materials.
- Provided **outdoor playing equipment** to Anganwadi schools to encourage the children to attend regularly. In several Anganwadi centers, it was observed that the children do not have access to required outdoor playing equipment.
- Constructed **RO Water Plant** in Schools to address the clean and safe drinking water.
- Provided **Cooking Wessels** to Schools.
- **Merit Awards** to students to encourage higher education.
- Provided **Reading Material** to 10th class students
- Constructed **25 toilets in Schools for Boys & Girls** to prevent the transmission of communicable diseases.

2. Health Care Services:

Health is the other flag ship program for Hetero Company, under health, we are working in following segments:

2.1 Vision Health Care Centre:



To Address the eyesight issues of marginalised communities, Hetero opened a Vision centre at Nakapally Village in collaboration with Sankurathri Foundation. The Vision centre equips latest technologies, well trained staff. Communities from neighbouring villages visits the Vision center, get the eye tests done, and for needed patients, undertake surgeries by specialist Surgeons.

Objective of the Centre:

To Support the needy villagers, who are having vision problem and not able to bare the expenses for eye surgeries.

So far, served **42,958 members**, distributed **17,983 spectacles** & conducted **1,806 eye surgeries.**



2.2 Mobile Medical Van:

The main purpose of this activity is to serve the underprivileged society and especially focus on seasonal diseases like fever, cold, allergies etc, blood pressure & sugar/diabetes.

Through this project, so far, we conducted **1,973 camps** and reached **1,04,612 members** & distributed medicines. A qualified medical doctor provides required medical support to the patients in the village itself. Once the testing is one, required medicines are provided to the patients free of cost. Interactions with few patients inferred that, on an average each patient save around Rs. 1000 per visit if they go and get the same medical support from nearby town.



2.3 Covid 19 response:

During Covid, every **15 days** we have done sanitation in the whole village to stop the spread of virus in the villages.

During lock down we have distributed groceries to the people in and around Nakkapally Region. We have organized special vaccination drive to the villagers.



Under this project we covered 27 villages and distributed **16,000 Grocery kit** (Dal, Rice, Sugar, oil packet etc) to the Villagers.

3. Village Infrastructure:

Under this project 27 villages are adopted by Hetero Group and constructed the following infrastructure in the villages.

- Constructed 6 Community Halls.
- Laying of CC Roads & Gravel roads
- Construction of Toilets
- Laying of Electrical Lines.
- Provided Solar lamps to the fisherman community
- Provided streetlights
- Construction of compound walls to Graveyards.
- Planted trees in the community.



4. Drinking Water & Sanitation:

Under this project following activities are completed.

- 14 RO Plants are installed in various villages to provide clean and neat drinking water.
- Provided running water to the whole community.
- Constructed Overhead tanks.
- Drilled 12 bore wells
- Constructed drainages in the community
- Created awareness on Swachh Bharath



Purchase Order

Vendor Name & Address
401592
SSKIVYA AGRO-TECH PRODUCTS
FLAT NO:101, MAYURI PREM BAGH APTS,

VISAKHAPATNAM 530017
GSTIN Number : 37ACOFS7346H1ZI
Name :
sskivya@yahoo.co.in

Purchase Order No. :3900000590
Purchase Order Date :22.02.2011
Buyer :
Ph No. :

GSTIN Number : 37AABCH6897E3Z6

Quotation No.: Quotation Date.:

Note: Not to deduct TCS as we are under obligation to deduct TDS under section 194Q as our turnover or total sales, gross receipts, exceeded the threshold limit of INR 10 Crores in the previous financial year.

Deliver and Bill to:
HETERO INFRASTRUCTURE SEZ LTD.
SY.No.150,286,312 N. NARASAPURAM
NAKKAPALLY (M) RAJAYAPETA (VILL)
VISAKHAPATNAM-531081, INDIA
Note: If there are multiple plants with different delivery address then it will be shown in item level

DL NO.
CIN NO. U24239TG2005PTC047265

Place of supply : 37-Andhra Pradesh
We request you to supply the following material/service subject terms and conditions mentioned.

Terms of delivery : : FOR-OUR PLANT
Terms of Payment : MENTIONED IN OTHER TERMS AND CONDITIONS
Insurance

Item	Material	Description	Unit Price	Order Qty.	Amount
10		DESALINATION WORKS AT SEA POINT			
		GROSS PRICE	8,544,000.000 INR	1.000 AU	8,544,000.00
					8,544,000.00

HSN CODE:

Delivery Date:31.03.2011

Other Terms & Conditions:

Total Gross Value **8,544,000.00**

For HETERO INFRASTRUCTURE SEZ LTD
This Document is Electronically Approved. Hence, Signature is not Required

Purchase Order

Vendor Name & Address
401592
SSKIVYA AGRO-TECH PRODUCTS
FLAT NO:101, MAYURI PREM BAGH APTS,

VISAKHAPATNAM 530017
GSTIN Number : 37ACOFS7346H1ZI
Name :
sskivya@yahoo.co.in

Deliver and Bill to:
HETERO INFRASTRUCTURE SEZ LTD.
SY.No.150,286,312 N. NARASAPURAM
NAKKAPALLY (M) RAJAYAPETA (VILL)
VISAKHAPATNAM-531081, INDIA
Note: If there are multiple plants with different delivery address then it will be shown in item level

Purchase Order No. :4900216618
Purchase Order Date :09.03.2023
Buyer :RAJEEV KUMAR KANTUBHUKTA
Ph No. :

GSTIN Number : 37AABCH6897E3Z6

Quotation No.: Quotation Date.:

Note: Not to deduct TCS as we are under obligation to deduct TDS under section 194Q as our turnover or total sales, gross receipts, exceeded the threshold limit of INR 10 Crores in the previous financial year.

DL NO.
CIN NO. U24239TG2005PTC047265

Place of supply : 37-Andhra Pradesh
We request you to supply the following material/service subject terms and conditions mentioned.

Terms of delivery : : DAP AT OUR SITE
Terms of Payment : 30% ADV , 70% AFTER COMPLETION OF WORK
Insurance

Item	Material	Description	Unit Price	Order Qty.	Amount
10		UNDER WATER INSPECTION INTAKE 560MM			
		GROSS PRICE	855,000.000 INR	1.000 AU	855,000.00
					855,000.00

HSN CODE:

Delivery Date:31.03.2023

Other Terms & Conditions:

Total Gross Value **855,000.00**

For HETERO INFRASTRUCTURE SEZ LTD
This Document is Electronically Approved. Hence, Signature is not Required

Purchase Order

Vendor Name & Address
401592
SSKIVYA AGRO-TECH PRODUCTS
FLAT NO:101, MAYURI PREM BAGH APTS,

VISAKHAPATNAM 530017
GSTIN Number : 37ACOFS7346H1ZI
Name :
sskivya@yahoo.co.in

Deliver and Bill to:
HETERO INFRASTRUCTURE SEZ LTD.
SY.No.150,286,312 N. NARASAPURAM
NAKKAPALLY (M) RAJAYAPETA (VILL)
VISAKHAPATNAM-531081, INDIA
Note: If there are multiple plants with different delivery address then it will be shown in item level

Purchase Order No. :4900216619
Purchase Order Date :09.03.2023
Buyer :RAJEEV KUMAR KANTUBHUKTA
Ph No. :

GSTIN Number : 37AABCH6897E3Z6

Quotation No.: Quotation Date.:

Note: Not to deduct TCS as we are under obligation to deduct TDS under section 194Q as our turnover or total sales, gross receipts, exceeded the threshold limit of INR 10 Crores in the previous financial year.

DL NO.
CIN NO. U24239TG2005PTC047265

Place of supply : 37-Andhra Pradesh
We request you to supply the following material/service subject terms and conditions mentioned.

Terms of delivery : : DAP AT OUR SITE
Terms of Payment : 30% ADV , 70% AFTER COMPLETION OF WORK
Insurance

Item	Material	Description	Unit Price	Order Qty.	Amount
10		OUTFALL DIFFUCER REPLACEMENT 200MM			
		GROSS PRICE	1,000,000.000 INR	1.000 AU	1,000,000.00
					1,000,000.00

HSN CODE:

Delivery Date:31.03.2023

Other Terms & Conditions:

Total Gross Value **1,000,000.00**

For HETERO INFRASTRUCTURE SEZ LTD
This Document is Electronically Approved. Hence, Signature is not Required

This Terms and Conditions document shall govern exclusively, unless specified otherwise in writing by HETERO INFR. SEZ LTD, all delivery of all Consignments which shall include but is not limited to materials, reactors, instruments, chemicals, vehicles, containers, machines, systems, software, gadget or electronic items (hereinafter referred as "Consignments") to HETERO INFR. SEZ LTD group of companies (herein referred as HETERO INFR. SEZ LTD).

1. Acceptance of Purchase Order:

1.1. Purchase Order will be binding upon the supplier when received and accepted by the supplier. Supplier shall send a written communication of acceptance within three (3) business days of receipt of Purchase Order.. In case no communication of acceptance is received from the Supplier, within three (3) business days of receipt of Purchase Order, the same shall be deemed to have been accepted by Supplier.

2. Delivery:

2.1. All Consignments must be delivered as per the agreed delivery dates specified in the Purchase Order if any or as per instructions received from HETERO INFR. SEZ LTD thereof.. Consignments which are not delivered as specified above are liable to be cancelled at the sole discretion of HETERO INFR. SEZ LTD

2.2. All Consignments shall have at least twenty four months of validity or such period of shelf life as specified by HETERO INFR. SEZ LTD from time to time. All Consignments if applicable shall carry manufacturer's warranty and user manual including but not limited to manufacturer's instructions on handling, safety, storage, maintenance and transportation, supplier's contact information, manufacturer contact information (if supplier is not the manufacturer), all statutory marks and labels applicable for each item or consignment as the case maybe. Supplier shall not change or edit any information provided by the manufacturer.

All Consignments must accompany (as per applicability)invoices, copy of Purchase Orders, list of Goods and quantities, delivery challan, quantity, quality/ technical specifications , Certificate of Analysis (COA), labels with mention of batch number, manufacturing date, details of expiry date/shelf life along with manufacturing site address.

In the event if Supplier is supplying multiple Consignments either ordered in a single Purchase Order or multiple purchase orders, Supplier shall pack them separately and clearly mark the content of each package. Packaging must be able to withstand inland climatic conditions and temperature and should be suitable to all modes of transport as warranted by the nature of the Consignment and shall be commensurate with best commercial transport and logistical practices. Similarly for air freighting packaging shall confirm to International Air Transport Association (IATA) standards and regulations.

2.3. Supplier should depute authorized and competent persons for commissioning and installation (if applicable) of Concaused by wrong commissioning and installation by the engineer/technician/software programmer deputed by Supplier.

3. Quality:

3.1. Quality of all Consignments supplied should be as per specifications mentioned under or either all of the following documents -

- **i. Purchase Order**
- **ii Supply or Purchase Agreement (in event one is executed)**
- **iii Quality Agreement or Technical Agreement (in event one is executed)**

With respect to quality, the documents shall have precedence in the following order - Quality Agreement or Technical agreement, Supply or Purchase Agreement and Purchase Order and such other instructions issued by HETERO INFR. SEZ LTD from time to time.

3.2. HETERO INFR. SEZ LTD's decision on Quality of Consignments shall be final and binding on supplier.

4. Incoterms:

The Supplier agrees to deliver the Consignments as per Incoterms 2010 specified in the Purchase Order from time to time.

5. Acceptance Testing:

5.1. The Supplier is obliged to render, free of charge, all reasonable cooperation required by HETERO INFR. SEZ LTD within the context of the testing and inspection of the Consignments, including the granting of access to the Supplier's facilities and the provision of personnel expertise.

5.2. Any Consignment that are damaged or does not meet with the specifications or there is any deviation/deficiency asagainst specifications under clause 3 of this document or is not in working condition (irrespective of whether delivery by supplier directly or through its agent, distributor, logistic service or provide or otherwise), then at option of HETERO INFR. SEZ LTD.

PHARMA - (i) the Supplier shall replace the Consignments as per specification within fifteen (15) days with no additional expense to HETERO INFR. SEZ LTD OR (ii) Supplier shall return all payments made by HETERO INFR. SEZ LTD within five (5) working days failing which HETERO INFR. SEZ LTD can charge interest at the rate of 18% per annum. HETERO INFR. SEZ LTD shall not be held liable for any costs arising therefrom. All risk of loss attaching to the Consignments shall be deemed to have remained with the Supplier throughout.

5.3. In case due to nature of material ordered, excess/shortfall is likely to occur, then the excess or short supply is permitted to the extent of the tolerance limits of ordered quantity. Supplier beyond this limit shall not be accepted and will be returned to Suppliers at Suppliers cost and risk. Exceptions are permitted in case prior approval is obtained from HETERO INFR. SEZ LTD in writing in this regards. It may be carefully noted that stipulated weight/quantity as measured at place of location of HETERO INFR. SEZ LTD is final and binding on the Supplier.

5.4. HETERO INFR. SEZ LTD shall not be liable for any delay or default in accepting the delivery of the Consignments.

6. Transfer of Title of Consignments:

Subject to Clause 4 of this document; HETERO INFR. SEZ LTD shall acquire title and risk transfer of the Consignments.However, for all consignments rejected by HETERO INFR. SEZ LTD per the terms and conditions of this document, The Supplier shall be solely liable at his own cost and expenses.

7. Payment:

7.1. Once HETERO INFR. SEZ LTD has acquired title to the Consignments, the Supplier shall send its invoices to the address specified by HETERO INFR. SEZ LTD in purchase order and enclosing the agreed documentation as detailed in clause 2.3 of this document.

7.2. All invoices raised by Supplier shall have the reference to Purchase Order number, date, delivery challan and other tax details. The amount as mentioned in the Purchase Order shall be inclusive of all taxes, transportation, insurance, handling and other governmental and local charges not imposed by law on HETERO INFR. SEZ LTD. Supplier shall provide copies of all corroborative invoices and documents inter alia includes but is not limited to freight charge, lorry charges, bill of lading and such receipts as requested by HETERO INFR. SEZ LTD .

8. Additional Remedies:

Post payment disbursement to Supplier, at any point of time if HETERO INFR. SEZ LTD finds the quality of Consignments to be not in adherence to specifications of Clause 3 of this document or the Consignments are not in workable condition, without prejudicing to any remedy available to HETERO INFR. SEZ LTD by law, at option of HETERO INFR. SEZ LTD , the Supplier shall either (i) Substitute the Consignments with at its own expense with no additional cost to HETERO INFR. SEZ LTD OR (ii) cure the defect within a span of twenty four (24) hours or as per time period specified by HETERO INFR. SEZ LTD OR (iii) reimburse entire payment made by HETERO INFR. SEZ LTD under this Agreement OR (iv) Adjust the entire amount in subsequent delivery (ies) to HETERO INFR. SEZ LTD.

9. Non- Assignable:

The Purchase Order is not assignable by the Supplier and Supplier shall be solely liable for all the acts and omission.

10. Intellectual Property Law:

Supplier represents and warrants that Supplier has all the licenses or authorization to Supply the Consignments under this Agreement. Supplier represents that the Consignments supplied to HETERO INFR. SEZ LTD does not infringe any third party intellectual property which includes but is not limited to patent or trademark or Design infringement of any third party. Supplier provides HETERO INFR. SEZ LTD a perpetual,irrevocable, sub-licensable, royalty free license to use the Consignments for all purposes. Supplier shall defend such cases at their costs and indemnify HETERO INFR. SEZ LTD for any such loss or damage that may arise due to such litigation or claims.During occurence of any such dispute,Supplier will take all interim license or authorization at its own cost to ensure business continuity at HETERO INFR. SEZ LTD .

11. Compliance by Supplier:

11.1. Supplier shall comply with all local, state and central laws applicable for the Consignments supplied to HETERO INFR. SEZ LTD.

11.2 The Vendor (supply/Service) shall comply with the applicable legal requirements and standards under the laws. This includes, but is not limited to, the laws and regulations governing environmental standards, health & safety standards, employment, child Labor, forced Labor, sexual harassment, discrimination, minimum wages, freedom of association and collective bargaining, and human rights. The Supplier shall use best efforts to promote the Code of Conduct among its Suppliers and sub suppliers.

11.3 The Vendor (supply/Service) should not offer any gift, gratuity, or any form of privilege to any Hetero employee. Gifts, meals, or entertainment are permitted only if they are ordinary and reasonable, of limited value, consistent with accepted business practices and accepted ethical standards, and do not violate any law.

11.4 Hetero reserves the right to terminate its business relationship with Vendor if the Vendor violates any laws, suppliers/other sub-contractors Violates this Social, Environment, Health, Safety, Compliance.

11.5. Supplier guarantees that the Consignments it supplies under this agreement will not violate any national or international or legal requirements or any equivalent or related regulations. This also includes those requirements relating to presence or use of chemicals or other materials in products or product safety laws or regulations related to hazardous substance. Supplier also shall take this written undertaking from any subcontractors or agent or any third party whom they may engage in executing this purcase order. Supplier shall ensure and obtain relevant test reports from certified and accredited Labs or third parties in ensuring these compliances and product safety laws. Supplier agrees to indemnify HETERO INFR. SEZ LTD from any loss or damages or legal expenses related thre on due to supplier's or thirdparty enagagd by supplier violation or breach of this clause.

12. Cancellation of Purchase Order:

HETERO INFR. SEZ LTD reserves the right to cancel or modify the Purchase Order on or before the delivery of the Consignment. Any payments made by HETERO INFR. SEZ LTD shall be refunded within three (3) days from the date of cancellation or modification (if applicable) of the purchase order.

13. Confidentiality:

All the information contained in the Purchase Order or otherwise any information disclosed to Supplier whether in written or oral form shall be treated as confidential and shall not be disclosed to any third party without the prior written consent of HETERO INFR. SEZ LTD.

14. Indemnity:

Supplier agrees to indemnify and hold HETERO INFR. SEZ LTDharmless from all costs, damages, taxes, charges or suffered by HETERO INFR. SEZ LTD as a result of or arising from any delay, default or use of the Consignments supplied under the Purchase Order.

15. Insurance.

Supplier shall take and maintain all insurance as applicable which includes but is not limited to public liability insurance, including products liability, completed operations, transit insurance, contractors liability and protective liability, automobile liability insurance (including non-owned automobile liability) and Workmen's Compensation and employer's liability insurance. Seller agrees to submit certificates of insurance evidencing its insurance coverage when requested by HETERO INFR. SEZ LTD

16. Insolvency of the Supplier

Should the Supplier becomes insolvent, or institutes or has instituted against it a petition for bankruptcy or is adjudicated bankrupt, or if an interim insolvency administrator is appointed or if insolvency proceedings are commenced in relation to the assets of the Supplier, or a receiver is appointed for the benefit of its creditors, the HETERO INFR. SEZ LTD its credito may terminate the pending purchase order if any issued thereunder without any further obligation whatsoever towards Supplier.

17. Conflict:

In the event of any conflict between the terms of this Purchase Order and the Agreement (if executed), the terms of the Agreement shall prevail and supersede anything written in Purchase Order.

18. HETERO INFR. SEZ LTD's Liability:

HETERO INFR. SEZ LTD's liability under this Purchase Order shall be limited to the value of the Purchase Order shall not be liable for any indirect,incidental and consequential damages arising from the Purchase Order.

19. Dispute Resolution:

Unless otherwise specifically agreed under an agreement executed with HETERO INFR. SEZ LTD, all disputes arising from this Purchase Order shall be subject to the exclusive jurisdiction of the courts located in Hyderabad.

20. Specific Requirements:

These are only general terms and conditions which are in addition but not in derogation of specific terms and conditions stated in Purchase Order.

21. General:

Nothing in this Purchase Order shall be deemed to grant any right, title or interest to Supplier.HETERO INFR. SEZ LTD disclaim all warranties either express or implied.The rights and remedies provided to HETERO INFR. SEZ LTD herein are not exclusive but are cumulative and in addition to any other remedies available at law or in equity. If any terms herein is held by a court of competent jurisdiction to be invalid or unenforceable, such invalidity or unenforceable shall not affect the validity of the remaining terms.

TAX INVOICE

INVOICE # **10070/2022-2023**
INVOICE DATE **2022-12-19**

ANDHRA PRADESH MARITIME BOARD
BEACH ROAD, KAKINADA, AP-533007
GSTIN 37AAAGA2316N1ZJ
PAN AAAGA2316N

AGENCY **Hetero Infrastructure SEZ Ltd** PAN **AABCH6897E**
GSTIN No **37AABCH6897E3Z6**
PORT **Kakinada**
DEPARTMENT **PO KKD**

S.no	Description of Services	Type of Services	SAC Code	Service Amt
1	As per the G.O.Ms.No.21, E, I&I (Ports.II) Dept., Dt.29.06.2018 and based on the previous inspection conducted by the Port Officials and previous measurements submitted by the Executive Engineer, Marine Division, Kakinada vide his letter Dt. 08.01.2020 and request made by the firm by phone, Fee towards way leave charges calculated as follows : A) 200 MM dia effluent pipeline. 1) Port Land for laying pipeline on land side area L46XW1.00 = 46.00@Rs.788x46/10 = Rs.3625/- for one year i.e., from 29.06.2022 to 28.06.2023 = Rs.3,625/-. 2) Port Land for laying pipeline in the Sea Side area L986 X W100 = 986 Sq.m@473x986/10 = Rs.46,638/- X one year i.e., from 29.06.2022 to 28.06.2023 = Rs.46,638/- Total A (1+2) = 50,263/- B) 500 MM dia pipeline 1) Port Land for laying pipeline on land side area L45.72 XW1.20 = 54.86@Rs.788x54.86/10 = Rs.4,323/- for 1 (one) year i.e., from 29.06.2022 to 28.06.2023 = Rs.4,323/-. 2) Port Land for laying pipeline in the Sea Side area L1100 X W1.20 = 1320 Sq.m@473x1320/10 = Rs.62,436/- X 1 (one) year i.e., from 29.06.2022 to 28.06.2023 = Rs.62,436/- Total B (1+2) = 4,323 + 62,436 = 66,759/- Total Way Leave Charges (A+B) = Rs.1,17,022/- (Rs.50,263/- +Rs.66,759/-) Note : 1) Invoice prepared based on the previous information furnished by your Firm. 2) Our Departmental Engineers will visit the site and after verification of the actual utilization facilities of your firm, if any due amount will be initiated at later stage pending amount should be cleared after raising revised final invoice. 3) Payment will be done within a 15 days from date of invoice raised by this office, if failed making payment within due date penalty will be levied as per the rules in force.	Way Leave Charges	996759	117022
				117022

Note: This is a system generated invoice, it doesn't require any signatures

Andhra Pradesh Maritime Board

PAYMENT RECEIPT

Transaction ID	4qi6fuixlch3tsu5
Bank Ref No	YSBI1655150276
Invoice Type	miscellaneous
Invoice Number	10070/2022-2023
Transaction Date	Jan 4, 2023 9:03:13 AM
Payment Status	Success
Success Info	Pending Authorization
Service Head	81
Total Payment Amount	Rs: 117022
Service Amount	Rs: 117022

PORT OFFICER

Andhra Pradesh Maritime Board

system generated receipt 05/01/2023 at 2:24PM

TAX INVOICE

INVOICE # **10071/2022-2023**
INVOICE DATE **2022-12-19**

ANDHRA PRADESH MARITIME BOARD
BEACH ROAD, KAKINADA, AP-533007
GSTIN 37AAAGA2316N1ZJ
PAN AAAGA2316N

AGENCY **Hetero Infrastructure SEZ Ltd** PAN **AABCH6897E**
GSTIN No **37AABCH6897E3Z6**
PORT **Kakinada**
DEPARTMENT **PO KKD**

S.no	Description of Services	Type of Services	SAC Code	Service Amt
1	Towards Collection of GST to the Invoice No. 10070/2022-2023, Dt. 19-12-2022	GST	997212	21064
				21064

Note: This is a system generated invoice, it doesn't require any signatures

Andhra Pradesh Maritime Board

PAYMENT RECEIPT

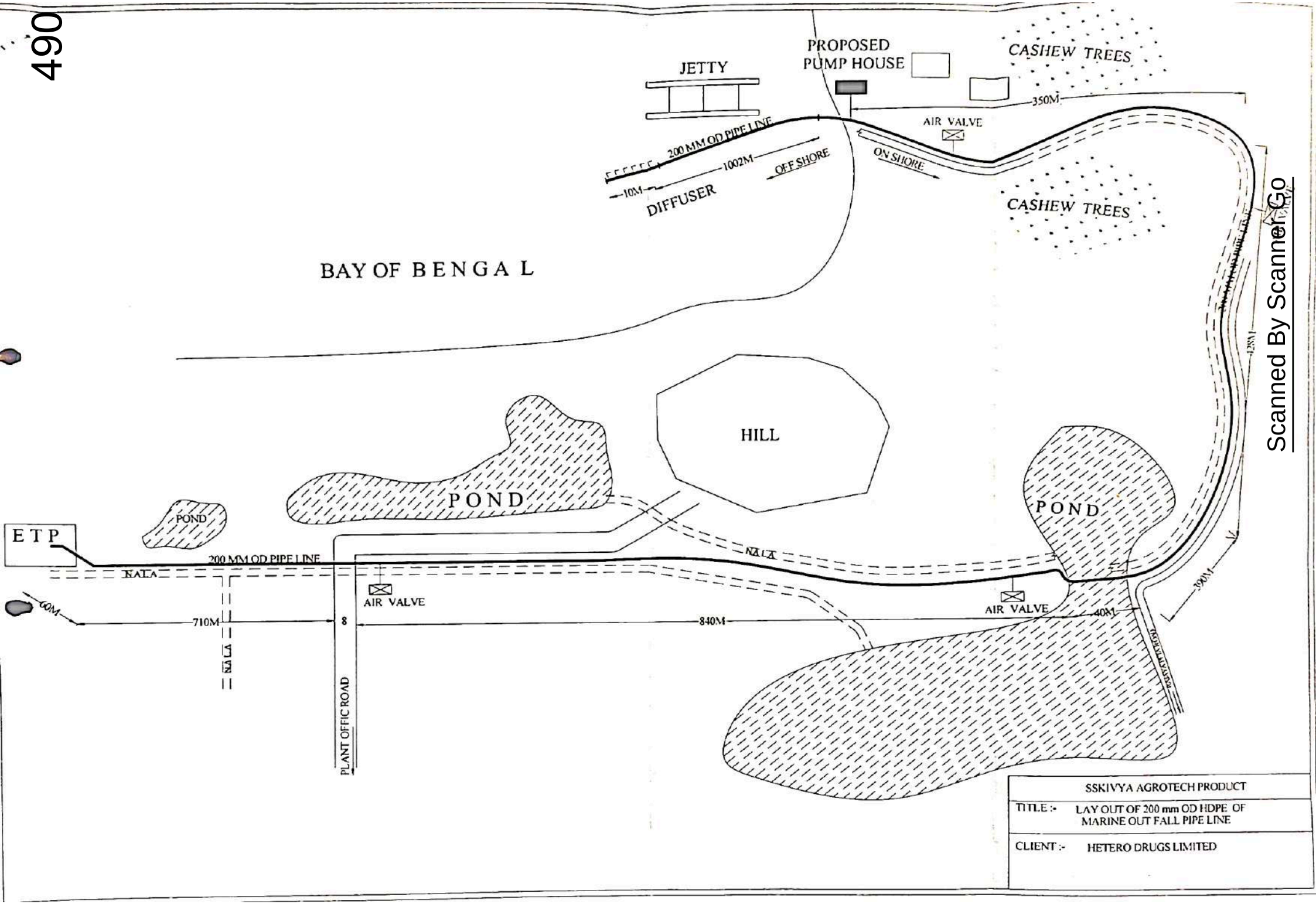
Transaction ID	4qi6fuinlch3r3r5
Bank Ref No	YSBI1655148082
Invoice Type	miscellaneous
Invoice Number	10071/2022-2023
Transaction Date	Jan 4, 2023 9:01:07 AM
Payment Status	Success
Success Info	Pending Authorization
Service Head	GST
Total Payment Amount	Rs: 21064
Service Amount	Rs: 21064

PORT OFFICER

Andhra Pradesh Maritime Board

system generated receipt 05/01/2023 at 2:23PM

490

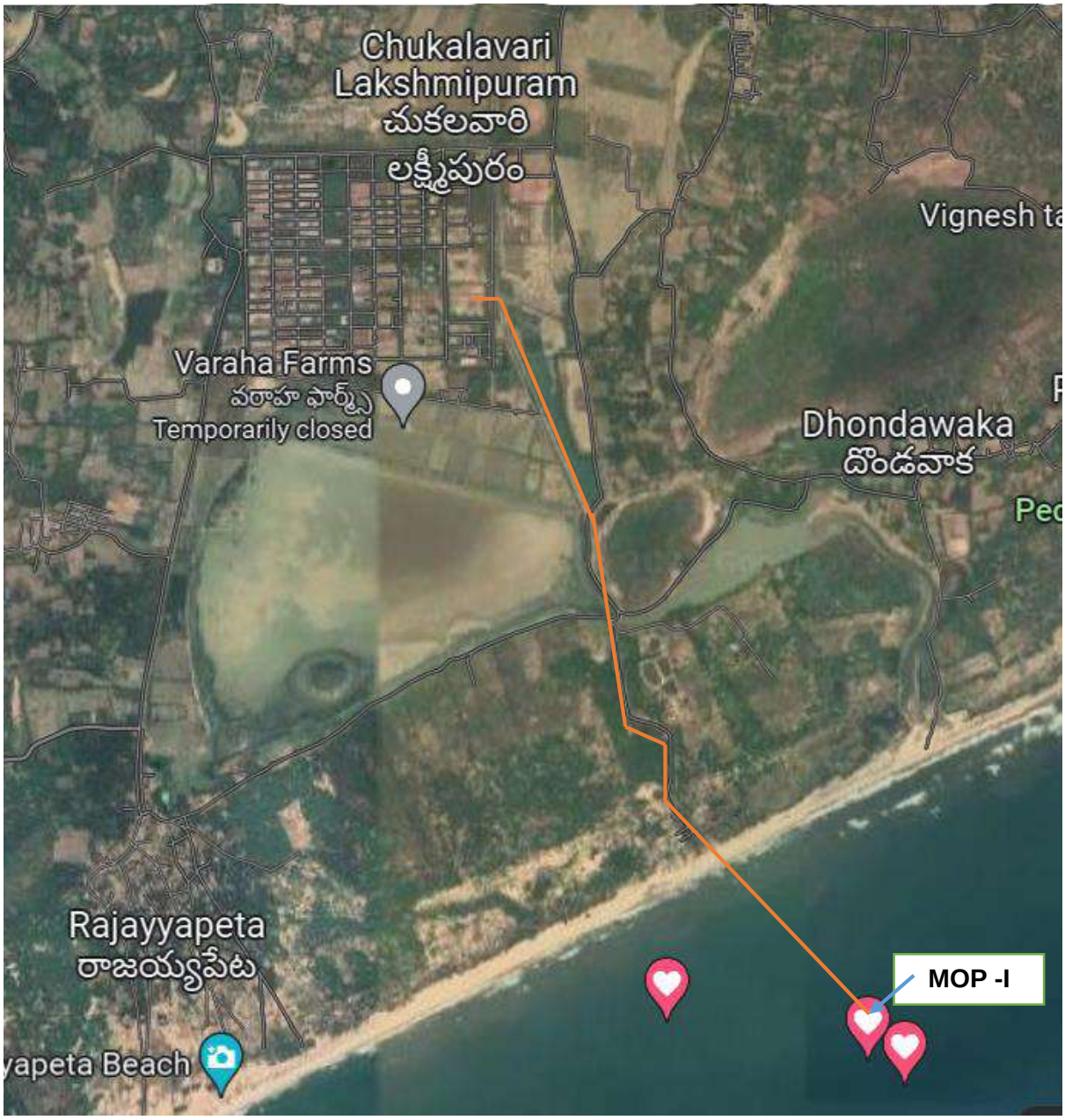


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HETERO INFRASTRUCTURE SEZ LTD

N.Narasapuram(V), Nakkapalli (M), Anakapalli Dist

MARINE DISPOSAL PIPELINE ROUTING FROM PLANT TO SEA



SV ENVIRO LABS & CONSULTANTS

(Environmental Engineers & Consultants in Pollution Control)

Corporate Office & Laboratory : Enviro House, B-1, Block-B, IDA, Autonagar, Visakhapatnam-530012
www.svenvirolabs.com, Ph:0891-2755528, Cell: +91 9440338628
info@svenvirolabs.com, svenviro_labs@yahoo.co.in

Branch Office : 2-53, Mahipala Street, Yanam - 533464.

Recognized by **Govt.of India-MoEF & CC, New Delhi, Accredited by : NABL & NABET**

Ref: SVELC/HISL/23-02/03

Date: 04-03-2023

NAME AND ADDRESS : **M/s. HETERO INFRASTRUCTURE SEZ LIMITED,**
N.Narasapuram Village, Nakkapally Mandal,
Visakhapatnam (Dt).

SAMPLE PARTICULARS : **WATER**

SOURCE OF COLLECTION : **DESALINATION REJECT WATER**

DATE OF COLLECTION : 24-02-2023

DATE OF RECEIPT : 25-02-2023

TEST REPORT

S.NO	PARAMETER	UNIT	RESULT	METHODS
1.	Turbidity	NTU	<0.01	APHA,2130-B, 23rd Edition
2.	pH	-	7.90	APHA 4500-H+B, 23rd Edition
3.	Total Dissolved Solids	mg/l	50110	APHA,2540-C, 23rd Edition
4.	Total Alkalinity as $CaCO_3$	mg/l	174	APHA,2320-B, 23rd Edition
5.	Total Hardness as $CaCO_3$	mg/l	10675	APHA,2340-C, 23rd Edition
6.	Calcium as Ca	mg/l	774	APHA,3500-Ca B, 23rd Edition
7.	Magnesium as Mg	mg/l	2124	APHA,3500-Mg B, 23rd Edition
8.	Chlorides as Cl^-	mg/l	28402	APHA,4500-Cl B, 23rd Edition
9.	Fluoride as F	mg/l	3.96	APHA,4500-FD, 23rd Edition
10.	Nitrate as NO_3^-	mg/l	3.25	APHA,4500 NO^{3-} B & C, 23rd Edition
11.	Sulphates as SO_4	mg/l	4189	APHA,4500-SO_4^{2-} E , 23rd Edition

CHECKED BY

SV ENVIRO LABS & CONSULTANTS

GOVERNMENT OF ANDHRA PRADESH
DEPARTMENT OF FISHERIES

From
Smt T.Sumalatha M.Sc.M.Phil,
Joint Director of Fisheries (FAC),
Visakhapatnam.

To
The Asisstent manager
Hetero Infrastructure SEZ Ltd
Nakkapalli Mandal.
Anakapalli Distrct.

Rc.No. 1766/B/2022. dated 13.12.2022

Sir,

Sub:- Fisheries – Fish data information- for the year 2014-15 to 2021-22- send the Report- Reg

Ref:- 1.Your latter Dated:29.11.2022. for Hetero infrastructure SEZ Ltd.

&&&&

I Wish to inform that the above reference cited, I am enclosing herewith the year wise Fish &

Prawn catch Data particulars for 5 year 2014-15 to 2021-22 in Visakhapatnam District. As per available Data.

Yours faithfully,

Encl:- Report As above

T. Sumalatha 14-12-22
Joint Director of Fisheri(FAC)
Visakhapatnam

14/12/22

YEARS -WISE FISH & PRAWN (M.Ton'S) PRODUCTION IN VISAKHAPATNAM DISTRICT

S.NO	ITEM	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	UPTO MARCH 2021-22
1	Marine Fish Production	85620	89084	105441	104185	104005	96093	100282	102977
2	Marine Shrimp Production	11700	14889	20172	23750	28802	37838	33575	28787
3	Inland Fish Production	8461	10289	14133	13585	50252	25009	57335	47527
4	Inland Prawn Production	7130	7268	10746	9557	82	89	85	95.1
5	Brackish water Shrimp culture	3265	4533	4090	4818	6577	5973	6793	11782
TOTAL		116176	126063	154582	155895	189718	165002	198070	191168

T. Surya Rao 14.12.22
Joint Director of Fisheries(FAC),
Visakhapatnam
14/12/22

Nakkapalli Jurisdiction(Nakkapalli and payakaraopeta Mandals)-Total Fin Fish &Shel Fish Catch Report For 2022 Year(From April To March)			
Month	Fin Fish Production(mts)	Shel Fish Production(mts)	Total Production(mts)
April	1582	192	1774
May	52	120	172
June	810	175	985
July	1780	715	2495
August	1625	614	2239
September	1587	546	2133
October	1475	411	1886
November	1280	309	1589
Total	**10191**	**3082**	**13273**

Asst. Director of Fisheries
Narsipatnam

Asst director of Fisheries
Narsipatnam

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In the MOEF&CC meeting held on 29.11.2022, for seeking clearance for M/s. Hetero outfall pipeline laying, the Chairperson suggested to compare the Marine Fishery Catch Statistics for the period from 2006 (i.e., before 2007 when effluent pipeline discharge was commissioned) to recent data available to assess whether there was any impact of Hetero Pharma Effluent discharge on the marine fishery resources.

Marine Fishery Catch data for Andhra Pradesh State was collected from Andhra Pradesh Fisheries Department website for the period 2004 to 2019 presented in **Table 1** and shown in **Fig. 1.**

Table 1. Marine Fish Production in Andhra Pradesh

Year	Marine Fish Production (in thousand tonnes)
2004 - 2005	1,815.81
2005 - 2006	1,920.67
2006 - 2007	2,071.12
2007 - 2008	2,188.15
2008 - 2009	2,449.24
2009 - 2010	2,465.44
2010 - 2011	2,518.26
2011 - 2012	3,264.72
2012 - 2013	3,515.85
2013 - 2014	3,733.38
2014 - 2015	4,062.49
2015 - 2016	4082.36
2016 - 2017	5002.25
2017 - 2018	5052.65
2018 - 2019	5088.48

Source: Department of Fisheries, Government of Andhra Pradesh

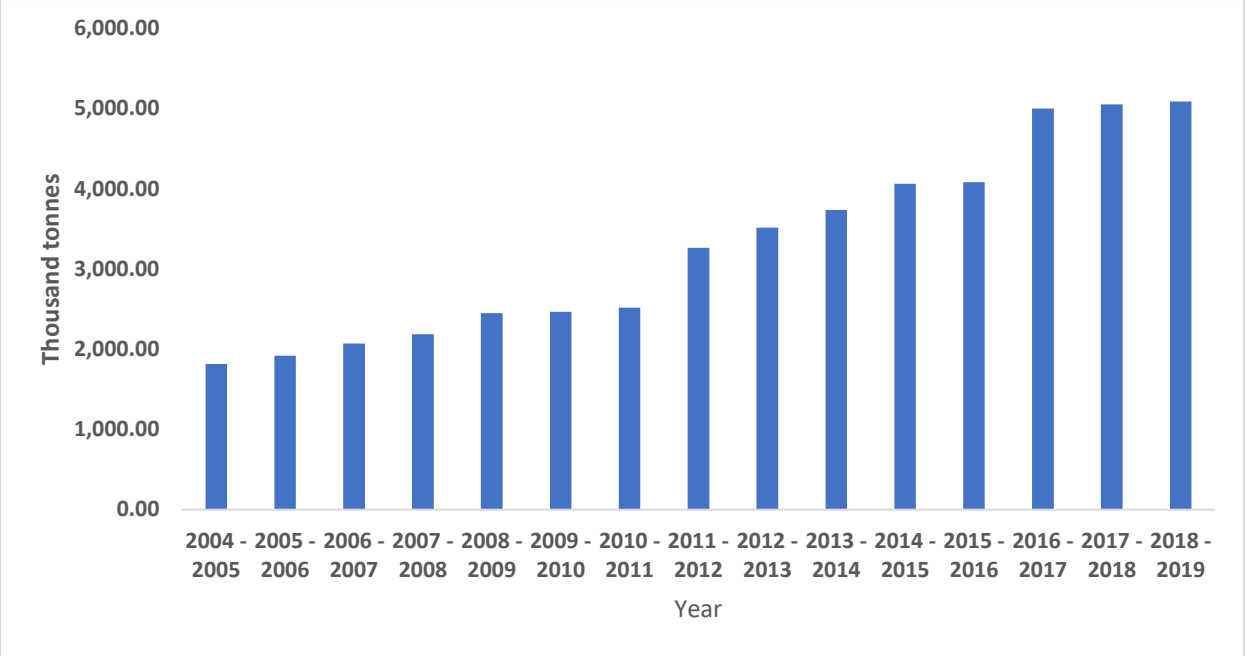


Fig. 1. Andhra Pradesh Marine Fish Production

Marine Fish catch data for Visakhapatnam District was sourced from Department of Fisheries, Andhra Pradesh. Data for the period 2007 to 2018 were collected and given in **Table 2** and shown in **Fig. 2.**

Table 2. Marine Fish Production in Visakhapatnam District

Year	Marine Fish Production (in Metric Tonnes)
2007-08	49448
2008-09	54777
2009-10	52578
2010-11	59037
2011-12	69982
2012-13	73523
2013-14	78585
2014-15	85620
2015-16	89084
2016-17	105441
2017-18	106704

Source: Department of Fisheries, Government of Andhra Pradesh

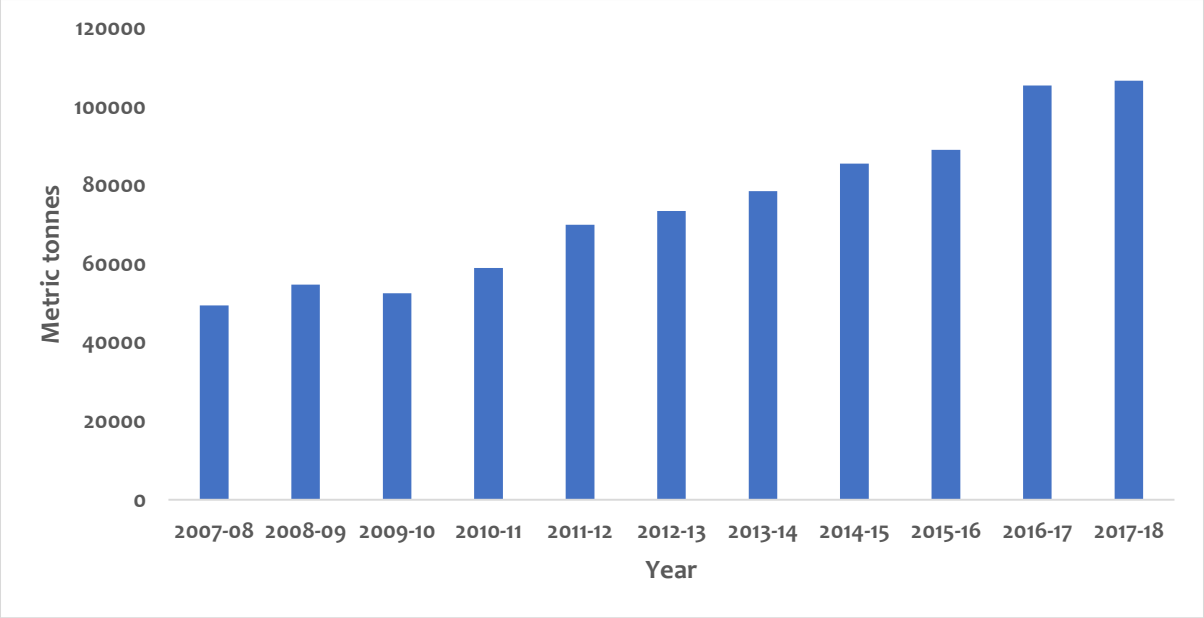


Fig. 2. Visakhapatnam Marine Fish Production

The following villages are located in Visakhapatnam district coast and are located within 10 km radius of the project site.

- Amalapuram
- Bangarampeta
- Boyapadu
- Chinatheenerla
- Donevaniri Laxmipuram
- Dondavaka
- Pedatheenerla
- Rajayyapeta

From Tables 1 & 2, it can be inferred that there is an increase in fish production for the last 15 years in Andhra Pradesh state. The same trend is followed in the district wise fish production statistics also. Thus, it is inferred that there shall not be any impact due to the discharge from existing effluent outfall pipeline.

Marine Water quality results

NIO	2007	2010	2012	2014	2017	INDOMER 2022	2023	CPCB Standards Coastal areas
Parameter	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	**Range**	
DO (mg/l)	5.09-6.65	3.24-5.58	5.64-7.58	2.26-5.22	2.7-6.0	5.9-6.1 (mg/l)	4.6-6.4	*
BOD (mg/l)	0.29-1.16	0.13-1.54	0.06-0.86	0.07-0.55	0.06-0.42	1.0-1.2 (mg/l)	0.6-4.1	30-100 mg/L
pH	7.9-8.1	8.0-8.1	8.1-8.2	7.4-8.0	7.4-8.0	7.91-7.95	7.77-8.29	5.5 - 9.0
TSM (mg/l)	10.6-35.2	34.2-69.6	19.0-32.8	16.4-48.8	16.8-45.6	2.6-6.2 (mg/l)	20.0-52.3	*
No2-N (µg/l)	0.6-4.3	1.4-10.4	0.6-6.8	8.2-17.8	1.6-8.5	0.43-0.48 (µmol/l) / 19.7-22.08 (µg/l)	ND – 0.78	*
NO3-N (µg/l)	--	--	--	--	21.3-62.7	4.5-4.8 (µmol/l) / 279- 297 (µg/l)	5.7-23.4	*
NH4-N (µg/l)	13.8- 52.4	4.90- 41.02	12.1- 34.0	22.4- 35.6	6.0- 45.9	4.9-5.1 (µmol/l) / 88 -92 (µg/l)	--	50 mg/L
PO4-P(µg/l)	8.37-40.46	2.88-33.28	27.6-75.3	42.8-131.8	14.3-47.2	1.2-1.3 (µmol/l)/ 113- 123 (µg/l)	0.2-1.1	*
SiO4-S (µg/l)	23-156	20-202	101-381	289-406	139-438	Not tested	4.6-28.0	*

Observation:

- DO results were relatively equal to 2012 results of NIO
- BOD results were relatively equal to 2010 results of NIO
- pH is similar when compared to all years
- TSM value is slightly lower than NIO results
- NO2-N Slightly higher than 2014
- NH4-N is slightly higher than NIO results
- Po4-P results were relatively equal to 2014.

The results were compared with CPCB Standards COASTAL AREAS limits and all the results falls within the CPCB specification.

SV ENVIRO LABS & CONSULTANTS

(Environmental Engineers & Consultants in Pollution Control)

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www.svenvirolabs.com, Ph:0891-2755528, Cell: +91 9440338628
info@svenvirolabs.com, svenviro_labs@yahoo.co.in

Branch Office : 2-53, Mahipala Street, Yanam - 533464.

Recognized by **Govt.of India-MoEF & CC, New Delhi, Accredited by : NABL & NABET**

Ref: SVELC/HISL/23-02/04

Date: 04-03-2023

NAME AND ADDRESS : **M/s. HETERO INFRASTRUCTURE SEZ LIMITED, N.Narasapuram Village, Nakkapally Mandal, Visakhapatnam (Dt).**

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION :
1. BOREWELL – 1 (Near ETP)
2. BOREWELL – 2 (Near Honour Labs)
3. BOREWELL – 3 (Near Labour Shed)
4. BOREWELL – 4 (Near HLL-3)

DATE OF COLLECTION : 24-02-2023

TEST REPORT

S.No	Parameter	Unit	Results			
			1	2	3	4
1.	pH	-	8.41	7.82	7.98	8.03
2.	Total Dissolved Solids	mg/l	7421	30142	13024	13492
3.	Total Alkalinity as $CaCO_3$	mg/l	452	332	402	517
4.	Total Hardness as $CaCO_3$	mg/l	901	8769	1572	1676
5.	Calcium as Ca	mg/l	45.8	558	132	180
6.	Magnesium as Mg	mg/l	191	1792	302	298
7.	Chlorides as Cl^-	mg/l	3125	13785	5112	5529
8.	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01
9.	Manganese as Mn	mg/l	0.23	2.82	0.51	0.03
10.	Zinc as Zn	mg/l	0.37	0.46	0.14	0.26
11.	Aluminum as Al	mg/l	0.14	0.50	0.02	0.14
12.	Boron as B	mg/l	1.72	0.75	1.24	1.03
13.	Barium as Ba	mg/l	0.14	0.05	0.03	0.07
14.	Selenium as Se	mg/l	0.01	0.05	0.03	0.02
15.	Silver as Ag	mg/l	<0.01	<0.01	<0.01	<0.01
16.	Cadmium as Cd	mg/l	<0.01	<0.01	<0.01	<0.01
17.	Cyanide as CN	mg/l	<0.01	<0.01	<0.01	<0.01
18.	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01
19.	Mercury as Hg	mg/l	<0.01	<0.01	<0.01	<0.01
20.	Nickel as Ni	mg/l	0.07	<0.01	<0.01	<0.01
21.	Total Arsenic as As	mg/l	0.02	0.10	0.03	0.02
22.	Total Chromium as Cr	mg/l	<0.01	<0.01	<0.01	<0.01
23.	Iron as Fe	mg/l	0.18	0.10	0.07	0.05

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017

CHECKED BY

SV Enviro Labs & Consultants * VISAKHA-12 *

SV ENVIRO LABS & CONSULTANTS

SV ENVIRO LABS & CONSULTANTS

(Environmental Engineers & Consultants in Pollution Control)

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& Laboratory www.svenvirolabs.com, Ph:0891-2755528, Cell: +91 9440338628
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Branch Office : 2-53, Mahipala Street, Yanam - 533464.

Recognized by Govt.of India-MoEF & CC, New Delhi, Accredited by : NABL & NABET

Ref: SVELC/HIL/23-02/01

Date: 04-03-2023

NAME AND ADDRESS : M/s. HETERO INFRASTRUCTURE LIMITED
NARASAPURAM (V),
NAKKAPALLI (M),
VISAKHAPATNAM.

SAMPLE PARTICULARS : SOIL

SOURCE OF COLLECTION : 1. HETERO LABS –III UNIT
2. HETERO LABS-IX
3. HETERO DRUGS UNIT-IX

DATE OF COLLECTION : 24-02-2023

DATE OF RECEIPT : 25-02-2023

TEST REPORT

S.NO	PARAMETER	UNIT	1	2	3
1.	pH	-	7.98	8.14	8.02
2.	Conductivity	ms/cm	0.492	0.471	0.449
3.	Moisture	%	4.85	5.87	4.70
4.	Bulk density	g/cc	1.43	1.55	1.48
5.	Porosity	%	54	58	52
6.	Organic Matter	%	0.87	0.69	1.24
7.	Nitrogen as N	mg/100gm	0.42	0.45	0.51
8.	Phosphorus as P	mg/100gm	5.6	4.8	5.3
9.	Potassium as K	mg/100gm	2.7	3.6	3.0

CHECKED BY

SV ENVIRO LABS & CONSULTANTS VISAKHAPATNAM

SV ENVIRO LABS & CONSULTANTS

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पेसो)
Petroleum & Explosives Safety Organisation (PESO)
पाँचवा तल, ए-ब्लाक, सी.जी.ओ.कॉम्प्लेक्स, सेमिनरी हिल्स,
नागपुर-440006
5th Floor, A-Block, CGO Complex, Seminary Hills,
Nagpur - 440006

E-mail : explosives@explosives.gov.in
Phone/Fax No : 0712-2510245, Fax-2510577

संख्या /No. : P/HQ/AP/15/3852 (P250196)

दिनांक /Dated : 23/12/2014

सेवा में /To,

M/s. Hetero Drugs Limited (Unit III),
Hetero Corporate, 7-2-A2,
Ind. Estate, Sanath Nagar,
Hyderabad,
District: HYDERABAD,
State: TELANGANA
PIN: 500018

विषय /Sub : Plot No, Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N. Narasapuram (v), Nakkapally (m), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 998899 में स्थित पेट्रोलियम वर्ग A,B प्रतिष्ठापन - पेट्रोलियम नियम 2002 के अंतर्गत प्रपत्र XV में जारी अनुज्ञप्ति सं P/HQ/AP/15/3852 (P250196) – संशोधन के संदर्भ में ।

Existing Petroleum Class A,B installation at Plot No, Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N. Narasapuram (v), Nakkapally (m), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 998899- Licence No. P/HQ/AP/15/3852 (P250196) - granted in form XV under Petroleum Rules 2002 – Amendment regarding

महोदय /Sir (s),

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या *explo/petro/unit/92/2014-15* दिनांक 29/10/2014 का संदर्भ ग्रहण करें ।
Reference to your letter No. *explo/petro/unit/92/2014-15* dated 29/10/2014 on the above subject.

दिनांक 31/12/2024 तक वैध अनुज्ञप्ति संख्या P/HQ/AP/15/3852 (P250196) दिनांक 23/12/2014 निम्नलिखित वर्ग एवं मात्राओं में पेट्रोलियम संग्रहण के लिए अथा संशोधित रूप इसके साथ संलग्न की जा रही है ।
Licence No. P/HQ/AP/15/3852 (P250196) dated 23/12/2014 valid upto 31/12/2024 is resumed herewith duly amended with respect to Capacity Amendment.

पेट्रोलियम का विवरण /Description of Petroleum	किलोलीटरों में अनुज्ञप्ति क्षमता /Quantity licensed in Kl.
वर्ग क प्रपुंज पेट्रोलियम /Petroleum Class A, in bulk	620.00 Kl.
वर्ग क प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class A, otherwise than in bulk	Nil.
वर्ग ख प्रपुंज पेट्रोलियम /Petroleum Class B, in bulk	124.00 Kl.
वर्ग ख प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class B, otherwise than in bulk	Nil.
वर्ग ग प्रपुंज पेट्रोलियम /Petroleum Class C, in bulk	Nil.
वर्ग ग प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class C,otherwise than in bulk	Nil.
कुल क्षमता /Total	744.00 Kl.

कृपया पावती दें।
Please acknowledge the receipt.

Note : ~~Your Balance Amount with the Organisation is Rs.nil/-, which will be used for processing of the same Licence in future.~~

भवदीय /Yours faithfully,

(आर.पी.सिंह)
(R.P.Singh)
उप मुख्य विस्फोटक नियंत्रक
Dy. Chief Controller of Explosives
कृते मुख्य विस्फोटक नियंत्रक
For Chief Controller of Explosives
नागपुर
Nagpur

Copy forwarded to :-
1. The The District Revenue Officer & Additional District Magistrate, Visakhapatnam , VISAKHAPATNAM(Andhra Pradesh) with reference to his NOC No 2897/2010/C8, Dated 20/05/2011
2. Jt. Chief Controller of Explosives, South Circle Office, CHENNAI. A Copy of the licence along with approved plan is enclosed.
3. Dy. Chief Controller of Explosives, Visakhapatnam, VISAKHAPATNAM. A Copy of the licence along with approved plan is enclosed.

For Chief Controller of Explosives
Nagpur

1823

FORM XV
(see Article 6 of the First Schedule)

LICENCE TO IMPORT AND STORE PETROLEUM IN AN INSTALLATION

Licence No. : **P/HQ/AP/15/3852(P250196)** Fee Rs. **11660/-** per year

Licence is hereby granted to **M/s. Hetero Drugs Limited (Unit IX), Hetero Corporate, 7-2-A2, Indl. Estate, Sanath Nagar, Hyderabad, District: HYDERABAD, State: TELANGANA, PIN: 500018** valid only for the importation and storage of **744.00 KL** Petroleum of the class(es) and in quantities as herein specified and storage thereof in the place described below and shown on the approved plan No **P/HQ/AP/15/3852(P250196)** dated **20/07/2011** attached hereto subject to the provisions of the Petroleum Act, 1934 and the rule made thereunder and to the further conditions of this Licence.

The Licence shall remain in force till the 31st day of December **2024**

Description of Petroleum	Quantity licenced in KL
Petroleum Class A, in bulk	**620.00 KL**
Petroleum Class A, otherwise than in bulk	**NIL**
Petroleum Class B, in bulk	**124.00 KL**
Petroleum Class B, otherwise than in bulk	**NIL**
Petroleum Class C, in bulk	**NIL**
Petroleum Class C,otherwise than in bulk	**NIL**
Total:	**744.00 KL**

July 20, 2011

Chief Controller of Explosives

1). Amendment dated - 16/02/2012
2). Amendment dated - 23/12/2014

DESCRIPTION AND LOCATION OF THE LICENSED PREMISES

The licensed premises, the layout , boundaries and other particulars of which are shown in the attached approved plan are situated at **Plot No: Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N. Narasapuram (v), Nakkapally (m), District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 999999** and consists of **Twenty aboveground Petroleum Class A & Four aboveground Petroleum Class B storage tanks together with connected facilities.** together with connected facilities.

भारत सरकार
Government of India
वाणिज्य और उद्योग मंत्रालय
Ministry of Commerce & Industry
पेट्रोलियम तथा विस्फोटक सुरक्षा संगठन (पैसो)
Petroleum & Explosives Safety Organisation (PESO)
पाँचवा तल, ए-ब्लाक, सी.जी.ओ.कॉम्प्लेक्स, सेमिनरी हिल्स
नागपुर- 440006
5th Floor, A-Block, CGO Complex, Seminary Hills,
Nagpur - 440006

E-mail : explosives@explosives.gov.in
Phone/Fax No : 0712 -2510245, Fax-2510577

PEB PCT

पत्र /No. : P/HQ/AP/15/3853 (P250194)

दिनांक /Dated : 02/02/2015

04 FEB 2015

सेवा /To,

M/s. M/s. Hetero Labs Ltd., (Unit IX),
Hetero Corporate, 7-2-A2,,
Indl. Estate, Sanath Nagar,
Hyderabad,
District: HYDERABAD,
State: TELANGANA
PIN: 500018

विषय /Sub : Plot No, Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N.Narasapuram (v), Nakkapally (m), Nakkapalle, Taluka: Nakkapalle, District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 999999 में स्थित पेट्रोलियम वर्ग A,B अधिष्ठापन - पेट्रोलियम नियम 2002 के अंतर्गत प्रपत्र XV में जारी अनुज्ञप्ति सं P/HQ/AP/15/3853 (P250194) – संशोधन के संदर्भ में ।

Existing Petroleum Class A,B installation at Plot No, Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N.Narasapuram (v), Nakkapally (m), Nakkapalle, Taluka: Nakkapalle, District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 999999- Licence No. P/HQ/AP/15/3853 (P250194) - granted in form XV under Petroleum Rules 2002 - Amendment regarding

महोदय /Sir

कृपया आपके उपर्युक्त विषय से संबंधित पत्र संख्या Explo/Petro/Unit-IX/03/2014-15 दिनांक 28/12/2014 का संदर्भ ग्रहण करें ।
Reference to your letter No. Explo/Petro/Unit-IX/03/2014-15 dated 28/12/2014 on the above subject.

दिनांक 31/12/2024 तक वैध अनुज्ञप्ति संख्या P/HQ/AP/15/3853 (P250194) दिनांक 02/02/2015 निम्नलिखित वर्ग एवं मात्राओं में पेट्रोलियम भंडारण के लिए यथा संशोधित कर इस पत्र के साथ लौटाई जा रही है ।
Licence No. P/HQ/AP/15/3853 (P250194) dated 02/02/2015 valid upto 31/12/2024 is returned herewith duly amended with respect to Lay out Amendment,

पेट्रोलियम का विवरण /Description of Petroleum	किलोलीटरों में अनुज्ञप्ति मात्रा /Quantity licenced in KL
वर्ग क प्रपुंज पेट्रोलियम /Petroleum Class A, in bulk	328.00 KL
वर्ग क प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class A, otherwise than in bulk	NIL
वर्ग ख प्रपुंज पेट्रोलियम /Petroleum Class B, in bulk	112.00 KL
वर्ग ख प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class B, otherwise than in bulk	NIL
वर्ग ग प्रपुंज पेट्रोलियम /Petroleum Class C, in bulk	NIL
वर्ग ग प्रपुंज पेट्रोलियम से भिन्न /Petroleum Class C,otherwise than in bulk	NIL
कुल मात्रा /Total	440.00 KL

कृपया पावती दें।
Please acknowledge the receipt.

Note : Your Balance Amount with the Organisation is Rs. [redacted] which will be used for processing of the same Licence in future.

भवदीय /Yours faithfully,

(आर.पी.सिंह)
(R.P.Singh)
उप मुख्य विस्फोटक नियंत्रक
Dy. Chief Controller of Explosives
कृते मुख्य विस्फोटक नियंत्रक
For Chief Controller of Explosives
नागपुर
Nagpur

warded to :-
e District Revenue Officer & Additional District Magistrate, Visakhapatnam , VISAKHAPATNAM(Andhra Pradesh) with reference to his NOC No 2898/2010/CS Dated 20/05/2011
of Controller of Explosives, South Circle Office, CHENNAI. A Copy of the licence along with approved plan is enclosed.
of Controller of Explosives, Visakhapatnam, VISAKHAPATNAM. A Copy of the licence along with approved plan is enclosed.

For Chief Controller of Explosives
Nagpur

(अधिक जानकारी जैसे आवेदन की स्थिति, शुल्क तथा अन्य विवरण के लिए हमारी वेबसाईट : http://peso.gov.in देखें)
(For more information regarding status,fees and other details please visit our website: http://peso.gov.in)

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FORM XV
(see Article 6 of the First Schedule)

LICENCE TO IMPORT AND STORE PETROLEUM IN AN INSTALLATION

Licence No. : **P/HQ/AP/15/3853(P250194)**

Fee Rs. **7100/-** per year

Licence is hereby granted to **M/s. M/s. Hetero Labs Ltd., (Unit IX), Hetero Corporate, 7-2-A2,, Indl. Estate, Sanath Nagar, Hyderabad, District: HYDERABAD, State: TELANGANA, PIN: 500018** valid only for the importation and storage of **440.00 KL** Petroleum of the class(es) and in quantities as herein specified and storage thereof in the place described below and shown on the approved plan No **P/HQ/AP/15/3853(P250194)** dated **20/07/2011** attached hereto subject to the provisions of the Petroleum Act, 1934 and the rule made thereunder and to the further conditions of this Licence.

The Licence shall remain in force till the 31st day of December **2024**

Description of Petroleum	Quantity licenced in KL
Petroleum Class A, in bulk	**328.00 KL**
Petroleum Class A, otherwise than in bulk	**NIL**
Petroleum Class B, in bulk	**112.00 KL**
Petroleum Class B, otherwise than in bulk	**NIL**
Petroleum Class C, in bulk	**NIL**
Petroleum Class C,otherwise than in bulk	**NIL**
Total	**440.00 KL**

July 20, 2011

Chief Controller of Explosives

1). Amendment dated - 16/02/2012
2). Amendment dated - 02/02/2015

DESCRIPTION AND LOCATION OF THE LICENSED PREMISES

The licensed premises, the layout , boundaries and other particulars of which are shown in the attached approved plan are situated at **Plot No: Sy. No. 119/1A to 119/1F, 119/2A to 119/2F, 119/3 & 120/1, 120/2A to 120/2L, NA, N.Narasapuram (v), Nakkapally (m), Nakkapalle, Taluka: Nakkapalle, District: VISAKHAPATNAM, State: Andhra Pradesh, PIN: 999999** and consists of **Twenty Four aboveground Petroleum Class A & Two aboveground Petroleum Class B storage tanks together with connected facilities.** together with connected facilities.

SV ENVIRO LABS & CONSULTANTS

Environmental Engineers & Consultants in Pollution Control

Enviro House,B-1, Block - B, IDA
Autonagar,Visakhapatnam
Phone: 9440338628
Email:info@svenvirolabs.com
(Recognized by GOI, Ministry of Environment & Forests)
(An ISO 9001 Certified and NABET Accredited for EIA)

Ref Code	:	SVELC/HISEZL3/23-02/003	**Date : 04-03-2023**
Name and Address	:	**M/s. HETERO INFRASTRUCTURE SEZ LIMITED,** N. Narasapuram Village, Nakkapally Mandal, Visakhapatnam (Dt).	
Sample Particulars	:	**NOISE LEVELS**	
Date of Collection	:	23-02-2023	

TEST REPORT

STACK DETAILS

S.No	Source of Collection	Noise Levels measured in dB(A)	
		Day	Night
1	Near Stores Area	65.2	60.4
2	Near D- Block Area	63.6	58.2
3	Near Scrubber Area	66.4	59.3
4	Near Production Block	68.2	61.6
5	Near Solvent Area	64.5	57.3
6	Near Canteen Area	62.6	53.2
CPCB STANDARDS		**75.0**	**70.0**

SV ENVIRO LABS & CONSULTANTS

o/c

507

CIN : U45200TG2006PLC049668

HETERO INFRASTRUCTURE SEZ LTD.

Ch. Lakshmipuram (Vill.), N. Narasapuram (Vill.), Rajayyapeta (Vill.), Nakkapally (Mandal)
VISAKHAPATNAM (Dist.) -531 081. A.P., India. Tel : 08931- 227307, Fax : 08931- 227200
E-mail : contact@heterodrugs.com. URL : http//www.heterodrugs.com.

24th November 2022

Letter NO: HIS/EHS/Irrigation/2022-23/01

The Executive Engineer
Water Resources Department
Visakhapatnam Division
Visakhapatnam

Dear Sir,

Sub : Diversion of natural Canal from factory premises to outside the premises – Collection of Rainwater in the pond within the factory premises - Request for suggestions for improvement and Approvals (if any) – Regarding

Ref :

1. **Government of Andhra Pradesh G.O.MS.No.163 of Revenue (Lands-I) department dated 09/07/2021.**
2. **Proceedings of District Collector, Visakhapatnam vide Eoffice file NO.196/2018-JA(E3)/ Dated 12 /11/2021.**
3. **Handing and Taken Over certificate issued by Tahsildar, Nakkapalli dated 29/11/2021.**
4. **Joint Committee inspection on 29/03/2022 and 30/03/2022 in reference to OA No.23 of NGT and its report.**

With reference to the above, this is to bring to your kind notice that one natural canal was passing/flowing through the factory premises in the past (way back) in the survey nos:118, 121, 122, 123, 124, 128,127, 139, 135, 136, 137, 139, 140, 143, 144, 145, 146, 147 of N. Narasapuram Village of Nakkapalli Mandal of Visakhapatnam Dist.

The natural canal was rerouted/disturbed by the earlier owners of the land M/s Vijaya Marines during its operations of Aquaculture farms before Hetero took over the land in the year 2005.

When we came to know about the Government lands in the factory premises, we have applied to Government of Andhra Pradesh for alienation of the Lands existing within the factory premises in favour of M/s Hetero Infrastructure SEZ Ltd. Government of Andhra Pradesh has alienated the said Lands in favour of M/s Hetero Infrastructure SEZ Ltd and M/s Hetero Infrastructure SEZ Ltd has purchased the Lands from Govt. of Andhra Pradesh by paying the amount mentioned in GO mentioned at Reference-1.

Based on the G.O. MS.NO.163 of Revenue (Lands-I) Department, District Collector Visakhapatnam has directed the Tahsildar, Nakkapalli to handover the Lands to M/s Hetero Infrastructure SEZ Ltd and the Tahsildar, Nakkapalli Mandal handed over the said lands to M/s Hetero Infrastructure SEZ Ltd through its letter mentioned at Reference -3.

The following documents in relation to land alienation are enclosed for your information and reference:

1. Government of Andhra Pradesh G.O.MS.No.163 of Revenue (Lands-I) department dated 09/07/2021 **(Annexure-I).**
2. Proceedings of District Collector, Visakhapatnam vide Eoffice file NO.196/2018-JA(E3)/ Dated 12 /11/2021 **(Annexure-II).**
3. Handing and Taken Over certificate issued by Tahsildar, Nakkapalli dated 29/11/2021 **(Annexure-III).**

P.O. Rs. 125/-

"Hetero Corporate" 7-2-A2, Industrial Estates, Sanath Nagar, HYDERABAD - 500 018, Telangana, India.
Tel : 91-40-23704923/24/25, Fax : 91-40-23704926, 23714250,23714119

In all the above orders it is mentioned that, wherever water courses are interrupted, occupied and otherwise converted, M/s Hetero Infrastructure SEZ Ltd shall take all necessary steps for channelling the flow of water and make such alternate arrangements as per the standards for free flow of water discharges to the existing creek to avoid inundation of the fields in upper reaches in the interest of public.

Based on the above condition, M/s Hetero Infrastructure SEZ Ltd has provided the canal outside the factory premises by connecting internal drains to enable free flow of rainwater discharges to the existing creek to avoid inundation of the fields in upper reaches in the interest of public.

The past canal route and present canal routes are enclosed for better understanding of the canal diversion as **Annexure -IV & V.**

Apart from above, Joint Committee appointed by National Green Tribunal in its OA No:23/2022 has visited our factory premises and recommended as below w.r.t natural canal & pond inside the factory premises:

1. *The industry has developed rainwater harvesting pond in an area of 12 acres. It has been observed that the pond is adjacent to the natural canal which is connected to Upputeru Cheruvu and the industry have stated that the source of the rain water harvesting pond is the natural canal. Therefore, it is required to approach concerned authorities viz., Central Ground Water Board/Authority, Irrigation Depart, Govt. of Andhra Pradesh for technical evaluation and permission for the same.*

2. *The industry shall strengthen and safeguard the natural canal which is connected to Upputeru Cheruvu which is flowing adjacent and through the project area.*

Copy of recommendations extracted of the Joint Committee report submitted to NGT is enclosed as ***Annexure – VI*** for your information and reference.

We have made the canal free of obstructions and not allowing any stagnations/inundation in upper reaches of the canal and we are collecting part of the rainwater from the canal in a pond existing within the factory premises. The pond existing in the plant premises is created by the then owner's M/s Vijaya Marines and it is a registered land of M/s Hetero Infrastructure SEZ Ltd.

In view of the above, you are requested to kindly provide us following at the earliest:

a) Suggestions if any for strengthening of the canal and
b) Permission (if any applicable) for collecting the water in a pond

Your early action in this regard is highly appreciated.

Thanking you,

Yours faithfully,
For Hetero Infrastructure SEZ Ltd

24/11/2022

S. Kullayi Reddy
Associate Vice President

Enclosures : As above

HETERO INFRASTRUCTURE SEZ LTD.

Ch. Lakshmipuram (Vill.), N. Narasapuram (Vill.), Rajayyapeta (Vill.), Nakkapally (Mandal)
VISAKHAPATNAM (Dist.) - 531 081. A.P., India. Tel : 08931- 227307, Fax : 08931- 227200
E-mail : contact@heterodrugs.com. URL : http//www.heterodrugs.com.

8th February 2023

Letter NO: HIS/EHS/APWALTA/2022-23/01

The Commissioner
APWALTA Authority
Panchayat Raj & Rural Development Department
Tadepalli
Guntur Dist
Andhra Pradesh State

Dear Sir,

Sub : Diversion of natural Canal from factory premises to outside the premises – Collection of Rainwater in the pond within the factory premises - Request for suggestions for improvement and Approvals (if any applicable) – Regarding

Ref :

1. **Joint Committee inspection on 29/03/2022 and 30/03/2022 in reference to OA No.23 of NGT and its report.**
2. **Letter Received from CGWB, Visakhapatnam vide letter No: T/15/CGWB/APSUO/NGT/CGWA/APWALTA-2022-23-13 dated 10/01/2023**
3. **Letter Received from Director, Ground water and water Audit Department, Government of Andhra Pradesh vide letter no:587/Hg-II/2023 dated 07/02/2023**

With reference to the above, this is to bring to your kind notice that one natural canal is passing/flowing through the factory premises situated at N. Narasapuram Village, Nakkapalli Mandal, Anakapalli Dist. and as per the recommendations of Joint Committee in its interim report submitted to the Hon'ble NGT, Chennai Bench, we have applied to the Central Ground Water Board, Visakhapatnam for technical evaluation & approval of collection and storage of rain water in the pond within the factory premises.

In reply to our letter, Scientist-D & OIC, AP SUO, Central Ground water Board advised us to approach the Director, Ground water and water Audit Department for technical evaluation and permission for collection and storage of rainwater in the pond within the factory premises as the Ground water regulation is being done under APWALTA Act in Andhra Pradesh State. Copy of letter issued by the CGWB is enclosed as ***Annexure-I*** for your kind information and perusal.

On receipt of letter from CGWB, we have applied to the Director, Ground water and water audit department, Government of Andhra Pradesh on 19th January 2023. In reply to our letter The Director of Ground water and water audit department informed us that, APWALTA is being implemented in Andhra Pradesh by Panchayati Raj & Rural development department and advised us to approach the Panchayat Raj & Rural development for necessary permissions. Copy of the letter is enclosed as ***Annexure -II*** for your information and perusal.

In view of the above, we are herewith applying for the technical evaluation and permission for storage of the rainwater in a pond within the factory premises and the details are enumerated as below:

The Joint Committee appointed by Hon'ble National Green Tribunal in its OA No:23/2022 has visited our factory premises and recommended as below w.r.t natural canal & pond inside the factory premises:

- *The industry has developed rainwater harvesting pond in an area of 12 acres. It has been observed that the pond is adjacent to the natural canal which is connected to Upputeru Cheruvu and the industry have stated that the source of the rain water harvesting pond is the natural canal. Therefore, it is required to approach concerned authorities viz., Central Ground Water Board/Authority, Irrigation Depart, Govt. of Andhra Pradesh for technical evaluation and permission for the same.*

- *The industry shall strengthen and safeguard the natural canal which is connected to Upputeru Cheruvu which is flowing adjacent and through the project area.*

Copy of recommendations extracted of the Joint Committee report submitted to NGT is enclosed as ***Annexure – III*** for your information and reference.

Copy of layout showing Factory premises/Canal/ Pond/Creek superimposed on Google map is enclosed as ***Annexure-IV*** for your information and ready reference.

We have made the canal free of obstructions and not allowing any stagnations/inundation in upper reaches of the canal and we are collecting part of the rainwater from the canal in a pond existing within the factory premises.

In view of the above, you are requested to kindly provide us following at the earliest:

a. Suggestions if any for strengthening of the canal and
b. Permission (if any applicable) for collecting the water in a pond

Your early action in this regard is highly appreciated.

Thanking you,

Yours faithfully,
For Hetero Infrastructure SEZ Ltd

HETERO INFRASTRUCTURE SEZ LTD. N. Narasapuram

S. Kullayi Reddy
Associate Vice President

Enclosures : As above

केंद्रीय भूमि जल बोर्ड/ Central Ground Water Board
जल संसाधन, नदी विकास और गंगा संरक्षणविभाग /Department of Water Resources, RD & GR
जल शक्ति मंत्रालय /Ministry of Jal Shakti
एपीराज्यइकाईकार्यालय/ AP State Unit Office
एच.सं. 1-117-1/7/ H.No. 1-117-1/7, उशोदयाजंक्शन/ Ushodaya Junction
सेक्टर-12/ Sector-12, एमवीपीकॉलोनी/MVP Colony, विशाखापत्तनम/ Visakhapatnam - 530017
Phone: 0891-2707870, 9701487320, Email: oicvishak-cgwb@nic.in

T/15/CGWB/APSUO/NGT/CGWA/APWALTA-2022-23 - 13 Date: 10.01.2023

To
Sri S Kullayi Reddy,
Associate Vice President,
M/S Hetero Infrastructures SEZ Limited,
Ch. Lakshmipuram Village, Nakkkapally Mandal,
Visakhapatnam District - 531081, Andhra Pradesh

Sub: Your letter no. nil dated 09.01.2023, requesting technical evaluation and approval of Collection & Storage of Rain Water in the pond within the factory premises -reg.

Ref: Joint Committee interim report in compliance with the order dated 21.02.2022 of Hon'ble NGT, Chennai

Sir,

With reference to your letter on the subject cited above and reference submitted to this office, it is to inform that, Ground Water regulation is being done under AP WALTA act in Andhra Pradesh State, hence, you are advised to approach the Director, Ground Water & Water Audit department, Govt. of Andhra Pradesh for Technical evaluation and permission of collection & storage of Rain Water in the pond within the factory premises.

Yours Sincerely
10/01/23
(Ravi Kumar Gumma)
Scientist-D & OIC, AP SUO

Copy to the:
1. Director, GWD & WA Department, 4th Floor, Vyasa Building, Namburivari Street, Back side of Old Govt. Hospital, Hanumanpet, Near Rly Station, Vijayawada- 520003, AP.
2. Regional Director, Central Ground Water Board, Southern Region, Hyderabad

(Ravi Kumar Gumma)
Scientist-D & OIC, AP SUO

GOVERNMENT OF ANDHRA PRADESH
GROUND WATER AND WATER AUDIT DEPARTMENT

From:
M.John Satya Raju,
M.Tech,
Director,
Ground Water and Water Audit Department,
Vysya Bhavan, Namboori vari Veedhi,
Hanumanpet, Vijayawada-520 003,
E-Mail:tappal-grw@ap.gov.in.

To:
The Associate Vice President,
M/s. Hetero Infrastructure Sez Limited,
Ch.Lakshmipuram Village,
Nakkapally Mandal,
Visakhapatnam District-531081,
Andhra Pradesh.

Letter No:587/Hg-II/2023 **Dated: 07.02.2023**

Sir,

Sub:- Ground Water and Water Audit Department – Diversion of natural Canal from factory premises to outside the premises – Collection of Rainwater in the pond within the factory premises – Suggestions for improvement and Approvals – Regarding.

Ref:- 1) Lr.No.HIS/EHS/GWD/2022-23/01, dt: 19.01.2023 of the Hetero Infrastructure Sez Limited, Visakhapatnam.
2) Joint Committee inspection on 29.03.2022 and 30.03.2022 in reference to OA No.23 of NGT and its report.
3) Letter received from CGWB, Visakhapatnam vide letter No.T/15/CGWB/APSUO/NGT/CGWA/APWALTA-2022-23-13, dt:10.01.2023.

***

It is to inform that vide reference 2nd cited, the Joint Committee advised to approach concerned authorities viz., Central Ground Water Board/Authority, Irrigation Department, Government of Andhra Pradesh for technical evaluation and permission for development of rain water harvesting pond within the factory premises.

Vide reference 3rd cited, Central Ground Water Board, Visakhapatnam has advised to approach Ground Water and Water Audit Department as it is WALTA Authority in the State.

