Development of Vizhinjam International Deepwater Multipurpose Seaport

Environmental Clearance F. No. 11-122/2011-IA.III dated 3rd January 2014

Half Yearly Compliance Report (HYCR) for the Period October 2021 to March 2022

Project Concessionaire

Adani Vizhinjam Port Private Ltd. (AVPPL)

Project Authority

Government of Kerala (GoK)

Implementing Agency on behalf of GoK

Vizhinjam International Seaport Limited (VISL)
(A GoK Undertaking)

May 2022

Vizhinjam International Seaport Limited

(A Government of Kerala Undertaking)

VISL/ 53 /2021 -GM1 (E)/166

21 May 2022

To
Additional Principal Chief Conservator of Forests (C),
Ministry of Environment Forest and Climate Change (MoEF&CC),
Regional Office (SZ), Kendriya Sadan,
4th Floor, E&F Wings, 17th Main Road,
Koramangala II Block, Bangalore-560034 (Karnataka)
rosz.bng-mefcc@nic.in, Ph: 080-25635901

Sub: Half Yearly Compliance Report (HYCR) of Environmental and CRZ Clearance for Vizhinjam International Multipurpose Deepwater Seaport for the period of **October 2021 to March 2022** – Reg.

Ref: 1) File No. 11-122/2011-IA.III dated 3rd January 2014
2) Letter No. 1285/A3/13/KCZMA/S&TD dated 24th August 2013
3) File No: EP/12.1/7/2013-14/Ker 829 dated 20th August 2019
4) F.No.11-122/2011-IA.III Proposal No. IA/KL/MIS/178082/2020 dated 29thDecember 2020

Dear Sir,

This has reference to the Environmental & CRZ Clearance (EC) issued on 3rd January 2014 (vide reference cited 1) by the Ministry of Environment, Forest & Climate Change (MoEF&CC) for the proposed Vizhinjam International Multipurpose Deepwater Seaport at Vizhinjam in Thiruvananthapuram District of Kerala State based on the recommendation of KCZMA (vide the reference cited 2). Subsequently, the validity of EC was extended by MoEF&CC dated 29th December 2020 (vide reference cited 4).

The Half Yearly Compliance Report (HYCR) of the conditions stipulated in the cited references for the period from **October 2021 to March 2022** is enclosed herewith for record and reference.

As per the MoEF&CC Letter (vide the reference cited 3), wherein submission of HYCRs by email / soft copy is declared acceptable, therefore the HYCR for the period **October 2021 to March 2022** is being submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email.

Yours Sincerely
For Vizhinjam International Seaport Ltd

Chief Executive Officer

Encl : As Stated Above
Copy to: MD & CEO Adani Vizhinjam Port Private Ltd. (AVPPL), 3rd Floor, Aspinwall House, Kuravankonam, Trivandrum, Kerala-695 003.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
11.	**Specific Conditions**	
(i)	"Consent for Establishment" shall be obtained from Kerala State Pollution Control Board under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.	**Complied** Consent for Establishment (CTE) had been obtained from Kerala State Pollution Control Board (KSPCB) vide Consent No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018. The CTE was renewed vide Consent No. PCB/HO/TVM/ICE-R/02/2018 dated 19.07.2018 valid up to 31.07.2023. Copy of the renewed CTE was submitted to Ministry of Environment and Climate Change (MoEF&CC) with the Half Yearly Compliance Report (HYCR) for the period April 2018 to September 2018.
(ii)	Project Proponent shall carry out intensive monitoring with regulatory reporting six monthly on shoreline changes to the Regional Office, MoEF.	**Being Complied** Based on the Shoreline Monitoring Plan prepared by L&T Infra Engineers Ltd (L&T IEL) under the guidance of National Institute of Ocean Technology (NIOT), Shoreline monitoring for a stretch of 40 km (20 km on both sides of the project site) is being done and reports are being regularly submitted to MoEF&CC as a part of the HYCR. Broadly the scope covers: • Wave Observations • Onshore Cross beach profiling • Offshore Cross beach profiling • Littoral Environmental Observations (LEO) • Beach Sampling • Multi-beam Echo Sounder (MBES) survey • River cross section surveys • Grab Sampling • Current Observations • Tide Observations • Weather Observations • Water Sampling • Turbidity Measurements Shoreline Monitoring Report for the period October 2021 to March 2022 is enclosed as **Annexure I**.

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		L&T IEL had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by NIOT. Five mathematical modelling reports have been prepared by L&T IEL so far and submitted to MoEF&CC; as detailed below: **Data Period** / **Submitted with HYCR for the Period** Feb 2015 to Feb 2017 — Apr 2017 to Sep 2017 Mar 2017 to Feb 2018 — Apr 2018 to Sep 2018 Mar 2018 to Feb 2019 — Apr 2019 to Sep 2019 Mar 2019 to Feb 2020 — Apr 2020 to Sep 2020 Mar 2020 to Feb 2021 — Apr 2021 to Sep 2021 From all the data analyses and model studies carried out by L&T IEL, it has been concluded that there was minimal variation on shoreline, beach morphology and water quality compared to the previous years and that the port construction has not caused any unnatural changes to these parameters in the vicinity of the port.
(iii)	The capital dredged material (7.6 Mm^3) shall be utilized for reclamation of berths.	**Being Complied** No dredging or reclamation was carried out during the compliance period from October 2021 to March 2022. The dredged material till 31.03.2022 amounting to 2.90 Mm^3 has been utilized for reclamation of 36 Ha area.
(iv)	Additional fish landing centre shall be developed as part of the proposed Vizhinjam port for upliftment of fisheries sector.	**Being Complied** The work for construction of the fish landing centre (Rs. 16.00 crores) and the fishery breakwater (Rs. 131.12 crores) has been initiated as part of the funded work component of the concession agreement with AVPPL. Based on CWPRS, Pune studies on tranquillity at the proposed new fishing harbour, the landing centre needs to be relocated after construction of an extension of seaward breakwater of the old fishing harbour. GoK is

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		finalising the way forward to build the additional fish landing centre to facilitate the local fishermen. *(Source: VISL)*
(v)	The project shall be executed in such a manner that there is minimum disturbance to fishing activity.	**Being Complied** Following is being practiced to ensure minimum disturbance to fishing activity: • Work is planned in such a way that there is only minimal hindrance to the fishermen due to construction activities. • Signboards have been placed for demarcation of construction area and navigational buoys/marker buoys are placed in the marine area for fishing boats to maintain a safe distance from the areas of breakwater construction. • For mutual understanding of the developmental activities with the local fishing community an exclusive CSR team has been assigned. • Using the technological advancements (such as WhatsApp), the dedicated CSR team of AVPPL are in constant touch with the fishermen/fishing community members to facilitate the flow of various project related information/updates. • AVPPL CSR team also provides regular updates to the committee which has been formed by the local church/other representatives adjoining to the port area, who in turn pass on port project execution information to the fishermen. • Turbidity buoys at 3 locations identified by NIOT had been deployed and continuous monitoring was carried out to assess the real time turbidity. The turbidity details for the compliance period are given in **Annexure I**. • Marine Water Quality is being monitored regularly and results are submitted as part of the compliance reports. No abnormal results were observed during the compliance period (**Refer Annexure II**).

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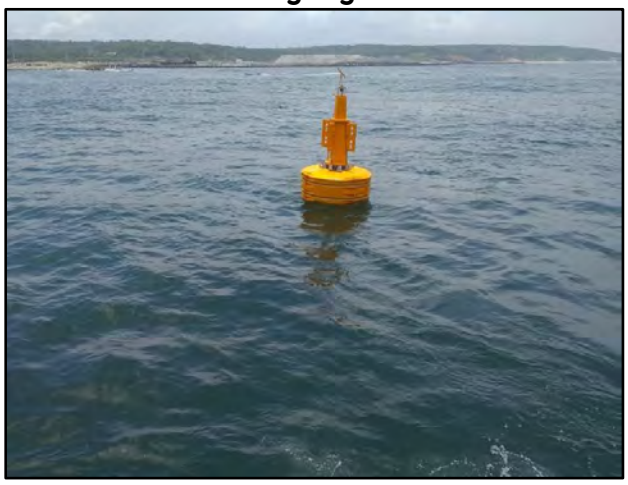
		 Warning Signboard  **Navigational Buoy** **Turbidity Buoy**
(vi)	Steps would be taken to safeguard the interests of the fisheries sector as detailed in the	**Being Complied** In consultation with the fishermen, enhanced livelihood compensation of Rs. 101.86 Crores was sanctioned by GoK, instead of Rs. 8.55

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	Resettlement Action Plan (RAP), Corporate Social Responsibility (CSR) and in the Integrated Fishing Community Management (IFCMP), namely a component of Rs.7.1 crores as part of the compensation package for the fisheries sector, as livelihood restoration measures for mussel collectors, shore seine fishermen and others. Rs.41.30 crores as part of CSR activities in the fisheries sector under (i) water supply scheme (7.3crores) (ii) new fishing landing centre (16crores) (iii) adoption of existing fishing harbor (5crores) (iv) sea food park (4crores) (iii) skill development centre (4crores) (iv) environmental sanitation (3crores) and (v) solid waste management (2crores).	crores; as suggested earlier in the EIA stage. Till 31.03.2022 an amount of Rs. 99.94 crores have been disbursed for a total number of 2640 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free of cost as well during the port construction period. Verification of the documents of few balance LAPs is in progress. *(Source: VISL)* The status of the Social Welfare activities envisaged in the fisheries sector is as follows: **Water Supply**: Water Supply Scheme for provision to the local people has been commissioned in April 2013 by VISL by expending an amount of Rs. 8.10 crores. For Operation & Maintenance (O&M) of the same an amount of Rs. 5.38 crores has been spent up to 31.03.2021. From 04.04.2019 onwards, O&M of the scheme is being done by Kerala Water Authority (KWA). An additional amount of Rs. 1.74 Crores has been sanctioned and deposited by VISL to KWA to extend connections for drinking water supply facilities to the community at Kottapuram Village. The work is in progress by KWA. *(Source: VISL)* **Fish Landing Centre**: The work for construction of the fish landing centre (Rs. 16.00 crores) and the fishery breakwater (Rs. 131.12 crores) has been initiated as part of the funded work component of the concession agreement with AVPPL Based on CWPRS, Pune studies on tranquillity at the proposed new fishing harbour, the landing centre needs to be relocated after construction of an extension of seaward breakwater of the old fishing harbour. GoK is finalising the way forward to build the additional fish landing

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		centre to facilitate the local fishermen. *(Source: VISL)* **Existing Fishing Harbour**: Tender for modernization of the existing fishing harbour was invited by Harbour Engineering Department (HED) and work awarded. However, the works could not be initiated due to sectoral protests among different fishermen groups. Government has formed a higher level committee to prepare a master plan for the old fishing harbour. *(Source: VISL)* **Seafood Park**: Procurement of land for seafood park (Rs. 26.00 crores) by VISL has been completed. Action for development of seafood park is being planned so as to commission the same along with the completion of the new fishing harbour. *(Source: VISL)* **Skill Development:** Additional Skill Acquisition Program (ASAP) is a GoK initiative aimed at imparting skill courses to students for improving their employability. No Objection Certificate (NoC) has been granted to ASAP to proceed with the construction of a Community Skill Park (CSP) in an area of 1.5 acres of land at Vizhinjam. It will operate on a PPP model wherein 25,000 sq. ft. building with facilities for students' hostel are being constructed by GoK under ASAP with ADB assistance, whereas the operation of the centre with logistics and other high-end courses is vested with Adani Skill Development Centre. Preference is being given to local people based on skill and competency during the construction stage. Tender for fixing transaction advisor has been invited. *(Source: VISL)*

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		 Community Skill Park **Environmental Sanitation/Solid Waste Management:** AVPPL/Adani Foundation has been conducting community cleaning campaign in association with Trivandrum Municipal corporation and many other grass roots level organisations. One of the livelihood groups, promoted under the CSR of AVPPL/Adani Foundation Karsheeka Karma Sena is coordinating the campaign. Most of the members who are actively participating in the cleaning campaign are from widow's category as part of the Widow's engagement programme. During the period, Karma Sena cleaned Laksham Veedu Colony near CSR office, Vizhinjam, Vayalinkara, Karimpallikkara, Sea Food park area and Valiyakadappuram in Kottappuram ward Vizhinjam Police station area, Chappath, Karimpallikkara and Kanjiramvila Laksham Veedu colony area engaging 519 women-days. As per the request received from Trivandrum Municipal Corporation it is decided to construct an MRF at harbor ward. Land for the same will be allotted by Harbour Engineering Department (HED). The operation of the unit will be done by Trivandrum Municipal Corporation under the technical support of Suchithwa Mission and Clean Kerala Company. A Haritha Karma Sena

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		will be formed for the daily collection of waste after the commissioning of the proposed unit. **Gangayar Canal:** As the community reported the sand accumulation at Gangayar causing flooding and which has directly affected many houses during rainy season, AVPPL/Adani Foundation has been regularly removing sand from the mouth of Ganagayar to ensure proper water flow to sea. The dredging department is doing the work at the mouth of Gangayar River joining sea at Valiyakadappuram every day during such spells of deposits. The proposed maintenance to ensure proper water flow and desilting of Gangayar initiated during the month of December 2020. The work has been entrusted to Minor Irrigation Department under the supervision of HED. The project cost of Rs. 120 lakhs have been shared equally by AVPPL and VISL and the same has been transferred to MID and the works in the finishing stage by Minor Irrigation Department. Desilting of waste up to 1 km from the mouth of the canal, Core wall (Break water) to block sand iteration at the southern side of the exiting Fishing Harbour and Installation of three Silt breakers at a distance of 500 m with footbridge are the major components of the work.

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		 Footbridge at Gangayar Canal Activities carried out by AVPPL/Adani Foundation as a part of CSR intervention for fishermen, fishing community and fisheries sector for the period of October 2021 to March 2022 is given in **Annexure III**.
(vii)	Rail connectivity shall be parallel to the harbour road on elevated structures at +4/5.00 m level without affecting the entry to the existing harbor.	**Will be Complied** Konkan Railway Corporation Limited (KRCL) has been engaged as a consultant for turnkey execution of the project. Out of the total rail route length of 10.7 km, 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway. Geophysical and geomorphological studies and hydrogeological studies have also been completed. EC amendments in this regard is in process. *(Source: VISL)*
(viii)	Compensation packages in accordance with the Central/State Government norms shall be given to all the authorized-cum-affected (having valid clearances as applicable) resort owners.	**Being Complied** Resort owners evicted have been compensated for land and not for the structures since they were in violation of CRZ notification. Remaining land of 2.865 Ha is to be acquired by Land Acquisition (LA) process; for which notification has been published and action initiated by the District Collector Thiruvananthapuram. *(Source: VISL)*

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(ix)	The port shall ensure that all ships under operation follow the MARPOL convention regarding discharge or spillage of any toxic, hazardous or polluting material like ballast water, oily water or sludge, sewage, garbage etc. The emission of NOx & SOx shall remain within permissible limits.	**Will be Complied** Currently project is under construction. This shall be complied during operational phase.
(x)	CSR activities shall cover villages within 10 km radius of the project.	**Being Complied** All CSR activities on livelihood development health, sanitation, education etc. are being implemented after receiving formal demands from social controlled institutions; government controlled institution and recognized platforms. CSR activities are being taken up and carried out mainly in the fields of education, community health, sustainable livelihood development, community infrastructure development and general administration. An amount of Rs. 579.86 Lakhs has been spent on CSR activities during the compliance period (October 2021 to March 2022) as shown below:

S. No.	Head	Amount (Rs. Lakhs)
1	Education	25.38
2	Health	128.68
3	Sustainable Livelihood Development	102.00
4	Community Infrastructure Development	283.80
5	General Administration	40.00
Total		**579.86**

Details on CSR activities carried out by AVPPL during compliance period (October 2021 to March 2022) are enclosed as **Annexure III**.

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(xi)	Oil Contingency Management Plan shall be put in place.	**Will be Complied** After duly incorporating the comments of Indian Coast Guard (ICG), the final facility Level Oil Spill Disaster Contingency Plan (OSDCP) in line with the National Oil Spill-Disaster Contingency Plan (NOS-DCP) has been submitted to ICG for approval vide letter No. AVPPL/ICG/2020-21/1134 dated 22.05.2020. After final review by PRT (West), ICG has made specific remarks on the compliance of OSDCP prepared in line with NOS-DCP guidelines; directing AVPPL to submit the OSDCP for approval only after pollution response equipment are in place before start of operation. Considering that the procurement of pollution response equipment will be in line with the development of the port, the final OSDCP will be submitted to ICG for approval prior to commissioning of the port; when the pollution response equipment are in place.
(xii)	All the recommendations /conditions stipulated by Kerala Coastal Zone Management Authority (KCZMA) shall be complied with.	**Being Complied** AVPPL are complying with all the recommendations/conditions of KCZMA. Copies of the HYCRs are also being sent to KCZMA. Compliance to the recommendations/conditions of KCZMA for the period October 2021 to March 2022 is enclosed as **Annexure IV**.
(xiii)	The responses/ commitments made during public hearing shall be complied with in letter and spirit.	**Being Complied** AVPPL are complying with the responses/commitments made during public hearing (as applicable). Status of the same is being submitted regularly with HYCRs to all the authorities concerned. The compliance status of the commitments made during Public Hearing & actions on the same during the compliance period October 2021 to March 2022 is enclosed as **Annexure V**.

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(xiv)	All the recommendation of the EMP shall be complied with in letter and spirit. All the mitigation measures submitted in the EIA report shall be prepared in a matrix format and the compliance for each mitigation plan shall be submitted to MoEF along with half yearly compliance report to MoEF-RO.	**Being Complied** Project is in construction stage. Out of the 5 identified EMP areas, work has started in Port Site (Building construction in back up yard), Road/Rail Corridor and in PAF (Project Annex Facility)). Recommendations of the Construction stage EMP for these areas are being implemented. Status of construction stage EMP in matrix format is enclosed as **Annexure VI**.
(xv)	The project proponent shall bring out a special tourism promotion package for the area in consultation with the State Government and implement the same along with the project.	**Being Complied** Implementation of the Tourism Management Plan is being discussed with tourism department for a way forward. *(Source: VISL)*
(xvi)	The project proponent shall place on its website its response to the Public Hearing, and representations as presented to the EAC in the 128th meeting held on 23rd November 2013, for information of the general public.	**Complied** All the relevant details pertaining to EIA, ToR, EAC meetings, Public Hearing, etc. related to the project have been placed on VISL website http://www.vizhinjamport.in/eia-30-5-13.php
(xvii)	There shall be no withdrawal of groundwater in Coastal Regulation Zone Area, for this project. In case any groundwater is proposed to be withdrawn from outside the CRZ area, specific prior permission from the concerned State/Central Groundwater Board shall be obtained in this regard.	**Noted** There will not be any withdrawal of groundwater in CRZ Area. In case of requirement of groundwater withdrawal outside CRZ area, specific prior permission will be obtained from State/Central Groundwater Board. KWA set up a 3.00 MLD water supply scheme for the project with the source of water being Vellayani Lake. The net availability of treated water from this supply scheme is 2.49 MLD of potable water out of which 1.49 MLD of water

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		shall be distributed to the local people as part of social welfare measures of VISL. The balance 1.0 MLD was to be used for port related activities. However, at present, the entire treated water from the scheme is being utilised by the community. The water for construction purposes for the port is being sourced from the open market/private suppliers. On an average about 50 KLD water is being consumed for construction related activities during the compliance period (October 2021 to March 2022).
(xviii)	The Hazardous waste generated shall be properly collected and handled as per the provision of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.	**Being Complied** Contractors working at site, under the EPC Contractor M/s. Howe Engineering Projects India Pvt. Ltd. (HEPIPL) have obtained separate consents from KSPCB for handling Hazardous Waste. During this compliance period (October 2021 to March 2022) 2.29 KL of used oil had been generated and it is being stored as per Hazardous Waste Rules at site and further disposed to authorized (CPCB/KSPCB) waste oil handlers.
(xix)	No hazardous chemicals shall be stored in the Coastal Regulation Zone area.	**Being Complied** No hazardous chemical is being stored in the CRZ area.
(xx)	The waste water generated from the activity shall be collected, treated and reused properly.	**Complied** Only batching plant wash/reject is generated from the construction activity presently. For the same, a settling tank is constructed and used for collection and recycling of all wash water generated. At present settled sludge is used for filling of low lying area.
(xxi)	Sewage Treatment facility should be provided in accordance with the CRZ Notification.	**Will be Complied** Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner is being planned and will be implemented in line with CRZ Notification along with the commissioning of the project.

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(xxii)	No solid waste will be disposed of 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.	**Being Complied** No solid waste is being disposed in the CRZ area. As mentioned in the EIA, contractors working at the site have been made responsible for management of Solid Waste during construction stage. The contractors are complying with the provisions pertaining to management of Solid Waste and it is being properly collected, segregated and disposed in line to Solid Waste Management Rules 2016, as amended.
(xxiii)	Installation and operation of DG set if any shall comply with the guidelines of CPCB. Oil spills if any shall be properly collected and disposed as per the Rules. Project proponent shall install necessary oil spill mitigation measures.	**Being Complied** 7 DG sets are presently being used at site. These are compliant to CPCB guidelines. If any oil spill occurs, it shall be properly collected and disposed as per the Rules.
(xxiv)	No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	**Being Complied** Construction of the project is being carried out as per the approval obtained under CRZ Notification.
(xxv)	The approach channel shall be properly demarcated with lighted buoys for safe navigation and adequate traffic control guidelines shall be framed.	**Will be Complied** The project is in construction phase and the same shall be complied during operational phase.
(xxvi)	The project proponent shall take up development of green belt in the project area, wherever possible. Adequate budget shall be provided in the Environment Management Plan for such development.	**Will be Complied** **Greenbelt**: Although a natural greenbelt exists, the greenbelt of adequate width with suitable species in consultation with forest department as identified in the EIA will be developed in all possible areas including back-up areas and along the boundary of the project area in line with the establishment of the project. A greenbelt development plan has been considered in the Master Plan and adequate budgetary provision has been kept

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		for this purpose. Landscape development work has been done for the median of the approach road. **Approach Road Median Plantation** **Compensatory Afforestation**: AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School. The plantation is in its third year of growth.
(xxvii)	The fund earmarked for environment management plan shall be included in the budget and this shall not be diverted for any other purposes.	**Being Complied** An amount of 40 Crores has been kept solely for EMP implementation as per the commitment in the EIA; and this amount is not diverted for any other purpose. An amount of Rs. 1.81 Crores has been utilized towards EMP implementation measures during compliance period October 2021 to March 2022. Till date, an amount of Rs. 21.39 Crores has been spent on environmental protection measures. The EMP expenditure is enclosed as **Annexure VII**.

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(xxviii)	The project proponent shall set up an organizational mechanism/institutional structure for Environment, Health & Safety & CSR under the supervision of a General Manager as outlined in the EIA Report for effective implementation of the stipulated EHS safeguards & CSR activities.	**Complied** During construction phase an officer of VISL has been designated as Head (EHS & CSR) for effective implementation of the stipulated EHS safeguards & CSR activities. AVPPL has also appointed competent and qualified professional for effective implementation of EHS safeguards & CSR activities. In addition to the above, independent environment, health and safety consultants have been appointed as per concession agreement signed between GoK and AVPPL. It is also ensured that contractors executing the work also deploy qualified and competent EHS personnel for effective implementation of EMP measures. Organizational Structure for Environment, Health, and Safety & CSR for construction phase is enclosed as **Annexure VIII**.
(xxix)	Staff Colony should be located beyond CRZ area.	**Will be Complied** Port facility planning is done in such a way that staff colony will be located beyond CRZ area.
12.	**General Conditions**	
(i)	Construction of the proposed structures shall be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification, 2011 & its amendments. All the construction designs/drawings relating to the proposed construction activities must have approvals of the concerned Statutory Departments / Agencies.	**Complied** All the construction activities are being carried out as per existing Central/local rules. Necessary permissions under CRZ Notification 2011 & its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments/Agencies have been obtained for the construction designs/drawings relating to construction activities as mentioned hereunder: • Consent to Establish (CTE) No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from State Pollution Control Board vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023.

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		• Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 7.12.2015. • CTE for consumer pump inside the Vizhinjam port premises was obtained on 07.03.2021 (Consent No.: PCB/TVM-DO/NTA/PTP/15/2021) for the period of 5 years valid up to 28.02.2026. • Consent to Operate (CTO) for Explosives Storage at Chappath area was obtained on 20.07.2021 (Consent No.: PCB/TVM-DO/ICO/NTA/HCS/49/2021) valid up to 31.12.2024. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01/10/2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises.
(ii)	Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment.	**Complied** On an average 442 Nos. of employees, staff and construction workers were engaged in the port construction activities on a daily basis during the compliance period October 2021 to March 2022. Presently, during the compliance period, the contractors have demobilized and there are no labourers residing in the labour camps. It is ensured that construction workers who are staying outside in the contractor rented houses/apartments are provided with necessary infrastructure facilities.
(iii)	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	**Being Complied** Mitigation measures are being followed while undertaking digging activities Surface & Ground water quality is monitored on a monthly basis in line to Environment Monitoring Plan prescribed in EIA and analysis reports are enclosed as **Annexure II**. There are no significant changes observed in the water quality during the compliance period.
(iv)	Borrow sites for each quarry sites for road construction	**Being Complied**

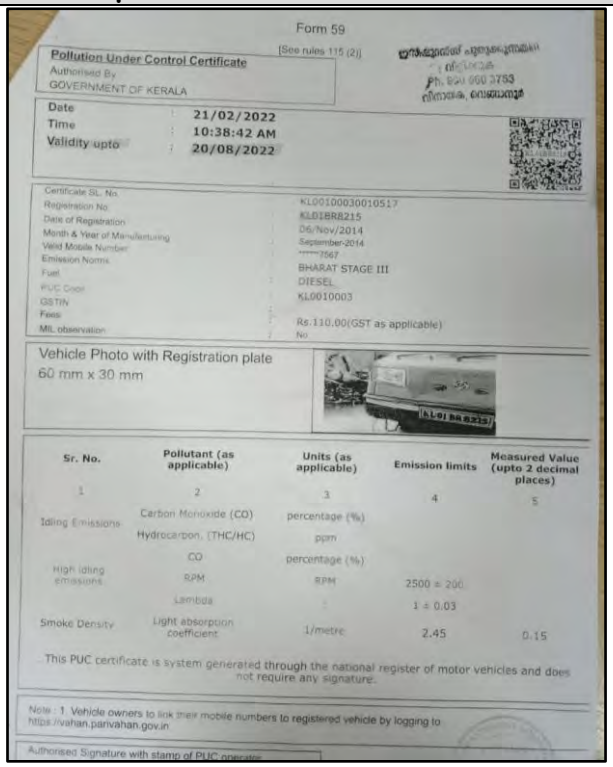
Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	material and dump sites must be identified keeping in view the following: (a) No excavation or dumping on private property is carried out without written consent of the owner. (b) No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations. (c) Excavation work shall be done in close consultation with the Soil Conservation and Watershed Development Agencies working in the area, and (d) Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such materials must be secured so that they shall not leach into the ground water.	Quarry material is being obtained from approved quarry sites only. Earth cutting generated from road corridor construction at present are dumped in truck terminal area. • No excavation has been carried out in private property. • No excavation or dumping has been carried out in wetlands, forest area or other ecologically valuable or sensitive locations. • Kerala State Remote Sensing and Environment Centre (KSREC) have studied the impact due to construction of port approach road. Recommendations of KSREC are being implemented and suitable mitigation measures as suggested in the KSREC report are being adopted during construction. • No bituminous or hazardous material has been used.
(v)	The construction material shall be obtained only from approved quarries. In case new quarries are to be opened, specific approvals from the competent authority shall be obtained in this regard.	**Being Complied** The construction material was obtained from approved quarries only. As on date, AVPPL have obtained Environmental Clearance (EC) from the State Environmental Impact Assessment Authority (SEIAA) and Consent to Operate (CTO) from KSPCB for the following granite building stone quarries:

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		• Block No.29, Re-Survey No.120/10 in Manickal Village, Nedumangad Taluk, Thiruvananthapuram District, Kerala (Details submitted along with the HYCR for the period October 2019 to March 2020) • Nagaroor Village, Chirayinkeezhu Taluk, Thiruvananthapuram District (Details submitted along with the HYCR for the period April 2019 to September 2019) In case of new quarries, necessary approvals will be obtained from the competent authority. Apart from these, the concessionaire is also sourcing rocks from the following private quarry owners in Kerala: • Vismaya Rocks Pvt. Ltd. Quarry at Kummil Village, Kottarakara Taluk, Kollam District, Kerala • Tasna Mines Quarry at Mancode Village, Kottarakara Taluk, Kollam District, Kerala The concessionaire is also sourcing rocks from several private quarry operators in Tamil Nadu. It is ensured that all private quarry owners have necessary approvals and permits from competent authorities.
(vi)	The project authorities shall make necessary arrangements for disposal of solid wastes and for the treatment of effluents by providing a proper wastewater treatment plant outside the CRZ area. The quality of treated effluents, solid wastes and noise level etc. must conform to the standards laid down by the competent authorities including the Central/State Pollution Control Board and	**Being Complied** • No solid waste is being disposed of in the CRZ area. • Solid waste is handled as per the Solid Waste Management Rules, 2016 as amended. • Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner is being planned and will be implemented in line with CRZ Notification along with the commissioning of the project. • Environment Monitoring is being carried out as per Environment Monitoring Plan prescribed in EIA by NABL accredited

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022

<table>
<tr><th>S. No.</th><th>Conditions</th><th>Compliance Status as on 31.03.2022</th></tr>
<tr><td></td><td>the Union Ministry of Environment and Forests under the Environment (Protection) Act, 1986, whichever are more stringent.</td><td>agency Standards Environmental & Analytical Laboratories.
• Summary of the Ambient Air Quality Monitoring (AAQM) during the compliance period October 2021 to March 2022 at 5 monitoring locations is mentioned below:
<table>
<tr><th>Parameter</th><th>Unit</th><th>Max</th><th>Avg.</th><th>Min</th><th>Perm. Limit</th></tr>
<tr><td>PM_{10}</td><td>µg/m³</td><td>83.5</td><td>48.3</td><td>16.0</td><td>100</td></tr>
<tr><td>$PM_{2.5}$</td><td>µg/m³</td><td>44.8</td><td>24.6</td><td>3.2</td><td>60</td></tr>
<tr><td>SO_2</td><td>µg/m³</td><td>5.10</td><td>2.70</td><td>BDL</td><td>80</td></tr>
<tr><td>NO_2</td><td>µg/m³</td><td>7.45</td><td>3.70</td><td>2.03</td><td>80</td></tr>
<tr><td>CO</td><td>mg/m³</td><td>BDL</td><td>BDL</td><td>BDL</td><td>4</td></tr>
<tr><td>HC</td><td>ppm</td><td>BDL</td><td>BDL</td><td>BDL</td><td>--</td></tr>
</table>
• Detailed Monitoring Reports for the period October 2021 to March 2022 is attached as Annexure II).
• All the monitored parameters were found within the prescribed limits.</td></tr>
<tr><td>(vii)</td><td>The proponent shall obtain the requisite consents for discharge of effluents and emissions under the Water (Prevention and control of Pollution) Act, 1974 and the Air (Prevention and control of Pollution) Act, 1981 from the Kerala State Pollution Control Board before commissioning of the project and a copy of each of these shall be sent to this Ministry.</td><td>Will be Complied
CTO under the Water (Prevention and control of Pollution) Act, 1974 and the Air (Prevention and control of Pollution) Act, 1981 will be obtained from KSPCB before commissioning of the project and copy of the CTO will be sent to Ministry on receipt.</td></tr>
<tr><td>(viii)</td><td>Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely.</td><td>Complied
Following precautionary measures are undertaken during transportation of the construction material as environment safeguard:
• Tarpaulin cover is being used during transportation of construction material</td></tr>
</table>

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		• All vehicles coming into the site are under a speed restriction of 20 km/hr • Regular Water Sprinkling is done on the approach road by water tankers. • It is ensured that all vehicles entering the Port have a valid PUC certification • The dumpers have speed governors ensuring adherence to speed limit **Water Sprinkling in Progress** **Tarpaulin Covered Truck**

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		 Form 59 [See rules 115 (2)] Pollution Under Control Certificate Authorised By GOVERNMENT OF KERALA Date 21/02/2022 Time 10:38:42 AM Validity upto 20/08/2022 Certificate SL. No. KL00100030010517 Registration No KL01BR8215 Date of Registration 06/Nov/2014 Month & Year of Manufacturing September-2014 Valid Mobile Number ******3567 Emission Norms BHARAT STAGE III Fuel DIESEL PUC Code KL0010003 GSTIN Fees Rs.110.00(GST as applicable) MIL observation No Vehicle Photo with Registration plate 60 mm x 30 mm Sr. No. / Pollutant (as applicable) / Units (as applicable) / Emission limits / Measured Value (upto 2 decimal places) 1 / 2 / 3 / 4 / 5 Idling Emissions — Carbon Monoxide (CO) — percentage (%) Hydrocarbon (THC/HC) — ppm High idling emissions — CO — percentage (%) RPM — RPM — 2500 ± 200 Lambda — 1 ± 0.03 Smoke Density — Light absorption coefficient — 1/metre — 2.45 — 0.15 This PUC certificate is system generated through the national register of motor vehicles and does not require any signature. Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://vahan.parivahan.gov.in Authorised Signature with stamp of PUC operator **PUC Certificate**
(ix)	Full support shall be extended to the officers of this Ministry/Regional Office at Bangalore by the project proponent during inspection of the project for monitoring purposes by furnishing full details and action plan including action taken reports in respect of mitigation measures and other environmental protection activities.	**Noted** There was no visit by officers of Ministry/Regional Office at Bangalore during the compliance period. All necessary support will be extended to officers of this Ministry/Regional Office during inspection of the project/site visit; whenever planned.
(x)	Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of	**Noted for Compliance**

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	environment and the same shall be complied with.	
(xi)	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied to the satisfaction of the Ministry.	**Noted**
(xii)	In the event of a change in project profile or change in the implementation agency, a fresh reference shall be made to the Ministry of Environment & Forests.	**Noted and Will be Complied** AVPPL is the concessionaire for implementing the project and operating it for the next 40 years, based on concession agreement signed between the GoK &, AVPPL on 17.08.2015. Vizhinjam International Seaport Limited (VISL) is the nodal agency for development of the port on behalf of GoK. As on date, there is no change in the project profile.
(xiii)	The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.	**Complied** Concession agreement with AVPPL was signed on 17.08.2015. The layout of the port has been approved by GoK by letter No.308799/E1/15/F&PD dated 30.10.2015 (Submitted along with the Compliance Report for the period October 2015 to March 2016). The preliminary construction activities commenced at site on 16.11.2015 followed by official inauguration on 05.12.2015. Financing agreement forming part of financial closure was submitted by the concessionaire on 13.05.2016.
(xiv)	Kerala State Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's Office/Tehsildar's office for 30 days.	**Noted** This condition does not pertain to project proponent. However, it is learnt that KSPCB had complied with the same.
13.	These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act,	**Noted for Compliance** EC has been obtained from MoEF vide letter dated 03.01.2014 (F.No.11-122/2011-IA.III). As per EIA Notification 2006 and Office Memorandum (O.M.) dated 12.04.2016, the

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	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, including the amendments and rules made thereafter.	validity of the EC is for seven years up to 03.01.2021. As per the provisions of MoEF&CC, the validity of the EC may be further extended for a maximum period of three years. VISL had submitted online application and required relevant documents on PARIVESH for extension of EC on 08.10.2020, 03.11.2020 and 19.11.2020. The Proposal (IA/KL/MIS/178082/2020) was considered in the 246th and 247th EAC meeting of Infra-1 committee of MoEF&CC held on 20.10.2020 and 23.11.2020; wherein VISL and NABET accredited consultant-L&T-IEL had made a presentation to the committee members. Thereafter, MoEF&CC vide letter No. IA/KL/MIS/178082/2020 dated 29.12.2020 (Copy of the same was submitted along with the compliance report for the period October 2020 to March 2021) have extended the validity of EC of Vizhinjam port by 3 years till 02.01.2024. Further, taking into account the outbreak of COVID-19 pandemic, MoEF&CC has amended the 2006 EIA Notification such that the period from the 01.04.2020 to the 31.03.2021 shall not be considered for the purpose of calculation of validity of existing ECs. Therefore, the EC of Vizhinjam port is valid till 01.01.2025.
14.	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,	**Complied** All the construction activities are being carried out as per existing Central/local rules. Necessary permissions under CRZ Notification 2011 & its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments / Agencies have been obtained for the construction

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	as applicable by project proponents from the respective competent authorities.	designs/drawings relating to the proposed construction as mentioned hereunder: • Consent to Establish (CTE) No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from State Pollution Control Board vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023. • Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 7.12.2015. • CTE for consumer pump inside the Vizhinjam port premises was obtained on 07.03.2021 (Consent No.: PCB/TVM-DO/NTA/PTP/15/2021) for the period of 5 years valid up to 28.02.2026. • Consent to Operate (CTO) for Explosives Storage at Chappath area was obtained on 20.07.2021 (Consent No.: PCB/TVM-DO/ICO/NTA/HCS/49/2021) valid up to 31.12.2024. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01.10.2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises.
15.	The project proponent shall advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environment Clearance and copies of the clearance letters are available with the Kerala State Pollution Control Board and may also be seen on the website of the Ministry of Environment & Forest at	**Complied** Details regarding the advertisement that the project had been accorded EC and copies of the clearance letter that were published in local newspapers was intimated (along with copy of advertisement) to the regional office of MoEF&CC, vide letter No. VISL/EC/MoEF/2013 dated 20.01.2014 (Submitted along with the HYCR for the period October 2015 to March 2016). Copy of the EC is available on VISL website at http://www. vizhinjamport.in/eia-30-5-13.php. The same is also uploaded on Adani Ports and Special Economic Zone (APSEZ) website at https://www.adaniports.com/Downloads

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	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.	
16.	This Clearance is subject to final order of the Hon'ble Supreme Court of India in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	**Noted**
17.	Any appeal against this clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.	**Noted** Three appeals challenging the EC granted to the project (two appeals filed at NGT, Southern Regional Bench, Chennai and one at NGT, Principal Bench, Delhi) and one original application (OA-filed at NGT, Principal Bench Delhi) indirectly challenging the CRZ Notification, 2011 were filed as per the NGT Act, 2010. The appeals filed at Chennai bench were later transferred to the Delhi bench. The Delhi Bench of NGT has upheld the EC granted to the project vide its judgment dated 02.09.2016.
18.	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, ZilaParishad/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	**Complied** The EC was submitted to the concerned Panchayat, Zila Parishad/Municipal Corporation, Urban Local Body and the Local NGOs from whom representations were received vide letter No. VISL/EC/MoEF/2013 dated 29.01.2014. Copy of the EC is available on VISL website at http://www. vizhinjamport.in/eia-30-5-13.php. The same is also uploaded on APSEZ website at https://www.adaniports.com/Downloads

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	the website of the company by the proponent.	
19.	The proponent shall upload the status of compliance of the stipulated Clearance conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, 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.	**Being Complied** The copy of the latest HYCR for the period April 2021 to September 2021 including the results of six monthly monitoring data for the same period has been uploaded on VISL website http://www.vizhinjamport.in and also on APSEZ website https://www.adaniports.com/Downloads. The HYCR for the period April 2021 to September 2021 has been submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA vide email dated 30.05.2021 (a copy of the email is enclosed as **Annexure IX**). Environment Monitoring is being carried out as per Environment Monitoring Plan prescribed in EIA by NABL accredited agency Standards Environmental & Analytical Laboratories. Detailed Monitoring reports (Air, Water, Noise, Marine Water, and Sediment) for the Compliance Period October 2021 to March 2022 are enclosed as **Annexure II**. Additionally, summary of monthly Environment monitoring results are also uploaded on the APSEZ website https://www.adaniports.com/Downloads.
20.	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF,	**Being Complied** HYCRs on the status of compliance of the stipulated clearance conditions including results of monitored data are regularly submitted to all the concerned agencies. As per the MoEF&CC Notification dated 26.11.2018, wherein submission of HYCRs by email/soft copy is declared acceptable, therefore the HYCR for the period April 2021 to September 2021 has been submitted to the

Half Yearly Compliance Report (HYCR) on Conditions Stipulated in Environmental & CRZ Clearance (EC) F.No.11-122/2011-IA.III dated 03.01.2014 for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	the respective Zonal Office of CPCB and the SPCB.	MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email dated 29.11.2021 (a copy of the email is enclosed as **Annexure IX**).
21.	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 Kerala 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 Clearance conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.	**Will be Complied** The project is in construction phase. The same shall be complied post commissioning during operational phase.