In this context, it is to bring to your notice that APWALTA is being implemented in Andhra Pradesh by Panchayat Raj & Rural Development Department. Hence, you may approach APWALTA Authority (Commissioner, PR & RD Department) or Andhra Pradesh Water Resources Department whichever is appropriate for technical evolution and to accord permission for the rainwater harvesting pond.

Yours faithfully,
Sd/-M.John Satya Raju
DIRECTOR.

Copy to the Central Ground Water Board, Andhra Pradesh State Unit Office, Visakhapatnam.

///True Copy///

for DIRECTOR

PERFORMANCE EVALUATION REPORT

M/s. HETERO INFRASTRUCTURE SEZ LTD
N. NARASAPURAM (V),
NAKKAPALLI (M), VISAKHAPATNAM,
ANDHRA PRADESH

Dec. 2021

PREPARED BY

SV ENVIRO LABS & CONSULTANTS
Environmental Engineers & Consultants in Pollution Control

H.O: Block-B, B-1, IDA, Autonagar, Visakhapatnam – 530 012
Ph: 0891-2755528, Tel/Fax: 0891-2755529, E-mail:
svenviro_labs@yahoo.co.in
B.O: 2-53, Mahipala St., Yanam–533 464, Ph: 0884-2321528, Ph: 9440338628
QCI NABET Accredited & Recognized by MOE&F, New Delhi.

CHAPTER-1
INTRODUCTION

1.1 INTRODUCTION:

M/s. Hetero Infrastructure SEZ Limited is located at N.Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh.

Hetero, research driven pharmaceutical company, is committed to the development, manufacturing and marketing of active pharmaceutical ingredients (APIs), intermediates and finished dosages. Hetero is recognized as a world leader in process chemistry, API manufacturing, formulation development, manufacturing and commercialization.

The pharmaceutical industries are established wastewater treatment plants as per the stipulations of regulatory body to control pollution before disposal. Generally the pharmaceutical waste waters will have High Total Dissolved Solids (HTDS) and another stream consists of Low TDS which are the main concern for the treatment system. The parameters looked into are pH, BOD, COD, TDS. A bulk drug industry Hetero Infrastructure SEZ Limited in Nakkapalli is studied in order to understand the efficiency of treatment units designed & achievement performance of individual units.

Hetero is committed towards leveraging its expertise in the area of pharmaceuticals, it is also focusing on Biotechnology and also on developing New Chemical Entities (NCEs) in select therapeutic areas.

SV ENVIRO LABS & CONSULTANTS evaluated the performance of Effluent Treatment Plant. Effluent samples were collected at different stages of treatment plant and analyzed each for the major parameters such as pH, TSS, TDS, BOD stage in removing the pollutants.

Effluent samples were collected at different stages of treatment units and analyzed for the major effluent quality parameters, such as pH, BOD, COD, Oil & Grease, Total Suspended Solids and Total Dissolved Solids. The performance efficiency of each unit in treating the pollutants was calculated. The generated data presented evidence that the Effluent Treatment Plant has been working with the norms of APPCB and meeting the discharge standard limits.

1.2 PROJECT DETAILS

M/s Hetero Drugs Ltd and M/s Hetero Labs Ltd is a Bulk Drug Manufacturing Complex with four units situated at N. Narasapuram, Nakkapalli – Mandal, Visakhapatnam –Dist of Andhra Pradesh. Out of four units one unit is in Non SEZ and three are in Special Economic Zone (SEZ) in the name of Hetero Infrastructure SEZ Ltd. The SEZ is also having the required infrastructure and pollution control facilities to operate the industrial estate.

The industrial estate is situated in Sy.Nos: 215, 286/1, 286/2, 283/1 in Ch. Lamxipuram village, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajayyapeta village, 19(part) in PedaTeenarla village, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N. Narsapuram village, Nakkapalli Mandal, Visakhapatnam District spread over an area of 139.856 ha.

The water requirement of the project is being met with the Sea water Desalination Plants installed in the premises of Hetero Infrastructure SEZ Ltd.

- Stripper
- Multiple Effect Evaporator,
- Agitated Thin Film Drier (ATFD),
- Effluent Treatment Plant
- RO Plant
- Guard Ponds
- Dedicated Hazardous Waste Storage Shed
- Dedicated detoxification Shed

The treated water quality is meeting the disposal norms prescribed by APPCB and the marine disposal monitoring is completely under the control of APPCB, Visakhapatnam.

Domestic and sewage wastewater is being treated in the dedicated sewage treatment plant and the treated water is being used for gardening/ green belt development.

Water conservation measures are adopted to reduce water consumption by installing push button vales and collecting roof top rainwater etc.

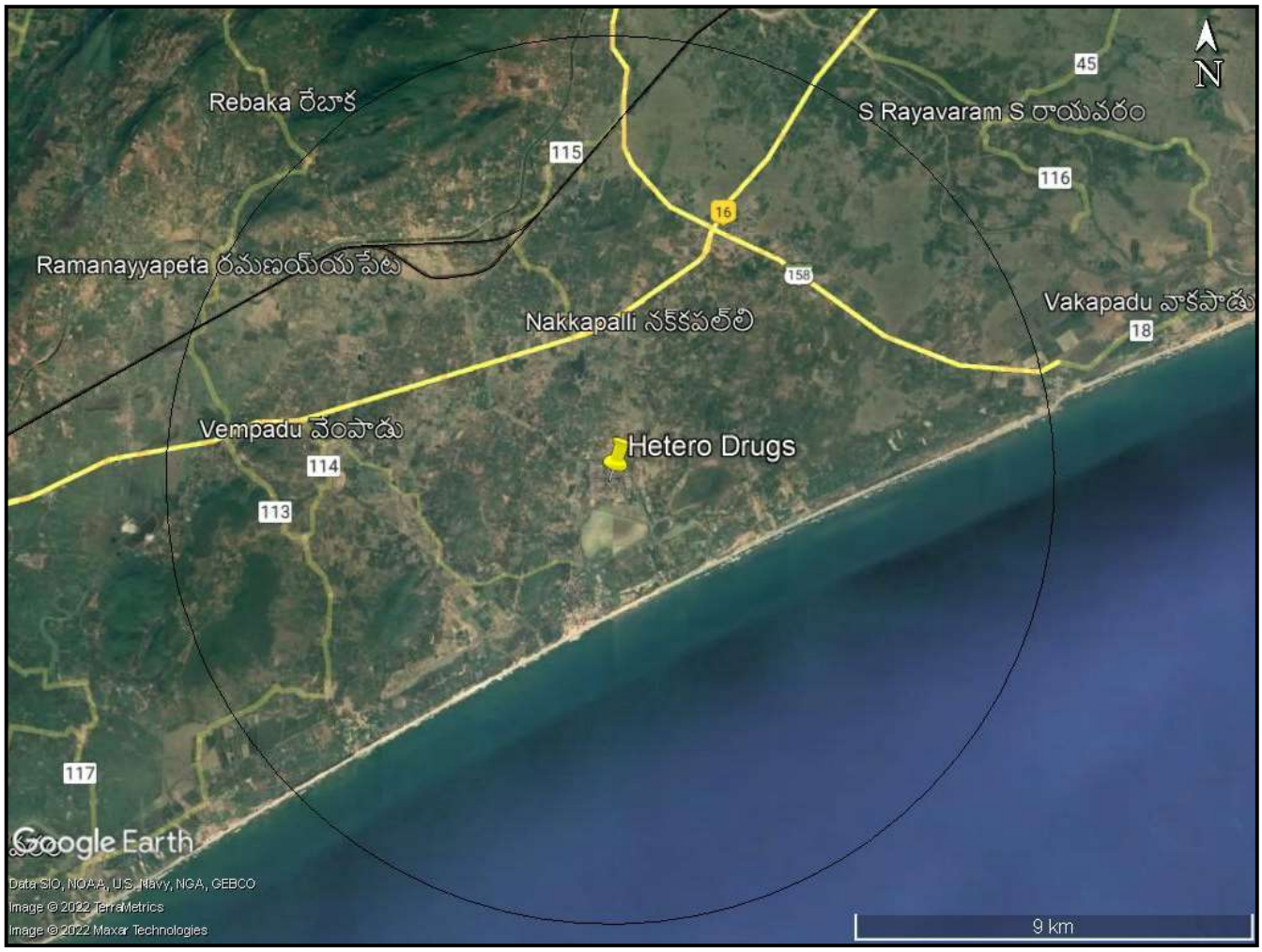
Amenities and utilities:

A number of amenities and utilities are provided in each unit and centralized provision made for pollution control facilities.

SITE PARTICULARS

S.No.	Particulars	Details
1.	Name of the Project	Hetero Infrastructure SEZ Ltd
2.	Location of the project	N. Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh
3.	Climatic conditions	Annual Max Temp 45^{o}C
		Annual Min Temp 29^{o}C
4.	Latitude	17°22'47.52"N
5.	Longitude	82°43'22.65"E
6.	Predominant wind direction	SW
7.	Nearest Railway Station	Narsipatnam Railway station at 7.40 kms
8.	Nearest Highway	NH- 16 at 2.7 kms
9.	Major Settlement	Nakkapalli at 2.5 kms
10.	Hills and mountains	Nil
11.	Ecological sensitive zones	No reserved forests

GOOGLE MAP AROUND 10 KM RADIUS



Use of Pharmaceuticals:

Pharmaceutical chemicals are used for benefit of human health and animal health. The production volumes and the usage rates of most pharmaceutical active ingredients (referred to here as pharmaceutical chemicals or pharmaceuticals) used for either human or animal health consumption are small relative to many consumer products.

Manufacturing Process:

Chemical Synthesis products are the majority of drugs currently in the market. Chemical synthesis consists of four steps – reaction, storage, separation, purification and drying. Large volumes of solvents are used during chemical synthesis, extractions and solvent inter changes. The manufacturing process of the above mentioned molecules involve various types of reactions like acetylation, Oxidation, Reduction, hydrogenation, hydrolysis etc.

1.3 NEED FOR THE STUDY

Rapid growth of industries has not only enhanced the productivity but also resulted in the production and release of toxic substances into the environment, creating health hazards and effected normal operations, flora and fauna. These wastes are potential pollutants when they produce harmful effects on the environment and generally released in the form of solids, liquid effluent and slurries containing a spectrum of organic and inorganic chemicals. Thus pollution is a necessary evil of all development. To combat the plethora of environmental evils of present day society, efficient and environmentally safe organic waste treatment technologies are needed.

The chemical based industry in India is expected to grow rapidly and the waste generation and related environmental problems are also assumed to increase. Poorly treated wastewater with high levels of pollutants caused by poor design, operation or treatment systems creates major environmental problems when discharge to surface water or land.

Such problems include

- Contamination and deoxygenating of streams and waterways by direct discharge or run off of inadequately treated wastewater.
- Excessive concentration of nutrients such as nitrogen and phosphorus in surface and subsurface water bodies. This contribute to excessive growth of plants and algae blooms, which makes the downstream water unsuitable for domestic, agriculture and industrial use
- High Salinity
- Low/High pH
- Over application of wastewater to land resulting in contaminated ground water.

1.4 OBJECTIVE AND SCOPE

Objective of the present study can be explicitly stated as the following

- To monitor performance of Effluent Treatment Plant and air pollution control equipment's
- Evaluation of operating and design parameters

The study included

- Characterization of Effluent Streams.
- Evaluation towards pollution control parameters of Effluent and air check whether treatment units are working with designed efficiency or not.
- Observations and Recommendations.

CHAPTER-2

DISPOSAL, CHARACTERISTICS & MONITORING DATA

2.1 METHODOLOGY

Samples were collected from various units of Effluent Treatment Plant at the below sampling points, analyzed for parameters pH, TDS, TSS, COD, BOD and removal efficiency is calculated.

HIGH TDS TREATMENT SYSTEM

1. Oil & Grease Chamber (O & G) Inlet
2. Oil & Grease Chamber Outlet
3. Equalization tank Outlet
4. Clarifier Outlet
5. Stripper Outlet
6. MEE Outlet

MEE CONDENSATE AND LOW TDS TREATMENT SYSTEM

7. Oil & Grease Chamber Inlet
8. Oil & Grease Chamber Outlet
9. Equalization Tank Outlet
10. Tube Deck Outlet
11. Bio tower Inlet
12. Bio tower Outlet
13. Aeration Tank -1 Outlet
14. Secondary Clarifier -1 Outlet
15. Aeration Tank – 2 Outlet
16. Secondary Clarifier – 2 Outlet
17. Pressure Sand Filter Outlet
18. Activated Carbon Filter Outlet
19. RO Permeate Outlet
20. RO Reject Outlet

2.2 THE SAMPLING PROGRAM:

The representative samples from various treatment units of the treatment plant were collected. Thus collected samples were used to analyze the parameters such as pH, TDS, BOD and COD. It is also used to analyze the performance evaluation of the waste water treatment plant. The methodology proposed for the study includes (1) Collection of representative samples (2) analysis of samples collected and preserved to estimate the parameters. The sampling plan is the first step for characterization of the wastewater at different points in a treatment flow. The wastewater characterization studies include wastewater sampling and the analysis of the samples to estimate the concentrations of the parameters of the wastewater. In general, there is no universal procedure for sampling; sampling programs must be individually tailored to fit each situation. Sampling programs are undertaken for a variety of reasons such as to obtain (1) routine operating data on overall plant performance (2) data that can be used to document the performance of a given treatment operation or process (3) data that can be used to implement proposed new programs and (4) data needed for reporting regulatory compliance.

2.3 COLLECTION OF SAMPLES

The sampling was done for characterization of industrial effluent at different points and evaluation of the Effluent water treatment plant. A representative sample will give better results in characterization of the wastewater. The sampling interval of one day is maintained during the collection of the part of the sample.

2.4 ANALYSIS OF THE SAMPLES

The samples collected for the assessment of the performance of the industrial waste water treatment plant have been analyzed for the concentration of pH, Total Dissolved Solids (TDS), Temperature, Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) These are the key parameters in the waste water to be observed and these parameters are used to check the performance of the ETP. The methods prescribed in the Standard Methods for Examination of Water and Wastewaters (American Public Health Association, 1998) were used to estimate the pH, TDS, temperature, BOD and COD for the characterization of wastewater at the selected points in the wastewater treatment plant. The preservation methods are generally limited to chemical addition, pH control, refrigeration methods are generally limited to chemical addition, pH control, refrigeration and freezing.

2.5 CPCB Standards for Marine Disposal

S.No.	Parameter	Concentration not to exceed mg/l Except pH
1.	pH	5.5-9.0
2.	BOD	100
3.	COD	250
4.	Oil and grease	20
5.	Suspended solids	a) For process waste water 100 b) For cooling water effluent 10 percent above total suspended matter of influent
6.	Temperature	Shall not exceed 5°C above the receiving water temperature
7.	Total residual Chlorine	1.0
8.	Ammonical nitrogen	50
9.	Free ammonia	5.0
10.	Arsenic	0.2
11.	Mercury	0.01
12.	Lead	2.0
13.	Cadmium	2.0
14.	Hexavalent Chromium	1.0
15.	Total chromium	2.0
16.	Copper	3.0
17.	Zinc	15
18.	Nickel	5.0
19.	Fluoride	15
20.	Sulphide	5.0
21.	Phenolic compounds	5.0

2.6 RESULTS

Table 2.1: The observed concentrations of the constituents obtained from the analysis of sample collected in High TDS Stream

Days	O & G Chamber Inlet					O & G Chamber Outlet					Equalization tank				
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)
Day 1	8.74	1983	36920	42484	19368	8.93	1854	38940	40246	18546	6.67	1976	36542	38249	17549
Day 2	9.32	1586	37426	43686	20476	9.12	1493	35268	41989	19283	7.54	1684	36148	39246	16346
Day 3	9.12	1238	43312	37540	17648	8.85	1142	45746	35648	17248	6.89	1356	42137	36549	17243
Day 4	8.96	992	32543	40389	18769	9.09	892	30568	38427	18624	7.83	1023	32634	37428	16546
Day 5	9.25	1638	36737	33546	15583	9.36	1526	37946	31685	14983	8.32	1694	35436	33743	15639
Days	**PC Outlet**					**Stripper Outlet**					**MEE Outlet**				
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)
Day 1	7.59	349	33249	35946	15486	7.24	362	35496	29548	13249	7.75	BDL	835	11820	5492
Day 2	7.23	287	32546	36248	17543	7.05	313	34498	28746	12546	7.82	BDL	746	10548	5102
Day 3	6.94	253	38248	33143	14947	6.75	283	40126	26847	11768	7.54	BDL	894	9458	4249
Day 4	8.23	242	28596	34546	16248	8.01	279	31547	27649	12945	9.1	BDL	756	10129	4843
Day 5	8.01	321	29546	29748	13549	7.86	349	32953	22549	10249	8.54	BDL	768	9126	4456

Table 2.2: The observed concentrations of the constituents obtained from the analysis of sample collected in MEE Condensate and Low TDS Stream

Days	O & G Chamber Inlet					O & G Chamber Outlet				
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)
Day 1	10.3	836	6576	11786	5234	9.4	786	6432	9214	4058
Day 2	8.2	919	5583	8678	3873	7.8	856	5216	7147	3015
Day 3	9.6	728	7127	12345	5137	9.1	678	6928	10842	4794
Day 4	9.4	795	5124	9214	4101	8.9	701	4986	7986	3543
Day 5	8.7	658	6215	10942	4956	8.3	594	5986	8748	3987
Days	**Equalization Tank Outlet**					**Tube Deck Outlet**				
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)
Day 1	7.74	725	7536	8685	3985	7.21	186	7216	8326	3526
Day 2	7.42	812	6318	6783	2792	6.9	210	5986	6437	2597
Day 3	8.2	626	7627	9589	4248	7.67	145	7157	9218	3987
Day 4	7.85	657	5975	7127	3143	7.12	154	5538	6855	2984
Day 5	7.2	524	6629	8592	3579	6.86	122	6123	8129	3316



Days	Bio tower Inlet					Bio tower Outlet					Aeration tank Outlet				
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)
Day 1	7.98	148	4095	7216	3258	7.12	132	3059	2756	1126	6.84	3000	3426	435	207
Day 2	7.36	164	2826	6129	2755	6.89	145	2657	2467	912	6.49	3100	2987	356	152
Day 3	8.24	126	3985	7845	3457	7.38	113	3496	3018	1286	6.96	2900	3758	514	213
Day 4	7.72	132	2789	6594	3016	7.05	117	2523	2219	985	6.75	3300	2835	323	135
Day 5	7.45	115	3258	6957	3104	6.93	102	2985	2648	1028	6.67	3250	3314	397	174
Days	**Secondary Clarifier Outlet**					**Aeration Tank - 2 Outlet**					**Secondary Clarifier -2 Outlet**				
	pH	**TSS (mg/l)**	**TDS (mg/l)**	**COD (mg/l)**	**BOD (mg/l)**	**pH**	**TSS (mg/l)**	**TDS (mg/l)**	**COD (mg/l)**	**BOD (mg/l)**	**pH**	**TSS (mg/l)**	**TDS (mg/l)**	**COD (mg/l)**	**BOD (mg/l)**
Day 1	7.13	89	3286	398	185	6.54	4250	3308	206	98	6.59	93	3123	194	92
Day 2	6.98	97	2812	327	143	6.65	4300	2876	183	81	6.68	106	2758	178	75
Day 3	7.35	85	3578	402	177	6.72	4420	3412	225	95	6.79	91	3217	205	91
Day 4	7.21	72	2765	303	126	6.49	4100	2823	164	76	6.53	78	2734	156	68
Day 5	7.07	70	3107	376	159	6.38	3950	2949	191	87	6.44	85	2776	183	82



Days	Pressure Sand Filter Outlet					Activated Carbon Filter Outlet					
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	Phosphate (mg/l)
Day 1	6.67	61	2985	182	83	6.82	55	2745	149	68	18.7
Day 2	6.65	65	2543	164	71	6.74	59	2456	128	57	20.1
Day 3	6.82	58	3018	185	84	6.93	51	2839	151	63	19.5
Day 4	6.63	49	2596	147	62	6.78	44	2387	123	56	17.6
Day 5	6.51	54	2579	171	76	6.65	48	2493	132	53	18.2

Days	RO Permeate					
	pH	TSS (mg/l)	TDS (mg/l)	COD (mg/l)	BOD (mg/l)	Phosphate (mg/l)
Day 1	6.34	<1.0	612	49	23	2.4
Day 2	6.56	<1.0	598	45	19	1.9
Day 3	7.12	<1.0	654	58	25	2.6
Day 4	6.84	<1.0	563	39	18	1.7
Day 5	6.28	<1.0	498	47	21	2.2



CHAPTER-5

TREATMENT SYSTEM DETAILS

EFFLUENT TREATMENT PLANT

5.1 TREATMENT SCHEME:

Preliminary Treatment:

Removal of wastewater constituents such as rags, sticks, floatables, grit and grease that may cause maintenance or operational problems with the treatment operations, processes, and ancillary systems. Removal of a portion of the suspended solids and organic matter from wastewater.

Secondary Treatment:

Removal of biodegradable organic matter (in solution or suspension) and suspended solids. Disinfection is also typically included in the definition of conventional secondary treatment. Removal of biodegradable organics, suspended solids, and nutrients (nitrogen, phosphorous, or both nitrogen and phosphorus).

Tertiary Treatment:

Removal of residual suspended solids (after secondary treatment), usually by granular medium filtration or micro screens. Disinfection is also typically a part of tertiary treatment. Nutrient removal is often included in this definition.

5.2 TREATMENT SYSTEM

TREATMENT SYSTEM OF HIGH TDS STREAMS

1. Grit and Oil & Grease Chamber
2. Equalization cum Neutralization tank
3. Flash mixer
4. Flocculator
5. Clarifier
6. MEE Feed tank
7. Stripper – 3 No's.
8. MEE – I, Stripper - 1
9. MEE – II, Stripper – 2+1
10. ATFD

TREAMENT SYSTEM OF MEE CONDENSATE AND LOW TDS STREAMS

1. Grit and Oil & Grease Chamber
2. Equalization cum Neutralization tank
3. Flash mixer
4. Flocculator
5. Tube Deck
6. Intermediate Feed Tank
7. Bio Tower
8. Aeration Tank - I
9. Secondary Clarifier - I & II
10. Aeration Tank – II
11. Secondary Clarifier – III & IV
12. Treated Effluent Tank
13. Pressure Sand Filter
14. Activated Carbon Filter
15. Sludge Filter Press
16. RO Plant

5.3 EFFLUENT TREATMENT PLANT DIMENSIONS AND CAPACITY DETAILS

Units	Size	Capacity	No. of Units
High TDS Effluent Treatment Plant			
Oil & Grease Chamber	-	40 KL	1
Equalization cum Neutralization tank	15mx15mx15m	675 KL	2
Flash Mixer	0.6mx0.6mx1.2m	0.432 KL	2
Flocculator	1.68mx1.68mx2.0m	5.64 KL	1
Primary Clarifier	6m Dia	70 KL	1
MEE Feed Tank	10.3mx8.4mx2.3m	200 KL	1
Stripper	-	15 KL/hr	3
MEE – I	-	10 KL/hr	1
MEE - II	-	15 KL/hr	1
MEE Condensate & Low TDS Effluent Treatment Plant			
Oil & Grease Chamber	-	20 KL	1
Equalization cum Neutralization tank	15mx15mx3.0m	675 KL	2
Flash Mixer	0.6mx0.6mx1.2m	0.432 KL	1
Flocculator	1.68mx1.68mx2.0m	5.64 KL	1
Tube Deck	2.35mx2.35mx2.25m	12.42 KL	1
Intermediate Feed Tank	14.1mx6.9mx2.6m	250 KL	1
Aeration Tank – I	45mx35mx3.5m	5500 KL	1
Secondary Clarifier-I&II	6m dia x 3 m height	70 KL	2
Aeration Tank - II	35mx22mx2.85m	2200 KL	1
Secondary Clarifier –III&IV	6m dia x 3m height	70 KL	2
Treated Effluent Tank	10.3mx10.3mx1m	100 KL	1
Pressure Sand Filter	2m dia x 2.5 m height	8.0 KL	1
Activated Carbon Filter	2m dia x 2.5 m height	8.0 KL	1
RO Plant			
Sludge Blender	3.1mx3.1mx3.0m	29 KL	1
Sludge Thickener	-	85 KL	1
Guard Pond – I & II	-	960 KL	2
Guard Pond - III	-	1000 KL	1
Guard Pond – IV&V	-	1200 KL	2

5.4 UNITS DESCRIPTION

5.4.1 Grit and Oil & Grease Chamber:

In this Oil/Grit chamber removing oil and grease from waste waters. The oil/grit separator unit operates by settling sediment and particulate matter, screening debris and separating free surface oils from storm water runoff. The oil chamber is designed to trap and separate free surface oils and grease from the storm water runoff.

5.4.2 Equalization & Neutralization:

At this stage the coming waste water is neutralized to reduce the fluctuation of pH of further treatment units. In this flow equalization and chemical neutralization are two important components of water and wastewater treatment. Here chemical neutralization is employed to balance the excess acidity or alkalinity in water, whereas flow equalization is a process of controlling flow velocity and flow composition. Chemical neutralization is the adjustment of pH to achieve the desired treatment.

5.4.3 Flash mixer:

Flash Mixer having the mechanical agitator. This is used for mixing the dosing chemicals. Flash mixers are specially designed and fabricated for the process requirement of water and wastewater treatment. The mixer design ensures efficient, minimum energy consumption and long life. This equipment blends coagulants and other chemicals with water / wastewater prior to flocculation. The aggressive agitation results in instantaneous and effective mixing of chemicals. This unit is also useful for general mixing.

5.4.4 Primary clarifier:

Primary clarifiers reduce the content of suspended solids and pollutants embedded in those suspended solids. Because of the large amount of reagent necessary to treat domestic wastewater, preliminary chemical coagulation and flocculation are generally not used, remaining suspended solids being reduced by following stages of the system. However, coagulation and flocculation can be used for building a compact treatment plant or for further polishing of the treated water.

5.4.5 Stripper:

In this Stripping section by using physical separation process here one or more components are removed from a liquid stream by a vapor stream. In this the liquid and vapor streams can have co-current or countercurrent flows. Stripping works on the basis of mass transfer. Steam is also frequently used as a stripping agent for water treatment. Volatile organic compounds are partially soluble in water. In this stripping section removal of volatile organic compounds takes place.

5.4.6 Multiple Effect Evaporators (MEE):

Evaporation plants are used as a thermal separation technology, for the concentration or separation of liquid solutions, suspensions and emulsions. A liquid concentrate that can still be pumped is generally the desired product. Evaporation may however also aim at separating the volatile constituents as would be the case in a solvent separation system. During these processes, it is usual that product qualities are maintained and preserved. These together with many other requirements result in a wide variety of evaporator types, operating modes and arrangements. The operating costs of an evaporation plant are largely determined by the energy consumption. Under steady-state conditions there must be a balance between the energy entering and leaving the system.

5.4.7 Agitated Thin Film Dryer (ATFD):

In Agitated Thin Film Dryer the feed product is evenly distributed by the rotor and its wipers over the heating surface, forming a thin liquid film of uniform thickness. Highly turbulent swirls are produced at the tip of the rotor blades and wipers with intensive mixing and agitation of the product, as it comes into contact with the heating surface. This assures excellent heat transfer combined with constant renewal of the product film and provides an even heating and short residence time of the product through the heated zone.

5.4.8 Aeration tank-I: -

Aeration tank is used for reduction of COD and BOD mainly, and by addition of air by maintaining the required dissolved oxygen and Mixed Liquor Suspended Solids (MLSS). Supernatant from the primary treatment over flows into the aeration tank.

Where the organic matter in the effluent is biologically decomposed under aerobic conditions. The mixed liquor in the tank is aerated. The mixed liquor from this tank overflows in to secondary clarifier.

5.4.9 Secondary clarifier-I:

The secondary clarifier is the most important part of the secondary treatment process. Then remains to separate out the microorganisms so that just clean water is left. This is done in a secondary clarifier which operates in the same manner as the primary clarifier. Some of the solids collected in secondary clarifier are sent to the aeration tank to treat more wastewater.

5.4.10 Aeration Tank – II:

The effluent from the secondary clarifier entering into Aeration Tank – II. In this Aeration Tank reduction of COD and BOD takes place. This Aeration Tank –II which operates in the same manner as the Aeration Tank-I. In this Aeration provides oxygen to bacterial for treating and stabilizing the waste water. Oxygen needed by bacteria to allow biodegradation to occur.

5.4.11 Secondary clarifier-II:

In this secondary clarifier remove solid particulates or suspended solids from liquid for clarification. The effluent from the Aeration Tank-II over flows into the Secondary Clarifier – II. It works similarly as Secondary Clarifier – I. Some of the solids collected in secondary clarifier are sent to the Pressure sand filter for further treatment.

5.4.12 Pressure Sand Filter:

In sand filtration remove suspended solids from water. The filtration medium consists of a multiple layer of sand with a variety in size and specific gravity. Raw water pump is used for generating necessary operating pressure in the pressure sand filter. Raw water is passed through Sand Filter at some pressure to reduce the suspended solids present in the raw water.

5.4.13 Activated Carbon Filter: -

Activated Carbon filter is a method of filtering that uses a piece of activated carbon to remove contaminants and impurities, utilizing chemical adsorption. Each piece of carbon is designed to provide a large section of surface area, in order to allow contaminants the most possible exposure to the filter media.

5.4.14 SLUDGE FILTER PRESS- 2 No's

Sludge Drying beds are open beds of land, consists of thick graded layers of gravel or crushed stone varying in size from bottom to top, and over lain by thick coarse sand layer. Open jointed under drain pipes are laid below the gravel layer. The beds are surrounded by brick walls. The sludge is pumped and spread over the top of the drying beds to depth, through distribution troughs having openings .A portion of the moisture drains through the bed, while most of it is evaporated to the atmosphere. Filtered effluent collected in sump and transferred to collection tank for treatment. The dried sludge is removed from beds, and they are dumped in low-lying areas or can be used as manure to fields.

CHAPTER-6

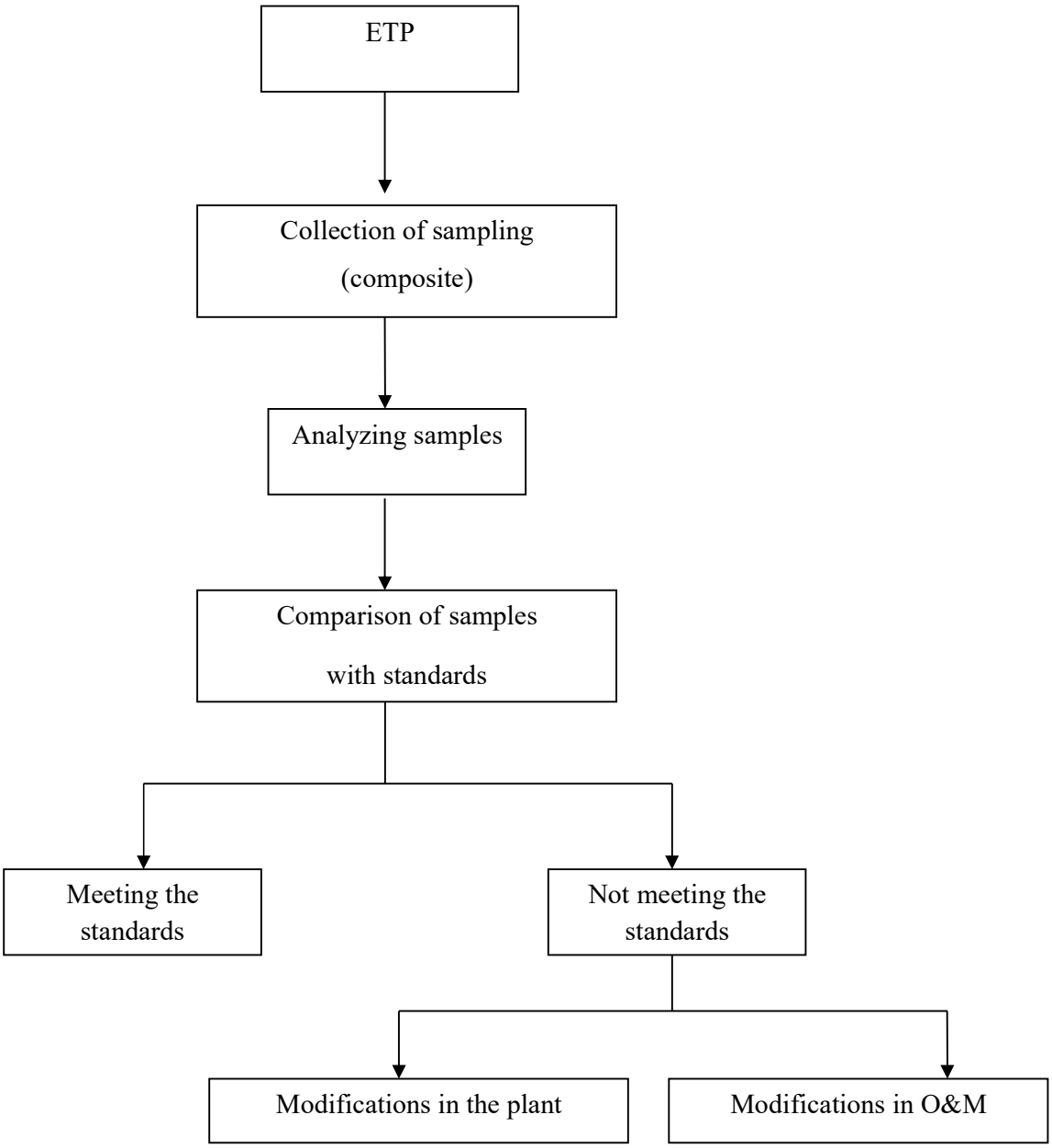
PERFORMANCE OF INDIVIDUAL UNITS OF ETP

6.1 DETERMINATION OF EFFLUENT TREATMENT PLANT (ETP) PERFORMANCE

The treatment efficiencies are estimated based on the influent to the ETP and the effluent from the ETP. For each selected treatment units the efficiencies were also estimated by considering the characteristics of the wastewater influent which is entering into the each of the units and effluent which is leaving the respective treatment unit.

Efficiency of the removal = (inflow characteristics – outflow characteristics)/inflow characteristics) * 100

Using the results of the sampling analysis for various characteristics of the effluents at different points or locations of the treatment plant, the efficiencies of some of the selected treatment units in the effluent treatment plant area assessed. Upon the efficiencies, the performance of the selected treatment units and the treatment plant as a whole will be assessed. Recommendations in operation and maintenance (O&M) in selected treatment units or modification of unit process of the wastewater treatment plant will be advised. The results and discussions are mentioned in the subsequent chapters. The efficiencies of the quality parameters were compared with the standards prescribed by the (American Public Health Association, 1998). The computed efficiencies of the wastewater treatment plant were used to know whether the ETP was meeting the design standards at which the plant was designed or requires any modification. If the experimented values are not in compliance with the standards then there is no need for modifications.



6.1. Flow chart for the performance evaluation of ETP

PERFORMANCE OF INDIVIDUAL TREATMENT UNITS:

The performance of evaluation involves the assessment of overall ETPs efficiency and performance of individual units. Particularly the key unit operation and process of the treatment plant. Therefore the assessment of overall efficiency of the treatment plant with reference to the COD and BOD was made.

6.2 Removal Efficiency of Preliminary Treatment of High TDS Effluent treatment plant:

The removal efficiency of the preliminary treatment units for the removal of dissolved solids, BOD and COD is generally limited (Environmental Protection Agency 1995). The same is observed in the present study. Even though the percentage removal is less, but the actual concentration reduction is notable as the reduction is notable as they reduce the load on the subsequent treatment unit.

High TDS wastewater stream discharges the waste water into the Grit and Oil & Grease Chamber. The contents of the Oil & Grit Chamber are entering the Equalization cum Neutralization tank. After neutralization the waste water passes through Primary Clarifier to remove the suspended particles. This indicates that the removal of TDS, COD and BOD is limited due to the combined effect of these treatment units. It is due to the fact that these treatment units are meant for removal of suspended matter but not dissolved substances. However, in terms of percentage reduction, the contribution of the pre & primary units many not be notable. But in terms of total concentration, these are reducing the total volumetric organic loading on to the subsequent treatment units of the High TDS effluent treatment plant.

6.2.1 Removal Efficiency of Oil & Grease Chamber

The High TDS Effluent enters into the Oil & Grease Chamber. In this chamber Oil & Grease present is removed.

Table 6.1 The waste water constituent removal efficiencies of the Oil & Grease Chamber computed from the analysis of the sample collected in ETP.

Days	Inlet O&G (mg/l)	Outlet O&G (mg/l)	Oil & Grease Removal Efficiency
1	416	125	69.95%
2	395	119	69.87%
3	323	108	66.56%
4	296	98	66.89%
5	354	112	68.36%

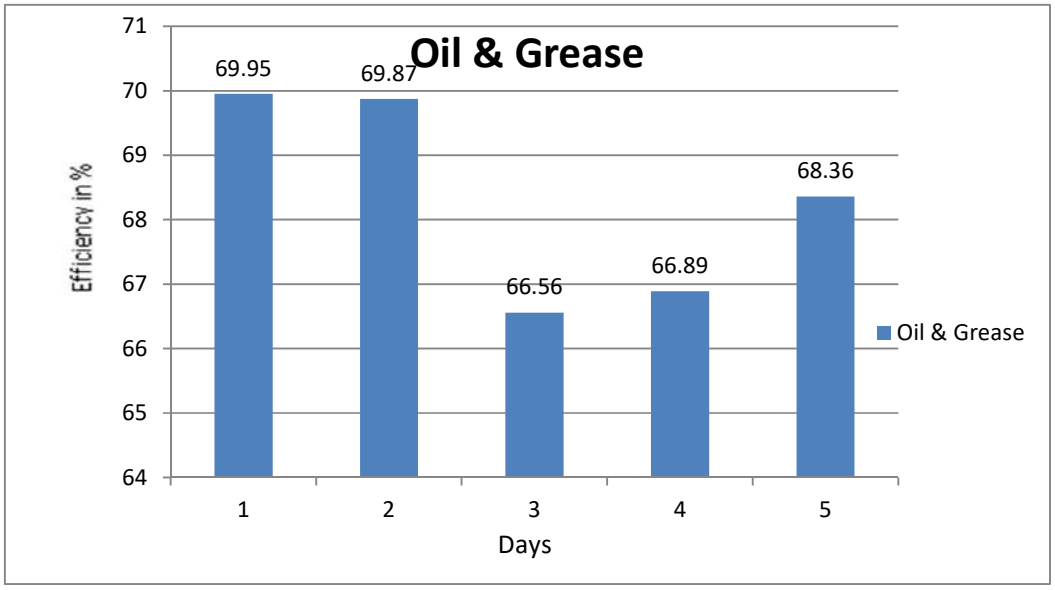


Figure 6.1: The percentage removal efficiencies of Oil & Grease Chamber

Oil & Grease ranges between 66.56% to 69.95%. The average removal efficiency of Oil & Grease chamber is 68.32%.

6.2.2 Equalization & neutralization tank:

The equalization is also used for neutralization the pH value of high TDS effluent entering into the equalization tank inlet varies. The neutralization is effectively taking

place the pH range is suitable for the primary and secondary treatment process. Hence the same neutralization process may be continued.

Table 6.2: The wastewater constituent removal efficiencies of the equalization & neutralization tank computed from the analysis of sample collected in ETP.

Days	Inlet pH	Outlet pH
1	8.93	6.67
2	9.12	7.54
3	8.85	6.89
4	9.09	7.83
5	9.36	8.32

The equalization is also used for neutralization the pH value of Inlet effluent entering into the equalization tank inlet varies between 8.85 and 9.36. Because of the neutralization the pH of the waste water at the outlet of the equalization cum neutralization tank lies under 6.67 and 8.32.

6.2.3 Removal Efficiency of Primary Clarifier

The primary clarifier is meant for the removal of suspended solids. The effluent from equalization cum neutralization tank passes through the flash mixer coagulant is being added to the waste water entering the flash mixer. It might convert the dissolved solids into suspended solids. Thus formed suspended solids along with the already existing suspended solids are removed in Primary Clarifier. Because of the conversion of the dissolved solids into suspended solids, the TDS removal efficiency was observed in the primary treatment. The fluctuations in the removal efficiencies of the primary treatment with reference to the TSS are significant.

Table 6.3: The wastewater constituent removal efficiencies of the Primary Clarifier Computed from the analysis of sample collected in ETP.

Days	Inlet TSS (mg/l)	Outlet TSS (mg/l)	TSS Removal Efficiency
1	1976	349	82.33%
2	1684	287	82.95%
3	1356	253	81.34%
4	1023	242	76.34%
5	1694	321	81.05%

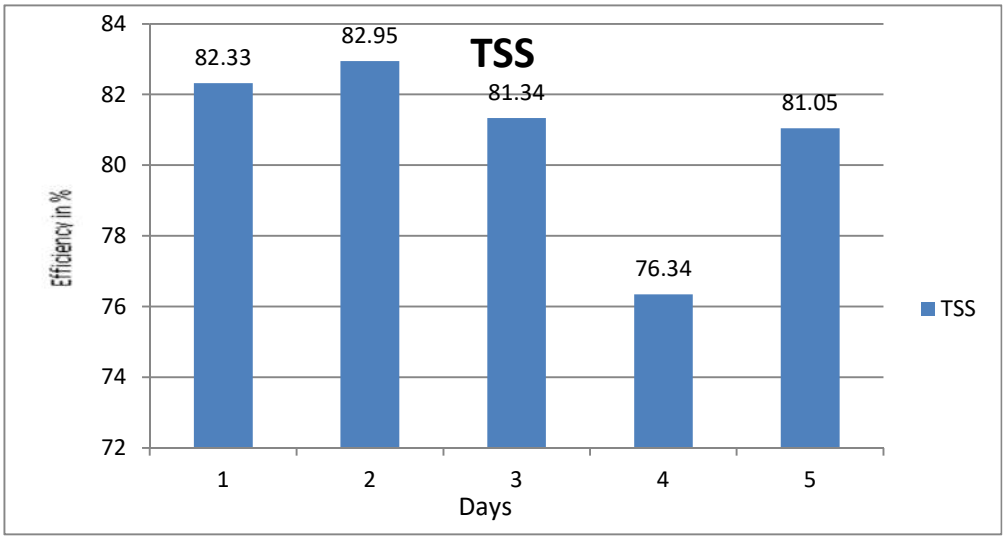


Figure 6.2: The Percentage Removal Efficiencies of Primary Clarifier

The TSS percentage removal efficiency varies between 76.34 % to 82.95%. In primary Clarifier it was observed that average reduction in the TSS about 80.80% which shows that effective removal of TSS takes place in Primary Clarifier.

6.2.4 Removal Efficiency of MEE:

The stripper effluent is joining to the multiple effective evaporators. In multiple effective evaporator, the thermal process separates the liquid which is being collected as MEE condensate. The MEE Concentrated is once again sent to Agitated Thin Film Dryer (ATFD). The ATFD further concentrates its content. The condensate ATFD is sent to the secondary treatment and concentrate salts are dispatched to the Treatment Storage and Disposal Facility (TSDF). The performance of the Stripper column and Multiple Effect Evaporator (MEE) together is evaluated with reference to the removal of TDS. The percentage removal of each of these constituents by the stripper column and MEE.

Table 6.4: The wastewater constituent removal efficiencies of the MEE computed from the analysis of sample collected in ETP.

Days	Inlet TDS (mg/l)	Outlet TDS (mg/l)	TDS Removal Efficiency
1	35496	953	97.31%
2	34498	746	97.83%
3	40126	992	97.52%
4	31547	589	98.13%
5	32953	892	97.29%

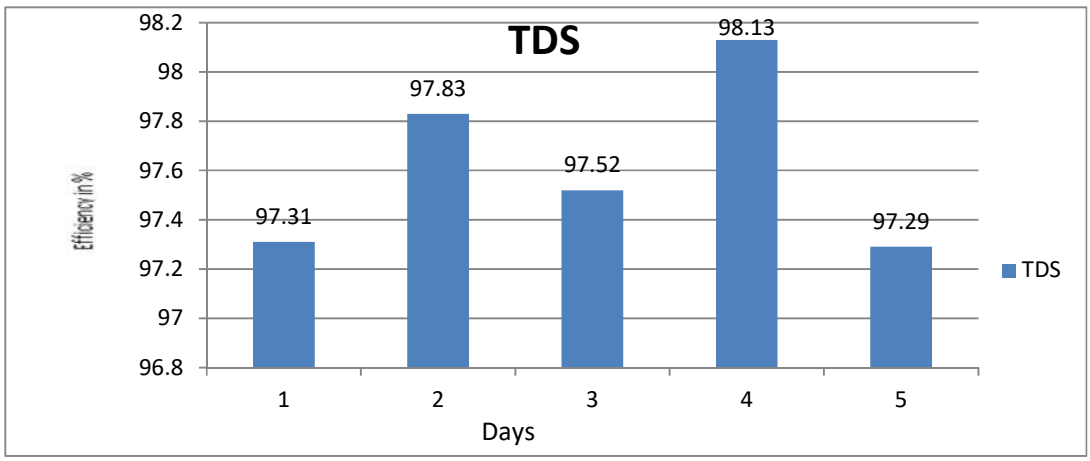


Figure 6.3: The Percentage Removal Efficiencies of MEE

High TDS stream from preliminary treatment enter into stripper column. In stripper column solvent is separated from the pre treated waste water. From stripper column the high TDS waste water enter into multiple effect evaporators. In evaporators dissolved matter is separated. In the combined effect it is observe the efficiency of stripper and Multiple effect evaporators are high in reducing the TDS ranges between 97.29% to 98.13%. It indicates that TDS removal efficiency of stripper column and MEE is satisfactory.

6.3 Removal Efficiency of MEE condensate and Low TDS Effluent Treatment plant Unit:

6.3.1 Removal Efficiency of Oil & Grease Chamber

The Low TDS effluent enters into the Oil & Grease Chamber. The Preliminary treatment consists of Grit and oil & grease chamber is provided for removal of oil & grease matter. The percentage removal efficiency of the Grit and oil& grease removal process with reference to the removal of Oil & Grease computed.

Table 6.5: The wastewater constituent removal efficiencies of the Oil & Grease Chamber computed from the analysis of sample collected in ETP.

Days	Inlet O&G (mg/l)	Outlet O&G (mg/l)	Oil & Grease Removal Efficiency
1	217	97	55.29%
2	262	102	61.06%
3	279	126	54.83%
4	184	95	48.36%
5	176	91	48.29%

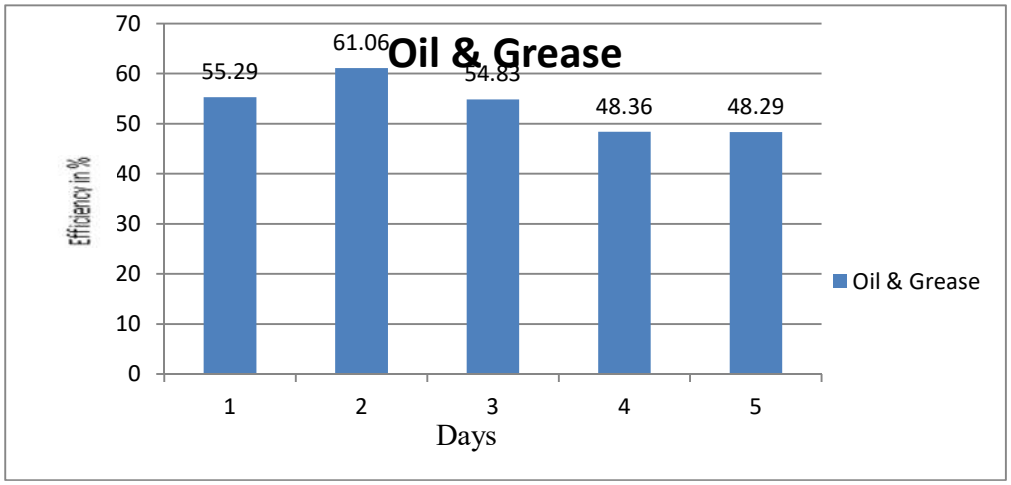


Figure 6.4: The Percentage Removal Efficiencies of Oil & Grease chamber

These results show that the efficiency of Oil & Grease Chamber are reducing the Oil & Grease ranges between 48.29% to 61.06%. The average reduction of the oil & grease is 53.57%.

6.3.2 Removal Efficiency of equalization & neutralization tank:

The equalization tank is primarily meant for damping of variations or fluctuations in the inflow rates. The constituent concentration reductions may be an additional advantage of the process. The present treatment plant employed/adopted the neutralization process in the same reactors. Hence the pH reduction/increase has been studied.

Table 6.6: The wastewater constituent removal efficiencies of the Equalization and Neutralization tank computed from the analysis of sample collected in ETP.

Days	pH Inlet	pH Outlet
1	9.4	7.74
2	7.8	7.42
3	9.1	8.2
4	8.9	7.85
5	8.3	7.2

The pH value of Low TDS effluent entering into the equalization tank varies between 7.8 and 9.4. Because of the neutralization the pH of the wastewater at the outlet of equalization cum neutralization tank lies under 7.2 to 8.2. The neutralization is effectively taking place the pH range is suitable for the primary and secondary treatment process. Hence the same neutralization process may be continued.

6.3.3 Removal Efficiency of Tube Deck:

The Tube Deck is meant for the removal of suspended solids. However, the Low TDS Effluent plant consists of a flash mixer before Tube Deck. The effluent from equalization cum neutralization tank passes through the flash mixer coagulant is being added to the wastewater entering the flash mixer. It might convert the dissolved solids into suspended solids. Thus formed suspended solids along with the already existing Suspended solids are removed in Tube Deck. Because of the conversion of the dissolved solids into suspended solids, the TDS removal efficiency was observed in the primary treatment.

Table 6.7: The wastewater constituent removal efficiencies of the Tube Deck computed from the analysis of sample collected in ETP.

Days	Inlet TSS (mg/l)	Outlet TSS (mg/l)	TSS Removal Efficiency
1	725	186	74.34%
2	812	210	74.13%
3	626	145	76.83%
4	657	154	76.56%
5	524	122	76.71%

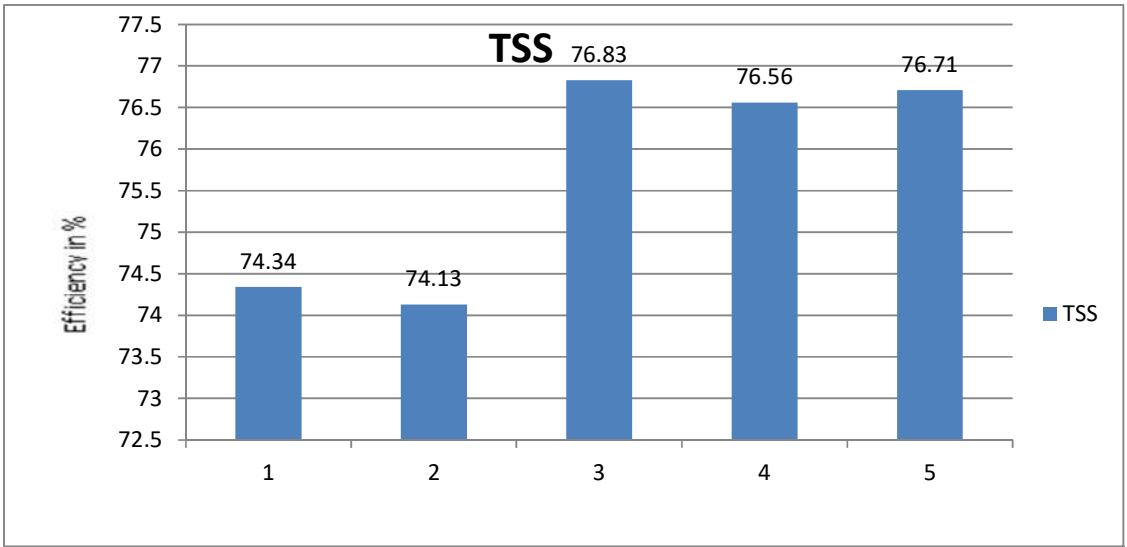


Figure 6.5: The Percentage Removal Efficiencies of Tube Deck

The TSS removal efficiency varies between 74.13% and 76.83%. In tube deck it was observed that average reduction in the TSS about 75.71% which shows that effective removal of TSS takes place in primary treatment.

6.3.4 Removal Efficiency of Bio Tower

The Bio Tower is meant for removal of organic matter present in the effluent. From the tube deck the effluent enters into the Bio Tower.

Table 6.8: The wastewater constituent removal efficiencies of the Bio Tower computed from the analysis of sample collected in ETP.

Days	Inlet COD (mg/l)	Outlet COD (mg/l)	COD Removal Efficiency	Inlet BOD (mg/l)	Outlet BOD (mg/l)	BOD Removal Efficiency
1	7216	2756	61.80%	3258	1126	65.43%
2	6129	2467	59.74%	2755	912	66.89%
3	7845	3018	61.52%	3457	1286	62.80%
4	6594	2219	66.34%	3016	985	67.34%
5	6957	2648	61.93%	3104	1028	66.88%

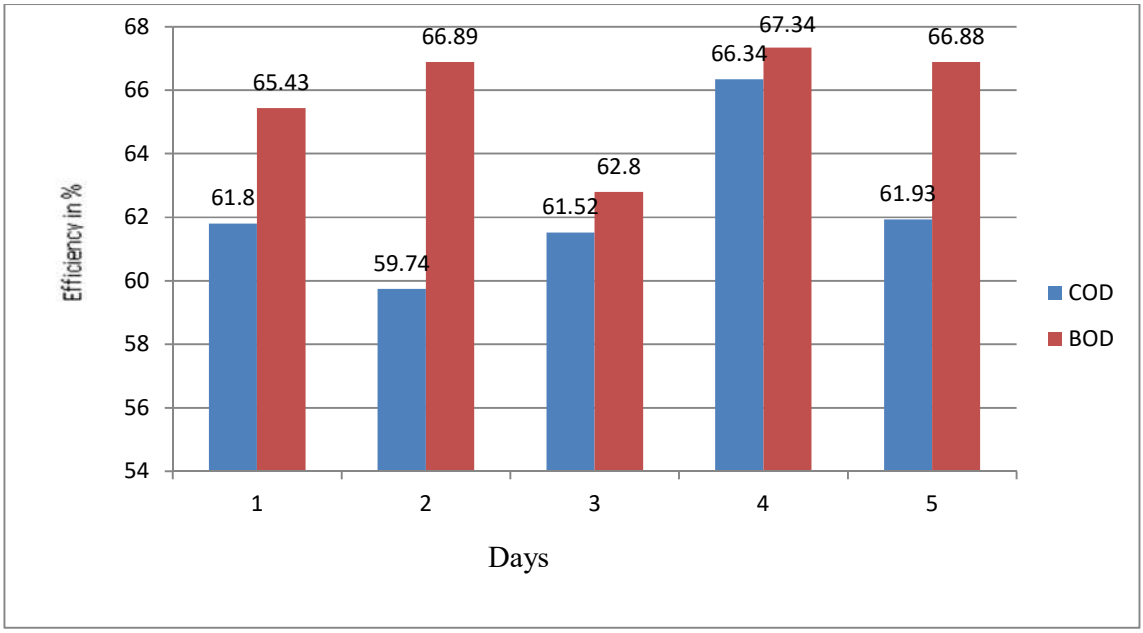


Figure 6.6: The Percentage Removal Efficiency of Bio Tower

The range of percentage removal efficiencies COD, BOD are 59.74 to 66.34%, 62.8 to 67.34%. The average COD and BOD removal efficiencies are about 62.27%. and 65.87%.

6.3.5 Removal Efficiency of Aeration Tank – I

The effluent from the Bio tower is entering into Aeration Tank. Aeration tank is used for reduction of COD and BOD mainly, and by addition of air by maintaining the required dissolved oxygen.

Table 6.9: The wastewater constituent removal efficiencies of the Aeration Tank – I computed from the analysis of sample collected in ETP.

Days	Inlet COD (mg/l)	Outlet COD (mg/l)	Removal Efficiency of COD	Inlet BOD (mg/l)	Outlet BOD (mg/l)	Removal Efficiency of BOD
1	2756	435	84.21%	1126	207	81.61%
2	2467	356	85.56%	912	152	83.33%
3	3018	514	82.96%	1286	213	83.43%
4	2219	323	85.44%	985	135	86.29%
5	2648	397	85.00%	1028	174	83.07%

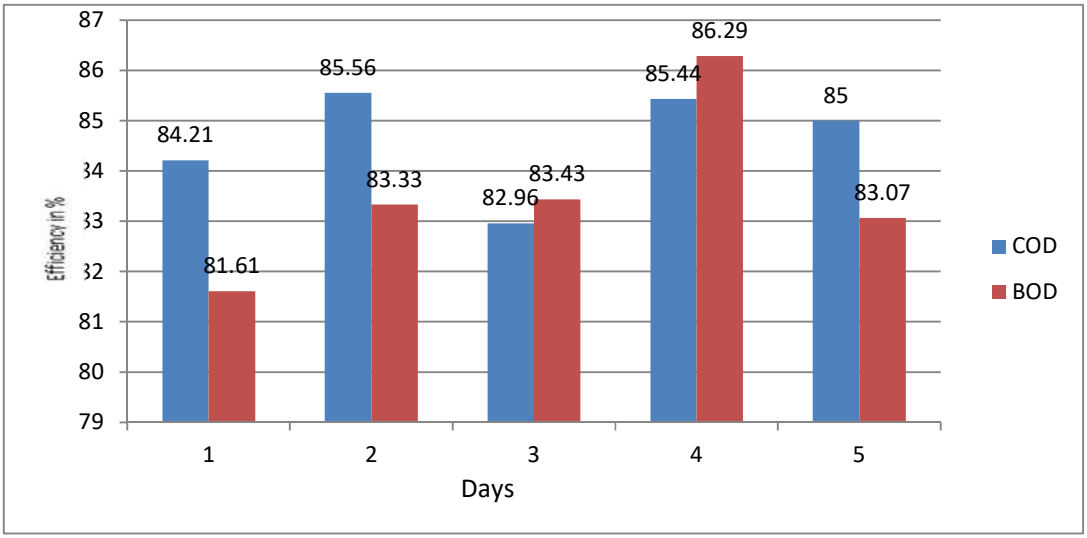


Figure 6.7: The percentage Removal Efficiencies of Aeration Tank - I

The range of percentage removal efficiencies COD, BOD are 82.96 to 85.56%, 81.61 to 86.29%. In Aeration tank it was observed that average reduction in the BOD and COD about 83.55% and 84.64% which shows that removal of BOD and COD takes place in Aeration Tank.

6.3.6 Removal Efficiency of Secondary Clarifier – I

The effluent from Aeration tank passes through the Secondary Clarifier. Secondary clarifiers remove flocs of biological growth created in some methods of secondary treatment including activated sludge, and rotating biological contactors.

Table 6.10: The wastewater constituent removal efficiencies of the Secondary Clarifier – I computed from the analysis of sample collected in ETP.

Days	Inlet TSS (mg/l)	Outlet TSS (mg/l)	TSS Removal Efficiency
1	3000	89	97.0
2	3100	97	96.8
3	2900	85	97.0
4	3300	72	97.8
5	3250	70	97.8

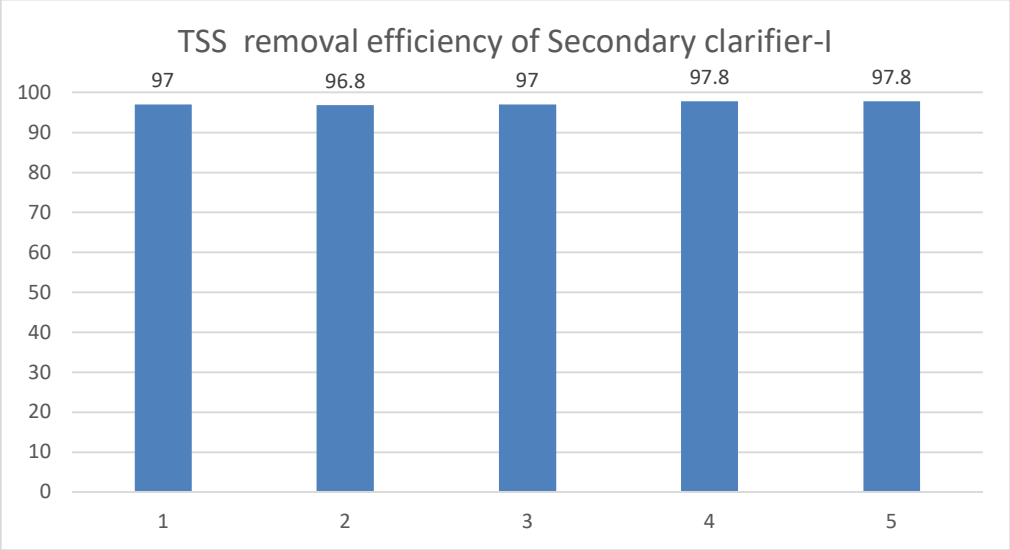


Figure 6.8: The Percentage Removal Efficiencies of Secondary Clarifier -I

The TSS removal efficiency varies between 96.8 % and 97.8 % in Secondary Clarifier. In secondary clarifier it was observed that average reduction in the TSS about 97.2% .

6.3.7 Removal Efficiency of Aeration Tank-2

The effluent from the Secondary Clarifier enters into the Aeration Tank – II. Removal of organic matter takes place in this aeration tank.

Table 6.11: The wastewater constituent removal efficiencies of the Aeration Tank –II computed from the analysis of sample collected in ETP.

Days	Inlet COD (mg/l)	Outlet COD (mg/l)	COD Removal Efficiency	Inlet COD (mg/l)	Outlet COD (mg/l)	BOD Removal Efficiency
1	398	206	48.24%	185	98	47.02%
2	327	183	44.03%	143	81	43.35%
3	402	225	44.02%	177	95	46.32%
4	303	164	45.87%	126	76	39.68%
5	376	191	49.20%	159	87	45.28%

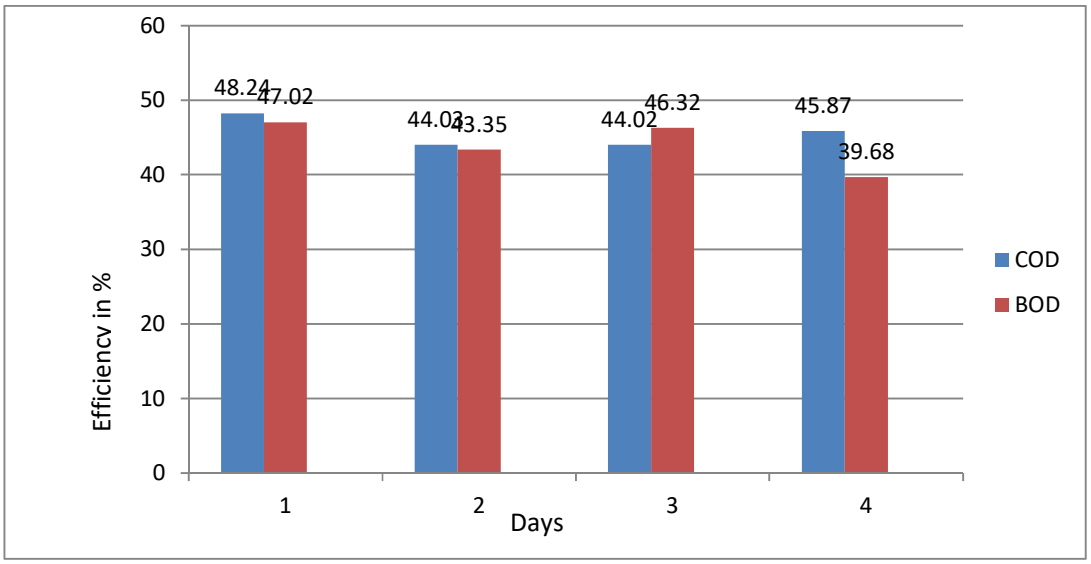


Figure 6.9: The Percentage Removal Efficiencies of Aeration Tank - II

The range of percentage removal efficiencies COD and BOD are 44.02% to 49.20% and 39.68% to 46.32% respectively. The average COD and BOD removal efficiencies are about 46.27% and 44.33%.

6.3.8 Removal Efficiency of Secondary Clarifier – II

The effluent from the Aeration tank – II enters into the Secondary Clarifier – II. The removal of suspended solids takes places in the secondary clarifier.

Table 6.12: The wastewater constituent removal efficiencies of the Secondary Clarifier –II computed from the analysis of sample collected in ETP.

Days	**Inlet TSS (mg/l)**	**Outlet TSS (mg/l)**	**TSS Removal Efficiency**
1	4250	93	97.8
2	4300	106	97.5
3	4420	91	97.9
4	4100	78	98.0
5	3950	85	97.8

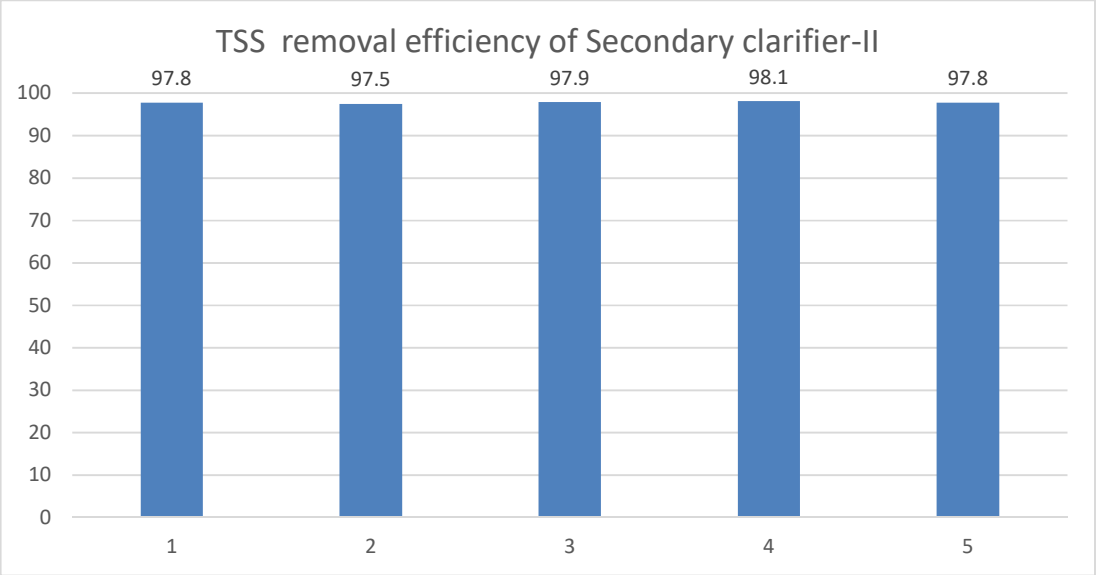


Figure 6.10: The Percentage Removal Efficiencies of Secondary Clarifier- II

The average TSS reduction is 97.8%. This shows that there is reduction of TSS is taking place in the secondary clarifier.

Removal Efficiency of PSF & ACF:

The treated effluent collected is further treated with the help of Pressure Sand Filter and activated carbon filter. The filters are part of tertiary treatment. The treated effluent from these filters will be sending to guard ponds before the final disposal.

6.3.9 Removal Efficiency of Pressure Sand Filter

Table 6.13: The wastewater constituent removal efficiencies of the Pressure Sand Filter computed from the analysis of sample collected in ETP.

Days	Inlet TSS (mg/l)	Outlet TSS (mg/l)	TSS Removal Efficiency
1	93	61	34.40%
2	106	65	38.67%
3	91	58	36.26%
4	78	49	37.17%
5	85	54	36.47%

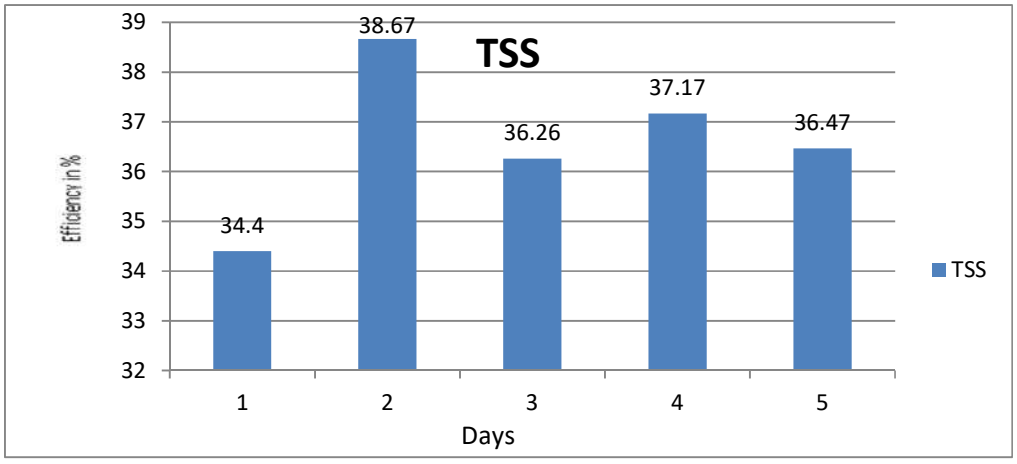


Figure 6.11 The Percentage Removal Efficiencies of Pressure Sand Filter

The TSS removal efficiency varies between 34.40% to 38.67%. The average TSS reduction reduction is 36.60%.

6.3.10 Activated Carbon Filter

Table 6.14: The wastewater constituent removal efficiencies of the Activated Carbon Filter computed from the analysis of sample collected in ETP.

Days	Inlet TSS (mg/l)	Outlet TSS (mg/l)	TSS Removal Efficiency
1	61	49	19.67%
2	65	55	15.38%
3	58	47	18.96%
4	49	39	20.40%
5	54	42	22.22%

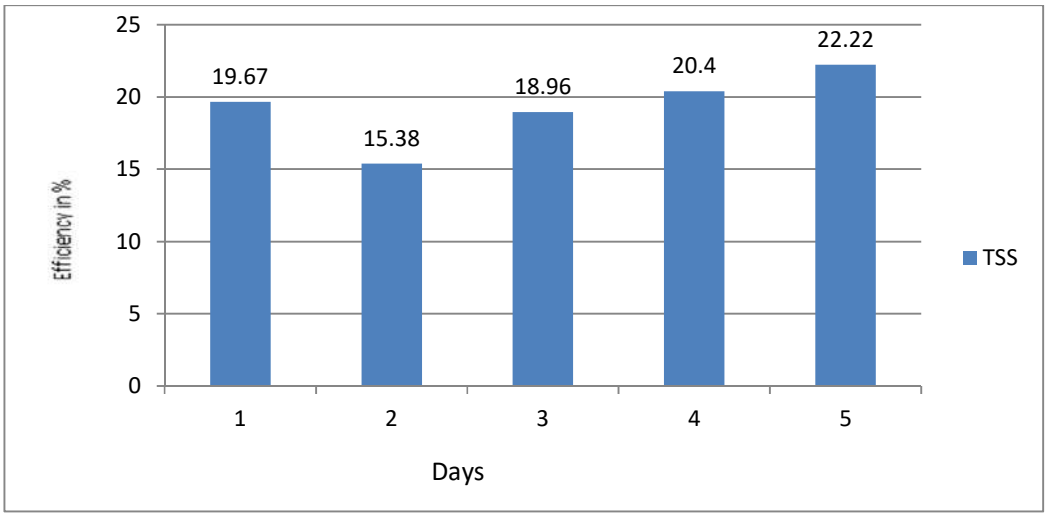


Figure 6.12 The Percentage Removal Efficiencies of Activated Carbon Filter

The percentage removal efficiency of TSS varies between 15.38% and 22.22%. The average TSS removal efficiency is about 19.33%.

6.3.10 RO Plant

Table 6.14: The wastewater constituent removal efficiencies of the RO plant computed from the analysis of sample collected in ETP.

Days	Inlet TDS (mg/l)	Outlet TDS (mg/l)	Inlet Phosphate (mg/l)	Outlet Phosphate (mg/l)
1	2545	612	18.7	2.4
2	2234	598	20.1	1.9
3	2782	654	19.5	2.6
4	2234	563	17.6	1.7
5	2159	498	18.2	2.2

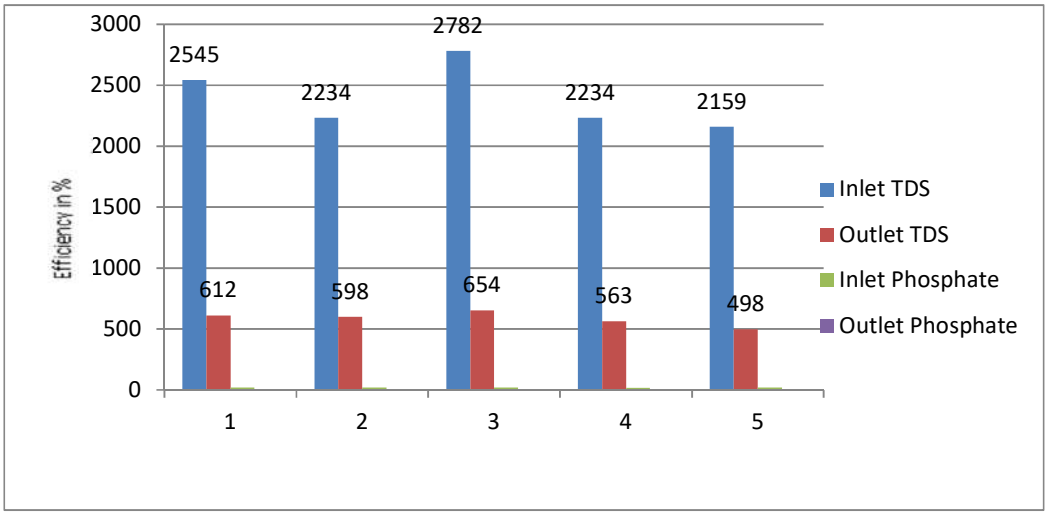


Figure 6.12 The Percentage Removal Efficiencies of RO Plant

The inlet TDS varies between 2159 and 2782 mg/l & outlet TDS varies between 498-654 mg/l. The inlet phosphate varies between 17.6-20.1 mg/l and outlet varies between 1.7-2.6 mg/l.

6.4 Performance of ESP attached to 45 TPH Boiler

6.4.1 Emissions from Chimney(ESP Outlet) attached to 45 TPH Boiler

S.No.	Description	Unit	Result	Method	PCB Standard
1.	Stack gas temperature	^0C	132	IS:11255-P-3	-
2	Flue Gas Velocity	m/sec	6.28	IS:11255-P-3	-
3.	Particulate Matter – PM	mg/Nm^3	49.6	IS:11255-P-1	115
4.	Sulphur Dioxide – SO_2	mg/Nm^3	52.4	IS:11255-P-2	-
5.	Oxides of Nitrogen - NOx	mg/Nm^3	58.9	IS:11255-P-7	

6.4.2 Emissions from 1010 KVA and 1250 KVA DG Sets

S.No.	Description	Unit	1010 KVA	1250 KVA	Method	PCB Standard
1.	Stack gas temperature	^0C	206	225	IS:11255-P-3	-
2	Flue Gas Velocity	m/sec	14.8	16.8	IS:11255-P-3	-
3.	Particulate Matter – PM	mg/Nm^3	60.2	62.6	IS:11255-P-1	115
4.	Sulphur Dioxide – SO_2	mg/Nm^3	39.9	40.4	IS:11255-P-2	-
5.	Oxides of Nitrogen - NOx	mg/Nm^3	43.7	48.6	IS:11255-P-7	

The emissions from the 45 TPH boiler and DG Set emissions were found to be within the prescribed PCB standards.

CHAPTER – 7

PHOTOGRAPHS

EFFLUENT TREATMENT PLANT PHOTOGRAPHS
















SAND FILTER








SECONDRY CLARIFIER - I






M.E.E - I

CHAPTER-8

OBSERVATIONS & RECOMMENDATIONS

8.1 Observations & Recommendations:

1. Removal of Oil & Grease at primary treatment

   Oil & Grease removal efficiency very less at collection tank due to high alkaline conditions and no proper mechanism for collection of O&G from raw effluent.

   - pH to be adjusted to slightly acidic.
   - Installation of automatic oil & grease mechanism at existing channel of syphon system.
2. Push pull system to be arranged to collect the VOCs at collection tank.
3. Change of Activated carbon filter media with 90 grade crystals of activated carbon.
4. Low DO observed in aeration system and need to install additional blowers.
5. Adequate scrubbing system is provided to all the reactors where acidic reactions are being carried. The industry is sending scrubbing media to ETP for treatment.
6. pH indicators are not connected to all scrubbers.
7. pH of Scrubber liquid showing less than 3.0. Periodic replacement of scrubber liquid is to be done after it is saturated.
8. Few of the scrubbers are single stage which can be modified to double stage for efficiently neutralizing emissions.
9. The industry is maintaining the records of in-house regular monitoring of the scrubbers.

VERMI COMPOST PLANT





Design Parameters:

Plant is designed to treat 100 Kgs of wet Garbage Per Day

HAZARDOUS WASTE AND MODE OF DISPOSAL

Hazardous wastes are being disposed as per the conditions stipulated by APPCB in the CTO.
Minimum stocks are being maintained in the Hazardous waste storage yard.
Hazardous waste and mode of disposal specified by the APPCB in CTO is mentioned below:

S.No	Details of waste	Mode of Disposal
1	Process Solid waste	To TSDF, Parawada, Anakapalli Dist. For secured Land filling
2	MEE/ Forced Evaporation Salt	
3	Incineration Ash	
4	ETP Sludge	
5	Solvent Residue/Organic Residue	Shall be incinerated to sent to Cement industries for Co-incineration/Coprocessing/ Pre-processing units
6	Spent Carbon	
7	Damage or Rejected APIs/products	
8	Damaged or Expired Raw materials	
9	Used PPEs	Shall be incinerated in in-house incinerator or sent to Cement industries for incineration
10	Used Oils	To Re-processing units authorized by APPCB
11	Used Batteries	Shall be sent to suppliers on buy back basis
12	e-Waste/ electrical waste	Sent to Authorized Recyclers approved by APPCB/CPCB.
13	Empty Drums/ Containers/ Liners contaminated with Hazardous chemicals/waste	To outside agencies after complete detoxification.
14	Empty barrels / containers / liners contaminated with hazardous chemicals / wastes	
15	LDPE Paper	To authorized Recyclers/ outside agencies
16	Coal Ash from Boilers	To Brick manufacturing units
17	Spent Solvents	Shall be recycled within the units of Hetero Infrastructure SEZ Ltd or sold to outside agencies
18	Recovered Solvents	

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: ETP **DATE: 03.12.2022** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	Cooling tower	85 dBA	77	--	77	--	
2	ATFD	85 dBA	76	75	76	75	
3	Vacuum Pump	85 dBA	79	--	78	--	
4	Air Blower (Aerator)	85 dBA	81	--	80	--	Use ear plug
5	Air Blower (Guard Pond)	85 dBA	81	--	80	--	Use ear plug
6	RO Plant	85 dBA	77	--	77	--	
7	STP	85 dBA	66	--	66	--	
8	Scrap Yard	85 dBA	66	--	50	--	
9	De-toxification yard	85 dBA	67	--	50	--	
10	East Compound wall	85 dBA	51	--	49	--	
11	North Compound wall	85 dBA	71	--	68	--	
12	West Compound wall	85 dBA	71	--	67	--	

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: ETP **DATE: 05.01.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	Cooling tower	85 dBA	76	--	76	--	
2	ATFD	85 dBA	76	75	76	75	
3	Vacuum Pump	85 dBA	80	--	79	--	
4	Air Blower (Aerator)	85 dBA	80	--	81	--	Use ear plug
5	Air Blower (Guard Pond)	85 dBA	81	--	80	--	Use ear plug
6	RO Plant	85 dBA	78	--	77	--	
7	STP	85 dBA	65	--	64	--	
8	Scrap Yard	85 dBA	66	--	50	--	
9	De-toxification yard	85 dBA	68	--	50	--	
10	East Compound wall	85 dBA	50	--	49	--	
11	North Compound wall	85 dBA	70	--	68	--	
12	West Compound wall	85 dBA	70	--	69	--	

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: ETP **DATE: 04.02.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	Cooling tower	85 dBA	76	--	75	--	
2	ATFD	85 dBA	74	73	74	72	
3	Vacuum Pump	85 dBA	78	--	78	--	
4	Air Blower (Aerator)	85 dBA	82	--	81	--	Use ear plug
5	Air Blower (Guard Pond)	85 dBA	82	--	81	--	Use ear plug
6	RO Plant	85 dBA	75	--	75	--	
7	STP	85 dBA	61	--	60	--	
8	Scrap Yard	85 dBA	62	--	49	--	
9	De-toxification yard	85 dBA	61	--	50	--	
10	East Compound wall	85 dBA	51	--	50	--	
11	North Compound wall	85 dBA	69	--	68	--	
12	West Compound wall	85 dBA	68	--	67	--	

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: ETP **DATE: 03.03.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	Cooling tower	85 dBA	77	--	76	--	
2	ATFD	85 dBA	75	73	74	73	
3	Vacuum Pump	85 dBA	78	--	78	--	
4	Air Blower (Aerator)	85 dBA	81	--	80	--	Use ear plug
5	Air Blower (Guard Pond)	85 dBA	80	--	79	--	Use ear plug
6	RO Plant	85 dBA	72	--	71	--	
7	STP	85 dBA	61	--	60	--	
8	Scrap Yard	85 dBA	62	--	50	--	
9	De-toxification yard	85 dBA	62	--	50	--	
10	East Compound wall	85 dBA	62	--	50	--	
11	North Compound wall	85 dBA	70	--	68	--	
12	West Compound wall	85 dBA	69	--	67	--	

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: POWER PLANT **DATE: 03.12.2022** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	45TPH Fans area	85 dBA	77	--	76	--	
2	45TPH Feed pump	85 dBA	84	--	84	--	Use ear plug
3	45TPH Boiler	85 dBA	79	81	79	81	
4	DM Plant	85 dBA	78	--	78	--	
5	Coal Crusher	85 dBA	79	83	78	83	Use ear plug
6	TG Set	85 dBA	--	83	--	83	Use ear plug
7	TG Ground Floor	85 dBA	80	--	80	--	
8	Compressor Area	85 dBA	77	--	77	--	
9	Cooling Tower	85 dBA	75	--	74	--	
10	CVL Boiler	85 dBA	80	--	79	--	
11	ZENITH Boiler	85 dBA	--	--	--	--	
12	MIRCO Boiler	85 dBA	--	--	--	--	
13	Hazardous Storage Yard	85 dBA	65	--	64	--	
14	South Compound Wall	85 dBA	52	--	51	--	
15	East Compound Wall	85 dBA	51	--	50	--	
16	West Compound Wall	85 dBA	67	--	66		

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: POWER PLANT **DATE: 05.01.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	45TPH Fans area	85 dBA	78	--	76	--	
2	45TPH Feed pump	85 dBA	84	--	83	--	Use ear plug
3	45TPH Boiler	85 dBA	80	81	79	80	
4	DM Plant	85 dBA	77	--	76	--	
5	Coal Crusher	85 dBA	79	82	78	81	Use ear plug
6	TG Set	85 dBA	--	83	--	82	Use ear plug
7	TG Ground Floor	85 dBA	81	--	80	--	
8	Compressor Area	85 dBA	77	--	76	--	
9	Cooling Tower	85 dBA	74	--	73	--	
10	CVL Boiler	85 dBA	79	--	79	--	
11	ZENITH Boiler	85 dBA	--	--	--	--	
12	MIRCO Boiler	85 dBA	--	--	--	--	
13	Hazardous Storage Yard	85 dBA	65	--	64	--	
14	South Compound Wall	85 dBA	51	--	51	--	
15	East Compound Wall	85 dBA	51	--	50	--	
16	West Compound Wall	85 dBA	68	--	67		

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: POWER PLANT **DATE: 04.02.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	45TPH Fans area	85 dBA	77	--	77	--	
2	45TPH Feed pump	85 dBA	85	--	84	--	Use ear plug
3	45TPH Boiler	85 dBA	80	81	80	81	
4	DM Plant	85 dBA	77	--	77	--	
5	Coal Crusher	85 dBA	79	82	78	82	Use ear plug
6	TG Set	85 dBA	--	83	--	83	Use ear plug
7	TG Ground Floor	85 dBA	80	--	79	--	
8	Compressor Area	85 dBA	77	--	77	--	
9	Cooling Tower	85 dBA	73	--	73	--	
10	CVL Boiler	85 dBA	80	--	79	--	
11	ZENITH Boiler	85 dBA	--	--	--	--	
12	MIRCO Boiler	85 dBA	--	--	--	--	
13	Hazardous Storage Yard	85 dBA	66	--	64	--	
14	South Compound Wall	85 dBA	52	--	51	--	
15	East Compound Wall	85 dBA	51	--	50	--	
16	West Compound Wall	85 dBA	68	--	66		

Done By:_____ Checked By:_____

Date :_____ Date :_____

HETERO INFRASTRUCTURE SEZ LIMITED

NOISE LEVEL MONITORING

LOCATION: POWER PLANT **DATE: 03.03.2023** FREQUENCY: MONTHLY

S. No.	Location	TLV dBA	Day time reading		Night time reading		Remarks
			Ground floor	First floor	Ground floor	First floor	
1	45TPH Fans area	85 dBA	78	--	76	--	
2	45TPH Feed pump	85 dBA	84	--	84	--	Use ear plug
3	45TPH Boiler	85 dBA	79	80	79	80	
4	DM Plant	85 dBA	76	--	76	--	
5	Coal Crusher	85 dBA	79	83	78	83	Use ear plug
6	TG Set	85 dBA	--	84	--	84	Use ear plug
7	TG Ground Floor	85 dBA	79	--	79	--	
8	Compressor Area	85 dBA	78	--	77	--	
9	Cooling Tower	85 dBA	74	--	74	--	
10	CVL Boiler	85 dBA	79	--	79	--	
11	ZENITH Boiler	85 dBA	--	--	--	--	
12	MIRCO Boiler	85 dBA	--	--	--	--	
13	Hazardous Storage Yard	85 dBA	65	--	64	--	
14	South Compound Wall	85 dBA	51	--	51	--	
15	East Compound Wall	85 dBA	51	--	50	--	
16	West Compound Wall	85 dBA	68	--	67		

Done By:_____ Checked By:_____

Date :_____ Date :_____

Annexure- XVIII

GREEN BELT PHOTOS









POND IN HETERO COMPLEX







GROUND WATER MONITORING WELL LOCATIONS





CAAQMS LOCATIONS

SV ENVIRO LABS & CONSULTANTS

(Environmental Engineers & Consultants in Pollution Control)

Corporate Office & Laboratory : Enviro House, B-1, Block-B, IDA, Autonagar, Visakhapatnam-530012
www.svenvirolabs.com, Ph:0891-2755528, Cell: +91 9440338628
info@svenvirolabs.com, svenviro_labs@yahoo.co.in

Branch Office : 2-53, Mahipala Street, Yanam - 533464.

Recognized by **Govt.of India-MoEF & CC, New Delhi, Accredited by : NABL & NABET**

Ref: SVELC/HISL/23-02/04

Date: 04-03-2023

NAME AND ADDRESS : **M/s. HETERO INFRASTRUCTURE SEZ LIMITED, N.Narasapuram Village, Nakkapally Mandal, Visakhapatnam (Dt).**

SAMPLE PARTICULARS : WATER

SOURCE OF COLLECTION :
1. BOREWELL – 1 (Near ETP)
2. BOREWELL – 2 (Near Honour Labs)
3. BOREWELL – 3 (Near Labour Shed)
4. BOREWELL – 4 (Near HLL-3)

DATE OF COLLECTION : 24-02-2023

TEST REPORT

S.No	Parameter	Unit	Results			
			1	2	3	4
1.	pH	-	8.41	7.82	7.98	8.03
2.	Total Dissolved Solids	mg/l	7421	30142	13024	13492
3.	Total Alkalinity as $CaCO_3$	mg/l	452	332	402	517
4.	Total Hardness as $CaCO_3$	mg/l	901	8769	1572	1676
5.	Calcium as Ca	mg/l	45.8	558	132	180
6.	Magnesium as Mg	mg/l	191	1792	302	298
7.	Chlorides as Cl^-	mg/l	3125	13785	5112	5529
8.	Copper as Cu	mg/l	<0.01	<0.01	<0.01	<0.01
9.	Manganese as Mn	mg/l	0.23	2.82	0.51	0.03
10.	Zinc as Zn	mg/l	0.37	0.46	0.14	0.26
11.	Aluminum as Al	mg/l	0.14	0.50	0.02	0.14
12.	Boron as B	mg/l	1.72	0.75	1.24	1.03
13.	Barium as Ba	mg/l	0.14	0.05	0.03	0.07
14.	Selenium as Se	mg/l	0.01	0.05	0.03	0.02
15.	Silver as Ag	mg/l	<0.01	<0.01	<0.01	<0.01
16.	Cadmium as Cd	mg/l	<0.01	<0.01	<0.01	<0.01
17.	Cyanide as CN	mg/l	<0.01	<0.01	<0.01	<0.01
18.	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01
19.	Mercury as Hg	mg/l	<0.01	<0.01	<0.01	<0.01
20.	Nickel as Ni	mg/l	0.07	<0.01	<0.01	<0.01
21.	Total Arsenic as As	mg/l	0.02	0.10	0.03	0.02
22.	Total Chromium as Cr	mg/l	<0.01	<0.01	<0.01	<0.01
23.	Iron as Fe	mg/l	0.18	0.10	0.07	0.05

Note: All the above parameters are tested as per APHA methods, 23rd Edition, 2017

CHECKED BY

SV Enviro Labs & Consultants * VISAKHA-12 *

SV ENVIRO LABS & CONSULTANTS

Untitled Map
Write a description for your map

Legend
Feature 1
HETERO SEZ UNIT 3
Helio Grounds
HONOUR LAB LTD UNIT-II
JVP CRICKET GROUND

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KONAVANIPALEM కొనవనిపాలెం

Nakkapalli నక్కపల్లి

Chennai - Kolkata Hwy

TEACHER'S COLONY

Lakshimpuram లక్ష్మింపురం

Upamaka Sri Venkateswara Swamy...

D. A. N. Raju Gardens

Jaanikipeta జానికిపేట

Chukalavari Lakshmipuram చుకలవారి లక్ష్మిపురం

Chinnatheenarla చిన్నతినర్ల

Daiva Sneham Gospel Ministries Church

Hetero Labs Ltd-Unit-III

JAMPANA KSHATRIYAS జంపన క్షత్రియాస్

Google Earth

PARKING AREA









VEERA
WASTE MANAGEMENT SYSTEM
E-Waste Recyclers

Form-6
[See rule 19]

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E-WASTE MANIFEST

1.	Sender's name and mailing address (including Phone No.:	Helgo Labs Limited Unit-9
2.	Sender's authorisation No, If applicable. :	7994/APPCB/ZO-VSP/CFO/WZA/2017
3.	Manifest Document No.	03/APPCB/VSP/E-Waste/HO/2017
4.	Transporter's name and address (including Phone No.)	Veera Waste Management Systems
5.	Type of vehicle	(Truck or Tanker or Special Vehicle) Mini Van
6.	Transporter/s registration No.	AP31TF4176
7.	Vehicle registration No.	AP31TF4176
8.	Receiver's name & address :	VEERA WASTE MANAGEMENT SYSTEM (VSP)
9.	Receiver's authorisation No, if applicable.	03/APPCB/VSP/E-WASE/HO/2017-
10.	Description of E-Waste (Item, Weight / Numbers):	Attached as Annexure-1
11.	Name and stamp of sender* (Manufacturer or producer or Bulk Consumer or Collection Centre or Refurbisher or dismantler): Signature : Cheque Month Day Year 30-06-2022	
12.	Transporter acknowledgment of receipt of E-Wastes	
	Name and stamp: Signature : Month 06 Day 30 Year 2022 30-06-2022	
13.	Receiver* (Collection Centre or Refurbisher or Dismantler or Recycler) certification of receipt of E-waster	
	Name and stamp: Signature : Month 06 Day 30 Year 2022 30-06-2022	

* As applicable

VEERA WASTE MANAGEMENT SYSTEM

Note:-

Copy number with color code (1)	Purpose (2)
Copy 1 (Yellow)	To be retained by the sender after taking signature on it from the transporter and other three copies will be carried by transporter.
Copy 2 (Pink)	To be retained by the receiver after signature of the transporter.
Copy 3 (Orange)	To be retained by the transporter after taking signature of the receiver.
Copy 4 (Green)	To be returned by the receiver with his/her signature to the sender

Form-6
[See rule 19]

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E-WASTE MANIFEST

1.	Sender's name and mailing address (including Phone No.:	Hetero Drugs Limited Unit-9
2.	Sender's authorisation No, If applicable. :	7994/APPCB/ZO-VSP/CFO/W&A/2017
3.	Manifest Document No.	03/APPCB/VSP/E-waste/HO/2017-
4.	Transporter's name and address (including Phone No.)	Veera Waste Management Systems
5.	Type of vehicle	(Truck or Tanker or Special Vehicle) Mini Van
6.	Transporter/s registration No.	AP 31 TF 4176
7.	Vehicle registration No.	AP 31 TF 4176
8.	Receiver's name & address :	VEERA WASTE MANAGEMENT SYSTEM (VSP)
9.	Receiver's authorisation No, if applicable.	03/APPCB/VSP/E-WASE/HO/2017-
10.	Description of E-Waste (Item, Weight / Numbers):	Attached as Annexure-1
11.	Name and stamp of sender* (Manufacturer or producer or Bulk Consumer or Collection Centre or Refurbisher or dismantler): Signature : Month 06 Day 30 Year 2022 30-06-2022	
12.	Transporter acknowledgment of receipt of E-Wastes	
	Name and stamp: Signature : Month 06 Day 30 Year 2022 30-06-2022	
13.	Receiver* (Collection Centre or Refurbisher or Dismantler or Recycler) certification of receipt of E-waster	
	Name and stamp: Signature : Month 06 Day 30 Year 2022 30-06-2022	

VEERA WASTE MANAGEMENT SYSTEM

* As applicable

Note:-

Copy number with color code (1)	Purpose (2)
Copy 1 (Yellow)	To be retained by the sender after taking signature on it from the transporter and other three copies will be carried by transporter.
Copy 2 (Pink)	To be retained by the receiver after signature of the transporter.
Copy 3 (Orange)	To be retained by the transporter after taking signature of the receiver.
Copy 4 (Green)	To be returned by the receiver with his/her signature to the sender

GOVERNMENT OF ANDHRA PRADESH
STATE DISASTER RESPONSE & FIRE SERVICES DEPARTMENT

From :
The Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

To :
The Management,
M/s Hetero Infrastructure SEZ Limited,
Sy.No.125, 138,150 N.Narasapuram Village,
Nakkapalli Mandal, Anakapalli District

Rc.No.15566/VSP/RFO/2020 MSB-ER, SDP Dated:22-07-2022.

Sir,

Sub: A.P. State Disaster Response and Fire Services Department-MSB Section-Issuance of Renewal of No Objection Certificate to Existing Building of M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District -Regarding.

Ref: 1. Occupancy NOC issued vide Rc.No: 15566/VSP/RFO/2020, Dated:23-12-2020 of Regional Fire Officer, Eastern Region, Vijayawada.
2. Application of M/s.Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District

* * * * * * * *

The Management of M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District has requested to issue Renewal of No Objection Certificate by duly remitting the Renewal Fee towards Fire Precautionary Fee vide reference 2nd cited.

2) The No Objection Certificate for Occupancy Certificate was issued vide reference 1st cited to the existing Application of M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District with (15) Blocks with total built up area of 12612Sq. Mtrs., for Industrial Occupancy (Category-G2)

3) Block Wise Details.

Sl. No	Name of the Block	No of Floors	Height of the Building	Built up Area in Sq.Mtrs	No. of Staircase
1	Incinerator	Ground Floor	08.45	200.00	--
2	Waste Hazardous Shed	Ground Floor	03.66	840.00	--
3	Coal Shed 1 & 2	Ground Floor	11.60	3610.00	--
4	DMSO Palnt Storage Shed-2	Ground Floor	10.00	900.00	--
5	20TPH Boiler-	Ground +02UF	14.00	720.00	--
6	45TPH Boiler	Ground +02UF	15.00	2513.00	2 Nos.
7	15TPH Boiler	Ground Floor	14.39	480.00	--
8	ETP Office , RO Plant	Ground Floor	05.82	306.00	--
9	12TPH Boiler	Ground Floor	10.00	150.00	--
10	Control Room, Degass Sump, ETP, RO Plant	Ground Floor	05.82	300.00	--
11	12TPH Boiler	Ground Floor	05.82	300.00	--
12	RO Plant & Lab Shed	Ground Floor	12.00	486.00	--

(Contd..2p)

13	Detoxification Shed	Ground Floor	05.78	1400.00	--
14	RO Plant	Ground Floor	05.05	200.00	--
15	Vermi Compost Shed	Ground Floor	05.05	207.00	--
			Total	**12612.00**	

4) The management has submitted the self-Certification report / Affidavit and stated that the furnished information is correct and to maintained the conventional systems (existing Firefighting systems) are in good working condition along with the following Fire Safety Measures keeping in view of practicality, an extra safety precaution, maintenance and resilience and also, it is noticed at any time that the information provided is false, they understand that Renewal NOC deemed may be cancelled by the concerned authority.

5) In view of the above and taking into consideration of the larger public interest and in the context of the COVID-19 pandemic across the country and also based on the Self-Certification/Affidavit submitted by the management, the Renewal of No Objection Certificate is issued to the Existing Building of M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District with (15) Blocks with total built up area of 12612Sq. Mtrs., for Industrial Occupancy (Category-G2)

6) It is suggested to the Management for providing the following Fire Safety Measures keeping in view of practicality, maintenance and resilience:

Sl. No.	Fire Fighting Equipment	Prescribed	Provided	Deficit
1	Fire Extinguishers	ABC type	122Nos.	Nil
2	Temperature Sensors	Temperature Sensors connected " Hooter " and that can give alerts through Cell phone instead of Sprinklers	Provided	Nil
3	Manual Call Point System	One Number per Floor	25 Nos.	Nil
4	Under Ground Static Water Tank (or) Terrace Water Tank	5,000 Ltrs. (Minimum)	1,00,000 Ltrs	Nil
5	Provide as per Hazard analysis and Risk assessment report or Third Party Fire safety Audit report or Chief Engineer of the Company and submit Photos	Electrical Pump 6833 LPM-01 No. Diesel Pump 6833LPM-01 No Jockey Pump-180 LPM-01 No.	Provided as per Third Party Fire Safety Audit Report	Nil

Note:-Further the management has also provided the (02) Nos.of 5 HP triplex pumps.

(Contd..3p)

7) **Electrical Safety System.**

(i) Miniature Circuit Breakers, MCB's.	:	Yes/Provided
(ii) No Overloading of Power Sockets..	:	Yes, ensured
(iii) 10 years old wiring to be changed specially wherever A/c is there ?	:	Yes, ensured
(iv) LED Lights in Closed Rooms, Corridors, Staircases connected to Inverter (Battery).	:	Yes, Connected
(v) Grounding/Earthing is provided	:	Yes/Provided
(vi) Lightening Conductor is provided	:	Yes/Provided
(vii) The above shall be certified by authorized Electrical Contractor/ Supervisor.	:	Yes/Certified

8) In view of the above and based on the Affidavit submitted by the Management, the Renewal No Objection Certificate is hereby issued to the M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District

9) Further, the Management has submitted the following documents.
   i. Hazard Assessment and Risk analysis report
   ii. On site/Off site emergency plan.
   iii. Third party safety audit.

10) Further, the Management has to submit the following information in self certification format to the website which will be intimated soon as shown below.

SELF CERTIFICATION (to be uploaded)					
Name and address of the industry / premises:					
S.No	Name of the Chemical	Storage Quantity at Present	No.of Days The quantity received	Nearest Fire Station with Phone No	Last Information given to Fire Services on Date
The above information is true to the best of my Knowledge					
Date			Signature Authority		

(b) **LIST OF HAZARDOUS CHEMICALS EMERGENCY INFORMATION**

Name of the Industry:															
Address:															
S. No	Chemical Name	Nature of chemical/toxic/ poisonous/flammable/explosive/hazardous	In case of Fire: Fire Fighting Media and instructions	Spill Cleanup procedure	Contact with eye/skin	Incompatible with	PPE	Flash point OC	Boiling Point OC	LEL%	UEL %	MSDS CODE	STORAGE Quantity	Geo Coordinates	
														Latitude	Longitude

11) Fire Safety Suggestions:

Sl. No.	As Builder	As Occupant	As Security personnel
1.	All the Fire protection arrangements shall be maintained in good working condition at all time.	The Escape/Exit roots shall not be kept Locked/Blocked or Encroached.	All the occupants must be trained the correct method of operation of the Fire Fighting System installed.

(Contd..4p)

Sl. No.	As Builder	As Occupant	As Security personnel
2.	Any loss of life or property due to non-functioning of Fire Safety Measures and other Installations shall be the responsibility of the management.	All occupants shall be trained to operate the Fire Safety Equipment during Emergency.	Mock Drills should be conducted once in 03 months for initial two years. Thereafter, once in every 06 months.
3.	Addition/Alteration, if any in the Building may be verified by Building Authority.	Mock Drills should be conducted once in 03 months for initial two years. Thereafter, once in every 06 months.	All Security Personnel shall be trained to operate the Fire Safety Equipment during Emergency.
4.	This Renewal Fire Certificate is only from Fire Safety Point of View.	Raise the alarm If the fire cannot be controlled; Evacuate the area completely at once with nearest Safe Exit.	Attack the Fire using available Fire Equipment only if you feel capable of controlling it. If not, take all steps to isolate the area by closing Doors and Windows.

11) The Management is responsible all risks involved in case of Fire Accident.

12) This Renewal of No Objection Certificate is valid for a period of Five years from the date of issue of this letter to the Management M/s Hetero Infrastructure SEZ Limited, Sy.No.125, 138,150 N.Narasapuram Village, Nakkapalli Mandal, Anakapalli District subject to the compliance of above Fire and Electrical Safety Measures. *The Owner/Occupier/Builder/Management concerned of the Building shall submit Self Declaration/Certification with regard to working condition of above Fire Safety System every year in the prescribed format and submit/upload the photographs of the Mock Drills conducted in the premises.* It is the responsibility of the Builder to maintain the Fire Safety Equipment in good working condition at all times and apply for next Periodical Renewal of No Objection Certificate, duly remitting the User Charges vide G.O.Ms.No.90, Home (Prisons & Fire Services) Department Dated:13-08-2021 & G.O.Ms.No.120, Home (Prisons & Fire Services) Department Dated:25.10.2021, two (02) months before expiry of this Renewal of No Objection Certificate.

Yours Sincerely,

Director General,
State Disaster Response and Fire Services,
Andhra Pradesh, Vijayawada.

Copy to the Director of Industries, 8th floor, APIIC Towers, Mangalagiri-522503

Note: In case of any emergency call to 101 or State Fire Control Room-9100108101.

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

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POLICY SCHEDULE FOR PUBLIC LIABILITY (Act Only) INSURANCE

UIN NUMBER - IRDAN190P0076100001

Insured's Name	:	HETERO INFRASTRUCTURE SEZ LIMITED			
Insured's Details			**Issuing Office Details**		
Customer ID	:	PO92918286	**Office Code**	:	HYDERABAD LCBO 960000 (960000)
Address	:	SY NO 125 138 150, N NARASAPURAM, NAKKAPALLY MANDAL, N NARASAPURAM, VISAKHAPATNAM, ANDHRA PRADESH, NAKKAPALLI ,ANDHRA PRADESH, 531081	**Address**	:	LARGE CORPORATE AND BROKERS OFFICE, 7C,7TH FLOOR, SURYA TOWERS, S.P.ROAD, SECUNDERABAD ,500003
Phone No	:		**Phone No**	:	4027810302
E-mail/Fax	:	krishna.d@heterodrugs.com, /	**E-mail/Fax**	:	nia.960000@newindia.co.in /
PAN No	:		**S.Tax Regn. No**	:	AAACN4165CST178
GSTIN/UIN	:	37AABCH6897E3Z6 / NA	**GSTIN**	:	36AAACN4165C3ZQ
	:		**SAC**	:	

Policy Details					
Policy Number	:	96000036223300000021	**Business Source Code**		
Period of Insurance	:	From: 11/11/2022 12:00:01 AM To: 10/11/2023 11:59:59 PM	**Dev.Off. level/Broker/Corp. Agent/Web Aggregator/CPSC User**	:	DIRECT - (DI00000188)
Date of Proposal	:	11-Nov-22	**Agent/Bancassurance/Specified Person**	:	
Prev. Policy no.	:	96000036213300000022	**Phone No**	:	NA / NA
Client Type	:	Non-Corporate	**E-mail/Fax**	:	/ /

Premium(₹)	ERF Premium(₹)	GST(₹)	Total (₹)	Total (₹ in words)	Receipt No. & Date
10671	10671	0	21342	RUPEES TWENTY-ONE THOUSAND THREE HUNDRED FORTY-TWO ONLY	9600008122000000334 8 - 22/11/22

Details of risk covered under current year policy:

								Deductibles	
Retroactive Date	**Paid Up Capital**	**No Of Locations Involved**	**AOA**	**AOA:AOY**	**AOY**	**Annual Turnover - Previous Year**	**Annual Turnover - Proposed Year**	**No of workmen**	**No of Other Employee**
11/11/2021	<= 15 Crore	1	50000000	1:3	150000000	900000000	1000000000	90	12

Retroactive Dates

									Deductibles	
Retroactive Date Details	**Date**	**Paid Up Capital**	**No Of Locations Involved**	**AOA**	**AOA:AOY**	**AOY**	**Annual Turnover - Previous Year**	**Annual Turnover - Proposed Year**	**No of workmen**	**No of Other Employee**
RETROACTIVE DATE 1	11/11/2021	<=15Crore	1	50000000	1.3	150000000	900000000	1000000000	90	12

RETRO-DATE IS SUBJECT TO LESSER OF LIMITS - NARROWER OF COVER.

Extensions under the Policy

Name of the Extension	Sub Limit of the Extension	Deductibles of the Extension

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

Special Conditions	Paid up capital:₹1.27 crore. Estimated Annual Turnover:₹102 crore.Condition precedent to liability - Nil claims as on date of inception ofpolicy.AS PER PUBLIC LIABILITY ACT POLICY Absolute exclusion for losses directly or indirectly arising out of contributed to by or resulting from Coronavirus (Covid 19 and /or nCov 2019) or any mutations or variations thereof
Special Exclusions	NA
Special Excess/Deductible	0

Retroactive Dates	**Date**
Retroactive date	11/11/2021

The Policy shall be subject to PUBLIC LIABILITY (Act Only) INSURANCE Policy clauses attached herewith.

Clauses	Description
Conditions	Arising out of willful or intentional non compliance of Statutory provisions
Conditions	If Company deny Liability for claim not within 1 year from date of condition claim have been discarded
Conditions	The Insured Owner shall keep record of annual turnover
Conditions	This policy may be canceled by the Insured Owner by giving 30 days notice
Conditions	This Policy may also be canceled by the Insurer by giving 30 days notice
Conditions	Company not be liable to make paymnt,if claim shall be in any manner fraudulent
Conditions	The Policy and the Schedule shall be read together as one contract
Conditions	Any dispute Policy shall be determined in accordance with the law
Conditions	Company notbe liable for clm,relief made after5Yr from date of occurence of acc
Conditions	During claim,any existing insurance covered same Liability, Company not liable to pay
Conditions	No payment shall be made by the insured without the written consent of Company
Exclusions	Damage to property owned,otherwise in Insured Owner control,care or custody
Exclusions	Directly or indirectly occasioned by happening through or in consequence of war
Exclusions	Ionizing radiation or contamination by radioactivity from any nuclear fuel
Exclusions	Radioactive,toxic,explosive of any explosive nuclear assembly
Exclusions	Arising under other legislation except in so for as Sec8,SubSec(1),(2)of Act
Exclusions	In respect of fines,penalties, punitive and or exemplary damages
Exclusions	Arising out of willful or intentional non compliance of Statutory provisions

Premium and GST Details

	Rate of Tax	Amount in INR
Premium		₹ 21342.00
SGST	0	0
CGST	0	0
IGST	0	0

In witness whereof the undersigned being duly authorised by the Insurers and on behalf of the Insurers has (have) hereunder set his (their) hand(s) on this 22nd day of November,2022.

For and on behalf of
The New India Assurance Company Limited

Date of Issue: 22/11/2022

Duly Constituted Attorney(s)

Stamp Duty under the Policy is ₹1

Mudrank_____Dt._____consolidated Stamp Fees Paid by Pay Order Number_____vide receipt number_____dt._____.

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

We hereby declare that though our aggregate turnover in any preceding financial year from 2017-18 onwards is more than the aggregate turnover notified under sub-rule (4) of rule 48, we are not required to prepare an invoice in terms of the provisions of the said sub-rule.

Tax Invoice No : 96000022E0004941

IRDA Registration Number: 190
NIA PAN NUMBER: AAACN4165C

591

CLASSIFIEDS

JOBS

ప్రతిష్ఠాత్మక ప్రైవేట్ ప్రభుత్వరంగ సంస్థలో 10th పాస్ లేదా ఇంటర్, ఐటీఐ 17-29 వయసు గలవారికి ... 09491899163.

ప్రైవేట్ హైస్కూల్ నందిగామలో ఖాళీ పోస్టులు 60/DV. సంప్రదించండి 7386452003 / 9989954096 / 9989972101 / 7386000586.

ఉన్నత ఆదాయం ఆర్జించు ప్రొఫెషనల్ కోర్సు 1 ఇంటర్ ఉత్తీర్ణులకు MBBS, CMDs ఇంటి వద్దనుండి 60 రోజుల్లో ఫ్రీ సీట్ కి 20- ఫ్రీ% Govt / Pvt / Mgt. ఎన్నారై, ఫ్రీ స్పాన్సర్ ప్రీ-సీట్స్. ఫ్రీ ఫ్రీ-సీట్ కి ... 9573799007.

ఓపెన్ ఉద్యోగం 10th పాస్ అయిన యువతీ యువకులు ప్రభుత్వ పెన్షన్ రేటుతో ఉద్యోగం ఉద్యోగం 17-35 సం.ల Call. 09032199981

ప్రముఖ I.S.O. సర్టిఫైడ్ ఆర్గనైజేషన్ నందిగామ్ లో ఖాళీగా ఉన్న ... X Class కనీసవిద్యార్హత ... 9989/99989.

ప్రముఖ ఫార్మాస్యూటికల్ సంస్థ ... MBA, CMDM, MBA, బీఫార్మ్ ... Dt. ఉం. 7989989899, 9394989...

ఆన్ లైన్ పెండింగ్ వర్క్స్, ఫారం ఫిల్ చేసి ఇచ్చే వర్క్ ... 7901999016.

ఇన్సూరెన్స్ రంగంలో 5 లేదా అంతకన్నా ఎక్కువ సంవత్సరాల అనుభవం ... MBA, ... 10,000 to 30,000 ... 7032256196, 9553098081.

MBPC ఫైనాన్స్ ... ఉద్యోగ అవకాశాలు ... 9701100111.

ప్రముఖ కోచింగ్ ... ఫ్యాకల్టీ ... AGM, ... 30 ఇంక్రిమెంట్స్ ... 7330811148 / 9951691488.

ఇంటర్ ... ప్రముఖ ... ఫ్యాకల్టీ (M/F) ... 9963337109.

FACULTY / TEACHERS

Teachers ... 1 PET ... 1 PGT ... 1 PM ... Qualified ... Tel. 2713949, 9441693073.

Wanted PET & Maths/Science / Eng. V (English Medium) Teachers ... Sri Narasimha School, T.C. Palya, Bommasandra Rly., Via-10, Ph. 08117[illegible].

Teachers ... Fluent Telugu ... Social, Maths, English for VI to X, Must work at Pondicherry Branch. Cont: Indian Springs. © 9491944336.

Wanted Class Teachers for Lower Children & Indoor / Ecrit Teacher for Higher Classes ... 7093613411, 9966014399.

Required Faculty for Civil, EEE, Mechanical, Maths, C, C++ Advanced for B.Tech & Polytechnic Tutorial ... 9397995326.

SECURITY GUARDS

... RTC ... Interviews ... 8000 ... 11,000/- ... 9989899899.

... ... 9989899899, 9035011899.

TUITIONS

... 11th ... 9000 ... 105, 106 ... 7989989899, 9014989...

... AC ... 9000 ... 2013, 2017 ... 9989899899.

... Singapore Maharaja Orchid ... Ramayana Tree ... Dubai ... Kalyan Jewellers Pvt. Ltd. © 97798 90999.

NOTICES

ఇంటర్నెట్ ద్వారా ప్రకటనలు ఇవ్వడానికి మరియు ఈనాడు ఆన్ లైన్ క్లాసిఫైడ్స్ సేవలు పొందడానికి మా వెబ్ సైట్ ... ఈనాడు ఆన్ లైన్ క్లాసిఫైడ్స్ ... ఇంటర్నెట్ ద్వారా ... ఈనాడు ఆన్ లైన్ క్లాసిఫైడ్స్

CIN : U45200TG2006PLC049668

HETERO INFRASTRUCTURE SEZ LTD.

Ch. Lakshmipuram (Vill.), N. Narasapuram (Vill.), Rajayyapeta (Vill.), Nakkapally (Mandal)
VISAKHAPATNAM (Dist.) - 531 081. A.P., India. Tel : 08931- 227307, Fax : 08931- 227200
E-mail : contact@heterodrugs.com. URL : http//www.heterodrugs.com.

27/10/2022

Letter No: HIS/EHS/APPCB/2022-23/16

The Environmental Engineer
Regional Office
A.P. Pollution Control Board
Visakhapatnam

Dear Sir,

Sub : Submission of Environmental Statement in Form-V of M/s Hetero Infrastructure SEZ Ltd for the Financial year 2021-22 - Regarding

Ref : APPCB/VSP/VSP/219/CFO/HO/2017 Dated 11/12/2017 and amendment dated 25/06/2019

With reference to above, we are herewith submitting the environmental statement in Form-V for the financial year 2021-22 for your information and perusal.

You are requested to kindly acknowledge the receipt.

Thanking you Sir,

Yours faithfully,
For Hetero Infrastructure SEZ Ltd

S. Kullayi Reddy
Associate Vice President -EHS

Enclosures : As Above

PROFILE

M/s. HETERO INFRASTRUCTURE SEZ Ltd, obtained EC & consent for establishment for setting up of 17 manufacturing facilities for producing Bulk Drug intermediates & APIs and also got Consent for operation for the same SEZ. Out of 17 permitted units, Hetero constructed following 03 units in Hetero Infrastructure SEZ Ltd,

- Hetero Drugs Ltd, Unit-IX (Plot No:1)
- Hetero Labs Ltd, Unit-IX (Plot No: 2 & 3)
- Honour Lab Ltd, Unit-III (Plot No:4)

All above mentioned units are producing Bulk Drugs & API and all these products are being manufactured on Regular basis. Manufacturing of the products is being undertaken as per the consent conditions.
Hetero Infrastructure is providing services like Water, Steam, Effluent Treatment Plant, Sewage Treatment plant, Vermi Compost plant, Scrap Yard, Hazardous waste managment etc to all the above mentioned units.

Apart from above mentioned units, the other unit Hetero Labs Ltd, Unit-III is making use of these facilities of Hetero Infrastructure SEZ Ltd as per the CFE & CFO.

Salient features of
M/s. Hetero Infrastructure SEZ Limited

Total Site Area	340 Acres
Built up Area	180 Acres
Area of Green Belt Developed	100 Acres
Area available for Green Belt Development	50 Acres
Year of Establishment	2010
Year of Commissioning	2011
Capital Cost	120 Crores
Type of plant	Facilitator for Bulk Drug Manufacturing units
Water Consumption as on date	242 KLD
Investment on Pollution Control	
• Capital Investment	100 Crore
• Recurring O & M	300 Lakhs/annum
Employment	300

MINISTRY OF ENVIRONMENT AND FORESTS NOTIFICATION
New Delhi, the 22nd April 1993
(PART II, SECTION 3, SUB-SECTION (1)

"FORM - V"
ENVIRONMENTAL STATEMENT FOR
THE FINANCIAL YEAR ENDING THE 31ST MARCH 2022

PART – A

Name and address of the owner/ Occupier of the industry, operation Or process	:	**Dr. C. Mohan Reddy, Director** 7-2-A2, Hetero Corporate, Industrial Estate Sanathnagar Hyderabad -500018
Registered Office Address	:	**M/s. Hetero Infrastructure SEZ Ltd,** 7-2-A2, Hetero Corporate Industrial Estate Sanathnagar Hyderabad -5000018 Tel: 040- 23704923/24/25
Works address	:	**M/s. Hetero Infrastructure SEZ Ltd,** N.Narsapuram (V), Nakkapally (Md), Visakhapatnam Dist - 531081.
Industry Category	:	Red.
Production Capacity	:	NA (Only Services)
Month and Year of Establishment	:	2010.
Date of Last Environmental Statement Submitted	:	September 2021

PART-B
Water and Raw Material Consumption

Water Consumption (m^3/day)

S.No	Water Consumption	Quantity (KL/day) Including power plant	Quantity (KL/day) Including power plant
1.	Process & Washing	837	-
2.	Cooling tower Make up	250	-
3.	Boiler Feed	330	242
4.	Domestic	120	-
5.	Raw water RO make up	107	
Total		**1644**	**242**

PART-C
Pollution discharged to environment/unit of output
(Parameter as specified in the consent issued)

	Quality ofPollutants discharged (mass/day)	Concentrations of Pollutants discharges (Mass/volume)	Percentage of variation from prescribed standards with reasons.
1.Ambient Air Quality	**Analysis Report Enclosed**		Within the limits
2.Stack Emissions			
3.Noise levels			
4.Effluent			

PART-D
HAZARDOUS WASTES
(As specified under 1[Hazardous Wastes (Management, Handling and Transboundry Movement) Rules, 2008)]

Hazardous Wastes	Total Quantity (Kg.)	
	During the previous financial Year (2020-21)	During the current financial Year (2021-22)
Forced Evaporation Salts	2205.4 Tons	1676.84
ETP Sludge	53.21 Tons	47.46
Incinerator Ash	6.12	0

PART-E
Solid Wastes

Solid waste	Total Quantity	
	During the previous financial year (2020-21)	During the current financial year (2021-22)
Boiler ash	7650 Tons	9418 Tons

PART-F
Characteristics in terms of Composition and quantum of hazardous as well as solid wastes and the disposal practices adopted by them

Fly Ash from Boiler : To Brick Manufacturers
Spent Carbon from Process : To TSDF , Parawada / Cement Industries
Forced Evaporation Salts : To TSDF , Parawada
Organic Residue : To TSDF , Parawada and Cement Industries

PART-G

Impact of the pollution abatement measures taken on Conservation of natural resources and on the cost of production.

The industry has adopted following measures for the conservation of natural resources:

- Sea water Desalination Plant for meeting the water requirement of the industry.
- Sewage Treatment Plant for reuse of Domestic wastewater for gardening purposes.
- Usage of vermicomposting for green belt and grounding purpose as a replacement for chemical fertilizers.
- Green belt Development for abatement of pollution

The industry adopted all possible pollution control measures (Common Facility located at M/s Hetero Infrastructure SEZ Ltd) which includes Equipment's for Conservation of energy, Effluent Treatment Plants (Stripper, MEE, ATFD Bio-tower & Dual stage aerobic Treatment plant based on ASP), Sewage Treatment plants, Equipments for controlling fugitive emissions (Scrubbers, Condensers) for the abatement of pollution. To avoid any chances of ground water/ Soil contamination, the industry has constructed all above Ground tanks for ETP, STP etc.

Further the industry has installed 03 nos of Continuous Ambient Air Quality Monitoring (CAAQM) stations for monitoring the quality of the air, Online effluent monitoring system (OEMS) for various parameters to check the quality of treated effluents being disposed into Sea, Portable & online VOC meters for measuring organic vapours concentration in and around factory area.

PART-H

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

The industry has already invested around Rs. 100.00 Crores towards installation of pollution control devices in Hetero Infrastructure SEZ Ltd and developed green belt in and around the factory Premises in an area of more than 40% of the total area of the Industry. Green belt consists of various plants like Ganuga, Neem, Almond, Silver oak, Plintoform, casurina, Eucalyptus and Conacorpous etc.

All installed Pollution control equipments are periodically evaluated and necessary modifications/replacements are being made for improvement in their performances from time to time as and when required irrespective of Budget allocations.

The industry proposed to invest additional amount of Rs 100 crore towards installation of new 1.2 MLD Effluent Treatment plant and associated facilities.

PART-I

Any other particulars for improving the quality of the environment

- Increasing the greenbelt area by planting more plants, lawns, bushes etc.
- Industry is maintaining good housekeeping, mitigating fugitive emissions, reducing spills of raw material by taking all possible measures.
- Recovering of solvents from the effluents in stripper thereby reducing the organic vapours entry into the atmosphere and effective biological treatment.
- Rainwater harvesting by collecting complete run off in an open pond for recharging of ground water as well as for reuse.
- Captive power generation of 6.1 MW in connection to the existing 45 TPH Boiler.
-

CONCLUSION

Hetero Infrastructure SEZ limited is taking all possible measures for the abatement of pollution and certain steps are in consideration for workplace improvement and cost reduction. The following are the pollution abatement measures taken by the industry:

Taking all steps required to assure low emission levels, without any prejudice to the quantum of production.

1. Utilization of domestic wastewater discharges for development of greenery after treating in Sewage Treatment Plants.
2. Giving due importance to the greenery and ultimately taken care in abating the pollution.
3. Rainwater harvesting by way of collecting rainwater in a pond created by the industry
4. Online instruments for monitoring the pollution levels in and around factory premises.
5. Operating Effluent Treatment Plant (Common) for bringing the pollution levels well within the norms of the Board.
6. Regular monitoring of air, water, effluent and Ground water by third party once in a month to keep watch on the pollution levels.

****

SV ENVIRO LABS & CONSULTANTS Environmental
Engineers & Consultants in Pollution Control
Enviro House,B-1, Block - B, IDA
Autonagar, Visakhapatnam
Phone: 9440338628
Email:info@svenvirolabs.com
(Recognized by GOI, Ministry of Environment & Forests)
(An ISO 9001 Certified and NABET Accredited for EIA)

Ref Code : SVELC/HISEZL/22-09/001 **Date : 08-10-2022**

Name and Address : **M/s. HETERO INFRASTRUCTURE SEZ LIMITED,**
N.Narasapuram Village, Nakkapally Mandal,
Visakhapatnam (Dt).

Sample Particulars : Effluent Analysis
Source of Collection : ETP OUTLET
Sample Code : SVELC/22/EFF/1191
Date of Collection : 29-09-2022
Date of Receipt : 29-09-2022

TEST REPORT

S No	Parameter	Unit	Result	Method	Standard
1	pH	-	7.63	APHA 4500-H+B, 23rd Ed,2017	5.5-9.0
2	Suspended Solids, SS	mg/l	21.0	APHA 2540-D, 23rd Ed,2017	100
3	Total Dissolved Solids, TDS	mg/l	1649	APHA,2540-C,23rd Ed, 2017	-
4	Chemical Oxygen Demand(COD)	mg/l	183	APHA 5220-B, 23rd Ed,2017	250
5	BOD 3d 27°C	mg/l	64.0	IS 3025 Part 44	100
6	Chlorides as Cl	mg/l	401	APHA,4500-Cl B,23rd Ed, 2017	1000
7	Oil & Grease	mg/l	2.3	APHA,5520-D,5-38,23rd Ed, 2017	10
8	Sulphide as S	mg/l	0.25	APHA,4500S^2 D, 23rd Ed,2017	2.0
9	Phenolic compounds (C_6H_5OH)	mg/l	0.04	APHA,5530-C, 23rd Ed,2017	1.0
10	Cyanide as CN	mg/l	BDL	APHA,4500-CN- E , 23rd Ed,2017	0.2
11	Hexavalent chromium as Cr^{+6}	mg/l	BDL	APHA,3500-Cr B , 23rd Ed,2017	0.1
12	Lead as Pb	mg/l	BDL	APHA,3120-B , 23rd Ed,2017	0.1

Note: BDL denotes Below Detectable Level

ANALYZED BY

SV ENVIRO LABS & CONSULTANTS

SV ENVIRO LABS & CONSULTANTS

Environmental Engineers & Consultants in Pollution Control

Enviro House,B-1, Block - B, IDA
Autonagar,Visakhapatnam
Phone: 9440338628
Email:info@svenvirolabs.com
(Recognized by GOI, Ministry of Environment & Forests)
(An ISO 9001 Certified and NABET Accredited for EIA)

Ref Code	: SVELC/HISEZL3/22-09/002	**Date : 08-10-2022**
Name and Address	: **M/s. HETERO INFRASTRUCTURE SEZ LIMITED,** N. Narasapuram Village, Nakkapally Mandal, Visakhapatnam (Dt).	
Sample Particulars	: Stack Monitoring	
Source of Collection	: 45 TPH Boiler Chimney	
Sample Code	: SVELC/22/SE/1192	
Date and Time of Start	: 28-09-2022 11:15 hr	
Duration of Sampling	: 60 MINS	

TEST REPORT

STACK DETAILS

S.No	Description	Unit	Result
1	Pitot Coefficient	-	0.87
2	Specific Gravity of Fluid	-	1.0
3	Temperature @ DGM	°C	32
4	Stack Temperature	°C	134
5	Nozzle Diameter	mm	10
6	Exit Velocity	m/sec	6.82
7	Duration of Sampling	minutes	60
8	Fuel Used	-	Coal

EMISSION DATA

S.No	Parameter	Unit	Result	Method	Standard
1	Particulate Matter – PM	mg/nm^3	51.2	IS:11255 – P-1	115
2	Sulphur Dioxide – SO_2	mg/nm^3	55.6	IS:11255 – P-2	-
3	Oxides of Nitrogen – NO_x	mg/nm^3	43.1	IS:11255 – P-7	-

ANALYZED BY

SV ENVIRO LABS & CONSULTANTS

CFE AGENDA ITEM No.
Dt: 06.09.2018
OCMMS application

01)	**Name of the Industry & Location address with Sy. Nos.**	**:**	**M/s. Hetero Infrastructure SEZ Ltd., Sy.Nos: 215, 286/1, 286/2, 283/1 in Ch. Lamxipuram village, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajayyapeta village, 19(part) in PedaTeenarla village, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N. Narasapuram (V) Nakkapalli (M), Visakhapatnam District.** **Applied for 6.1 MW Power Plant.**
	Longitude and Latitude	**:**	82^0 43'36.51" E & 17^0 22' 37.63" E
02)	**EC status**	**:**	1. EC order dt. 25.10.2010 for SEZ. 2. EC order dt. 13.10.2017 for extension of validity period of EC. 3. EC amendment order dt. 15.06.2018 issued by MoEF&CC, GoI, for installation of Turbine for 6.1 MW.
03)	**Project cost**	**:**	No additional investment.
04)	**Project site details:**	**:**	
	i) Total area of the land	:	342 Acres (120 Ha)
	ii) Built up area	:	200 Acres
	iii) Greenery	:	125 Acres
	iv) Nearest Human habitation	:	1. Butchirajupeta (V) is existing at a distance of 0.8 km away from the site in South-West direction. 2. Ch. Lakshmi Puram (H) is at a distance of 0.15 km away from the site in Northern direction. 3. Ayyanna Palem (H) is existing at a distance of 0.5 km away from the site.
	v) Nearby water body	:	Upputeru (Salt lake) is adjacent to the industry in Southern direction.
	vi) **Surroundings of the site**	:	
	North	:	Dry agricultural lands
	South	:	Open lands followed by Upputeru (Salt lake)
	East	:	Dry agricultural lands
	West	:	Nakkapalli to Rajaiahpeta road via Upamaka
	vii) **Road details**	:	Rajayyapeta & Upmaka Road is adjacent in western direction.

5) Activity: SEZ Infrastructure facility. **Expansion –** Installation of turbine to generate 6.1 MW power.

S. No	Activity	As per EC dated 25.10.2010 & 13.10.2017	As per CFE Order dated 13.12.2010	As per CFO order dated 11.12.2017
1.	Providing common infrastructure facilities for Bulk drug manufacturing units in SEZ	To establish 17 plots (including 4 No. of plots for which EC already obtained) for providing common infrastructure facilities for SEZ units.	To establish 17 No. of plots for providing common infrastructure facilities for SEZ units.	To operate 4 No. of manufacturing units with utilities in SEZ (i.e., M/s. Hetero Drugs Ltd., Unit – IX, Plot No.1, M/s. hetero Labs Ltd., Unit – IX, Plot No.2 & 3, M/s. Honour Labs Ltd., Unit – III), Plot No. – 4 & M/s. Hetero Labs Ltd., Unit - III.

Proposed:

S. No	Activity proposed for CFE	As per EC amendment dt. 15.06.2018
1.	Installation of turbine to generate 6.1 MW Power utilizing steam from existing 45 TPH Coal fired boiler in the existing SEZ.	Installation of turbine to generate 6.1 MW Power utilizing steam from existing 45 TPH Coal fired boiler in the existing SEZ.

06) Water consumption.

Source of Water supply **:** YLBC canal

S. No.	Purpose	As per EC dated 25.10.10	As per EC dated 15.06.2018	As per CFE dated 13.12.10	Proposed quantity*
1.	Process & Washing	1644.00	Nil	767.00	837.00
2.	Boiler feed			290.00	330.00
3.	Cooling Tower			390.00	250.00
4.	Domestic			105.00	120.00
5.	Raw water RO makeup			122.00	107.00
	Total	**1644.00**	**Nil**	**1674.00**	**1644.00**

07) Waste Water Generation:

S. No	Source	As per EC dt. 25.10.10	As per EC dt. 15.06.2018	As per CFE dt. 13.12.10	Proposed quantity
	HTDS	**Quantity in KLD**			
1	Process & Washings	1040.60	Nil	767.00	837.00
	LTDS				
2	Cooling Towers Blow down			162.00	100.00
3	Boiler blow down			112.00	64.00
4	Domestic (Recycled)	90.00		90.00	100.00
5	Raw water RO Rejects			---	30.00
	TOTAL	**1130.60**	**Nil**	**1131.00**	**1131.00**

*The industry has submitted revised water consumption and waste water generation on 23.08.2018.

As per the EC dated25.10.2010, the industry's permitted wastewater generation is 1130.60 KLD, the industry has applied for 1131.0 KLD. **Hence, water consumption may be restricted to 1130.60 KLD.**

The industry is segregating the effluents into 2 streams

HTDS & HCOD i.e., TDS > 15,000 mg/l & COD > 15,000 mg/l and
LTDS & HCOD i.e., TDS < 15,000 mg/l & COD > 15,000 mg/l.

ETP Details & Mode of Disposal (Existing):

Source of effluent	Treatment	Mode of final disposal
HTDS effluents: Process effluents, washings & scrubber	The individual units segregating the effluents into HTDS & LTDS and sending effluents through closed conveyance to M/s. Hetero Infrastructure SEZ Ltd., and same was stored in Equalization tank of 650 KL X 4 Nos. After neutralization, the industry is sending the effluent to Stripper – 3 Nos – 300 KL each , MEE - 500 KLD (300 KLD + 200 KLD) and ATFD 40 KLD.	Stripper condensate sent to SRS for further distillation, MEE condensate and ATFD Condensate being sent to biological ETP.
LTDS effluents: Cooling tower blowdown, Boiler blowdown	M/s. Hetero Complex had established 550 KLD ETP to treat the effluent The ETP consists of: (450 KLD + 100 KLD) Screen chamber, Oil & Grit chamber, Flash mixer, Equalization tank (2 Nos.), Flocculation, Primary Tube Deck, Clarifier 4 Nos. (Primary, Secondary & Tertiary), Bio tower, Aeration (primary & secondary), Sludge thickener / filter press, Intermediate Storage tanks for treated effluent, Pressure sand filter, Activated Carbon filter, Guard Ponds (5 Nos.) – 960 KL X 2Nos, 1000 KL X 1, 1200 KL X 2.	After treatment, the treated wastewater is being disposed into Sea through marine outfall.
Raw water RO rejects	Collection Tank	Pump into Guard Ponds and disposed into Sea through marine outfall
Domestic – (4 Units) + 100 KL from Hostel	STP – 300 KL – consisting of Bar screen & Grit chamber, Equalization tank, Aeration tank, Tube deck settling tank, Chlorination tank, Intermediate water sump, Pressure Sand Filter, Activated carbon filter, Sludge drying beds.	Used for Green belt within the premises.

ETP Details & Mode of Disposal: **:** No additional changes in the existing ETP

08) Hazardous / Solid Waste details:

The cumulative solid waste generation of all streams from all the member units of SEZ shall not exceed 96 TPD as per EC dated 25.10.2010. The Developer of SEZ shall comply with the following:

Sl. No.	Details of waste	Mode of Disposal
1.	Process Solid Waste	To landfill of TSDF, Parawada, Visakhapatnam
2.	Solvent Residue	Shall be incinerated / sent to cement industries for co-incineration.
3.	ETP Sludge	To landfill of TSDF, Parawada, Visakhapatnam
4.	Multiple Effect Evaporation OR Forced Evaporation & Incinerable Ash	To landfill of TSDF, Parawada, Visakhapatnam
5.	Used Oils	To re-processing units authorized by APPCB
6.	Used batteries	Shall be sent back to the suppliers
7.	Spent carbon	Shall be incinerated / sent to cement industries for co-incineration.
8.	Coal ash from boilers	To brick manufacturing units.

Proposed:

Sl. No.	Details of waste	Quantity	Mode of Disposal
1.	Organic Residue	25.00 TPD	To be sent to the Cement industries for usage as alternate fuel/Co-processing in the kiln or TSDF, Parwada, Visakhapatnam Dist. for incineration
2.	Solvent Residue		
3.	Spent Carbon	5.50 TPD	
4.	Process Waste Inorganic	3.408 TPD	To be sent for Land filling at TSDF, Parwada, Visakhapatnam or to be sent to cement industries along with Organic waste for Co-processing.
5.	MEE Salt	26.01 TPD	
6.	ETP Sludge	1.4 TPD	
	Total	**61.318**	
7.	Empty Drums/ Containers/ Liners Contaminated with Hazardous chemicals waste	2600 No's/ Month	Shall be sent to outside Agencies after complete Detoxification.
8.	Used/Waste oils	1500 LPM	Shall be sent for Re-processing units authorized by APPCB
9.	Spent Solvents	420.59 KLD	Shall be recycled within the units of Hetero Infrastructure SEZ Ltd or sent to APPC Authorized Recyclers
10.	Recovered Solvents	116.81 KLD	Shall be recycled within the units of Hetero Infrastructure SEZ Ltd or sold to outside Parties.
	Non – hazardous wastes		
11.	Used Batteries	100 No/ Year	Shall be sent to Manufacturers or Dealers on buy back basis
12.	Coal Ash	31.5 TPD	Shall be sent to Brick manufacturing units.

09) Air pollution:

As per CFE order dt. 13.12.2010, the industry permitted to install 4 X 25 TPH, 2 X 10 TPH and 2 X 6 TPH Coal fired Boilers, 1 X 300 KG/hr incinerator and 5 X 1000 KVA, 1 X 500 KVA, 3 X 320 KVA & 16 X 200 KVA, D.G. Sets.

As per CFO order dt. 11.12.2017, the industry has installed and operating the following:

Sl. No	Details of Stack	Stack 1	Stack 2	Stack 3	Stack 4	Stack 5	Stack 6
a)	Attached to	Coal fired boilers				Incinerator	DG Sets
b)	Capacity	1 x 45 TPH	1 x 10 TPH	2 x 6 TPH	1 x 20 TPH	300 Kg/hr (General solid waste)	2 X 1130 KVA & 1 X 360 KVA
c)	Fuel	Coal				Liquid	Diesel
d)	Stack height	53 m	30 m	30 m	35 m	30 m	10 m
f)	Details of Air Pollution Control Equipment	ESP	Bag filters	Bag filters	Bag filters	MDC & Scrubber	Acoustic enclosures

Proposed:

S. NO	Details of Stack	Stack-1	Stack-2	Stack-3	Stack-4	Stack -5	Others
1	Attached to	Boiler	Boiler	Boiler	Boiler	Incinerator	DG Sets
2	Capacity	45 TPH x 2	20 TPH x 1	12 TPH x 1	10 TPH x 1	500 Kg/hour (General Solid waste)	2 x 2020 KVA + 2 x 1000 KVA + 1 x 500 KVA + 2 x 320 KVA
3	Fuel	Coal	Coal	Coal	Coal	HSD	HSD
4	Fuel Quantity	250 TPD	120 TPD	60 TPD	50 TPD	20 LPD	200 x 5 LPH

5	Stack Height	50 m	35 m	30 m	30 m	30 m	As per CPCB Guidelines
6	Control Equipment	ESP – 2 Nos.	Bag Filter	Bag Filter	Bag Filter	Dust Collector followed by Scrubber	Acoustic Enclosures

10) Compliance status of conditions stipulated in Schedule B of CFO order 11.12.2017:

<table>
<tr><th>Sl. No</th><th>Condition</th><th>Compliance</th></tr>
<tr><td>1.</td><td>The treated effluent discharged from CETP into Guard ponds and at marine outfall shall not contain constituents in excess of the tolerance limits mentioned below.
<table>
<tr><th>Outlet No</th><th>Parameter</th><th>Limiting standards</th></tr>
<tr><td rowspan="8">2</td><td>PH</td><td>5.5 to 9.0</td></tr>
<tr><td>COD</td><td>250</td></tr>
<tr><td>BOD(5days at 20^0C)</td><td>100</td></tr>
<tr><td>Temperature at the point of discharge</td><td>45^0</td></tr>
<tr><td>Oil and Grease</td><td>20</td></tr>
<tr><td>Suspended Solids</td><td>100</td></tr>
<tr><td>Total residual chlorine</td><td>1.0</td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="3"></td><td>Ammonical Nitrogen</td><td>50</td></tr>
<tr><td>Arsenic</td><td>0.2</td></tr>
<tr><td>Mercury</td><td>0.01</td></tr>
<tr><td rowspan="5"></td><td>Lead</td><td>1.0</td></tr>
<tr><td>Cadmium</td><td>2.0</td></tr>
<tr><td>Total chromium</td><td>2.0</td></tr>
<tr><td>Copper</td><td>3.0</td></tr>
<tr><td>Zinc</td><td>15</td></tr>
<tr><td rowspan="6"></td><td>Selenium</td><td>0.05</td></tr>
<tr><td>Nickel</td><td>5.0</td></tr>
<tr><td>Cyanide</td><td>0.2</td></tr>
<tr><td>Fluoride</td><td>15</td></tr>
<tr><td>Sulphide</td><td>5.0</td></tr>
<tr><td>Phenolic compounds</td><td>5.0</td></tr>
<tr><td>Bio-assay test</td><td>90% survival of fish after 96 hours in 100% effluents.</td></tr>
<tr><td colspan="3">*
All Efforts shall be made to remove colour and unpleasant odour as far as possible.
The TDS of the treated effluents discharges from CETP at marine outfall shall not be more than the TDS of sea.</td></tr>
</table></td><td>APPCB is permitting the discharge of wastewater through Marine outfall after meeting the standards.

The marine discharge is permitted under the supervision of APPCB officials.

As per the Guard pond data, M/s. Hetero Infrastructure is not met the standards 2 times (in the month April 2018 – COD 304 mg/l & July, 2018 – pH – 10.72) during the period from February, 2018 to July, 2018.</td></tr>
<tr><td>5.</td><td>The industry shall comply with emission limits for DG sets of capacity up to 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 800KW 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.</td><td>The industry has installed 2 X 1130 KVA & 1 X 360 KVA and proposed to install 2 x 2020 KVA, 2 x 1000 KVA, 1 x 500 KVA, 2 x 320 KVA DG sets in the expansion.</td></tr>
</table>

9.	M/s. Hetero Infrastructure shall not operate the captive power till they obtain EC/CFE/CFO of the Board.	Not complied. The industry has obtained EC vide order dated 15.06.2018 for captive power plant of M/s Hetero Infrastructure SEZ Ltd., and applied for CFE of the Board.
13.	Industry shall maintain Bio-Assay facility individually for each of the guard ponds with proper lined and leak proof constructions and submit reports every month to the RO, Visakhapatnam.	The industry is carrying out Bio assay test on lab scale. The industry has provided common bio assay test provision for all guard ponds. Reports not submitted on monthly basis.
24.	The recommendations of the NIO for maintenance of diffuser system and monitoring of aquatic life in the sea shall be done periodically by engaging the NIO for every three months. The consolidated trend analysis report of the marine aquatic life shall be submitted to the RO, VSP & ZO, VSP every three months.	NIO has conducted Post project marine in the Year 2017 and the report is yet to be received. Earlier, NIO has conducted Post monitoring and the same was submitted to the Board in the year 2015.

11) Compliance status of directions stipulated in Task Force order dt. 23.07.2016:

Sl. No.	Condition	Compliance
1.	The SEZ shall not operate power plant of capacity 6.1 MW till they obtain EC from MoEF & CC and CFE/CFO of the Board.	Not complied. The industry has obtained EC vide order dated 15.06.2018 for installation of Turbine to generate 6.1 MW Power and applied for CFE of the Board.
2.	The SEZ shall pursue all the units located in SEZ area and non-SEZ area to produce only consented products with consented capacities.	The facility informed that they will comply.
3.	The SEZ shall obtain CFE/CFO amendment for boiler configuration with 45 TPH boiler.	The industry has obtained CFE for install 132 TPH (4 X 25 T, 2 X 10 T and 2 X 6 T Boilers) capacity and also obtained CFO for 45 TPH Boiler. Hence the condition may not be applicable.
4.	The SEZ shall approach to MoEF regarding discrepancy of availability of land for all the units issued Environmental Clearance (EC)	The industry informed that the file is pending with Govt of A.P.
5.	The SEZ shall provide digital flow meter for LTDS effluent at the inlet of ETP within 1 month.	The industry has provided digital flow meters.
6.	The SEZ shall construct leachate collection system followed by dyke walls for newly constructed hazardous waste storage shed within 30 days.	The industry has constructed leachate collection sump with dyke wall for new hazardous waste shed.
7.	The SEZ shall obtain the CFO amendment for all the effluents generating from the SEZ and non-SEZ units immediately.	The industry has obtained CFO for all the effluents generating from the SEZ and non-SEZ units.
8.	The SEZ shall operate Bio Assay test facility continuously.	The industry is carrying out Bio assay test on lab scale.
9.	The SEZ shall obtain public liability insurance policy for Hetero Infrastructure SEZ ltd within one week.	The industry has obtained PLI Policy for a period up to 10.11.2018 which includes ERF.
10.	The SEZ shall cover remaining 2 equalization tanks with FRP hoods and the vents are to be connected to scrubbers to control odour nuisance within 3 months.	The industry has provided hoods on the top of 4 Nos. of equalization tanks.
11.	The SEZ shall install VOC analyzer immediately at CETP area within 1 month.	The industry has installed portable VOC meter.
12.	The SEZ shall connect remaining 2 CAAQM stations to Board website immediately.	Out of 3 CAAQM stations, 2 stations were connected to APPCB.
13.	The SEZ shall ensure continuous compliance of CFO & HW Authorization conditions issued by the Board vide order dL16.02.2015.	Reported above.

12) Remarks of the Inspection Officer:

M/s. Hetero is engaged in manufacturing of Bulk Drugs located at Nakkapalli, Visakhapatnam District. M/s. Hetero is operating SEZ & Non-SEZ Areas.

The following individual industries within M/s. Hetero Complex, Nakkapalli, Visakhapatnam District were operating.

I. SEZ

1. M/s. Hetero Drugs Ltd., (Unit – IX), Plot No.1 of SEZ
2. M/s. Hetero Labs Ltd.,(Unit – IX), Plot No.2, 3 & 6 of SEZ
3. M/s. Honour Labs Ltd., Ltd.,(Unit – III), Plot No.4 & 5 of SEZ

II. Non-SEZ:

M/s. Hetero Labs Ltd.,(Unit – III), Non – SEZ

III. Infrastructure :

M/s. Hetero Infrastructure SEZ Ltd., Plot No.7, 8 & 9 (Common facilites)

M/s. Hetero Infrastructure:

1. Hetero Infrastructure, SEZ has obtained E.C & CRZ Clearance vide order dt. 25.10.2010 for the development of SEZ for pharmaceutical and Chemical manufacturing units on a total plot area is 138.51 ha and proposed to develop 17 plots, which include 4 plots for which EC was already issued earlier.

2. M/s. Hetero Infrastructure SEZ Ltd., has obtained Consent for Establishment vide Order No. 219/PCB/CFE/RO-VSP/ho/2010 – 2355 dated 13.12.2010 to establish 17 no. of plots for subsequent industrial development and provide Common infrastructure like roads, lighting, weighbridge, raw materials storage facility, bulk solvent storage, utilities like boiler, DG sets, chilling plants, cooling tower, fire station, water storage and supply, health centre, industrial canteen and pollution control facilities including effluent treatment plant, sewage treatment plant, incinerator and marine outfall for disposal of treated effluents for SEZ Units in an area of 342 Acres (138.51 Hectares).

3. Out of 17 Nos. of plots, 6 plots were occupied by manufacturing units viz., M/s. Hetero Drugs Ltd., Unit IX , M/s. Hetero Labs Ltd., Unit – IX, M/s. Honour Labs – Unit – III and 3 plots were occupied by M/s. Hetero Infra common facilities.

4. The industry has obtained extension of validity of EC & CRZ Clearance vide Order No.21 – 641/2007 – IA.III dated 13.10.2017 for a period up to 24.10.2020. In the CFO order, the industry was permitted to treat the effluents from both SEZ and Non-SEZ units.

5. **M/s. Hetero Infrastructure SEZ Ltd., obtained Renewal of Consent for Operation vide order dated 11.12.2017 valid for a period up to 31.12.2022.**

6. The industry also obtained amendment of Environmental Clearance vide Order No.21 – 641/2007 – IA.III dated 15.06.2018 for installation of turbine to generate 6.1 MW Power utilizing steam from existing 45 TPH Coal fired boiler in the existing SEZ and all other conditions stipulated in the Environmental Clearance letter No. 21-641/2007-1A.III dated 25th October, 2010, shall be unchanged..

7. Now, M/s. Hetero Infrastructure SEZ Ltd., has proposed for 6.1 MW Co - Gen Power Plant and applied for Consent for establishment of the Board.

8. Earlier, the industry has applied CFE (Expansion) for generation of 6.1 MW Co - Gen Power Plant and the verification report was submitted to Board Office on 19.09.2015. The Board vide letter dated 30.10.2015, communicated the decision of CFE committee stating that:

   i. The industry obtained EC vide order dated 25.10.2010 for the development of SEZ for Pharmaceutical and chemical manufacturing units.
   ii. The proposal is only for generating 6.1 MW Power by installation of turbine to the existing boiler and by installing DG Sets.

iii. As per the recent MoEF&CC Notification dated 06.07.2015, power plant with capacity more than 5.0 MW requires EC. The proposed capacity of power plant is 6.1 MW. Hence, the industry is required to take EC for the proposed Power Plant.

9. The industry already installed and operating turbine and generating power by using existing 45 TPH Boiler.

10. In the EC Order dated 25.10.2010 and CFE Order dated 13.12.2010 wherein the following Sy. Nos were mentioned

    a. Sy.Nos: 215, 286/1, 286/2, 283/1 in Ch. Lamxipuram village, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajayyapeta village, 19(part) in PedaTeenarla village, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 215, N. Narasapuram (V) Nakkapalli (M), Visakhapatnam Dist.

11. In the EC extension order dated 13.10.2017 and amendment Order 15.06.2018, the Sy. No. 215 of N. Narsapuram was mentioned as 512.

Manufacturing Units:

12. All the manufacturing units except Honour Labs segregating the effluents into HTDS and LTDS effluents.

13. The industries located in SEZ & NON-SEZ units are utilizing common facilities of Boiler, stripper, Effluent Treatment Plant, Sewage Treatment Plant, Multiple Effect Evaporator, and Hazardous waste storages located at Hetero Infrastructure SEZ Ltd.,

14. All manufacturing units are sending effluents to M/s. Hetero Infrastructure through pipeline conveyance.

15. All manufacturing units have installed scrubbers to control process emissions. The industries are transferring major solvents through closed conveyance, provided primary & secondary condensers to process reactors and provided nitrogen blanketing to Bulk solvent storage tanks.

16. All SEZ units are sending spent solvents to solvent recovery unit located in the premises of M/s. Hetero infrastructure SEZ Ltd. and M/s. Hetero Labs Ltd., Unit – III, is having separate Solvent recovery system in Non - SEZ area.

17. The individual units are sending hazardous waste to Hetero Infrastructure for storage and final disposal.

Infrastructure:

18. As per the EC Order the source of water was mentioned as YLBC Canal and Desalination of Sea water. The industry informed that the YLBC canal was recorded due to the typographical error.

19. As per the CFE Order dt 13.12.2010, the source of water was YLBC Canal.

20. As per the CFE expansion application, the source of water is Sea water. It was observed that from starting of the industry, the industry is drawing water from Sea.

21. M/s. Hetero infrastructure is operating desalination plant of 2000 Kl/day capacity and drawing water from desalination plant for raw water requirement for all the units.

22. M/s. Hetero Infrastructure is operating coal fired boilers of 45 TPH, 20 TPH, 12 TPH and 10 TPH provided with ESP for 45 TPH boiler and Bag filters for remaining boilers as air pollution control measures. **Now, the industry has proposed 1 X 45 TPH coal fired boiler in addition to the existing boilers.**

23. M/s. Hetero is having detoxification facility at M/s. Hetero Infrastructure SEZ and developed separate common drum yard with concrete platform and leachate facility. After detoxification, the drums are sold out.

Sl. No.	Name of the Waste	Generated Quantity		Disposal Quantity	Permitted Quantity		
		Quantity in TPD					
		SEZ	Non-SEZ		SEZ	Non-SEZ	
1.	Spent Carbon	1.09	0.53	1.67	2.076	2.036	Cement industries
2.	Organic Residue	1.67	0.95	2.67	9.711	12.793	
3.	Process Inorganic Waste	0.15	0.12	0.26	2.719	2.479	TSDF Parawada, Visakhapatnam
4.	MEE Salts	4.17	---	4.27	3.992	9.264	
5.	ETP Sludge	0.14	---	0.13	---	0.2	
6.	Incineration Ash	0.09	---	0.06	---	---	

As per the Hazardous waste generation details the generation quantities are below the permitted quantities.

24. M/s. Hetero has installed and operating 300 KL each 3 Nos of strippers, 500 KLD (300 KLD + 200 KLD) of MEE & ATFD – 40 KLD to treat the HTDS effluents and 550 KLD biological ETP to treat the LTDS effluents

25. The industry is operating ETP with Oil & Grease trap, Equalization tanks – 4 Nos., Flash mixture, Primary clarifier, Stripper followed by MEE, Agitated Thin Film Drier (ATFD), Bio tower, Aeration tank I, Clarifier 1 & 2 Aeration tank – 2, Clarifier 3 & 4, sand and granular activated carbon filter for treating the process effluents followed by Guard ponds.

26. M/s. Hetero Infrastructure is operating STP of 300 KL/day. After treatment, the treated wastewater is being utilized for greenbelt development within the Hetero Complex. Hetero Infrastructure is also receiving the domestic waste water of 100 KLD for the Hostel located outside the SEZ.

27. M/s. Hetero Infrastructure SEZ Ltd., has installed Continuous Effluent Monitoring system with parameters pH, TSS, TOC, COD, BOD & flow and data connected to the CPCB & APPCB website.

28. Hetero Labs, Unit – IX, SEZ, Hetero Drugs, Unit – IX, SEZ and Hetero Labs Unit – III, Non SEZ have installed flow meters and web camera and data connected to CPCB. The 3 units not connected APPCB.

29. M/s. Honour Labs has installed flow meter but not installed web camera. The above 4 units not connected CPCB and APPCB.

30. The facility has installed 3 Nos. of CAAQM stations, 2 Nos. of continuous stack monitoring with 3 nos. of VOC analyzers. Out of 3 CAAQM stations, the industry has connected 2 CAAQM stations to APPCB server.

31. M/s. Hetero is operating marine outfall facility and it is being monitored by the Board's officials regularly. M/s. Hetero is discharging the treated wastewater through marine outfall only after meeting the Board standards. As per the Guard pond data, M/s. Hetero Infrastructure is not met the standards 2 times (in the month April 2018 – COD 304 mg/l & July, 2018 – pH – 10.72) during the period from February, 2018 to July, 2018.

32. As per the details, the industry has disposed the following waste during the period from February, 2018 to July, 2018.
33. The industry is treating HTDS effluents in stripper, MEE & ATFD. The MEE condensate sent to Biological ETP. The LTDS effluents (waste water from utilities) and MEE condensate are treated in Biological ETP and treated water stored in Guard ponds. The industry also pumping the Raw water RO rejects directly in to the Guard ponds and finally discharge into sea through marine out fall in the presence of Board Officials.

In view of the above, Issue of CFE for Expansion for power generation of 6.1 MW by installation of turbine may be considered.

a. The industry shall connect 3rd CAAQM station to APPCB.

b. The industry shall install meter to measure boiler blow down water.
c. The industry shall install flow meters and web camera at M/s Honour Labs, Unit – III as per CPCB protocol and connected to CPCB & APPCB.
d. The 3 Nos of manufacturing units shall connect the flow meters and web camera to APPCB immediately.
e. The industry shall comply the Taskforce directions issued to manufacturing units and Hetero Infra time to time
f. The industry shall update the information in OCEMS - Industry Information Data Entry Software for Compliance Reporting Protocol in PART-II (Sections F & G) Every Quarter on 1st January, 1st April, 1st July and 1st October through this software system.
g. The industry shall submit the information regarding usage of Ozone Depleting Substance once in six months to the Board.

Industry's request for increasing Waste Water:

The industry vide letter dt. 23.07.2018, informed that as per the Environmental Clearances of M/s Hetero Labs Ltd, Unit-III, Non - SEZ dt 10.09.2012 and M/s Hetero Drugs Ltd, Unit-VI, Non - SEZ dt 10.09.2012 they have permitted to treat the effluent generated from both Non SEZ units in CETP of M/s Hetero Infrastructure SEZ Ltd in addition to the effluents generated from the units of SEZ.

Accordingly the industry has obtained CFO from the APPCB on 11.12.2017 for treating the effluents from Both SEZ and Non – SEZ units.

Now the industry requested the Board to amend the CFE for increase of waste water quantity of 2456.6 KLD for SEZ units and Non – SEZ.

Unit	**EC No.**	**Effluent Generation** (m3/Day)
Hetero Labs Limited Unit-III(Non-SEZ)	J-11011/396/2011-IA II (I)	676
Hetero Drugs Limited Unit-VI(Non-SEZ)	J-11011/398/2010-IA II (I)	650
Hetero Infrastructure SEZ Ltd.	21-641/2007-IA.III	1130.6
TOTAL EFFLUENT GENERATION		**2456.6**

RO remarks on the above request:

Back ground:

M/s Hetero is operating SEZ & Non-SEZ facilities for manufacturing Bulk Drugs at N. Narasapuram Village, Visakhapatnam District of Andhra Pradesh. At present three manufacturing facilities namely M/s Hetero Labs Ltd, Unit-IX, M/s Hetero Drugs Ltd, Unit-IX and M/s Honour Lab ltd, Unit-III are in operation in SEZ area. In addition to these units, all common facilities such as Desalination plant, Boilers, ETP, STP, Vermi Compost, Hazardous waste storage area and detoxification facility for used containers/carboys etc. are established in SEZ area.