Enclosures:

Annexure Number	Details of Annexure
Annexure I:	Shoreline Monitoring Report (October 2021 to March 2022)
Annexure II:	Environment Monitoring Report (October 2021 to March 2022)
Annexure III:	CSR Activities by AVPPL (October 2021 to March 2022)
Annexure IV:	Compliance to Conditions of KCZMA Recommendation
Annexure V:	Compliance of the Commitments made during Public Hearing
Annexure VI:	Status of Environment Management Plan
Annexure VII:	EMP Expenditure
Annexure VIII:	Environment Health, Safety & CSR Organizational Structure
Annexure IX:	Email Submission of HYCR for the Period April 2021 to September 2021

Annexure I

Shoreline Monitoring Report

(October 2021 to March 2022)

SHANKAR SURVEYS

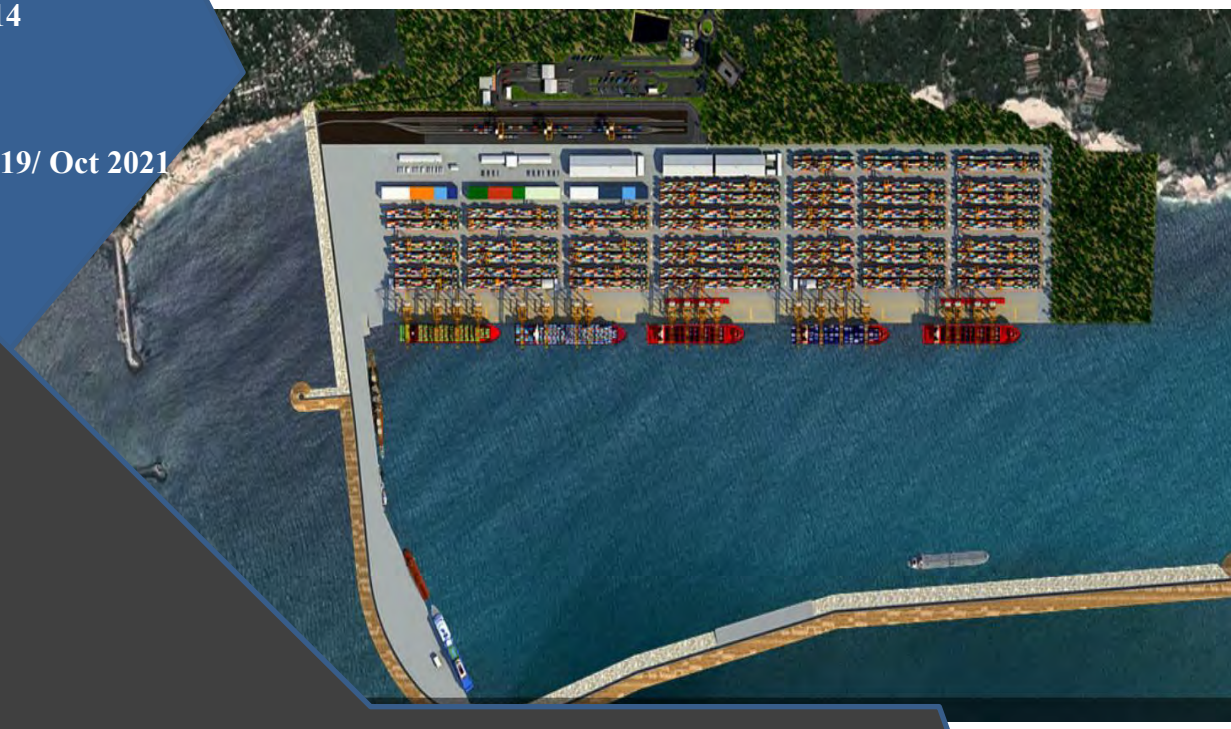
Adani Vizhinjam Port Pvt. Ltd

OCEANOGRAPHIC AND BATHYMETRIC DATA COLLECTION FOR ASSESSMENT OF SHORELINE CHANGES

Shankar And Co.
115, Neco Chambers,
CBD Belapur,
Navi Mumbai – 400 614

Date: 26th May 2022

SAC Ref # SAC/P167-19/ Oct 2021 – Mar 2022 Rev 1



HALF YEARLY REPORT
(OCTOBER 2021 TO MARCH 2022)

"APPROVAL SHEET"

Prepared by:	***Signed***	***Date***
V Mehta		*26/05/2022*

Checked and Approved by:	***Signed***	***Date***
S Philip		*26/05/2022*

REVISION CONTROL

Date	Rev	Section / Page No.	Remarks	Comment by
11/05/2022	0		Submitted for approval	
26/05/2022	1	Sec 5.2, Pg 26	Added 'respectively' in third line as suggested	AVPPL
		Sec 6.1, Pg 45	Added 'February 2022' to the time series of February 2022 tide	AVPPL
		Sec 6.3, Pg 49	Current measurements are given for the post-monsoon 2021 period	AVPPL
		Sec 6.10, Pg 78	Colour legend added to the D50 graph	AVPPL

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List of Annexures

Annexure I – Photo Documentation of CSP Locations
Annexure II – Overlay of month-on-month GPS survey charts

ABBREVIATIONS

ADCP	Acoustic Doppler Current Profiler
APHA	American Public Health Association Guidelines
CES	Coastal Erosion Stone
AVPPL	Adani Vizhinjam Port Pvt. Ltd.
BDL	Below Detectable Level
C.M.	Central Meridian
CD	Chart Datum
cm	Centimetre
COG	Course over ground
dd mm.mmm	Degrees minutes. Decimal minutes
DGPS	Differential Global Positioning System
DTM	Digital Terrain Model
EC	Environmental & CRZ Clearance
EIL	Engineer In Charge
EEZ	Exclusive Economic Zone
GoI	Government of India
GoK	Government of Kerala
GPS	Global Positioning System
HSE	Health, Safety & Environment
HWM	High Water Mark
IHO	International Hydrographic Organization
INCOIS	Indian National Centre for Ocean Information Services
IS 1498	Indian Standard for Classification and Identification of Soils for General Engineering Purposes
IS 3025	Indian Standard or Methods of Sampling and Test for Water and Waste water Part 1 - Sampling
kHz	Kilohertz
Km	Kilometre
kPa	Kilo Pascal
LAT	Lowest Astronomical Tide
Lat	Latitude
LEO	Littoral environmental observation
Long	Longitude
m	Metre
MBES	Multibeam Echo Sounder
Mg/L	Milligram per litre
MoEF	Ministry of Environment & Forests

MoU	Memorandum of Understanding
MSL	Mean Sea Level
MV	Motor Vessel
NA	Not Applicable
NABL	National Accreditation Board for Testing and Calibration Laboratories
NHO	Naval Hydrographic Organization
NIOT	National Institute of Ocean Technology
nm	Nautical mile
NTU	Nephelometric Turbidity Units
PEP	Project Execution Plan
PVD	Progressive vector diagram
PPP	Public Private Partnership
ppt	Parts per Thousand
RTK	Real Time Kinematics
SAC	Shankar And Co.
SBES	Single Beam Echo Sounder
SoI	Survey of India
SOG	Speed over ground
SOW	Scope of Work
TEU	Twenty Foot Equivalent Unit
UNCLOS	United Nations Convention on the Law of the Sea
UTM	Universal Transverse Mercator projection
VISL	Vizhinjam International Seaport Ltd.
w.d.	Water depth
WGS84	World Geodetic System 1984
WMO	World Meteorological Organisation

DEFINITIONS

Project Owner	Vizhinjam International Seaport Ltd (VISL), Thiruvananthapuram
Project Concessionaire	Adani Vizhinjam Port Pvt. Ltd. (AVPPL), Thiruvananthapuram
Advisor to VISL	National Institute of Ocean Technology (NIOT), Chennai
Survey Contractor	Shankar And Co. (SAC), Navi Mumbai
Survey Requirement	Oceanographic & Bathymetric Survey for Shoreline Monitoring
Chart Datum	Chart datum is the level to which soundings on published charts are reduced, and above which tidal predictions and tidal levels are given in the Tide Table. All depths on charts are referred to this datum.
Current Speed	The speed at which a water body moves in the ocean. The speed is denoted in cm/s
Rip Current	A relatively strong, narrow current flowing outward from the beach through the surf zone
Current Direction	The direction **towards which** the currents are flowing. A westerly current implies that the currents are flowing from east to west
LEO	Littoral Environmental Observations
Wave Peak period (Tp)	The peak period gives the characteristic frequency of the arriving wave energy. This gives the period at which the spectrum has its highest value.
Significant Wave Height (Hs)	Significant wave height is the average peak-to-peak amplitude of the largest one third of the waves in a given field.
Wave direction	The direction **from which** the waves are coming. A westerly wave implies that the waves are moving from west to east.
Wind Speed	The speed at which the air moves with respect to the surface of earth. The speed is denoted in m/s
Wind Direction	Wind direction is an indicator of the direction that the wind is **blowing from**. A northerly wind is coming from the north and blowing towards the south
Atmospheric pressure	It is defined as the force per unit area exerted against a surface by the weight of the air above that surface. Atmospheric pressure is expressed in millibars (mb)
Relative Humidity	Relative humidity is defined as the ratio of the water vapor density (mass per unit volume) to the saturation water vapor density, usually expressed in percent
Turbidity	Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air.

1 EXECUTIVE SUMMARY

The **Vizhinjam International Deepwater Multipurpose Seaport** is a prestigious project taken up by the Government of Kerala, (GoK). It is designed primarily to cater to container trans-shipment besides multi-purpose and break-bulk cargo. The port is being currently developed in a Public-Private Partnership (PPP) component on a design, build, finance, operate and transfer ("DBFOT") basis. The private partner, the Concessionaire **M/s Adani Vizhinjam Port Private Limited** (AVPPL) had commenced construction on 5th December 2015.

Vizhinjam International Seaport Ltd (VISL) - a company fully owned by GoK is the implementing agency for the project, will be responsible for all obligations and responsibilities of GoK in respect of the Project and the Concession Agreement.

With its numerous natural advantages and potential, the port will contribute greatly to economic development and will be an asset in terms of infrastructure development in the country.

The project obtained Environmental & CRZ Clearance ("EC") from the Ministry of Environment & Forests (MoEF), Government of India (GoI) on 3rd January 2014, wherein it has been specified to carry out intense monitoring and regulatory reporting of the shoreline changes in the project area. Accordingly, VISL has entered into a memorandum of understanding (MoU) with the National Institute of Ocean Technology (NIOT), Chennai, under the Ministry of Earth Sciences (MoES), for a long-term shoreline monitoring programme including the seasonal bathymetry mapping.
(Source: https://www.vizhinjamport.in/home.html)

Shankar And Co, hereinafter referred to as SAC, based in Navi Mumbai has been awarded the contract to carry out Shoreline Monitoring – Oceanographic & Bathymetric Data Collection in the vicinity of the proposed site for the development of the Vizhinjam International Deepwater Multipurpose Seaport, vide the service order; SO 5700267194 dated 3rd May 2019 by AVPPL.

As part of the study, NIOT provided a wave rider buoy to be deployed off Mulloor and the data and watch & ward of the buoy was to be monitored by SAC. Turbidity measurements at three locations from three levels is to be monitored on a real time basis, for which turbidity measuring buoys were deployed in the month of November 2019.

This report provides the results of the data collected for the half yearly period from October 2021 to March 2022. All co-ordinates in the reports and charts are referenced to WGS-84, UTM Projection, CM 75° East, Zone 43, Northern Hemisphere.

2 INTRODUCTION

The proposed project is being developed as a PPP project on a DBFOT basis in accordance with the terms and conditions set forth in the concession agreement signed between AVPPL and GoK/VISL. The investment for land, external infrastructure (rail, water and power) and breakwater will be borne by the landlord (VISL/GoK). The investments for other port infrastructure (dredging & reclamation, berths, terminals, superstructure & equipment) will be shared on PPP basis availing Viability Gap Funding (VGF). The PPP concessionaire, AVPPL has been given the right to operate the port for a specified concession period of 40 years. Traffic-linked stage-wise future development of the project with an ultimate berth length of 2000m is also envisaged.

The proposed site is endowed with a natural depth of 23 to 25m (which is by far the best compared to other ports in the world) as close as 2 km from the coast. This will enable berthing of mother vessels of 18000 TEU and higher. Since the port site is located at the southern tip of India, barely 10 nautical miles from the international sea route (Suez – Far East route & Far East – Middle East route), it has the potential to become the future trans-shipment hub of the country.
(Source: https://www.vizhinjamport.in/download/Feasibility-Report.pdf)

The study includes carrying out MetOcean observations (wave, meteorological parameters and tide) at one location, to measure current for 30 days each, at four locations, during 3 different seasons; Pre-monsoon (Mar-May), monsoon (Jun-Oct), and Post-monsoon period (Nov-Feb), to measure in real-time turbidity from three levels and three locations, bathymetric survey of up to 20m contour in two seasons, cross-shore profiling (CSP) from 10m CD (4 CSP lines carried out up to a depth of 20m during the months of January, May, August and October) to 100m inland from the high water line along a stretch of 40 km, water & grab sampling, littoral environmental observation and river crossing survey. All these are to be carried out for a period of 3 years commencing June 2019.

A Google Earth image, showing the Multibeam survey area; locations of the observations, including the wave/current, tide and Automatic Weather Station (AWS) measurement location, is given in Figure 2-1 and Figure **2-2**.

P1, P2 and P3 correspond to Acoustic Doppler Current Profiler (ADCP) locations and P4 corresponds to both, ADCP and wave location.

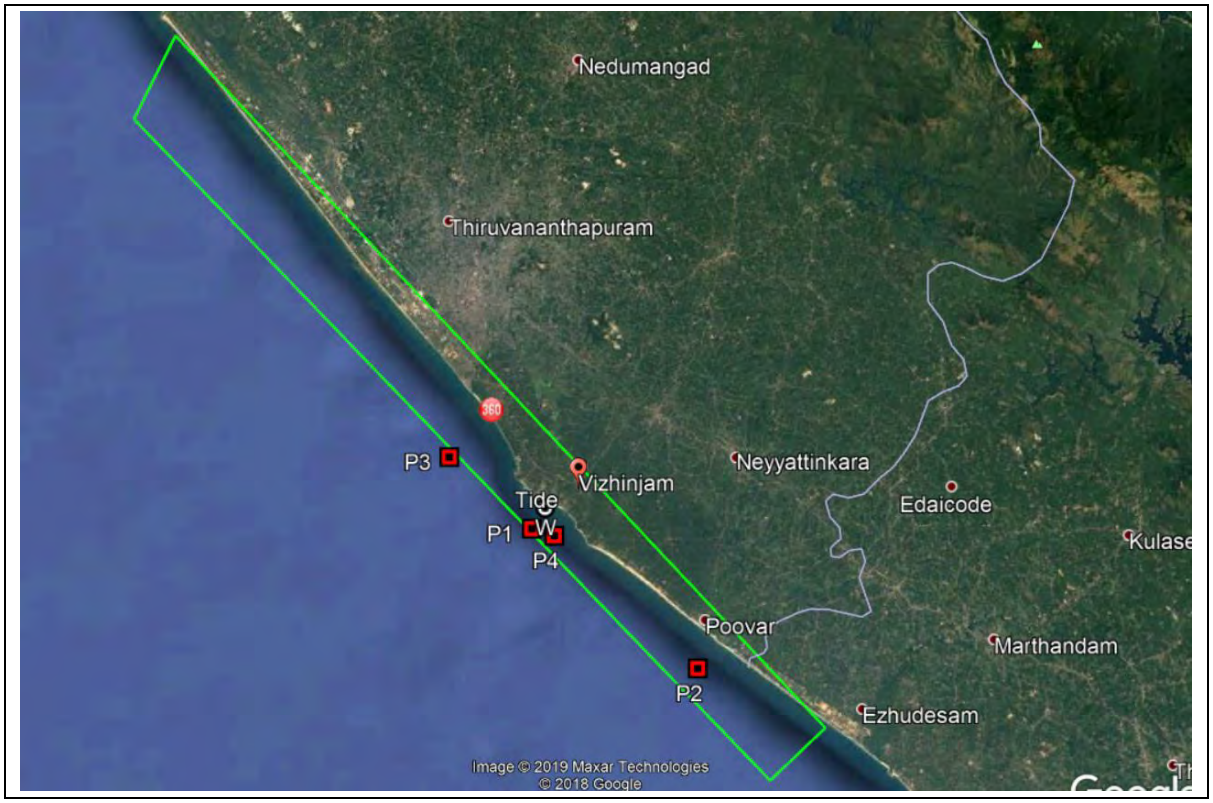


Figure 2-1: General Survey Location

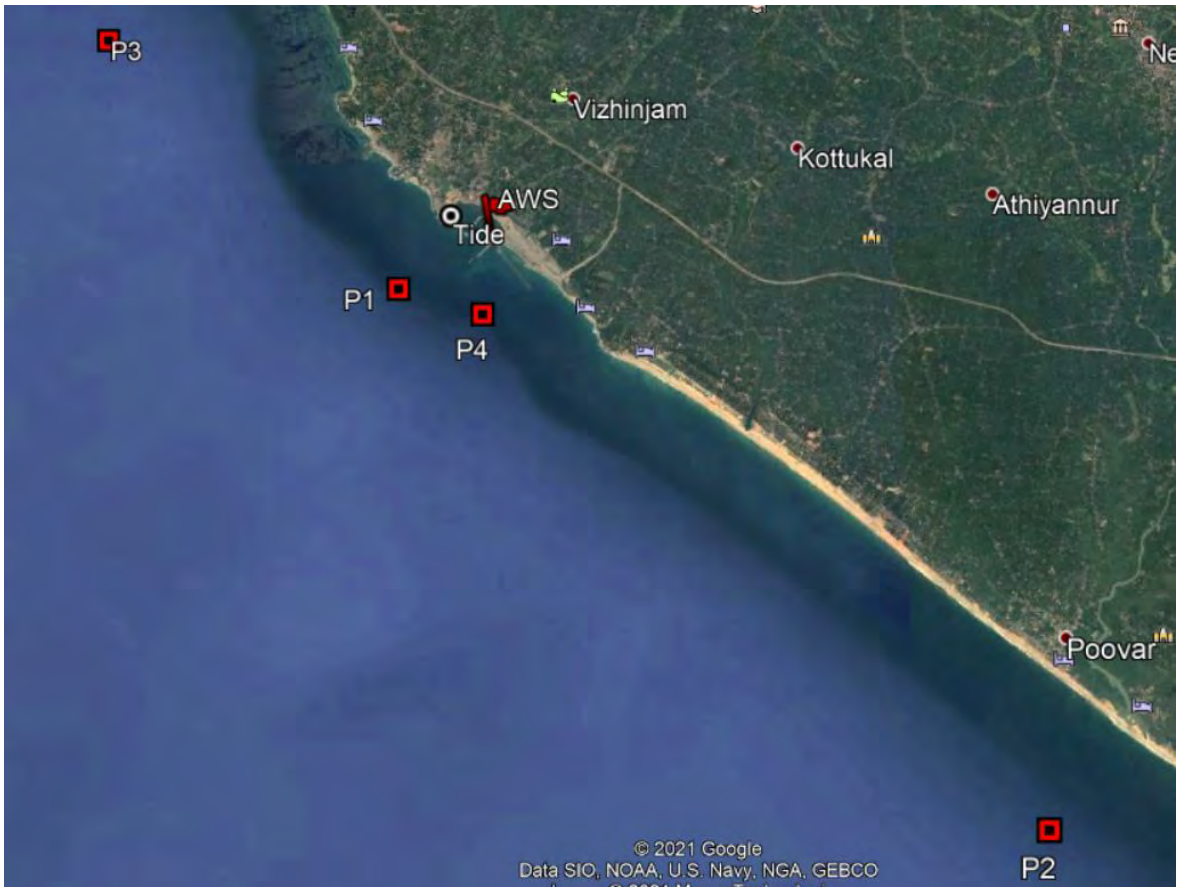


Figure 2-2: MetOcean Locations

The CSP lines, which coincide with the Littoral Environment Observation (LEO), beach sampling and photographic documentation, are indicated in Figure 2-3. The cross-shore profiles are named as CSP-01 to CSP-81. CSP-01 corresponds to the southernmost profile which lies to the south of the existing Vizhinjam Harbour and gradually increases progressing towards north for the entire 40 km stretch (20 km on either side of the port) with a 500 m interval between each CSP line, CSP-81 being the northernmost profile.

Figure 2-3: CSP, LEO and Photographic Documentation Locations

3 SCOPE OF WORK

The survey scope of work as per the contract includes the following:

- To mobilise a suitable marine spread and a survey boat at site for carrying out the operations.
- To provide requisite personnel and equipment for undertaking of oceanographic measurements and study of shoreline.
- Monthly cross-shore beach profiling perpendicular to the shoreline for a 40 km stretch at intervals of 500m, using RTK or total station landward up to 100m from HTL or +2m of HTL and using shallow draft boats, sled or any other suitable techniques seaward down to 10m CD (4 CSP Lines carried out up to a depth of 20 m in the months of January, May, August and October).
- Monthly monitoring of littoral zone (at the CSP locations) to observe the littoral transport direction and alongshore current speed by means of appropriate drogue observations and visual observations.
- Monthly photographic documentation of geomorphological changes (at the CSP locations).
- Seasonal beach sediment sampling and analysis (at the CSP locations).
- Bathymetric survey twice in a year, i.e. just after the monsoon season and just prior to the commencement of the next monsoon to generate 0.5m contours (with bathymetric survey lines spaced at 25 m interval) in areas with depths to 20m CD using multi beam echo sounder.
- Bathymetry/cross section survey for 500m length of rivers debouching in a 40 km stretch of the coast.
- Seabed sediment sampling and analysis in 80 sq. km with one sample per sq km.
- Collection and analysis of water samples at specified periods (seasonal) for total suspended solids (TSS) and turbidity from four specified locations.
- Current measurements (both magnitude and direction) using Acoustic Doppler Current Profiler (ADCP) at four locations, as marked in Figure 2-1, for the duration of full tidal cycle/30 days each during Pre-monsoon (Mar-May), Monsoon (Jun-Oct) and Post-monsoon period (Nov-Feb).
- Wave observations using WRB Datawell DWG-G shall be carried out at one location as marked on the location map.
- Tide measurements using an automatic tide gauge close to the survey area to observe the tidal variations around the clock at 6-minute intervals or as specified to cover one full year. The tide gauge shall be connected to the nearest Survey of India Benchmark.

- Collection of wind speed & direction, atmospheric pressure, humidity, temperature at 1 location specified by the client/EIC (Engineer In Charge) by establishing an Automatic Weather Station (AWS).
- Continuous monitoring of turbidity at 3 location (1 upstream & 2 downstream of dredging location) - Online meter (3 levels) to be installed on buoys and data to be displayed at system in office.
- Analysis and processing of the data and submission of periodic reports.

3.1 Location Coordinates

The location co-ordinates for the current and wave observations are given below:

Table 3-1: Current / Wave locations

Location Co-ordinates WGS-84 Spheroid, UTM Projection, CM 75 East, Zone 43, North			
Name	**Latitude**	**Longitude**	**Depth w.r.t CD (m)**
ADCP - P1 (Vizhinjam)	08° 21' 55.4"N	76° 58' 51.6"E	22.1
ADCP- P2 (Poovar)	08° 17' 35.8"N	77° 04' 03.5"E	23.1
ADCP- P3 (Pachalloor)	08° 24' 08.6"N	76° 56' 16.1"E	21.9
ADCP/Wave - P4 (Mulloor)	08° 21' 42.3"N	76° 59' 33.9"E	22.9

The current observations are to be carried out for 30 days in each of the seasons at the above locations.

The location co-ordinates of the tide station are provided below:

Table 3-2: Tide station location coordinates

Tide Station Co-ordinates WGS-84 Spheroid, UTM Projection, CM 75 East, Zone 43, North			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Tide station	08° 22' 33.68"N	76° 59' 16.65"E	2.785

The Gill Metpack Automatic Weather Station with rain gauge was installed on the terrace of the Port Control Office building. The following table shows the coordinates of the AWS installation:

Table 3-3: Weather station location coordinates

Weather Station Co-ordinates			
WGS-84 Spheroid, UTM Projection, CM 75 East, Zone 43, North			
Name	**Latitude**	**Longitude**	**Height above CD (m)**
Weather station (on top of Port Control Office building)	08° 22’ 22.75” N	76° 59' 39.62" E	12.785

The wind sensor was installed at a height of 14.235m above MSL (14.785m above CD). As suggested by NIOT and as per the WMO standard, 7% of the speed was reduced to derive the wind speeds at 10m above MSL.

3.2 Turbidity Monitoring

Turbidity buoys were deployed in the month of November 2019 to measure the water turbidity at three locations. The turbidity from three different depths, i.e. surface, mid-depth and bottom was measured.

The location co-ordinates of the turbidity buoys are provided below:

Table 3-4: Turbidity buoy Locations

TURBIDITY BUOY LOCATIONS WGS-84, UTM Projection, CM 75° East, Zone 43, North						
Buoy No.	Latitude	Longitude	Water Depth (m)	Depth of sensor placement (m)		
				Surface	Mid-depth	Bottom
Turbidity Buoy-1	08° 20' 58.60" N	77° 00' 08.10" E	22.3	5.0	10.0	15.0
Turbidity Buoy-2	08° 21' 49.90" N	76° 59' 14.30" E	22.0	5.0	10.0	15.0
Turbidity Buoy-3	08° 22' 20.01" N	76° 59' 12.54" E	14.4	4.0	8.0	12.0

3.3 Beach and Water Sampling

A total of 81 beach samples were to be collected in one season, as part of the contract. The samples were to be analyzed for grain size distribution as per Wentworth classification. The samples were collected in the month of December 2021 for the post monsoon 2021 period. The coordinates of the beach sampling locations are provided in the table below.

Table 3-5: Beach Sampling Locations

BEACH SAMPLING LOCATIONS WGS-84, UTM Projection, CM 75° East, Zone 43, North		
Location	Latitude	Longitude
BS-1	8° 16.0265’ N	77° 7.9532’ E
BS-2	8° 16.1775’ N	77° 7.7195’ E
BS-3	8° 16.3348’ N	77° 7.4987’ E
BS-4	8° 16.4955’ N	77° 7.2778’ E
BS-5	8° 16.6565’ N	77° 7.0579’ E
BS-6	8° 16.8176’ N	77° 6.8379’ E
BS-7	8° 16.9782’ N	77° 6.6187’ E
BS-8	8° 17.1382’ N	77° 6.3980’ E
BS-9	8° 17.2984’ N	77° 6.1765’ E
BS-10	8° 17.4586’ N	77° 5.9566’ E

BEACH SAMPLING LOCATIONS WGS-84, UTM Projection, CM 75° East, Zone 43, North		
BS-11	8° 17.6207' N	77° 5.7379' E
BS-12	8° 17.7276' N	77° 5.5946' E
BS-13	8° 17.8899' N	77° 5.3756' E
BS-14	8° 18.0524' N	77° 5.1568' E
BS-15	8° 18.2151' N	77° 4.9388' E
BS-16	8° 18.3603' N	77° 4.7165' E
BS-17	8° 18.5517' N	77° 4.5120' E
BS-18	8° 18.7213' N	77° 4.3003' E
BS-19	8° 18.8852' N	77° 4.0829' E
BS-20	8° 19.0488' N	77° 3.8659' E
BS-21	8° 19.2152' N	77° 3.6499' E
BS-22	8° 19.3848' N	77° 3.4369' E
BS-23	8° 19.5582' N	77° 3.2282' E
BS-24	8° 19.7318' N	77° 3.0196' E
BS-25	8° 19.9075' N	77° 2.8098' E
BS-26	8° 20.0796' N	77° 2.5989' E
BS-27	8° 20.2492' N	77° 2.3841' E
BS-28	8° 20.4130' N	77° 2.1703' E
BS-29	8° 20.5731' N	77° 1.9581' E
BS-30	8° 20.7305' N	77° 1.7499' E
BS-31	8° 20.8951' N	77° 1.5274' E
BS-32	8° 21.0493' N	77° 1.2973' E
BS-33	8° 21.1815' N	77° 1.0911' E
BS-34	8° 21.3210' N	77° 0.8491' E
BS-35	8° 21.3974' N	77° 0.6359' E
BS-36	8° 21.6830' N	77° 0.4829' E
BS-37	8° 21.8799' N	77° 0.2980' E
BS-38	8° 22.1369' N	77° 0.1947' E
BS-39	8° 22.3420' N	76° 59.9895' E
BS-40	8° 22.5417' N	76° 59.7689' E
BS-41	8° 22.8201' N	76° 59.0753' E
BS-42	8° 23.0287' N	76° 58.7934' E
BS-43	8° 23.1727' N	76° 58.6741' E
BS-44	8° 23.3709' N	76° 58.5145' E

BEACH SAMPLING LOCATIONS WGS-84, UTM Projection, CM 75° East, Zone 43, North		
BS-45	8° 23.7061' N	76° 58.3743' E
BS-46	8° 23.8974' N	76° 58.3798' E
BS-47	8° 24.1304' N	76° 58.2814' E
BS-48	8° 24.4789' N	76° 58.1346' E
BS-49	8° 24.6320' N	76° 58.0289' E
BS-50	8° 24.8665' N	76° 57.8917' E
BS-51	8° 25.0976' N	76° 57.7474' E
BS-52	8° 25.3176' N	76° 57.5868' E
BS-53	8° 25.5653' N	76° 57.4562' E
BS-54	8° 25.7602' N	76° 57.2767' E
BS-55	8° 25.9643' N	76° 57.0963' E
BS-56	8° 26.1500' N	76° 56.9073' E
BS-57	8° 26.3461' N	76° 56.7308' E
BS-58	8° 26.5741' N	76° 56.5678' E
BS-59	8° 26.7782' N	76° 56.4051' E
BS-60	8° 26.9997' N	76° 56.2272' E
BS-61	8° 27.2030' N	76° 56.0492' E
BS-62	8° 27.4175' N	76° 55.8762' E
BS-63	8° 27.6142' N	76° 55.6937' E
BS-64	8° 27.8102' N	76° 55.5014' E
BS-65	8° 28.0132' N	76° 55.3255' E
BS-66	8° 28.2159' N	76° 55.1437' E
BS-67	8° 28.4224' N	76° 54.9642' E
BS-68	8° 28.6228' N	76° 54.7840' E
BS-69	8° 28.8276' N	76° 54.6048' E
BS-70	8° 29.0316' N	76° 54.4243' E
BS-71	8° 29.1104' N	76° 54.3586' E
BS-72	8° 29.3118' N	76° 54.1755' E
BS-73	8° 29.5150' N	76° 53.9964' E
BS-74	8° 29.7202' N	76° 53.8181' E
BS-75	8° 29.9258' N	76° 53.6393' E
BS-76	8° 30.1345' N	76° 53.4652' E
BS-77	8° 30.3450' N	76° 53.2940' E
BS-78	8° 30.5558' N	76° 53.1226' E

BEACH SAMPLING LOCATIONS		
WGS-84, UTM Projection, CM 75° East, Zone 43, North		
BS-79	8° 30.7701' N	76° 52.9558' E
BS-80	8° 30.9840' N	76° 52.7867' E
BS-81	8° 31.1988' N	76° 52.6188' E

The water samples (132 from four locations) were collected and analysed for TSS as per IS 3025, Part 17:1984 (reaffirmed 2012); Turbidity was analysed as per IS 3025, Part 10:1984 (reaffirmed 2012) technical specifications. The salinity was analysed as per American Public Health Association (APHA) guidelines.

The water samples were collected in the month of September 2021 for the monsoon period and also in the month of February 2022 for the post monsoon period.

The location co-ordinates of water sampling locations are provided below:

Table 3-6: Water Sampling Locations

WATER SAMPLING LOCATIONS			
WGS-84, UTM Projection, CM 75° East, Zone 43, North			
Location	**Water Depth (m)**	**Latitude**	**Longitude**
L1 (Mulloor)	21.1	08° 21.923' N	76° 58.860' E
L2 (Proposed Dredge dumping)	23.2	08° 21.705' N	76° 59.565' E
L3 (Pachalloor)	27.4	08° 24.143' N	76° 56.268' E
L4 (Poovar)	23.0	08° 17.597' N	77° 04.058' E

4 SURVEY CONTROL

4.1 Geodesy

The survey operations were conducted in the WGS 84 Spheroid, Universal Transverse Mercator Projection based on the geodetic parameters presented below. All co-ordinates quoted within this document are with reference to it.

Table 4-1: Geodetic Parameters

GEODETIC PARAMETERS	
Satellite Datum	
Spheroid	WGS-84
Datum	WGS 84
Semi-Major Axis	6378137.000 m
Semi Minor Axis	6356752.314 m
Inverse Flattening	298.2572
Projection Parameters	
Grid Projection	Universal Transverse Mercator
Latitude of Origin of Projection	0 (Equator)
Longitude of Origin of Projection	75° E, Zone 43
Hemisphere	North
False Easting (metres)	500000
False Northing (metres)	0
Scale Factor on CM	0.9996
Units	Metres

4.2 Survey Vessels

The following vessels were utilized for the survey operation:

Figure 4-1: Watch keeping vessel MFB Samuel

Figure 4-2: Transit vessel MFB Sindhu Yatra Matha

Figure 4-3: Multibeam Survey boat MV Samuel 3

4.3 Personnel

The following survey personnel from SAC/AVPPL were assigned to the project in the capacities listed in the table below during the period.

Table 4-2: Personnel

Shankar And Co.	
Name	**Designation**
Vishtasp Mehta	Project Manager
Unnikrishnan K.U.	Party Chief / Surveyor
Emmanuel Joseph	Party Chief / Surveyor
Zaifer Ali	Party Chief / Surveyor
Vishnu Haridas	Land Surveyor
Vaishak K.R.	Land Surveyor
Vishnu Haridas	Land / Hydrographic Surveyor
Amal Thahir	Land / Hydrographic Surveyor
Ajeesh A.S.	Trainee Surveyor
Sanjeevanee Khaire	Data Processor (Navi Mumbai office)
Adani Vizhinjam Port Pvt. Ltd.	
Name	**Designation**
Hebin C.	Manager - Environment
Jesse Fullonton	Assistant Manager - Environment

5 SURVEY EQUIPMENT DETAILS

5.1 Wave Rider Buoy

The Datawell DWR (G) Wave Rider Buoy (WRB) was deployed by NIOT in collaboration with VISL and AVPPL, under a tripartite agreement and is being monitored and maintained by SAC. A Datawell DWR (G) was supplied and installed for the project. The WRB was programmed to measure all the wave parameters at half-hourly intervals. The data is transmitted on a real time basis via the HF antenna to the receiver set up at Ayur Bay resort.

The system consists of WRB with HF whip/LED flasher, GPS antenna, internal data logger, RX-D receiver with HF antenna and acquisition and post processing software w@ves21. The system has a GPS receiver mounted on a buoy along with HF radio for data transmission in real time. The system has an accuracy of 1 cm + 0.5% of vertical motion; resolution of 1cm and range of ± 30 m at the sampling rate of 1.28 Hz. The directional accuracy and resolution are 1.5 within the range of 0 to 360 .

Since the WRB is GPS based, it does not require any calibration.

5.1.1 Principles of wave measurement

The GPS wave buoy measurement principle bears a strong analogy with the Doppler-shift phenomenon of a car passing nearby, blowing its horn. The GPS system calculates the velocity of the buoy from changes in the frequency of GPS signals. The velocities are integrated with time to determine buoy displacement. In practice the GPS system uses signals from multiple satellites to determine three-dimensional buoy motion. A gravity sensitive accelerometer in the buoy measures wave height by means of vertical acceleration of the platform of the buoy.

5.1.2 Instrument Mooring

The mooring arrangement incorporates the following components between the sea bottom and the mooring eye underneath the buoy: a sinker or anchor weight, polypropylene rope, nylon covered galvanized steel cable (combination rope) and associated terminals, floats, rubber cords with associated terminals, swivels, ballast chain, anodes and shackles and cotter pins.

A schematic of the mooring of WRB is given below:

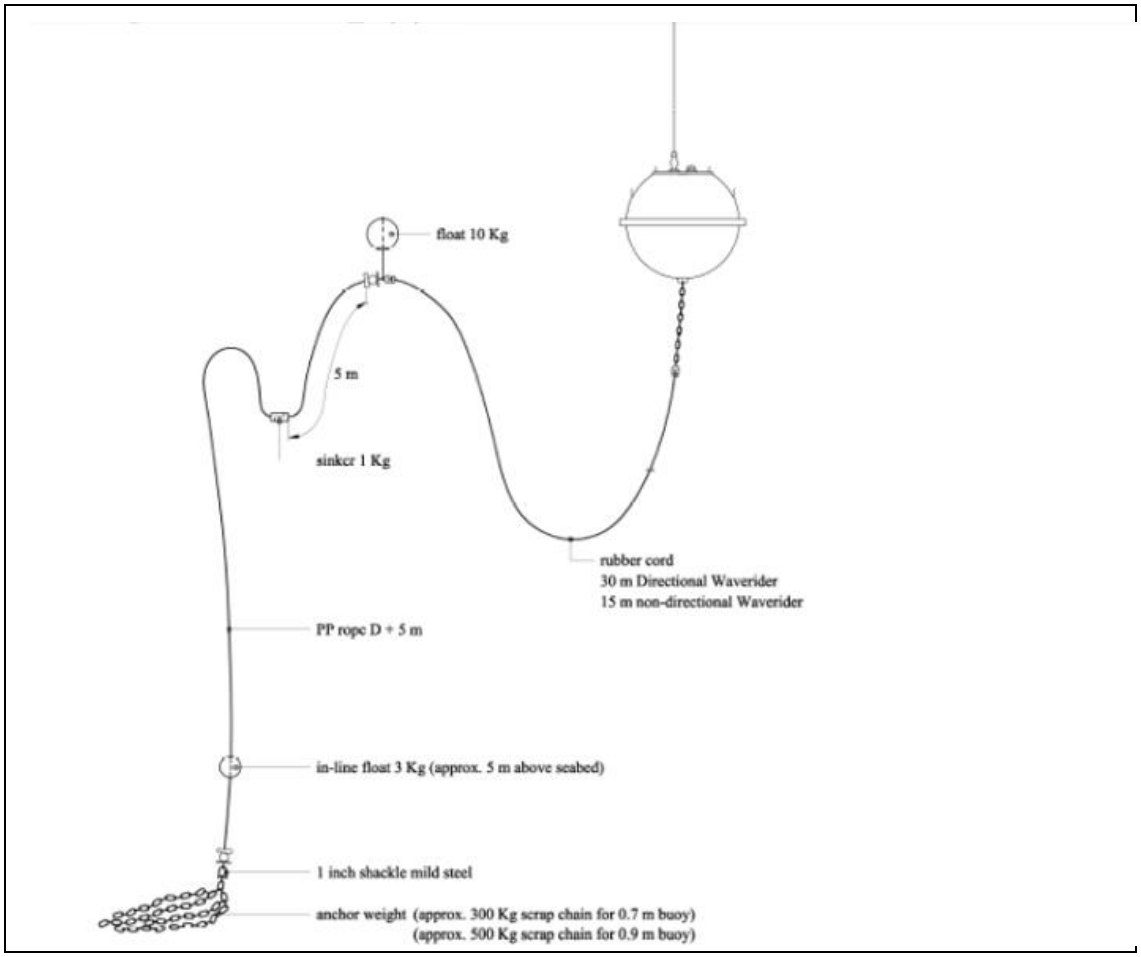


Figure 5-1: WRB Mooring Diagram

A highly elastic rubber cord is essential for high quality wave measurements. It allows the buoy to follow the wave motion, thus guaranteeing that the measured motion of the buoy is indeed the same as the desired motion. The buoy was deployed using single point mooring with free-floating method. The mooring design was configured as per the site conditions, followed by the mooring suggestions provided by the supplier. As frequent fishing activities were observed at the deployment location, one boat was anchored near the WRB without hindering the wave data measurements along with sufficient crew on board for around the clock watch-keeping.

A photograph of WRB deployed at the location is shown below:

Figure 5-2: WRB deployed at site

5.2 Current Meter

Teledyne Workhorse Sentinel 600 KHz Acoustic Doppler Current Profilers (ADCP) and Nortek Aquadopp 600 KHz ADCP's were installed at locations P1, P2, P3 and P4, namely, Vizhinjam, Poovar, Pachalloor and Mulloor respectively, for one season. The current speed and direction were measured at intervals of every 10 minutes from surface to seabed at every 1m bin. Data from three various depths i.e. at the surface, mid-depth and bottom at each location are provided in the report. A few field photographs of ADCP installation are shown below.

Figure 5-3: ADCP deployment at Vizhinjam

Figure 5-4: ADCP deployed at Poovar

Figure 5-5: ADCP deployed at Mulloor

5.3 Automatic Tide Gauge

The Valeport Tidemaster Automatic Tide Gauge (ATG) was installed at the Coast Guard jetty, inside the fishing harbour for measuring the tides. The tide gauge is a pressure-sensor based instrument, measuring the water level due to change in pressure on the surface of sensor. The sensor was installed in a 6m long pipe to ensure that the zero of sensor is always in water, irrespective of the phases of tide. This was levelled to the local benchmark, situated on top of the jetty. The tide station was programmed to measure the tide at 6-minute intervals throughout the duration of the project.

In the month of December 2021, the level of the BM-2 benchmark at Vizhinjam Mosque was amended by SOI. Accordingly, the 'z' value of the temporary benchmark marked on the wharf was also re-established by transferring the level from BM-2 and fixed at 2.785m above Chart Datum.

A photograph of the tide gauge location is shown below:

Figure 5-6: Tide Gauge

The specifications of Valeport Tidemaster ATG is provided below:

Model	:	Tidemaster
Type	:	Vented Strain Gauge with stainless steel mounting
Range	:	Standard 10 dBar (~10m)
Accuracy	:	±0.1 % Full scale

5.4 Automatic Weather Station (AWS)

A Gill Metpack Automatic Weather Station (AWS) was installed on the terrace of the Port Control Office building. The system measures wind speed/direction, atmospheric pressure, temperature, relative humidity and rainfall.

The system consists of the following:

- Sonic anemometer
- Relative humidity & temperature sensor
- Pressure sensor
- Rainfall Gauge
- Datalogger

The data is logged in a data logger installed at the receiving station at intervals of 10 minutes. The data is also transmitted from the data logger to a cloud-based server for further processing and QC checks.

Some images of the automatic weather station are provided below:

Figure 5-7: AWS on top of Port Control Office building

5.5 Real Time Kinematic (RTK) Survey

An RTK system was mobilized at site to carry out cross-shore profiling on the landward side. The system used was a Geomax Zenith 35 Pro RTK system with base station and rover. A photograph of the system is provided below:

Figure 5-8: RTK System with base station and rover

5.6 Multibeam Echo Sounder System

An R2Sonic 2020 Multibeam Echo Sounder, operating at a frequency of 500 kHz, was used to delineate the topography of the seabed. The measured sound velocity and observed tide was fed into the system during data processing.

The swath bathymetry system was calibrated according to methods described in the manufacturer's manual. The swath transducer system was aligned with the roll/pitch/heave sensor. Great care was taken to mount the heads and pitch/roll/heave sensor as accurately as possible and the final calibration was carried out during sea trials prior to each survey. The calibration values obtained in the month of March 2022 are given below.

Table 5-1: MBES Calibration results

Parameter	Value	Comments
Latency	0.00s	Trimble SPS 461 positioning system
Roll	-2.15°	DMS accuracy 0.05° in roll
Pitch	-12.00º	DMS accuracy 0.05° in pitch
Yaw	-4.00º	Accuracy better than 0.2°

5.7 DGPS Positioning System

Vessel positioning was carried out by the Trimble SPS 461 dual antenna DGPS system which also provides the heading. Vessel track and offset positions were recorded digitally in the navigation software. The positioning system was interfaced to the navigation software as well as the digital data acquisition system. DGPS positioning accuracy of the moving vessel was better than ±1m.

The computed position of the vessel from the DGPS receiver was interfaced to the navigation computer system. Hypack navigation and data acquisition software was used to provide track guidance information to the survey crew and also output the position of the vessel to assist the helmsman in maintaining the selected track guidance line. The VDU displays the selected survey line, the position of the vessel in relation to that line and numerical data to assist the helmsman such as the along-line and off-line distances, vessel speed and course made good, gyro heading, distance and bearing to end of line and water depth. The position of each fix, together with other information such as fix numbers, depths, PDOP (Position Dilution of Precision) and along-line distances were logged to the hard drive.

5.7.1 DGPS Consistency Check

In order to determine the integrity and reliability of the positioning system, the system was checked for its consistency during mobilization. The DGPS calibration for the month of February 2022 is provided in this report.

After installing the Trimble SPS 461 DGPS positioning system on board the vessel, two points were marked on the jetty. The DGPS antenna was set up on the jetty at these two points, designated as Point A and Point B.

Time was synchronized between Trimble/Hypack and the observer's watch, for which local time (GMT+5.30) was used. The Trimble DGPS antenna positions were logged in the Hypack navigation software. The logged data was processed to derive the final positions of both the points.

The difference between the calculated distance and measured distance was found to be within the permissible accuracy limit. The scatter plot of the DGPS calibration is shown in the figure below.

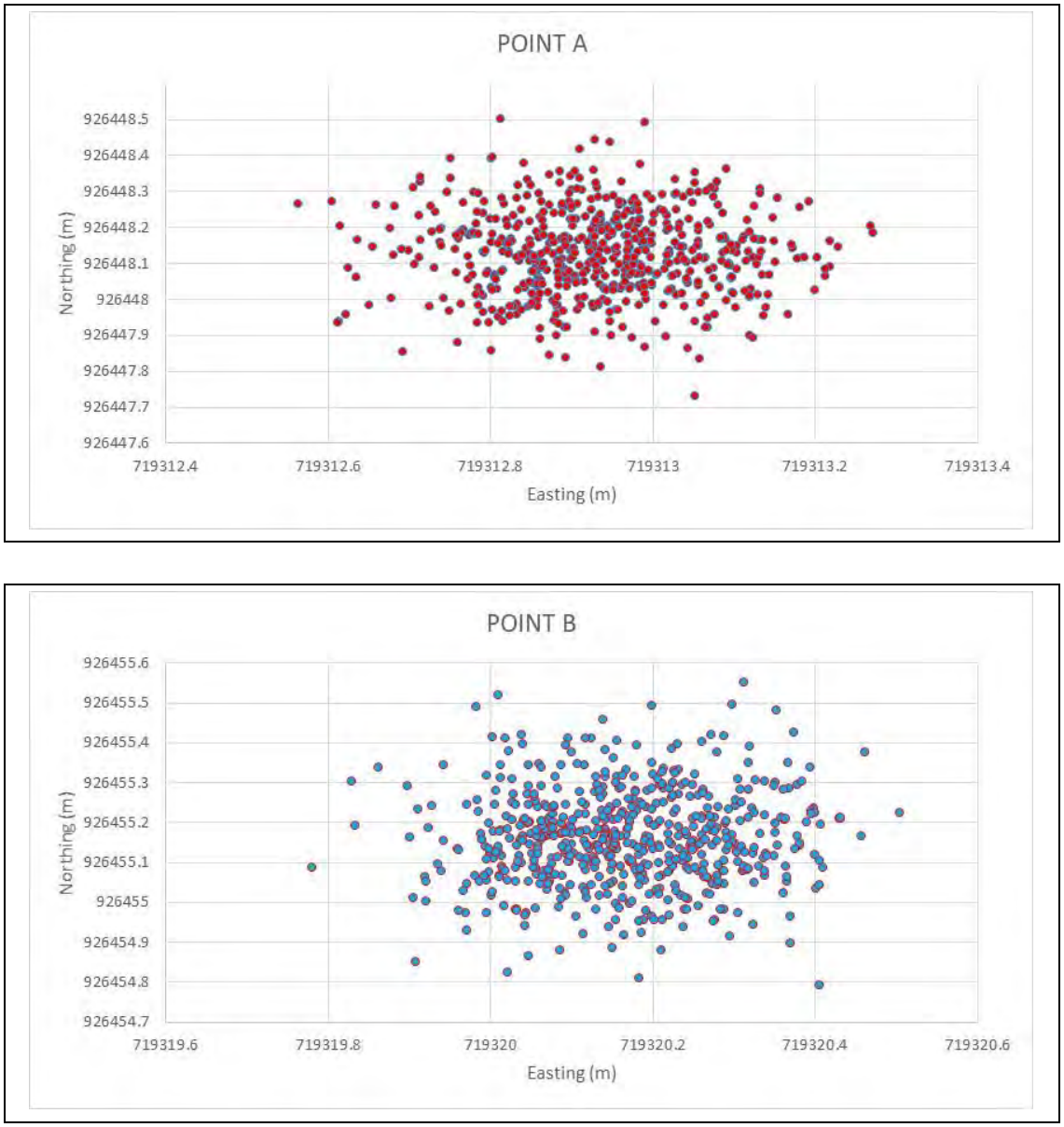


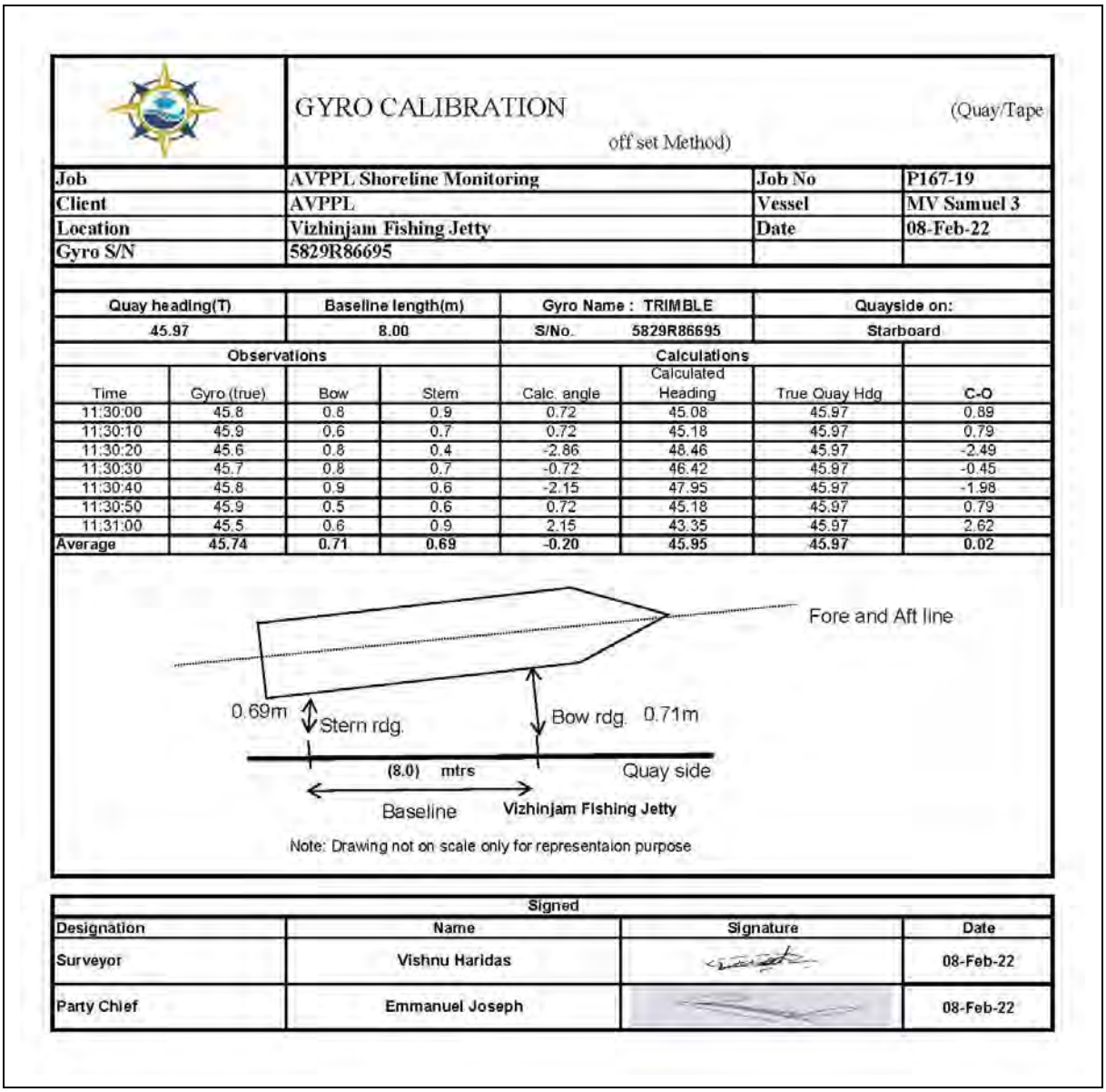
Figure 5-9: Scatter Plot of DGPS calibration on board MV Samuel 3

Table 5-2: DGPS Calibration results

AVERAGE POSITIONS		
POINT	**LATITUDE**	**LONGITUDE**
A	8° 22' 34.48" N	76° 59' 29.88" E
B	8° 22' 34.71" N	76° 59' 30.11" E
Distance between points		**10.09 m**
Measured Distance		**10.00 m**
Difference		**0.09 m**

5.7.2 Gyrocompass Calibration

The calculated heading of the vessel was compared with the recorded gyrocompass heading to derive a calculated-observed (C-O) value, which was entered into the navigation software before commencing the survey. The gyro calibration for the month of February 2022 is provided in the figure below.



GYRO CALIBRATION (Quay/Tape off set Method)

Job	AVPPL Shoreline Monitoring	Job No	P167-19
Client	AVPPL	Vessel	MV Samuel 3
Location	Vizhinjam Fishing Jetty	Date	08-Feb-22
Gyro S/N	5829R86695		

Quay heading(T)	Baseline length(m)	Gyro Name : TRIMBLE	Quayside on:
45.97	8.00	S/No. 5829R86695	Starboard

Observations				Calculations			
Time	Gyro (true)	Bow	Stern	Calc. angle	Calculated Heading	True Quay Hdg	C-O
11:30:00	45.8	0.8	0.9	0.72	45.08	45.97	0.89
11:30:10	45.9	0.6	0.7	0.72	45.18	45.97	0.79
11:30:20	45.6	0.8	0.4	-2.86	48.46	45.97	-2.49
11:30:30	45.7	0.8	0.7	-0.72	46.42	45.97	-0.45
11:30:40	45.8	0.9	0.6	-2.15	47.95	45.97	-1.98
11:30:50	45.9	0.5	0.6	0.72	45.18	45.97	0.79
11:31:00	45.5	0.6	0.9	2.15	43.35	45.97	2.62
Average	45.74	0.71	0.69	-0.20	45.95	45.97	0.02

Note: Drawing not on scale only for representaion purpose

Signed			
Designation	Name	Signature	Date
Surveyor	Vishnu Haridas		08-Feb-22
Party Chief	Emmanuel Joseph		08-Feb-22

Figure 5-10: Gyrocompass Calibration on board MV Samuel 3

5.8 Turbidity Monitoring

Optic sensors manufactured by Ponsel, France were used to measure the turbidity at all locations. The sensors are installed on a 6m buoy which houses a telemetry module. A battery which is charged by solar panels fitted on the buoy is used to power the system. The buoy is deployed on a two-point mooring system as shown in the figure below.

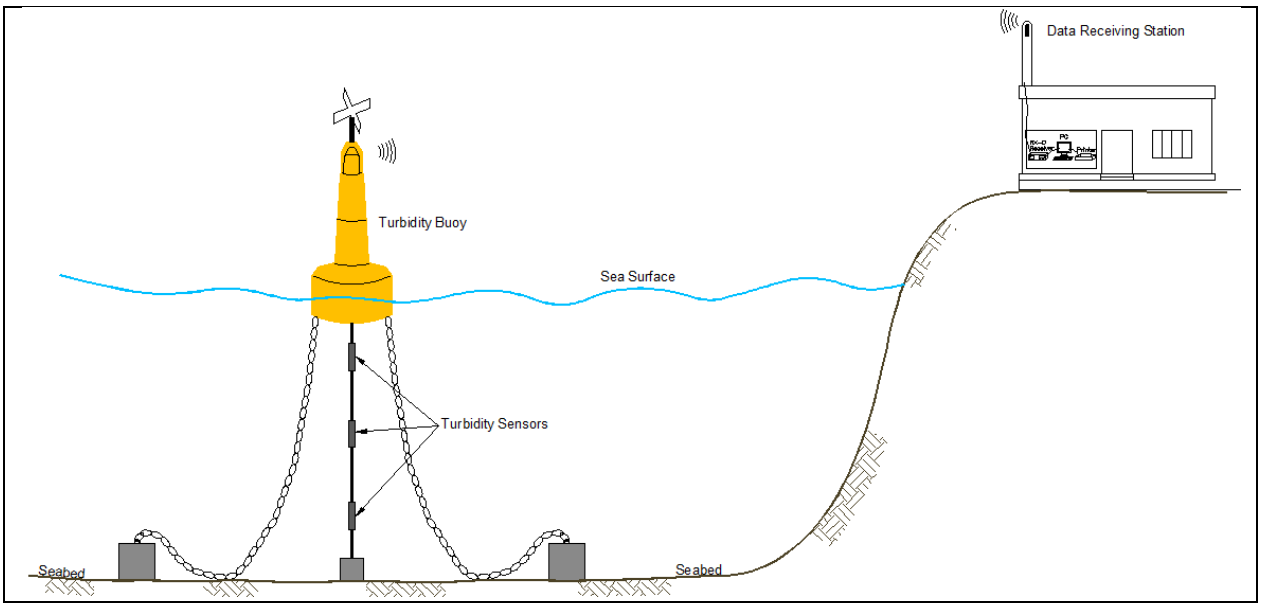


Figure 5-11: Turbidity buoy Mooring Diagram

The sensor details are provided below:

Make	:	Ponsel by Aqualabo France
Sensor Type	:	Nephelo/TU
Range	:	0 to 2000 NTU

The data from the turbidity buoys was transmitted and recorded on the server at an interval of every 10 minutes. A photograph of a turbidity buoy is shown in the figure below.

Figure 5-12: Turbidity Buoy-1

6 SURVEY RESULTS

6.1 Tidal Measurements

The tides were observed near the Coast Guard jetty. The tide is referenced to the chart datum, the value of which was provided by VISL. The temporary benchmark (TBM) is marked on the wharf and is 3.268m above chart datum. An image of the TBM is provided below:

Figure 6-1: Location of TBM

The value of the SOI benchmark BM-2 was re-established by SOI to 10.11m above MSL as per SOI letter No. 2497/39-C-(Vizhinjam) dated 31st December 2021 and accordingly the 'z' value of the temporary benchmark marked on the wharf was also re-established by transferring the level from BM-2 and fixed at 2.785m above Chart Datum. The figure below shows the amended RL of the jetty top.

Figure 6-2: Revised TBM level

The data obtained from the ATG was validated by carrying out random manual tide checks using measuring tape. Some of the random manual tide checks for the month of March 2022 are given in the table below:

Table 6-1: Manual vs ATG tide reading comparison

Date & Time	ATG Reading (m)	Manual Reading (m)	Difference (m)
17-03-2022 08:00	0.566	0.60	0.03
17-03-2022 08:06	0.578	0.60	0.02
17-03-2022 08:12	0.579	0.61	0.03
17-03-2022 08:18	0.601	0.59	0.01
17-03-2022 08:24	0.577	0.62	0.04
17-03-2022 08:30	0.621	0.63	0.01
22-03-2022 17:30	0.965	0.98	0.01
22-03-2022 17:36	0.944	0.97	0.03
22-03-2022 17:42	0.939	0.95	0.01
22-03-2022 17:48	0.921	0.95	0.03

From the above table it can be inferred that the data obtained from the ATG is meeting the required accuracy.

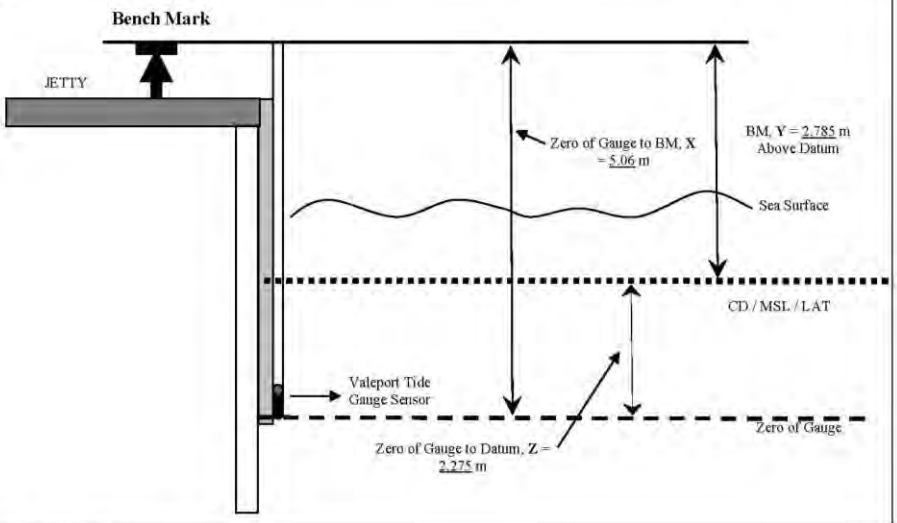
The offset calculation of the Tidemaster tide gauge based on the 'jetty top' value is given in the figure below:

TIDE GAUGE INSTALLATION

Job Number	P167-19	**Project**	Shoreline Monitoring at Vizhinjam
Client	Adani Vizhinjam Port Pvt. Ltd.		
Location	Vizhinjam	**Installation Date**	22/10/2021
Tide Gauge Sr. No.	**75804**	**Party Chief**	**Emmanuel Joseph**

Tide Gauge setup refers to:	✓	**CD**		**MSL**		**LAT**

Diagram



Bench Mark details:

Value of Bench Mark	**2.785**	**Meters above the Chart Datum**
Levelled By	**Vishnu Haridas**	
Date	**10/02/2022**	

Checked the level from zero of the gauge to BM on: 10/02/2022

Calculations:

X, Length from Bench Mark to Zero of Tide Gauge	**5.06 m**
Y, Level of Bench Mark above Datum	**2.785 m**
Z, Tide Correction factor, Z=X - Y	**2.275 m**
Tide height in m above Datum = Raw Tide reading - Z	

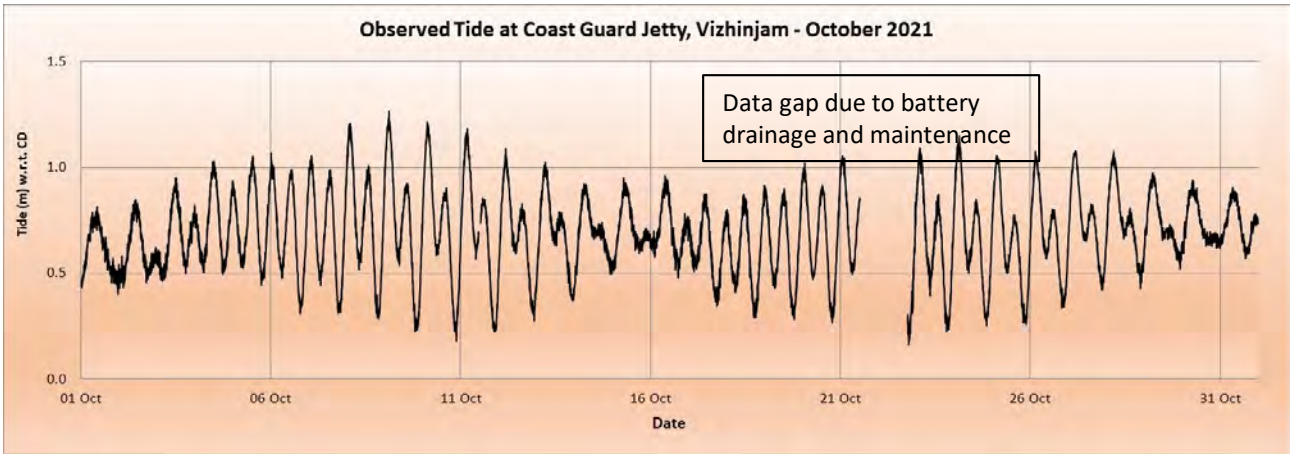
Signature:

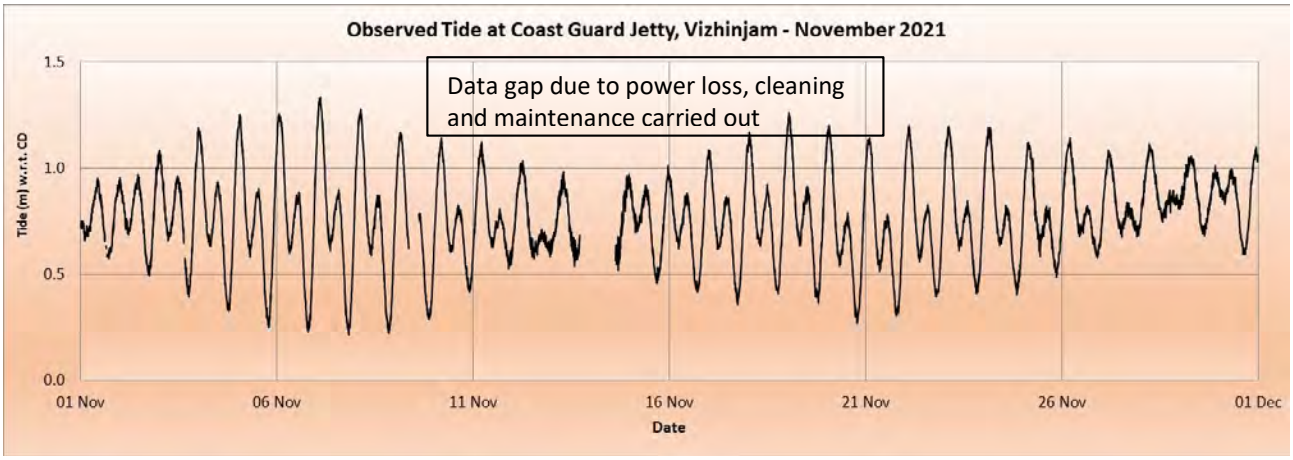
Surveyor / Engineer	**Vishnu Haridas**
Party Chief	**Emmanuel Joseph**

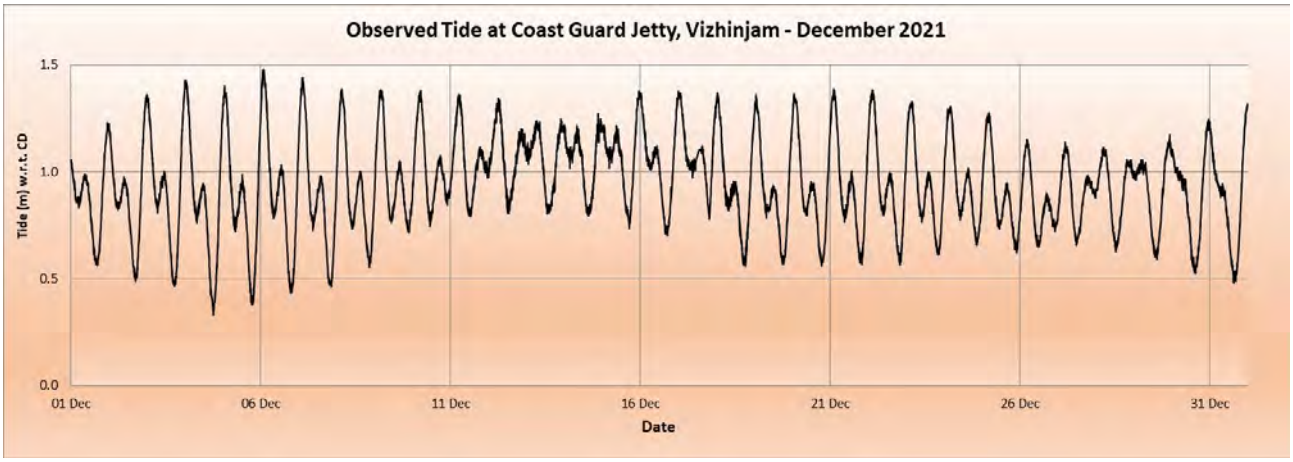
DOC-SAC Tide Gauge Installation Rev 0

Figure 6-3: Schematic Diagram of Valeport Tidemaster Tide Gauge

The tides observed are mixed semi-diurnal in nature, with the maximum range being observed in the springs. The representation of tide data collected, in the form of graphs is placed below.







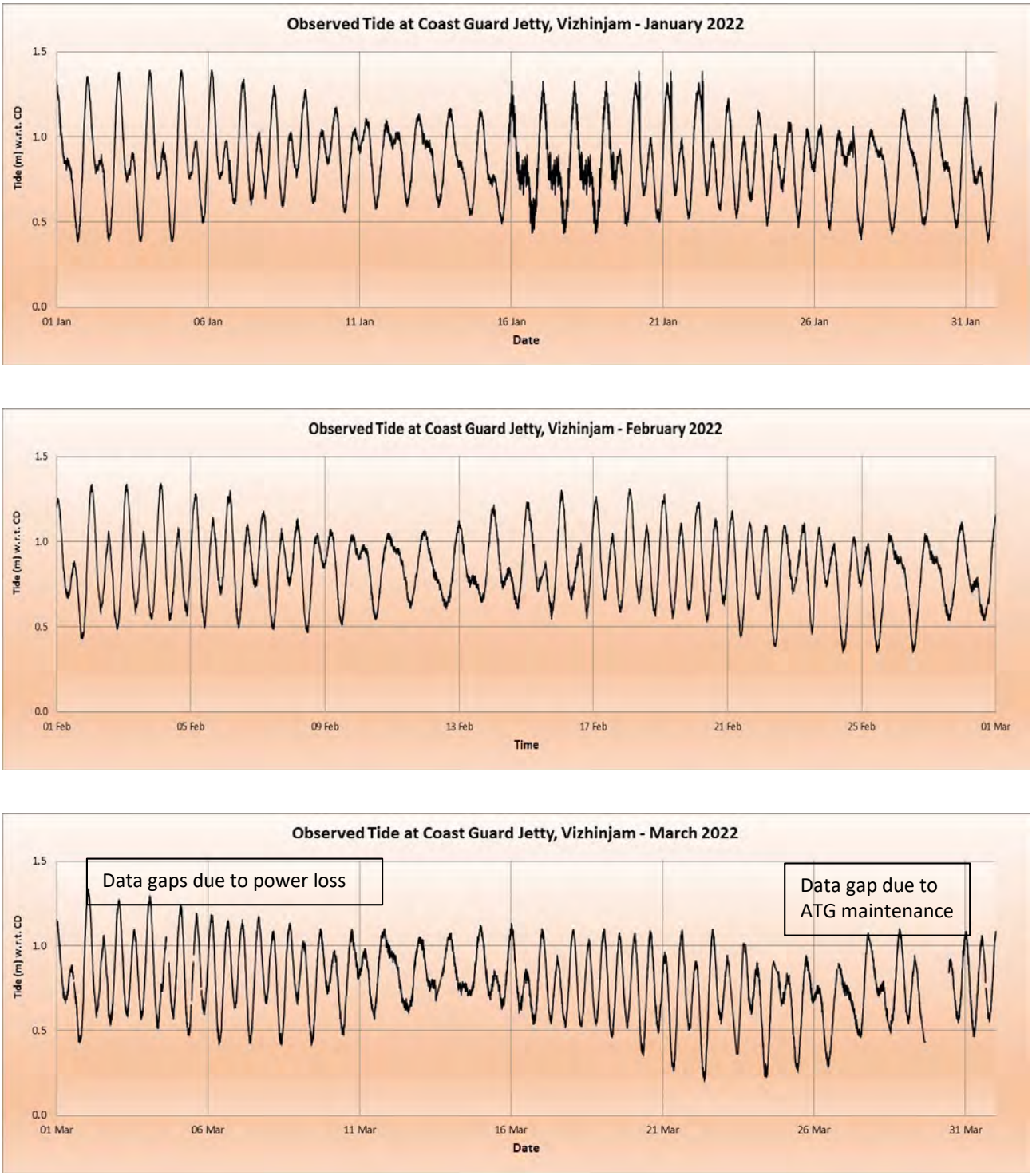


Figure 6-4: Time series of tide

6.2 Wave Measurements

The data from the WRB (provided by NIOT) was downloaded and processed to produce the time series and rose diagram, which are provided below:

Refer to the following rose plots of significant height (Hs) v/s direction for the entire period from October 2021 to March 2022:

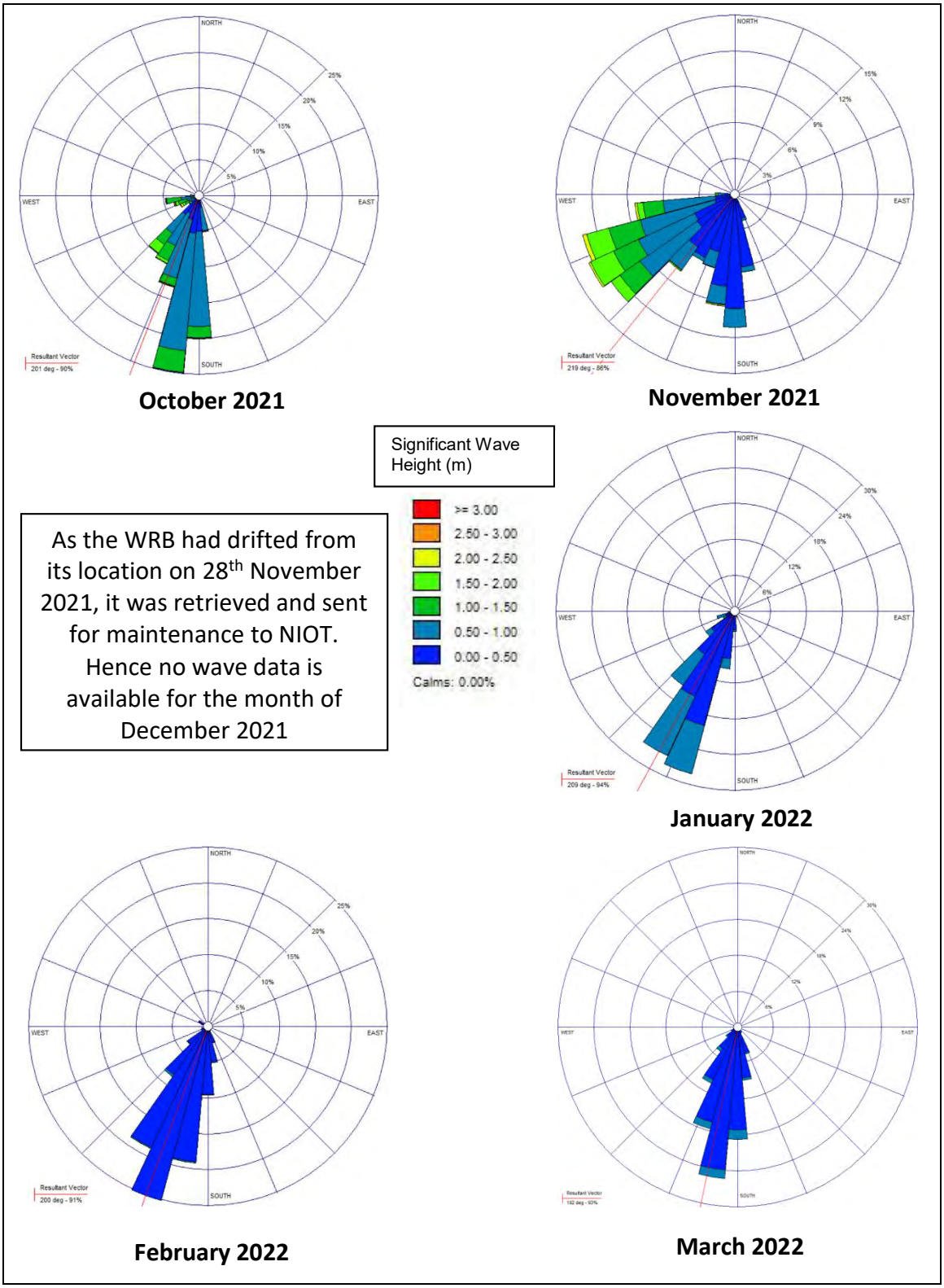


Figure 6-5: Wave Rose (Hs in metre v/s Direction)

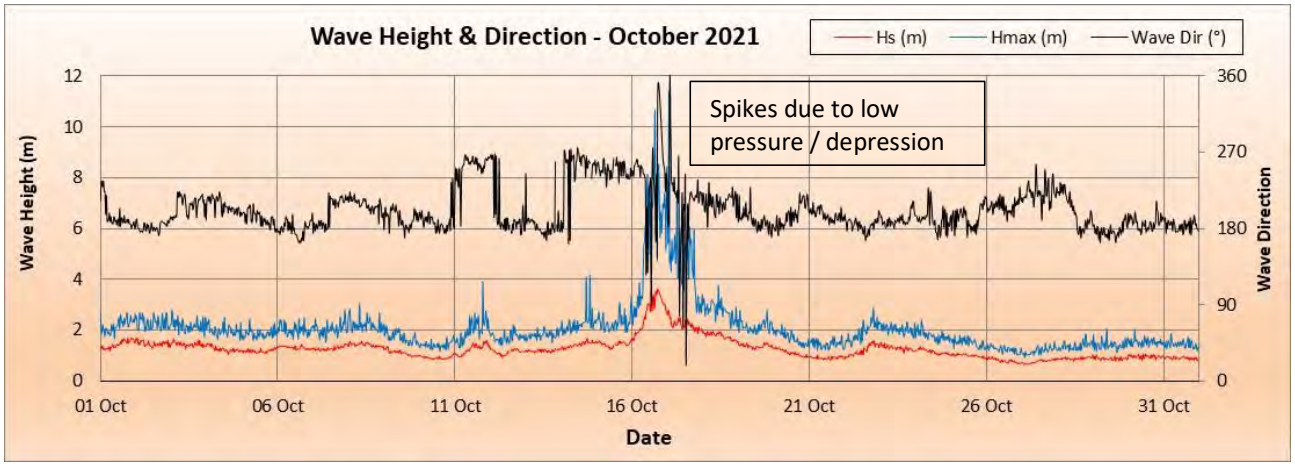
The following table provides the monthly maximum significant wave height (Hs) and wave period (Tp) observed during the period from October 2021 to March 2022.