Initially in 2006, M/s Hetero applied and got 04 ECs in non SEZ area in the following names:

- M/s Hetero Labs Ltd, Unit-III
- M/s Hetero Drugs Ltd, Unit-VI
- M/s Cirex Pharmaceutical Ltd, Unit-II
- M/s Symed Labs Ltd

M/s Hetero has developed Hetero Labs, Unit-III and Hetero Drugs Unit-VI as Non-SEZ units in an area of 140 Acres. Left M/s Cirex pharmaceuticals & M/s Symed Labs Ltd un-developed. Environmental Clearance was issued in the name of M/s Hetero Infrastructure SEZ Ltd for developing 17 industrial plots for Pharmaceuticals & Chemicals manufacturing in 138.51 hectares which includes 04 plots for which EC already earlier in 2006 in the name of M/s Cyrex Pharmaceuticals Ltd & M/s Symed Labs Ltd. While applying for SEZ, to meet the land requirement of SEZ Industry has clubbed the land of undeveloped M/s Cyrex& M/s Symed with M/s Hetero Infrastructure SEZ Ltd. Again in 2011, Hetero gone for fresh EC to increase the production Capacity of M/s Hetero Labs Ltd, Unit-III and M/s Hetero Drugs Ltd, Unit-VI.

The details of ECs are as below:

I.M/s Hetero Labs Ltd, Unit-III

- EC NO: J-11011/252/2006-IA.II(A) Dated 25.09.2006
- EC NO: J-11011/396/2011-IA.II(I) Dated 10.09.2012

II. M/s Hetero Drugs Ltd, Unit-VI

- EC NO: J-11011/253/2006-IA.II(A) Dated 22.09.2006
- EC NO: J-11011/398/2010-IA.II(I) Dated 10.09.2012

III. M/s Hetero Infrastructure SEZ Ltd

- EC No: 21-641/2007-IA-III dated 25.10.2010

IV. M/s Cirex Pharmaceuticals Ltd, Unit-II (Not in Force & merged with M/s Hetero Infrastructure SEZ Ltd)

- EC NO: J-11011/257/2006-IA.II(I) dated 31.10.2006

V. M/s Symed Labs Ltd (Not in Force & merged with M/s Hetero Infrastructure SEZ Ltd)

- EC No: J-11011/256/2006-IA.II(I) dated 17.10.2006

HETERO LABS LIMITED UNIT-III			
EC No.	**Production Capacity** (TPM)	**Water Consumption** (m3/Day)	**Effluent Generation** (m3/Day)
J-11011/252/2006-IA II (I)	60	237*	Not Mentioned
J-11011/396/2011-IA II (I)	500	958	676

* As per the EC Expansion Order dt 10.09.2012, the permitted water consumption was issued as 247.99 KLD and Waste water issued for 182.48 KLD for existing project.

HETERO DRUGS LIMITED UNIT-VI			
EC No.	**Production Capacity** (TPM)	**Water Consumption** (m3/Day)	**Effluent Generation** (m3/Day)
J-11011/253/2006-IA II (I)	60	238**	182.48 **
J-11011/398/2010-IA II (I)	450	935	650

** As per the EC Expansion Order dt 10.09.2012, the permitted water consumption was issued as 241.0 KLD and Waste water issued for 182.48 KLD for existing project.

Total Effluent Generation after Expansion to be treated in Hetero Infrastructure SEZ Ltd.

Unit	**EC No.**	**Effluent Generation** (m3/Day)
Hetero Labs Limited Unit-III	J-11011/396/2011-IA II (I)	676
Hetero Drugs Limited Unit-VI	J-11011/398/2010-IA II (I)	650
Hetero Infrastructure SEZ Ltd.	21-641/2007-IA.III	1130.6
TOTAL EFFLUENT GENERATION		**2456.6**

EC Status of Hetero Infrastructure, SEZ

Hetero Infrastructure, SEZ has obtained E.C vide order dt. 25.10.2010 and permitted production quantity was not mentioned. The following points mentioned in the order.

1. It is, interalia, noted that the project involves the development of SEZ for pharmaceutical and Chemical manufacturing units on a total plot area is 138.51 ha. It is proposed to develop 17 plots, which include 4 plots for which EC was already issued earlier. All the units will be manufacturing bulk drugs (API) and chemicals (Life saving drugs). The total built-up area proposed is 1,12,942.50 Sq.Mtrs. The total water requirement is 1.644 MLD (source-YLBC Canal). The total effluent will be 1130.6 KLD (trade effluent – 1040.6 KLD and domestic

effluent – 90 KLD). The treated waste water to be used for boilers – 290 KLD, AC cooling – 424 KLD and washings – 175 KLD. Total solid waste generation will be 96 T/day. The power requirement is 10 MW. The total area proposed for parking is 19,200 sq.m. Total cost of the project is Rs. 126.00 Crores.

2. The proposed special Economic Zone (SEZ) is located outside the CRZ area. The industry proposed to utilize the existing effluent discharge pipeline of M/s. Hetero Drugs Limited for the discharge of treated effluent of SEZ into the sea near Dondawaka (V) near Rajaiahpet village, Nakkapalli Mandal, Visakhapatnam District. The estimated quantity of effluents is 1040 cu.m. per day ''

EC Status of Non- SEZ manufacturing unit:

The Hetero Labs Unit – III, Non SEZ area obtained EC Expansion vide order dt 10.09.2012 for enhancement of production quantity from 60 TPM to 500 TPM:

"Total fresh water requirement from desalination, plant will increase from 247.99 m^3/day to 958 m^3/day after expansion. Industrial effluent generation will be increased from182.48 m^3/day to 676 m^3/day after expansion. Industrial effluent will be segregated into High TDS/COD and Low TDS/COD effluent streams. High TDS/COD effluent stream will be treated through steam stripper followed by multiple effect evaporators (MEE) and agitated this film drier (ATFD). Low TDS/COD effluent stream will be treated in effluent treatment plant (ETP) comprising primary, secondary and tertiary treatment. The unit will have common effluent treatment facilities to treat the effluent generated from two units by name Hetero Labs Ltd., Unit- III and Hetero Drugs Ltd., Unit- VI in the neighboring SEZ owned by a group company. The treated effluent will be disposed off to marine outfall after confirming discharging standards through guard ponds".

The Hetero Drugs Unit – VI, Non SEZ area obtained EC Expansion vide order dt 10.09.2012 for enhancement of production quantity from 60 TPM to 450 TPM:

"Total fresh water requirement from desalination, plant will increased from 241 m^3/day to 935 m^3/day after expansion ,Industrial effluent generation will be increased from 182.48 m^3/day to 650 m^3/day after expansion. Industrial effluent will be segregated into High TDS/COD and Low TDS/COD effluent streams. High TDS/COD effluent stream will be treated through steam stripper followed by multiple effect evaporators (MEE) and agitated this film drier (ATFD). Low TDS/COD effluent stream will be treated in effluent treatment plant (ETP) comprising primary, secondary and tertiary treatment. The unit will have common effluent treatment facilities to treat the effluent generated from two units namely Hetero Labs Ltd., Unit- III and Hetero Drugs Ltd., Unit- VI in the neighboring SEZ owned by a group company. The treated effluent will be disposed off to marine outfall after confirming discharging standards through guard ponds".

Consolidated Water Consumption , waste water generation details:

Hetero Labs Limited Unit-III (Non-SEZ)

S. No.	Water Consumption		As per EC (KLD)		As per CFE (KLD)	
	Purpose		25.09.2006	10.09.2012 (Exp)	11.10.2013	
1	**Water consumption in**		237	**958**	**461**	
	1.	Process effluent	---	---	166.0	
	2.	Washings	---	---		
	3.	Boiler Blow down	---	---	54.0	
	4.	Cooling tower blow down	---	---	108.0	
	5.	RO Rejects	---	---	98.0	
	6.	Domestic	---	---	35.0	
2	**Wastewater generation**		---	**676**	**330**	
					HTDS	**LTDS**
	1.	Process effluents	---	---	166.0	---
	2.	Washing & utilities & Condensate	---	---		
	3.	Boiler blow down	---	---	---	20.0
	4.	Cooling tower blow down	---	---	---	16.0
	5.	RO Rejects	---	---	---	98.0
	6.	Domestic	---	---	---	30.0
		Total			**166.0**	**164.0**

Hetero Drugs Limited Unit-VI (Non-SEZ) (Merged into Hetero Labs Unit – III)

S. No.	Water Consumption Purpose		As per EC KLD 22.09.2006	As per EC KLD 10.09.2012 (Exp)	As per CFE KLD 11.10.2013	
1	**Water consumption in**		238	**935**	**308**	
	7.	Process effluent	---	---	95.0	
	8.	Washings	---	---		
	9.	Boiler Blow down	---	---	35.0	
	10.	Cooling tower blow down	---	---	53.0	
	11.	RO Rejects	---	---	90.0	
	12.	Domestic	---	---	35.0	
2	**Wastewater generation**		---	**650**	245.0	
					HTDS	**LTDS**
	7.	Process effluents	---	---	95.0	---
	8.	Washing & utilities & Condensate	---	---		
	9.	Boiler blow down	---	---	---	14.0
	10.	Cooling tower blow down	---	---	---	16.0
	11.	RO Rejects	---	---	---	90.0
	12.	Domestic	---	---	---	30.0
		Total			**95.0**	**150.0**

Hetero Infrastructure(SEZ):

S. No.	Water Consumption Purpose		As per EC KLD 25.10.2010	As per EC KLD 15.06.2018	As per CFE KLD 13.12.2010		As per CFO KLD 11.12.2017	
1	**Water consumption in**		1644	**No Change**	**1674**		**1315.15**	
	1.	Process effluent	---	---	767		645.15	
	2.	Washings	---	---				
	3.	Boiler Blow down	---	---	290		540	
	4.	Cooling tower blow down	---	---	390			
	5.	RO Rejects	---	---	122		---	
	6.	Domestic	---	---	105		130	
2	**Wastewater generation**		1130.6	**No Change**	**1131**		**66.0**	
					HTDS	**LTDS**	**HTDS**	**LTDS**
	1.	Process effluents	---	---	767	---	---	---
	2.	Washing & utilities & Condensate	---	---		---		
	3.	Boiler blow down	---	---	---	112	---	66.0
	4.	Cooling tower blow down	---	---	---	162	---	
	5.	RO Rejects	---	---	---	---	---	---
	6.	Domestic	---	---	---	90	---	---
		Total			**767**	**364**	**---**	**66.0**

HDL Unit-IX, Plot No.1 :

S. No.	Water Consumption		As per EC KLD		As per CFE KLD		As per CFO KLD	
	Purpose		25.10.2010	15.06.2018	13.12.2016		04.05.2017	
1	**Water consumption in**		1644	**No Change**	**177.79**		**177.79**	
	1.	Process effluent	---	---	62.79		62.79	
	2.	Washings	---	---				
	3.	Boiler Blow down	---	---	90.0		90.0	
	4.	Cooling tower blow down	---	---				
	5.	RO Rejects	---	---	---		---	
	6.	Domestic	---	---	25		25	
2	**Wastewater generation**		1130.6	**No Change**	**91.73**		**91.73**	
					HTDS	**LTDS**	**HTDS**	**LTDS**
	7.	Process effluents	---	---	62.73	---	62.73	---
	8.	Washing & utilities & Condensate	---	---		---		
	9.	Boiler blow down	---	---	---	4.0	---	4.0
	10.	Cooling tower blow down	---	---	---		---	
	11.	RO Rejects	---	---	---	---	---	---
	12.	Domestic	---	---	---	25.0	---	25.0
		Total			**62.73**	**29.0**	**62.73**	**29.0**

HLL Unit-IX, Plot No.2 :

S. No.	Water Consumption		As per EC KLD		As per CFE KLD		As per CFO KLD	
	Purpose		25.10.2010	15.06.2018	04.06.2013		27.02.2015	
1	**Water consumption in**		1644	**No Change**	**246.13**		**246.13**	
	1.	Process effluent	---	---	101.13		101.13	
	2.	Washings	---	---				
	3.	Boiler Blow down	---	---	120.0		120	
	4.	Cooling tower blow down	---	---				
	5.	RO Rejects	---	---	---		---	
	6.	Domestic	---	---	25		25	
2	**Wastewater generation**		1130.6	**No Change**	**130.13**		**130.13**	
					HTDS	**LTDS**	**HTDS**	**LTDS**
	7.	Process effluents	---	---	101.13	---	101.13	---
	8.	Washing & utilities & Condensate	---	---		---		
	9.	Boiler blow down	---	---	---	4.0	---	4.0
	10.	Cooling tower blow down	---	---	---		---	
	11.	RO Rejects	---	---	---	---	---	---
	12.	Domestic	---	---	---	25.0	---	25.0
		Total			**101.13**	**29.0**	**101.13**	**29.0**

Honour Labs – Unit – III, Plot No.4

S. No.	Water Consumption		As per EC KLD		As per CFE KLD		As per CFO KLD	
	Purpose		25.10.2010	15.06.2018	03.06.2017		23.08.2017	
1	**Water consumption in**		1644	**No Change**	**122.23**		**122.23**	
	1.	Process effluent	---	---	32.23		32.23	
	2.	Washings	---	---				
	3.	Boiler Blow down	---	---	80.0		80.0	
	4.	Cooling tower blow down	---	---				
	5.	RO Rejects	---	---	---		---	
	6.	Domestic	---	---	10		10	
2	**Wastewater generation**		1130.6	**No Change**	**46.228**		**46.228**	
					HTDS	**LTDS**	**HTDS**	**LTDS**
	7.	Process effluents	---	---	30.874	1.354	30.874	1.354
	8.	Washing & utilities & Condensate	---	---		---		
	9.	Boiler blow down	---	---	---	4.0	---	4.0
	10.	Cooling tower blow down	---	---	---		---	
	11.	RO Rejects	---	---	---	---	---	---
	12.	Domestic	---	---	---	25.0	---	10.0
		Total			**30.874**	**15.354**	**30.874**	**15.354**

Observations:-

1. As per the EC, M/s. Hetero Infrastructure, SEZ has permitted to use 1644 KLD of water and permitted effluent quantity is 1130.6KLD.

2. M/s. Hetero Infrastructure has obtained the EC amendment for the establishment of the Captive power plant of capacity 6.1 MW by installing turbine by using the steam from the existing boiler of capacity 45 TPH without increasing water consumption and waste water generation vide order dated 15.06.2018.

3. The total water consumption for the SEZ units including infrastructure permitted by the Board is 1674 as against the EC permitted quantity of 1644 KLD.

4. The total waste water generation for the SEZ units including infrastructure permitted by the Board is 1131 as against the EC permitted quantity of 1130.6 KLD.

5. M/s. Hetro group has established Two units, **Hetero Labs Limited Unit-III and Hetero Drugs Limited Unit-VI** by obtaining separate EC's , CFE and CFO of the Board in the Non SEZ area.

6. The total water permitted in the EC for both the unit is 1893 KLD and waste water generation is 1326 KLD.

7. As per the EC, both the units are permitted to treat the their effluents in the existing Common Effluent Treatment Plant(CETP) in the neighboring SEZ owned by a group company.

8. Board has issued CFE's for both the units for water consumption 769 KLD and waste water generation is 575 KLD.

9. The total effluent permitted by the Board as per the CFE for Both SEZ(1131KLD) and Non SEZ(575KLD) units is **1706** KLD.

10. M/s. Hetero Infrastructure has installed Steam Stripper(900 KLD), MEE(500KLD), ATFD(40 KLD) and Biological treatment of capacity 550KLD.

11. The total SEZ and NON SEZ units generating 272 KLD of HTDS and 291 KLD of LTDS effluents, which is 50% of its permitted capacity.

12. As per the EC, M/s. Hetero Infrastructure is permitted to generate and dispose the hazardous waste of capacity 96 TPD and not mentioned the Hazardous waste quantities in the EC for Non-SEZ units.

13. The quantity of Hazardous waste generation from all the here units in SEZ are within the permitted quantities.

14. The treated effluents are being discharging in to marine out fall in the presence of the board officials after treating to the specified standards.

Remarks:

1. As per the EC of M/s. Hetero Infrastructure the permitted waste water of quantity is 1130.6KLD and permitted discharge quantity through marine out fall is 1040KLD.

2. M/s. Hetero group from Both SEZ and NON SEZ units are permitted as per CFE to treat their effluents of quantity 1706 KLD at M/s. Hetero Infrastructure, which is more than the EC permitted quantity.

3. The existing Biological treatment system of Capacity 550 KLD may not be sufficient for the treatment of LTDS effluents, if the unit increase the production to the CFE quantities.

4. **As per the EC, the industry has to let out the reject from desalination plant in to separate discharge pipe line about 2KM from the shore, but the industry is letting out the reject from desalination plant at the shore itself.**

5. **The industry has not stopped power generation from the captive power plant till they obtain EC amendment, as per the Task force directions.**

In view of the above, the request of the industry may be examined for enhancement of waste water generation from 1130.6 KLD to 2456.6 KLD from both SEZ and Non – SEZ for treating at M/s. Hetero Infrastructure and to discharge the same quantity through marine out fall by considering the above.

13) Head Office Remarks:

a) M/s. Hetero Infrastructure SEZ Ltd., obtained CFE of the Board vide order dt. 13.12.2010 to establish 17 Nos. of plots for subsequent industrial development and provide common infrastructure facilities and marine outfall for disposal of treated effluents from SEZ units.

b) The industry has obtained renewal of Consent & Authorization vide order dt. 11.12.2017 to operate 4 No. of manufacturing units with utilities in SEZ. It is valid upto 31.12.2022.

c) Now, the industry proposed to generate 6.1 MW power (utilizing steam from existing 45 TPH coal fired boiler in the existing SEZ).

d) The industry obtained amendment to EC vide order dt. 15.06.2018 for installation of turbine to generate 6.1 MW power utilizing steam from existing 45 TPH coal fired boiler in the existing SEZ. As per EC amendment order, the proposal does not entail any increase in permitted pollution loads of EC dt. 25.10.2010.

e) The industry already installed turbine to generate power 6.1 MW without EC.

f) The issue was reviewed in the Task Force meeting and issued directions vide order dt. 23.07.2016 with a condition that the industry shall not operate power plant of capacity 6.1 MW till they obtain EC and CFE / CFO of the Board.

g) Again the Board stipulated a condition while issuing CFO order dt. 11.12.2017 that the industry shall not operate power plant till they obtain EC / CFE / CFO of the Board.

h) The Regional Officer reported that the industry has not stopped power generation from the captive power plant as per the Task Force directions.

i) The industry has not paid any CFE fee stating that no additional investment. In the EC amendment order dt. 15.06.2018 it is mentioned that investment cost is Rs. 11.45 Crores for installation of turbine and other accessories for transfer of power.

j) The proponent vide lr. dt. 22.08.2018 requested the Board for amendment to CFE by submitting revised quantities of water consumption and waste water generation. Some of the quantities are slightly more than the existing quantities submitted by the MoEF&CC, GoI in the EC orders. Hence, the quantities may be restricted to the quantities mentioned in the earlier EC order / CFE orders.

k) Industry shall clarify whether it has 1 x 45 TPH boiler of 2 x 45 TPH boilers. Industry has to clarify the incinerator capacity and DG sets whether they are replacing with the new ones are not?

l) As per the EC, the industry has to let out the reject from desalination plant into separate discharge pipeline about 2 km from the shore. But, the industry is letting out the reject from the desalination plant at the shore itself.

The item is placed before the CFE Committee for taking a decision.

CFE AGENDA ITEM No.
Dt: 19.09.2019
AP Single Desk application

01)	**Name of the Industry & Location address with Sy. Nos.**	**:**	**M/s. Hetero Labs Ltd., Unit – III, R. Sy. No.119, 126, 150, 120, 125 (P), 138 (P), 150 (P), 151/1, 151/2 (P), 158/1 N. Narsapuram (V), Nakkapalli (M), Visakhapatnam District.** **Applied for CFE expansion**
	Longitude and Latitude	**:**	17°22'47.56"N 82°43'13.31"E and 17°22'47.56"N 82°43'13.31"E
02)	**EC status**	**:**	1. EC order dt. 10.09.2012 issued by MoE&F, GoI, New Delhi for enhancement of production capacity from 60 TPM to 500 TPM issued to M/s. Hetero Labs Ltd., - III (Formerly Unit-V). 2. EC order dated 10.09.2012 for enhancement of production capacity from 60 TPM to 450 TPM issued to M/s. Hetero Drugs Ltd., Unit-VI(Formerly unit-IX) Total capacity = 950 TPM.
03)	**Project cost**	**:**	As on 31.03.2019 is Rs.428.2652 cr. Earlier the industry project cost was Rs. 388.79616 Cr, therefore the project cost increased of Rs. 39.47 for which the industry paid required CFE fee. The industry representative informed that the project cost was increased during the year 2017 to 2019 towards modifications in the plant.
04)	**Project site details:**	**:**	
	i) Total area of the land	:	85 Acres (HLL – Unit – III – 40 Acres + HDL – Unit – IV – 45 Acres)
	ii) Built up area	:	40 Acres
	iii) Greenery	:	40 Acres
	iv) Nearest Human habitation	:	1. Butchirajupeta (V) is existing at a distance of 0.6 km away from the site in South-West direction. 2. Ch. Lakshmi Puram (H) is at a distance of 0.15 km away from the site in Northern direction. 3. Ayyanna Palem (H) is existing at a distance of 0.5 km away from the site.
	v) Nearby water body	:	Upputaru (Salt lake) is adjacent to the industry in Southern direction.
	vi) **Surroundings of the site**	:	
	North : SEZ of M/s. Hetero Labs Ltd., Unit – IX **South** : Open Lands **East** : SEZ of M/s. Hetero Labs – Unit – IX of SEZ **West** : Road (Nakkapalli to Rajayyapeta Road) and industry's quarters		
	vii) **Road details**	:	Rajayyapeta & Upmaka Road is adjacent in western direction

05) Products & By Products: Bulk drug & Intermediates manufacturing industry.

As per CFE order dt. 26.10.2017:

S. No.	Product Name **Regular Products**	Qty (kg/day)
1.	Abacavir sulphate	166.67
2.	Capecitabine	133.33
3.	Cefidinir	166.67
4.	Cefixime Trihydrate	1000
5.	Cefoxitin Sodium	333.33
6.	Cefpodoxime Proxetil	666.67
7.	Cefuroxime Axetil	666.67
8.	Citicoline Sodium	100
9.	Darunavir	250
10.	Dolutegravir Sodium	167
11.	Domperidone IP	166.67
12.	Efavirenz	333.33
13.	Fluconazole	166.67
14.	Folic acid	100
15.	Gliclazide	166.67
16.	Hydralazine Hydrochloride	200
17.	Irbesartan	166.67
18.	Lamivudine	2333.33
19.	Levetiracetam	1500
20.	Losartan Potassium	866.67
21.	Nevirapine	1000
22.	Omeprazole	166.67
23.	Pamidronate sodium	166.67
24.	Phenyl Ephrine.HCL	166.67
25.	Pioglitazone Hydrochloride	166.67
26.	Quetiapine fumerate	333.33
27.	Ritonavir	100
28.	Rosiglitazone maleate	166.67
29.	Rosuavstatin calcium	100
30.	Telmisartan	100
31.	Tenofovir Disproxil fumerate	666.67
32.	Terbinafine HCL	166.67
33.	Tranexamic acid	100
34.	Valsartan	500
35.	Zidovudine	1166.67
	Sub Total	**14716.7**

S. No.	Product Name **Campaign Products**	Qty (kg/day)
1.	Acyclovir	33.33
2.	Alendronate Sodium Trihydrate	3.33
3.	Alfuzosin Hydrochloride	26.67
4.	Aliskiren Hemifumarate	6.67
5.	Amlodipine Besylate	25
6.	Anastrozole	1
7.	Aripiprazole	33.33
8.	Atazanavir Sulphate	33.33
9.	Atomoxetine HCL	33.33
10.	Atorvastatin Calcium Trihydrate	33.33
11.	Benazepril HCL	3.33
12.	Benfotiamine	66.67
13.	Bicalutamide	66.67
14.	Butenafine Hydrochloride	0.67
15.	candesartan cilexetil	16.67
16.	Cefditoren pivoxil	66.67
17.	Cilazapril Monohydrate	3.33
18.	Cilostazol	25
19.	Citalopram Hydrobromide	66.67
20.	Clopidogrel Hydrogen Sulfate	26.67
21.	Daclatasvir	13.33

22.	Deflazacort	1.67
23.	Desloratadine	1.67
24.	Didanosine	3.33
25.	Dorzolamide HCl	5
26.	Duloxetine HCL	25
27.	Eletripton	16.67
28.	Emtricitabine	33.33
29.	Eplerenone	1.67
30.	Eprosartan Mesylate	16.67
31.	Erlotinib Hydrochloride	16.67
32.	Escitalopram Oxalate	16.67
33.	Esomeprazole Megnesium	33.33
34.	Etoricoxib	25
35.	Ezetimibe	16.67
36.	Famciclovir	26.67
37.	Febuxostat	16.67
38.	Fosamprenavir Calcium	66.67
39.	Fosinopril Sodium	33.33
40.	Glimpiride	26.67
41.	Indinavir	16.67
42.	Itraconazole	25
43.	Lacosamide	33.33
44.	Lansoprazole	33.33
45.	Ledipasvir Premix IH	16.67
46.	Letrozole Intermediate	33.33
47.	Levo Milnacipran	16.67
48.	Levofloxacin	25
49.	Lisinopril Dihydrate	20
50.	Lopinavir	66.67
51.	Loratadine	6.67
52.	Maraviroc	16.67
53.	Methyl Cobalamin	16.67
54.	Mifepristone	3.33
55.	Miglitol	1.67
56.	Milnacipran	16.67
57.	Milnacipran HCL	1.67
58.	Montelukast sodium	25
59.	Moxifloxacin	26.67
60.	Moxonidine	16.67
61.	Nadifloxacin	0.67
62.	Nelfinavir	3.33
63.	Olanzapine	33.33
64.	Osaltamivir phosphate	25
65.	Ozagrel HCL	3.33
66.	Pantoprazole Sodium	25
67.	Perindopril	16.67
68.	Phthalazinone	33.33
69.	Posaconazole	33.33
70.	Rabeprazole Sodium	25
71.	Raltegravir	50
72.	Ramipril	33.33
73.	Ranolazine di HCL	16.67
74.	Rasagiline Mesylate	3.33
75.	Residronate Sodium	3.33
76.	Rifaximin	33.33
77.	Roflumilast	3.33
78.	Rufinamide	20
79.	Rupatadine fumarate	3.33
80.	Sequinavir Mesylate	26.67
81.	Sertaconazole	16.67
82.	Sertraline HCL	25
83.	Simvastatin	66.67
84.	Sofosbuvir	50

85.	Stavudine	16.67
86.	Sumatriptan Succinate	3.33
87.	Tazarotene	1.67
88.	Tegaserod Maleate	1.67
89.	Temozolomide	2.67
90.	Tiagabine	23.33
91.	Tioconazole	26.67
92.	Topiramate	16.67
93.	Torsemide	2.67
94.	Valacyclovir	50
95.	Velpatasvir	16.67
96.	Venilafaxine	16.67
97.	Voriconazole	27.33
98.	Zonisamide	33.33
99.	Voglibose	1.66*
	Sub Total	**2176.69**

The total production of the industry shall be 13,000 Kg/day (i.e., 11,816.67 Kg/day from 15 No. of products out of 35 regular products and 1183.33 Kg/day from 27 No. products out of 99 campaign products.) at any point of time.

M/s. Hetero Drugs Ltd., Unit – VI their sister concern had obtained Environmental Clearance No. J-11011/398/2010/1 A II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 450 TPM. The industry obtained CFE (Expansion) Order No. 136/PCB/CFE/RO-VSP/2013 - 4158, dated 11.10.2013 for producing the 9 products on regular basis 9 products on campaign basis with the maximum production capacity of 4.0TPD in Phase - I. this industry merged with M/s. Hetero Labs Ltd., Unit – III and obtained combined CFO & HWA of the Board vide order No. APPCB/VSP/VSP/CFO/HO/ 137/2015 – 2869, dated 06.08.2015 valid up to 31.12.2017.

About M/s. Hetero Labs Ltd., - Unit - III

1. The industry has obtained Environmental Clearance vide order No. No F. NO. J – 11011/396/2011-IA II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 500 TPM.
2. The industry has obtained CFE (Enhancement) vide order No. 137/PCB/VSP/RO-VSP/CFE/HO/2013 -4157, dated 11.10.2013 for producing 10 products on regular basis 10 products on campaign basis with the maximum production capacity of 9.0 TPD in Phase - I.
3. The industry had obtained combined CFO & HWA of the Board vide order No. APPCB/ VSP/VSP/CFO/HO/137/2015 – 2869, dated 06.08.2015 valid up to 31.12.2017 after merging with M/s. Hetero Drugs Ltd., Unit – VI subjected to a condition that “the industry shall obtain the common EC from the MOEF&CC for merging M/s. Hetero Drugs Ltd., Unit-VI, with Hetero Labs Ltd. Unit-III and submit copy to the Board”. (Condition No. 19 Stipulated in Schedule – B)

Present status:

As per CFO order dated 11.12.2017 M/s. Hetero Labs Ltd., Unit – III was permitted for the total production of the industry shall be 13,000 Kg/day (i.e., 11,816.67 Kg/day from 15 No. of products out of 35 regular products and 1183.33 Kg/day from 27 No. products out of 99 campaign products.) at any point of time. Now M/s. Hetero Labs Ltd., Unit – III proposed for (Expansion) for the following regular and campaign products.

After expansion:

S. No	Product Name	Production (kg/day)	No. of stages	Key starting Raw material	Quantity of KSM (kg/day)
GROUP –A (REGULAR PRODUCTS)					
1	Abacavir sulphate	666.67	II	Vinecelactam	666.67
2	Atomoxetine HCL	166.67	IV	Acetophenone	154.33
3	Atorvastatin calcium	333.33	I	4R-Cis)-1,1-Dimethylethyl-6-2-[-(4-Fluorophenyl)-5-(1-Methylethyl)-3-phenyl-4-[(phenylamino-carbonyl]-1H-pyrrol-1-yl]ethyl-2,2-dimethyl-1,3-dioxane-4-acetate	399.99

4	Cefditorine pivoxil	333.33	V	7-phenyl acetamido-3-chloro methyl-cephalosporinicacid-para-methoxy benzyl ester(GCLE)	333.33
5	Cefidinir	333.33	IV	(2)-Ethyl 2-(2-aminothiazol-4-yl)-2-(hydroxyimine) acetate	333.33
6	Cefixime Trihydrate	666.67	V	T-phenyl acetamido-3-methyl chloro cephosporonic acid,4-methoxy benzyl ester	666.67
7	Ceforoxime Axetil	666.67	III	Deacetoxy-7 amino cephlosporanic acid (D-7ACA)	666.67
8	Cefoxitin Sodium	333.33	IV	7-(2-Thienyl)acetamido cephalosporinic acid sodium salt	333.33
9	Cefpodoxime Proxetil	166.67	IV	Deacetyl-7-Aminocephlosporamic Acid(D-7ACA)	166.67
10	Citalopram hydrobromide	266.67	II	5-Cyanophthalide	165.21
11	Darunavir	333.33	II	(3as,4s,6ar)-a-methoxy tetrahydro furo(3,,4-b)furan-2(3H)-one	333.33
12	Dolutegravir	333.34	II	Methyl-4-methoxy acetoacetate	333.34
13	Emtricitabine	666.66	I	L-Tararic acid	786.6
14	Effavirenz	166.67	I	4-chloro-2-Trifluoro Acetyl anailine Hydro chloride hydrate	166.67
15	Escitalopram Oxalate	1333.3	III	Tetra hydrafuran	5546.5
16	Ezetimibe	333.33	III	Glutaric an hydride	333.33
17	Hydralazine Hydrochloride	400	III	1-Phthalazione	400
18	Indinavir	500	II	[2R-[3(S*)1(2S*,3R*)]]2-Benzyl-1-(2,2-dimethyl1-2.3.3a,8a-tetrahydro-indeno[1,2-d]oxazo1-3-yl)-3-(2-oxiranyl)-1-propanone	323.8
19	Irbesartan	1333.3	II	1-Aminocyclopentane acetamide	614.36
20	Lamivudine	10000	III	5-Chloro-1,3-oxathiolane-2-carboxylic acid-(1R,2S,5R) menthyl ester	21707.3
21	Levetiracetam	1000	I	(S)-2-Amino butyramide. Hydrochloride	1050
22	Lopinavir	333.34	VI	2S)-2Amino-3phenyl propinoic acid	333.34
23	Losartan Potassium	1000	V	Valeronitrile	300
24	Maraviroc	500	VI	Natropinone Hcl	500
25	Nevirapine	833.33	II	2-Chloro-N-(2-chloro-4-methyl-3-pyridinyl)-3-pyridine carboxamide	1282
26	Olmesartan	333.34	I	4-(1-Hydroxy-1-methylethyl)-2-propyl-1H-imidazole-5-carboxylic acid (5-methyl-2-oxo-1,3-dioxol-4-yl)methyl ester	250
27	Osaltamivir phosphate	166.67	X	Sicmic acid	166.67

28	Pantoprazole Sodium	1000	III	5-[Difluoromethoxy)-1H-benzimidazole-2-thiol	1000
29	Pioglitazone Hydrochloride	1000	V	5-Ethyl-2-pyridine Ethanol	1000
30	Quetiapine fumerate	666.67	II	11-Chloro dibenzo-(1,4) -thiazepine	590.2
31	Ritonavir	333.34	III	(2S,3S,5S)-2-Amino-3-hydroxy-5-(t-butyloxycarbonylamino)-1,6-diphenyl hexane	269.3
32	Rosiglitazone maleate	666.67	III	2-Chloropyridine	260.9
33	Simvastatin	333.34	V	Lovastatin	333.34
34	Telmisartan	666.67	III	2-N-Propyl-4-methyl-6-(1-methyl benzimidazole-2-yl)benzimidazole	666.67
35	Tenofovir Disproxil fumerate	666.67	II	Adenine	261.4
36	Terbinafine HCL	333.34	I	N-methyl-1-naphalene methane amine hydrochloride	333.34
37	Valsartan	1666.67	II	L-Valinemetyl ester hydrochloride	1250
38	Zidovudine	833.34	II	Thymidine	565

S. No.	**Product Name**	**Production per Day (Kg)**	**No.of Stages**	**Key Raw Material**	**Qty of KSM (Kgs/day)**
GROUP –B (CAMPAIGN PRODUCTS)					
1	Alendronate Sodium Trihydrate	3.33	I	4-Amino butyric acid	1.62
2	Aliskiren Hemifumarate	6.67	I	tert-Butyl (1S,3S)-3-(3-(3-methoxypropoxy)-4-methoxy benzyl)-1-((4S)-tetrahydro-4-isopropyl-5-oxofuran-2-yl)-4-methylpentylcarbamate	8.89
3	Amlodipine Besylate	66.67	I	Phthalimido Amlodipine	84.97
4	Aripiprazole	33.34	III	7-hydro-3,4-di hydro carbostyril	33.34
5	Atazanavir Sulphate	33.34	IV	4-Formyl phenyl boric acid	16.67
6	Benazepril HCL	3.33	II	R-2 Hydroxy-4-phenyl-butanoic acid ethyl ester	3.33
7	Butenafine Hydrochloride	0.67	I	1-(Bromomethyl)-4-tert-butylbenzene	0.46
8	candesartan cilexetil	66.67	II	Candesartan	100
9	Capecitabine	66.67	V	D-Ribose	96.97
10	Cilazapril Monohydrate	33.34	VIII	L-Glutamic acid	33.34
11	Cilostazol	33.34	I	5-(4-Chlorobutyl)-1-cyclohexyl-1H-tetrazole	31.67
12	Clopidogrel Hydrogen Sulfate	33.33	I	Methyl(+)-alpha-amino(2-chlorophenyl)acetate tartaric acid salt	69.83
13	Dapoxitine HCL	25	I	β-(dimethylamino) benzenepropanol	18.88

14	Deflazacort	1.67	I	6b-Acetyl-5-hydroxy-4a,6a, 8-trimethyl-4a,4b,5,6, 6a,6b,7,8,9a,10,10a,10b,11, 12-tetradecahydro-9-oxa-7-aza-pentaleno[2,1-a]phenanthren-2-one	2.19
15	Desloratadine	1.67	I	4-(8-chloro-5,6-dihydro-11H-benzo[5,6] cycloheptal[1,2-b]pyridin-11-ylidene)-1- piperidine carboxylic acid ethyl ester	2.46
16	Dorzolamide HCl	5	I	(±)-Trans-5,6-dihydro-4H-4-Ethyl amino-6-methylthieno[2,3-b] thiopyran-2-sulfonamide-7,7-dioxide	11.21
17	Duloxetine HCL	25	IV	2-Acetylthiophene	41.94
18	Entacapone	66.65	I	3,4-Dihydroxy-5-nitro benzaldehyde	49.98
19	Eplerenone	1.67	I	7-Methylhydrogen 17alpha-hydroxy-3-oxapregne-4,9(11)-diene-7-alpha, 21-dicarboxylate, gamma-lactone	2.07
20	Eprosartan Mesylate	16.67	IV	p-toluic acid	18.33
21	Esomeprazole Megnesium	33.33	I	(±) Omeprazole	92.25
22	Etoricoxib	100	II	1-(6-methylpyridin-3-yl)-2[4-(methylsulfonyl)phenyl]etha ne	100
23	Famcyclovir	33.33	I	1,3-propanediol, 2-[2-(2-Amino-9H-purin-9-yl)ethyl]	32.04
24	Feropenem Sodium	3.33	I	[5R-[3(R),5alpha,6alpha (R)]]-6-(1 hydroxyethyl)-7-oxo-3-(tetrahydro-2-furanyl)-4-thia-1-azabi cyclo[3,2,0]hept-2-ene-2-caboxylic acid 2-propenyl ester	4.5
25	Fluticasone	0.33		(6α,11β,16α,17α)-6,9-difluoro-11,17-dihydroxy-16-methyl-3-oxo-androsta-1,4-diene-17,carbothioic acid	0.35
26	Fosinopril Sodium	33.33	VII	Trans-4-hydroxy-L-proline	74.65
27	Glimpiride	33.33	I	4-[2-(3-ethyl-4-methyl-2-oxo-3-pyrroline-1-carboxamido) ethyl]benzene sulfonamide	36.22
28	Imatinib	66.67	IV	2-methyl-5-Nitro benzene amine	66.67
29	Itraconazole	25	I	2,4-dihydro-4-[4-[4-4 methoxy phenyl]-1piperazinyl]phenyl]-2-(1-methylpropyl)-3-H-1,2,4-triazol-3-one	27.17
30	Levofloxacin	25	I	Ethyl 9,10-difluoro-2 ,3-dihydro-3-(S) -methyl-7 -oxo-7H-pyrido[1,2,3-de]-1,4-benzoxazine-6-carboxylate	26.18
31	Loratidine	6.67	V	3-(2-(3-chloro phenyl ethyl pyride	6.67

32	Milnacipran HCL	1.67	I	N,N-Diethyl-2-((1,3-dioxoisoindolin-2-yl)-methyl-1-phenyl cyclopropane carboamide	2.71
33	Montelukast sodium	33.33	I	2-[2-[3(S)-[3-[2-(7-chloro-2-quinolinyl)-ethyl]phenyl]-3-hydroxy propyl]phenyl-2-propanol	38.45
34	Moxifloxacin	33.33	I	Ethyl-1-cyclopropyl-6,7-difluoro-1,4-dihydro-8-methoxy-4-oxo-quinoline-3-carboxylate	34.31
35	Moxotidine	33.33	I	4,6-dichloro-2-methyl-5-pyrimidine	37.32
36	Nadifloxacin	3.34	I	5-Bromo-6-fluoro-2-methyl-1,2,3,4-tetrahydroquinoline	3.11
37	NebivoloL HCL	25	I	Para Fluroanisole	29.75
38	Ozagrel HCL	3.33	I	Ethyl-3-[4-(bromomethyl)phenylprop-2-enoate	4.43
39	Posaconazole	33.33	I	N-{4-[4-(4-Hydroxy-phenyl)-piperazin-1-yl]-phenyl}-carbamic acid phenylester	28.88
40	Rabeprazole Sodium	25	II	4-(3-methoxypropoxy)-3-methyl-2-chloromethyl-pyridine hydrochloride	25.57
41	Ramipril	33.33	I	Benzyl(cis,endo)-octahydrocyclo penta(b)pyrrole-2(s)-carboxylate hydro chloride	33.33
42	Ranolazine di HCL	16.67	I	N-(2,6-Dimethylphenyl)-1-piperazineacetamide	10.31
43	Rasagiline Mesylate	3.33	I	(R)-(+)-Aminoindan hydrochloride	2.95
44	Residronate Sodium	3.33	I	2-(3-pyridyl)acetic acid	1.94
45	Rufinamide	20	III	2,6-difluoro benzoic acid	22.6
46	Rupatadine fumarate	3.33	I	Loratadine	3.4
47	Sequinavir Mesylate	26.67	V	Methanol	105.61
48	Sertraline HCL	33.33	III	4-(3,4-Dichlorophenyl)-3,4-dihydro-N-methyl-1(2H)-Naphthalenimine	37.87
49	Sildenafil citrate	33.33	III	2-Ethoxy Benzoic Acid	30.66
50	Sumatriptan Succinate	3.33	I	N-methyl-3-(2-chloroethyl)-1H-indole-5-methanesulfonamide	3.02
51	Tazarotane	1.67	I	6-Ethynyl-4,4-Dimethylthiochroman	1.41
52	Tegaserod Maleate	1.67	I	Hydrazinecarbo thioamide	0.54
53	Tiagabine	33.33	I	4-Bromo-1,1-bis(3-methyl-2-thienyl)-1-butene	36.1
54	Tioconazole	26.67	I	2-Chloro-3-(bromomethyl)thiophene	18.6
55	Topiramate	33.33	I	2,3,4,5-bis-O-(1-methylidene)-beta-D-fructopyranose	37
56	Torsemide	8.33	I	4-[(3-Methylphenyl)amino]-3-pyridinesulfonamide	6.94

57	Valacyclovir	66.67	II	2-(Acetylamino)-1,9-dihydro-9-[[2-(acetyloxy)ethoxy] methyl]-6H-purin-6-one	98.8
58	Voriconazole	33.33	I	6-Ethyl-5-fluoro-4-chloro pyrimidine	23.7
59	Zonisamide	100	I	1,2-Benzisoxazole-3-acetic acid	196
60	Validation batches for samples purpose	100	--	--	--

The industry applied for CFE (Expansion) and proposed to manufacture 27 regular products and 27 campaign products with maximum production capacity of 882.6 TPM or 29.42 TPD at any point of time.

06) Water consumption:

Source of Water supply **:** Hetero SEZ & Sea water

S. No.	Purpose	M/s. Hetero Labs Limited – Unit – III as per CFE 11.10.2013	M/s. Hetero Drugs Limited – Unit – VI as per CFE 11.10.2013	Qty. after change of product mix (after merging)and CFO order dt: 11.12.2017	Qty after expansion
		Quantity in KLD			
1.	Process & Washings	166.0	95.0	261.0	620
2.	Boiler feed	54.0	35.0	----	--
3.	Cooling Tower makeup	108.0	53.0	161.0	600
4.	Greenbelt Development & Civil works*	98.0	90.0	-----	200
5.	Domestic	35.0	35.0	70.0	120
	Total	**461.0**	**308.0**	**492.0**	**1540****

No separate Boiler for Hetero Labs Ltd., unit – III and the industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ Ltd., hence water consumption for boiler feed and RO feed is not required.

*RO reject proposed to utilize for greenbelt development and civil works.

**Proposed water consumption as per application 1540 KLD whereas the industry using 200 KLD of RO reject water for greenbelt development and civil works. Therefore the industry may be permitted total water consumption is only 1340 KLD

07) Waste Water Generation:

S. No.	Source	M/s. Hetero Labs Limited – Unit – III as per CFE 26.10.2017	M/s. Hetero Drugs Limited – Unit – VI as per CFE 26.10.2017	Qty. after change of product mix (after merging)and CFO order dt: 11.12.2017	Qty after expansion
	HTDS:	**Quantity in KLD**			
1.	Process & Washings	166.0	95.0	261	616.51
	LTDS:				
1.	Boiler blow down	20.0	14.0	----	----
2.	Cooling Tower	16.0	16.0	32	120
3.	RO Reject	98.0	90.0	---	---
4.	Domestic	30.0	30.0	60	120
	Total	**330.0**	**245.0**	**353.00**	**856.51**

As there is no separate Boiler for Hetero Labs Ltd., unit – III and the industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ Ltd., hence no wastewater generation from boiler blow down and RO Rejects.

1. The industry is proposed to segregate the effluents into 2 streams

   HTDS & HCOD i.e., TDS > 15,000 mg/l & COD > 15,000 mg/l and

   LTDS & HCOD i.e., TDS < 15,000 mg/l & COD > 15,000 mg/l.

2. As per CFO order dated 06.08.2015, the industry has permitted to generate 575 KLD.

ETP Details & Mode of Disposal:

Source of effluent	Treatment	Mode of final disposal
Process, washings & scrubber wastewater	above ground Collection tanks production block wise	Sent to Stripper, MEE followed by ATFD of M/s. Hetero Infrastructure Ltd., Hetero SEZ for further treatment and disposal
Cooling tower blow down	Collection tanks production block wise above ground	Sent to biological ETP of M/s. Hetero Infrastructure Ltd., Hetero SEZ for further treatment and disposal
For Domestic waste water	Treatment in STP at Hetero Infrastructure, SEZ and treated waste water for green belt development.	

ETP Details & Mode of Disposal:

At present the Effluent generated from M/s Hetero Labs Limited, Unit-III is being treated in the effluent treatment plant of M/s Hetero Infrastructure SEZ Ltd along with the effluents of units (Hetero Labs Ltd, Unit-IX, Hetero Drugs Ltd, Unit-IX and Honor Lab Ltd, Unit-III) located in M/s Hetero Infrastructure SEZ Ltd. The existing Capacity of Effluent Treatment plant is as below:

Unit of ETP	Capacity	Treatment
Primary Treatment	450 KLD x 2 No	For removal of floating matter, suspended matter from the raw effluent.
Stripper	300 KLD x 03 Nos	For reducing COD from the HTDS & HCOD effluents
MEE	300 KLD x 1 No	For treatment of HTDS & HCOD effluents.
ATFD	30 m^2 area @ feed rate of 2000 lt/hour	For drying the concentrated effluent of MEE.
Biological Treatment	450 KLD x 1 No 100 KLD x 1 No	For treatment of LTDS effluents along with condensate of MEE & ATFD.

M/s Hetero Labs Ltd, Unit-III is proposed effluent treatment of 1000 KLD capacity at M/s Hetero Infrastructure SEZ Ltd for which the industry is required to obtain CFE of the Board. The details of proposed effluent treatment as below:

Unit	Capacity	Description
Primary Treatment	800 KLD x 1 No for HTDS 200 KLD x 1 No for LTDS	For removal of suspended particulate matter from the effluent. The system comprises of Grit Chamber, Fat Trap, Equalization Tank, Flash mixer, Flocculator and Clarifier
Stripper	500 KLD x 1 No	For removal of Organics from the effluent. The system comprises of Steam stripper with all accessories
Multiple Effect Evaporator (MEE)	500 KLD x 2 No	For Concentration of effluents to remove chemicals from the effluent. The system comprises of 5 effect evaporator and all associated equipments like Cooling Tower, Flow meters etc.
Agitated Thin Film Drier (ATFD)	30 m^2 surface area x 3 Nos	For drying of concentrated effluent. consists of ATFD, Scrubbers and associated equipments
Biological Treatment	1000 KLD x 1 No	For treatment of condensate of MEE, ATFD and LTDS effluents to bring down the effluent characteristics to within the prescribed norms.
Final Treatment	Suitable sizes	For polishing the treated effluent before disposal. The system comprises of PSF, ACF, Sludge handling units, Guard ponds etc.

08) Hazardous / Solid Waste details: Existing & after expansion

S. No.	Type of waste	Quantity as per CFO order dt: 11.12.2017 (TPD)	Total quantity generated after proposed expansion (TPD)	Mode of Disposal
1	Spent Carbon	2.036	**3.822**	To the Cement industries for usage as alternate fuel in the kiln (or) TSDF, Parwada Visakhapatnam For incineration.
2	Organic Residue	12.793	**58.98**	To the Cement industries for usage as alternate fuel in the kiln (or) TSDF, Parwada Visakhapatnam Dist. For incineration
3	Process Inorganic Waste	**--**	**12.847**	To TSDF, Parwada Visakhapatnam for secured land filling or shall be sent to Cement industries along with Other wastes.
4	Forced Evaporation Salts	**--**	**9.264**	To TSDF, Parwada Visakhapatnam for secured land filling through ***M/s Hetero Infrastructure SEZ Ltd*** or shall be sent to Cement industries along with Other wastes.
5	Expired or damaged Raw materials	**--**	**0.2**	To TSDF, Parwada Visakhapatnam for secured land filling or shall be sent to Cement industries along with Other wastes for Co-processing depending on the characteristics of the material
6	Damaged or Expired products (Intermediates/ API)	**--**	**0.2**	To the Cement industries for usage as alternate fuel in the kiln along with Organic Residue (or) TSDF, Parwada Visakhapatnam Dist. For incineration.
7	Used PPEs & Other General waste	**--**	**0.5**	To Cement Industries for incineration purpose or to be incinerated at the in-house dual Chamber Incinerator.
	HAZARDOUS WASTE WITH RECYCLING OPTION			
1	Used / Waste Oils	180 LPM	1500 LPM	To Authorized Recyclers/ Re-processors approved by APPCB/CPCB
2	Spent Solvents	204.7 KLD	465 KLD	Shall be recycled within the premises or sold to Authorised Recyclers
3	Recovered Solvents	195.1 KLD	440 KLD	Shall be recycled within the premises or sold to Authorised Recyclers
4	Containers and Container Liners	2600 No/Month	5000 No/Month	After Complete detoxification shall be disposed to outside agencies.
5	Lead Batteries	-	20 No/Month	To supplier or Manufacturer on Buy back basis
6	LDPE Paper	-	500 Kg/day	After Complete detoxification shall be disposed to outside agencies.
7	e-waste	-	50 Kg/day	To Authorised Recyclers
8	Electrical Waste	-	50 Kg/day	To Authorised Recyclers

09) Air pollution:

There is no separate boiler for M/s. Hetero Labs Limited(Unit – III) and the industry is drawing stream from M/s Hetero Infrastructure SEZ Ltd.

M/s. Hetero Labs Limited – Unit – III as per CFO Order dt: 11.12.2017.

Sl. No	Details of Stack	Stack 1	Stack 2	Stack – 3
a)	Attached to	DG SET	DG SET	DG SET
b)	Capacity	2 X 2030 KVA	2 X 1165 KVA	725 KVA
c)	Fuel form	Liquid	Liquid	Liquid
d)	Stack height	20 m	20 m	14 m
e)	Control Equipment	Acoustic enclosures with silencer	Acoustic enclosures with silencer	Acoustic enclosures with silencer

After expansion:

There is no separate Boiler for Hetero Labs Ltd., unit – III, and the industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ and not proposed any DG sets for expansion.

EC Compliance:

1. M/s. Hetero Labs Ltd., Unit – III had obtained Environmental Clearance vide order dated 10.09.2012 for enhancement of production capacity from 60 TPM to 500 TPM and M/s. Hetero Drugs Ltd., Unit – VI had obtained vide order dated 10.09.2012 for enhancement of production capacity from 60 TPM to 450 TPM. In total M/s. Hetero Drugs Ltd., Unit – VI after merging into M/s. Hetero Labs Ltd., Unit – III the total production capacity is 950 TPM.
2. The industry applied for common EC to MoEF&CC, GOI for merger of EC dt: 10.09.2012 in favour of M/s. Hetero Drugs Limited (Unit-VI) with the EC dt:10.09.2012 of M/s. Hetero Labs Limited(Unit-III). As per the minutes of the 38th EAC Committee meeting held during 25th to 27th June 2018, the committee recommended for transfer of EC from M/s. Hetero Drugs Limited (Unit-VI) to M/s. Hetero Labs Limited(Unit-III).

10) Compliance status of conditions stipulated in Schedule B of CFO order 11.12.2017 valid upto 31.12.2022

Sl. No.	Condition	Compliance
SCHEDULE –B		
	Air Pollution	
12.	The industry shall comply with ambient air quality standards of PM_{10}(particulate matter size less than 10 µg) -100 µg /m^3; $PM_{2.5}$(particulate matter size less than 2.5 µg)-60 µg /m^3;SO_2-80 µg /m^3;NO_{x-80} µg /m^3;out side 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 10PM)-75dB(A) Night time (10PM to6 AM)- 70dB(A)	The industry has installed 3 nos. of online CAAQM stations. Two stations connected to APPCB website and one station is damaged. The industry has placed Purchase Order for 3rd CAAQM station as the old one got damaged and is beyond repairs. The 3rd CAAQM station will be in place by December 2019. The industry has submitted 3rd party monitoring reports.
	GENERAL	
18.	The industry shall obtain the common EC from the MOEF&CC for merging M/s. Hetero Drugs Ltd., Unit-VI, with Hetero Labs Ltd. Unit-III and submit copy to the board.	The industry applied for common EC to MoEF&CC, GOI for merger of EC dt: 10.09.2012 in favour of M/s. Hetero Drugs Limited(Unit-VI) with the EC dt:10.09.2012 of M/s. Hetero Labs Limited(Unit-III). As per the minutes of the 38th EAC Committee meeting held during 25th to 27th June 2018, the committee recommended

		for transfer of EC from M/s. Hetero Drugs Limited(Unit-VI) to M/s. Hetero Labs Limited(Unit-III). The industry not submitted copy of the common EC.
20.	The industry shall maintain dedicated multi stage scrubbers to the process vents and report the compliance to Regional Office, Visakhapatnam.	The industry has installed 30 nos. of double stage scrubbers The industry has installed 11 nos. of online pH meters to the scrubbers.
27.	The Industry shall evaluate the performance of the solvent recovery system for each stream wise and furnish plan of action to maintain the efficiency of solvent recovery more than 95% of each stream wise.	Not submitted.
29.	Under no circumstances, the industry shall burn the hazardous along with other wastes. The industry shall install scientific double chamber, thermal destruction facility for disposal of non-hazardous waste/domestic solid waste along with allied prevention and control of pollution measures and submit compliance report to Regional office, Visakhapatnam.	The industry is sending Hazardous waste to TSDF and cement industries for co-incineration. The industry has installed incinerator for disposal of non-hazardous / domestic waste and disposing the ash generated to TSDF, Parawada.
32.	Industry shall submit the inventory of the solvents (i.e both fresh and spent) to the RO on Monthly basis.	Not submitted.

11) Compliance status of directions stipulated in Task Force order dated: 16.05.2017:

Sl.No.	Direction	Compliance
1.	The industry shall not manufacture any un-consent products without obtaining CFE / CFO order of the Board.	Complied.
2.	The industry shall cover HTDS effluent equalization tanks and connected to the scrubber to prevent VOC emissions within one month as committed by the management.	The industry has covered HTDS effluent equalization tanks with hoods and vent connected to the scrubber.
3.	The industry shall install water meters for utilities (cooling towers) also within one month.	The industry has installed water meters block wise and not provided separately for process and utilities.
4.	The industry shall improve drum cleaning system.	The industry is carrying out drum washing at M/s. Hetero Infra area and provided hydro jet pump.
5.	The industry shall install online pH meters with recording facility for all the scrubbers of all production blocks within 30 days.	The industry has installed 11 Nos. of pH meters to the scrubbers.
6.	The industry shall provide nitrogen blanketing system for remaining 12 nos of solvent storage tanks within three months as committed by the management.	Nitrogen blanketing has been provided to 12 Tanks out of 24 solvent storage tanks. At present insulation & vent condensers have been provided to all low boiling solvents.
7.	The industry shall install Electro Magnetic Flow Meters for HTDS effluents before pumping them to CETP located at M/s.Hetero infrastructure system (SEZ) for further treatment within 30 days.	The industry has installed 2 Nos. of electromagnetic flow meters for pumping HTDS & LTDS effluent to M/s. Hetero Infrastructure SEZ Ltd.,
8.	The industry shall obtain common EC for the MoEF & CC for merging of M/s. Hetero drugs ltd., Unit –VI with Hetero Labs Ltd., Unit-III.	Not obtained
9.	The industry shall ensure continuous compliance of the conditions issued in the CFO & HWA order.	Reported above at Column No.19

Details of the production blocks and scrubbers:

Block	No. of ANFD	No. of Scrubbers		Total
		Single stage	Multi stage	
HLL-A	4	3	4	7
HLL-B	4	4	2	6
HLL-C	0	3	2	5
HLL-D	2	0	2	2
HLL-E	9	4	3	7
HLL-G	9	1	1	2
HLL-H	7	1	2	3
HLL-I	10	2	3	5
HLL-J	0	4	0	4
HLL-K	3	4	3	7
HLL-L	5	2	2	4
HLL-M	1	2	2	4
HLL-Q	3	1	2	3
HLL-N	8	0	2	2
HLL-P	6	1	0	1
RM STORE	…	2	0	2
SRS-I	…	2	0	2
Pharma	…	1	0	1
RCVD	…	1	0	1
Total scrubbers	71			68

12) Remarks of the Inspection Officer:

a) M/s. Hetero Drugs Ltd., Unit – VI had obtained Environmental Clearance No. J-11011/398/2010/1 A II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 450 TPM.

b) M/s. Hetero Labs Ltd., - Unit – III had obtained Environmental Clearance vide order No. No F. NO. J – 11011/396/2011-IA II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 500 TPM.

c) M/s. Hetero Drugs Ltd., Unit – VI had merged with M/s. Hetero Labs Ltd., Unit – III and obtained combined CFO & HWA of the Board vide order No. APPCB/VSP/VSP/CFO/HO/ 137/2015 – 2869, dated 06.08.2015 valid up to 31.12.2017 subjected to a condition that “the industry shall obtain the common EC from the MOEF&CC for merging M/s. Hetero Drugs Ltd., Unit-VI, with Hetero Labs Ltd. Unit-III and submit copy to the Board”. (Condition No. 19 Stipulated in Schedule – B)

d) M/s. Hetero Labs Ltd., Unit – III obtained CFO(CPM) vide order dated 11.12.2017 for the total production of the industry shall be 13,000 Kg/day (i.e., 11,816.67 Kg/day from 15 No. of products out of 35 regular products and 1183.33 Kg/day from 27 No. products out of 99 campaign products.) at any point of time. Now M/s. Hetero Labs Ltd., Unit – III applied for CFE(Expansion) and proposed to manufacture 27 regular products and 27 campaign products with maximum production capacity of 882.6 TPM or 29.42 TPD at any point of time.

e) M/s. Hetero Labs Ltd., Unit – III is drawing steam from M/s. Hetero Infrastructure SEZ Ltd., hence water consumption quantity, wastewater generation for Boiler makeup / Blow down and RO Rejects, hazardous waste viz., MEE Salts, FEE Salts and ETP Sludge were not generated in the premises (M/s. Hetero Labs Ltd., Unit – III). Hence, the CFE (Expansion) may not be issued for the above.

f) During the inspection the following are observed.

i. The industry was in operation.
ii. The industry is having 15 No. of production blocks, 1 ware house, 1 Pharma Block and solvent recovery system.
iii. The industry is utilizing common facilities of Boiler, stripper, ETP, STP, MEE and Hazardous waste storages located at Hetero complex.
iv. The industry has installed web camera to flow meters as per CPCB directions.

g) The industry applied for common EC to MoEF&CC, GOI for merger of EC dt: **10.09.2012** in favour of M/s. Hetero Drugs Limited(Unit-VI) with the EC dt:10.09.2012 of M/s. Hetero Labs Limited(Unit-III). As per the minutes of the 38th EAC Committee meeting held during 25th to 27th June 2018, the committee recommended for transfer of EC from M/s. Hetero Drugs Limited(Unit-VI) to M/s. Hetero Labs Limited(Unit-III). The industry not submitted copy of the common EC.

h) Issuance of CFE (Expansion) to the industry may be considered **only after submission of copy of the transfer of Environmental Clearance** from M/s. Hetero Drugs Limited(Unit-VI) to M/s. Hetero Labs Limited(Unit-III) with condition that the M/s. Hetero Infrastructure SEZ Ltd shall obtain CFE of the Board for establishment of **proposed ETP of capacity 1000 KLD.**

13) Recommendations of the Regional Officer:

Issuance of CFE (Expansion) to the industry may be considered subject to common Environmental Clearance for both the units M/s. Hetero Drugs Limited(Unit-VI) and M/s. Hetero Labs Limited(Unit-III).

14) Head Office Remarks:

a) M/s. Hetero Drugs Ltd., Unit – VI had obtained Environmental Clearance No. J-11011/398/2010/1 A II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 450 TPM.

b) M/s. Hetero Labs Ltd., - Unit – III had obtained Environmental Clearance vide order No. No F. NO. J – 11011/396/2011-IA II (I), dated 10.09.2012 for enhancement of production capacity from 60 TPM to 500 TPM.

i. The total permitted production capacity as per both the ECs (Unit – III & Unit – VI) is 950 TPM (i.e. 31.67 TPD). In the present proposal, the industry increasing the production capacity from 13 TPD to 29.42 TPD. It is within the permitted capacity of the EC.

ii. Quantity of waste water is increasing from 353 KLD to 856.51 KLD in the proposed expansion.

iii. Presently, the industry is sending the effluents to the ETP in the M/s. Hetero Infrastructure SEZ Ltd. Now, the industry has proposed to install new ETP of capacity 1000 KLD in the SEZ. It is not clear whether the ETP is exclusively for these two units or for all the industries in SEZ and non-SEZ area. The industry has to clarify.

iv. If the proposed ETP of capacity 1000 KLD is for these two units (Non-SEZ units) the industry has to clarify why the new ETP of 1000 KLD is proposed in the SEZ area.

v. The industry shall submit details of EC obtained for different units in SEZ and non SEZ area, water consumption waste water generation quantities and treatment capacities.

vi. In the proposed ETP of capacity 1000 KLD, the stripper capacity is 500 KLD only. The quantity of HTDS effluents is 616.51 KLD. Whereas the capacity of MEE is 1000 KLD.

vii. The stripper capacity is to be increased from 500 KLD to 1000 KLD.

c) M/s. Hetero Drugs Ltd., Unit – VI had merged with M/s. Hetero Labs Ltd., Unit – III and obtained combined CFO & HWA of the Board vide order No. APPCB/VSP/VSP/CFO/HO/ 137/2015 – 2869, dated 06.08.2015 valid up to 31.12.2017 subjected to a condition that “the industry shall obtain the common EC from the MOEF&CC for merging M/s. Hetero Drugs Ltd., Unit-VI, with Hetero Labs Ltd. Unit-III and submit copy to the Board”. (Condition No. 19 Stipulated in Schedule – B).

d) No separate Boiler for Hetero Labs Ltd., unit – III and the industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ Ltd., hence water consumption for boiler feed and RO feed is not required.

e) As there is no separate Boiler for Hetero Labs Ltd., unit – III and the industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ Ltd., hence no wastewater generation from boiler blow down and RO Rejects.

f) At present the Effluent generated from M/s Hetero Labs Limited, Unit-III is being treated in the effluent treatment plant of M/s Hetero Infrastructure SEZ Ltd along with the effluents of units (Hetero Labs Ltd, Unit-IX, Hetero Drugs Ltd, Unit-IX and Honor Lab Ltd, Unit-III) located in M/s Hetero Infrastructure SEZ Ltd.

g) M/s Hetero Labs Ltd, Unit-III is proposed effluent treatment of 1000 KLD capacity at M/s Hetero Infrastructure SEZ Ltd for which the industry is required to obtain CFE of the Board.

h) The industry applied for common EC to MoEF&CC, GOI for merger of EC dt: 10.09.2012 in favour of M/s. Hetero Drugs Limited(Unit-VI) with the EC dt:10.09.2012 of M/s. Hetero Labs Limited(Unit-III). As per the minutes of the 38th EAC Committee meeting held during 25th to 27th June 2018, the committee recommended for transfer of EC from M/s. Hetero Drugs Limited(Unit-VI) to M/s. Hetero Labs Limited(Unit-III). The industry not submitted copy of the common EC.

i) M/s. Hetero Labs Ltd., Unit – III is drawing steam from M/s. Hetero Infrastructure SEZ Ltd., hence water consumption quantity, wastewater generation for Boiler makeup / Blow down and RO Rejects, hazardous waste viz., MEE Salts, FEE Salts and ETP Sludge were not generated in the premises (M/s. Hetero Labs Ltd., Unit – III). Hence, the CFE (Expansion) may not be issued for the above.

j) The industry has to submit an amendment to EC order merging Unit – III and Unit – VI as stipulated in the CFE order dt. 26.10.2017 and CFO order dt. 11.12.2017. But, the industry has not submitted so far.

k) The industry shall obtain CFE for the proposed ETP of capacity 1000 KLD.

The item is placed before the CFE Committee for taking a decision.

CFE AGENDA ITEM No.
Dt:28.04.2022

01)	**Name of the Industry & Location address with Sy.Nos.**	**:**	**M/s. Hetero Drugs Ltd., (Unit IX), Plot No. 1 of Hetero Infrastructure SEZ Ltd., N. Narsapuram (V), Nakkapalli (M), Visakhapatnam** **Applied for CFE for CPM**
	Longitude and Latitude	**:**	$82^0$43'12.41" & $17^0$22'55.74"
02)	**EC status**	**:**	EC order dt. 25.10.2010 issued by MoEF, GoI, New Delhi
03)	**Project cost**	**:**	Rs.264.349 Crores
04)	**Project site details:**	**:**	
	i) Total area of the land	:	11.5 Acres
	ii) Built up area	:	6.0 Acres
	iii) Greenery	:	4.0 Acre
	iv) Nearest Human habitation	:	i. Ayyannapalem hamlet of Upmaka is about 0.5 KM in northern direction ii. Upmaka Agraharam Village is about 1.0 Km in Norther-West direction. iii. N.Narsapuram Village is at about 0.8 Km in western direction. iv. Janakipeta is at a distance of about 1.0 Km in North east direction.
	v) Nearby water body	:	Upputeru (Salt lake) is existing after M/s.Hetero Infrastructure SEZ Ltd., towards southern direction
	vi) **Surroundings of the site**	:	
	North : Internal Roads of SEZ **South** : Hetero Labs, Unit – IX **East** : Hetero Labs, Unit – IX **West** : Rajayyapeta & Upmaka Road.		
	vii) **Road details**	:	Rajayyapeta & Upmaka Road is adjacent in western direction.

5) Products & By Products: Bulk drug & Intermediates manufacturing industry.

As per CFO & HWA No:, dated 01.06.2017 valid up to 31.07.2022

A. Regular Products

S. No.	Product Name	Production capacity (Kg/day)	No. of stages	Name of the starting key raw material	Quantity of SRM (Kg/day)
1.	Acyclovir	333.33	I	Guanine	272
2.	Amlodipine Besylate	66.67	I	Phthalimido amlodipine	324.33
3.	Bupropion	500.00	II	m-chloropropiophenone	331.9
4.	Celecoxib	333.33	I	4-methylacetophenone	170
5.	Citaloparm hydro bromide	133.33	II	5-cyanophthalide	94.7
6.	Diclofenac Diethyl Amine	333.33	I	Diclofenac sodium	317.4
7.	Diclofenac Potassium	333.33	I	Diclofenac sodium	323.6
8.	Diclofenac Sodium	1000.00	III	2,6-dichloro diphenylamine	634.8
9.	Diolat	66.67	I	(E)-3-[3'-(4"-fluorophenyl)-1'-(1"-methylethyl) indol-2'-yl] prop-2-enal	77.3
10.	Divalproex Sodium	333.33	IV	Diethyl malonate 5-methoxy-2-[[(4-methoxy-3,5-	666.7
11.	Esomeprazole Magnesium Di Hydrate	133.33	II	Dimethylpyridin-2-yl)methyl]thio]-1H-benzimidazole	94.7
12.	Esomeprazole Magnesium Tri Hydrate	233.33	II	5-Methoxy-2-[[(4-methyxy-3,5-dimethylpyridin-2-yl)methyl]thio]-1H-benzimidazole	194.7
13.	Fenofibrate	333.33	I	4-Chlorobenzoyl-4-Hydroxybenzo phenome	220
14.	Fexofenadine	166.67	II	4-[4-Chloro-1-oxobutyl]-2,2-dimethyl phenylacetic acid	116.7
15.	Gabapentine	500.00	I	2,2"-(cyclohexane-1,1-dyl) diacetic acid (S)-1-N2-(1-Ethoxycarbonyl-3-	1296
16.	Lisinopril	66.67	I	Phenylpropyl)-N6-trifluoroacetyl-L-lysine	330.66
17.	Metaxalone	166.67	II	3,5-Dimethylphenol	335.38
18.	Nabimitone	100.00	I	(3E)-4-(6- Methoxynaph thalen-2-yl)but-3-en-2-one	104
19.	Nateglinide	116.67	II	4-(1-Methyl ethyl) cyclohexane carboxylic acid methyl ester	81.7
20.	Naproxen	193.33	I	2-Bromo-6-Methoxynapthalene	210.7

21.	Omeprazole	200.00	II	2-Mercapto-5-methoxy-benzimidazole	178
22.	Pregabalin	200.00	I	3-(Carbamoylmethyl)-5-methylhexanoic acid	395.6
23.	Raltegravir	66.67	I	5-methyl-1, 3, 4-oxadiazole-2-carbonyl Potassium	133.33
24.	Ranalazone	166.67	II	Guaiacol (2S, 3S, 5S)-2-Amino-3-hydroxy-5-	83.34
25.	Ritanovir	66.67	II	(t-butyloxycarbonylamino)-1,6-diphenyl hexane	44.7
26.	Sertraline HCl	500.00	II	4-(3-4-Dichlorophenyl)3, 4-dihydro-1-(2H)-napthalenone	610
27.	Savelomir Carbonate	100.00	I	Polyallylamine hydrochloride	181
28.	Sevelamir HCL	200.00	I	Poly alyl Amine	76
29.	Topiramate	200.00	II	2,3,4,5, Bis-O-(1-methyletylidine)-beta-D-fructopyranose	740
The industry shall manufacture 6 regular products at any point of time.					

B. Compaign Products					
S. No	**Product Name**	**Production capacity (Kg/day)**	**No. of stages**	**Name of the starting key raw material**	**Qty of starting key raw material (Kg/day)**
1	Adefovir dipivoxil	10.00	I	Adefovir	7.1
2.	Alvimopan Dihydrate	16.67	I	3,4-dimethyl-4-aryl piperdine	12.2
3.	Azilsertan	10.00	II	Methyl-1-[(2-Cyanobiphenyl-4-yl) methyl]-2-ethoxy benzimidazole-7-carboxylate	28.66
4.	Azythromycin	16.67	I	6-azacyclopentadecan-7,15-dione	104.2
5.	Boceprevir	10.00	I	(1R,2S,5S)-6,6-Dimethyl-3-aza bicycle [3.1.0]hexane-2-carboxylic acid methyl ester hydrochloride	5.6
6.	Bosantan	16.67	II	(2-Methoxyphenoxy) propanedioic acid dimethyl ester	13.34
7.	Cinacalcet	33.33	I	1-(-Napthyl)ethylamine	6.07
8.	Colesevelam Hydro Chloride	50.00	I	Sevelamer Hydrochloride	50
9.	Debigetran Exilate Mesylate	33.33	IV	Ethyl 3-[3-amino-4-(methylamino)benzoyl] (pyridine-2-yl)amino propanoate	44.44
10.	Darifenacin Hydrobromide	10.00	I	(S)-alpha, alpha-diphenyl-3-pyrrolidineacetamide	8.4
11.	Des Venalofoxin	16.67	I	1-[2-Amino-1-(4-benzyloxyphenyl)ethyl] cyclohexanol	93.74

12.	Dex lansoprazole	33.33	I	Lansoprazole	144.9
13.	Eletripan Hydrobromide	16.67	I	1H-Indole, 3[[(2S)-1-methyl-2-pyrrolidinyl]methyl]-5-[(1E)-2-(phenylsulfonyl)ethelnyl]	18.7
14.	Eslicarbazipin	16.67	II	Oxcarbazepine	20.23
15.	Ezetimbe	5.0	I	(3R,4S)-1-(4-fluorophenyl)-2-oxo-4-[4-(phenyl methoxy) phenyl]-3-Azetidinepropanoyl chloride	7.7
16.	Febuxostat	33.33	II	2-(3-formyl-4-hydroxyphenyl)-4-methylthiazole-5-carboxylic acid ethyl ester	181.8
17.	Fesoterodine	6.67	I	3-(Diisopropylamino)-1- phenylpropyl) -4-(hydroxymethyl) phenol	5.23
18.	Fingolimode	10.00	I	2-Acetamido-2-[2-(4-octylphenyl)ethyl] malonate	15.4
19.	Fosinopril Sodium	33.33	I	Racemic[[2-methyl-1-(oxopropoxy)propoxy](4-phenyl butyl)phosphinyl acetic acid	63.49
20.	Gancyclovir	16.67	I	1,3-Diacetoxy-2-(acetoxymethoxy) Propane	23.3
21.	Isradipine	8.33	I	2,1,3-benzoxa diazole,-4-carboxaldehyde	4.6
22.	Lacosamide	50.00	I	2-{[(tert-utoxy)carbonyl] amino}-3-methoxy propanoic acid	89.84
23.	Linagliptin	6.67	II	2-(Chloromethyl)-4- methylquinazoline	12
24.	Lopinavir	66.67	I	2S-(1-Tetrahydro-pyrimid-2-onyl)- 3-methylbutanoic acid	57.3
25.	Lurasidone	33.33	II	Trans-1,2-bis (hydroxymethyl) cyclohexane	22
26.	Mamantine HCL	33.33	I	1,3-Dimethyladamantane	18.6
27.	Meribegrone	33.33	III	PHENYL ETHANOL	18
28.	Nisoldipine	16.67	I	2-Nitro benzaldehyde	11
29.	Orlistat	16.00	I	3S-[3-alpha,4beta(S*)]]-3-hexy1-4[2-hyd roxytridecyl]-2-oxetanone	18.5
30.	Pitavastatin	16.67	I	(2-cyclopropyl-4-(4- fluorophenyl) quinolin-3-yl)methanol	23.53
31.	Posaconazole	10.00	I	N-{4-[4-(4-Hydroxy-phenyl)- piperazin-1-yl]-phenyl}-carbamic acid phenylester	5.9
32.	Prasugrel	33.33	I	Cyclopropyl 2-fluorobenzyl carbonyl bromide	26.53
33.	Prulifoxcine	33.33	III	6-fluoro-1- methyl-4-oxo-7-(1-piperaziny1)1H,4H41,3]thiazeto[3,2-a]quinoline-3-carboxylic acid.	66.6
34.	Relaxifene Hydro chloride	33.33	I	4-(2-piperidin-1- ylethoxy) benzoylchloride hydrochloride	62

35.	Rilpivirine Hydrochloride	16.67	II	2,4-Dichloropyrimidine	274.66
36.	Residronate Sodium	16.67	I	2-(3-Pyridyl)acetic acid	12.82
37.	Rivastigimine Base	50.00	I	Dimetol	25.6
38.	Rivastigimine Tartrate	33.33	I	3-[1-(dimethylamino) ethyl]phenol	22.3
39.	Rizatriptan	16.67	I	4-(1H-1,2,4-triazol-1-ylmethyl)phenylhydrazine hydrochloride	14.6
40.	Ropinirole Hydrochloride	6.67	I	2-(2-0xo-1,3-dihydro-4- indolyl)ethyl-p-toluenesulfonate	24.6
41.	Roruvastin	50.00	I	(R)-7-[4-(4-Fluorophenyl)-6-(1-methylethyl) -2- [methyl (methylsulfonyl) amino]-5-pyrimidinyl] -5-pyrimidinyl]-3- hydroxy-5-oxo-6-heptenoic acid methyl ester	18.7
42.	Rufinamide	33.33	I	2-(Azidomethyl)-1,3- difluorobenzene	89.2
43.	Saxagliptin	6.67	II	2-(Boc-amino)-2-(3-hydroxy-1-adamantyl) acetic acid	8.36
44.	Silodosin	6.67	I	(R)-3-(5-(2-aminopropyl)-7-cynoindolin -1y1)propyl benzoate tartarate	10.37
45.	Sitagliptin	6.67	I	(3R)-3-tert-butoxycarbonylamino-4-(2,4,5-trifluoro-phenyl)-butanoic acid	6.67
46.	Tadalafil	10.00	I	(1R,3R)-methyl 1,2,3,4-tetrahydro- 1-(3,4-methyl enedioxyphenyl)-9H-pyrido- [3,4-b]indole-3-carboxylate	8.3
47.	Trospium Chloride	10.00	I	Spiro[8-azoniabicyclo [3.2.1]octane-401-8,11-pyrrolidinium]chloride	14.3
48.	Valdagliptin	10.00	I	1-Amino-adamentane	12.88
49.	Valgaciclovir	33.33	I	2-(2-amino-1,6-dihydro-6-oxo- purin-yl)methoxy-1,3-propanediol	17.3
50.	Vardenafil Hydrochloride	6.67	I	2-(2-Ethoxy-phenyl)-5-methyl-7-propy1-3,4-dihydroimidazo[5, 1-f][1,2,4]triazin-4-one	29.7
51.	Zolmitriptan	10.00	I	(S)-4-(4-hydrazine benzyl-2-oxazolidinone	9.3
	Any 8 campaign products shall be manufactured at a time.				
	The industry shall manufacture 14 no. of products with maximum production capacity of 3533.32 Kgs/day i.e., 6 no. of regular products (3166.66 Kgs/day) and 8 No. of campaign products (366.66 Kgs/day)".				

Now, the industry proposed for Change of product mix and applied for CFE (CPM) of the Board with the following changes:

i. Added 6 new campaign Products and validation Products.

ii. Dropped 8 regular products & 22 campaign products & out of 90 permitted products.
iii. Total 53 products including validation Products with a maximum production capacity of 3386 Kg/day.
iv. The industry proposed to produce 05 regular products and 07 campaign products with maximum production capacity of 3386 Kgs/day.
v. Production capacity decreases from 3533.32 Kgs/day to 3386 Kg/day.
vi. No change in water consumption and wastewater generation decreases from 89.73 KLD to 89.667 KLD.
vii. The industry has proposed to install Solvent Recovery System.
viii. The generation of organic residue increases from 3.76 to 3.866 TPD after (CPM).

As per the production details furnished by the industry, the industry has manufactured 36 no.s of products including R&D products during the period from Oct, 2021 to March, 2022 and the average production quantity of 1.68 tons/day against the consented quantity of 3.533 tons/day.