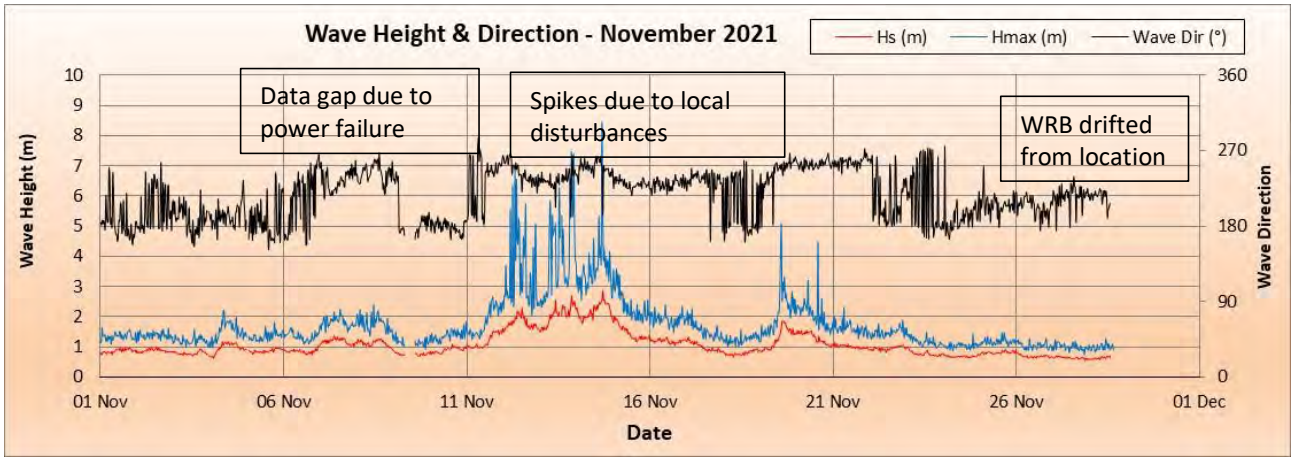
Table 6-2: Monthly maximum Hs, Hmax and Tp

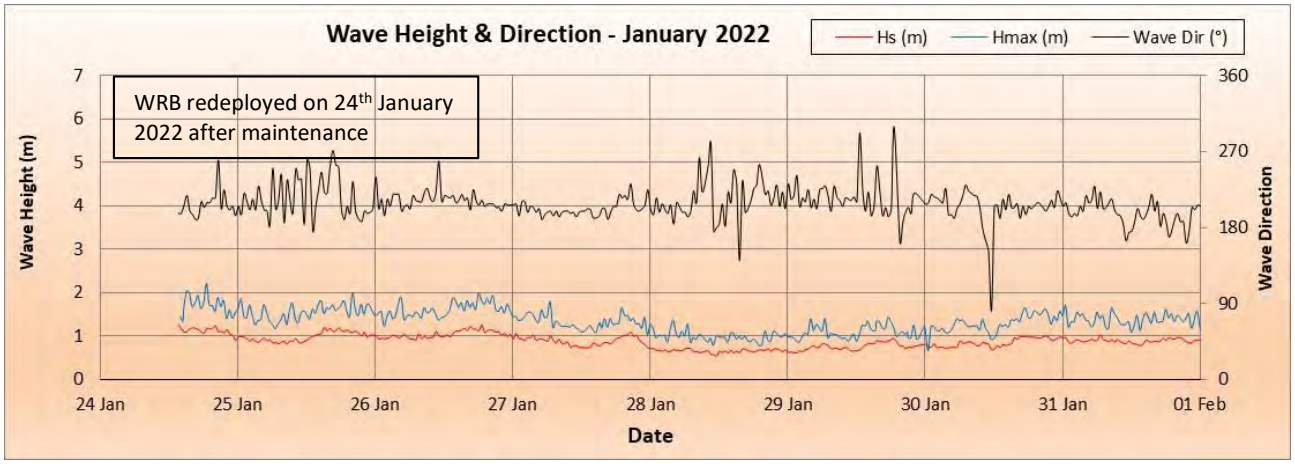
Maximum significant wave height (Hs), Hmax and Maximum wave period (Tp)				
Month	**Hs (m)**	**Predominant Direction (°)**	**Hmax (m)**	**Tp (sec)**
October 2021	3.62	201	11.42	16.67
November 2021	2.87	219	8.45	16.67
December 2021	Wave data not available due to maintenance of WRB			
January 2022	1.26	209	2.22	18.18
February 2022	1.13	200	2.36	16.67
March 2022	1.18	192	2.18	18.18

The above table indicates that with the withdrawal of monsoon, the wave heights decreased.

The time series of wave data from October 2021 to March 2022 is shown below. The time series for the month of December 2021 is not provided as the WRB had drifted from its original location and drifted away on 28th November 2021. The equipment was recovered, sent for maintenance and was redeployed towards the end of January 2022.


Wave Height & Direction - October 2021
Hs (m)
Hmax (m)
Wave Dir (°)
Spikes due to low pressure / depression
Wave Height (m)
Wave Direction
Date
01 Oct
06 Oct
11 Oct
16 Oct
21 Oct
26 Oct
31 Oct


Wave Height & Direction - November 2021
Hs (m)
Hmax (m)
Wave Dir (°)
Data gap due to power failure
Spikes due to local disturbances
WRB drifted from location
Wave Height (m)
Wave Direction
Date
01 Nov
06 Nov
11 Nov
16 Nov
21 Nov
26 Nov
01 Dec


Wave Height & Direction - January 2022
Hs (m)
Hmax (m)
Wave Dir (°)
WRB redeployed on 24th January 2022 after maintenance
Wave Height (m)
Wave Direction
Date
24 Jan
25 Jan
26 Jan
27 Jan
28 Jan
29 Jan
30 Jan
31 Jan
01 Feb

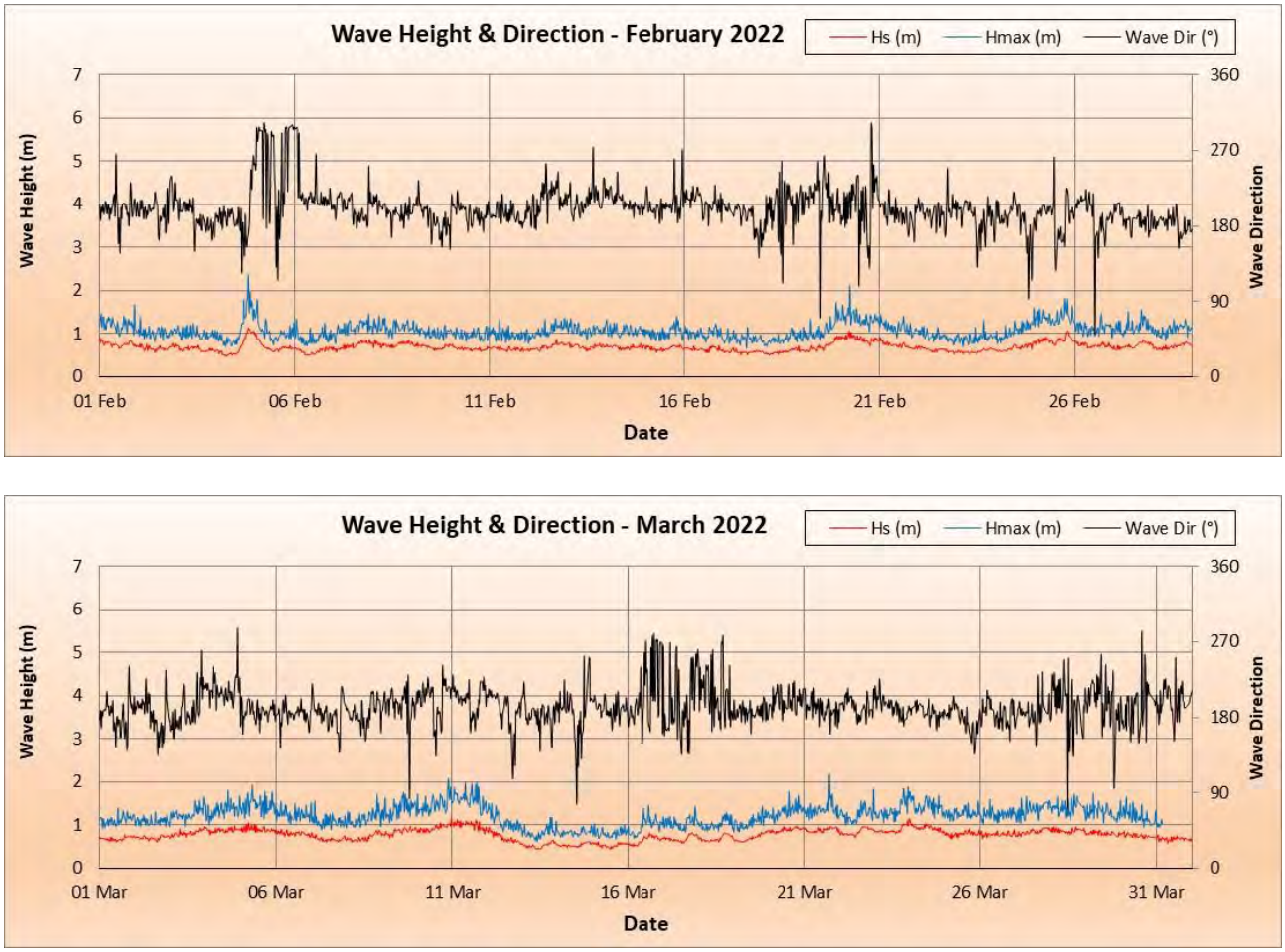


Figure 6-6: Time series of wave parameters

6.3 Current Measurements

① Current meters were deployed at four locations during for post monsoon 2021 period to measure the speed and direction of the current at three different levels, i.e., surface, mid-depth and near bottom.

The following table gives the deployment details of the ADCPs in the survey area for the post monsoon 2021 season.

Table 6-3: ADCP mooring locations and observation period

Location	Water Depth (m)	Period of Observation (Post-monsoon 2021)	Latitude	Longitude	Frequency
P1 (Vizhinjam)	22.1	4th Feb – 5th Mar 2022	08° 21' 55.4"N	76° 58' 51.6"E	600 kHz
P2 (Poovar)	23.1	4th Feb – 5th Mar 2022	08° 17' 35.8"N	77° 04' 03.5"E	600 kHz
P3 (Pachalloor)	21.9	5th Feb – 7th Mar 2022	08° 24' 08.6"N	76° 56' 16.1"E	600 kHz
P4 (Mulloor)	22.9	5th Feb – 7th Mar 2022	08° 21' 42.3"N	76° 59' 33.9"E	600 kHz

The following table provides the maximum surface currents recorded at each location during the post-monsoon 2021 period.

Table 6-4: Maximum speed of surface currents

Maximum Surface Current Speed in cm/s				
Season	**Location P1 (Vizhinjam)**	**Location P2 (Poovar)**	**Location P3 (Pachalloor)**	**Location P4 (Mulloor)**
Post monsoon 2021	79.6	71.3	66.9	71.2

The current rose plot of surface current speed at all locations for the post-monsoon 2021 period is shown below.

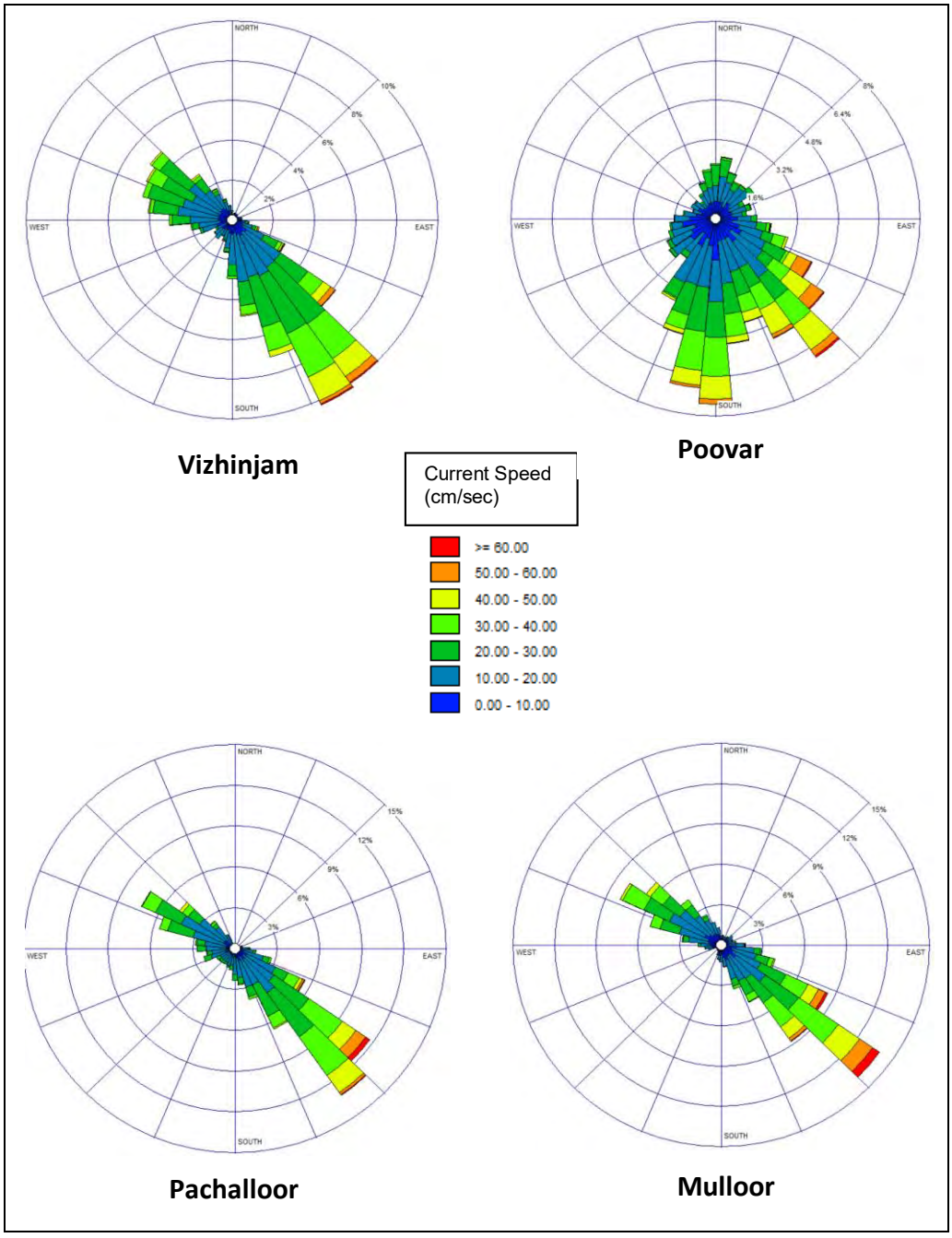


Figure 6-7: Rose Plot (surface speed in cm/sec) – All locations

The rose plot reveals a flow parallel to the shore. During the observation period, the flow was predominantly towards the southeast in all locations. At Poovar location, the flow was seen towards south and southeast.

6.4 Measurement of Meteorological Parameters

The automatic weather station was installed on the terrace of the Port Control Office building. The wind data from October 2021 to March 2022 is compiled and presented in the form of rose plots below.

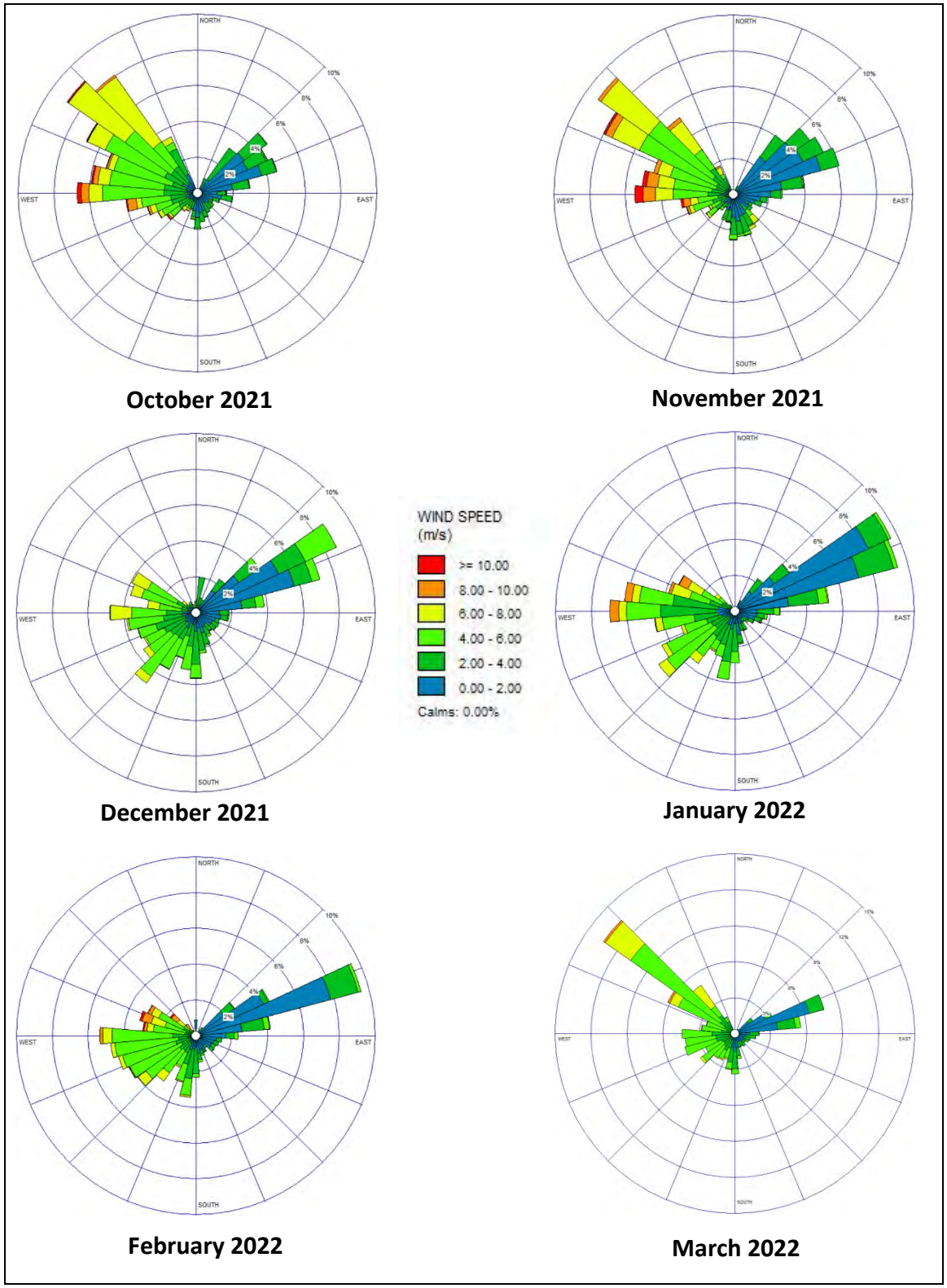


Figure 6-8: Wind rose (Speed in m/s vs direction)

The monthly maximum wind speed and predominant direction are provided in the tables below.

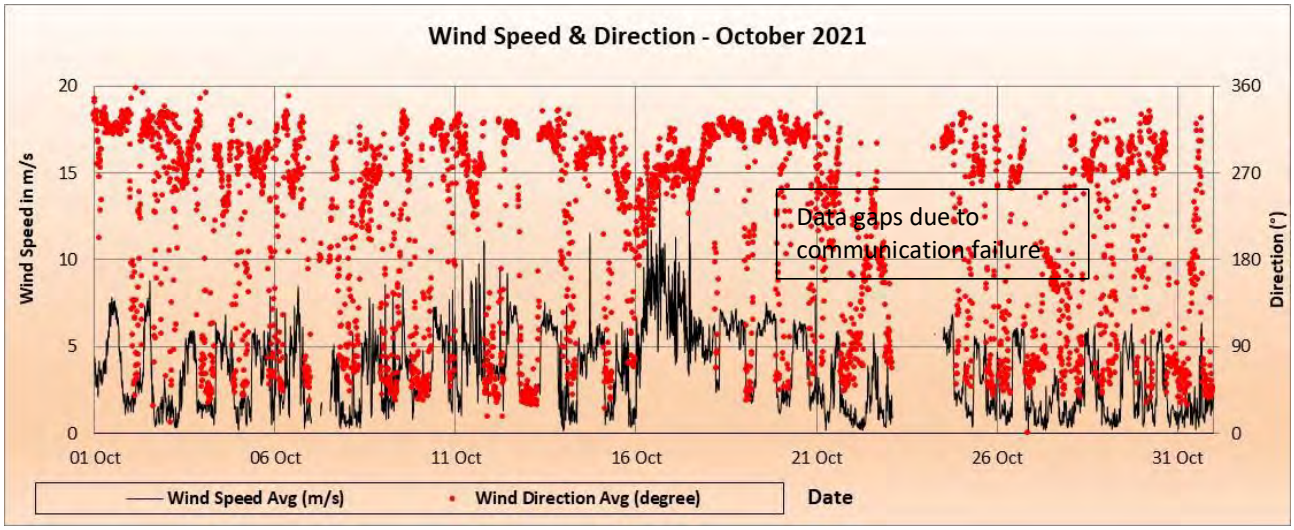
Table 6-5: Monthly maximum wind speed from landside

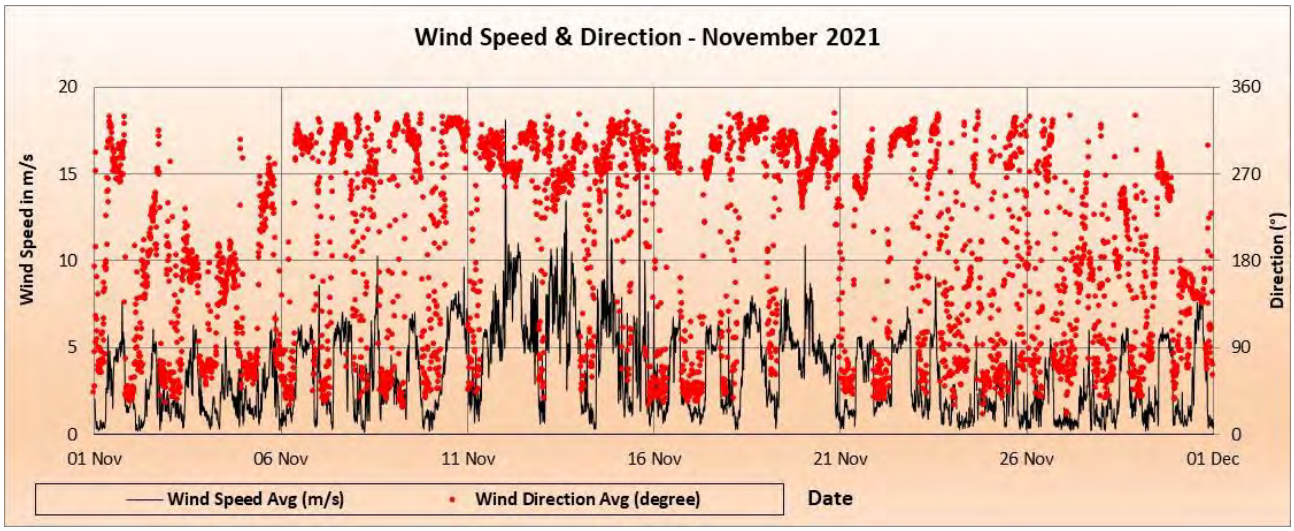
Month	Wind Speed (m/s)	Predominant Direction (°)
October 2021	8.00	73.17
November 2021	8.19	76.49
December 2021	6.12	70.07
January 2022	7.95	70.38
February 2022	15.23	170.73
March 2022	6.28	80.30

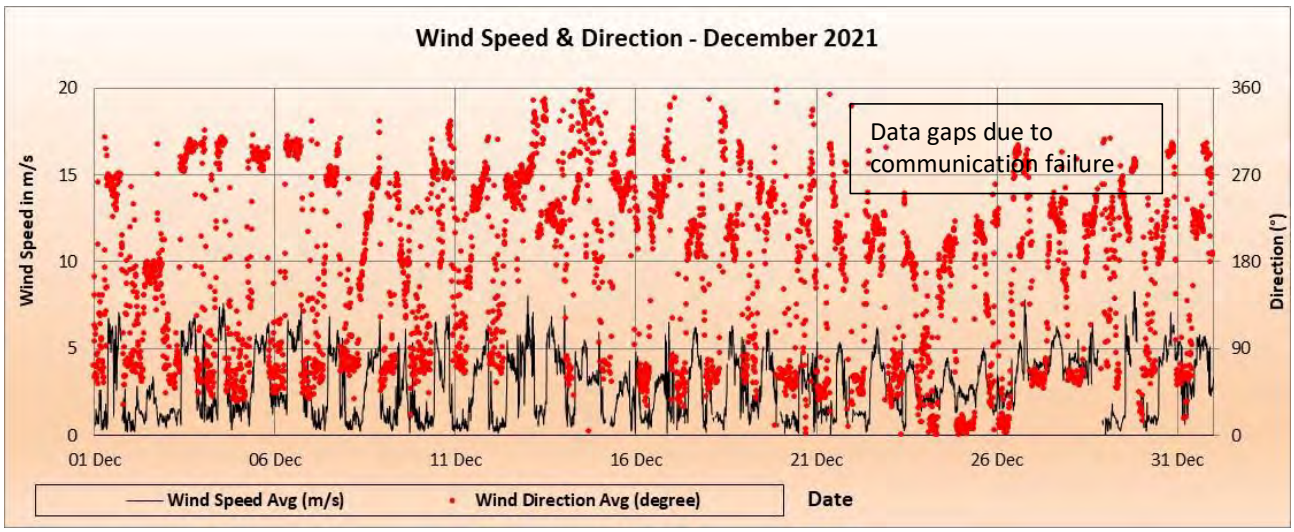
Table 6-6: Monthly maximum wind speed from seaside

Month	Wind Speed (m/s)	Predominant Direction (°)
October 2021	15.81	287.37
November 2021	18.09	287.85
December 2021	8.27	248.25
January 2022	10.25	254.77
February 2022	15.23	251.40
March 2022	9.80	275.07

The time series of wind data from October 2021 to March 2022 is shown below.


Wind Speed & Direction - October 2021
Wind Speed in m/s
Direction (°)
Data gaps due to communication failure
01 Oct
06 Oct
11 Oct
16 Oct
21 Oct
26 Oct
31 Oct
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date


Wind Speed & Direction - November 2021
Wind Speed in m/s
Direction (°)
01 Nov
06 Nov
11 Nov
16 Nov
21 Nov
26 Nov
01 Dec
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date


Wind Speed & Direction - December 2021
Wind Speed in m/s
Direction (°)
Data gaps due to communication failure
01 Dec
06 Dec
11 Dec
16 Dec
21 Dec
26 Dec
31 Dec
Wind Speed Avg (m/s)
Wind Direction Avg (degree)
Date

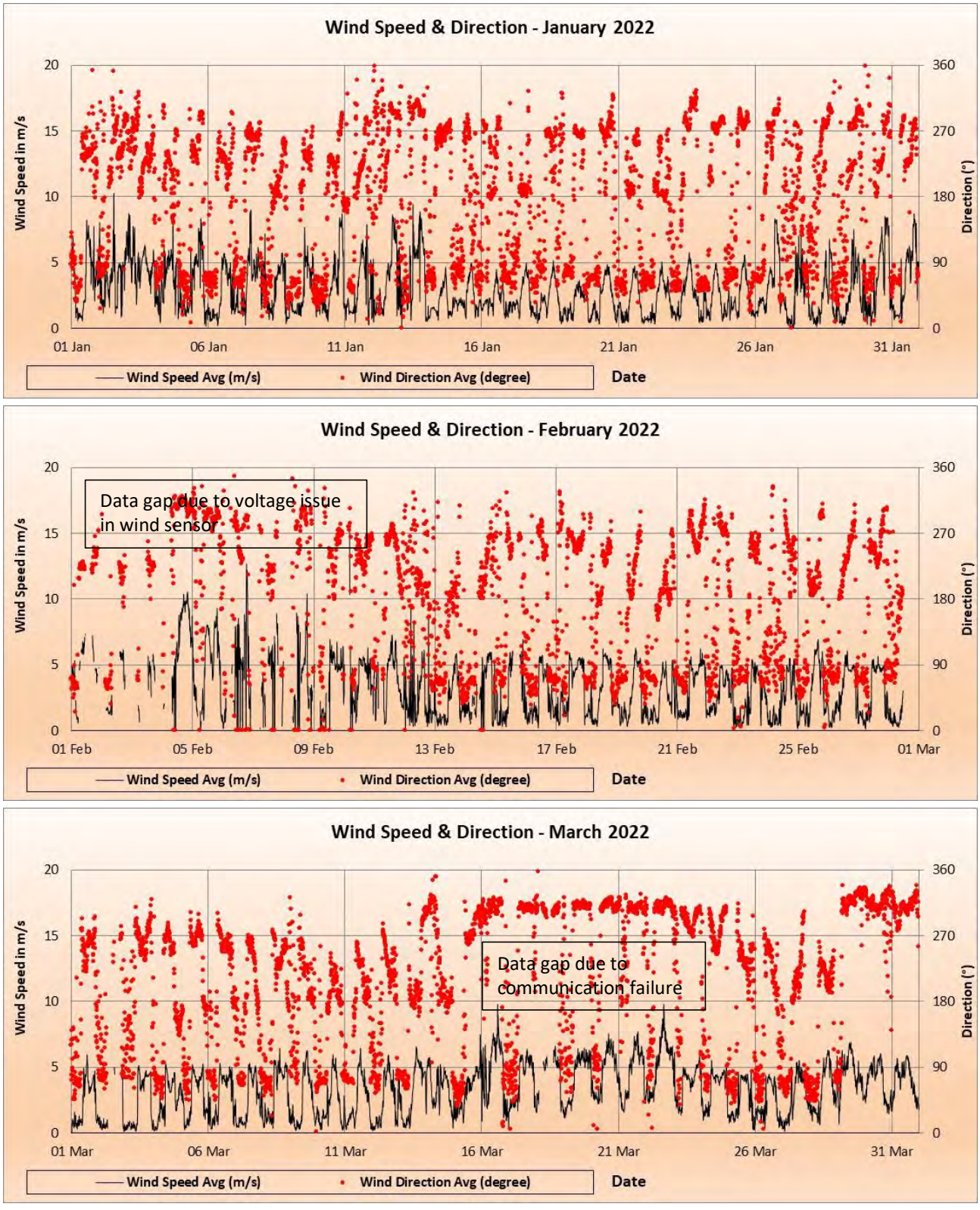


Figure 6-9: Time series of wind data

The percentage occurrence tables for atmospheric pressure, temperature and relative humidity for the period of October 2021 to March 2022 are shown below.

Table 6-7: Frequency distribution of atmospheric pressure

Frequency Distribution	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Atm. Pressure (mb)	**Percentage Occurrence**					
<1000	0.05	0.00	0.00	0.00	0.00	0.00
1000-1004	8.48	3.88	0.00	0.00	1.06	0.55
1004-1008	47.27	58.13	6.29	6.63	29.24	52.33
>1008	44.20	37.99	93.71	93.37	69.70	47.12
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 6-8: Frequency distribution of temperature

Frequency Distribution	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Temperature (°)	**Percentage Occurrence**					
20-24	0.48	5.21	0.97	0.45	0.58	0.00
24-28	83.04	78.02	51.22	57.15	50.27	37.51
28-32	16.48	16.77	47.81	42.40	49.15	62.47
>32	0.00	0.00	0.00	0.00	0.00	0.02
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

Table 6-9: Frequency distribution of relative humidity

Frequency Distribution	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22
Rel. Humidity (%)	**Percentage Occurrence**					
50-60	0.00	0.26	0.83	1.12	0.99	1.01
60-70	0.00	2.28	17.53	6.97	16.68	11.94
70-80	12.34	19.84	37.67	52.26	47.46	57.12
>80	87.66	77.62	43.97	39.65	34.87	29.92
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**

The frequency histograms for atmospheric pressure, temperature and relative humidity for the period of October 2021 to March 2022 are shown below.

Figure 6-10: Histogram of atmospheric pressure

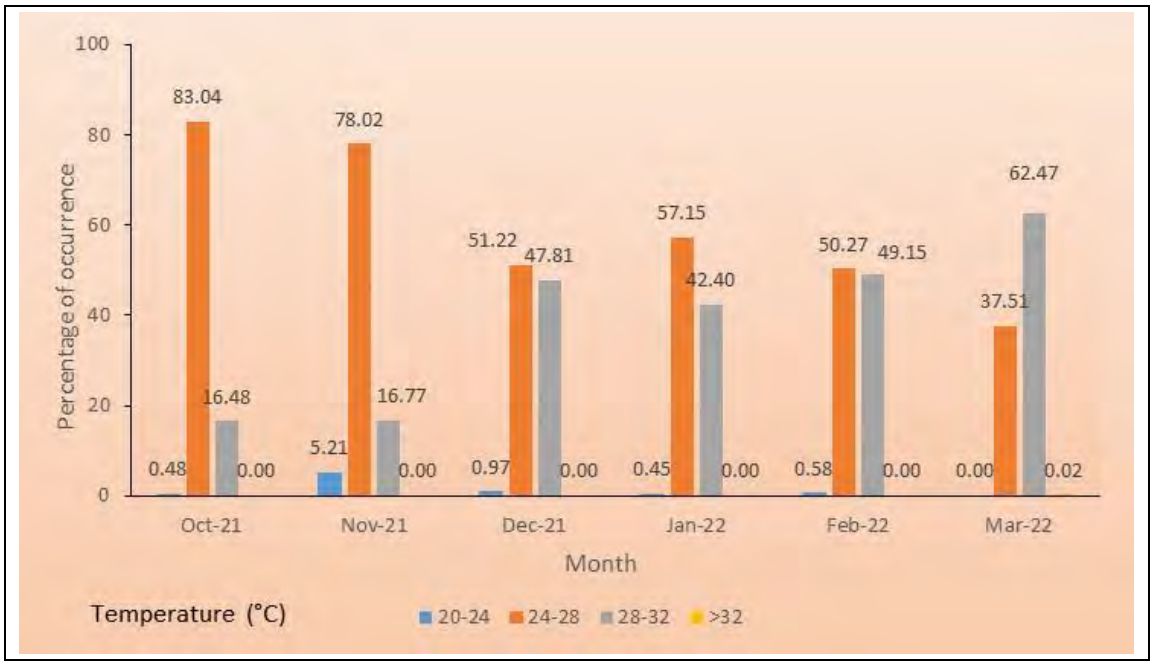


Figure 6-11: Histogram of temperature

Figure 6-12: Histogram of relative humidity

The following table shows the amount of rainfall received during the entire period from October 2021 to March 2022.

Table 6-10: Cumulative rainfall

Month	Cumulative Rainfall (mm)
October 2021	358.0
November 2021	465.2
December 2021	31.4
January 2022	4.0
February 2022	77.6
March 2022	20.4

The histogram of rainfall for the entire period is provided in the image below.

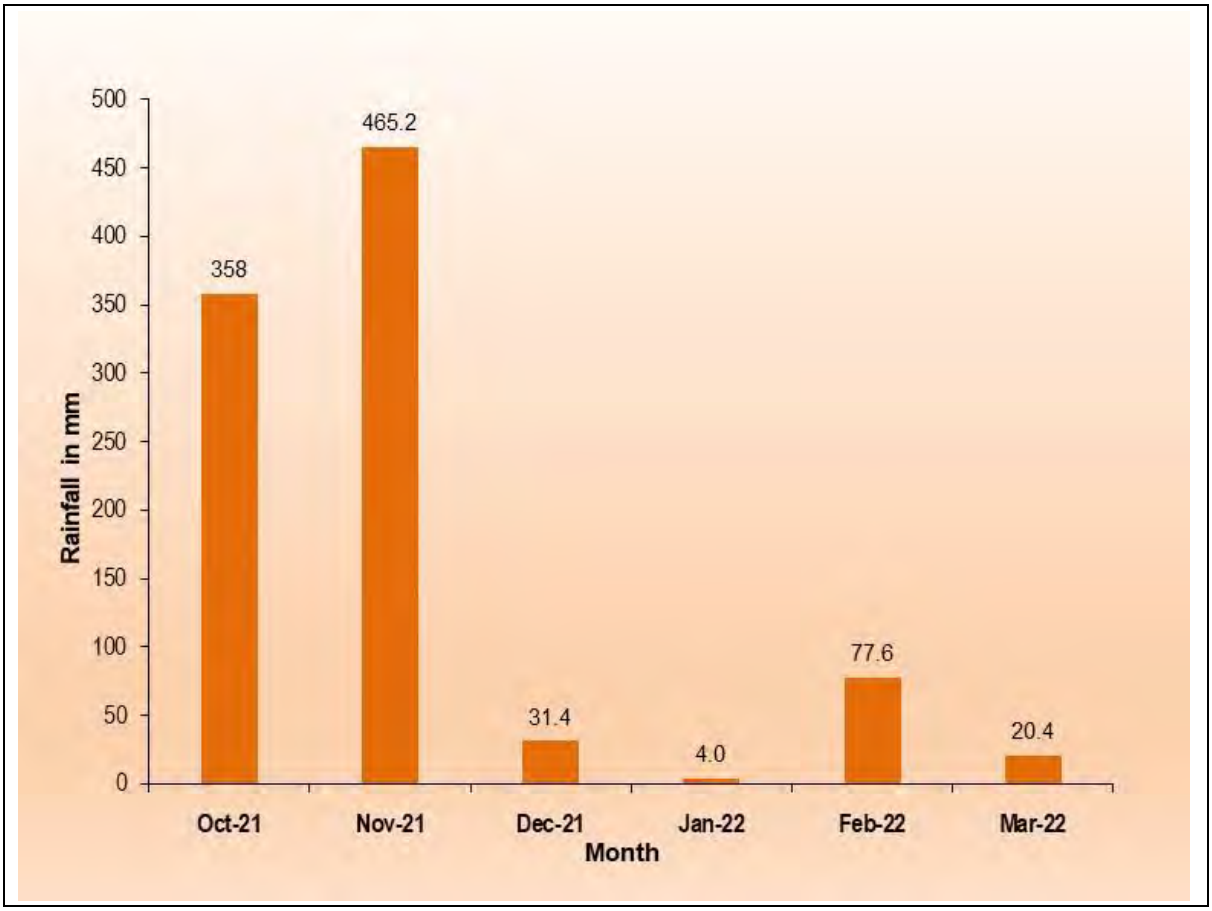


Figure 6-13: Histogram of cumulative rainfall

① The data reveals that the temperature increased gradually from December 2021 to March 2022. The maximum occurrence of relative humidity readings greater than 80% was observed in the month of October 2021 as a result of active monsoon. In the months of December 2021 and January 2022, the majority of atmospheric pressure readings were greater than 1008 mb.

6.5 Littoral Environment Observations

The LEO was carried out at all 81 locations in all the months. The LEO plate was deployed at all the locations and the same was tracked for about five to ten minutes, as per the site conditions. The initial and final GPS positions were then used to calculate the SOG and COG. The estimated wave height, angle of wave, period and the stretch of breakers were also noted down in the log.

The along shore current followed a northerly trend in the post-monsoon 2021 period. The following table shows the maximum along shore current speed recorded in each month.

Table 6-11: Monthly maximum along shore current

Month	Max Speed (cm/s)	Predominant Direction	Line No.	Location
October 2021	15.73	North	CSP-17	Poovar Beach South
November 2021	17.64	North	CSP-80	Thumba
December 2021	20.20	North	CSP-36	Mulloor
January 2022	15.43	North	CSP-55	Punthura
February 2022	15.60	Bi-directional	CSP-32	Adimalathura
March 2022	18.74	North	CSP-15	Poovar Beach South

A pictorial representation of the alongshore current direction the post-monsoon 2021 period is shown in the Google Earth image below.

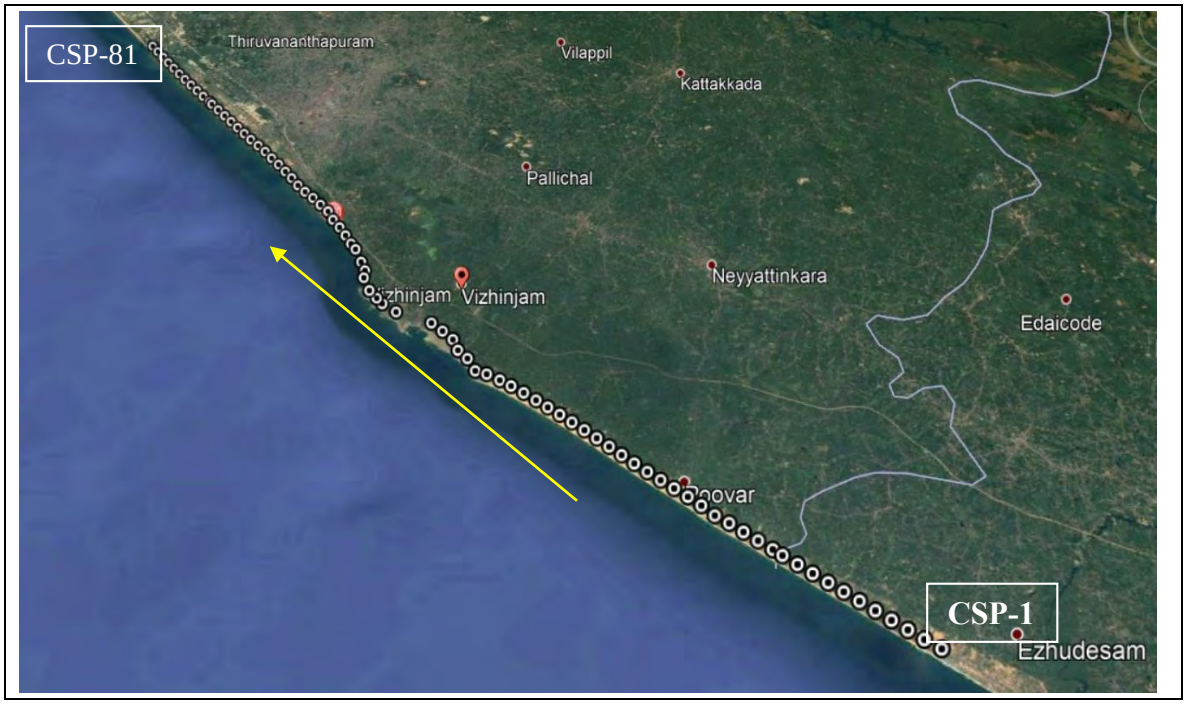


Figure 6-14: Representation of surface current direction from October 2021 to March 2022

6.6 Photographic Documentation

Photographic documentation was carried out for all the 81 locations, coinciding with the cross-shore profiling.

The latest photographs for the month of March 2022 are provided in **Annexure I**. As a common reference point, a flag was fixed at each of the cross-shore profiling alignments while taking the photograph. Using the RTK system, this point was staked during the photography.

6.7 Cross Shore Profiles

The cross-shore profiling for the period was carried out using RTK in the onshore region and a wide swath bathymetric system in the offshore region. The nearest depth which could be attained was about 4 to 5m due to the presence of waves breaking in the zone. The boat is not able to approach this zone, due to breakers nearshore considering the safety of personnel onboard.

There is a steep hill which lies on the CSP 35 line, due to which cross-shore profiling is not possible in the onshore area.

In the month of October 2021, a few lines of offshore CSP were attempted in rough weather. The data did not pass the Quality Control checks and hence had to be rejected. The bad weather continued throughout the month of November 2021 as well, hence only 8 offshore CSP lines could be completed. In December 2021, the nearshore survey was attempted using a sled along with pressure sensor, which proved to be a reliable method for collecting nearshore soundings. The survey was carried out at CSP-73 (Vettucaud area). In the month of February 2022, the nearshore survey was carried out at CSP locations 2, 33 and 34, whereas in the month of March 2022, the activity was done at locations 2, 33, 34, 68, 69, 73 and 74.

The following table provides the identification of CSP vis-à-vis the local name:

Table 6-12: CSP Location names

CSP NO.	LANDMARK	LOCATION	SITE CONDITION
CSP-01	CATHOLIC CRISMATIC PRAYER CENTER	EDAPPADU BEACH	Seawall, Groyne No. 1
CSP-02			Beach
CSP-03			Seawall
CSP-04	ST. MARY'S CHURCH	VALLAVILAY	Groyne Nos. 2 to 5 in the vicinity, Beach and Seawall
CSP-05			Groyne Nos. 6 to 8 in the vicinity, Beach and Seawall
CSP-06			Groyne Nos. 9 to 13 in the vicinity, Beach and Seawall
CSP-07	ST. NICOLAS' CHURCH	NEERODY	Groyne Nos. 14 to 16 in the vicinity, Beach and Seawall
CSP-08			Groyne Nos. 17 to 21 in the vicinity, Beach and Seawall
CSP-09			Groyne Nos. 22 to 24 in the vicinity, Beach and Seawall
CSP-10	SREE BHADRAKALI TEMPLE	POZHIYOOR	Groyne Nos. 25 to 27 in the vicinity, Beach and Seawall
CSP-11			Groyne Nos. 28 and 29 in the vicinity, Beach and Seawall
CSP-12			Seawall
CSP-13	ST. MATHEW'S CHURCH	PARUTHIYOOR	Seawall
CSP-14	CHURCH OF CHRIST		Beach and Seawall
CSP-15	POOVAR ISLAND RESORT	POOVAR BEACH SOUTH	Beach
CSP-16			Beach
CSP-17			Beach
CSP-18	POZHIKARA BEACH	POOVAR	Beach
CSP-19			Beach
CSP-20	ST. ANTONY'S CHAPEL	POOVAR BEACH NORTH	Beach
CSP-21			Beach
CSP-22	ST. ANTONY'S CHURH	KARUMKULAM	Beach
CSP-23			Beach
CSP-24			Beach
CSP-25			Beach
CSP-26			Beach
CSP-27	GOTHAMBU ROAD	PULLUVILA	Beach
CSP-28			Beach
CSP-29			Beach
CSP-30			Beach
CSP-31	ADIMALATHURA CATHOLIC CHURCH	ADIMALATHURA	Beach
CSP-32			Beach

CSP NO.	LANDMARK	LOCATION	SITE CONDITION
CSP-33			Beach
CSP-34			Beach
CSP-35	AZHIMALA TEMPLE	AZHIMALA	Rocky Area
CSP-35A	AZHIMALA TEMPLE	AZHIMALA	Beach
CSP-36	NAGAR BHAGAVATHY TEMPLE	MULLUR	Beach
CSP-37			Beach
CSP-38	ADANI PORT RECLAMATION AREA	ADANI PORT OFFICE VIZHINJAM	Beach
CSP-39			Beach
CSP-40			Beach
CSP-40A			Beach
CSP-41	VIZHINJAM LIGHT HOUSE	KOVALAM	Beach and Rocky Area
CSP-42			Beach
CSP-43			Beach
CSP-44			Beach and Seawall
CSP-45			Beach and Seawall
CSP-46			Beach and Seawall
CSP-47	SAMUDRA BEACH PARK		Beach and Seawall
CSP-48	MOSQUE	PANATHURA	Beach and Seawall
CSP-49			Seawall
CSP-50	PANATHURA TEMPLE		Seawall
CSP-51			Seawall
CSP-52			Groyne No. 30 in the vicinity, Seawall
CSP-53	PUNTHURA FISH MARKET	PUNTHURA	Groyne No. 31 in the vicinity, Beach
CSP-54			Beach
CSP-55			Beach
CSP-56			Seawall
CSP-57			Groyne Nos. 32 and 33 in the vicinity, Beach and Seawall
CSP-58	BEEMA PALLY	BEEMA PALLY	Groyne Nos. 34 to 36 in the vicinity, Beach and Seawall
CSP-59			Seawall
CSP-60			Groyne No. 37 in the vicinity, Beach and Seawall
CSP-61	CHERIYATHURA SPORTS GROUND	CHERIYATHURA	Groyne Nos. 38 to 42 in the vicinity, Beach and Seawall
CSP-62			Groyne Nos. 43 to 47 in the vicinity, Beach and Seawall

CSP NO.	LANDMARK	LOCATION	SITE CONDITION
CSP-63	VALIYATHURA BRIDGE	VALIYATHURA	Groyne Nos. 48 to 51 in the vicinity, Beach and Seawall
CSP-64			Seawall, Valiyathura Bridge
CSP-65			Seawall
CSP-66			Beach and Seawall
CSP-67			Beach
CSP-68	SHANGUMUGHAM BEACH	SHANGUMUGHAM	Beach
CSP-69			Beach
CSP-70	ST. PETER'S CHURCH		Beach
CSP-71			Beach and Seawall
CSP-72	VETTUCAUD CHURCH	VETTUCAUD	Beach
CSP-73			Beach
CSP-74			Beach
CSP-75	VELI CHILDREN'S PARK	KOCHUVELI	Beach
CSP-76			Beach
CSP-77			Beach
CSP-78	ST. THOMAS' CHURCH	VALIYAVELI	Beach
CSP-79			Beach
CSP-80	CHRISTIAN BROTHEREN CHURCH	THUMBA	Beach
CSP-81			Beach

6.8 Shoreline Monitoring Survey

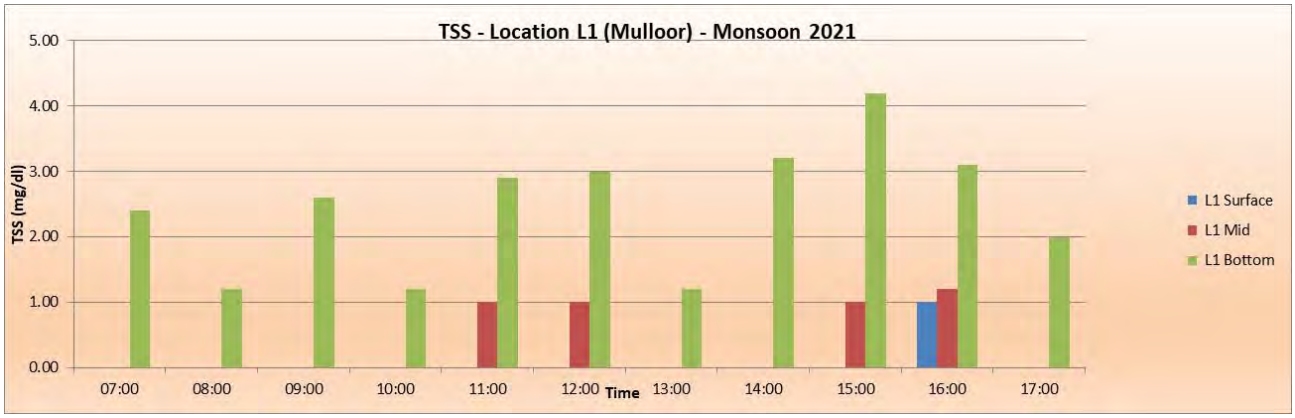
From the month of November 2021, the shoreline monitoring survey was commenced using GPS in order to study the changes taking place along the coastline.

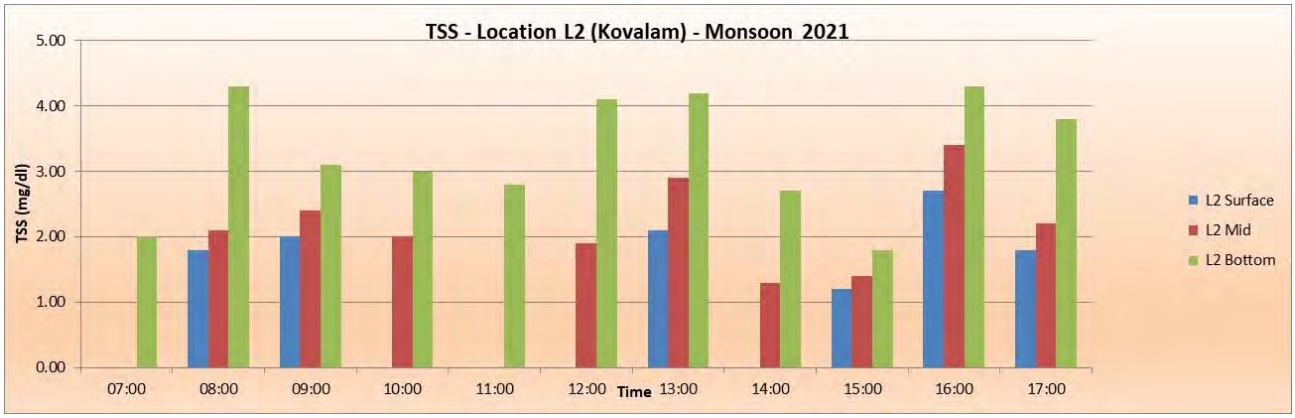
The entire 41 km of shoreline was surveyed from December 2021 to March 2022. The survey was carried out using RTK system in GPS mode. This stretch extends from CSP-1 in the south (Eddapadu) to CSP-81 in the north (Thumba). A total of 51 groynes have been observed within the survey area.

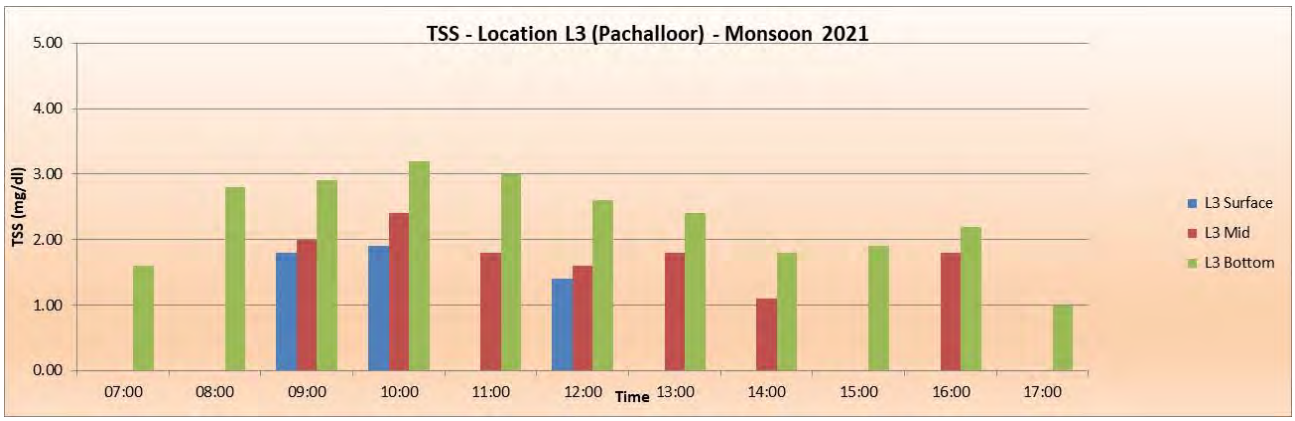
6.9 Water Sampling

Water samples were collected from 4 locations, namely, L1 (Mulloor), L2 (Kovalam), L3 (Pachalloor) and L4 (Poovar) from three levels: surface, mid-depth and near bottom during the monsoon season from 20th to 23rd September 2021 and the post monsoon season from 3rd to 6th March 2022 . The parameters measured were Total Suspended Solids (TSS), turbidity and salinity at NABL accredited laboratory in Kochi (Standard^{s} Environmental & Analytical Laboratories, Accreditation and Approval: NABL as per ISO 17025:2005).

The time series for Total Suspended Solids (in mg/l) for the monsoon 2021 period are provided below.







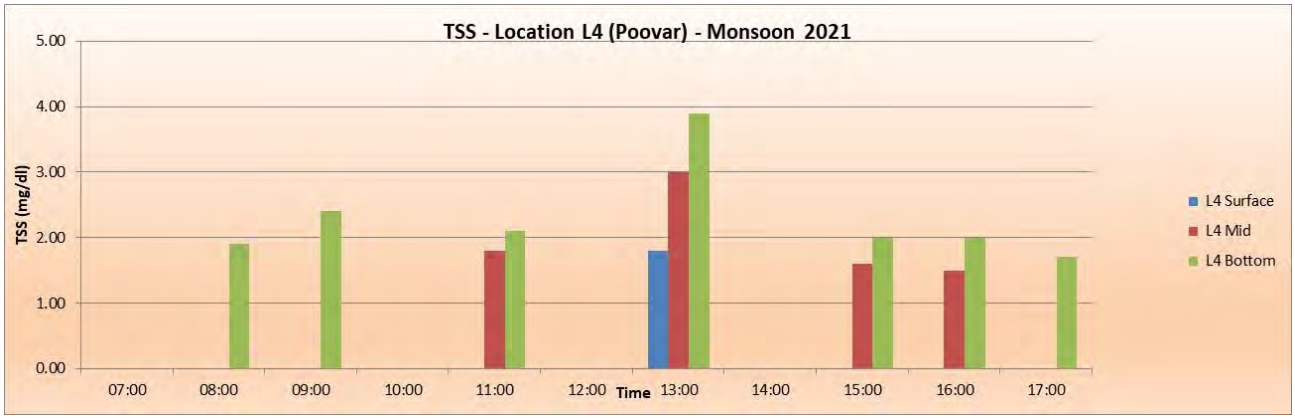
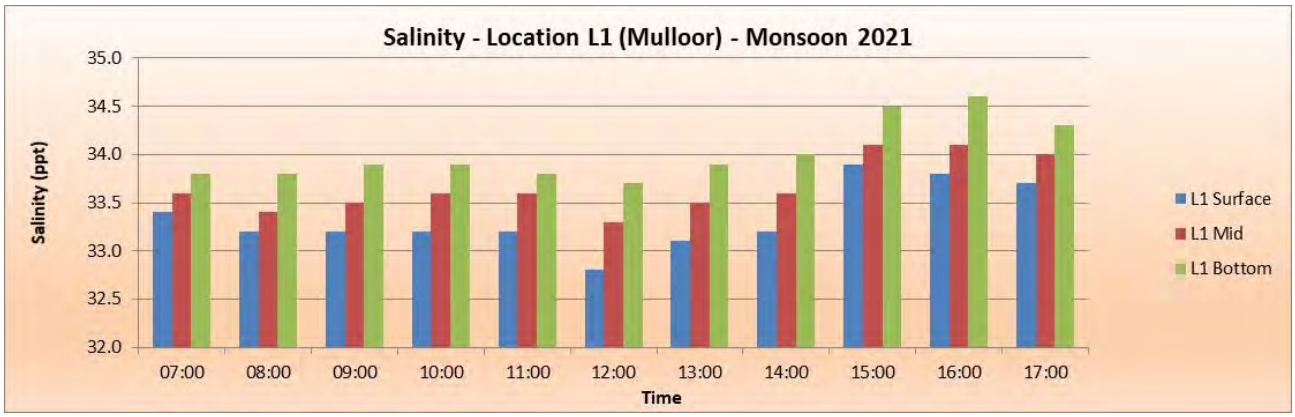


Figure 6-15: Time Series of TSS

The maximum Total Suspended Solids recorded was 4.3 mg/l near the bottom at Location L2 (Kovalam) for the monsoon 2021 period.

Note: *The Minimum Detectable Limit of the system is 1.00 mg/l. Any values below this are not shown in the bar chart.*

The time series for salinity at all three levels for the monsoon 2021 period is given as follows.



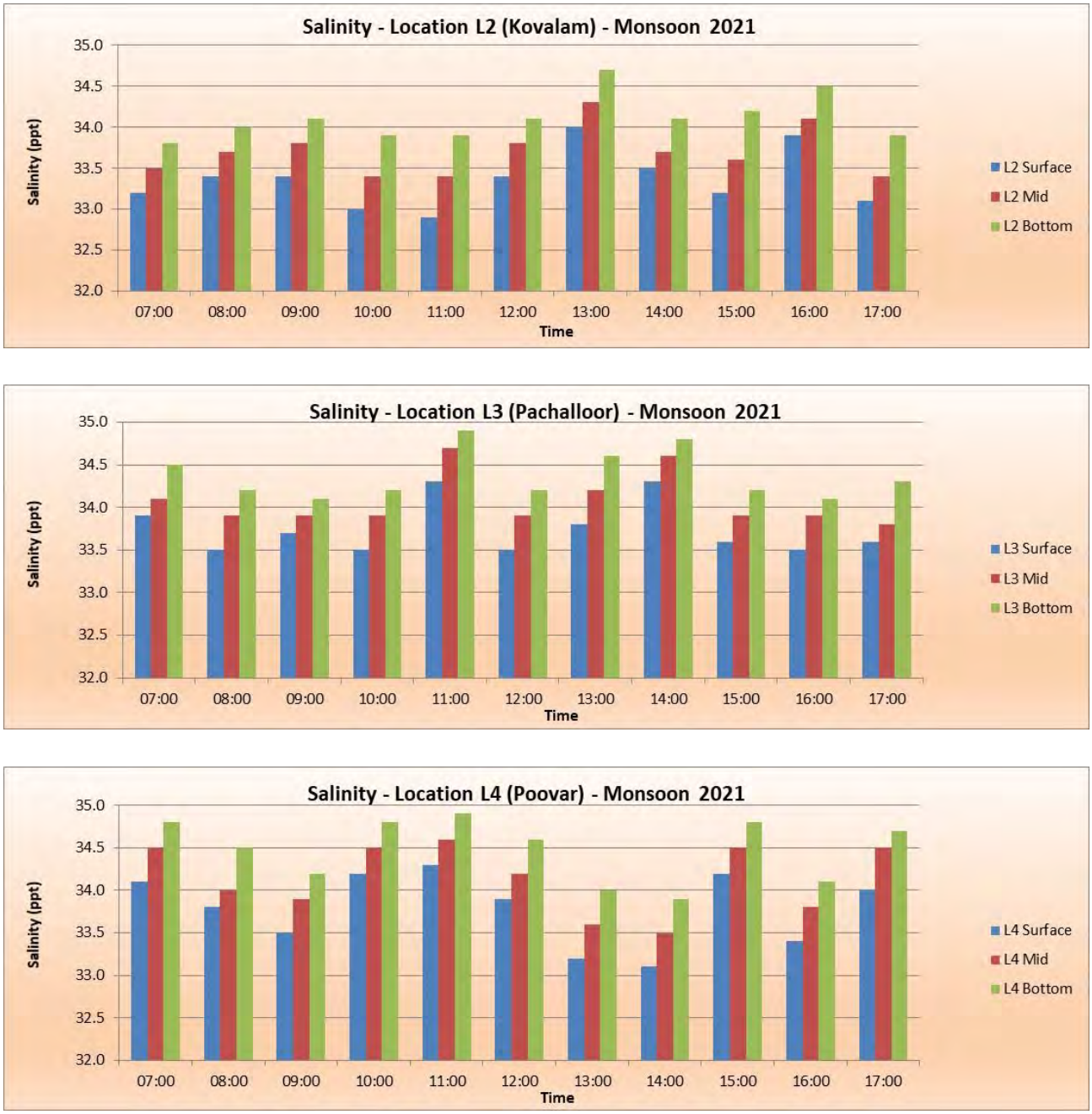
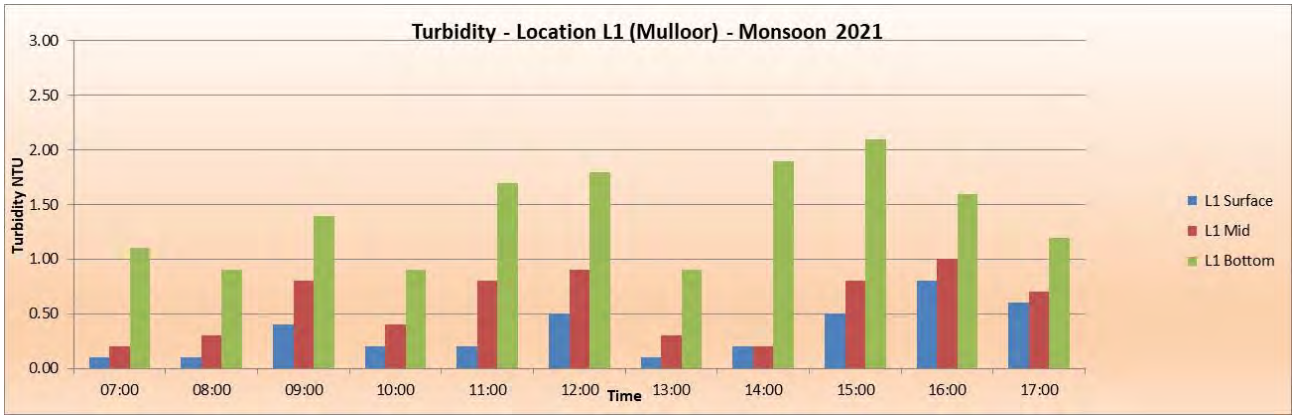
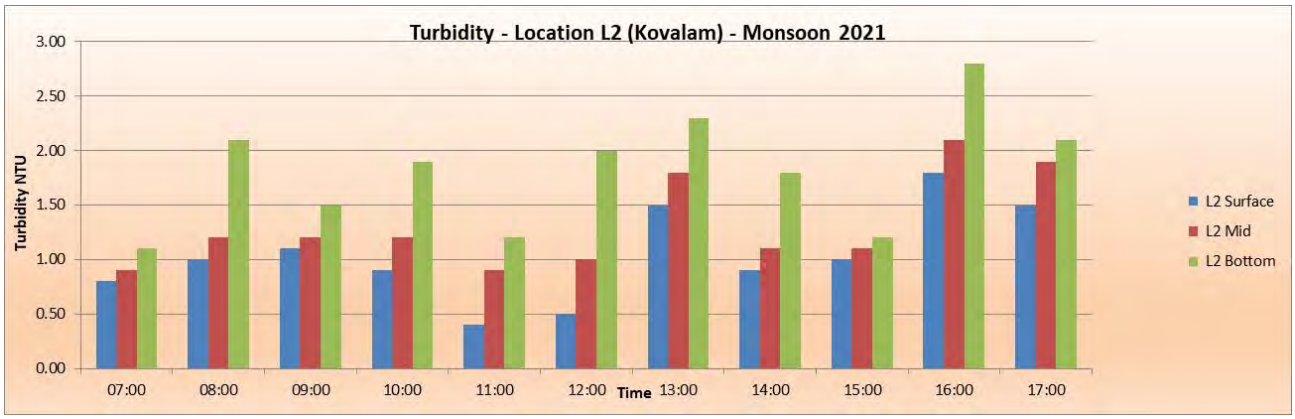


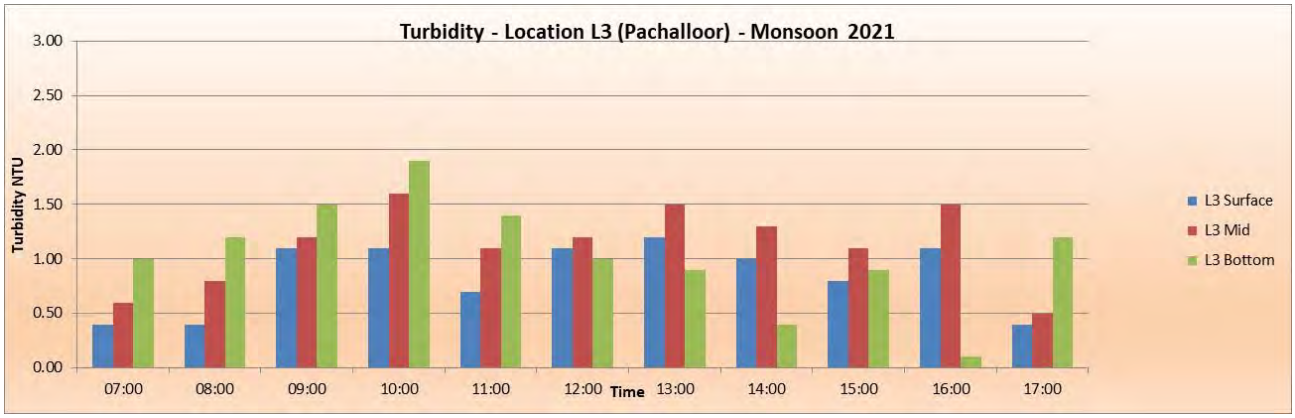
Figure 6-16: Time Series of salinity

For the monsoon 2021 period, the salinity values are seen to be in the range of 32.8 and 34.9 ppt.

The time series for turbidity at all levels for the monsoon 2021 period is shown below.


Turbidity - Location L1 (Mulloor) - Monsoon 2021
Turbidity NTU
3.00
2.50
2.00
1.50
1.00
0.50
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L1 Surface
L1 Mid
L1 Bottom


Turbidity - Location L2 (Kovalam) - Monsoon 2021
Turbidity NTU
3.00
2.50
2.00
1.50
1.00
0.50
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L2 Surface
L2 Mid
L2 Bottom


Turbidity - Location L3 (Pachalloor) - Monsoon 2021
Turbidity NTU
3.00
2.50
2.00
1.50
1.00
0.50
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L3 Surface
L3 Mid
L3 Bottom

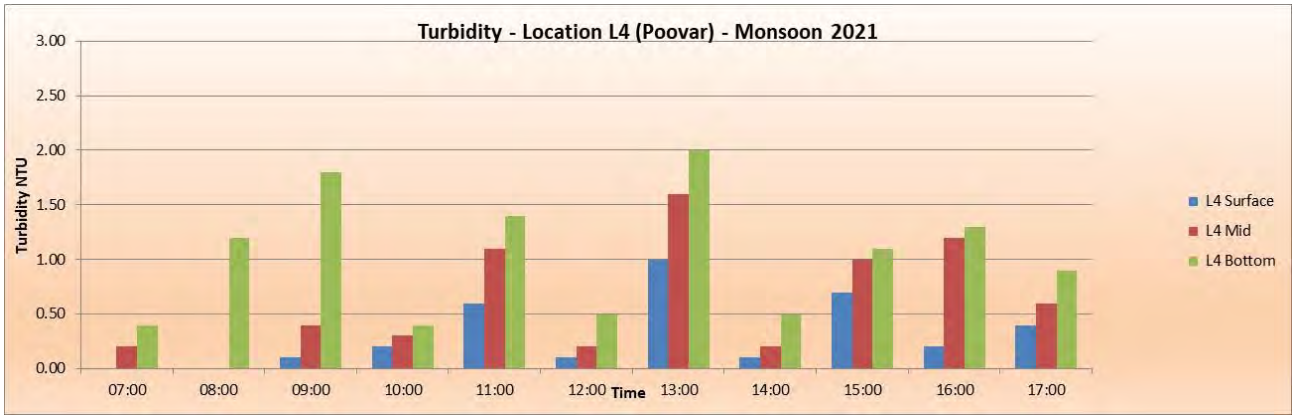
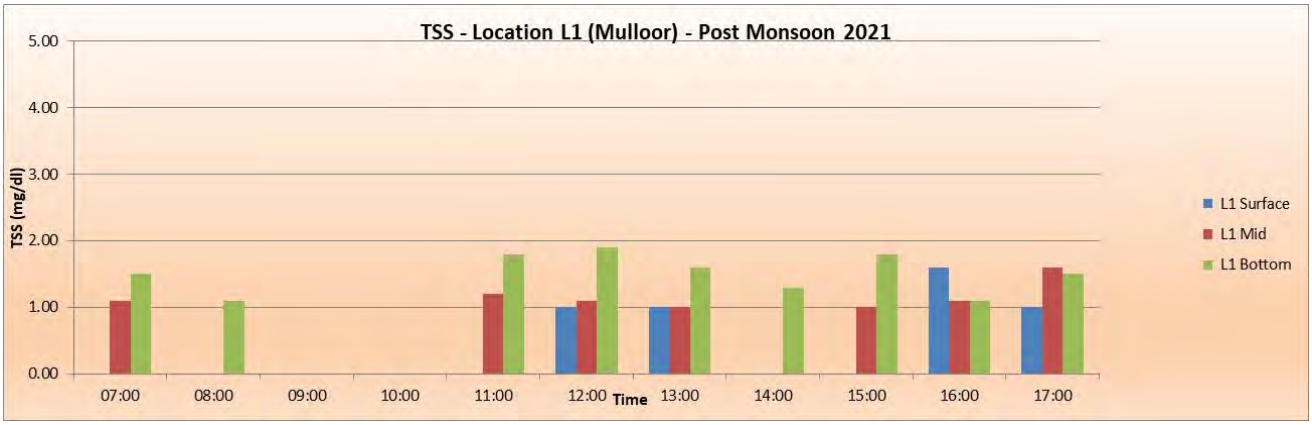


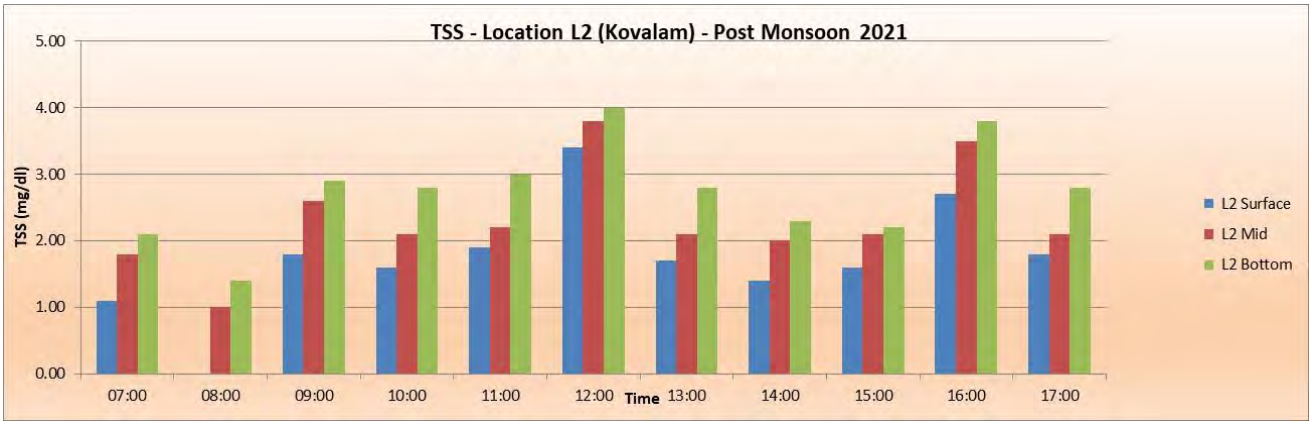
Figure 6-17: Time Series of Turbidity at water sampling locations

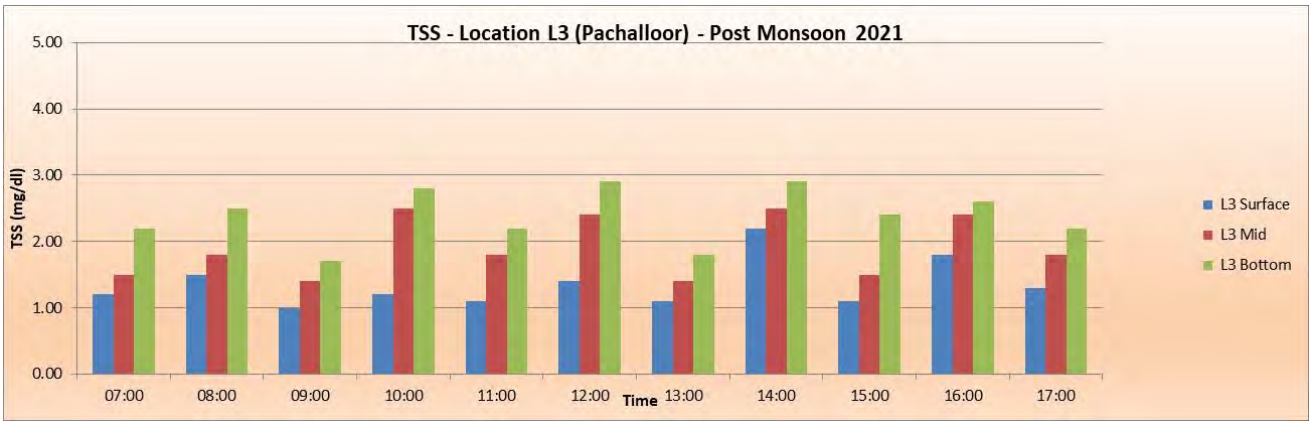
For the monsoon 2021 period the maximum turbidity recorded was 2.8 NTU near the bottom at Location L2 (Kovalam).