Proposed after CFE (CPM):

Regular products

S. No	Product Name	Production Capacity (kg/day)	No of Stages	Name of the Starting key Raw Material	Qty of Key Starting Raw Material (kg/day)
1	Acyclovir	333.33	II	Guanine	250
2	Bupropion	500	II	m-chloropropiophenone	416
3	Celecoxib	333.33	II	4-methylacetophenone	170
4	Citaloparmhydro Bromide	133.33	III	5-cyanophthalide	94.3
5	Diclofenac Diethyl Amine	333.33	I	Diclofenacsodium	317.4
6	Diclofenac Potassium	333.33	II	Diclofenacsodium	323.6
7	Diclofenac Sodium	800	III	2-Chloro-N-(2,6-dichlorophenyl)-N-phenyl acetamide	914.3
8	Diolat-12	150	II	(E)-3-[3'-(4"-fluorophenyl)-1'-(1"-methylethyl) indol-2'-yl]prop-2-enal	137.3
9	Divalproex Sodium	333.33	IV	Diethyl malonate 5-methoxy-2-[[(4-methoxy-3,5-	476
10	Esome Prazole Magnesium Di-Hydrate	133.33	II	Dimethylpyridin-2-yl)methyl]thio]-1Hbenzimidazole	613.3
11	Esome Prazole Magnesium Tri-Hydrate	233.33	II	5-Methoxy-2-[[(4-methyxy-3,5-dimethylpyridin-2-yl)methyl]thio]-1Hbenzimidazole	194.7

12	Fenofibrate	333.33	II	4-Chlorobenzoyl-4-Hydroxybenzophenome	220
13	Fexofenadine	300	II	4-[4-Chloro-1-oxobutyl]-2,2-dimethylphenylaceticacid	210.0
14	Gabapentine	400	III	2,2”-(cyclohexane-1,1-dyl) diacetic acid (S)-1-N2-(1-Ethoxycarbonyl-3-	1036.8
15	Metaxalone	166.67	II	3,5-Dimethylphenol	335.38
16	Nabimitone	100	III	(3E)-4-(6-Methoxynaphthalen-2-yl)but-3-en-2-one	104
17	Pregabalin	200	III	3-(Carbamoylmethyl)-5-methylhexanoicacid	395.6
18	Ritanovir Premix Amorphous & Form)	666.67	V	(t-butyloxycarbonylamino)-1,6-diphenyl hexane	666.67
19	Savelomir Carbonate	100	I	Polyallylaminehydrochloride	181
20	Sertraline HCl Form-I & II	600	III	4-(3-4-Dichlorophenyl)3, 4-dihydro-1-(2H)-napthalenone	2264
21	Topiramate	200	III	2,3,4,5,Bis-O-(1-methyletylidine)-beta-Dfructopyranose	740

Campaign Products					
S.No.	**Product Name**	**Production Capacity (kg/day)**	**No. of Stages**	**Name of the Starting key Raw Material**	**Qty of Starting Key Raw Material (kg/day)**
1	Carbidopa	20	III	Methyldopa	76.14
2	Cinacalcet	16.66	II	1-(-Napthyl)ethylamine	21.6
3	Dabigetran Exilate Mesylate	33.33	IV	Ethyl 3-[3-amino-4-(methylamino) benzoyl](pyridine-2-yl)aminopropanoate	44.44
4	Eletripan Hydrobromide	16.67	IV	1H-Indole, 3[[(2S)-1-methyl-2-pyrrolidinyl] methyl]-5-[(1E)-2-(phenylsulfonyl)ethelnyl]	18.7
5	Febuxostat	33.33	IV	2-(3-formyl-4-hydroxy phenyl)-4-methylthiazole-5-carboxylic acidethyl ester	63.4

6	Fesoterodine	6.67	III	3-(Diisopropylamino)-1-phenylpropyl)-4-(hydroxymethyl)phenol	5.23
7	Ivacaftor(Premix)	10	IV	2,4 Di tertbutyl-5-nitrophenylmethylcarbonate(DNC)	8
8	Lacosamide	50.00	I	2-{[(tert-utoxy)carbonyl]amino}-3-methoxypropanoicacid	77.58
9	Levodopa	33.33	III	L-Tyrosine	31.84
10	Lopinavir	66.67	I	2S-(1-Tetrahydro-pyrimid-2-onyl)-3-methylbutanoicacid	57.3
11	Lurasidone	40	III	Trans-1,2-bis (hydroxymethyl)cyclohexane	26.4
12	MamantineHCL	33.33	II	1,3-Dimethyladamantane	18.6
13	Mexiletine Hydrochloride	80	II	2,6XYLENE(DPO)	150
14	Mirabegron Alpha	20	II	2-(2-aminothiazol-4-yl) aceticacid(ATA)	15.47
15	Mirabegron Beta	33.33	II	PhenylEthanol	44.4
16	Pitavastatin	16.67	I	(2-cyclopropyl-4-(4-fluorophenyl)quinolin-3 -yl)methanol	49
17	Prasugrel Hydrochloride	17	III	Cyclopropyl 2-fluorobenzylcarbonylbromide	39.23
18	Relaxifene Hydrochloride	33.33	II	4-(2-piperidin-1-ylethoxy)benzoylchloridehydrochloride	62
19	Residronate Sodium	16.67	II	2-(3-Pyridyl)aceticacid	12.82
20	Rilpivirine Hydrochloride	16.67	II	2,4-Dichloropyrimidine	68.39
21	Rivastigimine Base	50	I	Dimetol	25.6
22	Rizatriptan	16.67	II	4-(1H-1,2,4-triazol-1-ylmethyl) phenylhydrazinehydrochloride	14.6
23	Rosuvastin	50	II	R)-7-[4-(4-Fluorophenyl)-6-(1-methylethyl) -2-[methyl(methylsulfonyl) amino]-5-pyrimidinyl]-5-pyrimidinyl]-3-hydroxy-5-oxo-6-heptenoicacid methylester	50
24	Rufinamide Premix	30	I	2,6-Difluorobenzylbromide	18.75

25	Rufinamide	33.33	II	2-(Azidomethyl)-1,3-difluorobenzene	35.5
26	Silodosin	6.67	IV	(R)-3-(5-(2-aminopropyl) -7-cynoindolin -1y1) propylbenzoatetartarate	18.67
27	Sodium Zirconium Cyclosilicate	50	I	SodiumSilicateSolution(Ssc)	100
28	Valgaciclovir	33.33	VI	Guanine	69.4
29	Zafirlukast (Amorphous)	10	IV	4-Methylacetophenone (MAP)	32.3
30	Zolmitriptan	10	IV	(S)-4-(4-hydrazine benzyl-2-oxazolidinone	21.4
31	2-Acetoxy ethyl acetoxymethylether	2000	I	1,3-dioxalane(dxn)	500
32	Validation batches for samples	100	--	--	--

Note: At any point of time Industry shall not manufacture more than 05 Regular products and 07 campaign products with maximum production capacity of 3386 Kg/day.

06) Water consumption:

Source of Water supply **:** Hetero infra SEZ

S. No.	Purpose	Qty as per CFO dt: 31.10.2018 (KLD)	Qty as per CFE(CPM) application (KLD)
1.	Process & Washing	62.79	62.79
2.	Cooling Towers	50.00	50.00
3.	Domestic	25.00	25.00
	Total	137.79	137.79

As per the details furnished by the industry, the industry's average water consumption is 81.07 KLD during the period from Oct-2021 to Mar-2022 which are within the limit.

07) Waste Water Generation:

S. No	Source	Qty as per CFO Order dt.31.10.2018 (KLD)			Qty as per CFE (Exp) application (KLD)		
		HTDS	LTDS	TOTAL	HTDS	LTDS	TOTAL
1.	Process & Washing	62.73	---	62.73	62.167	---	62.167
2.	Cooling tower Blow down	----	2.0	2.0	----	2.50	2.50
3.	Domestic	----	25.00	25.00	----	25.00	25.00
	Total	**62.79**	**27.00**	**89.73**	**62.167**	**27.50**	**89.667**

As per the details furnished by the industry, the industry's average wastewater generation during the period from Oct-2021 to Mar-2022 is 51.91 KLD i.e., HTDS – 49.93 KLD & LTDS – 1.98 KLD.

ETP Details & Mode of Disposal (Existing):

I. Outlet No. 1 a. Stream Details: b. Treatment unit's details. c. Point of disposal	: : :	Process, Washings 20 KL collection tank provided at production blocks for collection of HTDS effluents. Sent to Stripper, MEE followed by ATFD of M/s. Hetero Infrastructure Ltd., Hetero SEZ for further treatment and disposal
II. Outlet No.2 a. Stream Details: b. Treatment unit's details. c. Point of disposal	: : :	Cooling tower blow down. 20 KL collection tank provided at production blocks for collection of LTDS effluents. Sent to Biological ETP of Hetero Infra SEZ.
ii. Outlet No. 2 : Domestic	:	Treatment in STP of 300 KLD capacity and treated waste water for green belt development.

As per CFO Order dt: 31.10.2018

Out let No.	Outlet Description	Max Daily Discharge (KLD)	Point of Disposal
1.	Trade Effluents: Process & Washings (HTDS & HCOD (having TD(l)S >=15,000 mg/l, & COD>=15,000 mg/l) after pre-treatment. LIDS & HCOD: (TD(l)S:<15,000 mg/l & COD:>15,000 mg/l)	62.73	Shall be treated in stripper, MEE & ATFD at CETP, M/s. Hetero Infrastructure, SEZ. Stripper condensate to be recycled, MEE condensate to Biological ETP, MEE salts to TSDF.
2	LTDS & LCOD Effluents Cooling tower blow down — 2 KLD (having TD(l)S <=15,000 mg/l, & COD <= 15,000 mg/l) after pre-treatment	2.0	After treatment at CETP, M/s. Hetero Infrastructure, SEZ to guard ponds and then into sea through marine outfall at a distance of 981 metres from seashore at a depth of Minimum 13 metres.
3	Domestic effluents (after treatment in STP at M/s. Hetero Infrastructure SEZ Ltd.,)	25.0	Green belt development within the Premises after treatment in Common STP located at M/s.Hetero Infrastructure Ltd., SEZ.

ETP Details & Mode of Disposal: (after CPM) : Not proposed any changes in the existing ETP

08) Hazardous /Solid Waste details:

S. No	Solid waste	Quantity as per CFE order dt.13.12.2013	Quantity as per CFE order dt.31.10.2016	Quantity after CFE(CPM)	Method of disposal
1.	Organic residue	3.76 TPD	3.33 TPD	3.866TPD	To TSDF for incineration/ Cement industries for Co-Processing
2.	Spent carbon	0.832TPD	0.395 TPD	0.337 TPD	
3.	Process waste - Inorganic	1.10 TPD	0.411 TPD	1.104 TPD	To TSDF for secured land fill.
4.	Empty barrels / containers liners contaminated with hazardous chemicals wastes	300 Nos/ Month	300 Nos/ Month	300 Nos/ month	After Detoxification disposed of to outside parties.
5.	Spent solvents	95 KLD	95 KLD	95 KLD	To covered and recycled within the HIL, SEZ / sent to authorized recyclers
6.	Damaged or Expired Raw materials	- -	--	200 Kg/day	To be sent to TSDF, Parawada for secured landfilling or to cement industries after mixing with Organic Residue
7.	Damage or Rejected APIs/products	- -	--	200 Kg/day	To be sent to the cement industries for co-incineration in the kiln or TSDF, Parawada, Visakhapatnam Dist. For incineration.
8.	Used PPEs	-	--	1.5TPD	To be sent to either TSDF or Cement Industries for Incineration or to be Disposed in dual Chamber Incinerator in house.
9.	Container & Container Liners of Hazardous waste & Hazardous Chemicals	-	--	1000 No./ Month	After detoxification it shall be disposed to the outside agencies/authorised recyclers.
10.	Used/Waste Oil	-	--	500Ltrs/ Month	To be sent to Authorized reprocesses /Recyclers.
11.	Lead acid Batteries	-	--	50 No.s /Month	To be returned to the authorised dealers on buy back basis
12.	LDPE Paper	-	--	40Ton/ month	Sent to Authorized Recyclers approved by APPCB/CPCB.
13.	e-Waste/ electrical waste	-	--	2.0 Ton/ month	Sent to Authorized Recyclers approved by APPCB/CPCB.

Note: The permitted solid waste generation as per the EC is 96 TPD. At present, three units are operating in SEZ and the total waste generation of all three units as per the CFOs is below 20 TPD.
As per the details furnished by the industry of hazardous waste Disposed during the period from Oct-21 to Mar-22 & stock at site are as follows:

Type of Waste	Quantity in Kg		
	Generation	Disposed	Stock
Process inorganic salt	0.27	0	16.3
Spent carbon	22570	24960	24650
Organic residue	119680	120620	11880
Spent Solvents	--	--	60 KL
Used oil	1000 litre	--	1000 litre
Used lead acid batteries	300 No.s	-	500 No.s

09) Air pollution:

Emissions from fuel burning : No separate Boiler for this unit. The industry is drawing steam from M/s. Hetero Infrastructure Ltd., SEZ.

AS per CFO Order dt: 31.10.2018

S.No.	Source of Pollution
1-14	Attached to Scrubbers of Process emissions

After CPM: No change

10) Court cases:
It is to submit that Sri Kambala Ammoriya & Others, Nakkapalli Mandal, Visakhapatnam District has filed an application in Hon'ble NGT against M/s. Hetero Infrastructure SEZ Ltd., & M/s. Hetero Laboratories Ltd, N-Narasapur Village, Nakkapalli Mandal, Visakhapatnam District. The Hon'ble NGT order dated:21.02.2022 in OA No. 23 of 2022 has appointed a Joint Committee and directed the committee to inspect the area in question and submit a factual as well as action taken report, if there is any violation found. The officials from APPCB along with the joint committee inspected on 29.03.2022 & 30.03.2022 and submitted interim report to Hon`ble NGT on 01.04.2022.

11) Compliance status of directions stipulated in Task Force order dated: 29.06.2017

S. No.	Condition	Compliance
1.	The industry shall obtain revocation of closure order from CPCB, New Delhi.	The industry has obtained revocation from CPCB on 19.12.2022.
2.	The industry shall complete the installation of fume extraction system with hood and connect to scrubber to control odour nuisance within 2 months.	The industry has installed fume extraction system.

3.	The industry shall provide multistage scrubbers along with pH meters for all the reactors within 3 months.	The industry has installed double stage scrubbers. During inspection of the Joint Committee, it was observed that some of the scrubbers are not working properly due to poor maintenance and also observed odour near the production blocks.
4.	The industry shall provide data logger system to pH meter within one month.	The industry installed pH meters with data logger to the scrubbers
5.	The industry shall comply all directions issued by the Board vide order dt.23.07.2016.	----
6.	The industry shall ensure continuous compliance of the conditions issued in the CFO & HWA order.	Reported at Column No.20.

12) Compliance status of conditions stipulated in Consent Order No : dt:31/10/2018

SNo.	Condition	Compliance
Air Pollution:		
18.	The evaporation losses in solvents shall be controlled by taking suitable measures, which include: i. Chilled brine circulation to effectively reduce the solvent losses into the atmosphere. ii. Transfer of solvents by using pumps and closed conveyance instead of manual handling. iii. Closed centrifuges be used due to which solvent losses are reduced drastically. iv. The reactor vents connected with primary & secondary condensers to catch the solvent vapours. v. All the solvent storage tanks are connected with vent condensers to prevent solvent vapours.	 Complied Complied Complied Provided Not provided. The industry provided Nitrogen blanketing & Water sprinkling system.
20.	The industry shall not use odour causing substances such as Mercaptan or cause odour nuisance in the surroundings.	Directed to comply
GENERAL:		
23.	The industry shall send the used /spent solvents to the recyclers authorized by APPCB and shall process them at their own solvent recovery plant within the plant premises.	Not installed own solvent recovery unit (SRU) within the plant premises and sending spent solvents to the authorized recyclers.
24.	The industry shall process the used/spent solvents in the own solvent recovery unit (SRU) within the plant premises to the extent possible and remaining if any, shall be sent to the recyclers authorized by APPCB.	

38.	Any other directions / circulars / notices issued by CPCB, MoEF&CC and APPCB shall be followed from time to time.	Directed to comply

13) Remarks of the Inspection Officer:

a) M/s. Hetero Drugs Ltd., Unit-IX is operating a Bulk Drug manufacturing unit Plot No. 1 of Hetero Infrastructure SEZ Ltd., N. Narsapuram (V), Nakkapalli (M), Visakhapatnam Dist., in an extent of 11.50 Acres and with a capital investment of Rs.150.12 Cr.

b) The industry has obtained CFO & HWA of the Board on 31.10.2018 with 29 Regular Products & 41 Campaign Products and permitted to manufacture any 14 products in worst case scenario of 6 from Regular & 8 Campaign Products limited to manufacture 3533.30 Kg/day. The CFO & HWA is valid up to 31.07.2022.

c) Now, the industry proposed for Change of product mix of the Board with certain changes. Now, the industry proposed for Change of product mix and applied for CFE (CPM) of the Board with the following changes:

   a. Added 6 new campaign Products and validation Products.
   b. Dropped 8 regular products & 22 campaign products & out of 90 permitted products.
   c. Total 53 products including validation Products with a maximum production capacity of 3386 Kg/day.
   d. The industry proposed to produce 05 regular products and 07 campaign products with maximum production capacity of 3386 Kgs/day.
   e. Production capacity decreases from 3533.32 Kgs/day to 3386 Kg/day.
   f. No change in water consumption and wastewater generation decreases from 89.73 KLD to 89.667 KLD.
   g. The industry has proposed to install Solvent Recovery System.
   h. The generation of organic residue increases from 3.76 to 3.866 TPD after (CPM).

d) The industry was inspected on 13.04.2022 and observed the following:

- The industry is in operation.
- The industry is having 5 no. of production blocks, Hydrogenation Block, QA & QC block and ware house.
- The industry is utilizing common facilities of Boiler, stripper, ETP, STP, MEE from M/s. Hetero Infrastructure SEZ Ltd.,
- The industry is collecting effluents in above ground MS tanks and same transferred to M/s. Hetero Infrastructure SEZ Ltd., for further treatment.
- The industry has installed 13 No. of double stage scrubber for production blocks, ware house and solvent yards to control process emissions. The industry has installed 6 No.s of online pH meters to the 6 scrubbers and other online pH meters to the remaining scrubbers are under installation.

- The industry has constructed separate shed for storage of drums with dyke wall.
- **The SSR & GLR installed by the industry as follows:**

BLOCK	SS Reactors	GL Reactors
A-BLOCK	24	8
B-BLOCK	22	10
C-BLOCK	7	8
D-BLOCK	17	19
E-BLOCK	5	-
F-BLOCK	6	5
PHARMA-I&II	9	-
Total	90	50

- The industry has provided safety equipment viz., SRV, fire module, water sprinkling system and rupture discs to the reactors and the industry has connected GLRs- 50 No.s to double stage scrubber to control process emissions and the industry has not connected SSR-90 No.s to the Scrubber.
- The industry has constructed runoff tank for collection tank of 60 KL for storage of first flush storm water and provided provision to pump the 1st flush runoff water into LTDS effluent collection tank.
- The industry has provided flame arrestors, nitrogen blanketing, auto detection and water sprinkler system and not provided condensers.
- The industry has installed web camera & flow meters and same connected to CPCB and APPCB website in M/s. Hetero Infrastructure SEZ Ltd.,
- The discharge of treated effluents through marine outfalls is taken up under the direct supervision of APPCB officials by following the set of Standard Operating Procedures (SOPs) prepared by the APPCB for this purpose.
- M/s.Hetero Infrastructure SEZ Ltd., is operating STP of capacity 300 KLD and after treatment, the treated wastewater areutilized for gardening.
- The emission from the chimney was not visible. During inspection the particulate matter (PM) recorded in online emission monitoring system connected to 45 TPH Coal Fired Boiler operating in M/s.Hetero Infrastructure SEZ Ltd., is 55.37 mg/Nm3, within the APPCB standards.
- The industry has installed 3 CAAQMS in the industry for continuous monitoring of air quality. Ambient air quality monitoring values recorded in CAAQMS at the time of inspection are submitted below:

Location of the CAAQM	Value in µg/m^3			
	PM_{10}	$PM_{2.5}$	SO_2	NO_x
North-East Gate	32.0	7.0	49.79	3.86
Near North Gate	60.0	13.8	21.9	18.25
Near South Gate	20.0	11.0	49.19	5.04

Standard	100	60	80	80

As per the above results the values are within the APPCB Standards.

- M/s.Hetero Infrastructure SEZ Ltd., is operating an ETP of capacity 550 KLD and all the units of Effluent Treatment plant were in operation and the industry was discharging treated effluents stored in guard ponds into the sea through marine out fall pipeline 2.3 KM off shore and 0.9 KM on shore under the field supervision of APPCB officials. The industry has installed online Continuous Effluent Monitoring System (CEMS) to monitor the parameters viz., pH, TSS, COD, BOD installed web cameras for the marine pipeline to verify the status of the treated effluent being discharged and CEMS is connected to the CPCB/APPCB web site. The marine discharge flow recorded during the inspection was 149.9 m^3 / hr. The pH, TSS, COD & BOD values noticed in the online effluent monitoring system during the marine discharge were 7.32, 6.74 mg/l, 10.59 mg/l & 1.65 mg/l respectively.
- M/s.Hetero Infrastructure SEZ Ltd., has provided dedicated hazardous waste storage shed with capacity 1000 Sq.mts and provided fire fighting equipments. Dedicated compartments are provided for storage of Hazardous waste based on the category of waste i.e., Organic Residue, Spent Carbon, Inorganic waste. The industry submitting annual returns in Form-IV as required under HWM Rules,2016.

e) The industry is having valid PLI policy which includes ERF amount of Rs. 58,032/-, which is valid up to 26.02.2023.

f) The industry is having PESO permission for storage of petroleum products-744 KL, which is valid upto 31.12.2024.

g) The industry has obtained NOC for occupancy from A.P. State Disaster Response and Fire Services Department order dt: 05.05.2020 valid up to 04.05.2023.

14) Recommendations of the Regional Officer:

1. An incident was occurred while carrying out the Telmisartan 3rd stage in the reactors which are using for recovery of DMSO spent solvents in the premises of M/s.Hetero Infrastructure SEZ Ltd., for which the APPCB has not given permission for manufacturing of the bulk drugs & API. The compensation calculated for violation of consent conditions as per the CPCB methodology. The EE, APPCB, Regional Office, Visakhapatnam submitted a report to Board Office, APPCB, Vijayawada to impose Environmental compensation of Rs.86,25,000/-for violating the conditions stipulated by the APPCB for manufacturing API products in the premises of M/s.Hetero Infrastructure SEZ Ltd., without obtaining CFE & CFO of the APPCB. The copy of the report is herewith enclosed.
2. Sri Kambala Ammoriya & Others, Nakkapalli Mandal, Visakhapatnam District has filed an application in Hon'ble NGT against M/s. Hetero Infrastructure SEZ Ltd., & M/s. Hetero Laboratories Ltd, N-Narasapur Village, Nakkapalli Mandal, Visakhapatnam District. The Hon'ble NGT order dated:21.02.2022 in OA No. 23 of 2022 has appointed a Joint Committee and directed the committee to inspect the area in question and submit a factual as well as action taken report, if there is any violation found. The officials from APPCB along with the joint committee inspected on 29.03.2022 & 30.03.2022 and submitted interim report to Hon`ble NGT on 01.04.2022. Copy of the report is herewith enclosed.

In view of the above, the issue of CFE (CPM) to the industry may be examined after payment of balance fee of Rs.13,88,900/- by incorporating the following conditions along with other necessary conditions:

- The industry shall provide online pH meters with data loggers to all scrubbers
- The industry shall connect the two stage scrubber to all SS reactors to control process emissions as the nearby public are complaining on odour nuisance during operation of the industries in Hetero complex.
- The industry shall install separate energy meter to the scrubber connected to the process reactors to ensure the continuous operation of the scrubber.
- The industry shall provide vent Condensers to the solvent Storage tanks to prevent solvent vapours.
- The industry shall construct Solvent recovery unit as per the SOP issued by CPCB for Utilization of Spent Solvent for Recovery of Solvent specified for Solvent Recovery Units.
- The industry shall strictly comply with the directions of the Hon`ble NGT in OA No. 23 of 2022 if any.

15) Head Office Remarks:

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iv. The industry proposed to produce 05 regular products and 07 campaign products with maximum production capacity of 3386 Kgs/day.

v. Production capacity decreases from 3533.32 Kgs/day to 3386 Kg/day.

vi. No change in water consumption and wastewater generation decreases from 89.73 KLD to 89.667 KLD.

vii. The industry has proposed to install Solvent Recovery System.

viii. The generation of organic residue increases from 3.76 to 3.866 TPD after (CPM).

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- The industry is collecting effluents in above ground MS tanks and same transferred to M/s. Hetero Infrastructure SEZ Ltd., for further treatment.
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A-Block	24	8
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C-Block	7	8
D-Block	17	19
E-Block	5	-
F-Block	6	5
Pharma-I&II	9	-
Total	90	50

- The industry has provided safety equipment viz., SRV, fire module, water sprinkling system and rupture discs to the reactors and the industry has connected GLRs- 50 No.s to double stage scrubber to control process emissions and the industry has not connected SSR-90 No.s to the Scrubber.
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- The industry has installed web camera & flow meters and same connected to CPCB and APPCB website in M/s. Hetero Infrastructure SEZ Ltd.,

- The discharge of treated effluents through marine outfalls is taken up under the direct supervision of APPCB officials by following the set of Standard Operating Procedures (SOPs) prepared by the APPCB for this purpose.
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Location of the CAAQM	**Value in µg/m^3**			
	PM_{10}	**$PM_{2.5}$**	**SO_2**	**NO_x**
North-East Gate	32.0	7.0	49.79	3.86
Near North Gate	60.0	13.8	21.9	18.25
Near South Gate	20.0	11.0	49.19	5.04
Standard	100	60	80	80

As per the above results the values are within the APPCB Standards.

- M/s.Hetero Infrastructure SEZ Ltd., is operating an ETP of capacity 550 KLD and all the units of Effluent Treatment plant were in operation and the industry was discharging treated effluents stored in guard ponds into the sea through marine out fall pipeline 2.3 KM off shore and 0.9 KM on shore under the field supervision of APPCB officials. The industry has installed online Continuous Effluent Monitoring System (CEMS) to monitor the parameters viz., pH, TSS, COD, BOD installed web cameras for the marine pipeline to verify the status of the treated effluent being discharged and CEMS is connected to the CPCB/APPCB web site. The marine discharge flow recorded during the inspection was 149.9 m^3 / hr. The pH, TSS, COD & BOD values noticed in the online effluent monitoring system during the marine discharge were 7.32, 6.74 mg/l, 10.59 mg/l & 1.65 mg/l respectively.
- M/s.Hetero Infrastructure SEZ Ltd., has provided dedicated hazardous waste storage shed with capacity 1000 Sq.mts and provided fire fighting equipments. Dedicated compartments are provided for storage of Hazardous waste based on the category of waste i.e., Organic Residue, Spent Carbon, Inorganic waste. The industry submitting annual returns in Form-IV as required under HWM Rules,2016.

e) The industry is having valid PLI policy which includes ERF amount of Rs. 58,032/-, which is valid up to 26.02.2023.

f) The industry is having PESO permission for storage of petroleum products-744 KL, which is valid upto 31.12.2024.

g) The industry has obtained NOC for occupancy from A.P. State Disaster Response and Fire Services Department order dt: 05.05.2020 valid up to 04.05.2023.

h) The RO: Visakhapatnam mentioned the following:

- An incident was occurred while carrying out the Telmisartan 3rd stage in the reactors which are using for recovery of DMSO spent solvents in the premises of M/s.Hetero Infrastructure SEZ Ltd., for which the APPCB has not given permission for manufacturing of the bulk drugs & API. The compensation calculated for violation of consent conditions as per the CPCB methodology. **The EE, APPCB, Regional Office, Visakhapatnam submitted a report to Board Office, APPCB, Vijayawada to impose Environmental compensation of Rs.86,25,000/-for violating the conditions stipulated by the APPCB for manufacturing API products in the premises of M/s.Hetero Infrastructure SEZ Ltd., without obtaining CFE & CFO of the APPCB.**
- Sri Kambala Ammoriya & Others, Nakkapalli Mandal, Visakhapatnam District has filed an application in Hon'ble NGT against M/s. Hetero Infrastructure SEZ Ltd., & M/s. Hetero Laboratories Ltd, N-Narasapur Village, Nakkapalli Mandal, Visakhapatnam District. The Hon'ble NGT order dated:21.02.2022 in OA No. 23 of 2022 has appointed a Joint Committee and directed the committee to inspect the area in question and submit a factual as well as action taken report, if there is any violation found. The officials from APPCB along with the joint committee inspected on 29.03.2022 & 30.03.2022 and submitted interim report to Hon`ble NGT on 01.04.2022. An extract of the report (Conclusions) is enclosed for kind information.

i) **The industry may be examined after payment of balance fee of Rs.13,88,900/- by incorporating the following conditions along with other necessary conditions**:

- The industry shall provide online pH meters with data loggers to all scrubbers
- The industry shall connect the two stage scrubber to all SS reactors to control process emissions as the nearby public are complaining on odour nuisance during operation of the industries in Hetero complex.
- The industry shall install separate energy meter to the scrubber connected to the process reactors to ensure the continuous operation of the scrubber.
- The industry shall provide vent Condensers to the solvent Storage tanks to prevent solvent vapours.
- The industry shall construct Solvent recovery unit as per the SOP issued by CPCB for Utilization of Spent Solvent for Recovery of Solvent specified for Solvent Recovery Units.
- The industry shall strictly comply with the directions of the Hon`ble NGT in OA No. 23 of 2022 if any.

The item is placed before the CFE Committee for taking a decision.

HETERO INFRASTRUCTURE SEZ LTD

Compliance to the Task Force Directions issued vide Order No: 125/APPCB/UH-II/TF/VSP/2016 Dated 30/11/2016

S.No	Direction	Compliance
1	The SEZ shall not operate Power plant of capacity 6.1MW till they obtain EC from MoEF & CC and CFE/CFO of the board.	**Complied.** The industry obtained EC amendment for installation of 6.1 MW captive power plant dated 15/06/2018 and subsequently obtained CFE/CFO of the Board. Copy of EC Amendment is enclosed as **Annexure-I.**
2	The SEZ shall pursue all the units located in SEZ Area and non SEZ area to produce only consented products with consented capacities	**Complying.** SEZ is pursuing with the units for producing consented products & Capacities. The industries are obtaining CFE/CFO-CPM as and when required from the Board.
3	The SEZ Shall obtain CFE/CFO amendment for Boiler Configuration with 45TBH Boiler	**Complied.** The industry has obtained CFE/CFO for the 45 TPH boiler Configuration. Copy of CFO is enclosed as **Annexure-II.**
4	The SEZ Shall Approach to MoEF regarding discrepancy of availability of land for all the units issued Environmental Clearance (EC).	**Complied.** To avoid land discrepancy of availability of Land, the industry has applied for denotification of land from SEZ to Non SEZ from Govt. of Andhra Pradesh. But due to various reasons, denotification file was not cleared at that time. Again in 2020, the industry has applied to the Govt. of Andhra Pradesh for alienation of Govt.Lands in and around the premises. The govt has alienated the 81.03 Acres of land in favour of M/s Hetero infrastructure SEZ Ltd vide G.O.MS.No. 163 dated 09/07/2021 of Revenue (Land-I) Department of Govt. of Andhra Pradesh**.** Copy of **"Land handover certificate"** issued by Tahsildar is enclosed as **Annexure-III** and details of total land available with Hetero is enclosed as **Annexure-IV.**
5	The SEZ shall provide digital flow meter for LTDS effluent at the inlet of ETP within 1 month	**Complied.** The industry has installed Digital flowmeters for both LTDS & HTDS effluents at the inlet of ETP and are connected to APPCB & CPCB websites. Photographs of the Flow meter installations are shown below:

		 
6	The SEZ shall construct leachate collection system followed by dyke walls for newly constructed hazardous waste storage shed within 30days	**Complied.** The SEZ has constructed separate compartments for waste segregation and leachate collection pit with pumping arrangement. Photograph of the installation is shown below: 
7	The SEZ shall obtain the CFO amendment for all the effluents generating from the SEZ and non-SEZ units immediately.	**Complied.** SEZ has obtained CFO by combining effluents of both SEZ & non SEZ units. Copy of CFO is enclosed as **Annexure-II.**
8	The SEZ shall operate Bioassay test Facility continuously.	**Complied.** The SEZ has installed Bioassay test facility and operating continuously in house. Photograph of the Bioassay test facility is enclosed as **Annexure-V.** Further, as per the directions of APPCB, M/s Hetero Infrastructure SEZ Ltd has assigned the work of carrying Bio-assay test & Trace elements in the

		treated effluent before discharging into Sea on monthly basis for one year to National Institute of Oceanography (NIO). Copy of the report issued by NIO is enclosed as **Annexure-VI**.
9	The SEZ shall obtain public liability insurance policy for Hetero Infrastructure SEZ Ltd, within one week.	**Complied.** M/s Hetero Infrastructure SEZ Ltd has obtained Public Liability Insurance policy in the year 2017. Copy of Latest PLI policy is enclosed as **Annexure-VII.**
10	The SEZ shall cover remaining 2 equalization tanks with FRP hoods, and the vents are to be connected to scrubbers to control odor nuisance within 3 months	**Complied.** The industry has covered all equalization tanks with FRP hoods and the vents of hoods are connected to the scrubbers to avoid odour nuisance. Photograph of Hoods and scrubbers are shown below:  
11	The SEZ shall install VOC analyzer immediately at CETP area within 1 month.	**Complied.** The industry has installed VOC analyzer in CETP area and connected to APPCB website for continuous monitoring. Photograph of installation is shown below:

		
12	The SEZ shall connect remaining 2 CAAQM stations to board website immediately	**Complied.** M/s Hetero Infrastructure SEZ Ltd has installed 03 CAAQM stations and are connected to APPCB website.
13	The SEZ Shall ensure continuous compliance of CFO & HW Authorization conditions issued by the Board vide order dt: 16.02.2015	**Complying.** SEZ is complying with the conditions of CFE&HW authorization and submitting compliance reports to the Board half yearly through online.

F.No. 21-641/2007-IA.III

Government of India
Ministry of Environment, Forest and Climate Change
(Impact Assessment Division)

Indira Paryavaran Bhawan,
Jor Bagh Road, Aliganj
New Delhi - 110 003

Dated: 15th June, 2018

To

The Director
M/s Hetero Infrastructure SEZ Limited
Hetero Corporate
7-2-A2, Industrial Estate, Sanath Nagar
Hyderabad - 500 018

Sub: Development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Narasapuram village, Nakkapalli Mandal, Visakhapatnam District (Andhra Pradesh) by M/s Hetero Infrastructure SEZ Ltd. - Amendment to Environment clearance regarding.

Sir,

This has reference to your letter No. nil submitted online on 2nd June, 2016 and subsequent clarifications vide letters dated 25th January, 2018, 28th March, 2018 and 12th April, 2018 on above mentioned subject.

2. The ministry had earlier issued environmental and CRZ clearance to the project for the Development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Survey No. 215, 286/1, 286/2, 283/1, in CH. Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19 (Part) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 512 at N. Narsapuram Village, Nakkapally Mandal, Visakhapatnam District, Andhra Pradesh by M/s Hetero Infrastructure SEZ Ltd., vide Ministry's letter of even no. dated 25th October, 2010, as per the provisions of the Environment Impact Assessment (EIA) Notifification, 2006 and subsequent amendments under the Environment (Protection) Act, 1986. The validity of the environment and CRZ clearance was extended for a period of 3 years, i.e., upto 24th October, 2020 vide Ministry's letter of even no. dated 13th October, 2017.

3. The proposal is for amendment of Environment Clearance for Development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Narasapuram village, Nakkapalli Mandal, Visakhapatnam District (Andhra Pradesh) by M/s Hetero Infrastructure SEZ Ltd. was considered by the Expert Appraisal Committee (Infra-1) in its meetings held on 16-17 January,

2017, 6-7 April, 2017 and 24th January, 2018 in the Ministry, Indira Paryavaran Bhawan, New Delhi.

4. The details of the project, as per the documents submitted by project proponent, and also as informed during the above said EAC meetings with the help of EIA Consultant Team Labs Limited, Hyderabad, are reported to be as under:

(i) The proposal is for the Development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Survey No. 215, 286/1, 286/2, 283/1, in CH. Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19 (Part) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125, 126, 129/1 to 129/9, 138, 142, 150, 512 at N. Narsapuram Village, Nakkapally Mandal, Visakhapatnam District, Andhra Pradesh by M/s Hetero Infrastructure SEZ Ltd.

(ii) The project is located at the intersection of longitude 83^0 39'25"(E) and latitude 18^0 08'21" (N).

(iii) The proposal is for inclusion of Turbine only, and does not entail any increase in permitted pollution loads of Environment Clearance obtained. vide letter No. 21-641/2007-IA.III dated 25.10.2010.

(iv) Installation of turbine to generate 6.1 MW power utilizing steam from existing 45 TPH coal fired boiler in existing SEZ.

(v) Total land area is 138.51 Ha. No additional land required for proposed installation of turbine in existing SEZ.

(vi) **Water requirement and Wastewater generation:**

Description	As per EC	Utilized	Balance
Water Consumption (KLD)	1644	1315.15	328.85
Wastewater Generated (KLD)	1130.6	595.08	535.52

(vii) **Investment cost:** Rs. 11.45 crores for installation installation of turbine and other accessories for transfer of power.

(viii) **Employment potential:** No additional employment.

(ix) **Benefits of the project:** The project is a net gain, as power is generated with the envisaged utilities only.

(x) There is no court case pending against the project.

5. Based on the recommendation of EAC in its 183rd meeting held on 24th December, 2018, the Ministry hereby issues the amendment to environment clearance dated 25th October, 2010 in favour of M/s Hetero Infrastructure SEZ Ltd. for installation of turbine to generate 6.1 MW power utilizing steam from existing 45 TPH coal fired boiler in existing Hetero SEZ area with following specific conditions in

RBK

addition to existing EC conditions issued vide MoEF&CC's letter No. 21-641/2007 dated 25th October, 2010.

(i) The proponent should obtained necessary clearance for co-generation of 6.1 MW power plant.

(ii) Groundwater level shall also be monitored along with groundwater quality on quarterly basis and report to be submitted to the Ministry's Regional Office, Chennai.

6. All other conditions stipulated in the Environmental Clearance letter No. 21-641/2007-IA.III dated 25th October, 2010, shall be unchanged.

15/6/2018
(Raghu Kumar Kodali)
Director/Scientist F

Copy to: -

(1) The Chairman, CPCB, Parivesh Bhawan, CBD-cum-Office Complex, East arjun Nagar, Delhi - 110 032..

(2) The member Secretary, Andhra Pradesh Pollution Control Board, Paryavaran Bhawan, IA-III, Industrial Area, Sanathynagar, Hyderabad - 18..

(3) The Additional Principal Chief Conservator of Forest (C), Ministry of Environment, Forest and climate change, Regional Office (SEZ), 1st and 2nd Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nangambakkam, Chennai - 34.

(4) Monitoring Cell, IA Division, MoEF&CC, New Delhi.

(5) Guard File.

15/06/2018
(Raghu Kumar Kodali)
Director/Scientist F

ANDHRA PRADESH POLLUTION CONTROL BOARD
D.No.33-26-14D/2, Near Sunrise Hospital, Pushpa Hotel Centre,
Chalamavari Street, Kasturibaipet, Vijayawada - 520 008
Phone. No.0866-2436217, Website : www.appcb.ap.nic.in

RED CATEGORY
RENEWAL OF CONSENT & AUTHORISATION ORDER
BY REGISTERED POST WITH ACKNOWLEDGEMENT DUE

Consent Order No : APPCB/VSP/VSP/219/CFO/HO/2017- Date: 11.12.2017

CONSENT is hereby granted for Operation under section 25/26 of the Water (Prevention & Control of Pollution) Act, 1974 and under section 21 of Air (Prevention & Control of Pollution) Act 1981 and amendments thereof and Authorisation under Rule 6 of the Hazardous & Other Wastes (Management and Transboundary, Movement) Rules, 2016 and the rules and orders made there under (hereinafter referred to as 'the Acts', `the Rules') to:

M/s. Hetero Infrastructure SEZ Ltd.,
N. Narsapuram, Ch. Lakshmipuram,
Rajaihpet, Pedda Teernala (V),
Nakkapalli (M),
Visakhapatnam District- 531081
E-mail: KullayiReddy.S@heterodrugs.com

(Hereinafter referred to as 'the Applicant') authorizing to operate the industrial plant to discharge the effluents from the outlets and the quantity of emissions per hour from the chimneys as detailed below:

i) Out lets for discharge of effluents:

Outlet No.	Outlet Description	Max Daily Discharge (KLD)
1.	**Process & Washings** (**M/s. Hetero Drugs Ltd., Unit-IX, Plot No.1 - 62.73 KLD + M/s. Hetero Labs Ltd., Unit-IX, Plot No.2 - 101.13 KLD + M/s. Honour Labs Ltd., Unit-III - 30.874 KLD** + Hetero Labs Unit - III - 261.0 KLD)	455.734
2.	**Cooling tower blow down & Boiler blow down** (M/s. Hetero Drugs Ltd., Unit - IX, Plot No.1, 4.00 KLD + M/s. Hetero Labs Ltd., Unit - IX, Plot No.2 - 4.00 KLD +M/s. Honour Labs Ltd., Unit - III - 4.00 KLD + Process & Washings - 1.354 KLD)	79.354 KLD
3.	**RO Rejects** M/s. Hetero Labs, Unit-III	
3.	**Domestic**	60.0

Stream	Description of stream	Point of disposal
1.	HTDS & HCOD effluents (having TD (I) s ≥ 15,000 mg/l & COD ≥ 15,000 mg/l LTDS & HCOD effluents: (TD(I)S:<15,000 mg/l & COD:>15,000 mg/l)	Shall be treated in Stripper, MEE & ATFD at CETP, M/s. Hetero Infrastructure, SEZ. Stripper condensate to recycle, MEE condensate to Boilogical ETP, MEE salts to TSDF.
3.	LTDS & LCOD effluents (having TD(I)S < 15,000 mg/l & COD < 15,000 mg/l)	After treatement at CETP, M/s. Hetero Infrastructure, SEZ to guard ponds and then into sea through marine outfall at a distance of 981 metres from seashore at a depth of minimum 13 metres.
4.	Domestic effluents after treatment in STP	Green belt development within the premises after treatment in Common STP located at M/s. Hetero Infrastructure Ltd.,

ii) Emissions from chimneys:

Chimney No.	Description of Chimney	Quantity of Emissions in m3/hr. at peak flow
1.	Attached to 1 x 45 TPH Coal fired boiler	--
2.	Attached to 1 x 10 TPH Coal fired boilers	--

3.	Attached to 2 x 6 TPH Coal fired boilers	--
4.	Attached to 1 x 20 TPH Coal fired boilers	--

iii) **HAZARDOUS WASTE AUTHORISATION (FORM - II) [See Rule 6 (2)]**

M/s. Hetero Infrastructure SEZ Ltd., in N. Narsapuram, Ch. Lakshmipuram, Rajaihpet, Pedda Teernala & (V), Nakkapalli (M), Visakhapatnam District, is hereby granted an authorization to operate a facility for collection, reception, storage, treatment, transport and disposal of Hazardous Wastes namely:

The cumulative solid waste generation of all streams from all member units of SEZ shall not exceed 96 TPD as per EC dt: 25.10.2010.

- **HAZARDOUS WASTES WITH DISPOSAL OPTION:**

S. No.	Name of the Hazardous Waste	Stream	HLL - III as per CFO order dt 06.08.15	HDL - IX As per CFO Order dated 04.05.17	HLL - IX as per CFO order dated 27.02.15	Honour as per CFO order dated 23.08.17	Disposal Option
1.	Solvent residue	28.1 of Schedule-I	12.793	3.33	4.99	1.391	Authorised Cement plants for co-processing / TSDF, Parawada, Visakhapatnam District for incineration.
2.	Spent carbon	28.3 of Schedule-I	2.036	0.395	1.36	0.321	
3.	ETP sludge	35.3 of Schedule - I	0.2	---	----	---	To TSDF, Parawada, Visakhapatnam District for secured land filling through M/s. Hetero Infrastructure Ltd., Hetero SEZ.
4.	Multiple Effect Evaporation or Forced Evaporation & Incineration ash	35.3 of Schedule - I	9.264	3.222		0.77	
5.	Process solid waste - Inorganic	28.1 of Schedule - I	2.479	0.411	2.1	0.208	

- **HAZARDOUS WASTES WITH RECYCLING OPTIONS:**

S. No.	Name of the Hazardous Waste	Stream	HLL - III as per CFO order dt 06.08.15	HDL - IX As per CFO Order dated 04.05.17	HLL - IX as per CFO order dated 27.02.15	Honour as per CFO order dated 23.08.17	Disposal Option
1.	Used /Waste Oils	5.1 of Schedule - I	180 LPM	150 LPM	150 LPM	150 LPM	Authorised reprocessors/ recyclers.
2.	Spent Solvents	28.6 of Schedule - I	204.7 KLD	95 KLD	205 KLD	120.59 KLD	Shall be recycled with in the HIL - SEZ / sent to authorized recyclers
3.	Recovered solvents	28.6 of Schedule - I	195.1 KLD	----	----	116.81 KLD	To be recycled within the industry or sold to outside parties.

4.	Container & Container liners of Hazardous waste & Hazardous chemicals	33.1 of Schedule - I	2600 No/Month	300 Nos/ month	400 Nos. / month	800 Nos. / month	After complete detoxification shall be disposed to outside agencies.

This consent order is valid for operation of the following four units with production quantities permitted in the respective CFO orders and for operation of CETP:

Products
To operate 4 Nos. of manufacturing units with utilities in SEZ (i.e., M/s. Hetero Drugs Ltd., **Unit-IX-Plot No:1** ; M/s. Hetero Labs Ltd., **Unit-IX, Plot No.2, M/s. Hetero Labs Ltd., Unit-III & M/s. Honour Labs Ltd., Unit-III**)

This order is subject to the provisions of `the Acts' and the Rules' and orders made thereunder and further subject to the terms and conditions incorporated in the schedule A, B & C enclosed to this order.

This combined order of consent & Hazardous Waste Authorisation shall be valid for a period ending with the **31st day of December, 2022.**

Sd/-
MEMBER SECRETARY

To
M/s. Hetero Infrastructure SEZ Ltd.,
N. Narsapuram, Ch. Lakshmipuram,
Rajaihpet, Pedda Teernala (V),
Nakkapalli (M),
Visakhapatnam District.

// T.C.F.B.O. //

12/12/17

Joint Chief Environmental Engineer
Unit Head-IV

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.
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.
3. All the rules & regulations notified by Ministry of Law and Justice, Government of India regarding Public Liability Insurance Act, 1991 should be followed as applicable.
4. The industry should put up two sign boards (6x4 ft. each) at publicly visible places at the main gate indicating the products, effluent discharge standards, air emission standards, hazardous waste quantities and validity of CFO and exhibit the CFO order at a prominent place in the factory premises.
5. Not withstanding 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.
6. The industry shall file the water cess returns in Form-I as required under section (5) of Water (Prevention and Control of Pollution) Cess Act, 1977 on or before the 5th of every calendar month, showing the quantity of water consumed in the previous month along

with water meter readings. The industry shall remit water cess as per the assessment orders as and when issued by Board.

7. 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.
8. 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. 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.
9. 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 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.

SCHEDULE - B

WATER POLLUTION:

1. The treated effluent discharged from CETP into Guard ponds and at marine outfall shall not contain constituents in excess of the tolerance limits mentioned below:

Outlet No.	Parameter	Concentration not to exceed limits in mg/l (except pH)
2	PH	5.5 to 9.0
	COD	250
	BOD (5 days at 20° C)	100
	Temperature at the point of discharge	45^0
	Oil and Grease	20
	Suspended Solids	100
	Total residual Chlorine	1.0
	Ammonical Nitrogen	50
	Arsenic (as As)	0.2
	Mercury (as Hg)	0.01
	Lead (as Pb)	1.0
	Cadimum (as Cd)	2.0
	Total Chromium (as Cr)	2.0
	Copper (as Cu)	3.0
	Zinc (as Zn)	15
	Selenium (as Se)	0.05
	Nickel (as Ni)	5.0
	Cyanide (as CN^-)	0.2
	Fluoride (as F)	15
	Sulphide (as S)	5.0
	Phenolic Compounds (as C_6H_5OH)	5.0
	Bio-assay test	90% survival of fish after 96 hours in 100% effluents.
*	All Efforts shall be made to remove colour and unpleasant odour as far as possible. The TDS of the treated effluents discharged from CETP at marine outfall shall not be more than the TDS of sea.	

2. The SEZ shall restrict water consumption to the quantities mentioned below:

S.No	Purpose	Quantity			
		Unit-IX-1	Unit-IX-2	Honour Labs, Unit-III	Hetero Labs Ltd., U-III
a.	Industrial cooling, boiler feed.	90.0	120.00	80.00	250
b.	Domestic & Gardening purposes	25.0	25.00	10.00	70
C.	Process, whereby water gets polluted and pollutants are easily bio degradable.	--	--	--	--
d.	*Processing, whereby water gets polluted and the pollutants are not easily bio - degradable.*	62.79	101.13	32.23	449
	Total	**177.79**	**246.13**	**122.23**	**769.0**

3. The units of SEZ shall segregate all the streams of waste water stipulated and dispose to CETP for further treatment.

AIR POLLUTION:

4. The emissions shall not contain constituents in excess of the prescribed limits mentioned below:

Chimney No.	Parameter	Emission Standards
1 - 4	Particulate Matter	115 mg/Nm^3

5. 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.
6. The industry shall comply with ambient air quality standards of PM_{10} (Particulate Matter size less than 10μm) - 100 μg/ m^3; $PM_{2.5}$ (Particulate Matter size less than 2.5 μm) - 60 μg/ m^3; SO_2 - 80 μg/ m^3; NO_x - 80 μg/m^3, 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).

GENERAL:

7. The industry shall comply with all the conditions of CFO.
8. The industry shall obtain revocation of closure order from APPCB
9. M/s Hetero Infrastructure shall not operate the captive power till they obtain EC/CFE/CFO of the Board.
10. The effluent quantity shall not exceed the permitted quantity of M/s. Hetero infrastructure from all the SEZ and Non-SEZ units.
11. The facility shall construct rainwater runoff tank for collection and storage of first flush storm water.
12. The industry shall comply the task force directions issued to Individual units located in SEZ & Non SEZ and Hetero Infra time to time.
13. The industry shall maintain Bio-Assay facility individually for each of the guard ponds with proper lining and leak proof construction and submit reports every month to the RO, Visakhapatnam.
14. The industry shall provide online VOC analyzer and submit compliance to Regional Office, Visakhapatnam.

15. The industry shall maintain online continuous effluent monitoring systems for pH, BOD, COD, TSS, Cr and As at the outlet of CETP before discharging to Sea and connect effluent monitoring system to APPCB/CPCB websites as per CPCB directions dated 05.02.2014.
16. The SEZ shall maintain online digital flow meters with totalizers at the inlet of CETP for each effluent stream as stipulated separately for each unit of SEZ/Non SEZ units, at inlet of Stripper, MEE, ATFD, condensate from MEE, inlet of each Guard pond and at marine outfall for continuous measurement. They shall maintain the flow meters in operating condition and shall regularly calibrate the efficacy of the performance.
17. Parameters such as BOD, DO, Suspended solids, Heavy Metals like Arsenic, Mercury, Lead, Chromium, Nickel, Cyanide, Phenolic compounds, Bio-Assay test etc shall be monitored before discharging into Sea. Also TDS levels in effluents shall not be more than TDS of Sea.
18. Records of unit wise quantities of different streams of effluents with flow meter readings shall be maintained to verify the effluent generation quantities for each unit.
19. The SEZ shall take proper care to nullify the effect of odour nuisance.
20. The SEZ shall co-ordinate with member units for segregation of effluents and shall ensure that separate leak proof, non corrosive tankers are used for carrying effluents containing Cyanide and heavy metals.
21. The SEZ shall own total responsibility for any illegal dumping elsewhere and for conveying the High TDS effluents to CETP and shall ensure implementation of adequate measures to prevent spillages / discharges of the effluents during loading and unloading the effluents.
22. The SEZ shall ensure that all the treatment facilities are impervious to prevent contamination of soil & ground water table.
23. The SEZ shall upgrade the contingency plan to prevent any leakages or accidental discharges outside the premises even during shock load / other events and shall own total responsibility for any leakages or discharges in any form outside the premises.
24. The recommendations of the NIO for maintenance of diffuser system and monitoring of aquatic life in the sea shall be done periodically by engaging the NIO. The consolidated trend analysis report of the marine aquatic life shall be submitted to the RO, VSP & ZO, VSP every three months.
25. The pipeline carrying the treated Low TDS effluents for marine disposal shall be buried at a safe depth. The operator of the CETP shall own total responsibility to prevent any leakages / damage of pipeline carrying the treated effluents.
26. The SEZ shall not discharge any High TDS effluents through the marine disposal pipeline with immediate effect.
27. If it is found the effluents are not confirming the prescribed standards, the effluents shall be taken back to the treatment system to provide adopting suitable treatment to achieve the prescribed standards.
28. The SEZ shall maintain consistent compliance of Environmental Clearance obtained from MoEF, GoI on 25.10.2010.
29. The Industry shall maintain the compliance of conditions stipulated in the Consent for Establishment Order No. 219/PCB/CFE/RO-VSP/HO/2010, dated 13.12.2010.
30. The industry shall develop green belt in all the vacant places. In future, excess green belt over and above 33 % of total area can be utilized for industrial activity as per requirement of industry.

SCHEDULE - C

[See rule 6(2)

[CONDITIONS OF AUTHORISATION FOR OCCUPIER OR OPERATOR HANDLING HAZARDOUS WASTES]

1. All the rules and regulations notified by Ministry of Environment and Forests, Government of India under the E(P) Act, 1986 in respect of management, handling, transportation and storage of the Hazardous wastes should be followed.
2. The industry shall not store hazardous waste for more than 90 days as per the Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016.
3. 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.
4. The industry shall maintain 6 copy manifest system for transportation of waste generated and a copy shall be submitted to concerned 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.

5. The industry shall maintain proper records for Hazardous & other wastes stated in Authorization 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 6 (5) of the Hazardous & Other Wastes (Management & Transboundary Movement) Rules, 2016 and amendments thereof.
6. The industry shall submit the condition wise compliance report of the conditions stipulated in Schedule A, B & C of this Order on half yearly basis to Board Office, Hyderabad and concerned Regional Office.

Sd/-
MEMBER SECRETARY

To
M/s. Hetero Infrastructure SEZ Ltd.,
N. Narsapuram, Ch. Lakshmipuram,
Rajaihpet, Pedda Teernala (V),
Nakkapalli (M),
Visakhapatnam District.

// T.C.F.B.O. //

12/12/17

for Joint Chief Environmental Engineer
Unit Head-IV

Tahsildar's office
Nakkapalli

HANDING/TAKEN OVER CERTIFICATE

In pursuance of the instructions issued by the District Collector, Visakhapatnam vide Proceedings Eoffice file No.196/2018-JA(E3)/dt: 12/11/2021, the possession of the following land parcels admeasuring an extent of **Ac.81.03Cts** covered by Chukkalavani Lakshmipuram, Upmaka, N.Narsapuram and Rajayyapeta villages of Nakkapalli Mandal handed over by the Tahsildar, Nakkapalli to Senior Manager, M/s Hetero Infrastructure SEZ Pvt. Ltd., Nakkapali on this **29th day of November, 2021** as mentioned in the G.O.Ms.No.163,Dt.09.07.2021.

Sl. No	Name of the village	Sy.No.	Extent proposed in Ac-Cts
1	Chukkala vani lakshmipuram	190/3	0.33
2		205/2	0.50
3		207	0.72
4		208	0.82
5		209	0.69
6		210	0.62
7		212-4	0.33
8		213/2	0.92
9		216/2	0.44
10		217	0.56
11		219	0.37
12		282	29.62
SUB TOTAL			**Ac.35.92Cts**
1	Upamaka	184/2	0.08
2		268/6B	0.30
3		268/17	1.10
4		268/9B	0.27
SUB TOTAL			**Ac.1.75Cts**

1	N.Narsapuram	118	3.06
2		121	1.12
3		122	1.28
4		123	2.04
5		124	2.00
6		127	3.88
7		128	2.53
8		135	0.87
9		136	1.22
10		137	1.08
11		139	2.02
12		140	1.36
13		143	0.64
14		144	0.70
15		145	2.42
16		146	2.00
17		147	2.00
SUB TOTAL			**Ac.30.22Cts**
1	Rajayyapeta	314	13.14
GRAND TOTAL			**Ac.81.03Cts**

HANDED OVER

Tahsildar
Nakkapalli

TAHSILDAR
NAKKAPALLI

TAKEN OVER

For HETERO INFRASTRUCTURE SEZ LTD

Authorised Signature

Senior Manager
M/s Hetero Infrastructure SEZ Pvt.Ltd.
Nakkapalli

OFFICE OF THE TAHSILDAR, NAKKAPALLI
GOVERNMENT OF ANDHRA PRADESH
VISAKHAPATNAM DISTRICT

Land Details of M/S Hetero, Nakkapalli					
S.NO	**DATE**	**DOCUMENT NO**	**VILLAGE**	**SY NO**	**EXTENT**
1	20.05.2005	RP NO:370/2002 IN O.A NO:2250/1999	N.Narasapuram, Nallamattipalem	150 P	67.94
				151/1 P	4.12
				151/2 P	13.28
				158/11 P	0.40
2	20/05/2005	R.P NO370/2002 IN O.A NO:2250/1999	N.Narasapuram, Nallamattipalem	119/1 P	12.96
				119/2 P	0.37
				119/3 P	0.20
				119/1F	1.10
				119/2D P	0.13
				119/2A P	0.40
				120/1P	3.96
				120/2G	1.61
				120/2F	0.22
				120/1	0.60
				120/2D	0.34
				120/2K	0.20
				120/2A	1.18
				120/2B	0.72
				120/2E	0.32
				120/2C	3.84
				120/2H	0.35
				125P	16.58
				126/8	1.02
				128/8C	0.31
				126/9A	0.41
				126/9D	0.75
				126/4	2.00
				126/6	0.20
				126/9E	0.82
				126/5	0.42
				126/3	1.50
				126/7	0.80
				126/8D	0.40
				126/8B	0.37
				126/9C	0.27
				126/9F	0.27
				126/2	1.48
				126/8A	0.44
				126/8E	0.48
				126/1B	0.18
				126/1D	0.13

				126/2H	0.30
				138 P	19.40
3	20.05.2005	241/2005	Nallamattipalem N.Narasapuram,	151/2	4.32
				125	0.70
				119/1	1.74
				150	1.00
4	28/9/2005	3623/2005	Ch. Lakshmipuram	286/1	8.63
				286/2	1.37
				283/1	15.75
5	02-03-2006	477/2006	N. Narasapuram	150 P	16.39
6	28/9/2005	3529/2005	N. Narasapuram	150 P	5.48
7	28/9/2005	3530/2005	N. Narasapuram	125P	9.22
8	02-03-2006	475/06	Peda Tennerla	20/1 Ac. 8.8	
				20/2 Ac. 7.1	15.90
9	02-03-2006	476/06	Peda Tennerla	19	7.66
10	28.04.2006	2158/06	N. Narasapuram	138	14.43
				129/6	1.43
11	18.08.2005	3060/2005	Upamaka	126/1P	0.17
12	30-06-2005	2356/2005	Nallamattipalem	156/9	1.00
13	18-08-2005	3039/2005	Ch. Lakshmipuram	215	1.24
14	18-08-2005	3040/2005	Rajayyapeta	313-1	2.14
				313-2	1.27
				313-3	1.05
				312-1	0.22
				312-2	0.11
				312-3	0.30
				312-4	0.12
				312-5	0.18
15	14-09-2005	3418/2005	N. Narsapuram	142	6.11
16	18-08-2005	3039/2005	Ch. Lakshmipuram	215	1.24
17	19-09-2005	3449/2005	Ch. Lakshmipuram	215	5.00
18	26-09-2005	3482/2005	Ch. Lakshmipuram	215	1.14
19	28/9/2005	3530/2005	N. Narasapuram	125P	9.22
20	30/12/2005	4722/2005	N. Narasapuram	151-2	0.91
21	28.04.2006	2160/06	N. Narasapuram	117/1	1.08
				117/2	3.38
				117/3	0.35
				129/1	0.40
				129/2	0.73
				129/3	0.60
				129/4	1.08
				129/5	0.65
				129/7	0.34
				129/8	1.49
				129/9	0.43
22	04-03-2006	1628/2006	CH.L PURAM	16/2 P	1.90
23	20.04.2006	1891/06	Ch Lakshmi Puram	215	7.00

24	12.05.2006	2491/06	Rajayapeta	312/10	1.88
				312/11	0.23
				312/12	0.30
25	12.05.2006	2495/06	Rajayapeta	313/3	1.84
				313/4	0.78
				313/5	0.84
				313/6	1.12
				313/7	2.12
26	12.05.2006	2494/06	Rajayapeta	312/6	3.38
				312/7	1.05
27	12.05.2006	2493/06	Rajayapeta	312/8	1.28
				312/13	1.76
28	12.05.2006	2492/06	Rajayapeta	312/9	0.87
29	22.12.2006	5419/2006	Upamaka	308/4	0.88
30	18.08.2006	3541/2006	N. Narasapuram	117/1	1.10
				117/2	0.36
31	05.10.2006	4174/2006	Nakkapalli	54/1A2	0.46
				54/1B	0.46
				54/1C2	1.11
				54/6A2	1.26
				54/6B	0.68
				54/7B	0.18
32	05.10.2006	4179/2006	Upamaka	4/2	1.53
33	04.10.2006	4178/2006	Nakkapalli	54/2	0.54
				54/3	1.14
				54/4	0.58
34	04.10.2006	4173/2006	Upamaka	4/1	1.23
				4/1	1.38
35	05.10.2006	4177/2006		4/4B	0.09
				4/4D	0.03
36	09.11.2006	4685/2006		1/5B	0.57
37	02.08.2007	2943/2007	Nakkapalli	70/15	0.08
				70/17	0.18
38	14.03.2007	1419/07	N Narasapuram	130	10.00
39	26-02-2007	1070/2007	Nallamattipalem	156/9	1.00
40	15-09-2007	1485/2007	Upamaka	92/9	0.15
41	15-09-2007	1485/2007	N.Narasapuram	103/1	0.75
42	06-06-2007	2863/2007	N.Narasapuram	107/3	0.26
43	01-09-2008	52/08	Nallamattipalem	156/8	0.89
44	02.08.2008	2940/2008	Nakkapalli	70/13	0.14
				70/14	0.19
45	02.08.2008	2941/2008	Nakkapalli	54/5	0.64
				54/8A	0.81
				54/8B	0.21
46	04.09.2008	3354/2008	Nakkapalli	70/10	0.16
				70/11	0.05
				70/12	0.09

46	04.09.2008	3354/2008	Nakkapalli	69/4D	0.30
				69/4E	0.28
				70/15	0.15
47	02.08.2008	2942/2008	Nakkapalli	69/4B	0.09
				69/4C	0.04
48	12.08.2008	3063/2008	Upamaka	5/1A	0.68
49	12.08.2008	3064/2008			0.55
50	01.09.2008	3355/2008			0.55
51	12.08.2008	3065/2008	Upamaka	4/3A	0.83
52	03.07.2008	2280/2008	Nayampudi	100/4	2.15
				100/5	0.92
				100/3A/1	0.33
				100/3C	0.36
53	15.05.2009	1198/2009	Nakkapalli	69/4A	0.35
				69/4C	0.27
				70/16	0.16
				70/21A	0.17
54	11-05-2009	2983/2009	N.Narasapuram	156/4	0.42
55	11-05-2009	2984/2009	N.Narasapuram	156/4	0.42
56	02.09.2009	2412/2009	N.NARASAPURAM	105-3	0.92
				105-4	0.09
				105-5	0.54
				105-6	0.55
				106-1	0.72
				106-2	1.05
				106-3	0.72
				106-4	0.68
				106-5	0.49
				106-6	0.11
				106-7	0.60
				106-8	0.71
57	20.11.2009	3180/2009	N.NARASAPURAM	104-2A	0.37
				104-2B	1.15
				104-2C	0.20
				104-3A	0.33
				104-3B	0.30
				104-3C	0.49
				104-3D	0.30
				104-4A	0.32
				104-4B	0.94
				104-4C	0.30
				105-1	1.86
				105-2	0.39
				105-7	0.18
				105-8	0.17
				105-9A	0.05
				105-9B	0.42

				105-9C	0.05
				108-1B	0.23
				108-1C	0.15
				106-6	0.68
	27.11.2009	3270/2009	N.NARASAPURAM	104-1	1.47
58				108-1A	0.37
	16.02.2010	418/2010	Nakkapalli	70/18	0.02
59					0.02
60	05.05.2009	1079/2009			0.27
	16.02.2010	418/2010	Nakkapalli	70/19A	0.20
61				69/4D	0.04
	12.08.2010	3245/2010	Nakkapalli	71/1A2	0.04
				71/1D2	0.03
				71/2A	0.28
62				71/3A	0.08
				71/4A1	0.08
				71/4B1	0.05
				71/4C1	0.15
				71/4D1	0.09
63	17.02.2010	420/2010	Upamaka	5/1A	0.52
	28.01.2010	216/2010	Nakkapalli	69/3	1.73
64				69/5	1.40
65	18.04.2011	1339/2011	Upamaka	4/4A	0.32
	18.04.2011	1338/2011	Upamaka	4/3B1	0.59
66				4/4E	0.24
	11-11-2011	4523/2011	Nallamattipalem	156/1	0.44
67				156/2	0.64
				156/5	0.48
68	20-10-2011	4264/2011	Upamaka	81/7	0.45
	21.12.2013	5196/2013	Ch Lakshmi Puram	214/2	1.00
				214/2	1.00
				214/2	1.00
				214/2	1.00
				214/2	2.58
				214/2	2.27
69				214/2	0.26
				216/1-1A	0.63
				216/3	0.80
				216-4A	0.80
				216-5A	0.30
				216-6A	0.20
				206-2A	1.00
	18.12.2013	4988/2013	Ch Lakshmi Puram	212/3	0.82
70				212/3	0.96
				212/2	2.92
				206-1B	1.24
				206-1B	1.50

71	21.12.2013	5197/2013	Ch Lakshmi Puram	206-1B	0.23
				206-1B	0.75
				206-1B	0.50
72	19.12.2013	5050/2013	Ch Lakshmi Puram	214/1	1.26
				214/1	1.26
				214/1	1.26
				214/1	0.73
				214/2	0.56
73	19.12.2013	5051/2013	Ch Lakshmi Puram	214/1	0.49
				214/2	1.00
				214/2	0.96
				214/2	1.50
				214/2	0.50
				214/2	1.00
				213-3B	0.64
74	23.12.2013	5233/2013	Ch Lakshmi Puram	212/2	0.50
				212/3	2.39
75	22.01.2014	183/2014	Upmaka	196-1A1	0.10
				196-3A1	0.05
				196-1B1	0.24
76	06.01.2014	52/2014	Upmaka	96-3B1,196-3C	0.34
				96-4A2,196-4B	0.56
				197-2A	0.15
				197-3A	0.53
				197-4B	0.21
77	20.01.2014	157/2014	Upmaka	12-2A2,212-2B	0.60
				15-2D2,215-2E	0.31
				216-3B	0.55
78	27.01.2014	1063/2014	Upmaka	216-6B	0.15
79	18.01.2014	144/2014	Upmaka	212-2C2	0.40
				216-1D2	0.11
80	27.01.2014	266/2014	Upmaka	226-2	1.09
81	27.01.2014	265/2014	Upmaka	232-5A	0.05
82	18.01.2014	145/2014	Upmaka	252-4B	0.03
				253-2B	0.34
				252-5B	0.40
				252-10B	0.22
				239-8	0.04
				239/9	0.01
				239-9	0.06
				253-3	0.07
				252-2	0.07
				240-1A	0.52
				239-6A	0.11
				230-5B	0.27
				230-2A	0.15
				230-1B	0.20

				231-4A2	0.38
				231-1B2	0.63
				232-4	0.69
				232-6B	0.18
83	24.02.2014	818/2014	Upmaka	254-1B	0.87
				254-5B	0.63
				256-2	1.82
				257-5A	0.28
				257-1B	1.31
84	10.03.2014	869/2014	Upmaka	254-2B	0.26
85	25.02.2014	571/2014	Upmaka	254-4B	0.38
86	05.03.2014	766/2014	Ch Lakshmi Puram	189-1B	1.01
87	30.12.2014	5461/2014	Ch Lakshmi Puram	198/1	0.27
88	29.12.2014	5450/2014	Ch Lakshmi Puram	198-1A	0.12
89	20.12.2014	5293/2014	Ch Lakshmi Puram	213/1	0.22
				213-3B	0.50
90	26.05.2014	1968/2014	Upamaka	212/2	0.06
					0.50
91	08.08.2014	3256/2014	Upamaka	218/5	0.49
				218/6	0.98
				218/7	0.75
92	08.08.2014	3257/2014	Upamaka	218/6	1.00
93	08.08.2014	3255/2014	Upamaka	214/6	0.51
94	08.08.2014	3253/2014	Upamaka	214/6	0.41
				214/7	0.88
95	08.08.2014	3254/2014	Upamaka	214/3	0.59
				214/4	0.54
				214/5	0.60
				214/7	0.16
96	18.08.2014	3397/2014	Upamaka	215/1	0.06
				215/2	0.30
97	17.12.2014	5223/2014	Upamaka	257/1	0.98
98	09.03.2015	1056/2015	Ch Lakshmi Puram	216-4A	0.80
99	09.04.2015	1578/2015	Upmaka	185-1A	1.00
100	15.04.2015	1698/2015	Nakkapally	327	0.50
101	18.04.2015	1768/2015		327-2B	1.50
102	16.05.2015	2362/2015	Ch Lakshmipuram	218	1.04
103	16.05.2015	2363/2015	Ch Lakshmipuram	216-5B	1.84
				214-2C	2.39
104	06.04.2015	1496/2015	UPAMAKA	177-1	7.91
				177-2	0.10
				166-1	7.24
106	21.02.2015	821/2015	Upamaka	214/2	0.06
				222/1	1.42
				222/2	1.30
107	21.02.2017	2123/2017	Upamaka	222/1	1.14
108	02.03.2017	540/2017	Ch Lakshmipuram	206/1A	1.50

109	03.03.2017	566/2017	Ch Lakshmipuram	214/2	2.50
110	20.04.2017	1055/2017	Ch Lakshmipuram	214/2	2.50
111	29.05.2017	1469/2017	Ch Lakshmipuram	206-7B	1.25
112	11.04.2018	1760/2018	Upamaka	222/1	0.16
113	07.02.2019	808/2019	Ch Lakshmipuram	206-5	0.75
114	15.02.2019	806/2019	Ch Lakshmipuram	206-4	1.00
LAND ALIENATED BY GOVERNMENT OF ANDHRA PRADESH					
1			CH.L.PURAM	190-3	0.33
				212/4	0.33
				213-2	0.92
				205/2	0.50
				207	0.72
				208	0.82
				209	0.69
				210	0.62
				282/1,2,3,4	29.62
				216/2	0.44
				217	0.56
				219	0.37
2			Upamaka	184/2	0.08
				268/6B	0.30
				268/17	1.10
				268/9B	0.27
3			N.Narasapuram	118	3.06
				121	1.12
				122	1.28
				123	2.04
				124	2.00
				127	3.88
				128	2.53
				135	0.87
				136	1.22
				137	1.08
				139	2.02
				140	1.36
				143	0.64
				144	0.70
				145	2.42
				146	2.00
				147	2.00
4			Rajayyapeta	314	13.14
			GRAND TOTAL		**580.38**

Annexure-III

BIOASSAY TEST FACILITY





DISTRIBUTION RESTRICTED

NIO/SP/2022
(SSP3482)

Monthly monitoring of Eco-toxicity of treated effluent

Sponsored by

Hetero Infrastructure SEZ Limited
Visakhapatnam

September 2022

सीएसआईआर – राष्ट्रीयसमुद्रविज्ञानसंस्थान
CSIR-NATIONAL INSTITUTE OF OCEANOGRAPHY
(वैज्ञानिकतथाऔद्योगिकअनुसंधानपरिषद)
(COUNCIL OF SCIENTIFIC & INDUSTRIAL RESEARCH)
दोना पावला, गोवा भारत **/ DONA PAULA, GOA - 403004 India**
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फैक्स **/Fax: 91(0)832-2450602**
इ-मेल**/e-mail :** ocean@nio.org
http:// www.nio.org

DISTRIBUTION RESTRICTED

Monthly monitoring of Eco-toxicity of treated effluent

SPONSORED BY

Hetero Infrastructure SEZ Limited
Visakhapatnam

NATIONAL INSTITUTE OF OCEANOGRAPHY
(Council of Scientific & Industrial Research)
Regional Centre, Visakhapatnam – 530 017

September 2022

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Foreword

Andhra Pradesh Pollution Control Board (APPCB), zonal office, Visakhapatnam has issued a notice (No. 2313/PCB/ZO-VSP/NIO/2022) on 27th May 2022 to all the marine discharge industries and CETPs to conduct monthly eco-toxicology tests on treated effluent, and trace metals and major organic compounds present in the treated effluent by CSIR-National Institute of Oceanography (NIO), Visakhapatnam. In this connection, M/s. Hetero Infrastructure SEZ Limited contacted CSIR-NIO, Regional Centre, Visakhapatnam to take up a study on monthly assessment of the eco-toxicity (bio-assay), trace metals and major organic compounds of the treated effluent from guard ponds of M/s. Hetero Infrastructure SEZ Limited to fulfil the specific condition of APPCB. After considering the proposal, CSIR-NIO has agreed to carry out the study on a monthly assessment of the treated effluent for the above-mentioned investigations. CSIR-NIO conducted a field campaign for September on 12th September 2022 and treated effluent was collected from guard pond No. 5. This report is the compilation of the data obtained for various investigations conducted on the treated effluent.

List of Contributors to the project

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Acknowledgements

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Executive Summary

As part of continuous monthly studies on the assessment of the quality of treated effluent from M/s. Hetero Infrastructure SEZ Limited, the treated effluent was collected from guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited on 12th September 2022. This treated effluent was tested for its eco-toxicity, levels of trace metals and major organic compounds. A 4-day (96 hours) long bio-assay experiment was conducted on the treated effluent using zebrafish following the method IS: 6582-1971 (Re-affirmed, 2003) as suggested by the CPCB. The results of the bio-assay experiment revealed that the eco-toxicity levels of the treated effluent collected from M/s. Hetero Infrastructure SEZ Limitedfulfilledthe CPCB standard of '90% survival after 96 hours in the 100% effluent' as the mortality of zebrafish in 100% effluent after 96 hours is 8%. Based on the survival rates of zebrafish at different concentrations of effluent, the median lethal concentrations for 50% and 10% mortality of zebrafishes (LC_{50} and LC_{10}, respectively) after 96 hours are estimated as 682% and 113%, respectively. Trace metal concentrations determined in the treated effluent are within the limits prescribed by CPCB for treated effluent of sea discharge. The concentration of total phenolic compounds in the treated effluent is very low (0.009 mg/l) and it is within the limit of CPCB for total phenolic compounds (1.0 mg/l). These results suggest that the treated effluent collected from guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited on 12th September 2022 complies with the CPCB norms for treated effluent for discharge into the sea.

2. Introduction

Some of the coast-based industries discharge their treated effluent into the sea through a designated marine outfall point after fulfilling the criterion set up by the central pollution control board (CPCB) and Andhra Pradesh state pollution control board (APPCB) for the treated effluent. APPCB has established a lock and key system for the guard ponds to release the treated effluent into the sea after meeting the criterion set up by CPCB and APPCB. There are 7pharmaceutical industries (Andhra Organics Ltd., Aurobindo Pharma Ltd., Lantech Pharmaceuticals Ltd., SMS Pharmaceuticals Ltd., Divis Laboratories Ltd., Hetero Drugs Ltd., Deccan Fine Chemicals India Pvt. Ltd.) and one text tile industry (Brandix India Apparel City Pvt Ltd) processing their effluent in the ETP (effluent treatment plant) and discharge the treated effluent into the coastal waters of north Andhra coast (betweenPydibhimavaramand Kesavaram). In addition, two CETPs (common effluent treatment plant), namely, VisakhaPharmacity Ltd. and Atchutapuram effluent treatment plant Ltd. (AETL)process the effluents received from various pharmaceutical industries in the CETP and discharge the treated effluent into the sea. National Thermal Power Corporation and Rashtriya Ispat Nigam Ltd. draw seawater for cooling purposes the discharge the warm and high salinity water back into the sea.

Andhra Pradesh Pollution Control Board (APPCB), Visakhapatnam has issued a notice (No. 2313/PCB/ZO-VSP/NIO/2022) to all sea discharge industries on 27th May 2022 and instructed them to assess the quality of treated effluent on monthly time scales for one year through the bio-assay experiments and the levels of trace metals and major organic compounds in the treated effluent by the CSIR-National Institute of Oceanography, Visakhapatnam. With reference to this, M/s. Hetero Infrastructure SEZ Limited approached CSIR-NIO, Visakhapatnam to carry out the above-mentioned studies on their treated effluent for the period of one year (from August 2022 to July 2023) on monthly

time intervals. In this connection, CSIR-NIO collected the treated effluent from guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited on 12th September 2022 and carried out a bio-assay experiment for four days using zebrafish and determined the concentration levels of trace metals and major organic compounds present in the treated effluent.

1.1 Objective:

The main objective of this study is to assess the quality of treated effluent from M/s. Hetero Infrastructure SEZ Limited through bio-assay test and concentration levels of trace metals and organic constituents present in the treated effluent, and to compare the results with the CPCB standards for compliance/non-compliance.

1.2 Sample collection:

A Niskin water sampler (10L, plate. 1.1) was used to collect a treated effluent sample from guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited on 12th September 2022 for dissolved oxygen (DO), biochemical oxygen demand for three days (BOD_3), pH, dissolved inorganic nutrients and microbial community studies. Water samples were collected in pre-cleaned white jerry cans (20L) for bio-assay studies and filtration of samples for chlorophyll-*a* and total suspended matter.



Plate 1.1: Niskin sampler (10L) used for collection of water samples

1.3 Methodology

The Physicochemical parameters were analyzed through the standard procedures following Carrit and Carpenter (1966), Grashoff (1974), Suzuki and Ishimaru (1990) and Grashoff et al. (1992). The detailed methodology of each parameter is given below.

1.3.1.1 pH

pH of the treated effluent sample collected in an air-tight glass bottle (60ml) was measured using a Metrohm pH analyzer (Titrando 865). Standard buffer solutions (Merck, Germany) were used for the calibration of the instrument. Based on the repeated analysis of aliquots of standards and samples, the precision of the analysis for pH is 0.002 units.

1.3.1.2 Dissolved Oxygen (DO)

Winkler's method was adopted for the determination of DO concentrations. A measured volume of effluent sample was fixed immediately after collection with the reagents Winkler's A (manganous chloride) and Winkler's B (alkaline potassium iodide). Standard titration with sodium thiosulphate was adopted for the analysis purpose. The concentration of DO was expressed in mg/l. The precision of analysis expressed as standard deviation with this method was ±0.07%.

1.3.1.3 Biochemical Oxygen Demand (BOD)

Samples for the determination of biochemical oxygen demand were collected in triplicate. The dissolved oxygen concentration was immediately determined using one of the triplicate samples according to Winkler's method. The remaining bottles were left for three days at 20ºC in the BOD incubator. Dissolved oxygen in these samples was determined after fixing the samples on completion of three days of incubation. BOD_3 was computed from the initial DO concentrations and expressed in mg/l.

1.3.1.4 Ammonium-Nitrogen (NH_4^+-N)

Ammonical-Nitrogen in the treated effluent sample was determined with the indophenol blue method using trione. Care was taken for the analysis of ammonium and ammonia-free distilled water was used for analysis to avoid any contamination as ammonia is highly soluble in water. The absorbance of the coloured complex was measured at 630 nm in a Spectrophotometer against a standard. NH_4 - N is expressed in µmol/l and the precision of analysis, in terms of standard deviation, is ±0.02 µmol/l.

1.3.1.5 Nitrite-Nitrogen (NO_2^--N)

Nitrite was determined by the method of Bend Schneider and Robinson whereby the nitrite in the water sample was diazotised with sulphanilamide and coupling with N-1-Naphthyl ethylene diamine dihydrochloride. The absorbance of the resultant azo-dye was measured at 543 nm against a standard solution. Concentrations of NO_2^--N in seawater being expressed in µmol/l.

1.3.1.6 Nitrate-Nitrogen (NO_3^--N)

Nitrate in the effluent sample was first reduced to nitrite using heterogeneous reduction by passing the buffered samples through an amalgamated cadmium column and the resultant nitrite was determined as above. The measured absorbance was due to the initial nitrite present in the sample and nitrite obtained by the reduction of nitrate in the sample. A necessary correction was therefore applied for any nitrite initially present in the sample. Concentrations of NO_3^--N in seawater were expressed in µmol/l. The precision of analysis for both nitrite and nitrate, in terms of standard deviation, is ±0.02 µmol/l.

1.3.1.7 Phosphate-Phosphorus (PO_4^{3-}-P)

Inorganic phosphate was measured by the method of Murphy and Riley in which the samples were made to react with acidified molybdate reagent and then reduced using ascorbic acid. The absorbance of the resultant phosphorous molybdenum blue complex was measured at 880 nm against a standard. Concentrations of PO_4^{3-}-P in effluent samples were expressed in µmol/l. The precision of analysis, in terms of standard deviation, is ±0.01 µmol/l.

1.3.1.8 Silicate-Silicon (SiO_4^{2-}-Si)

Silicate-silicon was also estimated by reaction with acid-molybdate and ascorbic acid in the presence of oxalic acid. The interference of phosphate is prevented by the addition of oxalic acid. The absorbance of the resultant silico - molybdenum blue complex was measured at 810 nm in a Spectrophotometer against a standard. Concentrations of SiO_4^{2-}- Si in an effluent sample were expressed in µmol/l. The precision of analysis, expressed as standard deviation, is ±0.02 µmol/l.

1.3.1.9 Total suspended matter (TSM)

One litre of the effluent sample was filtered through a pre-weighed Polycarbonate filter (0.22 µm; Millipore) and after filtration, the filter was dried for about 2 days at 60°C. The dried filter was weighed and noted down the reading. The filter was dried again and took the weight measurement. This procedure was continued until the weight loss of the filter due to drying is zero. The weight of the material retained on the filter was considered as TSM concentration and was expressed as mg/l.

1.3.1.10 Bio-assay test (Eco-toxicology test)

The bio-assay test was performed following the CPCB standard method (IS: 6582-1971) using zebrafish (*D. Rerio*) as the test species. Bio-assay test was conducted on different effluent concentrations, such as 0% (control), 10%, 20%, 30%, 50%, 60%, 90% and 100% and the test

was conducted for 4 days (96 hours.). Mortality of zebrafishes in different concentrations was noted down at regular time intervals of 1h, 6h, 12h, 24h, 36h, 48h, 60h, 72h, 84h and 96 hours. LDP line software was used to calculate the median lethal concentrations for the mortality of 50% and 10% of test organisms (LC_{50} and LC_{10}, respectively) of treated effluent for 24h, 48h, 72h and 96 hours.

1.3.1.11 Trace metals

Trace metal concentrations in the treated effluent sample collected from the guard pond of the industry were filtered through a 0.22 µm polycarbonate filter to remove the particles. The filtered water was analyzed for trace metals by an Inductively Coupled Plasma–Mass Spectrometer (ICP-MS). Internal standards, such as Li, Sc, Ge, Y, In, Tb and Bi were added to the effluent sample and determined the concentrations of these elements along with other trace metals to monitor the performance of the ICP-MS instrument. International standard (NIST 1640a) was run to check the accuracy of the trace metal concentration. The calibration curve was established by running the standards of different concentrations (0.5. 1.0, 5.0, 25, 50 and 100 PPB) before the analysis of effluent samples. In most of the cases, the linear fit with an r^2 value of 0.9999 was obtained.

1.3.1.12 Microbiological analysis

About 100 ml of the sample was sub-sampled into a pre-sterilized bottle for bacterial analysis. All samples were collected with precautions required for microbiological analysis and analyzed in the laboratory. The sample was serially diluted 3 times to obtain the dilutions of 10^{-1} to 10^{-3} with sterile salt water. Heterotrophic bacterial counts were determined using R2A agar. Around 100 µl of each serially diluted water samples are plated on R2A agar plates and spread with a sterile glass rod and incubated at 37^{o}C for 48-72 hours. The colonies formed on

the plates are counted using the colony counter and represented as a number of colony forming units per ml of water sample after considering the dilution factor. Total coliform counts were obtained by plating water samples on MacConkey agar. The colonies formed on the plates are counted using the colony counter and represented as a number of colony forming units (CFU) per ml of water sample after considering the dilution factor. The colonies of pink-red colour and with bile precipitate are counted as ECLO on MacConkey agar plates. The colonies of colourless to pale pink are counted as EFLO on MacConkey agar plates. PALO counts were obtained by plating water samples on Cetrimide agar. The colonies exhibiting fluorescence at 250nm and a bluish-green pigmentation are considered PALO. VLO counts were obtained by plating water samples on TCBS agar. The colonies formed on the TCBS agar plates are counted as VLO. The colonies of yellow colour are counted as VCLO on TCBS agar plates. The colonies of bluish-green colour are counted as VPLO on TCBS agar plates.

2 Results

2.1 Treated effluent characteristics

Treated effluent was tested for DO, BOD_3, pH, TSM and dissolved inorganic nutrients and the results were provided in Table 2.1.

S. No.	Parameter	Concentrations	CPCB standard*
1	DO (mg/l)	9.6	-
2	BOD_3 (mg/l)	5.8	30
3	pH	6.372	6.0 – 8.5
4	Nitrate-N	0.88	-
5	Phosphate-P	0.50	5.0
6	Silicate-Si	0.51	-
7	TSM (mg/l)	7.1	100

*: as per Environment (Protection) Second Amendment Rules, 2021

The dissolved oxygen (DO) concentration of the treated effluent is 9.6 mg/l. BOD_3 of the effluent is 5.8 mg/l which is far below the standard limit of 30 mg/l set by CPCB. pH of the treated effluent is 6.372 and it is well within the CPCB limit of 6.0 -8.5 (Table 2.1). The concentration of total suspended matter (TSM) is very low and it is only 7.1mg/l. TSM concentrations are below the standard limit of 100 mg/l set by CPCB. Dissolved inorganic nutrients such as nitrate and phosphate concentrations in the effluent are within the standard limits of CPCB.

Abundance (CFU/ml) of various bacterial populations in the effluent of M/s. Hetero Infrastructure SEZ Limited is given in Table 2.2. ECLO (*Escherichia coli like organism*), EFLO (*Enterococcus faecalis* like organism), VLO (*Vibro*like organism), VCLO (*Vibrio cholerae* like organism**)** and VPLO (*Vibrio parahaemolyticus* like organism) were not grown. Only Total viable count (TVC) was obtained for this sample. TVC was $0.66x10^3$ CFU/ml and it is well within the range of the TVC found in the coastal waters off the north Andhra coast ($0.003 - 1.94 x10^5$ CFU/ml).

Table 2.2: Abundance of various bacterial populations in the effluent of M/s. Hetero Infrastructure SEZ Limited

Bacteria	Abundance (CFU/ml)
TVC	$0.66x10^3$
ECLO	NG
EFLO	NG
VLO	NG
VCLO	NG
VPLO	NG

TVC Total Viable Count
ECLO *Escherichia coli* like organism Count
EFLO *Enterococcus faecalis* like organism Count

VLO *Vibro* like organism Count
VCLO *Vibrio cholerae* like organism Count
VPLO *Vibrio parahaemolyticus* like organism Count
NG No Growth

2.2 Bio-assay test

The survival rate of zebrafish at various time intervals during the experiment period of 96 hours in different concentrations of treated effluent was given in Table 2.2

An effluent concentration of 0% represents the control and no mortality of zebrafish was observed in the control. The first mortality of zebrafish was observed in the effluent concentration of 60% after 36 hours of the experiment. In the 100% effluent concentration, the first mortality was observed after 6 hours of the experiment and 92% of zebrafish survived after completion of the experiment (i.e., 96 hours) (Table 2.2).

Table 2.2: Survival rate (%) of zebrafish at different periods exposed to different concentrations of effluent

Exposure time	Effluent Concentration							
	Control	10%	20%	30%	50%	60%	90%	100%
1 hr	100	100	100	100	100	100	100	100
6 hr	100	100	100	100	100	100	100	100
12 hr	100	100	100	100	100	100	100	96
24 hr	100	100	100	100	100	100	96	96
36 hr	100	100	100	100	100	100	96	96
48 hr	100	100	100	100	100	96	96	96
60 hr	100	100	100	100	100	96	96	92
72 hr	100	100	100	100	100	96	96	92
84 hr	100	100	100	100	100	96	92	92
96 hr	100	100	100	100	100	96	92	92

The mortality rate of zebrafish (%) observed in the test concentrations of 0%, 10%, 20%, 30%, 50%, 60%, 90% and 100% during the exposure time of 24 h, 48 h, 72 h and 96 hours was given in Table 2.3.

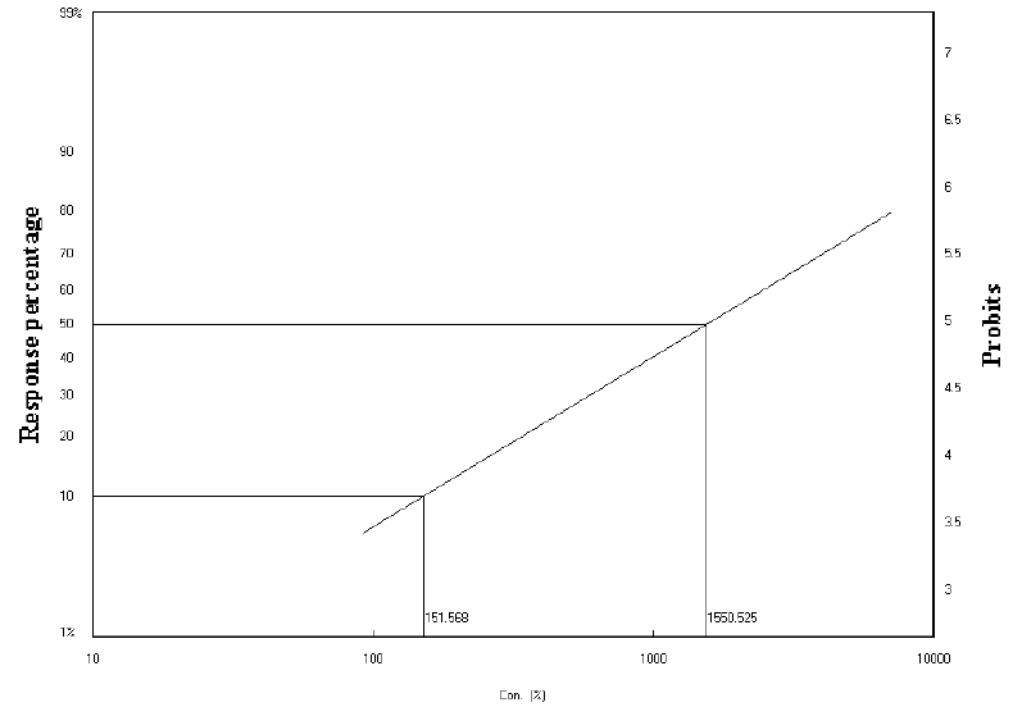
Table 2.3: Cumulative mortality of zebra fishes in different concentrations of effluent at exposure periods of 24 h, 48 h, 72 h and 96 hours.

Test concentrations (% v/v)	***Cumulative Mortality (%) of zebrafish***			
	Exposure periods (hr)			
	24	48	72	96
Control (0%)	0	0	0	0
10%	0	0	0	0
20%	0	0	0	0
30%	0	0	0	0
50%	0	0	0	0
60%	0	4	4	4
90%	4	4	4	8
100%	4	4	8	8

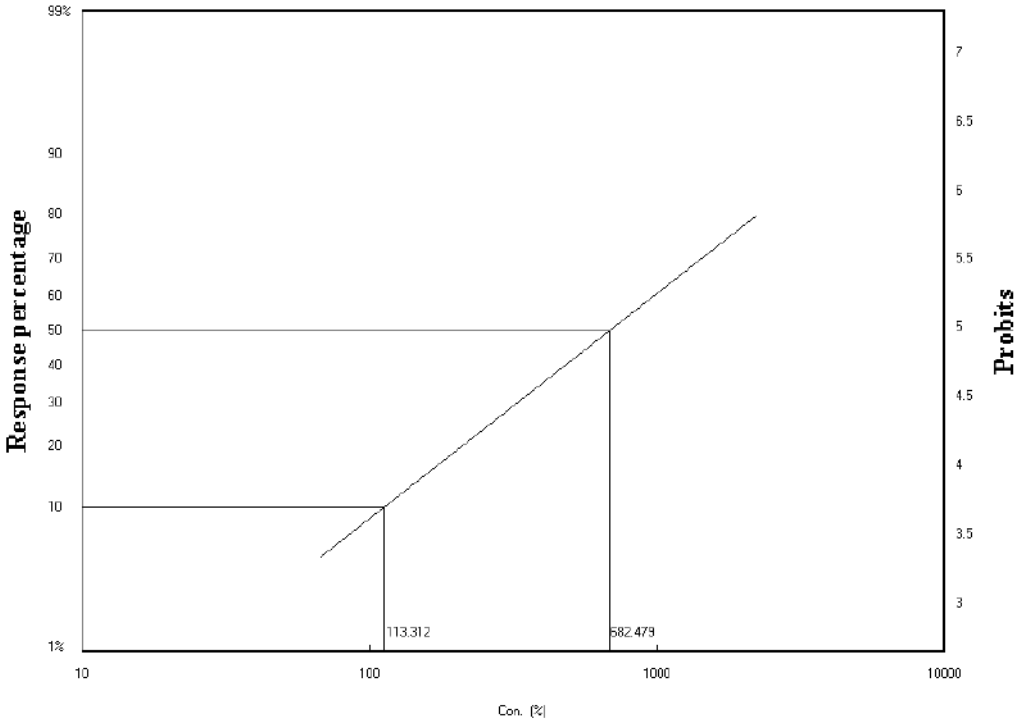
Based on the above observations, median lethal concentrations for the mortality of 50% and 10% of test organisms (LC_{50} and LC_{10}, respectively) of treated effluent after 48 h, 72 h and 96 h of the experiment were calculated using LDP Line software and were given in Table 2.4.

Table 2.4: Median Lethal concentrations (LC_{50} and LC_{10}) of effluent at exposure periods of 24h, 48h, 72h and 96 hours.

Exposure time (h)	LC_{50} (%)	LC_{10} (%)
24	-	-
48	-	-
72	1550	151
96	682	113



72 h



96 h

2.3 Trace metals

Trace metals in seawater are essential for biota, however, elevated concentrations of trace metals cause a negative impact on biological organisms. Further, the accumulation of heavy metals in the tissues of edible fishes through biomagnification enters into humans.

Hence, the determination of trace (heavy) metal concentrations in coastal waters are very important. Treated effluent released into the sea from industries is one of the possible sources of trace metals in coastal waters. Hence, trace metals such as vanadium (V), chromium (Cr), manganese (Mn), Iron (Fe), cobalt (Co), nickel (Ni), copper (Cu), zinc (Zn), Arsenic (As), Selenium (Se), cadmium (Cd) and lead (Pb) were analysed by ICP-MS in the treated effluent collected from M/s. Hetero Infrastructure SEZ Limited. Concentrations of these metals in the effluent are given in Table 2.5 and compared with the standard (maximum) limits of CPCB for these trace metals in the treated effluent for sea discharge.

Table 2.5: Trace element concentrations in the treated effluent

Element	Effluent Conc. (µg/l)	CPCB limit (µg/l)
V	1.4	200
Cr	1.5	2000
Mn	6.6	2000
Fe	15.4	3000
Co	n.d.	-
Ni	1.7	2000
Cu	n.d.	3000
Zn	42.7	5000
As	0.2	200
Se	n.d.	50
Cd	0.9	50
Pb	0.2	100

All the elements listed above are very well within the standard limits of CPCB for effluent for sea discharge, suggesting that treated effluent is released into the sea from M/s. Hetero Infrastructure SEZ Limited may not result in any accumulation of trace elements in the coastal waters of the north Andhra coast.

2.4 Organic compounds

Total phenolic compounds present in the treated effluent collected from the guard pond were determined using a spectrophotometer. The concentration of total phenolic compounds in the treated effluent is very low and they are only 0.009 mg/l and which is very low compared to the limit of CPCB for total phenolic compounds (1.0 mg/l).

3. Conclusion

Treated effluent collected from the guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited fulfilled the norms of CPCB for a bio-assay test with a survival rate of 92% for zebrafish in 100% effluent after 96 hours. Trace metal concentrations in the treated effluent are very well within the limits of CPCB. The concentration of total phenolic compounds in the treated effluent is 0.009 mg/l and is very well within the limit of CPCB for phenolic compounds (1.0 mg/l). Overall, characteristics of the treated effluent collected from the guard pond No. 5 of M/s. Hetero Infrastructure SEZ Limited on 12th September 2022 complies with the CPCB standards for treated effluent for discharge into the sea.

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

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POLICY SCHEDULE FOR PUBLIC LIABILITY (Act Only) INSURANCE

UIN NUMBER - IRDAN190P0076100001

Insured's Name	:	HETERO INFRASTRUCTURE SEZ LIMITED			
Insured's Details			**Issuing Office Details**		
Customer ID	:	PO92918286	**Office Code**	:	HYDERABAD LCBO 960000 (960000)
Address	:	SY NO 125 138 150, N NARASAPURAM, NAKKAPALLY MANDAL, N NARASAPURAM, VISAKHAPATNAM, ANDHRA PRADESH, NAKKAPALLI ,ANDHRA PRADESH, 531081	**Address**	:	LARGE CORPORATE AND BROKERS OFFICE, 7C,7TH FLOOR, SURYA TOWERS, S.P.ROAD, SECUNDERABAD ,500003
Phone No	:		**Phone No**	:	4027810302
E-mail/Fax	:	krishna.d@heterodrugs.com, /	**E-mail/Fax**	:	nia.960000@newindia.co.in /
PAN No	:		**S.Tax Regn. No**	:	AAACN4165CST178
GSTIN/UIN	:	37AABCH6897E3Z6 / NA	**GSTIN**	:	36AAACN4165C3ZQ
	:		**SAC**	:	

Policy Details					
Policy Number	:	96000036223300000021	**Business Source Code**		
Period of Insurance	:	From: 11/11/2022 12:00:01 AM To: 10/11/2023 11:59:59 PM	**Dev.Off. level/Broker/Corp. Agent/Web Aggregator/CPSC User**	:	DIRECT - (DI00000188)
Date of Proposal	:	11-Nov-22	**Agent/Bancassurance/Specified Person**	:	
Prev. Policy no.	:	96000036213300000022	**Phone No**	:	NA / NA
Client Type	:	Non-Corporate	**E-mail/Fax**	:	/ /

Premium(₹)	ERF Premium(₹)	GST(₹)	Total (₹)	Total (₹ in words)	Receipt No. & Date
10671	10671	0	21342	RUPEES TWENTY-ONE THOUSAND THREE HUNDRED FORTY-TWO ONLY	9600008122000000334 8 - 22/11/22

Details of risk covered under current year policy:

								Deductibles	
Retroactive Date	**Paid Up Capital**	**No Of Locations Involved**	**AOA**	**AOA:AOY**	**AOY**	**Annual Turnover - Previous Year**	**Annual Turnover - Proposed Year**	**No of workmen**	**No of Other Employee**
11/11/2021	<= 15 Crore	1	50000000	1:3	150000000	900000000	1000000000	90	12

Retroactive Dates

									Deductibles	
Retroactive Date Details	**Date**	**Paid Up Capital**	**No Of Locations Involved**	**AOA**	**AOA:AOY**	**AOY**	**Annual Turnover - Previous Year**	**Annual Turnover - Proposed Year**	**No of workmen**	**No of Other Employee**
RETROACTIVE DATE 1	11/11/2021	<=15Crore	1	50000000	1.3	150000000	900000000	1000000000	90	12

RETRO-DATE IS SUBJECT TO LESSER OF LIMITS - NARROWER OF COVER.

Extensions under the Policy

Name of the Extension	Sub Limit of the Extension	Deductibles of the Extension

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

Special Conditions	Paid up capital:₹1.27 crore. Estimated Annual Turnover:₹102 crore.Condition precedent to liability - Nil claims as on date of inception ofpolicy.AS PER PUBLIC LIABILITY ACT POLICY Absolute exclusion for losses directly or indirectly arising out of contributed to by or resulting from Coronavirus (Covid 19 and /or nCov 2019) or any mutations or variations thereof
Special Exclusions	NA
Special Excess/Deductible	0

Retroactive Dates	**Date**
Retroactive date	11/11/2021

The Policy shall be subject to PUBLIC LIABILITY (Act Only) INSURANCE Policy clauses attached herewith.

Clauses	Description
Conditions	Arising out of willful or intentional non compliance of Statutory provisions
Conditions	If Company deny Liability for claim not within 1 year from date of condition claim have been discarded
Conditions	The Insured Owner shall keep record of annual turnover
Conditions	This policy may be canceled by the Insured Owner by giving 30 days notice
Conditions	This Policy may also be canceled by the Insurer by giving 30 days notice
Conditions	Company not be liable to make paymnt,if claim shall be in any manner fraudulent
Conditions	The Policy and the Schedule shall be read together as one contract
Conditions	Any dispute Policy shall be determined in accordance with the law
Conditions	Company notbe liable for clm,relief made after5Yr from date of occurence of acc
Conditions	During claim,any existing insurance covered same Liability, Company not liable to pay
Conditions	No payment shall be made by the insured without the written consent of Company
Exclusions	Damage to property owned,otherwise in Insured Owner control,care or custody
Exclusions	Directly or indirectly occasioned by happening through or in consequence of war
Exclusions	Ionizing radiation or contamination by radioactivity from any nuclear fuel
Exclusions	Radioactive,toxic,explosive of any explosive nuclear assembly
Exclusions	Arising under other legislation except in so for as Sec8,SubSec(1),(2)of Act
Exclusions	In respect of fines,penalties, punitive and or exemplary damages
Exclusions	Arising out of willful or intentional non compliance of Statutory provisions

Premium and GST Details

	Rate of Tax	Amount in INR
Premium		₹ 21342.00
SGST	0	0
CGST	0	0
IGST	0	0

In witness whereof the undersigned being duly authorised by the Insurers and on behalf of the Insurers has (have) hereunder set his (their) hand(s) on this 22nd day of November,2022.

For and on behalf of
The New India Assurance Company Limited

Date of Issue: 22/11/2022

Duly Constituted Attorney(s)

Stamp Duty under the Policy is ₹1

Mudrank_____Dt._____consolidated Stamp Fees Paid by Pay Order Number_____vide receipt number_____dt._____.

THE NEW INDIA ASSURANCE CO. LTD.
(Government of India Undertaking)

We hereby declare that though our aggregate turnover in any preceding financial year from 2017-18 onwards is more than the aggregate turnover notified under sub-rule (4) of rule 48, we are not required to prepare an invoice in terms of the provisions of the said sub-rule.

Tax Invoice No : 96000022E0004941

IRDA Registration Number: 190
NIA PAN NUMBER: AAACN4165C

HETERO LABS LIMITED UNIT-III

Compliance to the Task Force Directions issued vide Order No: 753/APPCB/UH-II/TF/VSP/2017 Dated 16/05/2017

S.No	Direction	Compliance
1	The Industry should not manufacture any un-consented products without obtaining CFE/CFO order of the board.	**Complied.** The industry is not manufacturing any un-consented products and applying for Change of product Mix as & when required.
2	The Industry shall cover HTDS Effluent equalization tanks and connected to the scrubber to prevent VOC emissions within one month as committed by the management.	**Complied.** The industry has covered the equalization tanks installed in the premises of M/s Hetero Infrastructure SEZ Ltd (there are no separate Equalization tanks in Hetero Labs Ltd, Unit-III) in the year 2017 itself and connected the vents to double stage scrubbers for controlling the emissions. Photograph of the installation is shown below:  
3	The Industry shall install water meters for utilities (cooling towers) also within one month.	**Complied.** The industry has installed flow meters for measuring water block wise as the cooling towers for the block are installed on the top of the building.
4	The industry shall improve drum cleaning system.	**Complied.** The industry is having dedicated drum washing facility in the premises of M/s Hetero Infrastructure SEZ Ltd and installed Hydro jet pumps for the cleaning of drums.
5	The industry shall install online pH meters with recording facility for all the scrubbers of all production blocks within 30 days.	**Complied.** The industry has installed online pH meters with recording facility for all the scrubbers and installed secondary scrubbers by connecting

		vents of scrubbers installed in the production blocks. All online pH meters of secondary scrubbers are connected to APPCB website.
6	The Industry shall provide nitrogen blanketing system for remaining 12 no's of solvent storage tanks within 3 months as committed by the management.	**Please refer below:** The industry has installed nitrogen blanketing to all solvent storage tanks in the year 2017 itself. But due to various reasons the industry gone for insulation of storage tanks and vent condensers with chilled water circulation. At present, though Nitrogen provision is there for all storage tanks, the industry has provided insulation and Vent condensers to some of the storage tanks.
7	The Industry shall install Electromagnetic flow meters for HTDS effluents before Pumping them to the CETP located at M/s. Hetero Infrastructure system (SEZ) for further treatment within 30 days.	**Complied.** The industry has provided Electromagnetic flow meters for HTDS effluents at the inlet of CETP located at M/s. Hetero Infrastructure SEZ Ltd in the year 2017 and flow meters are connected to CPCB & APPCB websites. Photograph of the installation is shown below: 
8	The Industry shall obtain common EC for the MoEF & CC for merging of M/s. Hetero Drugs Ltd, Unit-VI with Hetero Labs Ltd, Unit-III.	**Complied.** The industry approached MoEF&CC for merging of Environmental Clearance of M/s. Hetero Drugs Ltd, Unit-VI with Hetero Labs Ltd, Unit-III in the year 2017-18. As per the discussions had during EAC meeting at MoEF&CC, there is provision in the Environment Act for merging both the Environmental Clearances. Hence the Ministry has changed the name of M/s Hetero Drugs Ltd, Unit-VI to M/s Hetero Labs Ltd. Copy of the name change letter issued by MoEF&CC is enclosed as **Annexure-I.**
9	The Industry shall ensure continuous compliance of the conditions issued in the CFO & HWA order.	**Complying.** The industry is ensuring continuous compliance of the conditions issued in the CFO & HWA Order and submitting the compliance report in APPCB website once in six months.

F.No. J-11011/398/2010-IA-II(I)
Government of India
Ministry of Environment, Forests & Climate Change
(IA-II Division)

Indira Paryavaran Bhawan
Joarbag Road, New Delhi-3
Dated 27th January, 2020

To

M/s Hetero Labs Limited
Village-Nallamattipalem, Mandal-Nakkapalli
Distric-Visakhapatnam (Andhra Pradesh)

Sub: Expansion of Bulk Drug Manufacturing unit (60 TPM to 450 TPM) at village Nallamapattipalem Mandal Nakkapally Vishakhapatnam (Andhra Pradesh) by M/s Hetero Drugs Limited (Unit VI)- Transfer of Environmental Clearance reg.

Sir,

This has reference to your online proposal No IA/AP/IND2/29761/2010 dated 18th April 2019 regarding transfer of the environmental clearance for the above project, from M/s Hetero Drugs Limited (Unit VI) to M/s Hetero Labs Limited.

2. The Ministry has granted environmental clearance vide letter dated 10th September 2012 in favour of M/s Hetero drugs Limited (unit VI) for the project for expansion of Bulk Drug Manufacturing unit (60 TPM to 450TPM) at village Nallamapttipalem Mandal Nakkapally Vishakhapatnam (Andhra Pradesh).

3. M/s Hetero Labs Limited has informed that the manufacturing unit located at village Nallamapttipalem Mandal Nakkapally Vishakhapatnam (Andhra Pradesh) has purchased vide deed of conveyance dated 17th March 2015 from M/s Hetero Drugs Limited, and thus necessitating transfer of all requisite approvals in the name of new company.

4. M/s Hetero Labs Limited has submitted (i) a copy of "No Objection" given by the Director of M/s Hetero drugs limited (Unit VI) to transfer the said EC in the name of M/s Hetero Labs Limited and (ii) A copy of undertaking as an affidavit from the Director of M/s Hetero Labs Limited to abide by the terms and conditions prescribed in the environmental clearance No.J-11011/398/2010-IA-II(I) dated 10th September 2012.

5. As per the relevant provisions of the EIA Notification, 2006 the environmental clearance to the project for the project for expansion of Bulk Drug Manufacturing unit (60 TPM to 450 TPM) at village Nallamapattipalem Mandal Nakkapally Visakhapatnam (Andhra Pradesh) granted by the Ministry vide letter dated 10th September , 2012 is hereby transferred **from M/s Hetero drugs limited (Unit VI) to M/s Hetero Labs Limited**, on the same terms and conditions under which prior environmental clearance was initially granted.

6. This issues with approval of the competent authority.

(Dr. R. B. Lal)
Scientist 'E'

Copy to :-

1. The Principal Secretary, Department of Environment, Govt of Andhra Pradesh, Hyderabad (Andhra Pradesh)

2. The Additional Principal Chief conservator of Forests ©, Regional Office (Southern Zone, Bangalore) Kendriya Sadan, 4th floor ,E & F wing, 17th Main road, Koramangala II block, Bangalore-34.
3. The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD –cum-office Complex, East Arjun Nagar, Delhi-32
4. The Member secretary, Telangana State Pollution control Board, Hyderabad-38
5. M/s Hetro Drugs Limited-(Unit-VI), Sanathnagar, Hyderabad-500 018 (Andhra Pradesh)
6. Monitoring Cell, Ministry of Environmen, Forest and climate change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi.
7. Guard File/ Monitoring File/ Record File.

(Dr. R. B. Lal)
Scientist 'E'

HETERO DRUGS LTD, UNIT-IX

COMPLIANCE TO THE TASK FORCE DIRECTION ISSUED BY APPCB
ORDER NO: 782/APPCB/UH-II/TF/ELR/2016 DATED: 23.07.2016

S.NO	CONDITION	COMPLIANCE
1	The Industry shall apply CFE/CFO order of the board for un-consented products immediately.	**Complying.** The industry is applying for CFO & CFE (Change of Product Mix) for new products as and when required. The details of CFE/CFO (CPM) recently obtained by the industry are as below: CTE Order No: 220/APPCB/CFE/RO-VSP/HO/2012 dated 13/12/2016 and CTO (CPM) order no: APPCB/VSP/220/CFO/HO/2010 dated 27/09/2022 valid up to 31/12/2023
2	The industry shall install multistage scrubber and online pH meters within 1 month.	**Complied.** The industry has installed multistage scrubbers with online pH meters to all the reactors where acidic reactions are being carried. The list of scrubbers installed is enclosed as **Annexure-I**
3	The Industry shall complete the installation of fume extraction system with hood and connected to scrubber to control odour nuisance within 2 months.	**Complied.** The industry has covered all equalization tanks with FRP hoods, and the vents of hoods are connected to the scrubbers to avoid odour nuisance. Photograph of installation is shown below: 
4	The industry shall install flowmeters unit wise for HTDS & LTDS Effluents to ascertain the quantification within 1 month.	**Complied.** The industry has installed unit wise flowmeters for HTDS & LTDS Effluents to ascertain the quantities of effluents and records are being maintained. All flowmeters are connected to CPCB & APPCB website. Photograph of installation is shown below: 

5	The Industry shall not cause any odour nuisance in the industry premises.	**Complying.** The industry is not causing any order nuisance in the industry premises. The following measures are adopted by the industry for controlling odour nuisance in the factory: ➢ Closed transfer of solvents & Chemicals ➢ Storage tanks are provided with nitrogen blanketing. ➢ All low boiling solvent storage tanks are provided with insulation. ➢ Dual stage condensers to the vents of reactors ➢ Multistage scrubbers to the vents of reactors where acidic reactions are being carried. ➢ Seal pumps & AODD pumps are being used for pumping solvents etc.
6	The industry shall ensure the validity CFO of the board and ensure continuous compliance of the conditions issued by the Board	**Complying.** The industry is ensuring the validity of CFO and submitting the compliances regularly to the Board through online once in six months.

HETERO DRUGS LTD, UNIT-IX

COMPLIANCE TO THE TASK FORCE DIRECTION ISSUED BY APPCB
ORDER NO: 782/APPCB/UH-II/TF/ELR/2017 DATED 29.06.2017

S.NO	CONDITION	COMPLIANCE
1	The Industry shall obtain revocation of closure order from CPCB, New Delhi.	**Complied.** M/s Hetero Infrastructure SEZ Ltd has obtained revocation of closure order from CPCB, New Delhi and the copy is submitted to APPCB.
2	The Industry shall complete the installation of fume extraction system with hood and connected to scrubber to control odour nuisance within 2 months.	**Complied.** The industry has covered all equalization tanks with FRP hoods, and the vents of hoods are connected to the scrubbers to avoid odour nuisance. Photograph of installation is shown below:  
3	The industry shall provide multi stage scrubber along with pH meters for all the reactors within 3 months.	**Complied.** The industry has installed multistage scrubbers with online pH meters to all the reactors where acidic reactions are being carried. The list of scrubbers installed is enclosed as **Annexure-I**
4	The industry shall provide data logger system to pH meter within one month.	**Complying.** The industry installed data loggers to online pH meters
5	The industry shall comply all directions issued by the board vide order Dt. 23.07.2016.	**Complying.** The industry is complying all the directions issued by the board vide order dt. 23.07.2016.
6	The Industry shall ensure continuous compliance of the conditions issued in the CFO & HWA order.	**Complying.** The industry is ensuring continuous compliance and submitting the compliances regularly to the Board through online once in six months.

HETERO DRUGS LTD, UNIT-IX

Annexure- I

DETAILS OF SCRUBBER

S.NO	BLOCK	SCR No	DESCRIPTION				Tank Capacity (KL)	Vapour details	Online pH meter
			Diameter	MOC	Stages	Height			
1	B-Block	B/SCB-01	800mm	HDPE	DOUBLE STAGE	6Mtr	2	HCL Vapors	Yes
			800mm	PPFRP		4Mtr			
2	B-Block	B/SCB-02	600mm	HDPE	DOUBLE STAGE	6Mtr	2		Yes
			800mm	PPFRP		4Mtr			
3	C-block	C/SCB-01	1000mm	HDPE	DOUBLE STAGE	6Mtr	3	Bromine,TBA Reaction.	Yes
			1000mm	HDPE		6Mtr	3		
4	C-block	C/SCB-02	1000mm	PPFRP	DOUBLE STAGE	6Mtr	3	Bromine ,TBA Reaction.	Yes
			1000mm	PPFRP		6Mtr	3		
5	D-Block	D/SCB-01	800mm	HDPE	DOUBLE STAGE	6Mtr	2	HCL,Bromine Vapors	Yes
			300mm	PPFRP		3Mtr			
6	E-Block	E/SCB-01	600mm	PPFRP	DOUBLE STAGE	6Mtr	2	Ammonia	Yes
			300mm	PPFRP		3Mtr			
7	IDS-Block	IDS/SCB-01	300mm	PPFRP	DOUBLE STAGE	3Mtr	1	Acid fumes	Yes
			150mm	PPFRP		2 0mtr			
8	H2A-BLOCK	H2A/SCB-05	800mm	HDPE	DOUBLE STAGE	6Mtr	2	Alluminium chliride, CAC	Yes
		H2A/SCB-05	800mm	HDPE		6Mtr			
9	H2A-BLOCK	H2A/SCB-06	800mm	PPFRP	DOUBLE STAGE	6Mtr	2		Yes
		H2A/SCB-06	800mm	PPFRP		6Mtr			
10	SOLVENT YARD	SY/SCB-01	800mm	PPFRP	DOUBLE STAGE	6Mtr	2	HCL Fumes,Acetic Acid Fumes,Sulphuric Acid Fumes,Liq Ammonia	Yes
		SY/SCB-01	800mm	PPFRP		4Mtr			

EIA STUDY FOR CRZ REGULARIZATION OF DESALINATION PLANT OF HETERO INFRASTRUCTURE SEZ LTD., N. NARASAPURAM (VILLAGE), NAKKAPALLI MANDAL, VISAKHAPATNAM DISTRICT, ANDHRA PRADESH

PROJECT CODE: 745122122

For

HETERO INFRASTRUCTURE SEZ LIMITED
N. Narasapuram (Village), Nakkapalli Mandal
Visakhapatnam Dist., Andhra Pradesh

November 2022

INDOMER COASTAL HYDRAULICS (P) LTD.
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Client	Hetero Infrastructure SEZ Limited, N. Narasapuram Village, Nakkapalli Mandal, Visakhapatnam District.
Project Title	EIA Study for CRZ Regularization of Desalination Plant of Hetero Infrastructure SEZ LTD., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh.
Project Code	745122122
Abstract	M/s Hetero Infrastructure SEZ Ltd. (henceforth called *Hetero*), obtained Environmental & CRZ clearance from MoEF&CC for development of industrial plots for manufacturing of bulk drugs and lifesaving drugs. This project includes 5 MLD Desalination Plant with 15 MLD seawater intake, discharge of 10 MLD brine rejects and discharge of 1.04 MLD treated effluent. The Environmental & CRZ clearance issued by MoEF&CC vide letter no: 21-641/2007-IA.III dated 25/10/2010 mentioned that the desalinationa plant shall be installed in SEZ area and outside CRZ area. But, in the year 2010, Hetero installed the desalination plant on the already existed building built in CRZ -III (NDZ) area. In order to regularise the location of existing desalination plant developed in CRZ -III (NDZ) area, as suggested in the APCZMA meeting held on 13/10/2022, Indomer Coastal Hydraulics (P) Ltd., Chennai has taken up the indicated studies and prepared this report. The relevant studies including the field investigations were undertaken in October 2022.
Foreword	The materials presented in the report carry the copyright of Hetero Infrastructure SEZ Ltd. and Indomer. These data should not be altered or distorted or copied or presented in different manner by any other organizations without the written consent from Hetero Infrastructure SEZ Ltd. and Indomer.
Document type	Un controlled

Date	Report Type	Originator	Checked by	Approved by	Approver's sign
4.11.2022	Final	Mr. M. Parthiban	Mr. J. Guru prasad	Dr. P. Chandramohan	
	Project Code	745122122		Text pages	95
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1. INTRODUCTION

Hetero is a globally renowned vertically integrated pharmaceutical company engaged in research and development, manufacturing and marketing of high-quality chemical and biologic medicines across diverse therapeutic areas. Backed by more than 27 years of expertise in the pharmaceutical industry, Hetero's strategic business areas spread across Active Pharmaceutical Ingredients (API), Global Generics, Biosimilars and Custom Pharmaceutical Services. The company is among the largest producers of Active Pharmaceutical Ingredients (APIs) in the world.

Hetero Infrastructure SEZ Limited (henceforth called Hetero), Hyderabad has set up Industrial Estate consisting of both SEZ and Non-SEZ exclusively for its own group of companies for manufacturing the Bulk Drugs (Active Pharmaceutical Ingredients) and its intermediates at Laxmipuram village (215,286/1, 286/2, 283/1), Rajayyapeta village (312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7), Pedateenerla village (19(P) & 20) and N. Narasapuram Village (117/1 to 117/3,119/1, 119/2, 120/1,120/2, 126, 129/1 to 129/9, 142, 150, 151) of Nakkapalli Mandal Visakhapatnam District spread in an area of about 496 acres. Out of the total area, built-up area is about 200 acres and green belt area is about 150 acres, open & roads-140 acres. M/s Hetero group is surrounded by open Lands & Uppateru in the South direction, Open lands in the East direction, open Lands in north direction and road connecting Upamaka village & Rajayappeta village in the West direction. This facility is designed to meet the best global standards for an API facility and to meet the growing demands of Bulk Drugs worldwide.

Hetero started construction of industrial plots in the year 2010 for manufacturing of bulk drugs and lifesaving drugs. The source of water requirement for the project is met from Desalination Plants installed in the premises the Hetero Infrastructure SEZ ltd which located in the CRZ area.

Before the land acquisition for construction of the desalination plant for Hetero SEZ, there were prawn aquaculture buildings, a jetty, and other buildings of Vijaya Marines. Existing facilitations in the year 2005 are shown below.





Hetero Chemical Complex

1.1 Project Background

Hetero obtained Environmental & CRZ clearance from MoEF&CC for development of 5 MLD desalination plant and laying of treated effluent pipeline vide letter no: 21-641/2007-IA.III dated 25/10/2010 with following facilities.

Desalination plant

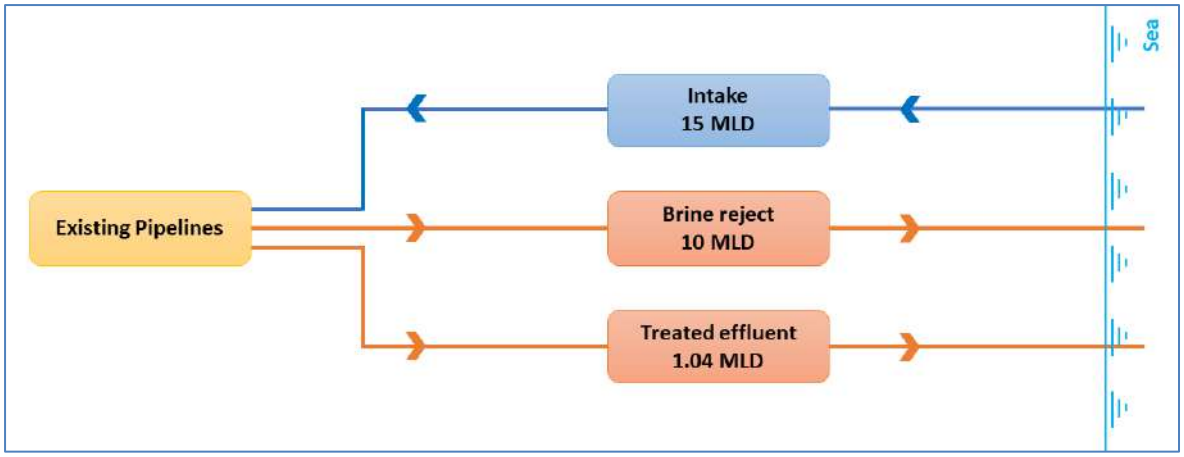
- Seawater intake pipeline of length 980 m into the sea from HTL to draw seawater of quantity 15 MLD.
- One brine reject pipeline of length 2000 m into the sea from HTL to discharge 10 MLD brine.

Treated effluent pipeline

- Another separate treated effluent discharge pipeline of 981 m into the sea to discharge the quantity of 1.04 MLD.

Existing pipelines

Hetero laid three separate pipeline based on NIO report 'Feasibility study for the seawater intake and outfall for the proposed Desalination Plant in Hetero complex at Nakkapalli' in the year 2010. Details of the existing pipeline is shown below.

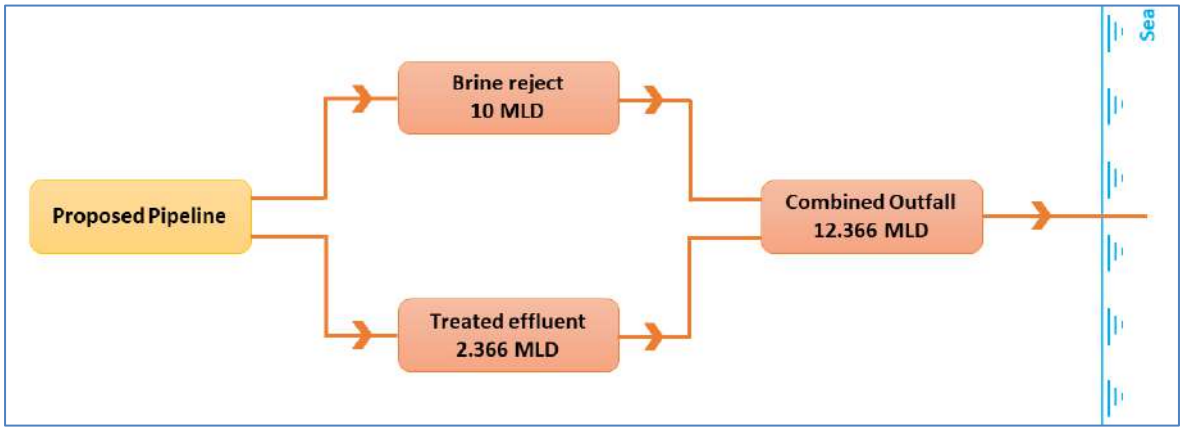


Proposed Pipelines

Presently the flow in the pipelines got reduced. Hetero had taken up inspection of the all the three pipelines. They assigned work of inspection of marine pipelines to Sskivya Agro Tech Products in the month of March 2021. They have inspected the pipelines and submitted the report status on the pipeline condition**.** As per the report it is evident that:

Over the period of 12 years, both of these two outfall pipelines got damaged due to four reasons. First reason is chocking up of the pipelines due to barnacle growth in the pipelines, second reason is entanglement of more fishing nets around the diffuser and the third reason is all diffuser ports got disoriented and the fourth reason is the diffuser ports got completely buried below the seabed.

In order to overcome this problem, project proponent is planned to replace existing treated effluent and desalination plant reject pipeline into a single marine disposal pipeline. Details of the proposed pipeline is shown below.



In the 52nd APCZMA metting held on 13/10/2022, the newly proposed outfall pipelines and regularization of existing desalination plant was presented to the commitiee members which is under examiantion. During the meeting committee has suggested to prepare regularization report for the existing desalination plant built in CRZ area. This report forms as "EIA study for CRZ regularization of desalination plant of Hetero Infrastructure SEZ Ltd". This report has been prepared in order to meet the suggestion from Andhra Pradesh Coastal Zone Management Authority (APCZMA) commitiee during the 52nd meeting held on 13/10/2022.

The clearance of existing desalination plant along with conditions obtained from MoEF&CC on 25 October 2010 is shown below.

No. 21-641/2007-IA.III
Government of India
Ministry of Environment & Forests
(IA-III Division)

Paryavaran Bhawan,
CGO Complex, Lodhi Road,
New Delhi-110 003

Dated: 25th October, 2010

To,
M/s Hetero Infrastructures SEZ Ltd,
H.No.8-3-166/7/1
Hetero House, Erragadda
Hyderabad – 500 018

Subject: Environmental & CRZ Clearance for the development of SEZ for Pharmaceutical and Chemical manufacturing units intake and outfall and for desalination plant at Sy. No. 215, 286/1, 286/2, 283/1, in Ch. Lakshmi Puram, 312/1 to 312/5, 312/10 to 312/12, 313/1 to 313/7 of Rajaiahpet, 19(qart) in Pedda Teernala, 117/1 to 117/3, 119/1, 119/2, 120/1, 120/2, 125,126, 129/1 to 129/9, 138, 142, 150, 215 N. Narasapuram village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh by M/s. Hetero Infrastructure SEZ Ltd. – Reg.

Sir,

This has reference to your application No. Nil dated 26.6.2007 and letter no. SEIAA/AP/VSP-14/2008-1234 dated 4.8.2008 and subsequent letters dated 2.3.2009, 20.8.2009, 5.9.2009, 15.12.2009, 22.2.2010, 9.4.2010 and 17.5.2010 seeking prior Environmental and CRZ Clearance for the above project under the EIA Notification, 2006 and CRZ Notification 1991. The proposal has been appraised as per prescribed procedure in the light of provisions under the EIA Notification, 2006 as amended in 2009 and CRZ Notification 1991 on the basis of the mandatory documents enclosed with the application viz., the Questionnaire, EIA, EMP, recommendations of SCZMA and the additional clarifications furnished in response to the observations of the Expert Appraisal Committee constituted by the competent authority in its meetings held on 3.3.2009, 15.4.2009, 6-7th October, 2009, 27-29th January, 2010, 25-26th February, 2010 & 28-29th June, 2010 & 21-23rd September,2010.

2. It is, interalia, noted that the project involves the development of SEZ for Pharmaceutical and Chemical manufacturing units on a total plot area is 138.51 ha. It is proposed to develop 17 plots, which include 4 plots for which EC was already issued earlier. All the units will be manufacturing bulk drungs (API) and chemicals (Life saving drugs). The total built-up area proposed is 1,12,942.50 sq. m. The total water requirement is 1.644 MLD (Source-YLBC Canal). The total effluent will be 1130.6 KLD (trade effluent – 1040.6 KLD and domestic effluent – 90 KLD). The treated waste water to be used for boilers – 290 KLD, AC cooling -424 KLD and washings -175 KLD.

Total solid waste generation will be 96 T/day. The power requirement is 10 MW. The total area proposed for parking is 19,200 sq.m. Total cost of the project is Rs 126.00 Crores.

3. The proposed Special Economic Zone (SEZ) is located outside the CRZ area. The industry proposed to utilize the existing effluent discharge pipeline of M/s Hetero Drugs Limited for the discharge of treated effluent of SEZ into the sea near Dondawaka (V) near Rajaiahpet village, Nakkapalli Mandal, Visakhapatnam District. The estimated quantity of effluent is 1040 cu.m. per day.

The National Institute of Oceanography (NIO), Visakhapatnam, a notified agency of Government of India has carried out the demarcation of LTL/HTL and CRZ area including the firming up of outfall point. The entire route of pipeline is passing through CRZ-III INCLUDING No Development Zone (NDZ) before entering inter tidal zone i.e. the area lying in between HTL and LTL which is classified as CRZ-I (ii). The NIO also carried out field studies to generated baseline and site specific data and also suggested suitable disposal point to facilitate quick dispersal of treated effluent. The width of the inter tidal zone varied between 130m to 175 mtr. at this stretch. The National Institute of Oceanography, Visakhapatnam after considering the prevailing physico-chemical and bathymetry of the study area, recommended the discharge point at 13 mtr. water depth i.e. at 17°21' 07" N latitude and 82° 44' 31" E longitude which is 981 M from the HTL. The NIO assessed the filed dilution of effluent was more than 100 times with one port diffuser system of 0.11 m. diameter with a jet velocity of 2 m/sec. at a depth of 13 m. The dilution can be enhanced to more than 200 times by using a 2 port diffuser of 0.07 m. diameter. The NIO recommended the diffuser system with Jet velocity of 2.0 m/sec. to avoid bio fouling and accumulation of the particulate matter inside the pipeline.

The proposal also includes 15 MLD desalination plant located within the SEZ area and outside the CRZ. The National Institute of Oceanography (NIO) firmed up the intake and outfall locations. Two separate pipelines are proposed each for intake of sea water of about 15 MLD and the estimated discharge of plant reject of about 10 MLD. The suggested length of intake pipeline is about 1.20 Km. from HTL and discharge pipeline is about 2.0 Km. The NIO suggested the intake location at 17° 21' 12" N latitude and 82° 44' 04" E longitude to draw 15 MLD sea water which is about 980 m. from the HTL at a depth of 6 m. The discharge location is indicated at 17° 21' 07" N latitude and 82° 44' 31 E longitude which is about more than 2 Km. from the HTL. The distance between the intake point and outfall point is maintained around 1.0 Km The discharge point provides for 30 times dilution by using a diffuser of 5 port with a velocity of 3 m/s at each port and the corresponding rise in salinity will be about 1 ppt above the ambient at release site. It is indicated in the RMEIA report that the ports will be separated by 3 m. distance and each port will make 45° angle with horizontal plane with a raise of to 2-3 m. above the bed to increase the dilutions. The salinity of treated water is indicated as 65 ppt. No ecologically sensitive areas such as mangroves or national parks are present in the vicinity of the proposed land fall point or along the route of the pipeline.

4. The proposal was examined by the Andhra Pradesh Coastal Zone Management Authority ON 13-05-2010 and opined that the pipeline passes through areas classified as CRZ-III followed by CRZ-I (ii) i.e. inter tidal zone before entering into the marine zone and recommended the proposal vide letter no. 1617/CZMA/2010 dt. 21-05-2010.

5. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and additional clarifications furnished in response to its observations, have recommended for the grant of Environmental & CRZ Clearance for the project mentioned above. Accordingly, the Ministry hereby accord environmental & CRZ clearance as per the provisions of Environmental Impact Assessment Notification – 2006 and CRZ Notification 1991 its subsequent amendments, subject to strict compliance of the terms and conditions as follows:

PART A - SPECIFIC CONDITIONS

I. Construction Phase

(i) "Consent for Establishment" shall be obtained from Andhra Pradesh 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.

(ii) Sufficient dilution shall be ensured to meet the ambient parameters within 50 m. distance from the outfall.

(iii) Regular Independent monitoring of marine water quality including temperature and salinity at the outfall shall be undertaken through a authorized agency and submitted along with six monthly monitoring report to the Ministry.

(iv) Filters in the way of extruders shall be provided at the intake point to prevent fishes entering in to the system.

(v) All the recommendations of EIA and DMP shall be strictly complied with.

(vi) Lighted buoys shall be provided at intake and out fall locations as indicators

(vii) The pipeline shall be buried at least 2 m depth in the onshore area and 4 mts. in the offshore area. Necessary permission with regard to the pipeline burial and laying shall be obtained from Maritime Board to ensure that the pipeline route does not fall in the navigation channel. Accordingly, the details of the laying of the pipeline shall be provided.

(viii) The pipeline shall not pass through any Sand dunes or mangroves. The project shall be implemented in such a manner that there is no damage whatsoever to the mangroves/ other sensitive coastal

ecosystem. If any damage to mangroves is anticipated / envisaged as a result of project activities then the clearance shall stand cancelled and the proponents shall seek fresh approval from the Ministry.

(ix) The reject shall meet the standards prescribed by Andhra Pradesh Pollution Control Board before disposal.

(x) A continuous and comprehensive post-project marine quality monitoring programme shall be taken up. This shall include monitoring of water quality, sediments quality and biological characteristics and report submitted every 6 months to Ministry's Regional Office at Bangalore.

(xi) It shall be ensured that there is no displacement of people, houses or fishing activity as a result of the project.

(xii) There shall be display boards at critical locations along the pipeline viz. road / rail/ river crossings giving emergency instructions. This will ensure prompt information regarding locations of accident during any emergency. Emergency Information Board shall contain emergency instructions in addition to contact details. Proper lightning shall be provided all along the road.

(xiii) There shall be no withdrawal of ground water in CRZ area, for this project.

(xiv) No other activities except the permissible actions under CRZ Notification 1991 shall be carried out within CRZ areas.

(xv) Soil and ground water samples will be tested to ascertain that there is no threat to ground water quality by leaching of heavy metals and other toxic contaminants.

(xvi) Construction spoils, including bituminous material and other hazardous materials, must not be allowed to contaminate watercourses and the dump sites for such material must be secured so that they should not leach into the ground water.

(xvii) Any hazardous waste generated during construction phase, should be disposed off as per applicable rules and norms with necessary approvals of the Andhra Pradesh State Pollution Control Board.

(xviii) The diesel generator sets to be used during construction phase should be low sulphur diesel type and should conform to Environment (Protection) Rules prescribed for air and noise emission standards.

(xix) The diesel required for operating DG sets shall be stored in underground tanks and if required, clearance from Chief Controller of Explosives shall be taken.

(xx) Vehicles hired for bringing construction material to the site should be in good condition and should have a pollution check certificate and should conform to applicable air and noise emission standards and should be operated only during non-peak hours.

(xxi) Ambient noise levels should conform to residential standards both during day and night. Incremental pollution loads on the ambient air and noise quality should be closely monitored during construction phase. Adequate measures should be made to reduce ambient air and noise level during construction phase, so as to conform to the stipulated standards by CPCB/ SPCB.

(xxii) Fly ash should be used as building material in the construction as per the provisions of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003.

(xxiii) Ready mixed concrete must be used in building construction.

(xxiv) Storm water control and its re-use as per CGWB and BIS standards for various applications.

(xxv) Water demand during construction should be reduced by use of pre-mixed concrete, curing agents and other best practices referred.

(xxvi) Permission to draw ground water shall be obtained from the competent Authority prior to construction/operation of the project.

(xxvii) Regular supervision of the above and other measures for monitoring should be in place all through the construction phase, so as to avoid disturbance to the surroundings.

(xxviii) Under the provisions of Environment (Protection) Act, 1986, legal action shall be initiated against the project proponent if it was found that construction of the project has been started without obtaining environmental clearance.

II. Operation Phase

i) The installation of the Effluent Treatment Plant (ETP) should be certified by an independent expert and a report in this regard should be submitted to the Ministry before the project is commissioned for operation. Treated affluent emanating from ETP shall be recycled/ reused to the maximum extent possible.

ii) The solid waste generated should be properly collected and segregated. Wet garbage should be composted and dry / inert solid waste should be disposed off to the approved sites for land filling after recovering recyclable material.

iii) Diesel power generating sets proposed as source of back up power for elevators and common area illumination during operation phase should

be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use low sulphur diesel. The location of the DG sets may be decided with in consultation with Andhra Pradesh State Pollution Control Board.

iv) Noise should be controlled to ensure that it does not exceed the prescribed standards. During night time the noise levels measured at the boundary of the building shall be restricted to the permissible levels to comply with the prevalent regulations.

v) The green belt of the adequate width and density preferably with local species along the periphery of the plot shall be raised so as to provide protection against particulates and noise.

vi) Weep holes in the compound walls shall be provided to ensure natural drainage of rain water in the catchment area during the monsoon period.

vii) Rain water harvesting for roof run- off and surface run- off, as plan submitted should be implemented. Before recharging the surface run off, pre-treatment must be done to remove suspended matter, oil and grease. The borewell for rainwater recharging should be kept at least 5 mts. above the highest ground water table.

viii) The ground water level and its quality should be monitored regularly in consultation with Central Ground Water Authority.

ix) Traffic congestion near the entry and exit points from the roads adjoining the proposed project site must be avoided. Parking should be fully internalized and no public space should be utilized.

x) A Report on the energy conservation measures confirming to energy conservation norms finalise by Bureau of Energy Efficiency should be prepared incorporating details about building materials & technology, R & U Factors etc and submit to the Ministry in three months time.

xi) Energy conservation measures like installation of CFLs/TFLs for the lighting the areas outside the building should be integral part of the project design and should be in place before project commissioning. Use CFLs and TFLs should be properly collected and disposed off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination. Use of solar panels may be done to the extent possible.

PART – B. GENERAL CONDITIONS

i) The environmental safeguards contained in the EIA Report should be implemented in letter and spirit.

ii) The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB.

6. Officials from the Regional Office of MOEF, Bangalore who would be monitoring the implementation of environmental safeguards should be given full cooperation, facilities and documents/data by the project proponents during their inspection. A complete set of all the documents submitted to MoEF should be forwarded to the CCF, Regional office of MOEF, Bangalore.

7. In the case of any change(s) in the scope of the project, the project would require a fresh appraisal by this Ministry.

8. The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.

9. All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc. shall be obtained, as applicable by project proponents from the respective competent authorities.

10. These stipulations would be enforced among others under the provisions of 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 and EIA Notification, 2006.

11. The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Kerala Pollution Control Board and may also be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in. The advertisement should be made within 10 days from the date of receipt of the Clearance letter and a copy of the same should be forwarded to the Regional office of this Ministry at Bangalore.

12. Environmental clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation V/s Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.

13. Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.

14. A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad/Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/ representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.

15. The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO_2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the company in the public domain.

16. The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.

Yours fathfully,

(Bharat Bhushan)
Director (IA)
25.10.2010

Copy to:

(1) Special Secretary (Environment), Government of Andhra Pradesh, Secretariat, Hyderabad- 500 022
(2) The Chairman, Andhra Pradesh Coastal Zone Management Authority and Environment, Forests, Science & Technology, Government of Andhra Pradesh, Hyderabad
(3) The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD-cum-Office Complex, East Arjun Nagar, Delhi – 110 032.
(4) The Member Secretary, A.P. State Pollution Control Board, Paryavaran Bhavan, A-3, Industrial Estate, Sanath nagar, Hyderabad – 500 018
(5) The CCF, Regional Office, Ministry of Environment & Forests(SZ), Kendriya Sadan, IVth floor, E&F wings, 17th Main Road, Koramangala II Block, Bangalore – 560 034.
(6) IA - Division, Monitoring Cell, MOEF, New Delhi - 110003.
(7) Guard file.

(Bharat Bhushan)
Director (IA)

The Environmental & CRZ clearance issued by MoEF&CC mentioned that desalination plant shall be installed in SEZ area and outside CRZ area.

However Hetero constructed the desalination plant on the existing abandoned building which was located in the CRZ III (NDZ) region. The construction was started in the year 2010, during which not much clarity was available on the CRZ regulations. The CRZ notification and guidelines was implemented from 6th of January 2011. But the plant was built before to the 2011 CRZ Notification by lack of understanding and mistake.

1.2 Purpose of the Report

Though the desalination plant was recommended to construct in SEZ area and outside CRZ area, due to not much clarity and as there was one abandoned building existed in CRZ – NDZ area, the desalination plant was constructed and running in CRZ III (NDZ) region for the past 11 years from 2011. Hence in order to legalize the location of existing desalination plant in CRZ -III (NDZ) area, Hetero approached Indomer Coastal Hydraulics (P) Ltd., Chennai to carryout necessary studies for regularization of the existing desalination plant. This report forms as "EIA study for CRZ regularization of desalination plant of Hetero Infrastructure SEZ Ltd". This report has been prepared in order to meet the suggestion from Andhra Pradesh Coastal Zone Management Authority (APCZMA) commitiee during the 52nd meeting held on 13/10/2022.

1.3 Brief Description of the Project

Location of project: The existing desalination plant of Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh. The location map of the project region is shown in **Fig. 1.1.**

Nature of project: In order to legalize the location of existing desalination plant in CRZ -III (NDZ) area. Location of the existing desalination plant super imposed in google map is shown in **Fig. 1.2.**

Salient features of project site

Particulars	Details
Desalination plant location	Teenarla Village, Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh
Current land use	SEZ area
Nearest Town	Nakkapalli
Rivers/Streams/Creek	None
Nearest Highway	AH 45 (6 km west)
Nearest Railway station	Gullipadu Railway Station (12.4 km west)
Nearest Airport	Visakhapatnam International Airport (65 km north)
Nearest port/ Harbour	Visakhapatnam port (65 km north)
Historical/Archaeological sites	None
Ecologically Sensitive Areas	Sand dunes (2.8 km northeast)
Seismic Zone	Zone III – Moderate Risk Zone

1.4 Coastal Regulation Zone

Based on CRZ Notification 2011, CRZ map has been prepared by the Institute of Remote Sensing (IRS), Anna University, Chennai, which is one of the approved agencies by MoEF&CC. The copy of CRZ map is shown in **Fig. 1.3.** As per the CRZ map prepared based on CRZ Notification 2011, the existing desalination plant falls under:

CRZ III : No Development Zone



IRS Anna University CRZ study

1.5 Gallery



Desalination Plant Entrance



Clarifier Tank

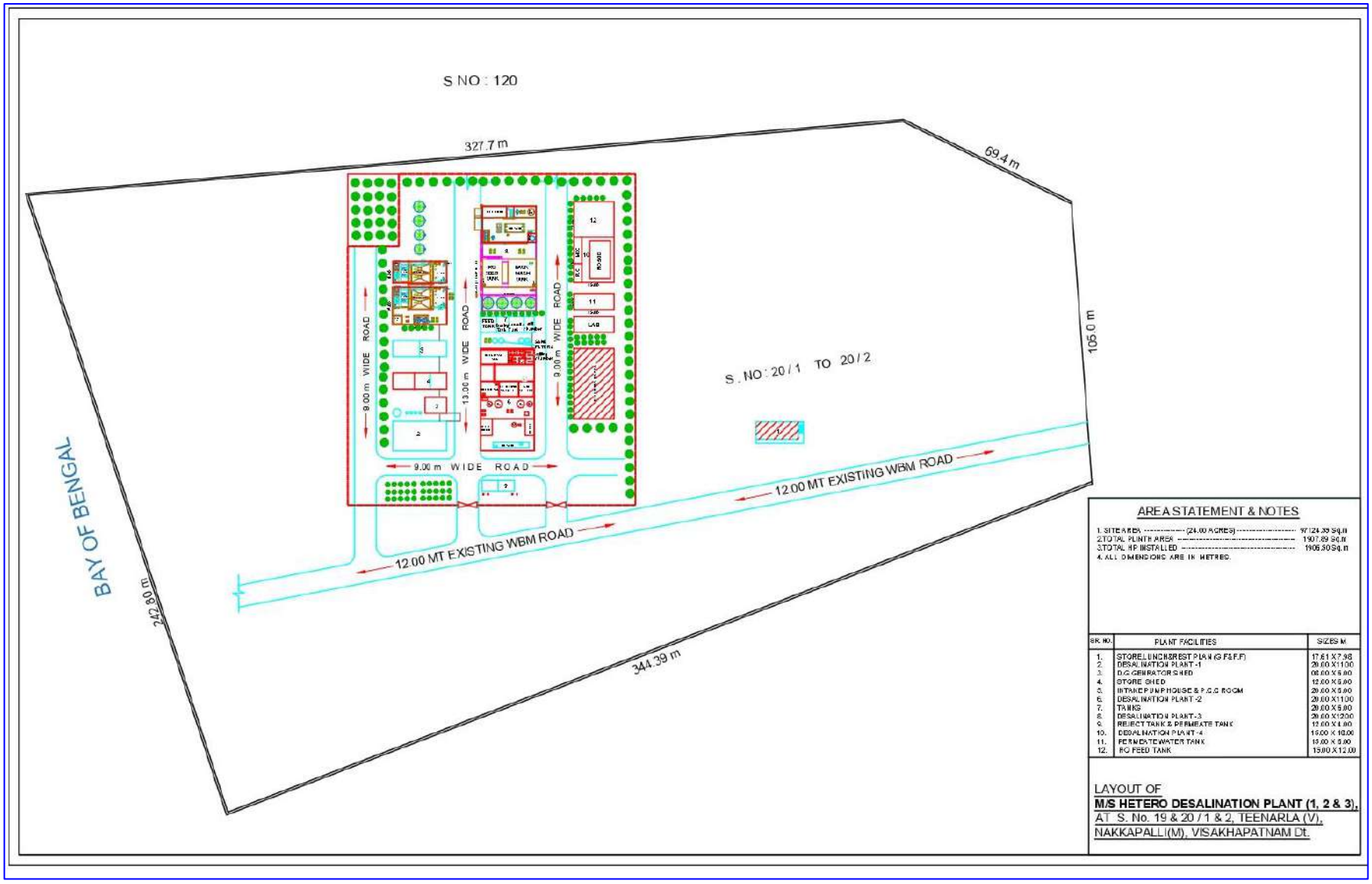




Reject Tank



Filters at Desalination Plant



Layout of the existing desalination plant

2. CRZ notification specific to setting up of desalination plant

2.1 CRZ notification 2011

The CRZ Notification 2011 and its subsequent amendments, impose restrictions on setting up/expansion of any industry, operations or processes and manufacture or handling within the CRZ limit and requires prior CRZ clearance from the SCZMA and the MoEF&CC, before commencing the onsite activities.

Desalination plants does not fall under any prescribed category in the list of projects or activities requiring Prior Environmental Clearance (EC) as per the Schedule of the EIA notification, 2006. Therefore, the proposed project does not require EC. Also, no protected areas are present within the 10 km radius neither forest area at site. Hence, clearance under the Forest Conservation Act, 1980 and Wildlife Protection Act, 1972 are not applicable.

Coastal Regulation Zone Notification 2011, issued by the Ministry of Environment and Forests (Department of Environment, Forests and Wildlife) is part of the Environment (Protection) Act, 1986. It was issued inviting objections and suggestions for the declaration of coastal stretches.

Based on CRZ Notification 2011, CRZ map has been prepared by the Institute of Remote Sensing (IRS), Anna University, Chennai, which is one of the approved agencies by MoEF&CC.

As per the Coastal Regulation Zone Notification 2011 from MoEF&CC,

Page no.11,
under Section 8,

Norms for regulation of activities permissible under this notification:
Sl. No.(iii) (h),

it is mentioned that:

'Foreshore facilities for desalination plants and associated facilities are permitted activities in NDZ" (CRZ -III No Development Zone)'

The relevant pages of the CRZ notification 2011, are extracted and enclosed as **Annexure – I**

Hence the existing Desalination plant of Hetero is a permitted activity and accordingly permission may be regularised for the area covered by the existing 5 MLD Desalination Plant.

2.2 CRZ notification 2019

Amendments were made based on the 2011 CRZ notification which was released in the year 2019.

As per the Coastal Regulation Zone Notification 2019 from MoEF&CC,

Page no.36,
under Section 5.3, (i)

Activities as permitted in CRZ-I B, shall also be permissible in CRZ-III, in so far as applicable.

Page no.34,
under Section 5.1.2.

(xviii) Desalination plants and associated facilities.

The relevant pages of the CRZ notification 2019, are extracted and enclosed as **Annexure – II**

Hence the existing Desalination plant of Hetero is a permitted activity and accordingly permission may be regularised for the area covered by the existing 5 MLD Desalination Plant.

3. Environmental Impact Assessment and Coastal Stability

Indomer has carried out a detailed EIA report and submitted to APCZMA titled *"Rapid Environmental Impact Assessment for Laying New Marine Disposal Pipeline in Place of Existing Treated Effluent and Desalination Plant Reject Pipelines for Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh"* based on evaluation of baseline data collected in December 2021 to January 2022. For specific requirement for the present regularization report once again check baseline data has been collected at 3 locations in October 2022.

3.1.1 Seawater Quality

The seawater, seabed sediment and biological samples were collected at 3 locations (stns. SS2 to SS4 and SS5). The details of the sampling locations are shown in **Fig. 3.1** and given in **Table 3.1.** The water samples were collected at surface, mid-depth and bottom.



Seawater sample collection

The seawater quality results are given in **Table 3.2.**

Temperature: The temperature variation is one of the factors in the coastal system, which may influence the physico-chemical characteristics and also influence the distribution and abundance of flora and fauna. The seawater temperature values varied from 25.2°C to 26.3°C during the study period. Temperature profiles at all sampling locations remain close when compared to the samples taken during December 2021.

Salinity: Salinity is an important parameter that governs the spatial distribution of marine organisms. Normally, the salinity of seawater is about 35 PSU among world oceans. Seawater salinity ranged from 30.9 to 31.7 PSU. Salinity was generally stable throughout the water column and compared to the samples collected in December 2021. Recorded salinity is normal for Andhra Pradesh coastal waters when compared to the samples taken during December 2021.

pH: Identifying pH for acidic or alkaline disturbances may help to locate zones of pollution and other quality conditions of seawater. pH ranged from 7.91 to 8.10. pH remains similar when compared to the samples taken during December 2021.

Total Dissolved Solids (TDS): TDS varied from 32450 to 32970 mg/l with an average 32944 mg/l between at all sampling locations.

Turbidity: Turbidity is the measure to understand the suspended particulate matter which controls the photosynthesis in the water column. Turbidity is a measure of water clarity, which is the number of suspended materials decreases the passage of light through the water.

Turbidity values ranged from 1.1 to o 2.7 NTU, indicating relatively clear water with low concentration of suspended sediment and good light penetration. The minimum value was recorded at stns. SS2 (surface) while the maximum was at stn. SS2 (Bottom) & SS5.

Total Suspended Solids (TSS): Total Suspended Solids in seawater originate either from autochthonous (biological life) or allochthonous (derived from terrestrial matter) sources. TSS values varied between 2.5 and 6.3 mg/l at all sampling locations. TSS remains similar when compared to the samples taken during December 2021.

Chlorides: Chlorides are generally present in natural water. The presence of chloride in the natural water can be attributed to suspension of salt deposits discharged of effluent from chemical industries, oil well operations sewage discharge, irrigation drainage seawater intrusion in coastal areas. The concentration of chloride ranged from 16846 to 17370 mg/l.

Dissolved oxygen (DO): Dissolved oxygen concentration varies according to many factors; the main factors are due to photosynthesis and respiration by plants and animals in water. Dissolved oxygen (DO) values ranged from 5.8 to 6.1 mg/l in the study area.

Biochemical Oxygen Demand (BOD): Rate of aerobic utilization of oxygen is a useful tool to evaluate the intensity of deterioration in an aquatic medium. The oxygen taken up for the breakup of organic matter leads to a reducing environment or in the event of release of excess nutrients, it may cause eutrophication.

BOD values ranged from 1.1 to 1.2 mg/l in the study period. The low BOD values indicate that oxidizable organic matter brought to the near shore waters is effectively assimilated in coastal water. The range of variation in BOD values indicates that the water column is well mixed in the project area.

Alkalinity: Alkalinity in natural water is due to free hydroxyl ions and weak acids and strong bases form hydrolysis of salts. Alkalinity values serve as an index of productive potential of water. The concentration of Alkalinity varied from 106 to 115 mg/l.

Calcium: Calcium occurs normally in seawater and the approximate level is about 400 ppm. The abundance of calcium is due to its natural occurrence in the earth's crust. Most marine organisms are made up of stone building skeletons called calcium carbonate. Calcium varied from 334 to 354 mg/l.

Magnesium: The mean value of magnesium concentration was in the range of 1050 to 1073 mg/l.

Total hardness: The mean value of total hardness with a range of 5171 to 5244 mg/l.

Nutrients: Nutrients determine the potential fertility of an ecosystem and hence it is important to know their distribution and behavior in different geographical locations and seasons. The fishery potential of an area is in turn dependent on the availability of primary nutrients like nitrogen and phosphorus. Enrichment of these nutrients by anthropogenic inputs in the coastal waters may result in eutrophication.

Ammonia-Nitrogen (NH_4-N): Unpolluted waters are generally devoid of ammonia and nitrite. However, coastal input by sewage and other nitrogenous organic matter and fertilizers can increase these nutrients to higher levels. In addition, ammonia in seawater can also come from various organisms as an excretory product due to the metabolic activity and the decomposition of organic matter by micro-organisms. The mean concentration with ranged from 3.6 to 5.2 µmol/l. The minimum value was recorded at stn. SS4 while the maximum was recorded at stn. SS2.

Nitrite-Nitrogen (NO_2-N): Nitrite is an important element, which occurs in seawater as an intermediate compound in the microbial reduction of nitrate or in the oxidation of ammonia. In addition, nitrite is excreted by phytoplankton especially during plankton bloom. Nitrite varied from 0.36 to 0.47 µmol/l at all sampling locations.

Nitrate-Nitrogen (NO_3-N): Nitrate values are in general higher as compared to nitrite values. Nitrate is the final oxidation product of nitrogen compounds in seawater and is considered to be the only thermodynamically stable oxidation level of nitrogen in seawater. Nitrate is considered to be the micronutrient, which controls primary production in the euphotic surface layer. The concentration of nitrate is governed by several factors of which microbial oxidation of NH_3 and uptake by primary producers may be important. The mean concentration of Nitrate was ranged from 4.4 to 8.1 µmol/l during the sampling periods. The minimum value was recorded at stn. SS2 and the maximum was at stn. SS4.

Total Nitrogen: Total nitrogen varied from 10.1 to 12.4 µmol/l.

Inorganic Phosphate (PO_4-P): Inorganic phosphate is also an important nutrient like nitrogen compound in the primary production of the sea. The concentration of phosphate, especially in the coastal waters is influenced by the river run off and anthropogenic activity. The mean concentration of Phosphate was range between 0.4 and 1.2 µmol/l.

Total phosphorous: Total phosphorous varied from 1.6 to 2.6 µmol/l at all sampling locations.

Sulphate: Sulfate with a range of 1882 to 1965 mg/l.

Fluoride: The concentration of fluoride ranged from 1.38 to 1.54 mg/l in the study area.