Note: *At times, when the value of Turbidity dropped to less than 0.1 NTU, it was Below Detectable Level (BDL) and the exact value could not be measured accurately and thus the column is not shown in the bar chart.*

The time series for Total Suspended Solids (in mg/l) for all the locations for the post-monsoon 2021 period are provided below.


TSS - Location L1 (Mulloor) - Post Monsoon 2021
TSS (mg/dl)
5.00
4.00
3.00
2.00
1.00
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L1 Surface
L1 Mid
L1 Bottom


TSS - Location L2 (Kovalam) - Post Monsoon 2021
TSS (mg/dl)
5.00
4.00
3.00
2.00
1.00
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L2 Surface
L2 Mid
L2 Bottom


TSS - Location L3 (Pachalloor) - Post Monsoon 2021
TSS (mg/dl)
5.00
4.00
3.00
2.00
1.00
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L3 Surface
L3 Mid
L3 Bottom

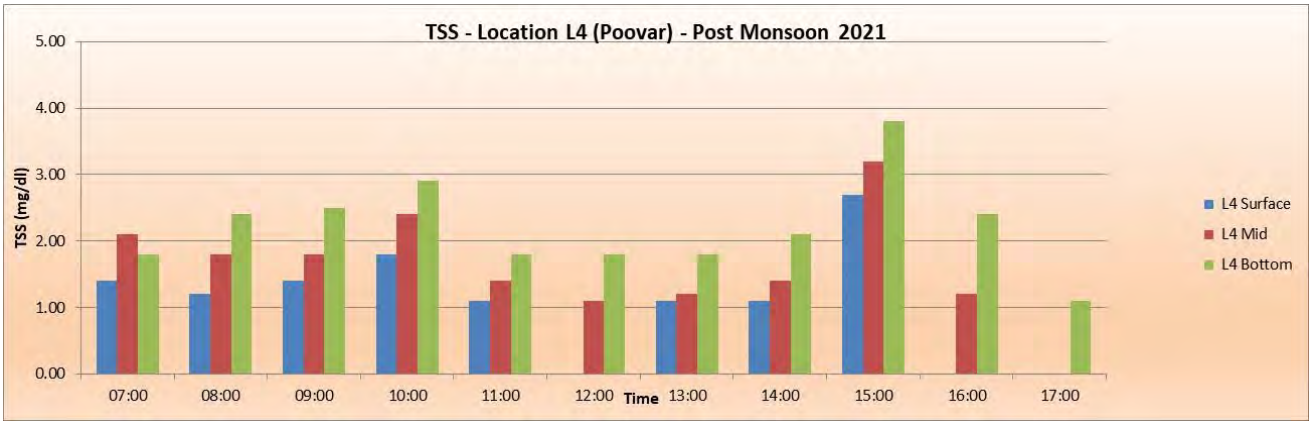
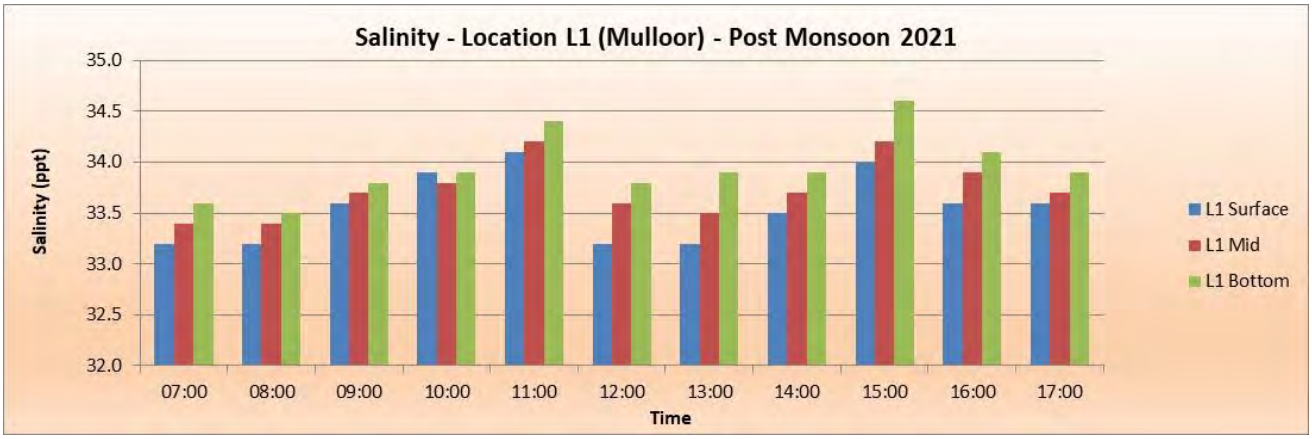


Figure 6-18: Time Series of TSS

The maximum TSS recorded was 4.0 mg/dl near the bottom at Location L2 (Kovalam) for the post monsoon 2021 period

Note: TSS values of less than 1 mg/dl are Below Detection Level (BDL) of the testing system and are hence not shown on the bar chart.

The histograms for salinity at all three levels for all the locations for the post monsoon 2021 period are given as follows.



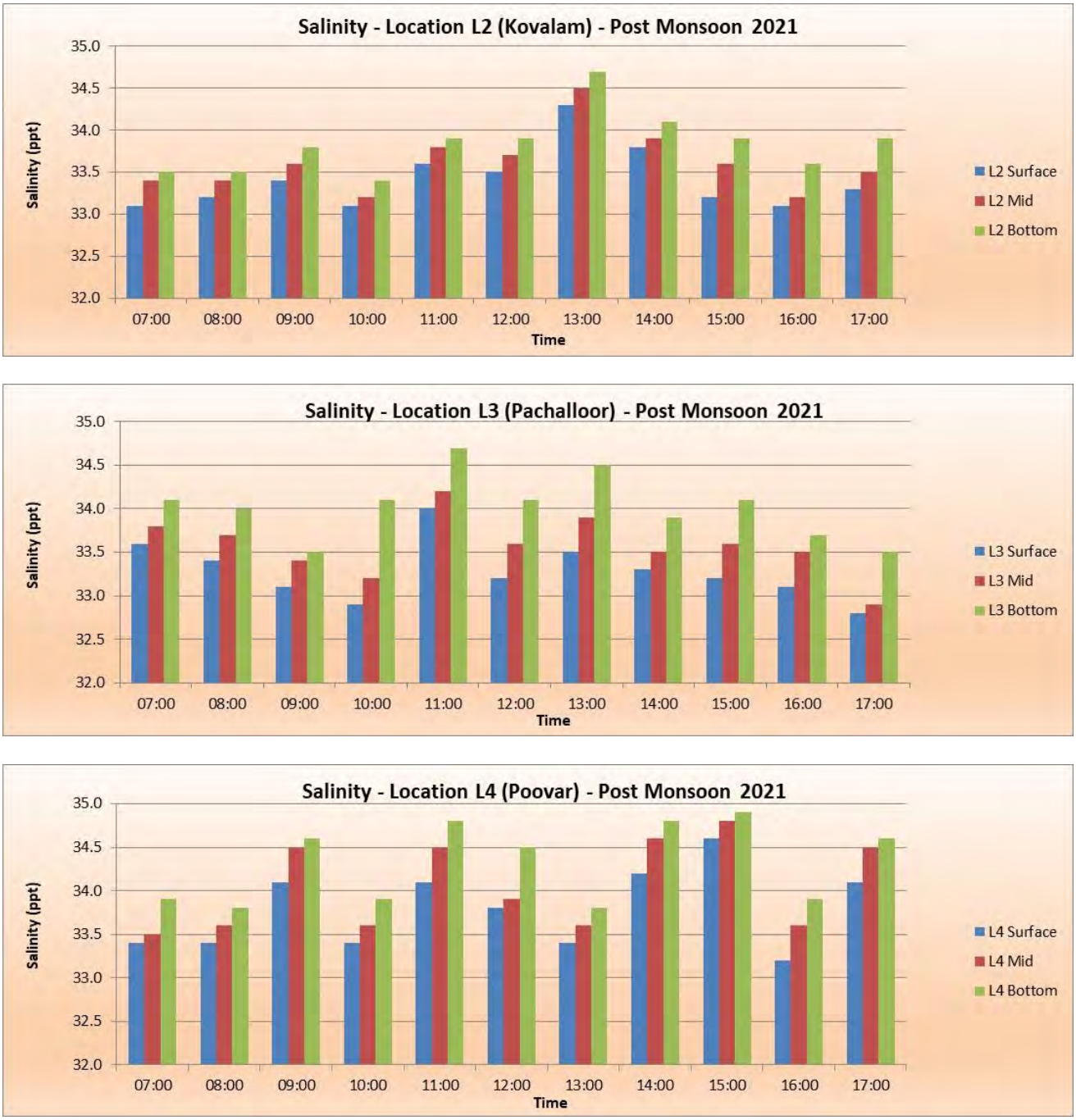
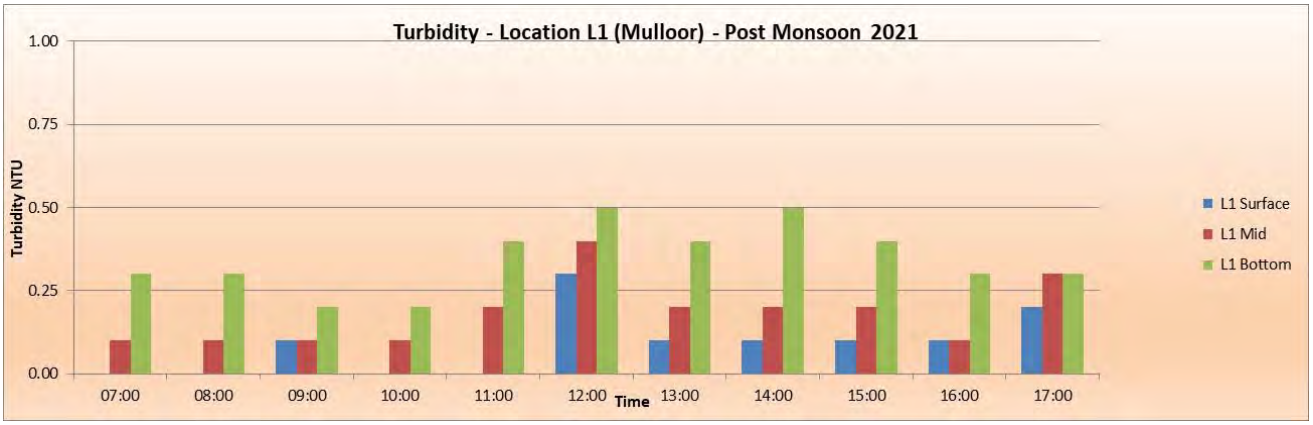
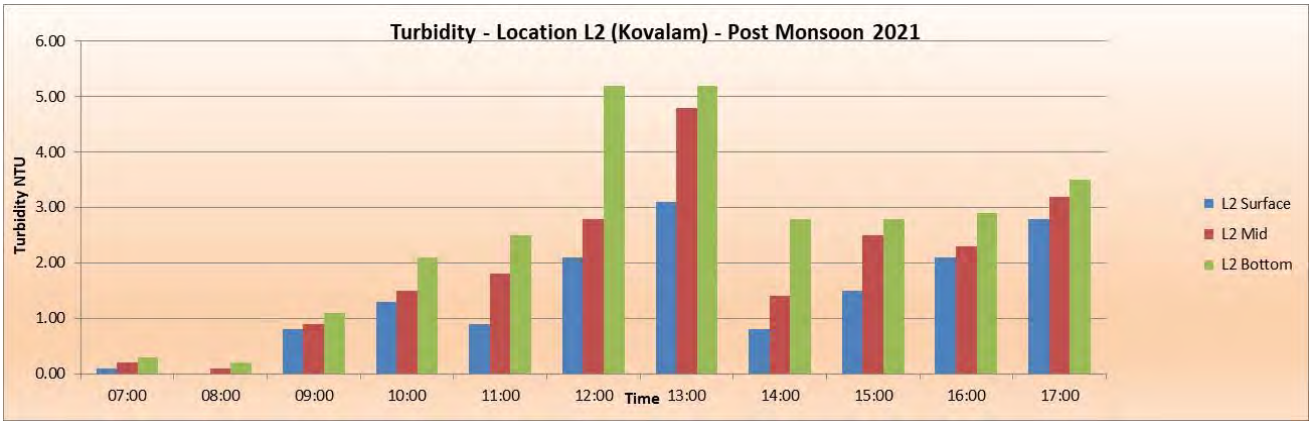


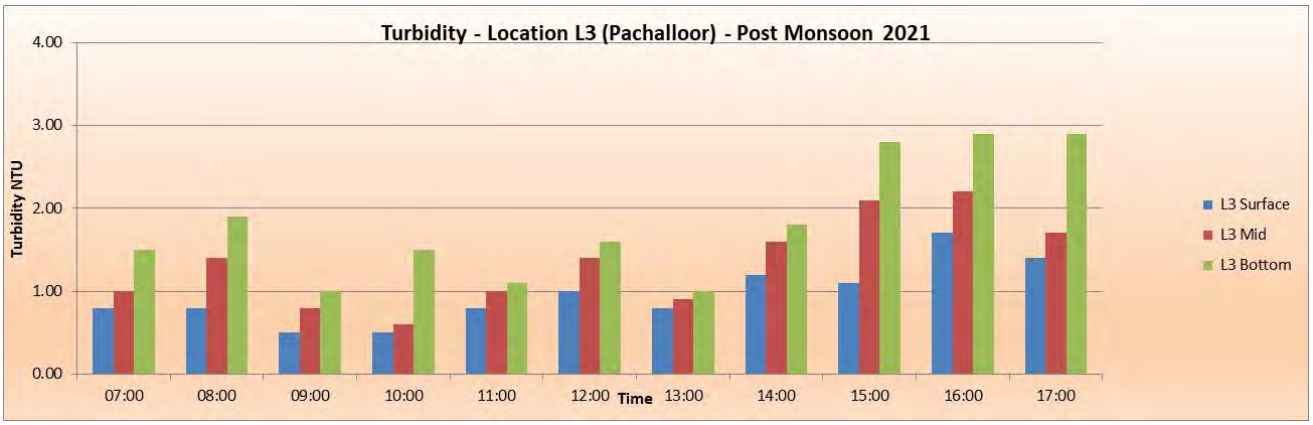
Figure 6-19: Time Series of salinity

The salinity at all locations is seen to be between 32.8 and 34.9 parts per thousand (ppt).

The histograms for turbidity at all levels for the locations for the post monsoon 2021 period is shown below.


Turbidity - Location L1 (Mulloor) - Post Monsoon 2021
Turbidity NTU
1.00
0.75
0.50
0.25
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L1 Surface
L1 Mid
L1 Bottom


Turbidity - Location L2 (Kovalam) - Post Monsoon 2021
Turbidity NTU
6.00
5.00
4.00
3.00
2.00
1.00
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L2 Surface
L2 Mid
L2 Bottom


Turbidity - Location L3 (Pachalloor) - Post Monsoon 2021
Turbidity NTU
4.00
3.00
2.00
1.00
0.00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time
L3 Surface
L3 Mid
L3 Bottom

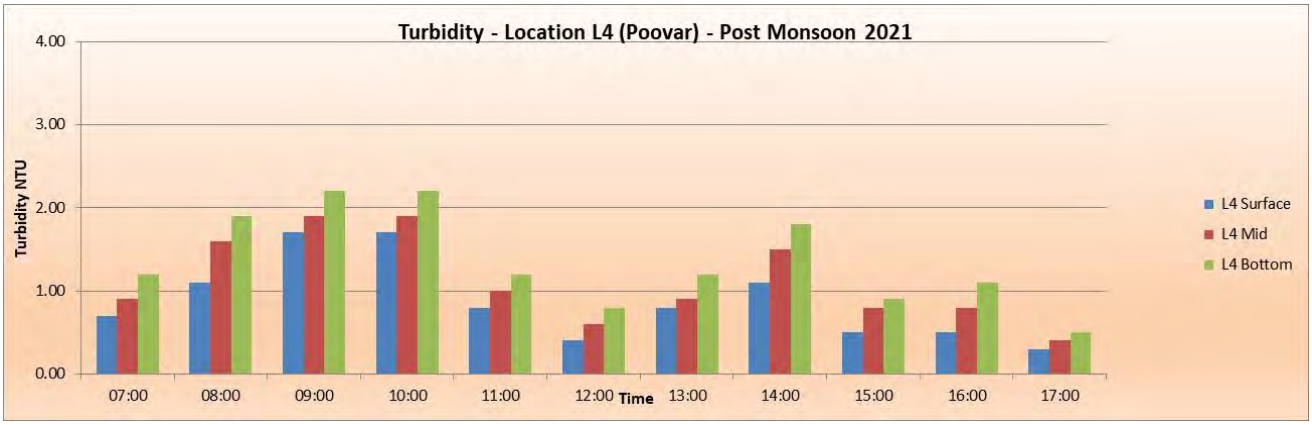


Figure 6-20: Time Series of Turbidity at water sampling locations

The maximum turbidity recorded was 5.2 NTU near the bottom at Location L2 (Kovalam) for the post monsoon 2021 period.

Note: Turbidity values of less than 0.1 NTU are Below Detection Level (BDL) of the testing system and are hence not shown in the bar chart.

6.10 Beach Sampling

Beach samples were collected from 66 out of the 81 locations for the post-monsoon 2021 period. The samples which could not be collected due to lack of beach were BS-11 to BS-14, BS-32, BS-49 to BS-52, BS-59 and BS-63 to BS-67.

The following table shows the D50 value (in mm) of the sediments collected along with the soil classification (Wentworth classification is followed) for the post monsoon 2021 period.

Table 6-13: Beach sample soil classification (Post-monsoon 2021period)

Sample Name	Gravel %	Sand %	Mud%	Total	D50 (mm)	Classification
BS-1	0	100	0	100	0.6276	Coarse Sand
BS-2	0	100	0	100	0.7039	Coarse Sand
BS-3	Not collected					
BS-4	0	100	0	100	0.4681	Medium Sand
BS-5	0	100	0	100	0.5743	Coarse Sand
BS-6	0	100	0	100	0.6143	Coarse Sand
BS-7	0	100	0	100	0.5481	Coarse Sand
BS-8	0	100	0	100	0.5224	Coarse Sand
BS-9	0	100	0	100	0.6587	Coarse Sand
BS-10	0	100	0	100	0.5320	Coarse Sand
BS-11	0	100	0	100	0.5700	Coarse Sand
BS-12	0	100	0	100	0.4272	Medium Sand
BS-13	0	100	0	100	0.5452	Coarse Sand
BS-14	0	100	0	100	0.5503	Coarse Sand
BS-15	0	100	0	100	0.4883	Medium Sand
BS-16	0	100	0	100	0.5109	Coarse Sand
BS-17	0	100	0	100	0.5392	Coarse Sand
BS-18	0	100	0	100	0.5235	Coarse Sand
BS-19	0	100	0	100	0.5145	Coarse Sand
BS-20	0	100	0	100	0.5082	Coarse Sand
BS-21	0	100	0	100	0.5091	Coarse Sand
BS-22	0	100	0	100	0.5450	Coarse Sand
BS-23	0	100	0	100	0.4785	Medium Sand
BS-24	0	100	0	100	0.4570	Medium Sand
BS-25	0	100	0	100	0.5979	Coarse Sand
BS-26	0	100	0	100	0.3705	Medium Sand
BS-27	0	100	0	100	0.4260	Medium Sand
BS-28	0	100	0	100	0.5624	Coarse Sand
BS-29	0	100	0	100	0.5697	Coarse Sand
BS-30	0	100	0	100	0.4586	Medium Sand
BS-31	0	100	0	100	0.5836	Coarse Sand
BS-32	0	100	0	100	0.4946	Medium Sand
BS-33	0	100	0	100	0.7156	Coarse Sand
BS-34	0	100	0	100	0.3414	Medium Sand
BS-35	Not collected					
BS-35A	0	100	0	100	0.4957	Medium Sand
BS-36	0	100	0	100	0.4138	Medium Sand
BS-37	0	100	0	100	0.5657	Coarse Sand
BS-38	0	100	0	100	0.5784	Coarse Sand
BS-39	0	100	0	100	0.6013	Coarse Sand

Sample Name	Gravel %	Sand %	Mud%	Total	D50 (mm)	Classification
BS-40	0	100	0	100	0.7375	Coarse Sand
BS-40A	0	100	0	100	0.6762	Coarse Sand
BS-41	0	100	0	100	0.4447	Medium Sand
BS-42	0	100	0	100	0.2599	Medium Sand
BS-43	0	100	0	100	0.2430	Fine Sand
BS-44	0	100	0	100	0.2762	Medium Sand
BS-45	0	100	0	100	0.3407	Medium Sand
BS-46	0	100	0	100	0.3321	Medium Sand
BS-47	Not collected					
BS-48	Not collected					
BS-49	Not collected					
BS-50	Not collected					
BS-51	Not collected					
BS-52	Not collected					
BS-53	0	100	0	100	0.4716	Medium Sand
BS-54	0	100	0	100	0.3801	Medium Sand
BS-55	0	100	0	100	0.4053	Medium Sand
BS-56	Not collected					
BS-57	Not collected					
BS-58	Not collected					
BS-59	Not collected					
BS-60	Not collected					
BS-61	0	100	0	100	0.4096	Medium Sand
BS-62	0	100	0	100	0.4304	Medium Sand
BS-63	Not collected					
BS-64	0	100	0	100	0.4306	Medium Sand
BS-65	Not collected					
BS-66	Not collected					
BS-67	0	100	0	100	0.6042	Coarse Sand
BS-68	0	100	0	100	0.4412	Medium Sand
BS-69	0	100	0	100	0.3194	Medium Sand
BS-70	0	100	0	100	0.4940	Medium Sand
BS-71	0	100	0	100	0.4045	Medium Sand
BS-72	0	100	0	100	0.3991	Medium Sand
BS-73	0	100	0	100	0.3917	Medium Sand
BS-74	0	100	0	100	0.3553	Medium Sand
BS-75	0	100	0	100	0.3784	Medium Sand
BS-76	0	100	0	100	0.4199	Medium Sand
BS-77	0	100	0	100	0.3545	Medium Sand
BS-78	0	100	0	100	0.3488	Medium Sand
BS-79	0	100	0	100	0.4803	Medium Sand
BS-80	0	100	0	100	0.4296	Medium Sand

Sample Name	Gravel %	Sand %	Mud%	Total	D50 (mm)	Classification
BS-81	0	100	0	100	0.4062	Medium Sand

The classification is based on Wentworth scale as provided below:

Very fine Sand – 0.0625 to 0.125 mm
Fine Sand – 0.125 to 0.250 mm
Medium Sand – 0.250 to 0.500 mm
Coarse Sand – 0.500 to 1.000 mm
Very coarse Sand – 1.000 to 2.000 mm

① The following graph shows the distribution of D50 value of the sediments collected in each location during the post monsoon 2021 period.

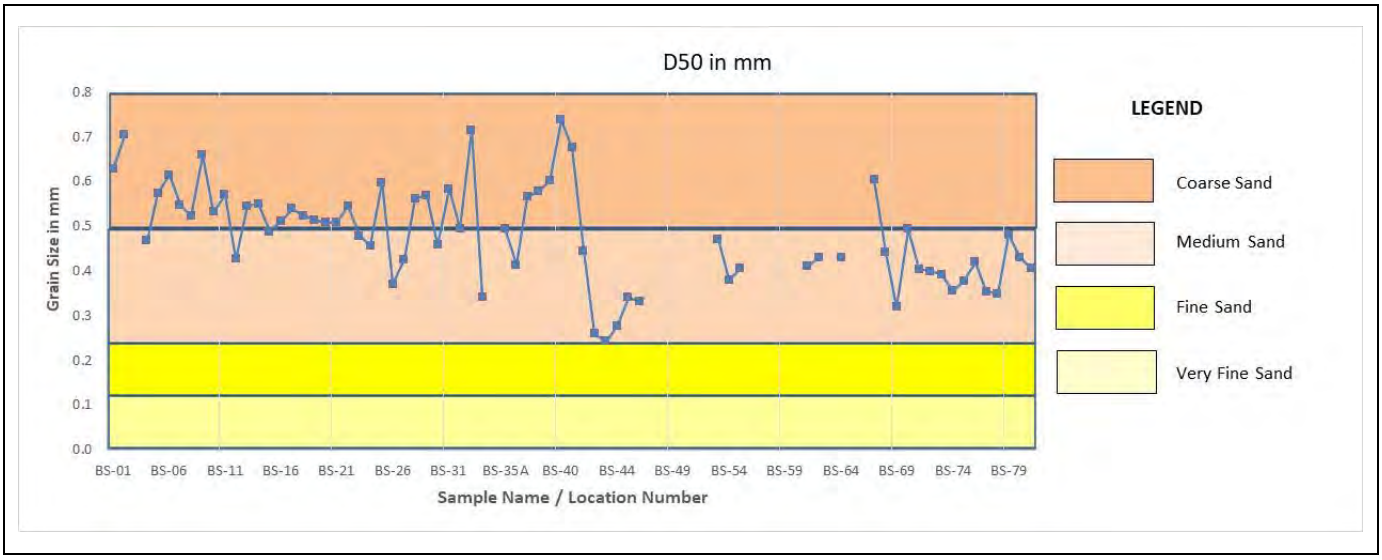
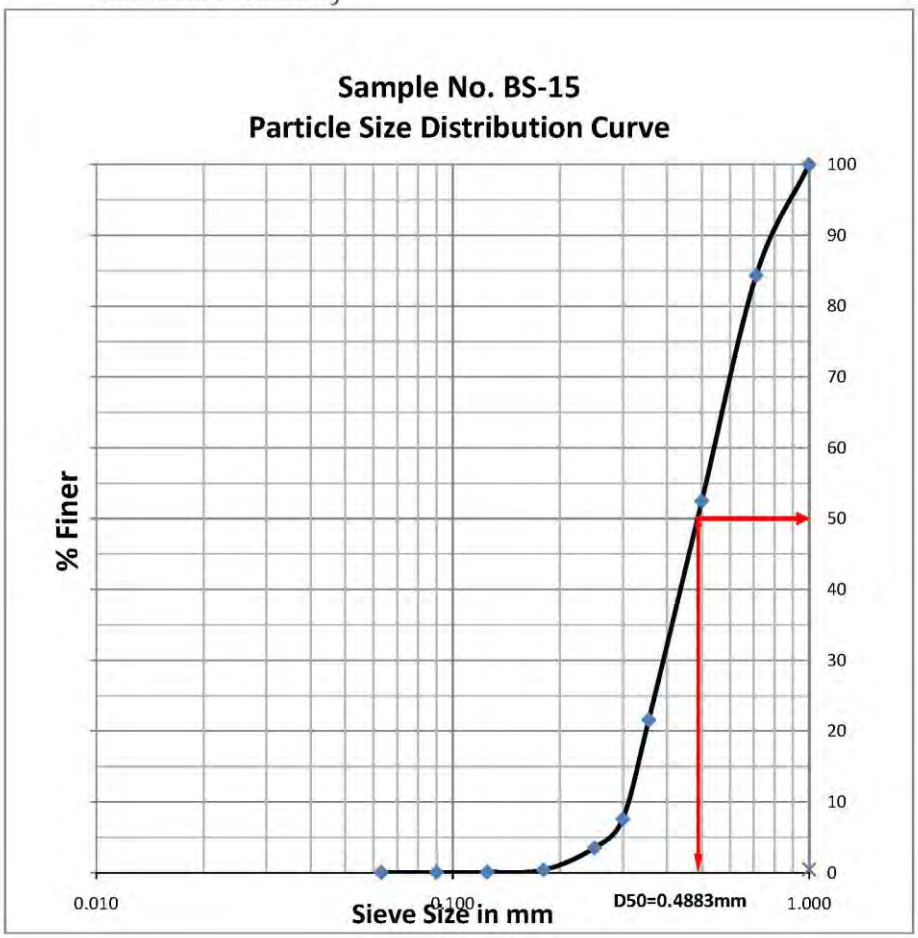


Figure 6-21: Distribution of D50 value of beach samples (Post monsoon 2021 period)

The particle size distribution curves for beach samples collected a few locations are placed in the images below.

Standard[S]
Environmental Monitoring



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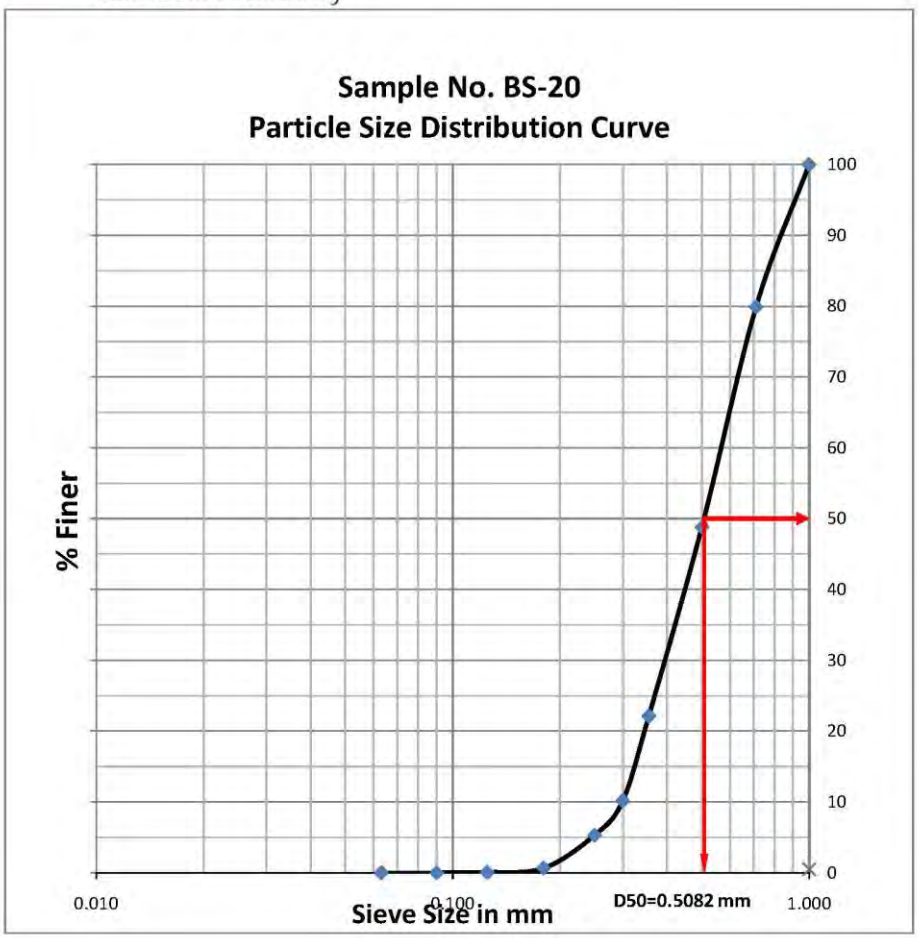
K.J. Tower, Pathalam, Udyogamandal P.O., Ernakulam-683 501, Tel. 0484-2546660, 93 87 27 24 02, 90 20 67 24 02
Web: www.sealabs.in, E-mail: seaalab@gmail.com, info@sealabs.in

Figure 6-22: Grain size distribution curve for BS-15 (Post monsoon 2021)

Standard[S]
Environmental Monitoring



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Web: www.sealabs.in, E-mail: seaalab@gmail.com, info@sealabs.in

Figure 6-23: Grain size distribution curve for BS-20 (Post monsoon 2021)

Standard[S] Environmental Monitoring

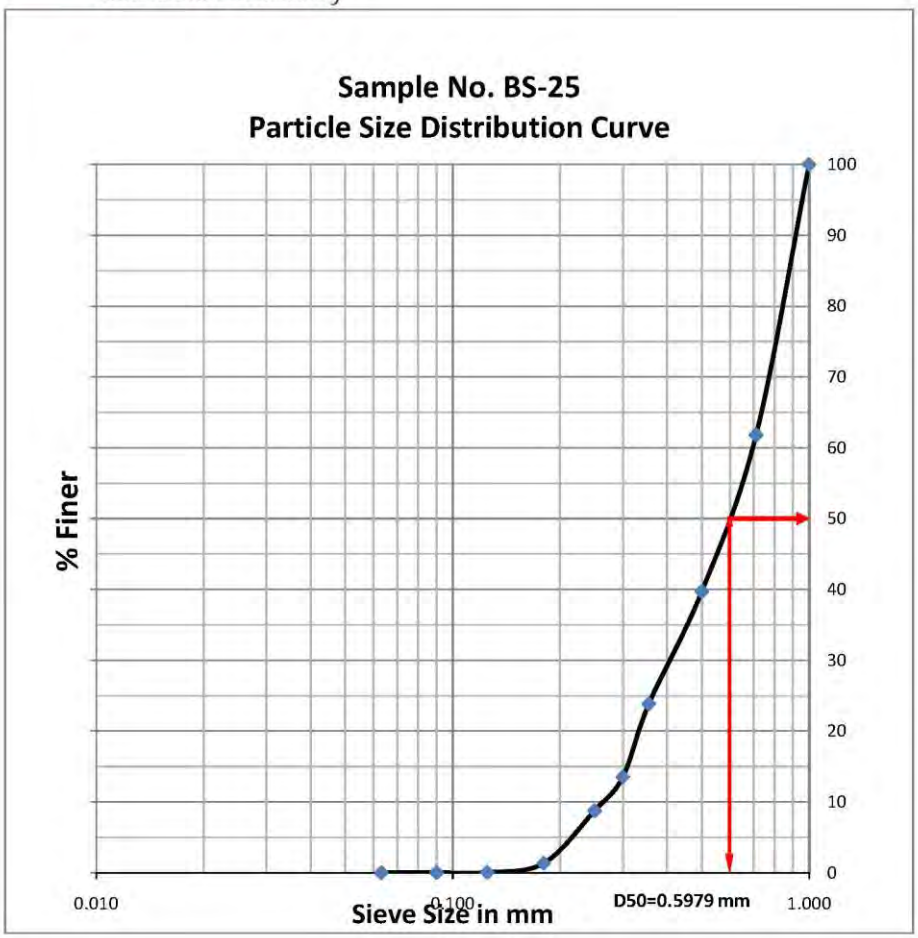

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Figure 6-24: Grain size distribution curve for BS-25 (Post monsoon 2021)

Standard[S] Environmental Monitoring

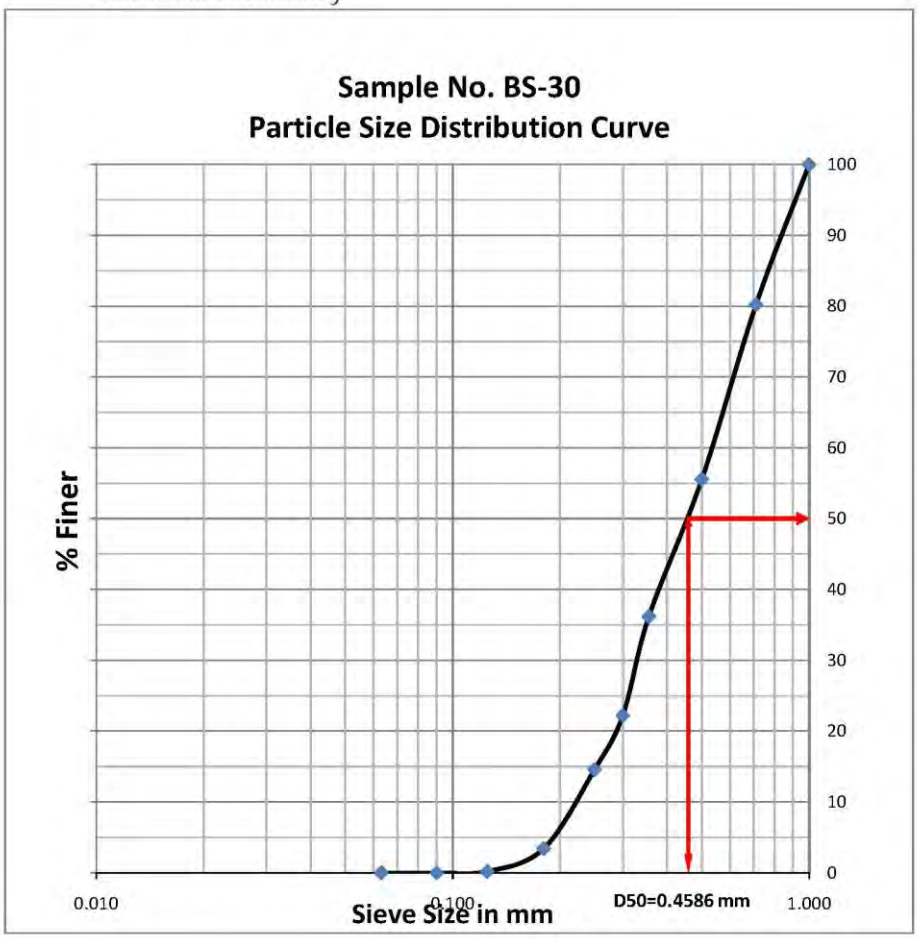

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Figure 6-25: Grain size distribution curve for BS-30 (Post monsoon 2021)

6.11 Turbidity Measurements

Turbidity is the cloudiness or haziness of a fluid caused by suspended solids that are usually invisible to the naked eye. It is generally expressed as Nephelometric Turbidity Units (NTU).

Nepheleisthe, Greek word for "cloud" and metric means “measure”. Nephelometric, therefore, means "measuring cloudiness." All turbidity measurements detect the amount of light either transmitted through or scattered by the particles in a sample of water. Most nephelometers measure the scattered light at 90°(the light source and the detector are oriented at right angles to each other.) If more light is able to reach the detector it means that there are many small particles scattering the source beam. If less light reaches the detector it indicates less particles in the water, and hence less turbidity. The amount of light scattered is influenced by many aspects of the particles, like colour, shape, and reflectivity.

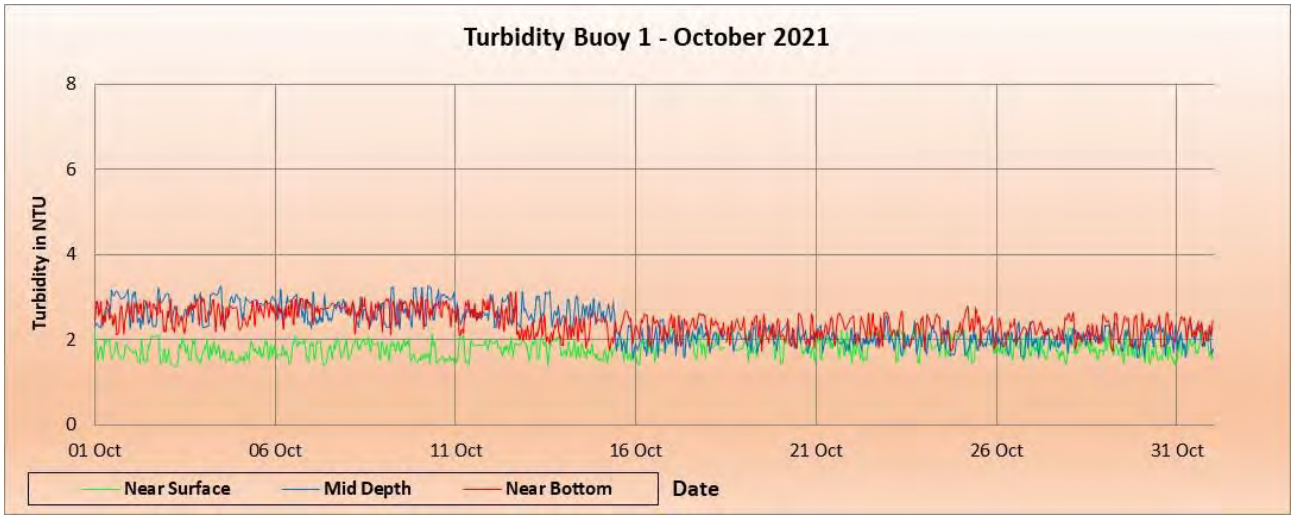
Turbidity monitoring buoys were deployed at three locations and the turbidity was measured at three different depths i.e. surface, mid-depth and bottom.

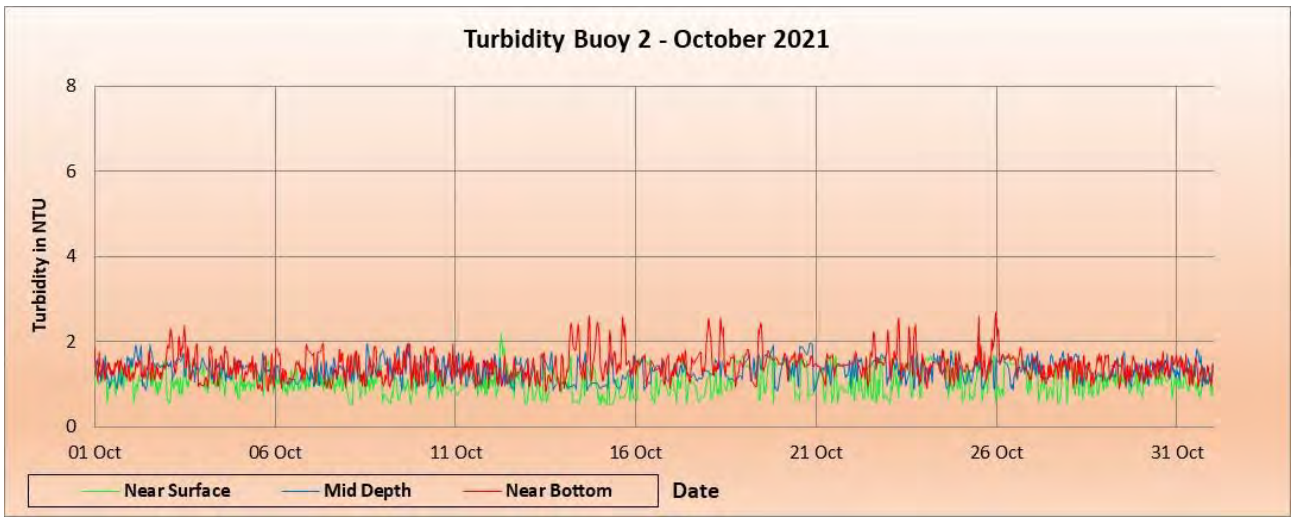
A summary of the maximum turbidity data (measured in NTU) recorded for the period of October 2021 to March 2022 at each turbidity buoy location is placed in the table below.

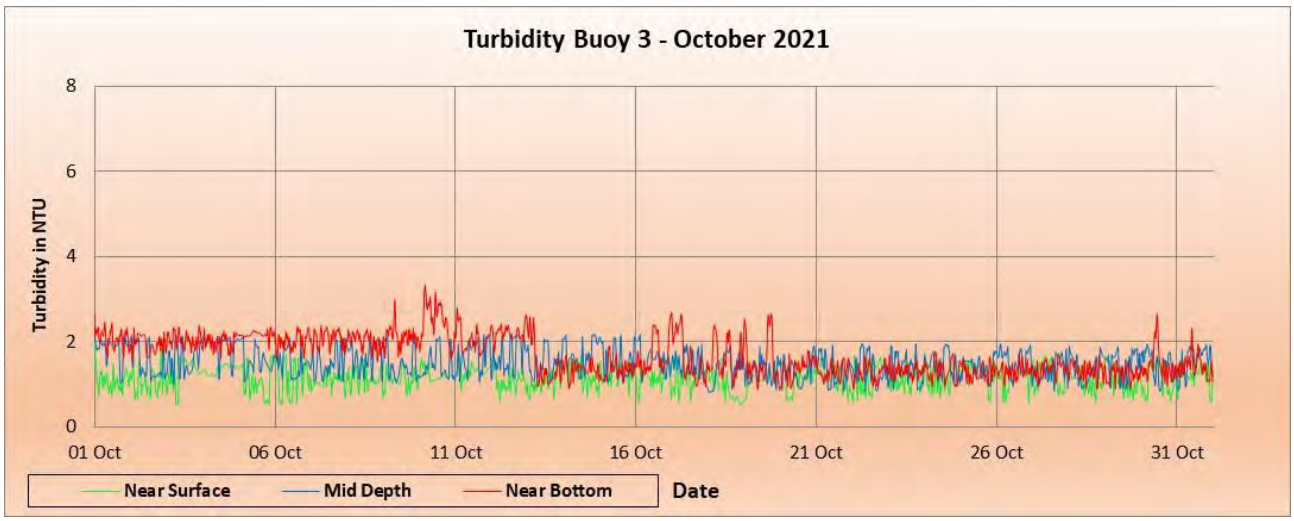
Table 6-14: Summary of maximum turbidity values in NTU

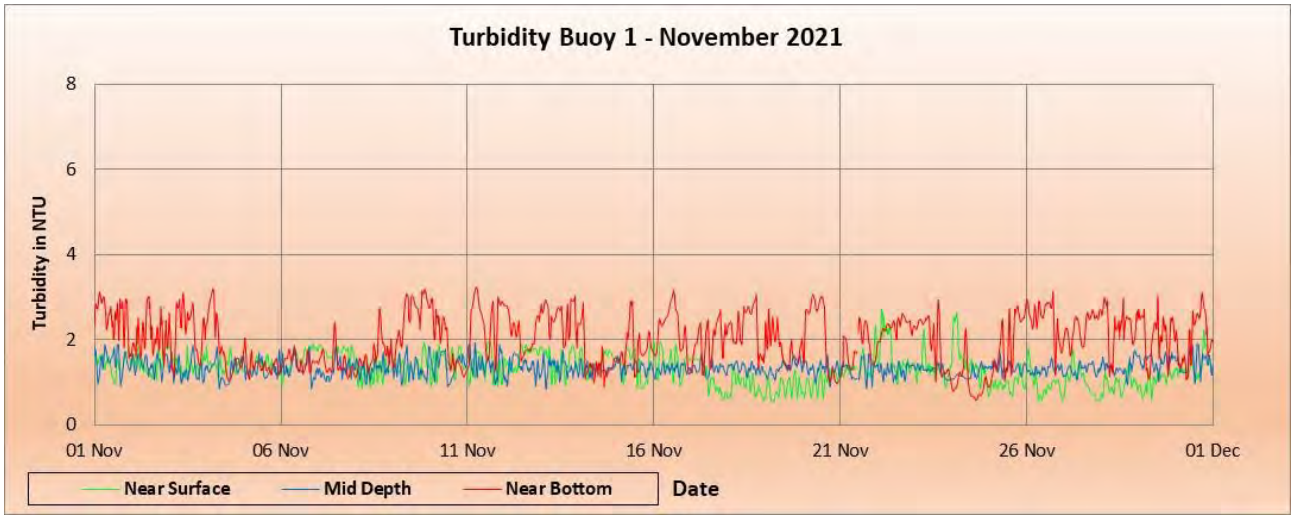
Location	Maximum Turbidity (NTU)	Depth	Month and Year
Turbidity Buoy-1	3.80	Near Bottom	January 2022
Turbidity Buoy-2	4.12	Near Bottom	December 2021
Turbidity Buoy-3	4.07	Near Surface	January 2022

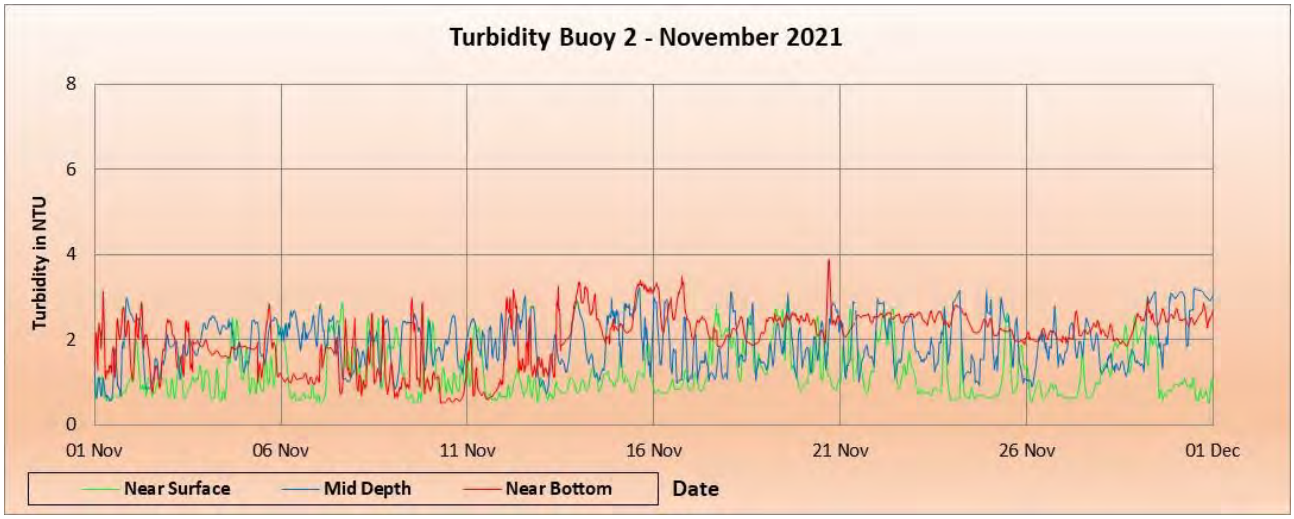
The time series curves of turbidity measurements from October 2021 to March 2022 are shown below.

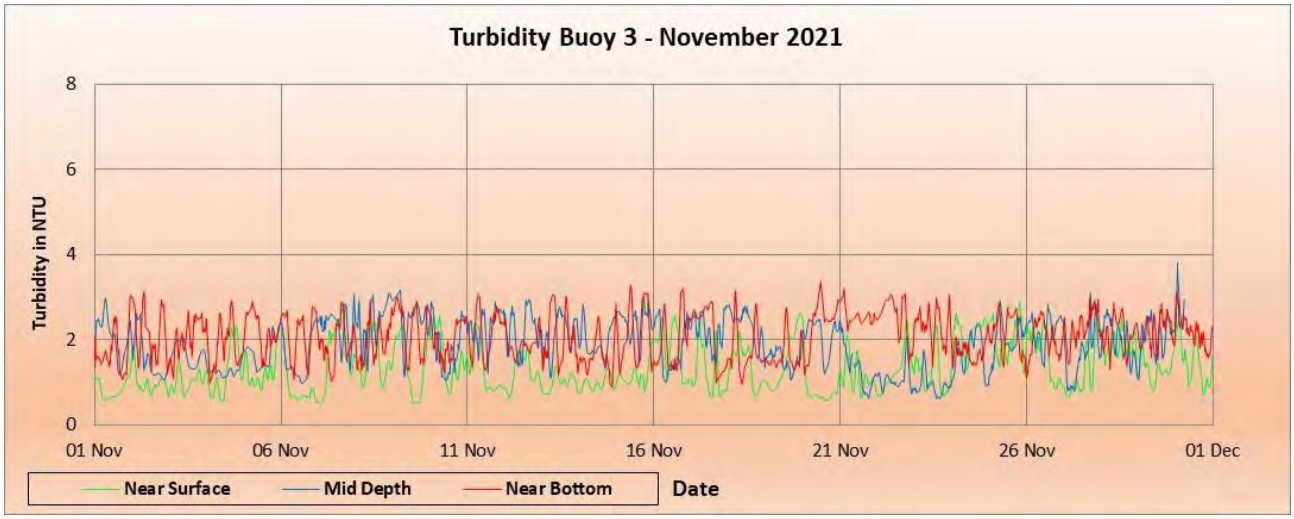

Turbidity Buoy 1 - October 2021
Turbidity in NTU
8
6
4
2
0
01 Oct
06 Oct
11 Oct
16 Oct
21 Oct
26 Oct
31 Oct
Near Surface
Mid Depth
Near Bottom
Date

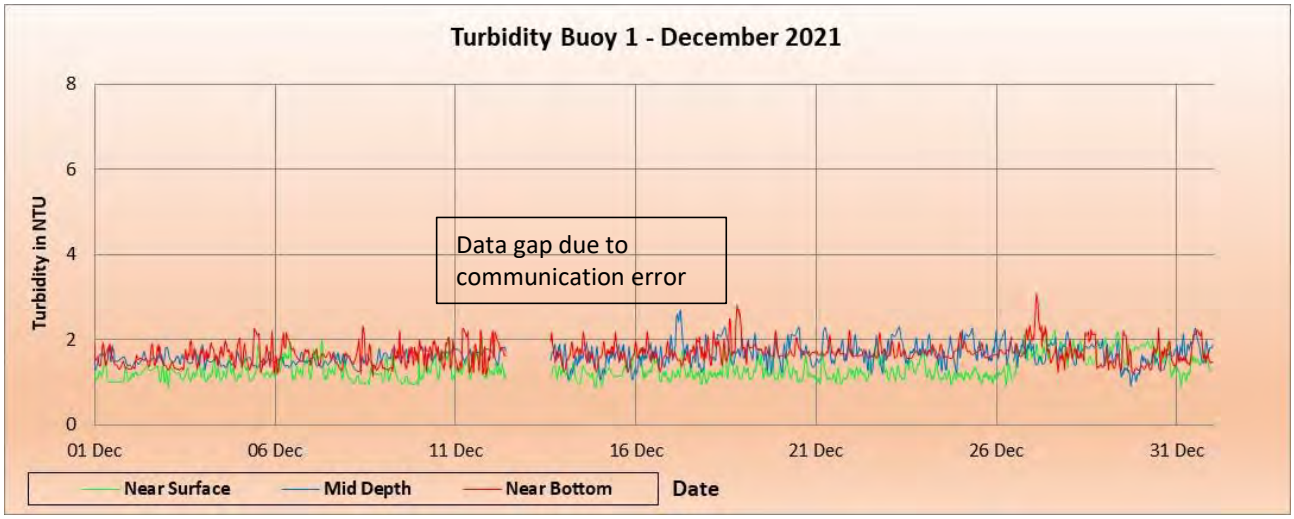

Turbidity Buoy 2 - October 2021
Turbidity in NTU
8
6
4
2
0
01 Oct
06 Oct
11 Oct
16 Oct
21 Oct
26 Oct
31 Oct
Near Surface
Mid Depth
Near Bottom
Date

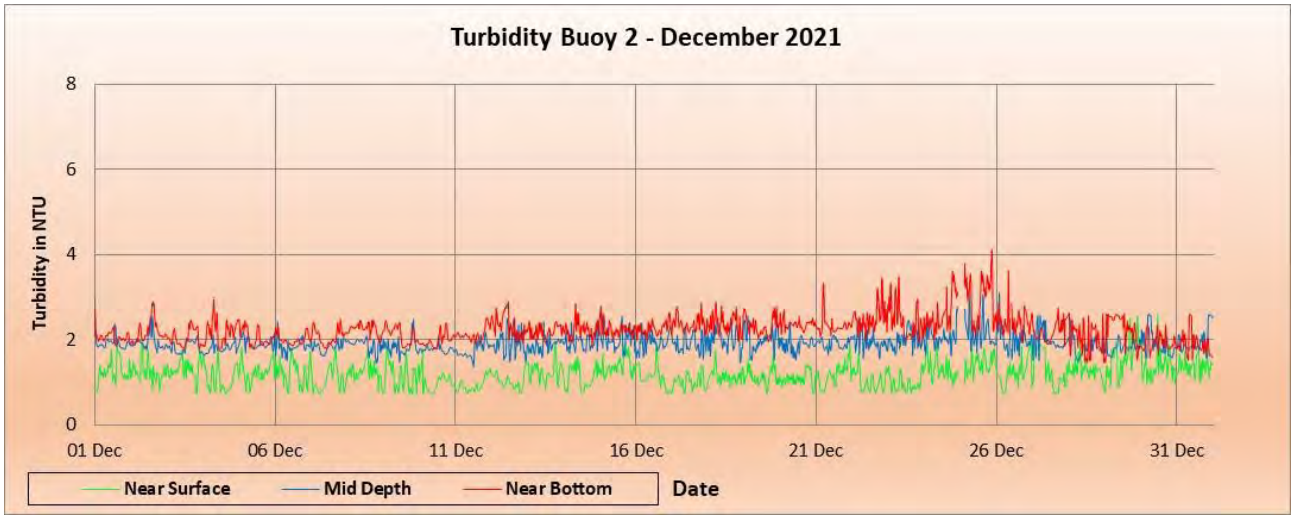

Turbidity Buoy 3 - October 2021
Turbidity in NTU
8
6
4
2
0
01 Oct
06 Oct
11 Oct
16 Oct
21 Oct
26 Oct
31 Oct
Near Surface
Mid Depth
Near Bottom
Date

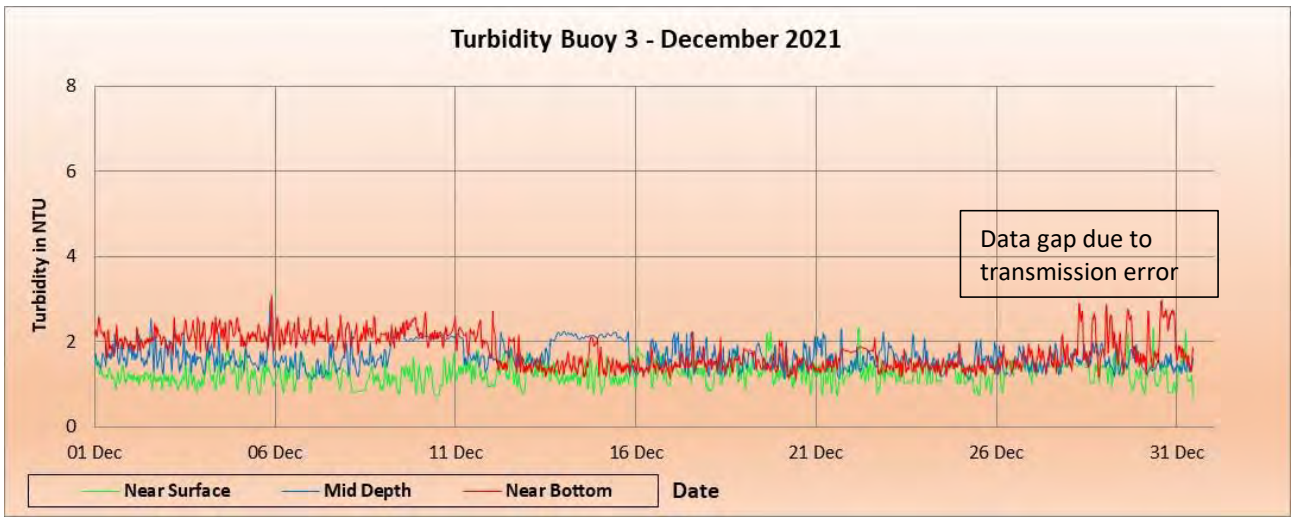

Turbidity Buoy 1 - November 2021
Turbidity in NTU
8
6
4
2
0
01 Nov
06 Nov
11 Nov
16 Nov
21 Nov
26 Nov
01 Dec
Near Surface
Mid Depth
Near Bottom
Date

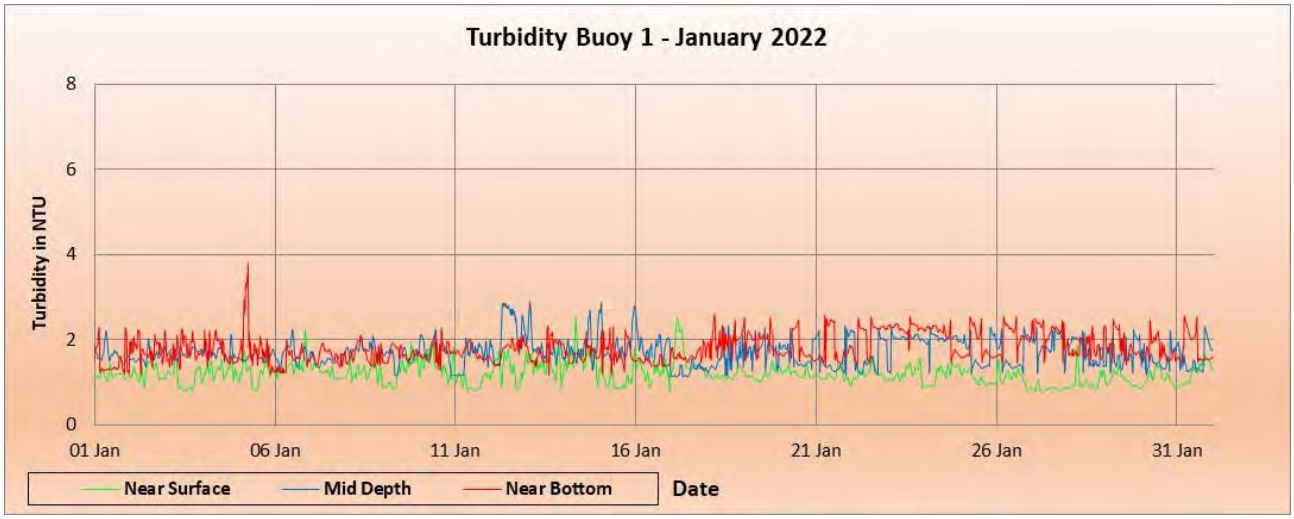

Turbidity Buoy 2 - November 2021
Turbidity in NTU
8
6
4
2
0
01 Nov
06 Nov
11 Nov
16 Nov
21 Nov
26 Nov
01 Dec
Near Surface
Mid Depth
Near Bottom
Date

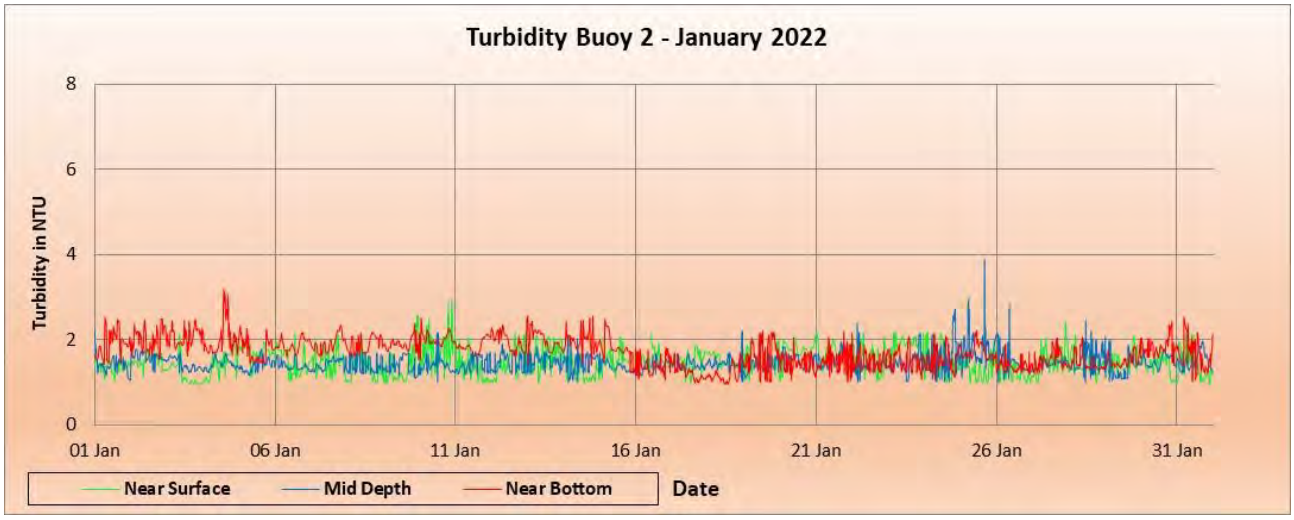

Turbidity Buoy 3 - November 2021
Turbidity in NTU
8
6
4
2
0
01 Nov
06 Nov
11 Nov
16 Nov
21 Nov
26 Nov
01 Dec
Near Surface
Mid Depth
Near Bottom
Date

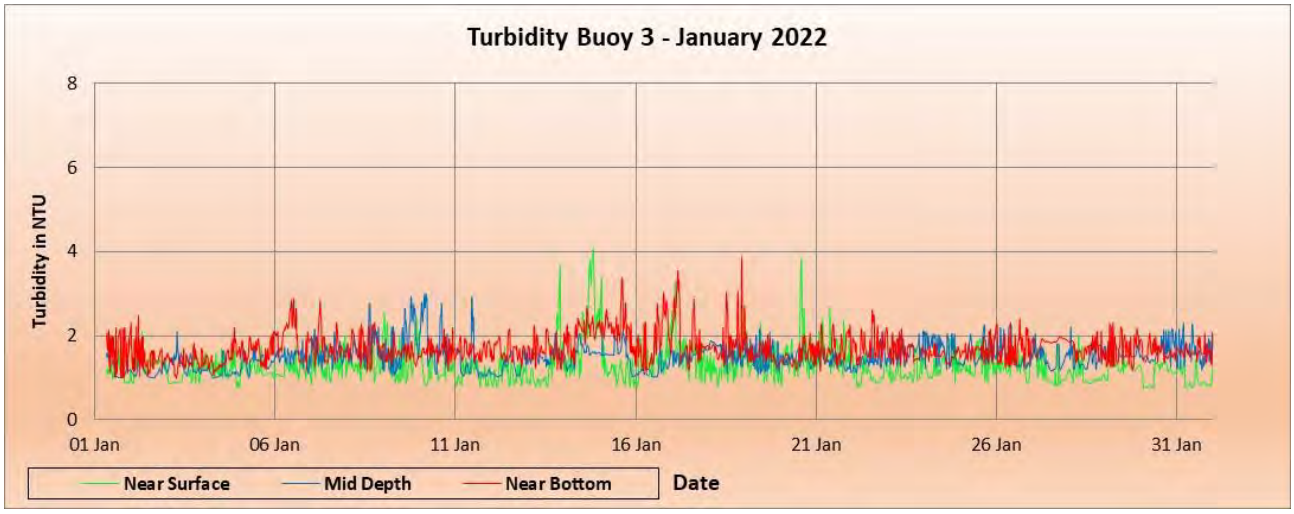

Turbidity Buoy 1 - December 2021
Turbidity in NTU
8
6
4
2
0
Data gap due to communication error
01 Dec
06 Dec
11 Dec
16 Dec
21 Dec
26 Dec
31 Dec
Near Surface
Mid Depth
Near Bottom
Date

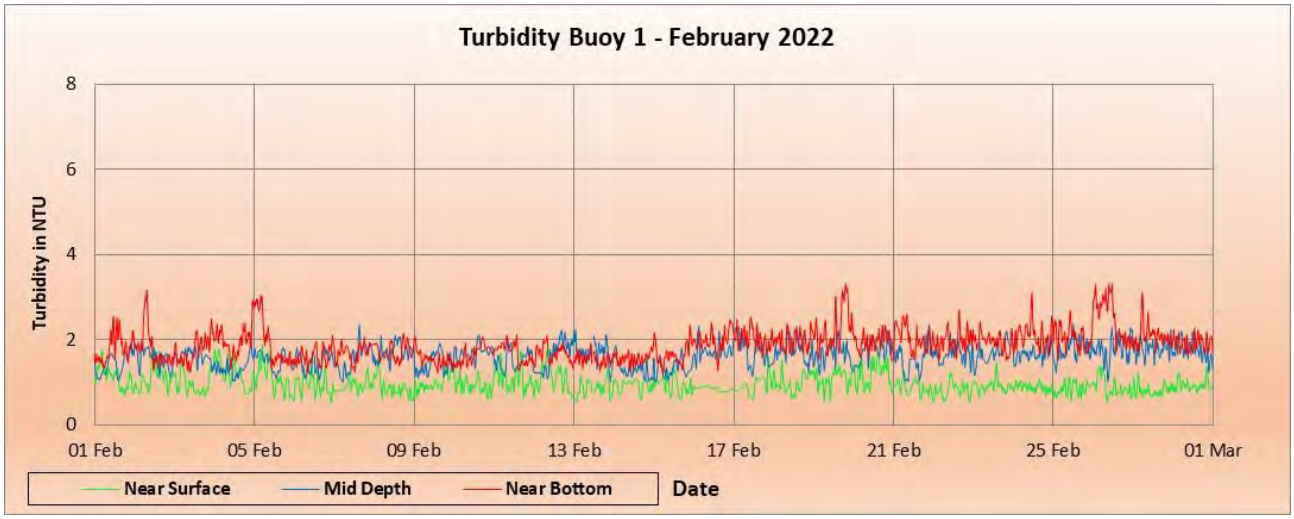

Turbidity Buoy 2 - December 2021
Turbidity in NTU
8
6
4
2
0
01 Dec
06 Dec
11 Dec
16 Dec
21 Dec
26 Dec
31 Dec
Near Surface
Mid Depth
Near Bottom
Date

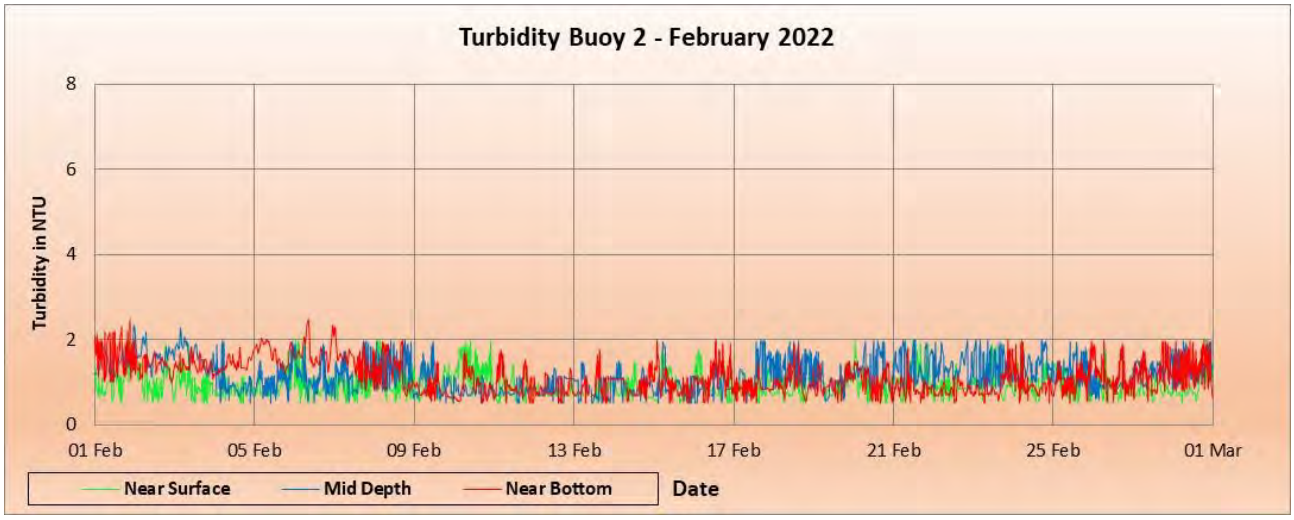

Turbidity Buoy 3 - December 2021
Turbidity in NTU
8
6
4
2
0
Data gap due to transmission error
01 Dec
06 Dec
11 Dec
16 Dec
21 Dec
26 Dec
31 Dec
Near Surface
Mid Depth
Near Bottom
Date

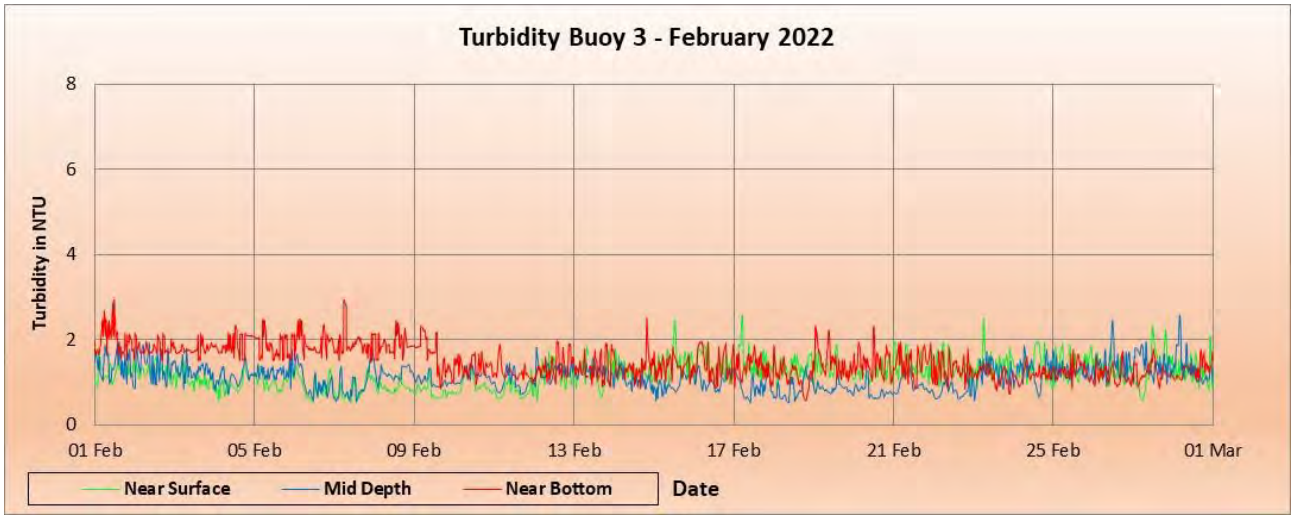

Turbidity Buoy 1 - January 2022
Turbidity in NTU
8
6
4
2
0
01 Jan
06 Jan
11 Jan
16 Jan
21 Jan
26 Jan
31 Jan
Near Surface
Mid Depth
Near Bottom
Date