Boron: The Boron concentration ranged from 2.3 mg/l to 3.2 mg/l at all sampling locations.

Potassium: Potassium is found in relatively small concentrations in most natural waters mainly because of its being reconstituted into insoluble secondary minerals formed in the process of weathering. Potassium concentration varied from 311 mg/l to 324 mg/l at all sampling locations.

Sodium: The mean value of sodium recorded varies between 10939 and 11282 mg/l at all sampling locations.

Seawater quality parameters were found in the normal range and the water environment is free from pollution. There are no major changes in seawater samples collected during October 2022 when compared to baseline data collected during December 2021.

3.1.2 Seabed Sediment Quality

The sediment samples were collected at 3 sampling locations as shown in **Fig. 3.1.** The collected seabed sediment sample structure is dominated by fine sand texture. Results of seabed sediment quality are given in **Table 3.3.**



Collection seabed sediment sample

Total Organic Carbon: Organic carbon varied from 0.35 to 1.30 %. **Total Nitrogen:** Total nitrogen level varied from 246 to 619 µg/g. **Total Phosphorus:** Total phosphorous concentration was varied from 32.8 to 65.2 µg/g at all sampling locations. **Calcium Carbonate:** The values of calcium carbonate varied from 6.9 to 9.4 % at all sampling locations.

Heavy Metals

Cadmium (Cd): The concentration of cadmium in the study area was found to be <0.1 µg/g. **Chromium (Cr):** The concentration of total chromium was found from 26.1 to 31.1 µg/g at all sampling locations. **Lead (Pb):** The lead concentration of the study area was found to vary from 3.0 to 3.8 µg/g at all sampling locations. **Zinc (Zn):** The concentration of Zinc ranged from 32.3 to 34.8 µg/g at all sampling locations. **Mercury (Hg):** The concentration of mercury was found <0.1 µg/g at all sampling locations. **Strontium (Sr):** The concentration of strontium ranged from 46 to 56.1 µg/g at all sampling locations. Results of heavy metals remain similar when compared to the samples taken during December 2021.

Phenol: The concentration of Phenol was found to be <0.5 µg/g at all three stations during the study period.

Seabed sediment is predominantly composed of fine sand in nature. Organic matter, Total Nitrogen, Phosphorous concentrations were found within the normal range of coastal waters. The concentrations of heavy metals and phenols showed low values indicating absence of contamination in seabed sediments. There are no major changes in seabed sediments samples collected during October 2022 when compared to baseline data collected during December 2021.

3.1.3 Marine Ecology and Biodiversity

The coastal/marine environment of India plays a critical role in the economy of the nation by virtue of its resources and ecosystems such as estuaries, coral reefs, marshes, mangrove forests, lagoons,

sandy and rocky beaches, seaweeds, seagrass beds, etc. These habitats are all known for their high biological productivity and to provide a wide range of habitats for many aquatic flora and fauna. The coast is divided into three zones namely subtidal zone (mostly covered with tidal water), intertidal zone (under daily influence of tidal inundation) and high tidal zone (where tidal waters inundate generally during the spring and neap tide), based on this tidal inundation.

Coastal flora can be grouped into two distinct types namely, dry, and wet coastal plant communities. The dry coastal communities are of 2 types - sandy strand vegetation and rocky strand vegetation, whereas wet coastal communities comprise of seaweeds, seagrasses, mangroves and salt marsh vegetation.

Marine fauna are highly diverse and range in size from microscopic zooplankton to the blue whale, comprising crustaceans, fishes, sharks, whales, sea snakes, dolphins, dugongs, etc. and live their entire/partial life in the ocean. Marine fauna are also animals that either enter or leave the ocean for breeding or resting purposes, such as turtles, seals and sea lions, penguins, and crabs. The seabirds can also be considered as marine fauna. While animals such as sponges and corals that are attached to the seabed are also marine fauna, they are typically considered under the benthic communities and habitats.

3.1.3.1 Plankton

Primary productivity: Marine primary production plays an important role in food web dynamics, in biogeochemical cycles and in marine fisheries. The estimation of primary productivity is based on the relationship between oxygen evolution and carbon fixation. Primarily, phytoplankton depends on carbon dioxide, sunlight, and nutrients for growth, but some other factors such as water depth, water temperature, wind and grazers also play a significant role. Primary productivity varies from freshwater to river mouth and from the river mouth to the marine water body. Its major components are net and gross primary production. The primary production measurement is estimated by the light and dark bottle technique.

The primary productivity values varied between 420 and 480 mgC/m^3/day from all sampling locations (**Table 3.4**). With an average value of 450 mgC/m^3/day. The higher productivity value was recorded at stn. SS5 in coastal water may be related to temperature and photoperiod, while the lower value was recorded at stn. SS2 in near shore water may be due to low transparency.

Phytoplankton: Phytoplankton are the most important primary producers of the sea; their productivity depends mostly on adequate supply of light and nutrients. Phytoplankton are non-evenly distributed both in space and time. The spatial and temporal abundance and composition is affected by biological, hydrographical and ecological processes. The main types of phytoplankton are diatoms, dinoflagellates, green algae, cyanobacteria and coccolithophores. Phytoplankton contributes to more than 90 per cent of total marine primary production.

Species composition: The phytoplankton species composition is given in **Table 3.5.** The total number of phytoplankton species present varied considerably. Totally 73 species of phytoplankton were observed, comprising three groups viz., 51 species of diatoms (Bacillariophyta), 18 species of dinoflagellates (Pyrrophyta) and 4 species of blue-green algae (Cyanophyta).

Distribution of phytoplankton was investigated quantitatively and qualitatively. The results are given in **Table 3.6.** The phytoplankton composition in the study area was constituted mainly by Bacillariophyceae, Dinophyceae and Cyanophyceae during the sampling period.

Population density: The coastal water phytoplankton population density varied from 22300 to 30100 cells/l. Maximum abundance was observed at stn. SS5, while minimum was recorded at stn. SS2. Phytoplankton population mostly consisted of Bacillariophyceae (69.6%), Dinophyceae (25.4%) and Cyanophyceae (5.1%). Rhizosolenia sp. was the most dominant species followed by *Coscinodiscus* sp., *Chaetoceros diversus*, *Protoperidinium* sp. and *Navicula sp*. The numerical abundance of phytoplankton is given in **Table 3.6.**

Shannon-Wiener's diversity: The Shannon - Wiener's diversity index (H') ranged from 5.41 to 5.45 (bits/ind.). The highest species diversity was observed at stn. SS5 and the lowest species diversity was at stn. SS2. Simpson richness ranged from 0.97 to 0.98. Pielou's Evenness index (J') ranged from 0.976 to 0.992.

Diversity indices of phytoplankton in coastal waters

Range	S	N	d	J'	H'(log)	1-Lambda'
Minimum	44	22300	4.30	0.976	5.41	0.97
Maximum	48	30100	4.56	0.992	5.45	0.98

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity Index of Phytoplankton: The similarity index of phytoplankton at all sampling locations showed that the percentage of the similarity ranged from 62.17 – 74.79%. The average similarity was 69.64% in coastal waters.

Similarity Index of Phytoplankton in coastal waters

Station	SS2	SS4	SS5
SS2			
SS4	62.17		
SS5	74.79	71.97	

Dominant phytoplankton species



Thalassiothrix frauenfeldii



Coscinodiscus sp.

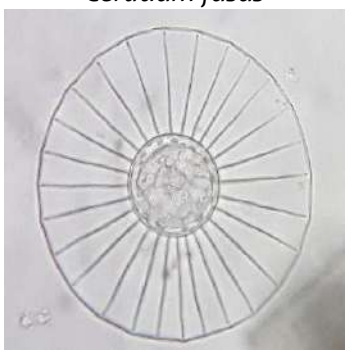


Odontella mobiliensis


Ceratium fusus


Prorocentrum micans


Trichodesmium erythraeum


Planktoniella sol


Chaetoceros affinis


Chaetoceros sp.


Ceratium furca


Ceratium macroceros


Protoperidinium oceanicum

Zooplankton

Zooplankton plays a key role in marine food web dynamics and biogeochemical cycling. Spatial distribution of zooplankton is an important factor in influencing the fish stock. Hence, any decline in zooplankton population may affect ecosystem functioning. Zooplankton dynamics is largely controlled by different environmental factors. Hence, any change in ambient water quality will significantly affect zooplankton population, which in turn can affect larval survival and hence fishery. Seasonal plankton succession is a process mainly regulated by temperature and salinity conditions.

Species composition: The systematic account of zooplankton encountered during the study period is presented in **Table 3.7.** Totally, 47 species of zooplankton were identified in the samples from the study area. Copepods were the most diverse group containing the highest number of species, followed by Decapods, Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. Copepods not only remained as the most dominant group but also appeared in large numbers during the sampling periods.

Population density and abundance: The zooplankton abundance ranged from 126761 to 149492 individuals/100 m^3. The highest abundance was recorded at stn. SS5, while the lowest was recorded at stn. SS2. The percentage occurrence of various groups fluctuated from location to location. The zooplankton biomass at different locations varied from 63.3 to 74.1 ml/100m^3. Most dominant species recorded in the present study were *Acrocalanus* sp., *Temora discaudata, Paracalanus* sp. and *Oithona nana.*

Shannon- Wiener's diversity: Shannon - Wiener's diversity index (H') values ranged from 4.64 to 4.75 bits/ind. The highest species diversity was observed at stn. SS5 and the lowest at stn. SS2. Simpson richness ranged from 0.944 to 0.956. Pielou's Evenness index (J') ranged from 0.912 to 0.954.

Diversity indices of Zooplankton in coastal waters

Range	S	N	d	J'	H'(log)	1-Lambda'
Minimum	29	126761	2.38	0.912	4.64	0.944
Maximum	34	149492	2.77	0.954	4.75	0.956

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity Index of Zooplankton: The similarity index of zooplankton in coastal waters showed that the percentage of similarity ranged from 52.49 to 62.22%, the average similarity 61.13%.

Similarity Index of Zooplankton in coastal waters

Station	SS2	SS4	SS5
SS2			
SS4	52.49		
SS5	68.69	62.22	

Common zooplankton dominant species



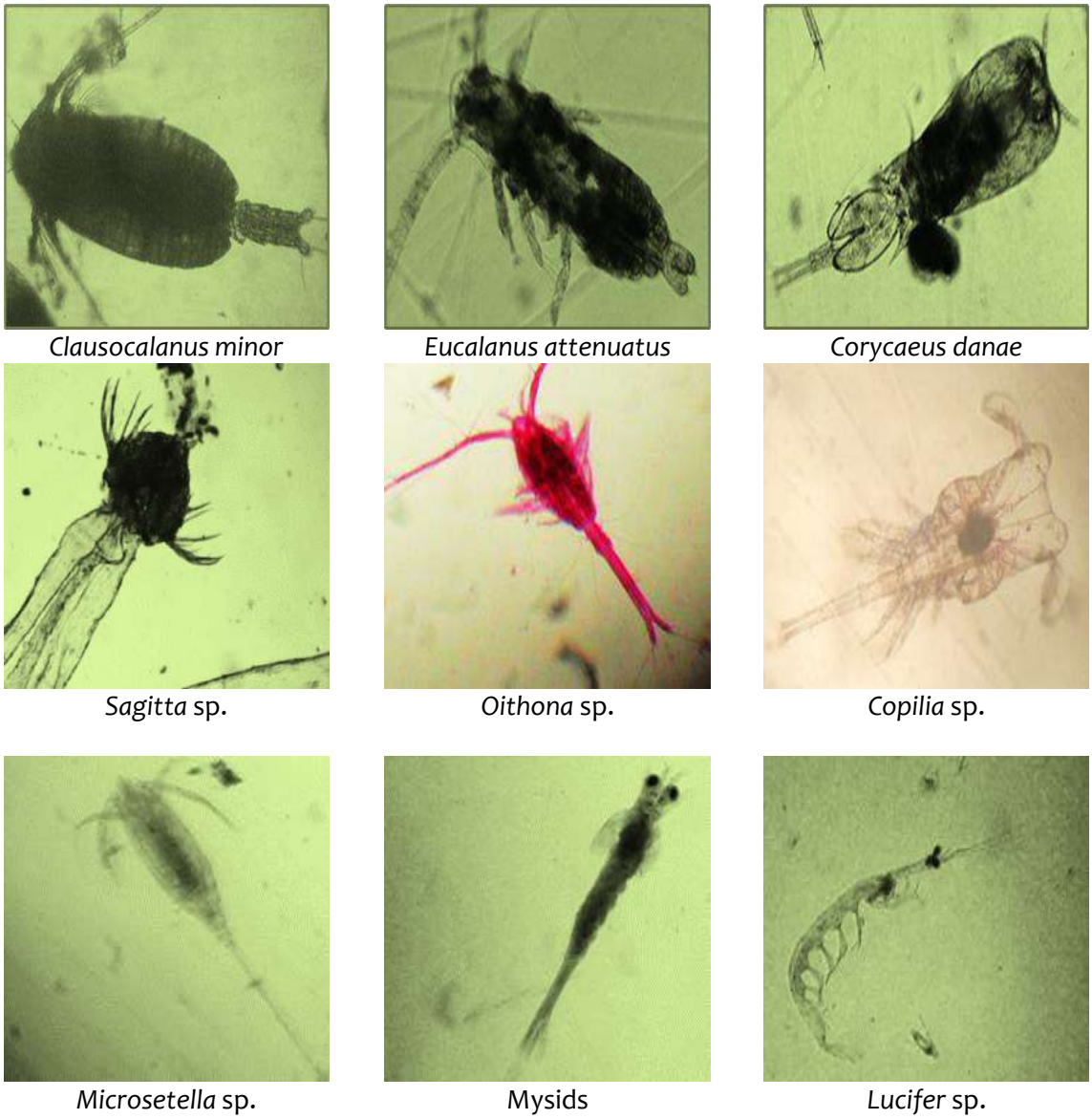
Evadne sp.



Centropages furcatus



Macrosetella sp.



Clausocalanus minor | *Eucalanus attenuatus* | *Corycaeus danae*

Sagitta sp. | *Oithona* sp. | *Copilia* sp.

Microsetella sp. | Mysids | *Lucifer* sp.

3.1.3.2 Benthos

The macrobenthic organisms can be analyzed from a high index of biological diversity. They are represented by many animal phyla, however dominant groups are represented by polychaetes, crustaceans, molluscs and echinoderms. Among these polychaetes form an important component of the benthic community in terms of abundance, species richness and diversity in most parts of the world Ocean. The dominant crustaceans include isopods, mysids, amphipods, ostracods and a few decapods. Molluscs are mainly represented by burrowing bivalves and a few gastropods that live in or on the surface. Echinoderms include brittle stars, sand dollars, sea cucumbers, starfish and heart urchins. Macrobenthos in marine sediments play an important role in ecosystem processes such as mineralization and mixing of sediments, the flux of oxygen into sediments, nutrients cycling, dispersion and burial and secondary production. These organisms provide key linkage between primary producers and higher trophic levels. Abundance of the subtidal and intertidal macrobenthic populations are presented in **Table 3.8.**



Collection of intertidal benthos

Numerical abundance and species diversity of subtidal benthic organisms: The density of macrobenthic organisms varied from 760 to 1040 nos./m^2 at all sampling locations of stns. SB2, SB4 and SB5. The maximum benthic organism density was found at stn. SB5 in seabed sediment, while minimum benthic organism density was found at stn. SB2. As expected, polychaetes dominated at all sampling locations over Molluscs, Arthropods and Amphioxiformes. All the sampling locations differed in the contributions of these groups. The Shannon-Wiener index H' ranged between 3.58 and 3.85 bits/individual during the study periods. Dominance index (d) was within the range between 1.81 and 2.16. Evenness index (J') fluctuated from 0.964 to 0.971.

Numerical abundance and species diversity of intertidal benthic organisms: The intertidal region is the most dynamic region governed by a large number of physicochemical factors lead by tide as a principal factor. Though intertidal regions are a highly productive region, the primary production available for benthos consumption is limited in the intertidal region. The organisms depend mostly on the deposition of materials from above, washed out from the land, sinking of phytoplankton and zooplankton from upper layers of the water column and its subsequent decomposition.

The density of macrobenthic organisms varied between 675 and 795 nos./m^2. Polychaetes dominated at all the sampling locations than the Arthropods and molluscs. The Shannon-Wiener index H' ranged from 3.62 to 3.67 bits/individual at stns. IB1 to IB3.

Diversity indices of macrobenthic organisms in seabed sediments

Range	S	N	d	J'	H'(log)	1-Lambda'
Subtidal macrobenthic organisms						
Minimum	13	760	1.81	0.964	3.58	0.910
Maximum	16	1040	2.16	0.971	3.85	0.924
Intertidal macrobenthic organisms						
Minimum	13	675	1.80	0.979	3.62	0.916
Maximum	13	795	1.84	0.990	3.67	0.920

S= Total species; N= total individuals; d= species richness; J'=evenness

Similarity index of macrobenthic organisms: The similarity index of macrobenthos in seabed sediments and intertidal benthos showed that the percentage of the similarity ranged from 20.93 – 97.09% with average similarity 55.39%.

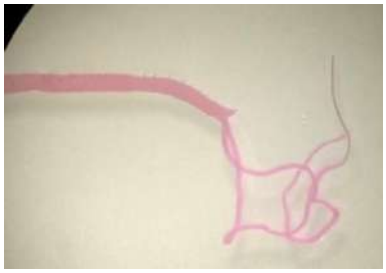
Similarity Index of Macro Benthic Organisms in seabed sediments and intertidal benthos

Station	SB2	SB4	SB5	IB1	IB2	IB3
SB2						
SB4	51.57					
SB5	20.93	36.76				
IB1	29.76	55.01	58.80			
IB2	29.60	55.73	58.31	96.79		
IB3	30.37	54.86	59.12	96.20	97.09	

Common Benthic organisms



Amphioxus sp.



Prionospio pinnata



Isopod



Capitella sp.



Cossura sp.



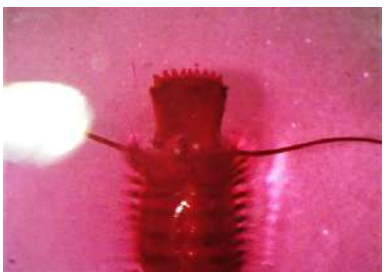
Isopod



Glycera sp.



Amphipod



Ancistrosyllis sp.

Interpretation and Ecological Status of the study area

It is always advantageous to assess the "Ecological Status" of a region before any major project is initiated so that the baseline information that was recorded can be used as a reference for future assessments. There are several statistical methods and indices to explain these changes and based on the values, people classify the ecological status. One such general method is the classification of Shannon -Weiner diversity Index.

Productivity Status	Species Diversity (Shannon - H')	Explanation
Very Low	0.0-1.5	Very highly polluted

Low	1.6-3.0	Highly polluted
Moderate	3.1-4.0	Moderately polluted
High	4.1-4.9	Transitional zone
Very High	5.0 and above	Normal/Pristine

In general, the pelagic environment presents a much larger uniformity than the benthic environment and species that inhabit it have much larger distribution areas.

Phytoplankton: Species diversity of the phytoplankton community of the coastal water is dominated by diatoms, dinoflagellates, and cyanobacteria. The most dominant phytoplankton species was *Rhizosolenia* sp.than the other phytoplankton species during the study period.

Zooplankton: Zooplankton biodiversity in this coastal water is mostly composed of copepods, followed by Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. The most dominant species was *Acrocalanus* sp.during the study period. Among macrobenthos, polychaetes were the most diverse groups in the subtidal as well as the intertidal regions. Overall, the following is concluded:

- The diversity indices of phytoplankton and zooplankton were within the range of 4.64 to 5.45, indicating good environmental conditions (transitional zone to normal/pristine).
- The mean diversity of subtidal and intertidal benthic faunal population was 3.58 to 3.85, indicating moderate environmental conditions.

The existing desalination plant do not have any direct or indirect impact on the Ecology and Biodiversity. Ecology and Biodiversity environment remain same for both samples collected during December 2021 and October 2022.

3.1.3.3 Coastal Vegetation

Sand dune Vegetation

The sand dune vegetations comprise vital components of coastal sand dune habitats owing to their bio-engineering role in sediment accumulation, sand binding and land building processes. Beach ecosystems in India have been studied for their physical, geological and restoration aspects. The coastal sand dune ecosystems are categorized as ecologically sensitive. Coastal dune constitutes a variety of habitats essential for the maintenance of food webs and productivity. Dune vegetation harbours many economically important species of plants like, *Casuarina equisetifolia, Borassus flabellifer, Eucalyptus* sp. in the coastal regions of India.

Project region

In the project region of 10 km radius sand vegetation were observed. The sand dune species found in the project region includes *Spinifex littoreus, Ipomoea pes-caprae, Sesuvium portulacastrum, Pedalium murax, Prosopis juliflora, Casuarina* sp. and *Borassus* sp.

Some common coastal sand dune vegetation observed during the study



Sesuvium portulacastrum



Spinifex littoreus



Pedalium murax



Ipomoea pes-caprae



Borassus sp.

Existing desalination plant do not have any direct or indirect impact on the sand dune vegetations.

3.1.3.4 Seaweeds and Seagrass

Seaweeds

Seaweeds are group of plants that live either in marine or brackish water environments and dominate in rocky intertidal regions. Seaweed zone is one of the conspicuous and widespread biotopes in the shallow marine environment.

Seaweeds are absent within the project region

Seagrass

Seagrasses are the marine flowering plants. They are the only angiosperms that successfully grow in intertidal and subtidal marine environment. Mangrove and coral reef ecosystems are also closely associated with the seagrass ecosystem.

Seagrass is absent within the project region

3.1.3.5 Coral reefs

Coral reefs are one of the most diverse and dynamic ecosystems. The coral reefs not only provide a sanctuary to myriad of marine life but also play a key role in protecting the coastline from erosion.

Corals are absent within the project region

3.1.3.6 Sea turtles

Sea turtles of Indian waters: Five species of sea turtles viz., Leatherback turtle, Hawksbill turtle, Loggerhead, Green turtle and Olive Ridley turtle are reported from the Indian waters. All the species of sea turtles found in India are presently declared as "Endangered" and are protected by law and are included under Schedule I of the Indian Wildlife (Protection) Act, 1972. With the exception of the Olive Ridley that nests throughout the region, other species nest on select beaches.

Status of sea turtle species and populations that were published in 2020

Scientific name	Common name	Distribution	IUCN Red list status
Dermochelys coriacea	Leatherback Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Caretta caretta	Loggerhead Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Lepidochelys olivacea	Olive Ridley Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Vulnerable
Eretmochelys imbricata	Hawksbill Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands, the coasts of Tamil Nadu, Orissa.	Critically Endangered
Chelonia mydas	Green Sea Turtle	Atlantic, Pacific, and Indian Oceans. India: Andaman and Nicobar Islands	Endangered

Source: IUCN Red List of Threatened Species. Version 2020-2. ISSN 2307-8235

The coastline of northern Andhra Pradesh extends from Bahuda Muhana Sagar to Godavari river mouth and is about 390 km in length. It is predominantly a rocky coast with small stretches of sandy beaches. The beach here is sandy and sand dunes are found between Vamsadhara - Nagavalli and few patches of intertidal rocks in Kalingapatnam and Visakhapatnam. The coastline of Andhra Pradesh is one of the important sporadic nesting habitats of olive ridley turtles (*Lepidochelys olivacea*) and is believed to form part of the migratory route of the turtles that nest in Orissa.

The other nesting sites reported in the East Godavari district coast are Sacramento and Hope Island. Besides Olive Ridley, three other species of sea turtles namely Hawksbill, Green and Leather back turtles also visit Hope Island in small number every year.

Already treated effluent and brine reject are discharged since 2010. Over the period of 12 years, no impact on turtles at offshore was observed due to the discharge.

Turtle nesting is absent near the project region.

3.1.3.7 Marine Mammals

Marine mammals are important components and occupy elevated trophic level in the oceanic environment. About 26 cetaceans (Whales, Dolphins and Porpoise) and one Sirenian, the Dugong are found in the waters of the Indian subcontinent. Marine mammals are adapted to thrive in wide variations of temperatures depths, pressure, darkness, etc. All the species are protected under Schedule I of the Wildlife (Protection) Act, 1972; six species are included in Appendix I and seven included under Appendix II of CITES.

The marine mammals are absent within the project region

3.1.3.8 Marine Protected Area

Marine and coastal areas are one of the highly diverse and productive ecosystems of our planet. These areas support a variety of coastal and marine habitats like mangroves, coral reefs, seagrasses, seaweeds/algae and saltmarshes. These habitats support in the production of detritus and recycling of nutrients, and thereby enrich the coastal waters and support the benthic population of the sea. They also serve as nursery grounds for the larvae and juveniles of marine denizens. These MPAs cover coastal wetlands, mangroves, coral reefs, lagoons, seagrasses beds and other biologically active resources. All the MPAs in the country are notified under the Wildlife (Protection) Act, 1972 and fall in category I and II of IUCN categories of Protected Areas (PAs). (MNP report 2019).

Protected area in Andhra Pradesh: Three sanctuaries-Krishna, Coringa and Pulicat are mainly in the marine environment. Krishna Sanctuary and Coringa Sanctuary have mangroves, estuaries, and backwater whereas Pulicat is a lagoon of brackish water and known for water birds and fishes. Pulicat lagoon is the largest brackish waterbody in the south India and the second largest saltwater lake in the country.

Sl. No.	Name of MPA	Category	Area (sq. km)	Year of establishment
1	Coringa	Sanctuary	235.7	1978
2	Krishna	Sanctuary	194.81	1989
3	Pulicat Lake	Sanctuary	500	1980

Source: ENVIS Centre on Wildlife and Protected Areas

In the proposed project area it is noticed that there are no notified/declared ecologically sensitive areas such as turtle nesting, Wildlife Protected areas, marine sanctuaries, National Parks etc. within 10 km of the project region.

3.1.3.9 Endangered species

Marine species were thought to be abundant and unlikely to become extinct. Exploitation of the marine resources over the years has caused the decline in many marine species population and

recovery found to be much slowly than the previously understood. Studies have shown that many species have restricted distribution which makes it vulnerable to exploitation and extinction.

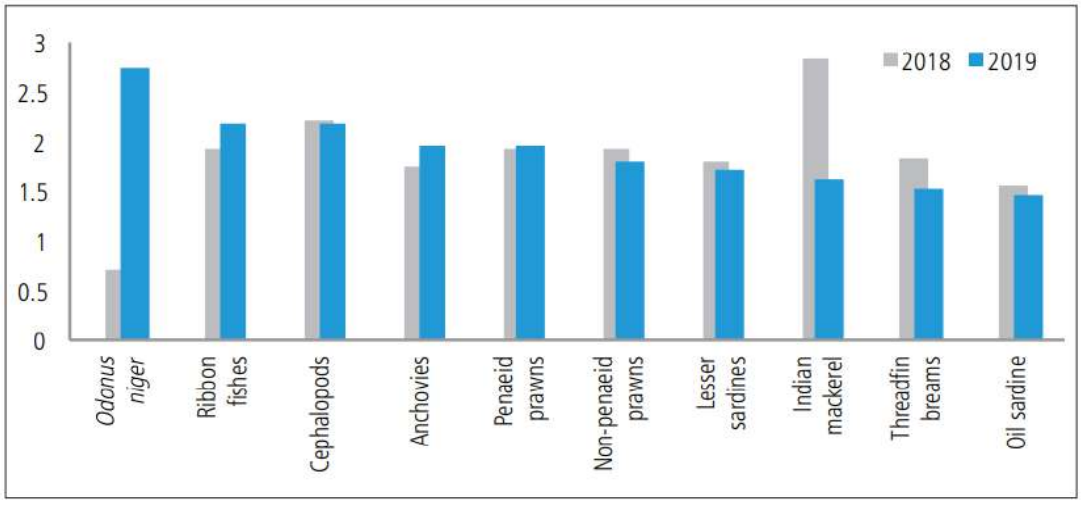
Endangered species are absent near the project region.

3.1.3.10 Fisheries

Marine fishery resources are renewable and limited, therefore management of the harvest of marine fishery resources is necessary for sustained production from the sea. Towards this, it is very much essential to have reliable and updated knowledgebase on status of marine fishery resources, fishing effort expended, number of fishing villages, number of landing centres, fisherfolk population, their educational status, occupational status, infrastructure facilities existing in fishing villages, fishing crafts, fishing gears, etc.

Indian marine fisheries

The estimate of marine fish landings in India for the year 2019 is 3.56 million tonnes compared to 3.49 million tonnes in 2018, showing a marginal increase of about 2.1%. Tamil Nadu grabbed the first place from Gujarat, which was holding the first position for the past few years, with 7.75 lakh tonnes compared to 7.02 lakh tonnes in 2018 (10.4% increase), accounting for 21.8% of the total landings in India. An important marine fishery in 2019 is that, nationwide *Odonus niger* became the major resource in the harvests with its landings increasing to 2.74 lakh tonnes from 72,140 tonnes in 2018. The second highest landings is ribbon fishes (2.19 lakh tonnes) followed by penaeid prawns (1.95 lakh tonnes), non-penaeid prawns (1.80 lakh tonnes), lesser sardines (1.71 lakh tonnes), Indian mackerel (1.62 lakh tonnes), threadfin breams (1.53 lakh tonnes) and oil sardine (1.45 lakh tonnes). In 2019, out of the total 3.56 million tonnes landings, 1.69 million tonnes are pelagic resources, 1.20 million tonnes are demersal resources, 0.44 million tonnes are crustaceans and 0.23 million tonnes are molluscs (CMRFI 2020).



(Source: CMRF, 2020)

All India landing of Major Resources (in lakh tonnes)

Andhra Pradesh marine fisheries

Andhra Pradesh state is endowed with a long coastline of 974 Kms with a continental shelf area of 33,227 Sq. kms. As per CMFRI census, 2010, the marine fishermen population in 9 coastal districts of Andhra Pradesh estimated at 6.05 lakh with 1.63 lakh fishermen families and 1.51 lakh active fishermen. There are 546 marine fishing villages situated along the coast of Andhra Pradesh. There

are about 555 fishermen villages and 349 fish landing centres scattered in 9 coastal districts viz., Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam and Nellore out of 23 districts and starts from Ichapuram in the Srikakulam district (north) and ends at Tada in Nellore district (south).

One major fishing harbour at Visakhapatnam, three minor fishing harbours at Kakinada, Machilipatnam and Nizampatnam are providing berthing facilities for 1871 mechanised fishing vessels in the state. A total number of 31,318 fishing vessels comprising 1871 mechanised, 14,648 motorised and 14,799 traditional fishing craft are involved in marine fishing activity. Fishermen are using some principle nets such as Drag nets, gill nets, trawl nets, cast nets, Hook & Line etc. for fishing operations in marine waters.

Andhra Pradesh, there were 1,341 trawlers involved in fishing in 2010. There was 26% decline in trawlers from 1,802 in 2005 to 1,341 in 2010. District wise contribution was Visakhapatnam (43%) with 579 trawlers, East Godavari district (36%) with 487 trawlers, Guntur district (11%) with 150 trawlers, Krishna district (6.3%) with 85 trawlers and Prakasam district (3%) with 40 trawlers in 2010.

Visakhapatnam District marine fisheries

Visakhapatnam District is one of the important maritime districts of Andhra Pradesh, the fishing households are busily engaged in all the sea shore- based activities like sorting, weighing, salting, drying, marketing, etc. The aim of the study of marine fishing landing centre, fishing village, fisher man families, fishing craft and fishing gear in Visakhapatnam District. The fish landing centre 66 number and fishing village 63, fisher man families 28779, traditional fisherman families 28738 and totally Fisherfolk population 113632 found at Visakhapatnam District (source: Marine Fisheries Census 2010).

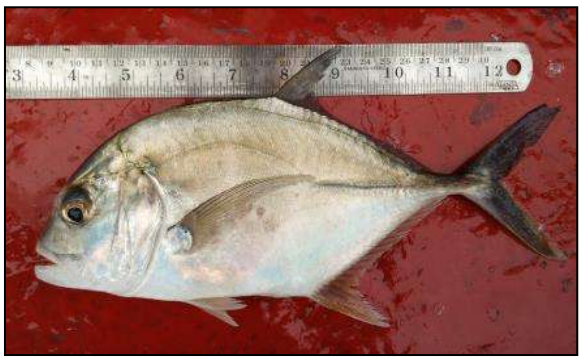
Fishing Craft: 579 nos. of Trawler, 2480 nos. of motorised craft and 4960 nos. of non-motorized craft are present at Visakhapatnam District. Totally 8019 nos. of fishing craft are available in Visakhapatnam District.

Fishing gear: Different type gears are used in Visakhapatnam District such as trawl net (84), gill net (774), drift net (41), ring seine (430), boat seine (82), bag net (57), shore seine (8), cast net (272), hooks & line (1429), troll line (37), fixed net (48), traps (2) and scoop net (12) as per Marine Fisheries Census 2010.

Common and important marine fishes in nearby project location



Pampus argenteus



Carangoides malabaricus



Leiognathus sp.



Johnius sp.



Sphyraena sp.



Decapterus sp.



Pomadasys kaakan



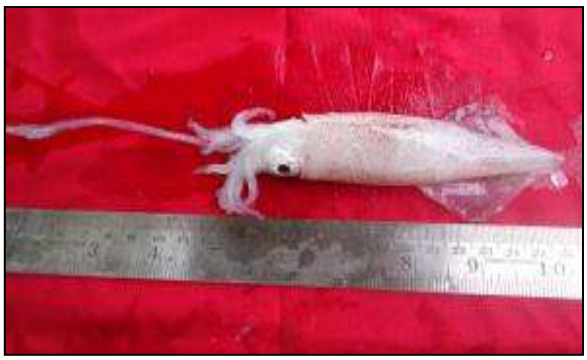
Scomberomorus guttatus



Nemipterus japonicus



Siganus canaliculatus



Loligo sp.



Penaeus monodon



Chaybdis cruciata



Portunus sanguinolentus



Sillago sihama



Stolephorus sp.



Arius sp.



Mugil cephalus



Thunnus sp.



Shark

Table 3.1. Location of seawater, seabed sediments and biological sampling locations

Check data collected at three locations in October 2022			
SS2 & SB2	17°21'05"	82°44'27"	S, M & B
SS4 & SB4	17°19'53"	82°45'07"	S, M & B
SS5 & SB5	17°19'09"	82°45'30"	S, M & B
IB1	17°22'24"	82°45'57"	Intertidal area
IB2	17°21'29"	82°44'01"	Intertidal area
IB3	17°20'17"	82°41'41"	Intertidal area

Notations: SS – seawater; SB - Seabed; IB - Intertidal Benthos; S - Surface; M - Mid-depth & B - Bottom

Table 3.2. Seawater quality

Station	Sample Layer	Temp. (°C)	Salinity (PSU)	pH	TDS (mg/l)	Turbidity (NTU)	TSS (mg/l)	Chlorides (mg/l)	DO (mg/l)	BOD (mg/l)	Alkalinity (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness (mg/l)
Data collected in December 2021														
SS2	S	26.0	31.6	7.99	32850	1.2	2.6	17197	6.1	1.0	112	344	1049	5170
	M	25.8	31.9	7.95	32950	1.7	3.7	17372	6.0	1.2	112	334	1061	5194
	B	25.5	31.9	7.91	32960	2.8	6.2	17372	5.9	1.2	116	334	1061	5194
SS4	S	26.2	30.9	8.10	32460	1.3	2.9	16846	6.0	1.1	108	344	1061	5219
	M	25.8	31.2	8.09	32780	1.8	4.0	17021	6.0	1.1	108	354	1055	5219
	B	25.3	31.2	8.07	32780	2.4	5.3	17021	5.9	1.2	108	354	1055	5219
SS5	S	26.4	31.2	8.10	32780	1.4	3.1	17021	6.0	1.1	104	334	1073	5243
	M	26.0	31.6	8.08	32870	1.7	3.7	17197	5.8	1.1	108	344	1061	5219
	B	25.5	31.6	8.07	32870	2.2	4.8	17197	5.8	1.2	108	344	1055	5194
Data collected in October 2022														
SS2	S	25.9	31.4	7.98	32850	1.1	2.5	17196	6.0	1.1	113	344	1050	5171
	M	25.7	31.7	7.94	32940	1.6	3.6	17370	6.0	1.1	113	344	1062	5196
	B	25.3	31.7	7.91	32970	2.7	6.3	17370	5.8	1.2	115	334	1062	5194
SS4	S	26.3	30.9	8.09	32450	1.2	2.8	16846	6.1	1.2	108	354	1061	5218
	M	25.6	31.1	8.09	32770	1.8	4.0	17025	6.1	1.1	107	354	1056	5219
	B	25	31.2	8.08	32770	2.5	5.3	17020	6.0	1.1	107	354	1055	5218
SS5	S	26.6	31.1	8.10	32780	1.4	3.2	17020	6.1	1.1	103	344	1073	5244
	M	25.8	31.4	8.07	32860	1.6	3.6	17196	5.9	1.2	106	354	1063	5218
	B	25.2	31.4	8.07	32870	2.2	4.9	17197	5.8	1.2	106	354	1055	5196

Table 3.2 Contd.

Station	Sample Layer	NH_4-N (µmol/l)	NO_2-N (µmol/l)	NO_3-N (µmol/l)	Total Nitrogen (µmol/l)	PO_4 (µmol/l)	Total Phosphorus (µmol/l)	SO_4 (mg/l)	Fluoride (mg/l)	B (mg/l)	K (mg/l)	Na (mg/l)
Data collected in December 2021												
SS2	S	4.9	0.43	4.5	10.0	1.2	2.5	1866	1.38	2.3	319	11167
	M	5.1	0.46	4.7	10.3	1.3	2.5	1905	1.46	2.3	323	11281
	B	5.1	0.48	4.8	10.4	1.3	2.7	1913	1.50	2.3	323	11281
SS4	S	3.7	0.37	8.2	12.3	0.5	2.3	1921	1.52	3.0	310	10939
	M	3.8	0.39	7.9	12.1	0.5	2.4	1925	1.43	3.1	314	11053
	B	3.7	0.39	7.7	11.8	0.5	2.4	1965	1.44	3.1	314	11053
SS5	S	4.4	0.39	7.5	12.3	0.4	1.7	1895	1.45	3.0	314	11053
	M	4.4	0.39	7.4	12.3	0.5	1.7	1888	1.47	3.1	319	11167
	B	4.5	0.37	7.2	12.1	0.5	1.7	1918	1.53	3.1	319	11167
Data collected in October 2022												
SS2	S	4.8	0.44	4.4	10.1	1.1	2.4	1864	1.38	2.3	318	11165
	M	5.2	0.46	4.5	10.2	1.2	2.4	1903	1.46	2.4	324	11282
	B	5.2	0.47	4.6	10.2	1.2	2.6	1913	1.50	2.3	323	11282
SS4	S	3.7	0.36	8.1	12.2	0.4	2.5	1922	1.52	3.1	311	10938
	M	3.8	0.38	7.8	12.2	0.4	2.5	1923	1.43	3.1	315	11054
	B	3.6	0.39	7.7	11.7	0.4	2.4	1965	1.44	3.0	314	11054
SS5	S	4.5	0.38	7.4	12.4	0.5	1.8	1894	1.45	3.0	315	11054
	M	4.5	0.38	7.4	12.4	0.4	1.6	1882	1.47	3.1	318	11168
	B	4.6	0.37	7.3	12.4	0.6	1.8	1919	1.54	3.2	319	11167

Contd.

Table 3.3. Seabed sediment quality

Data collected in December 2021				
Station	Total Organic Carbon (%)	Total Nitrogen (µg/g)	Total Phosphorus (µg/g)	Calcium Carbonate (%)
SB2	0.86	410	32.9	9.3
SB4	0.34	248	35.3	6.8
SB5	1.29	618	65.0	9.3
Data collected in October 2022				
SB2	0.85	411	32.8	9.4
SB4	0.35	246	35.4	6.9
SB5	1.30	619	65.2	9.4

Table 3.3 Contd.

Data collected in December 2021							
Station	Cadmium (µg/g)	Chromium (µg/g)	Lead (µg/g)	Zinc (µg/g)	Mercury (µg/g)	Strontium (µg/g)	Phenols (µg/g)
SB2	<0.1	30.3	3.0	34.9	<0.1	51.7	<0.5
SB4	<0.1	26.0	3.3	32.4	<0.1	46.0	<0.5
SB5	<0.1	31.0	3.8	33.6	<0.1	56.0	<0.5
Data collected in October 2022							
SB2	<0.1	30.2	3.0	34.8	<0.1	51.9	<0.5
SB4	<0.1	26.1	3.2	32.3	<0.1	46.0	<0.5
SB5	<0.1	31.1	3.9	33.8	<0.1	56.1	<0.5

Table 3.4. Primary productivity

Station	Gross Photosynthetic activity	Net Photosynthetic activity	Primary production mgC/m^3/day
Data collected in December 2021			
SS2	1.5	0.6	450
SS4	1.6	0.7	480
SS5	1.5	0.6	450
Average			460
Data collected in October 2022			
SS1	1.4	0.5	420
SS2	1.5	0.6	450
SS3	1.6	0.7	480
Average			450

Table 3.5. Phytoplankton species wise composition*

Sl.No.	Genus/ Species	Data collected in December 2021			Data collected in October 2022		
		SS2	SS4	SS5	SS2	SS4	SS5
Phylum: Heterokontophyta							
Class: Bacillariophyceae (Diatoms)							
Order: Centrales							
1.	*Bacteriastrum delicatulum*	-	+	+	+	-	+
2.	*Bacteriastrum hyalinum*	+	+	+	+	+	+
3.	*Chaetoceros* sp.	+	-	+	-	+	+
4.	*Chaetoceros affinis*	+	-	+	+	+	+
5.	*Chaetoceros compressus*	-	+	+	+	+	-
6.	*Chaetoceros decipiens*	+	+	+	+	+	+
7.	*Chaetoceros diversus*	+	-	-	+	+	+
8.	*Chaetoceros lorenzianus*	+	+	+	+	-	+
9.	*Corethron criophilum*	+	-	+	-	+	+
10.	*Coscinodiscus* sp.	-	-	+	+	+	+
11.	*Coscinodiscus centralis*	+	+	-	+	+	-
12.	*Coscinodiscus excentricus*	+	+	+	+	+	+
13.	*Coscinodiscus marginatus*	+	-	+	-	+	+
14.	*Coscinodiscus radiatus*	-	+	-	+	+	-

15.	*Cyclotella* sp.	+	+	+	-	+	+
16.	*Ditylum brightwellii*	-	-	+	+	+	+
17.	*Guinardia* sp.	+	+	-	-	+	+
18.	*Hemidiscus sinensis*	+	-	+	+	-	+
19.	*Hemiaulus* sp.	-	+	+	+	+	+
20.	*Leptocylindrus* sp.	+	+	-	+	-	+
21.	*Leptocylindrus minimus*	-	+	+	+	+	+
22.	*Lauderia annulata*	+	+	-	-	+	+
23.	*Odontella mobiliensis*	+	+	+	+	+	+
24.	*Odontella sinensis*	+	-	+	-	+	-
25.	*Planktoniella sol*	-	+	-	+	-	+
26.	*Rhizosolenia* sp.	+	+	+	+	+	+
27.	*Rhizosolenia cylindrus*	+	+	+	+	+	-
28.	*Rhizosolenia imbricata*	+	+	+	+	-	+
29.	*Rhizosolenia styliformis*	-	-	+	+	+	+
30.	*Surirella scalaris*	+	+	-	-	+	+
31.	*Skeletonema costatum*	+	-	+	+	-	+
32.	*Stephanopyxis* sp.	+	+	+	+	+	-
33.	*Thalassiosira* sp.	+	+	+	-	+	+
34.	*Triceratium* sp.	-	+	+	+	+	+
Order: Pennales							
35.	*Amphora* sp.	-	+	-	-	+	-
36.	*Asterionella japonica*	+	-	+	+	-	+
37.	*Bacillaria paradoxa*	-	+	+	+	+	+
38.	*Climacosphenia moniligera*	+	-	-	+	-	+
39.	*Campylodiscus* sp.	+	+	+	-	+	-
40.	*Entomoneis* sp.	-	+	+	+	+	+
41.	*Grammatophora undulata*	+	-	-	-	+	-
42.	*Navicula* sp.	+	+	+	+	+	+
43.	*Navicula hennedyi*	+	+	-	+	-	+

44.	*Nitzschia* sp.	-	-	+	+	+	+
45.	*Nitzschia longissima*	+	+	-	+	-	+
46.	*Nitzschia seriata*	-	+	-	-	+	-
47.	*Pleurosigma directum*	+	+	+	+	-	+
48.	*Pleurosigma elongatum*	+	+	+	-	+	+
49.	*Thalassionema frauenfeldii*	+	-	+	+	+	+
50.	*Thalassionema nitzschioides*	+	+	+	+	+	-
51.	*Thalassiothrix longissima*	-	+	-	+	+	+
Class: Dinophyceae (Dinoflagellates)							
52.	*Ceratium lineatum*	+	+	-	+	+	+
53.	*Ceratium furca*	+	+	+	-	+	-
54.	*Ceratium fusus*	+	+	+	+	-	+
55.	*Ceratium macroceros*	+	-	+	-	+	+
56.	*Ceratium tripos*	-	+	-	+	-	+
57.	*Dinophysis* sp.	-	+	-	+	+	+
58.	*Dinophysis caudata*	+	+	+	-	+	+
59.	*Dinophysis hastata*	+	-	+	+	+	-
60.	*Dinophysis schuttii*	+	+	-	+	-	-
61.	*Gonyaulax* sp.	-	+	+	-	+	+
62.	*Lingulodinium polyedra*	+	+	+	+	+	-
63.	*Noctiluca* sp.	+	+	-	+	+	+
64.	*Protoperidinium* sp.	+	+	+	-	-	+
65.	*Protoperidinium divergens*	+	-	+	+	-	+
66.	*Protoperidinium oceanicum*	+	+	+	+	+	+
67.	*Prorocentrum micans*	+	+	-	+	+	+
68.	*Pyrophacus horologium*	-	-	+	+	-	+
69.	*Pyrophacus steinii*	+	+	+	-	+	-
Class: Cyanophyceae (Blue greens)							
70.	*Chlorella* sp.	+	+	-	+	-	+
71.	*Trichodesmium erythraeum*	+	+	+	+	+	+

Total	51	51	49	51	54	56

*Net sample

Table 3.6. Numerical abundance* of Phytoplankton (cells/L)

Sl.No.	Genus/ Species	Data collected in December 2021			Total	%	Data collected in October 2022			Total	%
		SS2	SS4	SS5			SS2	SS4	SS5		
Phylum: Heterokontophyta											
Class: Bacillariophyceae (Diatoms)											
Order: Centrales											
1.	*Bacteriastrum delicatulum*	-	400	500	900	1.27	500	600	700	1800	2.3
2.	*Bacteriastrum hyalinum*	400	400	300	1100	1.56	-	500	400	900	1.1
3.	*Chaetoceros affinis*	300	-	400	700	0.99	500	700	500	1700	2.2
4.	*Chaetoceros compressus*	-	400	400	800	1.13	400	500	-	900	1.1
5.	*Chaetoceros decipiens*	500	500	400	1400	1.98	-	400	-	400	0.5
6.	*Chaetoceros diversus*	300	-	-	300	0.83	800	1000	1200	3000	3.8
7.	*Chaetoceros lorenzianus*	1000	1800	1200	4000	5.68	500	600	700	1800	2.3
8.	*Corethron criophilum*	300	-	400	700	0.99	-	500	400	900	1.1
9.	*Coscinodiscus* sp.	-	-	400	400	0.56	800	1000	1400	3200	4.1
10.	*Coscinodiscus centralis*	600	400	-	1000	1.42	-	500	600	1100	1.4
11.	*Coscinodiscus excentricus*	800	1200	800	2800	3.97	400	400	-	800	1.0
12.	*Coscinodiscus marginatus*	300	-	500	800	1.13	-	500	200	700	0.9
13.	*Coscinodiscus radiatus*	-	400	-	400	0.56	400	-	400	800	1.0
14.	*Cyclotella* sp.	400	500	400	1200	1.70	-	300	-	300	0.4

15.	*Ditylum brightwellii*	0	-	400	400	0.56	400	-	400	800	1.0
16.	*Guinardia* sp.	400	500	-	900	1.27	-	300	500	800	1.0
17.	*Hemidiscus sinensis*	400	-	400	800	1.13	500	-	-	500	0.6
18.	*Hemiaulus* sp.	-	500	400	900	1.27	400	400	-	800	1.0
19.	*Leptocylindrus minimus*	-	400	500	900	1.27	500	-	500	1000	1.3
20.	*Lauderia annulata*	400	400	-	800	1.13	-	400	600	1000	1.3
21.	*Odontella mobiliensis*	600	600	500	1600	2.27	500	700	800	2000	2.5
22.	*Odontella sinensis*	500	-	500	1000	1.42	400	-	-	400	0.5
23.	*Planktoniella sol*	-	600	-	600	0.85	-	500	-	500	0.6
24.	*Rhizosolenia* sp.	500	600	700	1800	2.55	1200	1600	2100	4900	6.2
25.	*Rhizosolenia cylindrus*	1000	800	700	2500	3.55	400	600	-	1000	1.3
26.	*Rhizosolenia imbricata*	800	600	500	1900	2.69	-	-	400	400	0.5
27.	*Rhizosolenia styliformis*	-	-	400	400	0.56	500	600	500	1600	2.0
28.	*Surirella scalaris*	300	400	-	700	0.99	400	-	400	800	1.0
29.	*Skeletonema costatum*	500	-	400	900	1.27	-	600	-	600	0.8
30.	*Thalassiosira* sp.	500	500	600	1600	2.27	400	500	600	1500	1.9
31.	*Triceratium* sp.	-	500	400	900	1.27	500	600	500	1600	2.0
Order: Pennales											
32.	*Asterionella japonica*	600	-	500	1200	1.70	500	600	500	1600	2.0
33.	*Bacillaria paradoxa*	-	400	600	1000	1.42	400	-	600	1000	1.3

34.	*Climacosphenia moniligera*	400	-	-	400	0.56	-	500	-	500	0.6
35.	*Campylodiscus* sp.	400	500	600	1500	2.13	500	500	600	1600	2.0
36.	*Entomoneis* sp.	-	400	500	900	1.27	400	-	400	800	1.0
37.	*Grammatophora undulata*	400	-	-	400	0.56	500	400	-	900	1.1
38.	*Navicula* sp.	500	500	400	1400	1.82	600	800	1000	2400	3.1
39.	*Nitzschia seriata*	-	400	-	400	0.56	500	400	500	1400	1.8
40.	*Pleurosigma directum*	600	500	400	1500	2.13	400	-	400	800	1.0
41.	*Pleurosigma elongatum*	400	500	500	1400	1.82	600	400	500	1500	1.9
42.	*Thalassionema frauenfeldii*	500	-	400	900	1.27	500	-	400	900	1.1
43.	*Thalassionema nitzschioides*	400	400	500	1300	1.84	-	500	600	1100	1.4
44.	*Thalassiothrix longissima*	-	500	-	500	0.710	500	600	500	1600	2.0
Class: Dinophyceae (Dinoflagellates)											
45.	*Ceratium furca*	400	500	400	1300	1.34	500	500	600	1600	2.0
46.	*Ceratium fusus*	500	600	500	1600	2.27	400	600	500	1500	1.9
47.	*Ceratium macroceros*	400	-	400	800	1.13	500	-	-	500	0.6
48.	*Dinophysis* sp.	-	400	-	400	0.56	-	400	500	900	1.1
49.	*Dinophysis caudate*	400	500	400	1200	1.70	500	0	500	1000	1.3
50.	*Dinophysis hastata*	500	-	500	1000	1.42	-	500	600	1100	1.4
51.	*Dinophysis schuttii*	400	500	-	900	1.27	500	-	500	1000	1.3
52.	*Gonyaulax* sp.	-	-	500	500	0.70	400	600	700	1700	2.2

53.	*Lingulodinium polyedra*	500	600	400	1500	2.13	500	-	400	900	1.1
54.	*Noctiluca* sp.	500	500	-	1000	1.42	-	400	600	1000	1.3
55.	*Protoperidinium* sp.	400	500	600	1500	2.13	600	800	1100	2500	3.2
56.	*Protoperidinium divergens*	500	-	500	1000	1.42	-	500	600	1100	1.4
57.	*Protoperidinium oceanicum*	700	700	600	2000	2.78	500	-	700	1200	1.5
58.	*Prorocentrum micans*	400	400	-	800	1.00	500	600	800	1900	2.4
59.	*Pyrophacus horologium*	-	-	500	500	0.70	400	400	-	800	1.0
60.	*Pyrophacus steinii*	400	400	300	1100	1.24	-	500	700	1200	1.5
Class: Cyanophyceae (Blue greens)											
61.	*Chlorella* sp.	700	400	-	1100	1.78	600	-	700	1300	1.7
62.	*Trichodesmium erythraeum*	600	600	500	1700	2.86	600	600	800	2000	2.5
Population (cells/L)		22300	25000	23100	70400	100	22300	26100	30100	78500	100.0
No. of species		45	44	43	-	-	44	46	48	-	-

* Bottle sample

Table 3.7. Numerical abundance of Zooplankton (Nos./100 m^3)

Sl. No.	Genus / Species	Data collected in December 2021					Data collected in October 2022				
		SS2	SS4	SS5	Total	%	SS2	SS4	SS5	Total	%
Phylum: Protozoa											
Order: Tintinnids (Ciliate groups)											
1	*Dictyocysta* sp.	-	4280	-	4280	1.42	1408	0	1451	2860	0.69
2	*Eutintinnus tenuis*	1412	1427	1362	4186	0.54	0	1412	2903	4315	1.04
3	*Favella* sp.	-	-	2725	2725	0.97	2817	4237	0	7054	1.70
4	*Tintinnopsis* sp.	1412	1427	-	2839	0.75	0	2825	0	2825	0.68
Phylum: Cnidaria											
5	*Diphyes* sp.	-	1427	1362	2789	1.07	4225	0	2903	7128	1.72
Phylum: Mollusca											
6	Bivalve veliger larvae	-	-	1362	1362	0.65	0	2825	0	2825	0.68
7	Gastropod veliger larvae	1412	2853	-	4265	0.65	0	0	0	0	0.00
Phylum: Annelida											
Class: Polychaeta											
8	Polychaete larvae	-	1427	1362	2789	0.76	4225	2825	0	7050	1.70
Subphylum: Crustacea											
Suborder: Cladocera											
9	*Evadne* sp.	1412	2853	1362	5627	0.86	2817	0	1451	4268	1.03
Class: Copepoda											
Order: Calanoida											
10	*Acartia danae*	-	-	5450	5450	2.14	5634	7062	4354	17050	4.11
11	*Acaria spinicauda*	14124	9986	8174	32284	8.58	4225	0	2903	7128	1.72
12	*Acrocalanus* sp.	5650	-	4087	9737	1.94	11268	14124	20319	45711	11.02
13	*Acrocalanus gracilis*	8475	7133	8174	23755	6.38	5634	4237	4354	14225	3.43
14	*Calanopia elliptica*	5650	2853	-	8503	2.49	0	2825	2903	5728	1.38
15	*Canthocalanus pauper*	-	8559	5450	14009	3.37	0	4237	0	4237	1.02
16	*Centropages furcatus*	5650	4280	5450	15380	3.64	4225	0	4354	8579	2.07
17	*Centropages tenuiremis*	-	-	4087	4087	1.72	0	5650	2903	8552	2.06
18	*Clausocalanus* sp.	-	5706	-	5706	1.83	4225	5650	0	9875	2.38
19	*Clausocalanus minor*	8475	8559	9537	26571	6.49	5634	0	4354	9988	2.41
20	*Eucalanus* sp.	2825	5706	4087	12618	2.60	0	7062	5806	12868	3.10
21	*Eucalanus attenuatus*	-	1427	2725	4152	1.29	0	2825	5806	8630	2.08

22	*Labidocera* sp.	4237	4280	4087	12604	1.93	5634	0	2903	8537	2.06
23	*Paracalanus parvus*	8475	7133	5450	21058	6.49	7042	7062	10160	24264	5.85
24	*Paracalanus aculeatus*	2825	-	4087	6912	2.28	4225	4237	2903	11365	2.74
25	*Pontellina plumata*	-	-	2725	2725	1.73	0	5650	0	5650	1.36
26	*Temora discaudata*	5650	4280	-	9930	2.15	9859	11299	17417	38575	9.30
27	*Temora turbinata*	7062	7133	4087	18282	5.43	7042	0	7257	14299	3.45
28	Copepod nauplii	1412	1427	-	5554	0.98	5634	4237	2903	12774	3.08
Order: Cyclopoida											
29	*Oithona* sp.	2825	7133	4087	14045	2.51	2817	2825	4354	9996	2.41
30	*Oithona brevicornis*	4237	4280	-	8517	2.92	0	7062	2903	9965	2.40
31	*Oithona nana*	9887	8559	10899	29345	7.14	7042	4237	8708	19988	4.82
Sub- order: Harpacticoida											
32	*Euterpina acutifrons*	4237	-	2725	6962	1.40	1408	2825	0	4233	1.02
33	*Macrosetella* sp.	1412	2853	1362	5627	0.98	0	1412	1451	2864	0.69
34	*Microsetella* sp.	-	1427	-	1427	0.65	1408	0	2903	4311	1.04
Order: Poecilostomatoida											
35	*Corycaeus danae*	1412	2853	2725	6990	1.39	0	2825	1451	4276	1.03
36	*Corycaeus catus*	4237	-	-	4237	1.30	1408	0	0	1408	0.34
37	*Copilia vitrea*	-	-	1362	1362	0.65	0	0	2903	2903	0.70
38	*Oncaea venusta*	2825	1427	1362	5614	0.87	5634	0	1451	7085	1.71
Order: Decapoda											
39	Brachyuran zoea	1412	2853	1362	5627	0.86	0	2825	2903	5728	1.38
40	Crustacean nauplii	-	1427	-	1427	0.54	2817	1412	0	4229	1.02
41	Mysid larvae	1412	-	1362	2774	0.87	0	2825	1451	4276	1.03
42	Euphausid larvae	-	1427	-	1427	0.65	1408	0	1451	2860	0.69
43	*Lucifer* sp.	2825	1427	2725	6977	0.96	0	1412	0	1412	0.34
Phylum: Chaetognatha											
44	*Sagitta* sp.	1412	1427	2725	5549	1.50	1412	1427	2725	19604	1.50
Phylum: Urochordata											
45	*Oikopleura* sp.	-	-	1362	1362	1.19	1408	1412	0	2821	0.68
Eggs and Larvae											
46	Fish eggs	2825	2853	2725	8403	1.95	2817	0	2903	5720	1.38
47	Fish larvae	-	1427	-	1427	0.54	0	2825	1451	4276	1.03
Population (Nos./100m^3)		127119	135521	123978	386618	100	126761	138418	149492	414671	100.00
Biomass (ml/100m^3)		59.3	62.8	58.6	-	-	63.3	67.8	74.1	-	-
No. of species		30	35	34	-	-	44	46	48	-	-

Table 3.8. Sub-tidal and intertidal benthic population

Sl. No.	Groups	Sub tidal benthos (Nos./m²) Data collected in December 2021			Sub tidal benthos (Nos./m²) Data collected in October 2022			Inter tidal benthos (Nos./m²) Data collected in December 2021			Inter tidal benthos (Nos./m²) Data collected in October 2022		
		SB1	SB2	SB3	SB1	SB2	SB3	IB1	IB2	IB3	IB1	IB2	IB3
Phylum: Annelida													
Class: Polychaeta													
1	*Ancistrosyllis parva*	40	120	-	120	40	0	45	60	60	45	60	60
2	*Armandia* sp.	80	-	80	0	80	40	60	75	60	60	75	60
3	*Cossura* sp.	-	80	40	80	0	0	-	-	-	0	0	0
4	*Capitella* sp.	80	-	-	0	80	40	30	60	45	30	60	45
5	*Cirratulus* sp.	80	40	-	40	80	0	-	-	-	0	0	0
6	*Dorvillea gardineri*	120	0	80	0	120	80	-	-	-	0	0	0
7	*Glycera* sp.	-	80	40	80	0	-	-	-	-	0	0	0
8	*Lumbrineris aberrans*	-	40	-	40	0	80	45	60	60	45	60	60
9	*Nereis* sp.	40	40	-	40	40	-	60	75	75	60	75	75
10	*Perinereis* sp.	-	-	80	0	0	80	75	45	45	75	45	45
11	*Pisione indica*	-	80	-	80	0	160	60	60	75	60	60	75
12	*Prionospio pinnata*	80	-	40	0	80	-	75	45	60	75	45	60
Phylum: Arthropoda					0								
13	Amphipods	80	-	80	0	80	80	45	75	105	45	75	105
14	*Emerita asiatica*	-	-	-	0	0	0	75	90	60	75	90	60
15	Isopods	80	-	40	0	80	40	45	60	30	45	60	30
16	*Leucosia* sp.	40	40	-	40	40	0	-	-	-	0	0	0
Phylum: Mollusca													

Class: Gastropoda													
17	*Ancilla* sp.	-	-	80	0	0	40	-	-	-	0	0	0
18	*Cypraea* sp.	40	40	-	40	40	0	-	-	-	0	0	0
19	*Conus virgo*	-	-	40	0	0	40	-	-	-	0	0	0
20	*Lophiotoma* sp.	40	40	40	40	40	0	-	-	-	0	0	0
21	*Natica* sp.	-	-	-	0	0	40	30	45	30	30	45	30
Class: Bivalvia													
22	*Anadara granosa*	40	40	80	40	40	0	-	-	-	0	0	0
23	*Donax* sp.	40	-	40	0	40	40	15	45	30	30	45	45
24	*Sunetta* sp.	-	-	40	0	0	80	-	-	-	0	0	0
25	*Pholas orientalis*	-	-	-	0	0	40	-	-	-	0	0	0
26	*Trachycadium asiaticum*	40	80	40	80	40	0	-	-	-	0	0	0
27	*Volachlamys tranquebarica*	-	40	-	40	0	80	-	-	-	0	0	0
Phylum: Chordata													
Order: Amphioxiformes													
28	*Amphioxus* sp.	-	-	40	0	0	80	-	-	-	0	0	0
Total		920	760	880	760	920	1040	660	795	735	675	795	750

3.2 Study on the coastline stability between 2011 and 2022

The Hetero desalination plant has been bult in the CRZ zone beyond the High Tide Line (HTL) before the strict compliance of CRZ Notification 2011. The front boundary of the desalination plant (facing the sea) is located 110 m landward from the HTL, and the rear side boundary is located 175 m from the HTL.

APCZMA during its appraisal meeting held on 13.10.2022 asked the project proponent to take up the study on Coastline Stability along the project location covering the last 10 years between 2011 and 2022. Accordingly, coastline stability study has been taken up based on the site inspection, NIO report on 'Feasibility study for the seawater intake and outfall for the proposed Desalination Plant in Hetero complex at Nakkapalli' and with satellite imageries corresponding to 10 years between 2011 and 2022.

Methods

Various shoreline survey techniques are being used to identify the changes in shoreline like stable dune line, berm line, high water line, low water line, storm inundation, beach profiles etc. The identification of past shoreline is normally done by past survey data if available or through comparison of satellite imageries. Over the last two decades, a range of reliable high resolution satellite data are available to public. Satellites now provide near-continuous monitoring of many of the world's shorelines. Traditional multispectral satellite-flown instruments, such as Landsat, SPOT etc., generate a discrete signal in a limited number of bands while Hyper-spectral imaging provides wide and continuous spectral coverage. The advantages of multi-spectral / hyper-spectral imagery are: large areas can be covered, and detailed spectral information can be obtained. Shorelines may be derived from visibly discernible coastal features (using true-or false-colour imagery) or by the application of digital image-processing techniques.

To understand the stability of the coastline near the Hetero desalination plant over the last 10 years, shoreline analysis was carried out using satellite data corresponding to 10 years between 2011 and 2022. The data gathered for 2022 was compared with ground truthing by the field survey. For extraction of shorelines, manual digitization was carried out using Google Earth Pro for the years 2011 and 2022. The comparison shows that the coastal form remained stable over the 10 years between 2011 and 2022 and on the other hand here is a small accretion to an extent of 3 m along the beach berm noticed in the last 10 years. The field data reported by NIO in 2010 and present survey taken in 2022 agrees with the satellite imageries. The form of shorelines derived from the satellite imageries for the year 2011 and 2022 are presented in **Fig. 3.2** depicts at the shoreline boundaries and indicates that the coastal zone stability in nature. The field observation shows, this coastal zone is predominantly sandy and well developed.

Normally, the segment of the coastline near the Hetero desalination plant is a stable coastline and not disturbed by manual interference. The beach has got a foreshore width of 50 m, backshore width of 30 m and the stable beach for a width of 100 m stretching into the land. The beach is widely protected by dune vegetation. Whenever there is a monsoon, there is a temporary change of beach up to backshore berm and during the subsequent fair weather, the beach once again gets build up. The HTL during the fair weather and monsoon seasons, remains more or less same stretch with the seasonal changes over the year. If there is a crossing of cyclones, there is a temporary disturbance to the beach to a maximum width of 10 m which once again gets build up during subsequent period.

Inference: *The study shows that the beach and the coastal zone where Hetero desalination plant is built, remained very stable over the last 10 years and it is expected to remain the same in future. The construction of desalination plant in the CRZ area doesn't cause any impact on the beach form, coastline stability and the adjacent shoreline. As the sea doesn't reach the location of desalination plant, the operation of the desalination plant didn't have any influence on the benthic animals in the sub-tidal and intertidal regions. Also, there is no impact on the planktons, fishes and other marine organisms.*





3.3 Impact and Mitigation Measure

The existing desalination plant was built above the High Tide Line (HTL) and it is not having any impact on beach coastal forms, sand dune vegetation, seawater quality, seabed sediment, marine ecology and biodiversity. Hence there will not be any impact on the CRZ III (No Development Zone).

4. Risk Assessment and Disaster Management

4.1 Risk assessment

In order to manage and control the risks and to mitigate the impacts of the proposed activities and effective functioning of the desalination plant, an Operation and Maintenance Manual will be prepared and strictly followed. The Manual will include a Comprehensive Maintenance Management System (CMMS) Guidelines, Emergency Procedures, Incident Management Plan and Environmental Response Plan.

Identification of risks related to the desalination project and assessment of their impacts have been carried out along with suggestions for control measures and are presented below.

Sl. No.	Risk	Control measures
1	Flow of seawater through intake potentially entraining marine flora and fauna	Design intake to minimize entry of marine flora and fauna.
2	Pumps creating an airborne noise source	Selection type and location of pumps in a manner that the airborne noise emission is minimized during operation. Install suitable cover on the pumping station to reduce noise emission and ensure pumps are within designated chambers.
3	Failure of chemical (hazardous substances) storage may lead to chemical spill in the storage area	To ensure that hazardous storage area in the plant is covered and is within an appropriate dedicated bunded area to contain any overflow. Bunded area may be equipped with level sensor to detect leakage. Tanks can have level transmitter and high-level switches to interlock feed system and prevent overfilling. Ensure chemical management controls including transport, storage and handling of hazardous materials and dangerous goods are in accordance with the regulatory guidelines and requirements of statutory agencies. Manpower with training in handling hazardous materials spill to be engaged.
4	Failure of clarification system (leading to excess of suspended solids in supernatant sent to brine and to marine outlet)	Monitor dosing of chemicals used to promote coagulation, flocculation and sedimentation of suspended solids. Measure turbidity of the clarified water continuously and control it by regulating the injection of chemicals. Dosing of chemicals into the treatment system may be automatically controlled according to the required flow rate and dosing rate. Manage and maintain the clarification system in good operating condition.

Sl. No.	Risk	Control measures
5	Potential for incorrect reverse osmosis chemical dosing leading to off-specification brine fluent sent to outfall	Install automatically controlled closed-loop (flow rate and dose rate) system for dosing of chemicals to optimize and prevent the addition of excess chemicals. The system to have provision to stop dosing of chemicals when a control setpoint is breached. Flow settings with alarm levels can trigger an operator response. On-line monitoring of the brine rejects prior to entering the outlet system to be installed. Make provision of automatic shutdown of the system to prevent off-specification brine from being sent to the outfall.
6	Production of out of specification brine reject and incorrect dilution factor of effluent in the mixing zone	Manage and maintain the Reverse Osmosis and Outlet systems as per manufacturers specified. Make provision of automatic shutdown of the system to prevent off-specification brine from being sent to the outfall chamber. Provide online monitoring of brine rejects before discharging through the outfall.
7	Discharge of brine reject via outlet structures and discharge of brine with incorrect dilution via outfall nozzles or leaking of outlet structures	Manage and maintain the Reverse Osmosis and Outlet systems as per approved specifications. Monitor outlet structures and confirm velocity from outfall nozzles is as per design. Flow settings to have warning levels that trigger a system response.
8	Cleaning of RO membranes and disposal of brine reject to the outlet	Manage and maintain the Reverse Osmosis membranes and stabilization ponds as specified. Ensure that effluent resulting from cleaning is neutralized in the neutralization tank and associated piping loop, sent to stabilization ponds for further treatment (including additional neutralization if required), prior to disposal to brine outlet. Provide automatic shutdown of the system in case of upset in treatment to prevent brine effluent from reaching the outlet chamber. Install monitoring triggers alarm levels that require an operator response.
9	Post-treatment disposal	Manage and maintain chlorination and treated water tank systems as specified. Provide automatic shutdown of the system in case of upset in treatment to prevent brine effluent from reaching the outlet chamber. Install monitoring triggers alarm levels that require an operator response.

4.2 Disaster Management Plan

Emergency/ disaster is an undesirable occurrence of events of such magnitude and nature that adversely affect operations, cause loss of human lives and property as well as damage to the

environment. Coastal infrastructure is vulnerable to various kinds of natural and manmade disasters. Examples of natural disaster are Flood, Cyclone, Tsunami, Earthquake etc., and manmade disasters like major fire, explosion, sudden heavy leakage of toxic/ poisonous gases, etc. An effective disaster management plan helps to minimize the losses in terms of human lives, assets and environmental damage. Typical disaster management strategy which can be followed to contour the event of any disaster is detailed in this section.

4.2.1 Disaster Management Objectives

- To protect and minimize the loss of lives and property/infrastructure from disasters.
- To minimize the suffering of people due to disasters.
- To minimize the disaster risk and vulnerability of people and infrastructure in the State.
- Promote a culture of prevention and mitigation through curriculum revision.
- Information Education Communication (IEC) awareness campaign, DM plans at all levels, mock drills, communicating hazards, risk and vulnerability at community level and streamlined and institutional techno-legal framework.
- Develop efficient disaster response/relief mechanism in the district.
- To provide clarity on roles and responsibilities for all stakeholders concerned with disaster management.
- To ensure co-ordination and promoting productive partnership with all other agencies related to disaster management.

Commence recovery programme as an opportunity to build better in case of a future disaster by incorporating community in the program Disaster Identification

A disaster occurs when a hazard such as cyclone, earthquake or tsunami coincides with a vulnerable situation. Based on geography and environmental setting of the study area and available information following natural hazards have been identified which may possibly lead to disaster.

4.2.1.1 Cyclone

Revenue Department in the District takes responsibility for monitoring and directing measures for organizing rescue, relief and rehabilitation. All other concerned Departments should extend full cooperation in all matters pertaining to the management of the Cyclone disaster whenever it occurs. Departments like Revenue, Police including Transport, Ports & Fisheries, R & B, Power, Finance, Information and Broadcasting etc. shall have a major role in emergency response during occurrence of Cyclone.

In case of cyclones, 72 hours advance warning of various levels of certainty are provided by the IMD. This system is well established, and the District Administrations will attend the emergency operations soon after the first warning is received. The typical sequence of cyclone early warnings are as follows:

- IMD's INSAT satellite-based Cyclone Warning Dissemination System (CWDS) is one of the best currently in use in India to communicate cyclone warnings from IMD to community and important officials in areas likely to be affected directly and quickly.

- After getting information from IMD, and State Government the Revenue Department is responsible for disseminating cyclone warnings to the public and Line Departments.

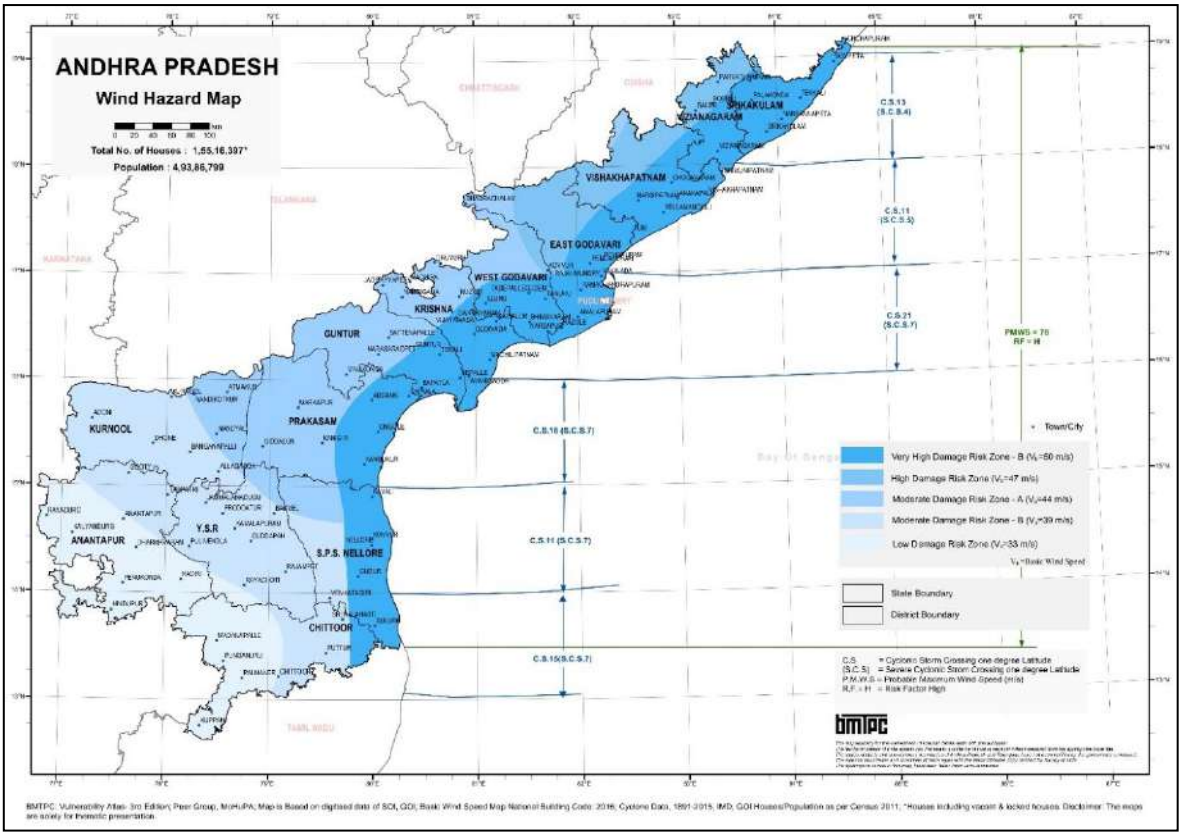
- On receiving an initial warning, the Revenue Department sends the warning to all Line Departments. Warning messages are transmitted wireless to all districts and talukas. District Collectors are provided with satellite phones and a Ham-radio to maintain effective communication, even if terrestrial and cell-phone communication fails.

Timely responsibilities

Time frame	Task
0 – 72 hrs	Warning receipt and dissemination
0 – 48 hrs	Review of situation and reporting
0 hrs	Disaster declaration
Before 24 hrs	Mobilization and deployment

Relief measures

- Search, rescue and medical assistance.
- Department of Roads and Buildings to evolve a mechanism for clearing access routes in order to facilitate search and rescue operations.
- Mobilization of specialized equipments and machinery to affected areas.
- Cordoning of affected areas with control of entry and exit.
- Police Department to evolve a mechanism for providing security of properties of government and public in the affected areas.
- Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements, essential medicines and temporary shelters.
- Deployment of mobile hospitals in affected areas for treatment of victims.
- Separate Cell to be established at District/Mandal level to coordinate with the NGOs and outside donor/aid agencies.



Wind hazard map

4.2.1.2 Earthquake

As per the history, the Visakhapatnam District have not experienced any major earthquakes above the magnitude 6. However, in the event of earthquake, to minimize the adverse impacts action plan with the following activities has been prepared.

- Declaration of earthquake disaster
- Affective Mechanism on receiving the report of occurrence of an earthquake

An earthquake of magnitude 5 or more is likely to cause deaths and injuries to human beings and also causes damages to all kinds of properties. Unfortunately, warning systems for future earthquakes are not available. Therefore, planning should cater for a quick response at all levels to reduce the effects of the earthquake to the minimum.

The Revenue Department will be formulating, controlling, monitoring and directing measures for earthquake preparedness, organizing rescue, relief and rehabilitation. All other concerned departments should extend full cooperation in all matters pertaining to the management of the earthquake disaster whenever it occurs.
The occurrence of an earthquake will be reported by the Indian Meteorological Department (IMD), National Geophysical Research Institute (NGRI) and Institute of Seismological Research (ISR). On receipt of the information, the District Administration will inform the real situation to concerned authorities.

Response mechanism

- Contact all Line Departments to inform them about the venue and time of first meeting to assess the situation and decide the course of action to be adopted by the State government.

- Issue instructions to all departments to ensure that all state government employees report for duty immediately in order to execute their responsibilities.

- Instruct all line departments to ensure their duty officers remain available round the clock with full updated information of the activities of their departments.

- Prepare and submit daily situation reports to the Government.

- Request the Government to mobilize additional manpower from the departments to the district for supporting the relief operation. They should be provided with task force action Plans of the concerned district prepared earlier.

- Management of media (Press/TV Channels/Government Press Notes) with special emphasis on rumor control.

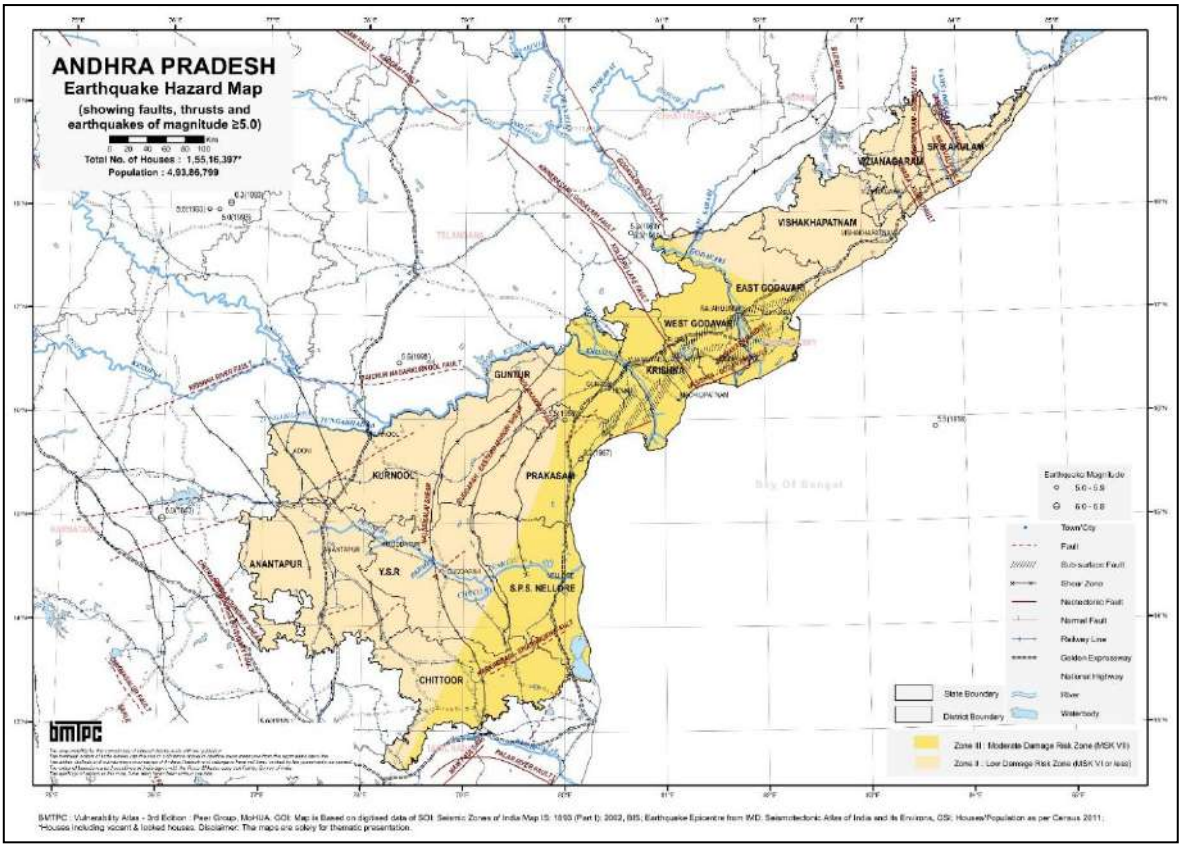
Relief measures

- Restoration of lines of communications, transportation and essential services.

- Implementation of search and rescue.

- Arrangement for food, clothing, blanket/bedding, drinking water, sanitation and hygiene, lighting arrangements, essential medicines and temporary shelters.

- Deployment of mobile hospitals in affected areas for treatment of victims.



Earthquake hazard map

4.2.1.3 Tsunami

A state-of-the-art early warning centre is established at INCOIS with all the necessary computational and communication infrastructure that enables reception of real-time data from all the sensors, analysis of the data, generation and dissemination of tsunami advisories following a standard operating procedure.

Seismic and sea-level data are continuously monitored in the Early Warning Centre using a custom-built software application that generates alarms/alerts in the warning centre whenever a pre-set threshold is crossed. Tsunami warnings/watches are then generated based on pre-set decision support rules and disseminated to the concerned authorities for action.

Dissemination

- The National Early Warning Centre will generate and disseminate timely advisories to the Control Room of the Ministry of Home Affairs for further dissemination to the Public.

- On receiving an initial warning at DDMA, sends the warning to all Line Departments, the District administration who are likely to be affected by different communication means explained before.

Relief measures

- The first priority in the aftermath of a disaster is to minimize loss of lives by undertaking rescue efforts for the affected people and providing medical treatment. People who are trapped

under destroyed buildings or are isolated due to any disaster need immediate assistance.

- For earthquake and most of the man-made disasters prediction cannot be done so the response activities are initiated immediately after its occurrence.

- The DDMA in conjunction with local authorities will be responsible for the search and rescue operations in an affected region.

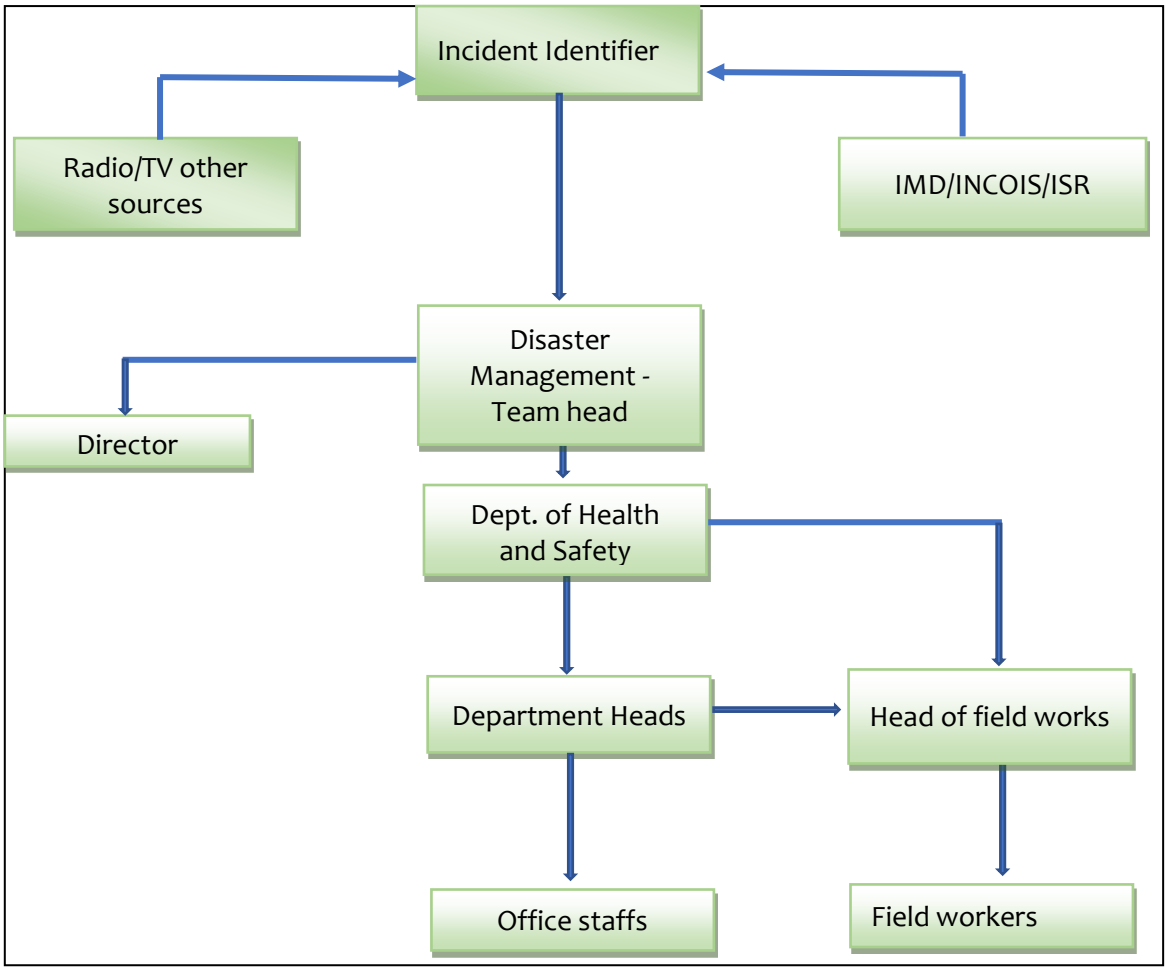
4.2.2 On Site / Inhouse Emergency Preparedness for Natural Disasters

a) Incident Response Team

An incident management team shall be constituted at the project site. This team should have the following personnel:

i) Control room officer,
ii) Health and Safety officer,
iii) Environment Management Cell,
iv) Department Heads,
v) Security Officers

This team should have the details of people on duty and their locations on daily basis. The evacuation plan should be available with the team. This team should have control on the emergency alarm. One staff should be designated to inspect the preparedness on a daily basis.



Communication network for DMP

b) Emergency Alarm

An emergency alarm /siren should be in place at the site area. The details of agencies competent enough for issuing warning or alert pertaining to various types of disasters are given below. In case of emergency when warning is given, the alarm at the site can be instantly activated and the vigilant team including the emergency response team can immediately start the evacuation and rescue operation. All the workers also should be advised to vacate and move to the designated safe places.

Details of agencies which give early warning systems	
Disaster	Agencies
Earthquakes	IMD, NDMA
Floods	Central Water Commission and Irrigation Dept., State Water Resources Department, NDMA
Tsunamis	INCOIS, NIOT, IMD, NDMA
Cyclones	IMD, NDMA

c) Emergency Rescue Kit

Minimum rescue resources should be kept in readiness. The following emergency rescue kit to be kept at the site.

- Lifesaving jackets
- 100 and 200 ft. ropes
- Flashlights
- Extra batteries
- Battery operated radio
- First aid kit etc.

d) Assembly Point

Evacuation of people from risk areas is the priority when early warning is received, or the natural warning sign indicates the immediate arrival of cyclone, Tsunami wave or rise of storm surge.

Evacuation plan describes the time span available before and during the Tsunami or storm surge event. When facing local threat, evacuation procedures most possibly will have the character of a 'runaway effort' and people should not expect to receive much institutional support. The primary objective should be bringing as many people as possible out of the reach of impact to safe or 'relatively safe' areas. Therefore, necessary steps have to be taken in advance to enable and support the community at risk to protect themselves at any time.

An assembly point could be identified and marked which should be known to all employees. A mock drill should be carried out every six months so that it acts as training as well as alertness to the employees.

e) Coordination with Governmental Agencies

After the 2004 Tsunami affected the Indian sub-continent, the following organizations are involved on watch and cautioning the government and public in the event of possibility of occurrence of Tsunami. As a part of Tsunami hazard mitigation, warning systems have been established in India by the coordination of the following organizations.

i) National Disaster Management Authority (NDMA), New Delhi.
ii) Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.
iii) Indian Meteorological Department (IMD), New Delhi.
iv) Visakhapatnam District Collectorate

The contact details of International and National agencies are given below.

Organization	Address	Email ID	Contact Number
NDMA	NDMA Bhavan, A-1 Safdarjang Enclave, New Delhi, DL 110029.	www.ndma.gov.in	+91 - 11 - 26701700
INCOIS	Ocean Valley, Pragathi Nagar (BO), Nizampet (SO), Hyderabad – 500090.	www.incois.gov.in	+91 - 40 - 23895002
IMD	Mausam Bhavan, Lodi road, New Delhi, DL 110033.	www.imd.gov.in	+91- 11 - 24699216
IMD	Andhra Pradesh	cs.hyd@imd.gov.in	040 27908506 27906172

Organization	Address	Email ID	Contact Number
APSDMA	Genious JR Towers, D. No:21/2B, Pathuru Cross Road Centre, Kunchanpalli(PO), Tadepalli Mandal, Guntur District, Andhra Pradesh.	ed-apsdma@ap.gov.in seoc-apsdma@ap.gov.in	0863-2377105 +91 8645246600 +91-9676957788 +91-8333905033
District Collector,	District Collector P855+Q94, Main Rd, Krishnagar, Krishna Nagar, Maharani Peta, Visakhapatnam, Andhra Pradesh 530002	vspm@ap.gov.in	08912563121

Information/ warnings from above agencies should be considered during the operation of plant. In case of warnings/high risk, operation shall be suspended and action as per preparedness plan shall be implemented.

f) Action Plan

Disaster management action can be divided into preventive (pre-incident), during incident and post incident actions. Each disaster, depending upon its intensity would have different extent of damage.

General precautions which are important to face any natural disaster in the site are:

- Employees working in open area shall stay outdoors away from fall objects, falling debris, trees, and power line.
- Disaster related training to staff (basic knowledge on behavior during earthquake, dos and don'ts etc.)
- Precautions such as staying away from buildings, windows and loosely lying materials etc.
- Cutting off the power supply to avoid electric shocks.
- Emergency telephone number should be displayed in the admin house and operational area.
- Vehicle drivers should drive to a clear spot (free from falling objects) and stay in the vehicle.
- Do not walk or drive through flooded area.
- Construction of elevated standing tower of 10 m height at project site.

i) Cyclone

In case of warning received from India Metrological Department, following action shall be taken immediately:

Before Cyclone

- Control room shall monitor low pressure formation, cyclone and IMD published details and warnings regularly.
- In case of any warnings, the same shall be reported to onsite disaster management head, HSE and group heads etc.

- Onsite Disaster Management team shall conduct a meeting if possible, immediately after the warning to recollect the management facilities and action to be taken.
- All preparations before the onset of cyclone, actions during cyclone shall be reviewed by the team head.

During Cyclone:

- Sound Emergency alarm/siren.
- Inform all staffs about the occurrence of event.
- Stop working/suspend cargo operation.
- Activate incident response team.
- Adequate manpower with tools, welding sets, ropes etc. shall be maintained during cyclone for rescue operation.

After Cyclone: Immediate attending of work area and report damage if any to higher authority. Immediate attending of damages and record should be kept for quick recovery as soon as possible.

ii) Earthquake

During Earthquake:

- Evacuate to safest place by following emergency exist route.
- Hold onto a firm object.
- If outside, stay outside.
- If there is no place to take cover, then move to and brace against an inside wall.

After Earthquake:

- Collect report of damages from every division immediately after the event of earthquake.
- Inspection of affected area by Disaster Management Team.
- Procurement of emergency power in case of power failure.
- Inform State and District Management authorities about the damage.
- Take necessary actions for the speedy recovery of operations.

iii) Tsunami

Before Tsunami:

- Control room shall monitor Tsunami warnings from IMD and Indian National Centre for Ocean Information (INCOIS).
- In case of any warnings, the same shall be reported to onsite disaster management head, HSE and group heads etc.
- Make sure all employees know how to respond to a tsunami.
- Flashlight, extra batteries, battery-operated radio, emergency medicines should be kept ready.

During Tsunami:

- Listen to a radio to get the latest emergency information and be ready to evacuate.
- Cut down power supply.

- Try to move to elevated ground and stay there for till further information on tsunami.
- Return to workplace only after authorities advise it is safe to do so.

After Tsunami:

- Collect report of damages from every division immediately after the event of tsunami.
- Inspection of affected area by Disaster Management Team.
- Procurement of emergency power in case of power failure.
- Inform State and District Management authorities about the damage.
- Take necessary actions for the speedy recovery of operations.

Summary of studies conducted by APSDMA suggest that project area is vulnerable to natural hazards like Cyclone, Storm surge and Earthquake. Implementation of proposed action plan as discussed above and coordination with National & State agency will be the key to address natural disasters.

5. Environmental Compensation

As per the office memorandum published by MoEF&CC on 19th February 2021 for procedure for dealing with violation arising due to not obtaining a prior clearance for permissible activities.

Section 4, (ii)

As per project commenced construction and/ or operation without a prior CRZ clearance, the CZM shall assess the environmental damages caused by such an action and shall give specific recommendation in respect of activities, corresponding to the environment or ecology damage assessed, to be taken up by the project proponent within a period of three years from the date of clearance, under Compensatory Conservation Plan (CCP) and a Community Resource Augmentation Plan (CRAP). The said plans may comprise of indicative activities as in the Annexure. The cost of assessment of environmental damage, if any may be guided by the Ministry of Environmental, Forest and Climate Change vide O.M No. 19-125-/2019-IA.III, date 05/03/2020 and/ or project specific assessment by the CZMA.

Refer **Annexure III** for the office memorandum published by MoEF&CC on 19th February 2021 for procedure for dealing with violation arising due to not obtaining a prior clearance for permissible activities.

5.1 Activities for Compensatory Conservation Plan

Sl. No.	Compensatory Conservation Plan	Budget allocated (₹. in crores)	Period of commencement
1	Setting up of solar and other non-conventional energy source at village or habitations	1	2023
2	Restoration of water bodies and setting up of rainwater harvesting system	2	2023
3	Beach cleaning and development of beach amenities etc.	1	2023

Total amount allocated for compensatory Conservation Plan: ₹. 4 Crores

5.2 Activities for Community Resource Augmentation Plan

Sl. No.	Compensatory Conservation Plan	Budget allocated (₹. in crores)	Period of commencement
1	Adaptations of nearby coastal village and providing civic amenities.	2	2023
2	Creation of self-help group and cooperative society for marketing of local community produce.	2	2023
3	Identification and training of unemployed youth in the nearby villages for eventual absorption in the company.	2	2023

Total amount allocated for compensatory Conservation Plan: ₹. 6 Crores

Total amount allocated for Environmental Compensation is ₹. 10 Crores

5.2.1 Previous CSR activities

Details of the CSR activities done by Hetero SEZ Ltd, to the nearby villages is given in the tabulation below.

Village Name: Rajayyapeta

Sl. No.	Name of the activity	Amount
1.	Drinking water pipeline for villagers	60,00,000
2.	Water pipeline and hose hold Taps 1250 taps House to House	12,00,000
3.	Bore well digging charges with motor and electrical line	11,00,000
4.	Construction of water tank water and operator salary (60*5000)	10,00,000
5.	38 Solar Street lights fixing at Rajayyapeta Beach (30w,12v dc-100AH LED) with fixing with civil work also	10,00,000
6.	3w solar lanterns led lights (400 pcs)	8,10,000
7.	36w led streetlights 120 pcs	5,00,000
8.	Construction of Ramalayam	25,00,000
9.	Construction of community hall (Gurumandir)	10,00,000
10.	Painting charges to local all temples	10,00,000
11.	Construction of compound wall at Nookatata temple	10,00,000
12.	Groceries distribution at Rajayyapeta village (Covid-19)	15,00,000
13.	Donated cement benches at Beach (10pcs)	1,50,000
14.	Swatch Bharat	1,50,000
15.	Donation for playing kits for Aganwadi centre	2,00,000
16.	Sweepers Salaries 4 no's Monthly (20,000) 4*5000	14,40,000
17.	Try Cycles donated (2 no's) AND Dust bins, bushes removing purpose JCB Support	8,00,000
18.	BT road patch works Rajayyapeta to Nakkapalli	20,00,000
19.	Laying of CC road at Rajayyapeta village	13,00,000
20.	Donated school benches 65no	2,00,000
21.	Vidya volunteers salary Support for education (3 no's)	8,64,000

22.	Donated to sports kits to schools	1,00,000
23.	School bags, books, stationary and uniform distribution to all students with Anganwadi kids also	30,00,000
24.	Donated Artificial limbs (Nearby villages)	10,00,000
25.	Eye Check-ups and free of cost cataract operation and glasses issued	6,00,000
26.	Support to local festivals	25,00,000
27.	10th class study material distribution	5,00,000
28.	Health Support to poor peoples Conducted Medical camps and (Mobile medical van visit every 15days once)	20,00,000
29.	Sanitization in Village because of COVID-19 Monthly two times	2,50,000
30.	Uniform distribution to Anganwadi kid 2pairs	1,00,000
Total Amount		**3,56,64,000**

Village Name: Boyapadu

Sl. No.	Name of the activity	Amount
1.	Drinking water Bore well digging charges (5nos)	10,00,000
2.	Construction of Ramalayam temple	20,00,000
3.	Construction of school compound wall and earth levelling and gravel filling work	6,00,000
4.	Solar Street lights fixing	2,50,000
5.	36w led streetlights 120pcs	1,50,000
6.	Groceries distribution at (Covid-19)	5,00,000
7.	Donated playing items for Aganwadi kids	1,50,000
8.	Cement benches arranged at beach /Dustbins	1,00,000
9.	Donated school benches for school children/sports kits	50,000
10.	3w solar lanterns led lights (50 pcs)	1,00,000
11.	Sweepers Salaries 4 no's Monthly (20,000) 4*5000	3,00,000
12.	Iron Grills and gate for school	1,00,000
13.	Vidya volunteers salary Support for education (1 no's)	3,00,000
14.	School bags, books and stationery and school benches	3,50,000
15.	Health Support to poor peoples Conducted Medical camps and (Mobile medical van visit every 15days once)	10,00,000

16.	Eye Check-ups and free of cost catract operation and glasses issued	3,00,000
17.	Donated Artificial limbs (Nearby villages)	1,00,000
18.	Sanitization in Village because of COVID-19 monthly two times	1,50,000
19.	uniform distribution to Anganwadi kid 2pairs	50,000
Total Amount		**75,50,000**

Village: Dondawaka

Sl. No.	Name of the activity	Amount
1.	Construction of school toilets 2 nos	3,50,000
2.	Electrical line Dondawaka to Beach Road	3,50,000
3.	Construction of compound wall	50,00,000
4.	Donated playing items for school children	1,50,000
5.	Construction of Gangadevi temple with grills	6,00,000
6.	Land Purchase for Anganwadi centre	5,00,000
7.	Culvert slab work at MPP school	1,00,000
8.	3w solar lanterns led lights (50 pcs)	1,00,000
9.	24w Led streetlights two times (60 pc)	2,50,000
10.	Donated artificial limbs (Nearby villages)	1,00,000
11.	Vidya volunteers salary support for education (1 nos)	3,00,000
12.	School bags, books and stationery and Uniforms 2 pairs school benches donated to school children	3,50,000
13.	Eye Check-ups and free of cost cataract operation and glasses issued	5,00,000
14.	Health Support to poor peoples Conducted Medical camps and (Mobile medical van visit every 15days once)	8,64,000
15.	Bushes removing purpose JCB Support (Dondawaka to Rajayyapeta road and Dondawaka to Beach Road)	6,00,000
16.	Groceries distribution at Rajayyapeta village (Covid-19)	3,50,000
17.	Sanitization in Village because of COVID-19 Monthly two times	1,50,000
Total Amount		**1,06,64,000**

Village Name: Peddateenarala

Sl. No.	Name of the activity	Amount
1.	Laying of CC road 400 mitre	25,00,000
2.	Land Purchase for school children playground purpose	15,00,000
3.	Construction of school toilets 2 no's	1,50,000
4.	Construction of RO plant 2kl with machinery	7,80,000
5.	Hand bores well digging	1,00,000
6.	24w Led streetlights	6,00,000
7.	Donated Tables & Racks for peddateenarala library	80,000
8.	Donated artificial limbs (Nearby villages)	1,20,000
9.	Vidya volunteers salary support for education (3 nos)	9,00,000
10.	School bags, books and stationery and Uniforms 2 pairs school benches donated to school children	15,00,000
11.	Eye Check-ups and free of cost cataract operation and glasses issued	8,00,000
12.	Conducted Medical camps And Mobile medical van visit every 15days once health check up to villagers	15,00,000
13.	Bushes removing purpose JCB Support	4,00,000
14.	Groceries distribution at rajayyapeta village (Covid-19)	10,40,000
15.	Sanitization in Village because of COVID-19 monthly two times	2,00,000
16.	Donated sports kits for school children	60,000
17.	Uniform distribution to Anganwadi kid 2 pairs	1,50,000
Total Amount		**1,23,80,000**

Village Name: Chinnateenarala

Sl. No.	Name of the activity	Amount
1.	Laying of Gravel road	12,00,000
2.	Construction of school toilets 2 no's	3,00,000
3.	36 w Led streetlights two times	12,00,000
4.	Donated artificial limbs (Nearby villages)	1,00,000
5.	Support to Fire victims families two Times	3,50,000
6.	Educational support to Y. aruna (Handicapper)	1,00,000

7.	Vidya volunteers salary support for education (2 nos)	5,76,000
8.	School bags, books and stationery and Uniforms 2 pairs Scholl benches donated to school children	3,37,500
9.	Eye Checkups and free of cost catract operation and glasses issued	4,00,000
10.	Conducted Medical camps And Mobile medical van visit every 15days once health check up to villagers	11,00,000
11.	Bushes removing purpose JCB Support	2,00,000
12.	Groceries distribution at Rajayyapeta village (Covid-19)	6,80,000
13.	Sanitization in Village because of COVID-19 monthly two times	1,50,000
14.	Donated sports kits for school children	50,000
15.	uniform distribution to Anganwadi kid 2pairs	1,00,000
Total Amount		**68,43,500**

Previous CSR Activities done by Hetero



Medical Check-up to nearby villages



Educational help to schools



Water Supply to villages



Temple Construction for villagers



Distribution of household essentials during Covid



Provided sits near beach for public



Distributed stationaries to schools



RO plant for villagers



Road facilities for villagers



Blood donation camp

6. Summary and Conclusion

Introduction

Hetero is a globally renowned vertically integrated pharmaceutical company engaged in research and development, manufacturing and marketing of high-quality chemical and biologic medicines across diverse therapeutic areas. Backed by more than 27 years of expertise in the pharmaceutical industry, Hetero's strategic business areas spread across Active Pharmaceutical Ingredients (API), Global Generics, Biosimilars and Custom Pharmaceutical Services. The company is among the largest producers of Active Pharmaceutical Ingredients (APIs) in the world.

Hetero constructed industrial plots in the year 2010 for manufacturing of bulk drugs and lifesaving drugs. The source of water requirement for the project is met from Desalination Plants installed in the premises the Hetero Infrastructure SEZ ltd.

Hetero obtained Environmental & CRZ clearance from MoEF&CC for development of 5 MLD desalination plant and laying of treated effluent pipeline vide letter no: 21-641/2007-IA.III dated 25/10/2010.

The Environmental & CRZ clearance issued by MoEF&CC mentioned that desalination plant shall be installed in SEZ area and outside CRZ area.

However hetero constructed the desalination plant on the existing abandoned building which was located in the CRZ III (NDZ) region. The construction was started in the year 2010, during which not much clarity was there on the CRZ criteria. The CRZ notification and guidelines came from the 6th of January 2011. But the plant was built before to the 2011 CRZ Notification by lack of understanding and mistake.

This report forms as "EIA study for CRZ regularization of desalination plant of Hetero Infrastructure SEZ Ltd". This report has been prepared in order to meet the suggestion from Andhra Pradesh Coastal Zone Management Authority (APCZMA) commitiee during the 52nd meeting held on 13/10/2022.

As per the CRZ map prepared based on CRZ Notification 2011, the existing desalination plant falls under:

CRZ III : No Development Zone

CRZ Notification 2011

Coastal Regulation Zone Notification 2011, issued by the Ministry of Environment and Forests (Department of Environment, Forests and Wildlife) is part of the Environment (Protection) Act, 1986. It was issued inviting objections and suggestions for the declaration of coastal stretches.

Based on CRZ Notification 2011, CRZ map has been prepared by the Institute of Remote Sensing (IRS), Anna University, Chennai, which is one of the approved agencies by MoEF&CC.

As per the Coastal Regulation Zone Notification 2011 from MoEF&CC,

Page no.11,
under Section 8,

Norms for regulation of activities permissible under this notification:
Sl. No.(iii) (h),

it is mentioned that:

'Foreshore facilities for desalination plants and associated facilities are permitted activities in NDZ" (CRZ -III No Development Zone)'

The relevant pages of the CRZ notification 2011, are extracted and enclosed as **Annexure – I**

Hence the existing Desalination plant of Hetero is a permitted activity and accordingly permission may be regularised for the area covered by the existing 5 MLD Desalination Plant.

CRZ Notification 2019

As per the Coastal Regulation Zone Notification 2019 from MoEF&CC,

Page no.36,
under Section 5.3, (i)

Activities as permitted in CRZ-I B, shall also be permissible in CRZ-III, in so far as applicable.

Page no.34,
under Section 5.1.2.

(xviii) Desalination plants and associated facilities.

The relevant pages of the CRZ notification 2019, are extracted and enclosed as **Annexure – II**

Hence the existing Desalination plant of Hetero is a permitted activity and accordingly permission may be regularised for the area covered by the existing 5 MLD Desalination Plant.

EIA Baseline Studies

Indomer has carried out a detailed EIA report and submitted to APCZMA titled *"Rapid Environmental Impact Assessment for Laying New Marine Disposal Pipeline in Place of Existing Treated Effluent and Desalination Plant Reject Pipelines for Hetero Infrastructure SEZ Ltd., N. Narasapuram (Village), Nakkapalli Mandal, Visakhapatnam District, Andhra Pradesh"* based on evaluation of baseline data collected in December 2021 to January 2022. For specific requirement for the present regularization report once again check baseline by covering 10 km radius around the proposed project region in October 2022.

Seawater Quality: Seawater quality parameters were found in the normal range and the water environment is free from pollution. There are no major changes in seawater samples collected during October 2022 when compared to baseline data collected during December 2021.

Seabed Sediment: Seabed sediment is predominantly composed of fine sand in nature. Organic matter, Total Nitrogen, Phosphorous concentrations were found within the normal range of coastal waters. The concentrations of heavy metals and phenols showed low values indicating absence of contamination in seabed sediments. There are no major changes in seabed sediments samples collected during October 2022 when compared to baseline data collected during December 2021.

Phytoplankton: Species diversity of the phytoplankton community of the coastal water is dominated by diatoms, dinoflagellates, and cyanobacteria. The most dominate phytoplankton species characters was *chaetoceros lorenzianus* than other phytoplankton species during the study period.

Zooplankton: Copepods were the most diverse group containing the highest number of species, followed by Decapods, Ciliate groups, Fish eggs and larvae, Chaetognatha, Mollusca, Urochordata, Cnidarian, Cladocera and Annelida. Copepods not only remained as the most dominant group but also appeared in large numbers during the sampling periods.

The existing desalination plant do not have any direct or indirect impact on the Ecology and Biodiversity. Ecology and Biodiversity environment remain same for both samples collected during December 2021 and October 2022.

Coastal Stability

The study shows that the beach and the coastal zone where Hetero desalination plant is built, remained very stable over the last 10 years and it is expected to remain the same in future. The construction of desalination plant in the CRZ area doesn't cause any impact on the beach form, coastline stability and the adjacent shoreline. As the sea doesn't reach the location of desalination plant, the operation of the desalination plant didn't have any influence on the benthic animals in the sub-tidal and intertidal regions. Also, there is no impact on the planktons, fishes and other marine organisms.

Impacts and mitigations

The existing desalination plant was built above the High Tide Line (HTL) and it is not having any impact on beach coastal forms, sand dune vegetation, seawater quality, seabed sediment, marine ecology and biodiversity. Hence there will not be any impact on the CRZ III (No Development Zone).

Environmental Compensatory

Activities for compensatory Conservation Plan

Sl. No.	Compensatory Conservation Plan	Budget allocated (Rs. in crores)	Period of commencement
1	Setting up of solar and other non-conventional energy source at village or habitations	1	2023

2	Restoration of water bodies and setting up of rainwater harvesting system	2	2023
3	Beach cleaning and development of beach amenities etc.	1	2023

Total amount allocated for compensatory Conservation Plan: 6 Crores

Activities for Community Resource Augmentation Plan

Sl. No.	Compensatory Conservation Plan	Budget allocated (Rs. in crores)	Period of commencement
	Adaptations of nearby coastal village and providing civic amenities.	2	2023
	Creation of self-help group and cooperative society for marketing of local community produce.	2	2023
1	Identification and training of unemployed youth in the nearby villages for eventual absorption in the company.	2	2023

Total amount allocated for compensatory Conservation Plan: 6 Crores

Total amount allocated for Environmental Compensation is ₹. 10 Crores

Conclusion

Based on the detailed study on the existing desalination plant along with possible impacts during the operation of the plant, it is clear that existing desalination plant does not create any major impact on the environment. However, regularization, implementation environmental compensation will ensure prompt action to counter any deviation from the baseline environmental quality and meet the goals of sustainable development and socio-economic progress of the region.

Annexure I – CRZ Notification 2011

COASTAL REGULATION ZONE NOTIFICATION
MINISTRY OF ENVIRONMENT AND FORESTS
(Department of Environment, Forests and Wildlife)

Supreme Court in Writ Petition 664 of 1993;

(c) the State Government or the Union territory CZMAs shall primarily be responsible for enforcing and monitoring of this notification and to assist in this task, the State Government and the Union territory shall constitute district level Committees under the Chairmanship of the District Magistrate concerned containing atleast three representatives of local traditional coastal communities including from fisherfolk;

(d) The dwelling units of the traditional coastal communities including fisherfolk, tribals as were permissible under the provisions of the CRZ notification, 1991, but which have not obtained formal approval from concerned authorities under the aforesaid notification shall be considered by the respective Union territory CZMAs and the dwelling units shall be regularized subject to the following condition, namely-

(i) these are not used for any commercial activity
(ii) these are not sold or transferred to non-traditional coastal community.

7. Classification of the CRZ – For the purpose of conserving and protecting the coastal areas and marine waters, the CRZ area shall be classified as follows, namely:-

(i) CRZ-I,–

A. The areas that are ecologically sensitive and the geomorphological features which play a role in the maintaining the integrity of the coast,-

(a) Mangroves, in case mangrove area is more than 1000 sq mts, a buffer of 50meters along the mangroves shall be provided;
(b) Corals and coral reefs and associated biodiversity;
(c) Sand Dunes;
(d) Mudflats which are biologically active;
(e) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986); including Biosphere Reserves;
(f) Salt Marshes;
(g) Turtle nesting grounds;
(h) Horse shoe crabs habitats;
(i) Sea grass beds;
(j) Nesting grounds of birds;
(k) Areas or structures of archaeological importance and heritage sites.

B. The area between Low Tide Line and High Tide Line;

(ii) CRZ-II,-

The areas that have been developed upto or close to the shoreline.

Explanation.- For the purposes of the expression "developed area" is referred to as that area within the existing municipal limits or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains;

(iii) CRZ-III,-

Areas that are relatively undisturbed and those do not belong to either CRZ-I or II which include coastal zone in the rural areas (developed and undeveloped) and also areas within municipal limits or in other legally designated urban areas, which are not substantially built up.

(iv.) *CRZ-IV*,-

A. the water area from the Low Tide Line to twelve nautical miles on the seaward side;

B. shall include the water area of the tidal influenced water body from the mouth of the water body at the sea upto the influence of tide which is measured as five parts per thousand during the driest season of the year.

(v) Areas requiring special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities,-

A. (i) CRZ area falling within municipal limits of Greater Mumbai;
(ii) the CRZ areas of Kerala including the backwaters and backwater islands;
(iii) CRZ areas of Goa.

B. Critically Vulnerable Coastal Areas (CVCA) such as Sunderbans region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 and managed with the involvement of coastal communities including fisherfolk.

8. Norms for regulation of activities permissible under this notification,-

(i) The development or construction activities in different categories of CRZ shall be regulated by the concerned CZMA in accordance with the following norms, namely:-

Note:- The word existing use hereinafter in relation to existence of various features or existence of regularisation or norms shall mean existence of these features or regularisation or norms as on 19.2.1991 wherein CRZ notification, was notified.

I. CRZ-I,-

(i) no new construction shall be permitted in CRZ-I except,-

(a) projects relating to Department of Atomic Energy;
(b) pipelines, conveying systems including transmission lines;
(c) facilities that are essential for activities permissible under CRZ-I;
(d) installation of weather radar for monitoring of cyclones movement and prediction by Indian Meteorological Department;
(e) construction of trans harbour sea link and without affecting the tidal flow of water, between LTL and HTL.
(f) development of green field airport already approved at only Navi Mumbai;

(ii) Areas between LTL and HTL which are not ecologically sensitive, necessary safety measures will be incorporated while permitting the following, namely:-

(a) exploration and extraction of natural gas;
(b) construction of dispensaries, schools, public rainshelter, community toilets, bridges, roads, jetties, water supply, drainage, sewerage which are required for traditional inhabitants living within the biosphere reserves after obtaining approval from concerned CZMA.
(c) necessary safety measure shall be incorporated while permitting such developmental activities in the area falling in the hazard zone;
(d) salt harvesting by solar evaporation of seawater;
(e) desalination plants;
(f) storage of non-hazardous cargo such as edible oil, fertilizers and food grain within notified ports;
(g) construction of trans harbour sea links, roads on stilts or pillars without affecting the tidal flow of water.

II. CRZ-II,-

(i) buildings shall be permitted only on the landward side of the existing road, or on the landward side of existing authorized structures;
(ii) buildings permitted on the landward side of the existing and proposed roads or existing authorized structures shall be subject to the existing local town and country planning regulations including the 'existing' norms of Floor Space Index or Floor Area Ratio:
Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road:
(iii) reconstruction of authorized building to be permitted subject with the existing Floor Space Index or Floor Area Ratio Norms and without change in present use;
(iv) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II appended to this notification and facilities for regasification of Liquefied Natural Gas subject to the conditions as mentioned in sub-paragraph (ii) of paragraph 3;
(v) desalination plants and associated facilities;
(vi) storage of non-hazardous cargo, such as edible oil, fertilizers and food grain in notified ports;
(vii) facilities for generating power by non-conventional power sources and associated facilities;

III. CRZ-III,-

A. Area upto 200mts from HTL on the landward side in case of seafront and 100mts along tidal influenced water bodies or width of the creek whichever is less is to be earmarked as "No Development Zone (NDZ)",-

(i) the NDZ shall not be applicable in such area falling within any notified port limits;

(ii) No construction shall be permitted within NDZ except for repairs or reconstruction of existing authorized structure not exceeding existing Floor Space Index, existing plinth area and existing density and for permissible activities under the notification including facilities essential for activities; Construction/reconstruction of dwelling units of traditional coastal communities including fisherfolk may be permitted between 100 and 200 metres from the HTL along the seafront in accordance with a comprehensive plan prepared by the State Government or the Union territory in consultation with the traditional coastal

communities including fisherfolk and incorporating the necessary disaster management provision, sanitation and recommended by the concerned State or the Union territory CZMA to NCZMA for approval by MoEF;

(iii) however, the following activities may be permitted in NDZ –

(a) agriculture, horticulture, gardens, pasture, parks, play field, and forestry;
(b) projects relating to Department of Atomic Energy;
(c) mining of rare minerals;
(d) salt manufacture from seawater;
(e) facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II;
(f) facilities for regasification of liquefied natural gas subject to conditions as mentioned in subparagraph (ii) of paragraph 3;
(g) facilities for generating power by non conventional energy sources;
(h) Foreshore facilities for desalination plants and associated facilities;
(i) weather radars;
(j) construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by CZMA;
(k) construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee;
(l) facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like;
(m) development of green field airport already permitted only at Navi Mumbai.

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 18th January, 2019

4. Prohibited activities within CRZ.- The following activities shall be prohibited, in general, within the entire CRZ and exceptions to these and other permissible and regulated activities in specific CRZ categories viz. CRZ-I, II, III and IV, shall be governed by the provisions of paragraph 5:-

(i) Setting up of new industries and expansion of existing industries, operations or processes.

(ii) Manufacture or handling of oil, storage or disposal of hazardous substances as specified in the notification of the Ministry of Environment, Forest and Climate Change number G.S.R.395 (E), dated the 4th April, 2016.

(iii) Setting up of new fish processing units.

(iv) Land reclamation, bunding or disturbing the natural course of seawater except for the activities permissible under this notification and executed with prior permission from the competent authority.

(v) Discharge of untreated waste and effluents from industries, cities or towns and other human settlements.

(vi) Dumping of city or town wastes including construction debris, industrial solid wastes, fly ash for the purpose of land filling.

(vii) Port and harbour projects in high eroding stretches of the coast.

(viii) Mining of sand, rocks and other sub-strata materials.

(ix) Dressing or altering of active sand dunes.

(x) In order to safeguard the aquatic system and marine life, disposal of plastic into the coastal waters shall be prohibited and adequate measures for management and disposal of plastic materials shall be undertaken in the CRZ.

(xi) Drawal of ground water.

5. Regulation of permissible activities in CRZ:

5.1 CRZ-I:

5.1.1. CRZ–IA:

These areas are ecologically most sensitive and generally no activities shall be permitted to be carried out in the CRZ-I A area, with following exceptions:-

(i) Eco-tourism activities such as mangrove walks, tree huts, nature trails, etc., in identified stretches areas subject to such eco-tourism plan featuring in the approved CZMP as per this notification, framed with due consultative process, public hearing, etc. and further subject to environmental safeguards and precautions related to the Ecologically Sensitive Areas, as enlisted in the CZMP.

(ii) In the mangrove buffer, only such activities shall be permitted like laying of pipelines, transmission lines, conveyance systems or mechanisms and construction of road on stilts, etc. that are required for public utilities.

(iii) Construction of roads and roads on stilts, by way of reclamation in CRZ-I areas, shall be permitted only in exceptional cases for defence, strategic purposes and public utilities, subject to a detailed marine or terrestrial or both environment impact assessment, to be recommended by the Coastal Zone Management Authority and approved by the Ministry of Environment, Forest and Climate Change; and in case construction of such roads passes through mangrove areas or is likely to damage the mangroves, a minimum three times the mangrove area affected or destroyed or cut during the construction process shall be taken up for compensatory plantation of mangroves.

5.1.2 CRZ-I B - The inter tidal areas:

Activities shall be regulated or permissible in the CRZ-I B areas as under:-

(i) Land reclamation, bunding, etc. shall be permitted only for activities such as,-

(a) foreshore facilities like ports, harbours, Jetties, wharves, quays, slipway, bridges, hover ports for coast guard, sea links, etc;

(b) projects for defence, strategic and security purposes;

(c) road on stilts, provided that such roads shall not be authorised for permitting development on the landward side of such roads, till the existing High Tide Line:

Provided that the use of reclaimed land may be permitted only for public utilities such as mass rapid or multimodal transit system, construction and installation of all necessary associated public utilities and infrastructure to operate such transit or transport system including those for electrical or electronic signaling system, transit stopover of permitted designs; except for any industrial operation, repair or maintenance;

(d) measures for control of erosion;

(e) maintenance and clearing of waterways, channels, ports and hover ports for coast guard;

(f) measures to prevent sand bars, installation of tidal regulators, laying of storm water drains or for structure for prevention of salinity ingress and freshwater recharge.

(ii) Activities related to waterfront or directly needing foreshore facilities such as ports and harbours, jetties, quays, wharves, erosion control measures, breakwaters, pipelines, lighthouses, navigational safety facilities, coastal police stations, Indian coast guard stations and the like.

(iii) Power by non-conventional energy sources and associated facilities.

(iv) Transfer of hazardous substances from ships to Ports, terminals and refineries and vice versa.

(v) Facilities for receipt and storage of petroleum products and liquefied natural gas as specified in Annexure-II to this notification, subject to implementation of safety regulations including guidelines issued by the Oil Industry Safety Directorate in the Ministry of Petroleum and Natural Gas and guidelines issued by the Ministry of Environment, Forest and Climate Change, provided that such facilities are for receipt and storage of fertilizers and raw materials required for fertilizers, like ammonia, phosphoric acid, sulphur, sulphuric acid, nitric acid, etc.

(vi) Storage of non-hazardous cargo i.e. edible oil, fertilizers and food grains in notified Ports.

(vii) Hatchery and natural fish drying.

(viii) Existing fish processing units may utilise 25% additional plinth area for modernisation purposes (only for additional equipment and pollution control measures) subject to the following:-

(a) Floor Space Index of such reconstruction not exceeding the permissible Floor Space Index as per prevalent town and country planning regulations;

(b) additional plinth area is constructed only to the landward side.

(c) approval of the concerned State Pollution Control Board or Pollution Control Committee.

(ix) Treatment facilities for waste and effluents and conveyance of treated effluents.

(x) Storm water drains.

(xi) Projects classified as strategic, defence related projects and projects of the Department of Atomic Energy, Government of India.

(xii) Manual mining of atomic mineral(s) notified under Part-B of the First Schedule to the Mining and Minerals (Development and Regulation) Act, 1957)(67 of 1957) occurring as such or in association with one or other minerals in the intertidal zone by such agencies as authorised by the Department of Atomic Energy, Government of India as per mining plan approved by the Atomic Mineral Directorate for Exploration and Research:

Provided that the manual mining operations shall be carried out only by deploying persons using baskets and hand spades for collection of ore or mineral within the intertidal zone and as per approved mining plan, without deploying or using drilling and blasting or Heavy Earth Moving Machinery in the intertidal zone.

(xiii) Exploration and extraction of oil and natural gas and all associated activities and facilities thereto;

(xiv) Foreshore requiring facilities for transport of raw materials, facilities for intake of cooling water, intake water for desalination plants, etc, and outfall for discharge of treated wastewater or cooling water from thermal power plants in conformity with the environmental standards notified by Ministry of Environment, Forest and Climate Change and relevant directions of Central Pollution Control Board (CPCB) or State Pollution Control Board (SPCB) or Pollution Control Committee (PCC), as the case may be.

(xv) Pipelines, conveying systems including transmission lines.

(xvi) Weather radar for monitoring of cyclones prediction, ocean observation platforms, movement and associated activities.

(xvii) Salt harvesting and associated facilities.

(xviii) Desalination plants and associated facilities.

5.2 CRZ-II:

(i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-II, in so far as applicable.

(ii) Construction of buildings for residential purposes, schools, hospitals, institutions, offices, public places, etc. shall be permitted only on the landward side of the existing road, or on the landward side of existing authorised fixed structures:

Provided that no permission for construction of buildings shall be given on landward side of any new roads which are constructed on the seaward side of an existing road.

(iii) Buildings permitted as in (ii) above, shall be subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index (FSI) or Floor Area Ratio (FAR) prevailing as on the date of this Notification, and in the event that there is a need for amendment of the FSI after the date of publication of this notification in the official Gazette, the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the SCZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures, etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters.

(iv) Reconstruction of authorised buildings shall be permitted, without change in present land use, subject to the local town and country planning regulations as applicable from time to time, and the norms for the Floor Space Index or Floor Area Ratio, prevailing as on the date of publication of this notification in the official Gazette and in the event that there is a need for amendment of the FSI after the said date of this notification, the Urban Local Body or State Government or Union territory Administration shall approach the Ministry of Environment, Forest and Climate Change through the concerned State Coastal Zone Management Authority (SCZMA) or Union Territory Coastal Zone Management Authority, as the case may be and the CZMA shall forward the proposal to the National Coastal Zone Management Authority (NCZMA) with its views in the matter, and the NCZMA shall thereafter examine various aspects like availability of public amenities, environmental protection measures etc., and take a suitable decision on the proposal and it shall be the responsibility of the concerned Town Planning Authority to ensure that the Solid Wastes are

handled as per respective Solid Waste Management Rules and no untreated sewage is discharged on to the coast or coastal waters.

(v) Development of vacant plots in designated areas for construction of beach resorts or hotels or tourism development projects subject to the conditions or guidelines at **Annexure-III** to this notification.

(vi) Temporary tourism facilities shall be permissible in the beaches which shall only include shacks, toilets or washrooms, change rooms, shower panels; walk ways constructed using interlocking paver blocks, etc, drinking water facilities, seating arrangements, etc. and such facilities shall however be permitted only subject to the tourism plan featuring in the approved CZMP as per this notification, framed with due consultative process or public hearing, etc. and further subject to environmental safeguards enlisted in the CZMP, however, a minimum distance of 10 meter from HTL shall be maintained for setting up of such facilities.

5.3 CRZ-III:

(i) Activities as permitted in CRZ-I B, shall also be permissible in CRZ-III, in so far as applicable.

(ii) **Regulation of activities in NDZ:**

Following shall be permissible and regulated in the NDZ:-

(a) No construction shall be permitted within NDZ in CRZ III, except for repairs or reconstruction of existing authorised structure not exceeding existing Floor Space Index, existing plinth area and existing density and for permissible activities under this notification including facilities essential for activities and construction or reconstruction of dwelling units of traditional coastal communities including fisher folk, incorporating necessary disaster management provisions and proper sanitation arrangements.

(b) Agriculture, horticulture, gardens, pastures, parks, playfields and forestry.

(c) Construction of dispensaries, schools, public rain shelter, community toilets, bridges, roads, provision of facilities for water supply, drainage, sewerage, crematoria, cemeteries and electric sub-station which are required for the local inhabitants may be permitted on a case to case basis by Coastal Zone Management Authority (CZMA).

(d) Construction of units or auxiliary thereto for domestic sewage, treatment and disposal with the prior approval of the concerned Pollution Control Board or Committee.

(e) Facilities required for local fishing communities such as fish drying yards, auction halls, net mending yards, traditional boat building yards, ice plant, ice crushing units, fish curing facilities and the like.

(f) Wherever there is a national or State highway passing through the NDZ of CRZ-III areas, temporary tourism facilities such as toilets, change rooms, drinking water facility and temporary shacks can be taken up on the seaward side of the road.

On landward side of such roads in the NDZ, resorts or hotels and associated tourism facilities shall be permitted and such facilities shall, however, be permitted only subject to the incorporation of tourism plan in the approved CZMP as per this notification and the conditions or guidelines at Annexure-III, to this notification as applicable.

Annexure III- Procedure for Dealing with Violation Arising Due To Not Obtaining A Prior CRZ Clearance Activities.

F.No.19-27/2015-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
IA-III Division (CRZ)

Indira Paryavaran Bhawan
Jor Bagh Road,
New Delhi-110003
Dated: 19th February, 2021

OFFICE MEMORANDUM

Subject: Procedure for dealing with violations arising due to not obtaining a prior CRZ clearance for permissible activities –regarding.

For the purpose of protecting and improving the quality of the coastal environment and abating coastal environmental pollution, it is necessary that all entities not complying with Coastal Regulation Zone notifications be brought under compliance of the environmental statutes in an expedient manner. This Ministry has received several requests from the coastal state governments for proposals, under Coastal Regulation Zone (CRZ) Notification, 2011, for considering CRZ clearance in respect of permissible activities which have commenced work without a prior CRZ clearance due to inadequate knowledge of the regulatory regime and other factors. Bringing such projects and activities in compliance with the environmental laws at the earliest point of time is therefore essential, rather than leaving them unregulated and unchecked, which will be more damaging to the environment.

2. Reference is invited to order dated 28th November, 2014 of the Hon'ble High Court of Jharkhand in the matter of Hindustan Copper Limited Versus Union of India, wherein the High Court held that the conditions laid down under Office Memorandum dated 12th December, 2012 in paragraph No. 5 (i) and 5 (ii) were illegal and unconstitutional and had further held that action for alleged violation would be an independent and separate proceeding and therefore, consideration of proposal for environment clearance could not await initiation of action against the project proponent. The Hon'ble Court further ruled that the proposal for environment clearance must be examined on its merits, independent of any proposed action for alleged violation of the environmental laws. Also, Hon'ble Supreme Court of India in Civil Appeal No. 1526 of 2016 Alembic Pharmaceuticals Ltd. Vs Rohit Prajapati & Ors., in its order dated 1st April, 2020, has mentioned that the closure of the industries are not warranted, however, order for payment of compensation as a facet of preserving the environment in accordance with the precautionary principle has been imposed and proposal for environment clearance must be examined on its merits, independent of any proposed action for alleged violation of the environmental laws.

3. To this effect, it is therefore necessary to establish a process for appraisal of such cases of violation arising due to not obtaining of prior clearance for permissible

1

activities in CRZ areas and for prescribing adequate environmental safeguards on such entities and provide an enabling process to deter violation of provisions of CRZ Notification, 2011 and the damage to environment is adequately compensated for.

4. The Ministry hereby, prescribes the following procedure for dealing with violation arising due to not obtaining a prior CRZ clearance for permissible activities as under:

i. All activities, which are otherwise permissible under the provisions of Coastal Regulation Zone Notification, but have commenced construction without prior clearance, would be considered for prospective clearance only in such cases wherein the project proponent applies for such a clearance to the concerned Coastal Zone Management Authority (CZMA) along with required documents as given in para number 4.2 of the said CRZ Notification, 2011 such as: (a) Form-I; (b) CRZ map in 1:4000 scale drawn up by any of the agencies identified by the Ministry of Environment, Forest and Climate Change *vide* its Office Order number J-17011/8/92-IAIII, dated the 8th August, 2019; (c) Marine EIA Report and/or Terrestrial EIA Report, as may be applicable; (d) NOC from SPCB, as may be applicable etc.

ii. As the project commenced construction and / or operations without a prior CRZ clearance, the CZMA shall assess the environmental damages caused by such an action and shall give **specific recommendation** in respect of activities, corresponding to the environmental or ecological damage assessed, to be taken up by the project proponent within a period of three years from the date of clearance, under Compensatory Conservation Plan (CCP) and a Community Resource Augmentation Plan (CRAP). The said plans may comprise of indicative activities as in the **Annexure.** The cost for assessment of environmental damage, if any, may be guided by the Ministry of Environment, Forest and Climate Change vide O.M No. 19-125/2019-IA.III, dated 05/03/2020 and / or project specific assessment by the CZMA.

iii. The CZMA shall also give **specific recommendations** and shall certify that there is no violation / contravention of the CRZ norms, while making such recommendations and that the project is in consonance with the approved CZMP as per CRZ Notification, 2011.

iv. On fulfilment of the provisions as prescribed above, the project proponent shall apply for consideration of clearance to the Ministry of Environment, Forest and Climate Change, in the 'PARIVESH' online portal, along with all documents as submitted to the concerned CZMA and the specific recommendation of the CZMA.

v. The project thereafter will be appraised for appropriate recommendation by the Expert Appraisal Committee (CRZ) constituted by the Ministry of Environment, Forest and Climate Change.

vi. The Expert Appraisal Committee shall examine the adequacy of the Environmental Management Plan, Comprising Compensatory Conservation Plan and Community Resource Augmentation Plan and endorse the specific recommendation of SCZMA in this regard and suggest other suitable remedial measures, if any. The Expert

Appraisal Committee shall also decide the percentage of total project cost required to be utilized for implementation of the above said plans.

vii. The concerned CZMA / State Environment Department shall oversee implementation and enforcement of the Compensatory Conservation Plan and Community Resource Augmentation Plan.

viii. Further, action should be taken by the respective State Government or Union Territory Administration or SPCB or UTPCC, as the case may be, under respective provisions of the Environment (Protection) Act, 1986, for violation of not taking prior approval.

This issues with the approval of the Hon'ble Minister (EFCC).

(Dr. Sujit Kumar Bajpayee)
Joint Secretary to the Government of India

To,

1. **The Principal Secretaries (Environment) of all Coastal States / UTs.**

Copy to:

1. PS to Minister (EFCC)
2. PS to MoS (EFCC)
3. PPS to Secretary (EFCC)
4. PPS to AS (RSP)/AS (RA)/AS(UD)
5. The Member Secretaries, CZMAs
6. The Member Secretaries, IA Division, MoEFCC
7. The Chairman, EAC (CRZ & Misc Projects)
8. Office copy / Guard file.

ANNEXURE

INDICATIVE LIST OF ACTIVITIES:

1. Activities for Compensatory Conservation Plan:

(a) Mangrove replantation / regeneration;
(b) Sea grass replantation / regeneration;
(c) Protection of sand dunes, mudflats;
(d) Measures for regeneration of beach sand;
(e) Soil remediation;
(f) Setting up of small infrastructure for coastal erosion control measures;
(g) Construction and maintenance of cyclone shelters;
(h) Protection measures and maintenance of heritage sites located in coastal areas;
(i) Setting up of solar and other non-conventional energy source at village or habitations;
(j) Restoration of water bodies and setting up of rain water harvesting systems;
(k) Beach cleaning and development of beach amenities etc.

2. Activities for Community Resources Augmentation Plan:

(a) Adoption of nearby coastal village and providing civic amenities;
(b) Creation of Self Help Group and Cooperative Society for marketing of local community produce;
(c) Creation of micro financing for vocation of the local community, in particular fishermen community;
(d) Identification and training of unemployed youth in the nearby villages for eventual absorption in the company;
(e) Sustainable community solid waste management strategy and programme;
(f) Installation and maintenance of organic waste collector;
(g) Disbursement and disposal of fishing nets with financial incentives;
(h) Renovation and maintenance of village wells etc.

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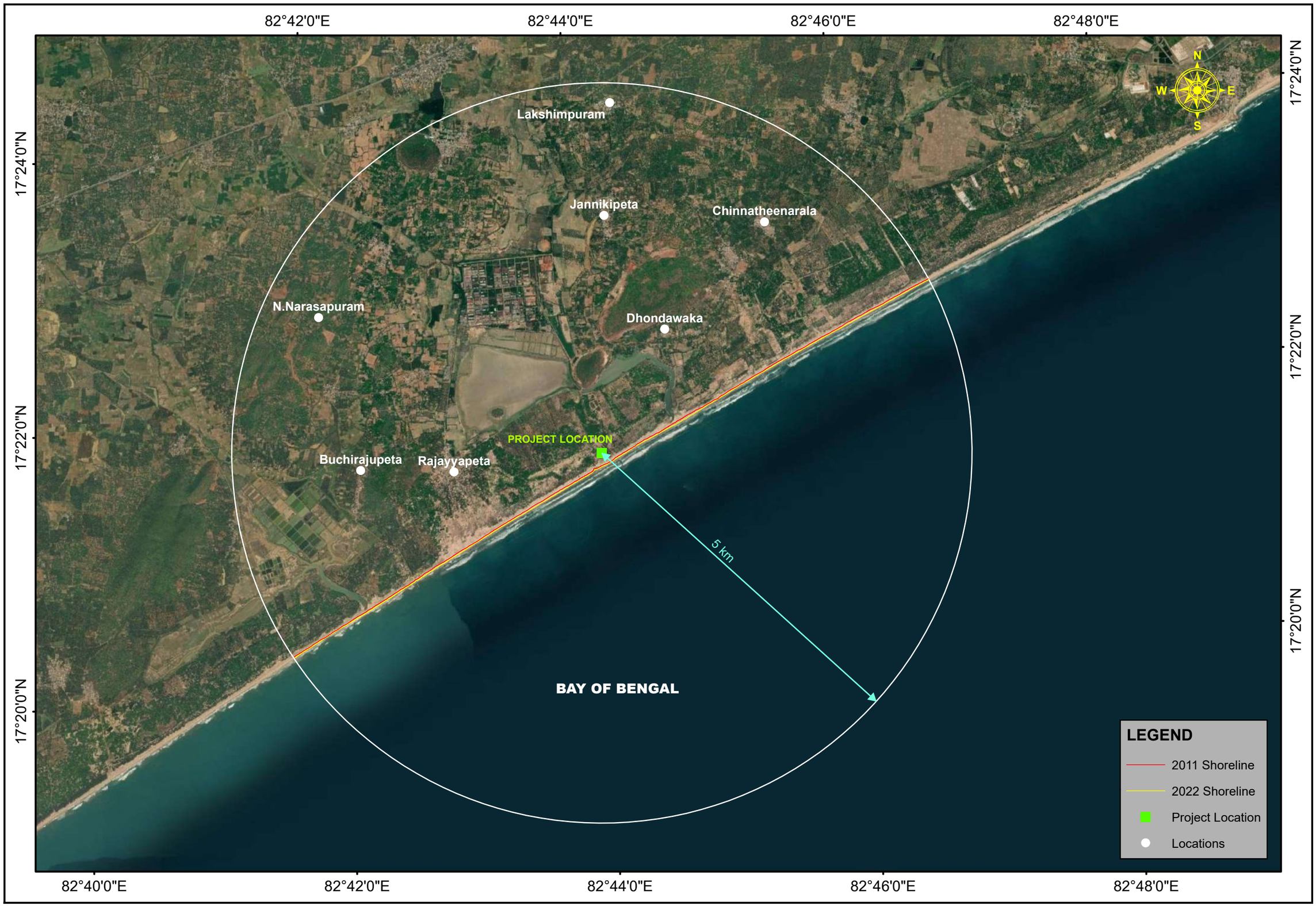


FIG. 3.2. COMPARISON OF THE COASTLINE BETWEEN 2011 AND 2022 (5 KM RADIUS)

F.No.19-27/2015-IA.III
Government of India
Ministry of Environment, Forest and Climate Change
IA-III Division (CRZ)

Indira Paryavaran Bhawan
Jor Bagh Road,
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Dated: 19th February, 2021

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Subject: Procedure for dealing with violations arising due to not obtaining a prior CRZ clearance for permissible activities –regarding.

For the purpose of protecting and improving the quality of the coastal environment and abating coastal environmental pollution, it is necessary that all entities not complying with Coastal Regulation Zone notifications be brought under compliance of the environmental statutes in an expedient manner. This Ministry has received several requests from the coastal state governments for proposals, under Coastal Regulation Zone (CRZ) Notification, 2011, for considering CRZ clearance in respect of permissible activities which have commenced work without a prior CRZ clearance due to inadequate knowledge of the regulatory regime and other factors. Bringing such projects and activities in compliance with the environmental laws at the earliest point of time is therefore essential, rather than leaving them unregulated and unchecked, which will be more damaging to the environment.

2. Reference is invited to order dated 28th November, 2014 of the Hon'ble High Court of Jharkhand in the matter of Hindustan Copper Limited Versus Union of India, wherein the High Court held that the conditions laid down under Office Memorandum dated 12th December, 2012 in paragraph No. 5 (i) and 5 (ii) were illegal and unconstitutional and had further held that action for alleged violation would be an independent and separate proceeding and therefore, consideration of proposal for environment clearance could not await initiation of action against the project proponent. The Hon'ble Court further ruled that the proposal for environment clearance must be examined on its merits, independent of any proposed action for alleged violation of the environmental laws. Also, Hon'ble Supreme Court of India in Civil Appeal No. 1526 of 2016 Alembic Pharmaceuticals Ltd. Vs Rohit Prajapati & Ors., in its order dated 1st April, 2020, has mentioned that the closure of the industries are not warranted, however, order for payment of compensation as a facet of preserving the environment in accordance with the precautionary principle has been imposed and proposal for environment clearance must be examined on its merits, independent of any proposed action for alleged violation of the environmental laws.

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viii. Further, action should be taken by the respective State Government or Union Territory Administration or SPCB or UTPCC, as the case may be, under respective provisions of the Environment (Protection) Act, 1986, for violation of not taking prior approval.

This issues with the approval of the Hon'ble Minister (EFCC).

(Dr. Sujit Kumar Bajpayee)
Joint Secretary to the Government of India

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Copy to:

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(e) Sustainable community solid waste management strategy and programme;
(f) Installation and maintenance of organic waste collector;
(g) Disbursement and disposal of fishing nets with financial incentives;
(h) Renovation and maintenance of village wells etc.

*****

GOVERNMENT OF ANDHRA PRADESH
DEPARTMENT OF FISHERIES

From
Smt T.Sumalatha M.Sc.M.Phil,
Joint Director of Fisheries (FAC),
Visakhapatnam.

To
The Asisstent manager
Hetero Infrastructure SEZ Ltd
Nakkapalli Mandal.
Anakapalli Distrct.

Rc.No. 1766/B/2022. dated 13.12.2022

Sir,

Sub:- Fisheries – Fish data information- for the year 2014-15 to 2021-22- send the Report- Reg

Ref:- 1.Your latter Dated:29.11.2022. for Hetero infrastructure SEZ Ltd.

&&&&

I Wish to inform that the above reference cited, I am enclosing herewith the year wise Fish &

Prawn catch Data particulars for 5 year 2014-15 to 2021-22 in Visakhapatnam District. As per available Data.

Yours faithfully,

Encl:- Report As above

T. Sumalatha 14-12-22
Joint Director of Fisheri(FAC)
Visakhapatnam

14/12/22

YEARS -WISE FISH & PRAWN (M.Ton'S) PRODUCTION IN VISAKHAPATNAM DISTRICT

S.NO	ITEM	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	UPTO MARCH 2021-22
1	Marine Fish Production	85620	89084	105441	104185	104005	96093	100282	102977
2	Marine Shrimp Production	11700	14889	20172	23750	28802	37838	33575	28787
3	Inland Fish Production	8461	10289	14133	13585	50252	25009	57335	47527
4	Inland Prawn Production	7130	7268	10746	9557	82	89	85	95.1
5	Brackish water Shrimp culture	3265	4533	4090	4818	6577	5973	6793	11782
TOTAL		116176	126063	154582	155895	189718	165002	198070	191168

T. Surya Rao 14.12.22
Joint Director of Fisheries(FAC),
Visakhapatnam
14/12/22

Nakkapalli Jurisdiction(Nakkapalli and payakaraopeta Mandals)-Total Fin Fish &Shel Fish Catch Report For 2022 Year(From April To March)			
Month	Fin Fish Production(mts)	Shel Fish Production(mts)	Total Production(mts)
April	1582	192	1774
May	52	120	172
June	810	175	985
July	1780	715	2495
August	1625	614	2239
September	1587	546	2133
October	1475	411	1886
November	1280	309	1589
Total	**10191**	**3082**	**13273**

Asst. Director of Fisheries
Narsipatnam

Asst director of Fisheries
Narsipatnam

Scanned with CamScanner

From

Medical Officer,
Primary Health Centre
Godicherla, Visakhapatnam

To

The Principal
Andhra Medical College,
Visakhapatnam

Rc.No.SPL/MO/2021 Dated: 06.01.2022

Sir,

Sub: -PHSS-POLUTION-Visakhapatnam District-Petition Filed by the Committee against " Hetro Drugs Piple Line" in the Limits of Nakkapalli Mandal- Medical Investigation Report- Submitted- Regarding.

Ref:- 1). Rc.No.1402/2021/D3, Dated: 30 /12/2021.Honorable District Collector and Magistrate, Visakhapatnam.

2).Telephonic conversation by the District Medical and Health Officer, Visakhapatnam and Principal, Andhra Medical College, Visakhapatanam Dated: 06.01.2022

<<<<<<>>>>>>

In obedience of the above reference cited 1st and 2nd , I (Dr.M.Kishore Kumar), Medical Officer, Primary Health Centre, Godicherla, Nakkapalli Mandal am working at PHC Godicherla since 23.01.2019. my self and my PHC staff is visiting our routine field visits of Rajayyapeta,Boyapadu, Pedateenarla, Dondawaka, Chinateenarla Villages other villages covered by the surrounding of " Hetero Drugs" in these villages the health condition of the villagers are normal and there is no panic situation aroused according to IDSP Report.

This is to submission of favor of information to Higher Authorities.

Thanking you Sir,

Medical Officer

MEDICAL OFFICER
PRIMARY HEALTH CENTRE
GODICHERLA, Visakha Dt.

Copy District Medical and Health Officer, Visakhapatanam for favor of Information.
Copy Submitted, Revenue Divisional Officer, Narasipatnam, Visakhapatanam
Copy to the Thasildar, Nakkapalli Mandal, Visakhapatna District.
Copy to File.

Rc. No.953/T/2021-22

Date: 29-04-2022

From
Deputy Director
Ground Water and Water Audit Department
Visakhapatnam

To
The Joint Collector
Visakhapatnam

Sir,

Sub:- APPCB – Hon'ble NGT, Chennai order dt. 21.02.2022 in Original Application [O.A] No. 23 of 2022[SZ] – Inspection of M/S Hetero Infrastructures SEZ LTD and M/S Hetero Laboratories LTD, N- Narsapuram Village, Nakkapalli mandal, Visakhapatnam District – Inspection report of Deputy Director- Ground Water and Water Audit Department – Visakhapatnam submitted – Regd.

Ref:- Lr No. 1003/PCB/RO-VSP/NGT/2022 Dated 22.03.2022 APPCB, Regional Office, Visakhapatnam.

******

I invite kind attention to the subject and reference cited. As per the instructions issued by the Hon'ble NGT committee has conducted inspection on M/S Hetero Infrastructures SEZ LTD and M/S Hetero Laboratories LTD, N-Narsapuram Village, Nakkapalli mandal, Visakhapatnam District.

According to the orders of the Hon'ble NGT and APPCB, Regional office, Visakhapatnam vide reference 1st cited conducted detailed Ground Water survey on 29-03-2022 and 30-03-2022 in and around 1. Rajayyapeta village 2. Donduwaka village and 3. Pedda Teenarlu village near M/S Hetero Infrastructures SEZ LTD and M/S Hetero Laboratories LTD, N- Narsapuram Village, Nakkapalli mandal, Visakhapatnam District to ascertain the ground water quality and then what is the nature of remedial measures to be taken to restore the damage caused on Environment. I herewith submit detailed inspection report for kind perusal and necessary action.

Encl: Inspection report

Yours Faithfully,

29.04.2022

Deputy Director

DEPUTY DIRECTOR
GROUND WATER & WATER AUDIT DEPT,
VISAKHAPATNAM

Copy submitted to the Executive Engineer, Pollution Control Board,
Visakhapatnam for favour of information

GOVERNMENT OF ANDHRA PRADESH
GROUND WATER AND WATER AUDIT DEPARTMENT,
SECTRO – 5, MVP COLONY, VISAKHAPATNAM DISTRICT.

Honorable National Green Tribunal Chennai order dt 21-02-2022 in original application (O.A) No. 23 of 2022 (SZ) and Lr. No.1003/PCB/RO-VSP/NGT/2022 dated 22.03.2022 of Environmental Engineer, Andhra Pradesh pollution Control Board, Regional Office, Visakhapatnam Joint inspections were made with committee team to ascertained as per directions of the Honorable National Green Tribunal is the soil as well as ground water quality and also the water quality in and around the unit within a safe distance in the affected area and non affected area whether it has been affected an account of the operation of M/S HETERO INFRASTRUCTURE SEZ Ltd & M/S HETERO LABORATORIES Ltd, N – Narasapuram (V) Nakkapalli Mandal, Visakhapatnam District on 29.03.2022 & 30.03.2022.

I submit that according to the orders vide reference above conducted detailed ground water investigations in and around the M/S HETERO INFRASTRUCTURE SEZ Ltd & M/S HETERO LABORATORIES Ltd, N – Narasapuram village, Rajyyapet, Dondawaka and Pedda Teenarlu villages of Nakkapalli Mandal, Visakhapatnam District where as the issues such as soil, ground water quality and environment damaged caused to on account of operation of M/S HETERO INFRASTRUCTURE SEZ Ltd & M/S HETERO LABORATORIES Ltd, N – Narasapuram village, Nakkapalli Mandal, Visakhapatnam District on 29-03-2022 and 30.03.2022.

I submit that the M/S HETERO INFRASTRUCTURE SEZ Ltd & M/S HETERO LABORATORIES Ltd, located on the National High way which is 75 Km away from Visakhapatnam Head Quarter. Rajayyapet, Donwaka and Pedda Teenarlu villages lies on east of M/S HETRO unit and west of Bay of Bengal. M/s Hetero infrastructures Ltd & M/S Hetero Laboratories Ltd covered with an extent of 490.00 acres having undulating topography generally sloping towards east. The unit area consisting with red and red loamy soil with 0.5 to 1.00m thickness underlained by Khondalites rock of eastern ghats of archecan age. It is observed that the Hetero units run exclusively with utilization of de- solemnization of sea water only not drawl of ground water in this purpose. During the course of investigations water samples were collected for chemical analysis before and de-salinization ie sea and water plant which is also existing on the bank of bay of Bengal located far away from the Hetero

unit in the area. I submit that the demand and requirement of water for the Hetero units is 2000 KLD which has supplied by water plant every day through pipe line without giving any adverse impact on soil as well as ground water quality in and around the study area.

I submit that it is observed that more than 8.00 acres of the area located at North East of the plant mined which is adjacent to the hill consisting with khondalies rock extended on both sides i.e along the sea coast Rajayyapet Dondawaka and Pedda Teenarlu villages somewhere consisting subsurface which act as barrier/dyke to prevent the influence of waste water from upputeru and unit in the area . Total 11 No's of water samples were collected from different locations ie. Effluent channel, Effluent tank, after treatment of Effluent tank etc to study and chemical analysis purpose in the area.

Further, I submit that it is also conducted detailed investigations in three villages i.e Rajayyapet, Dondawaka and Pedda Teenarlu villeges whereas complaints raised on damage of environment, soil and ground water quality caused an account of operation of M/s Hetero Infrastructures Ltd & M/S Hetero Laboratories Ltd N-Narasapuram village of Nakkapalli mandal, Visakhapatnam District. 1. Rajayyapet, 2. Dondawaka and 3. Pedda Teernallu area coastal villages lies on

(1) North latitudes = 17° 363237 East Longitude = 82° 715104

(2) North latitudes = 17° 373724 East Longitude = 82° 725543

(3) North latitudes = 17° 379427 East Longitude = 82° 752291

Which are falls in survey of India topo sheet No.65 K/11 and the studied villages population is 5,480; 905; and 2,852 respectively. All these three villages consisting with alluvium soil underlained by weathered Khondlaites of Archecan age. Inventoried total 27 numbers of Bore wells and 3 Nos of Filter point wells in and around these villages. The bore wells total depth ranges from 8.00 to 55.00m bgl and Filter point wells depth in 15 m bgl each respectively. Depth to water level varies form 1.03 to 4.20 m bgl . all these structures are energized with hand pumps and submersible pumpsets which are functioning successfully in all seasons. Of which 3 numbers of filter point wells drilled by Hetero Infrastructure SEZ Ltd. units for supply the drinking through R.O. Plant in Pedda Teenarlu village such structure energized with 3 HP submersible pumpset is functioning successfully .

And three more filter point wells drilled by Hetero Infrastructure SEZ Led units to supply the water through OHSR system in Rajayyapet village such structures also energized with 3 HP submersible pumpsets and inter connected earth other with

OHSR which are functioning successfully in all seasons in the area. All these field level facts and ground water structures are depicted in the enclosed field sketch and statement. During the course of investigations collected total 41 water samples in and around these three villages for chemical analysis purpose. Details of chemical analysis data results and its discussions herewith enclosed for your ready reference.

I submit that 41 No's of water samples were collected in and around M/S Hetero Infrastructure Sez Ltd & M/S Hetero Laboratories Ltd and Rajayyapet, Dondawaka and Pedda Teenarlu villages of Nakkapalli mandal, Visakhapatnam district are analyzed in water quality lab level – II of this office of the parameters available and following are the results and based on the results of the above chemical analysis data reveals that bore well location

1. Yuvasena sangam with code 2/12
2. Nearby Nunna koti kirana shop with code 3/23
3. Nuka thatha Temple with code 4/1
4. Upputeru Tank with code 7/21
5. P. Tatalu with code 19/42
6. Panchayati / YSR Colony with code 20/18
7. Panchayathi bore well with code 22/16
8. Kundeti Demudu with code 24/22 and
9. Bondu Nukamma with code 25/26 in Rajayyapeta village, Nakkapalli mandal is not suitable for drinking purpose because of such bore wells water containing the ground water in such structures fluoride content beyond the permissible limit balance of the bore wells in general is potable.

In Dondavaka village only 1 bore well located near community hall with code 29/101 bore well water is not suitable for drinking purpose due to water contained fluoride beyond permissible limit and the balance of bore wells water in general potable. Further, 8 numbers of bore wells studied, collected water samples and analyzed and its results reveals that quality of water in general is suitable for drinking purpose in Pedda Teenarlu village of Nakkapalli mandal, Visakhapatnam district

Further, 11 number of water samples analyzed pertaining to in and around the M/S Hetero Infra structures SEZ limited and M/S Hetero Laboratory Limited of which 2 samples collected from sea and Ground water monitoring well II over grade and 2 samples are unsuitable for analysis due to whereas the Specific Conductance value more than 30000 Micro Siemens which are called as over grade and another

two samples were unclear and heavy trace elements concentrates which are unsuitable for analysis which are collected from before treatment of effluent tank and one sample collected in effluent drain into 1st fore run sump II. It is observed that after treatment of the effluent code 17/15, desalinized water code 6/11 and potable storage tank code 15/28 analysis data results reveals that the quality of water in general is also within permissible limits. The remaining water samples pertaining to existing borewells established in the unit for monitoring purpose only.

In view of the above field level findings and interpretation results of the Geo hydrogeological and chemical analysis of the samples collected from these 3 villages, different locations in Hetero Limited and Creek water the following discussions are made.

1. M/S Hetero Infrastructures SEZ Limited and M/S Hetero Laboratories Limited are lies on the National Highway which is consisting with Red loamy and gravel soil underlained by Khondalites of Archean age.
2. The unit area having lack of recharging conditions due to devoid of fractures in the sub-surface country rock in the area.
3. One desalinization plant constructed more than 1.5 kms of East of Hetero limited and 300m West to Bay of Bengal in the area. The water plant has drawl the 5000 KL from the sea after desalinization, normalization of Ph value then such processed water 2000 KLD supply to meet the limit through laying pipelines without giving scope for adverse impact on soil and ground water in and around the Hetero limits.
4. 11 numbers of water samples collected in and around the M/S Hetero Infrastructures SEZ limited and M/S Hetero Laboratories Limited for chemical analysis purpose. Such outcome data results already discussed in the report.
5. It is suggested that the unit authority should start any work pertaining to Hetero Limited with obtaining the permissions given by the authority concerned well in advance only.
6. It is suggested that the firm should not release the effluents or after treated effluents directly or indirectly to the existing Upputeru Creek water through existing mining pit. The factory effluents having concentrated trace elements with unbearable bad smell caused to damage the environment, pollute the Upputeru creek water and fishes whereas the people completely depend on their livelihood by fishing every day in the area.

7. It is ascertained that the inspected three villages named as 1. Rajayyapeta, 2. Dondawaka 3. Pedda Teenarlu are located in non-affected area which are maintained safe distance from the existing M/S Hetero Infrastructures SEZ Limited and M/S Hetero Laboratories Limited in Narsapuram village of Nakkapalli mandal, Visakhapatnam District.
8. Further it is observed that on account of operation of M/S Hetero Infrastructures SEZ Limited and M/S Hetero Laboratories Limited does not give adverse impact on soil cover and ground water quality in such villages which are lies innon-affected area with safe distance from the unit.
9. The firm should establish water plant (RO water plant) in addition to existing water facility to supply the good quality drinking water to Rajayyapeta village people for sake of their better health and life.
10. It is directed the firm that to strengthening the existing bore well and smooth operation of the RO plant to scatter the sufficient drinking to the Pedda Teernalu village and extend the same upto Donkawaka village properly.
11. Regarding medical subject the unit authority should provide the medical staff with qualified doctors to visit these villages twice in every month door to door where people suffer with ill health then give the treatment with sufficient medicines for early recovery of their health in such villages without deviation.

29.04.2022

DEPUTY DIRECTOR.

DEPUTY DIRECTOR
GROUND WATER & WATER AUDIT DEPT.
VISAKHAPATNAM