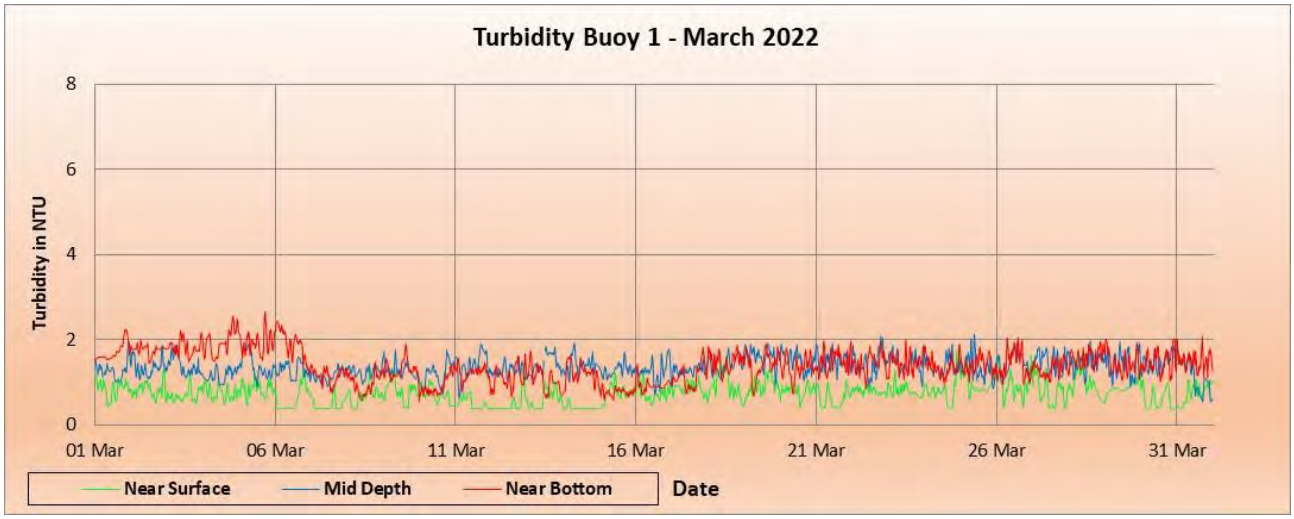

Turbidity Buoy 2 - January 2022
Turbidity in NTU
8
6
4
2
0
01 Jan
06 Jan
11 Jan
16 Jan
21 Jan
26 Jan
31 Jan
Near Surface
Mid Depth
Near Bottom
Date

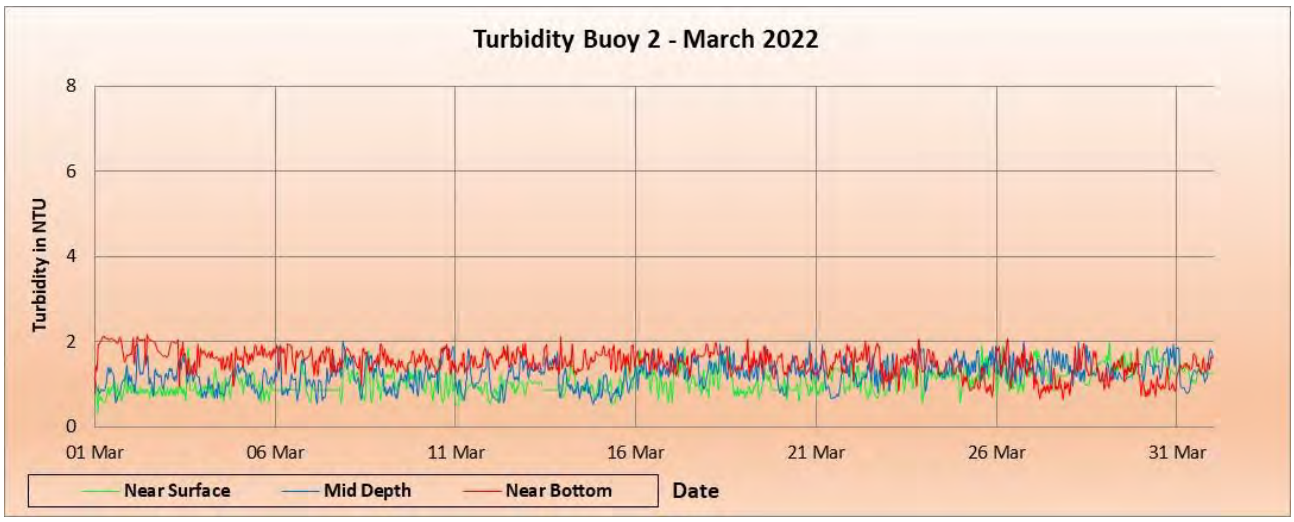

Turbidity Buoy 3 - January 2022
Turbidity in NTU
8
6
4
2
0
01 Jan
06 Jan
11 Jan
16 Jan
21 Jan
26 Jan
31 Jan
Near Surface
Mid Depth
Near Bottom
Date


Turbidity Buoy 1 - February 2022
Turbidity in NTU
0
2
4
6
8
01 Feb
05 Feb
09 Feb
13 Feb
17 Feb
21 Feb
25 Feb
01 Mar
Near Surface
Mid Depth
Near Bottom
Date


Turbidity Buoy 2 - February 2022
Turbidity in NTU
0
2
4
6
8
01 Feb
05 Feb
09 Feb
13 Feb
17 Feb
21 Feb
25 Feb
01 Mar
Near Surface
Mid Depth
Near Bottom
Date


Turbidity Buoy 3 - February 2022
Turbidity in NTU
0
2
4
6
8
01 Feb
05 Feb
09 Feb
13 Feb
17 Feb
21 Feb
25 Feb
01 Mar
Near Surface
Mid Depth
Near Bottom
Date





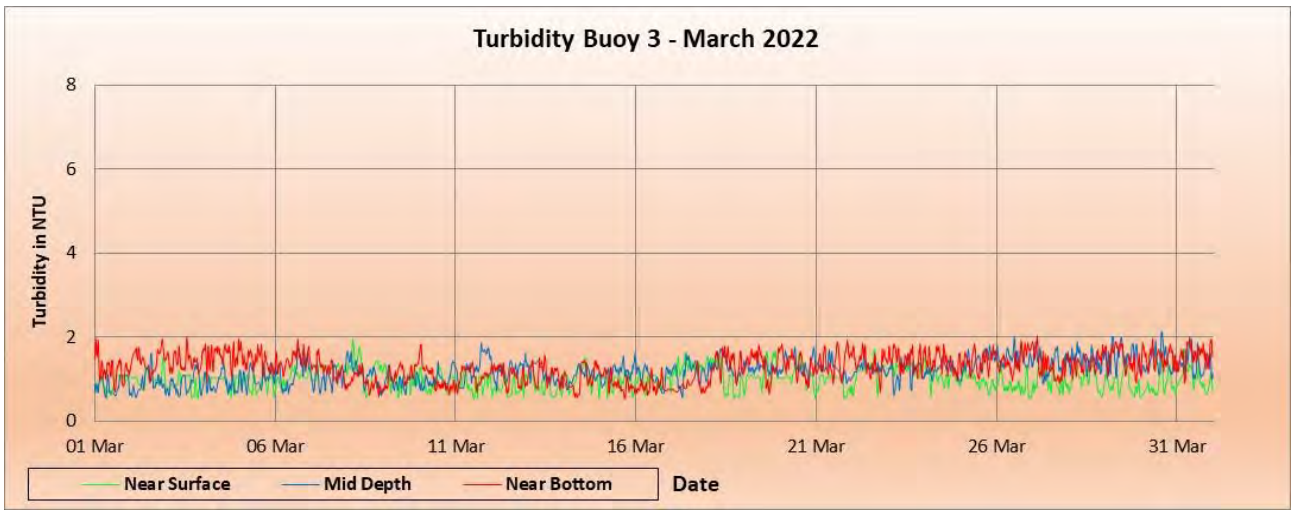


Figure 6-26: Time Series of Turbidity measurements

The validation of turbidity sensor data was carried out for the post monsoon 2021 period. The samples were collected on 4th, 5th and 6th March 2022. The following table provides the turbidity values measured from the buoys and from that of the collected samples, which were analysed for turbidity as per IS 3025, Part 10:1984 (reaffirmed 2017) in a NABL approved laboratory.

Table 6-15: Turbidity Values

Turbidity Values in NTU						
Buoy No.	**Observed from Buoy**			**Values from Collected Water Samples**		
	Sur	**Mid**	**Bot**	**Sur**	**Mid**	**Bot**
Turbidity Buoy-1	0.66	1.13	2.04	0.70	1.00	2.00
Turbidity Buoy-2	0.74	1.18	1.59	0.80	1.20	1.50
Turbidity Buoy-3	1.11	1.41	1.45	1.00	1.30	1.50

On comparing both the values, the integrity of the data obtained from the turbidity buoy sensors can be verified and it can be inferred that the sensors are performing as desired.

6.12 Bathymetry

Survey Location

The following image shows the coverage of the area surveyed using R2Sonic 2020 multibeam echo sounder.

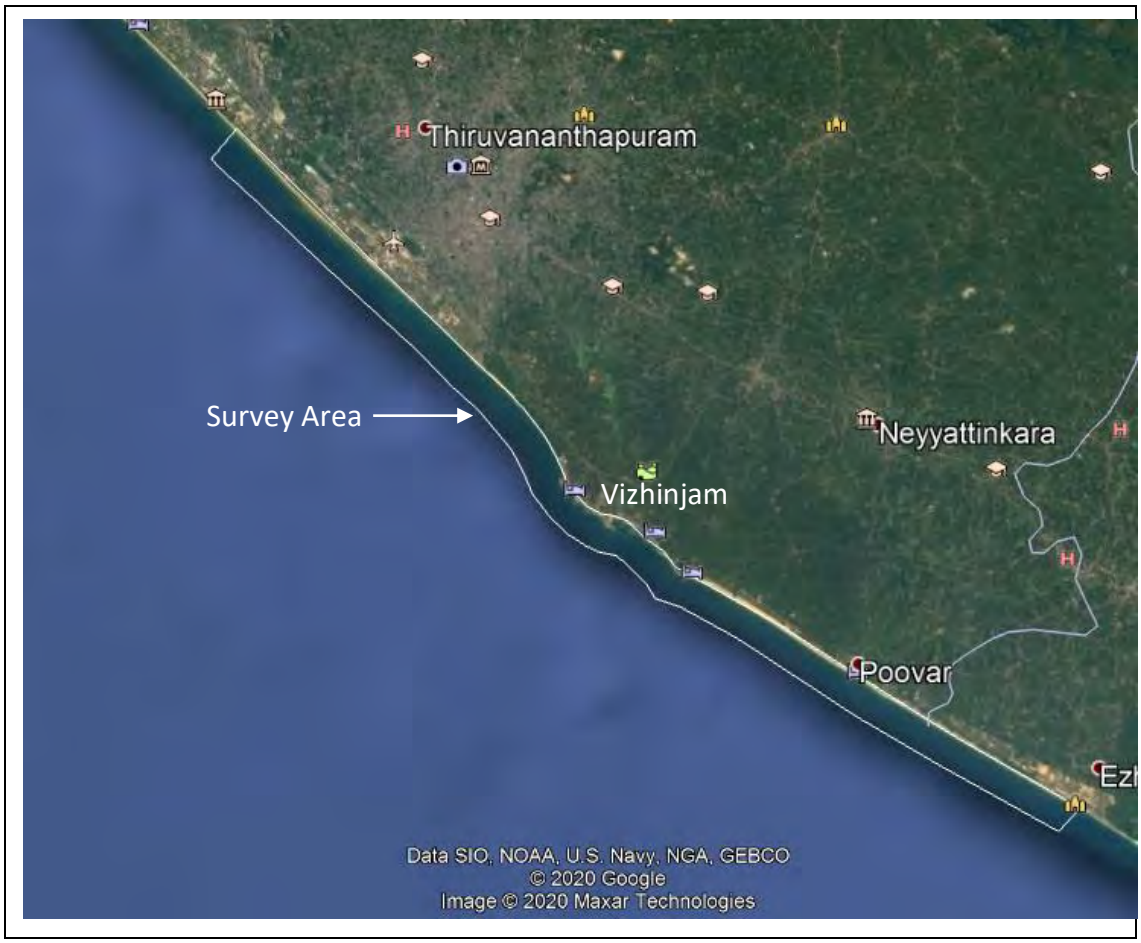


Figure 6-27: Bathymetry area coverage

Line Plan and Survey Methodology

The survey lines were planned at intervals of 25m parallel to the coast up to the depth of 20m. The vessel was positioned using a Trimble DGPS system which also provided the heading. The vessel tracks and offset positions were recorded digitally and the data from the multibeam echo sounder was logged digitally within the Hypack acquisition software.

Prior to commencement of the survey, the DGPS and gyrocompass calibrations were carried out when the survey vessel was berthed at the Vizhinjam Fishing Jetty. The multibeam echo sounder was calibrated by conducting the patch test. The bathymetric data was reduced to Chart Datum (CD) by using the observed tides from the tide gauge

installed at the Coast Guard Jetty. A Valeport Sound Velocity Probe (SVP) was used to measure the speed of sound of in the water column. Motion compensation was achieved by the DMS-05 Motion Reference Unit (MRU). Quality checks were constantly performed at every step of the data processing. Data was processed using Hypack software. Calibration values obtained from the patch test were applied to the acquired data along with the required sound velocity profile and tide data for creation of final xyz file.

Results

The bathymetric survey of the area about 40 km in length was carried out up to the 20m contour using a multibeam echo sounder.

The maximum depth recorded by multibeam echo sounder is 25.3m below CD in the northern part of the survey area at few locations along the western boundary. The seabed is seen to slope gently towards the southwest.

7 WEATHER

During the months of October to December 2021, the weather was extremely unfavourable for survey operations. On 28th November 2021, the Wave Rider Buoy drifted from its original location. It was salvaged the next day and sent for maintenance to NIOT. After the necessary works were carried out, the equipment was redeployed in the month of January 2022. While carrying out the cross-shore profiles, due to the breakers near shore, the boat had to take a turn between 4 to 5m water depth, due to heavy breakers in the nearshore section, considering the safety of personnel and equipment on board. After the weather improved, the nearshore survey was carried out using a pressure sensor installed on a sled.

8 REFERENCES

The following documents/web sites were referenced during the preparation of the report.

- AVPPL Service order 5700267194 dated 3rd May 2019
- Web site https://www.vizhinjamport.in/home.html, and https://www.vizhinjamport.in/download/Feasibility-Report.pdf
- WMO manual, section 5.2.2
- SAC Project Execution Plan SAC/P167-19/PEP AVPPL
- Monthly survey reports from October 2021 to March 2022

9 CONCLUSIONS

The following conclusions were made during this phase of the project:

1. Tide was mixed semi diurnal with a maximum range being observed during spring tide.
2. The significant wave heights decreased after the month of December 2021. The maximum wind speeds were blowing from the northwesterly direction.
3. The current direction was predominantly towards southeast in all locations. At Poovar, the flow was towards south as well as southeast.
4. The long-shore current speed was recorded in a northerly direction in the post monsoon months.
5. The salinity was in the range of 32.8 and 34.9 ppt for the water samples collected in both monsoon as well as post monsoon 2021 period.

6. The maximum Total Suspended Solids recorded was 4.3 mg/l near the bottom at Location L2 (Kovalam) for the monsoon 2021 period and 4.0 mg/l near the bottom at Location L2 (Kovalam) again for the post monsoon 2021 period
7. The maximum turbidity recorded at the water sampling locations was 2.8 NTU near the bottom of Location L2 (Kovalam) during the monsoon 2021 period and 5.2 NTU near the bottom at Location L2 (Kovalam) again for the post monsoon 2021 period
8. At the location of the turbidity buoys, the maximum turbidity recorded at Location 1 was 3.80 NTU near the bottom in the month of January 2022, maximum turbidity measured at Location 2 was 4.12 NTU near the bottom in the month of December 2021 and that recorded at Location 3 was 4.07 NTU near the surface in the month of January 2022.
9. The beach samples consisted mainly of coarse to medium sand.
10. The seabed is seen to slope gently towards the southwest. The maximum depth recorded by multibeam echo sounder is 25.3m below CD in the northern part of the survey area at few locations along the western boundary.

10 ACKNOWLEDGEMENTS

During the course of project, the support received from AVPPL staff is highly appreciated and acknowledged. The guidance received throughout the project from NIOT scientists is also hereby appreciated. The boat crew and all others, who had supported us during the project is also acknowledged.

Annexure I

Photo Documentation At CSP Locations - March 2022

Figure 1- March CSP 01

Figure 2- March CSP 02

Figure 3- March CSP 03

Figure 4- March CSP 04

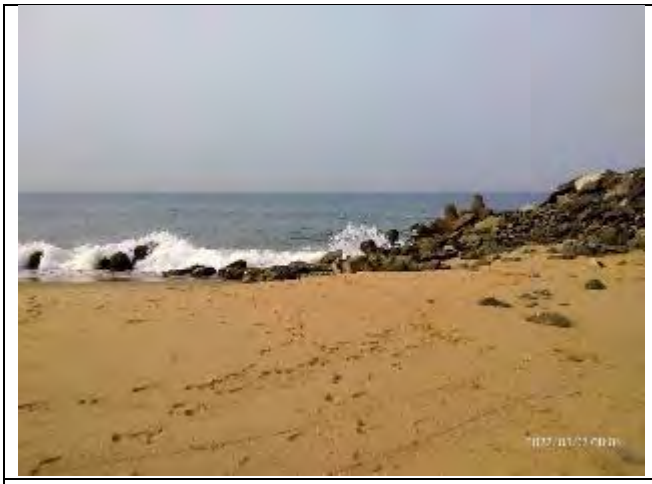


Figure 5- March CSP 05

Figure 6- March CSP 06

Figure 7- March CSP 07

Figure 8- March CSP 08

Figure 9- March CSP 09

Figure 10- March CSP 10

Figure 11- March CSP 11

Figure 12- March CSP 12

Figure 13- March CSP 13

Figure 14- March CSP 14

Figure 15- March CSP 15

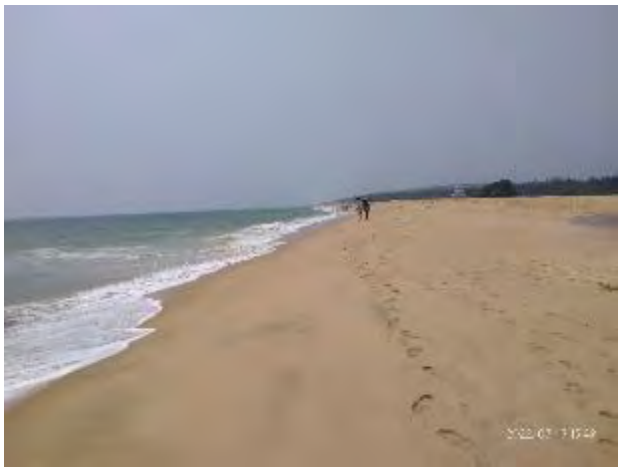


Figure 16- March CSP 16

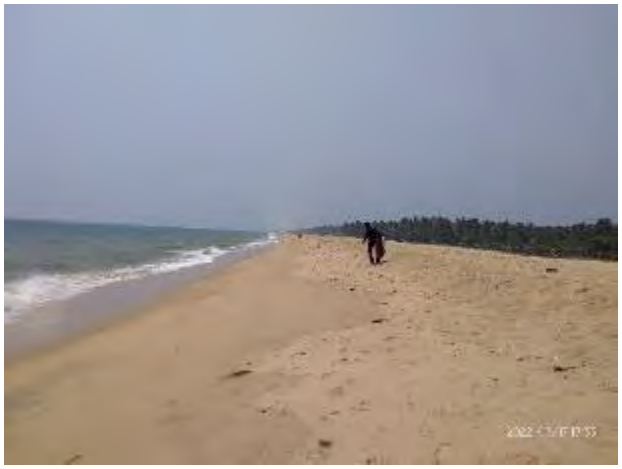


Figure 17- March CSP 17

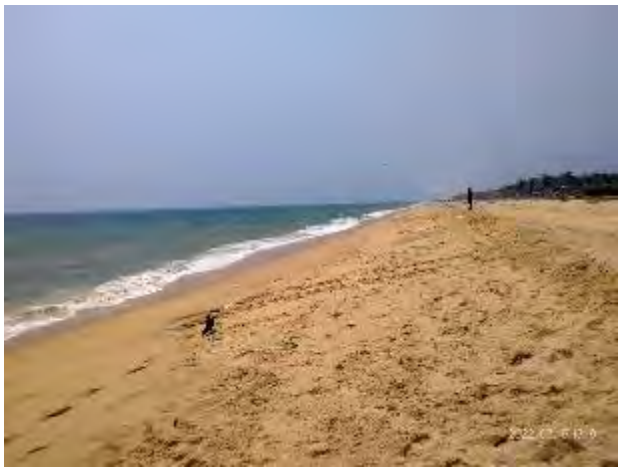


Figure 18- March CSP 18

Figure 19- March CSP 19

Figure 20- March CSP 20

Figure 21- March CSP 21

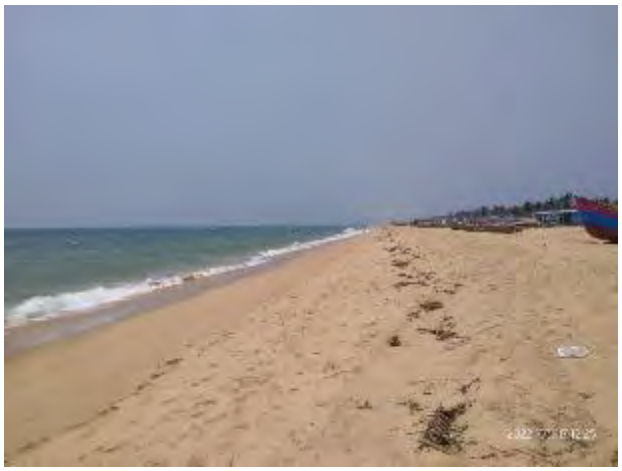


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Figure 23- March CSP 23

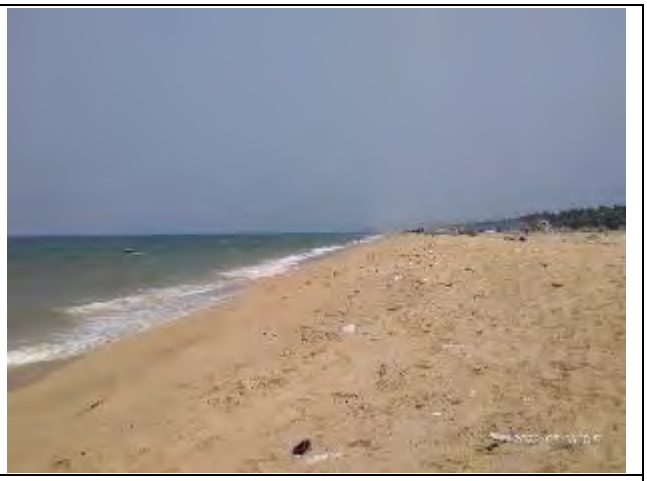

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Figure 25- March CSP 25

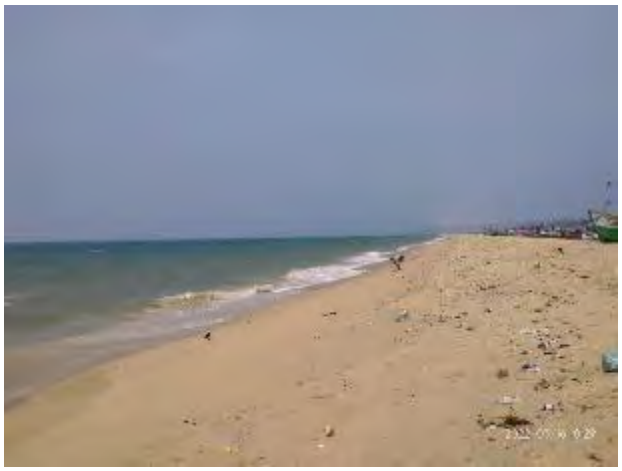
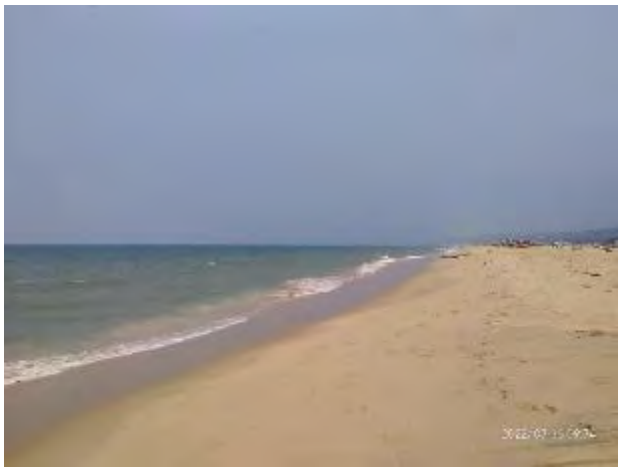


Figure 26- March CSP 26

Figure 27- March CSP 27



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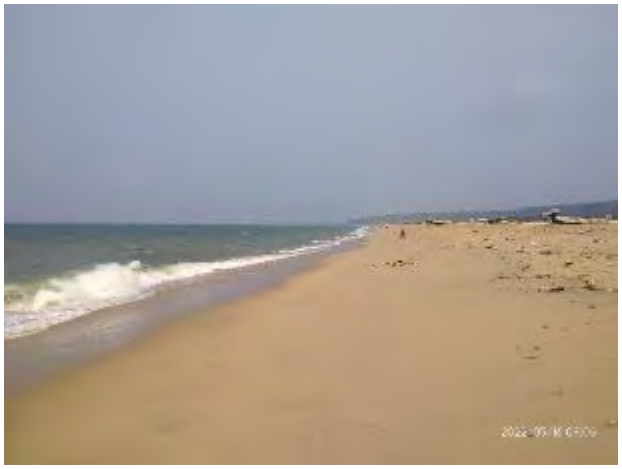
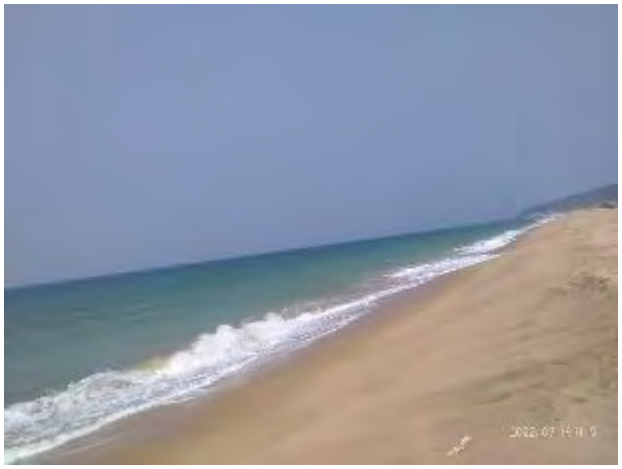


Figure 29- March CSP 29

Figure 30- March CSP 30



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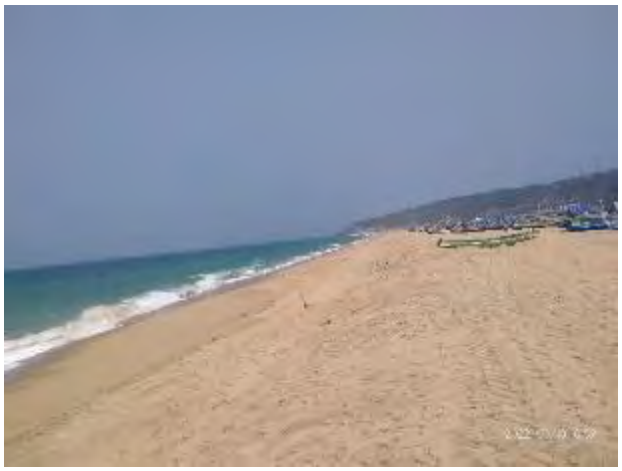

Figure 32- March CSP 32

Figure 33- March CSP 33

Figure 34- March CSP 34

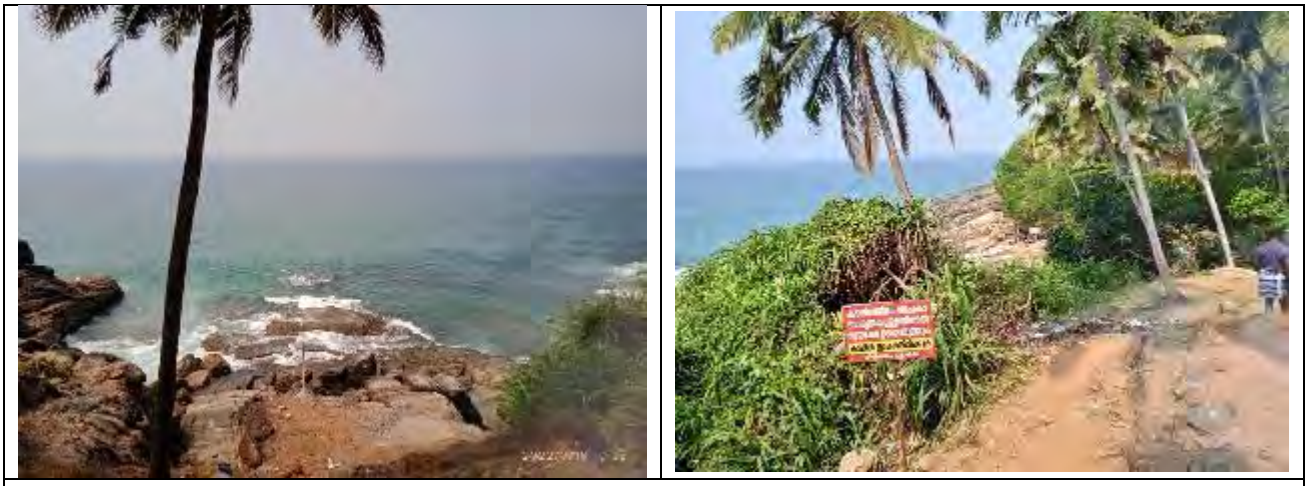

Figure 35- March CSP 35

Figure 36- March CSP 35-A

Figure 37- March CSP 36

Figure 38- March CSP 37

Figure 39- March CSP 38

Figure 40- March CSP 39

Figure 41- March CSP 40

Figure 42- March CSP 40-A

Figure 43- March CSP 41

Figure 44- March CSP 42

Figure 45- March CSP 43

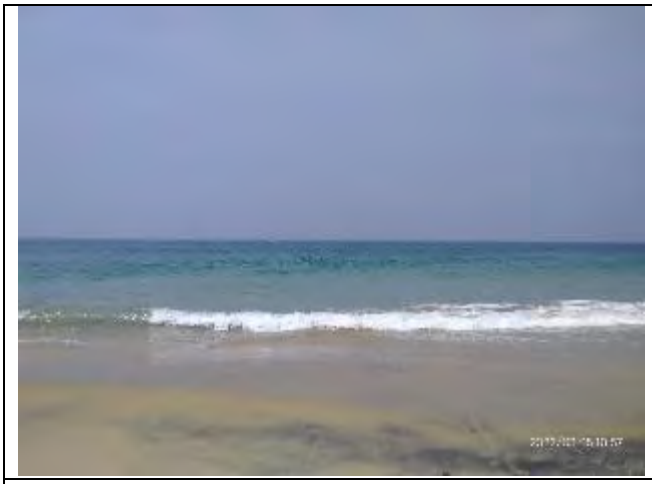

Figure 46- March CSP 44

Figure 47- March CSP 45

Figure 48- March CSP 46

Figure 49- March CSP 47

Figure 50- March CSP 48

Figure 51- March CSP 49

Figure 52- March CSP 50

Figure 53- March CSP 51

Figure 54- March CSP 52

Figure 55- March CSP 53

Figure 56- March CSP 54

Figure 57- March CSP 55

Figure 58- March CSP 56

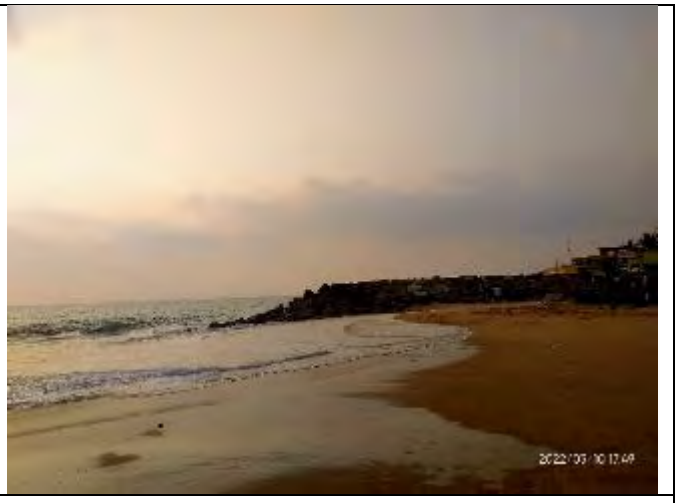

Figure 59- March CSP 57

Figure 60- March CSP 58

Figure 61- March CSP 59

Figure 62- March CSP 60

Figure 63- March CSP 61

Figure 64- March CSP 62

Figure 65- March CSP 63

Figure 66- March CSP 64

Figure 67- March CSP 65

Figure 68- March CSP 66

Figure 69- March CSP 67

Figure 70- March CSP 68

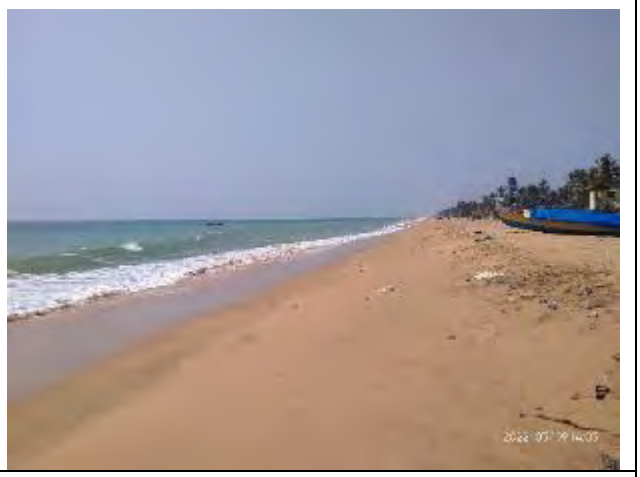

Figure 71- March CSP 69

Figure 72- March CSP 70

Figure 73- March CSP 71

Figure 74- March CSP 72

Figure 75- March CSP 73

Figure 76- March CSP 74

Figure 77- March CSP 75

Figure 78- March CSP 76

Figure 79- March CSP 77

Figure 80- March CSP 78

Figure 81- March CSP 79

Figure 82- March CSP 80

d

Figure 83- March CSP 81

Annexure II

Overlay of Month on Month GPS Survey Charts

Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
- SHORELINE DECEMBER 2021
- SHORELINE JANUARY 2022
- SHORELINE FEBRUARY 2022
- SHORELINE MARCH 2022
- SEAWALL

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.2572235630
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

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Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

SHANKAR AND CO.
115, 1st Floor, Neco Chambers
Sector 11, CBD Belapur, Navi Mumbai
Tele/Fax:- 022 27562900
E-mail : info@shankarsurveys.com

Project

Oceanograohic And Bathymetric Data Collection
For Assessment of Shoreline Changes

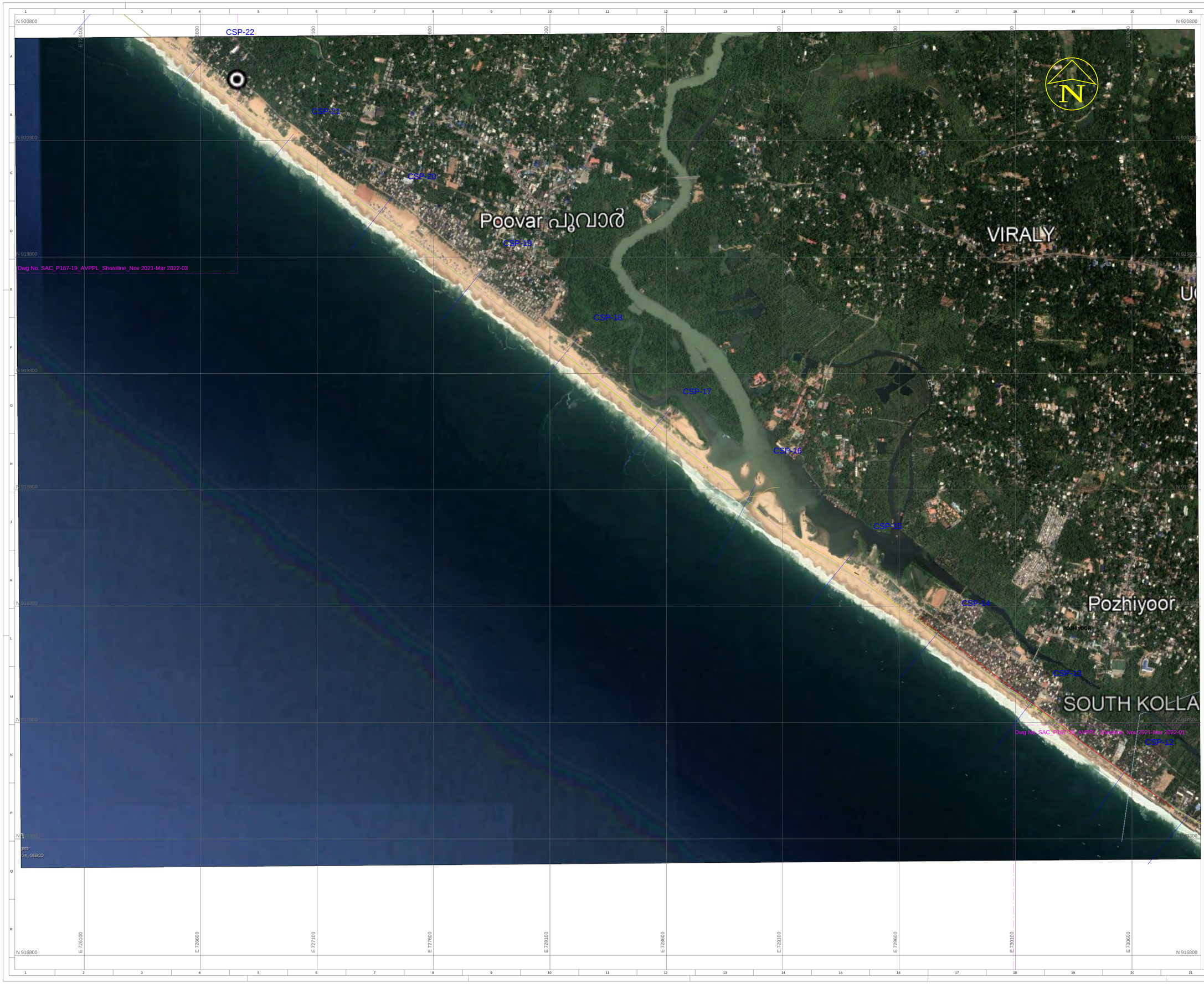
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	26.05.2022

Drawn : S. Khaire | Interpreted : A. Thahir | Checked : V. Mehta | Approved : S. Philip

Dwg. No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-01



Notes :

1. All coordinates are in WGS-84 datum, UTM grid system, Zone 43 North

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- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
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Semi-Minor Axis	:	6356752.314245m
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Key Plan

Client

adani

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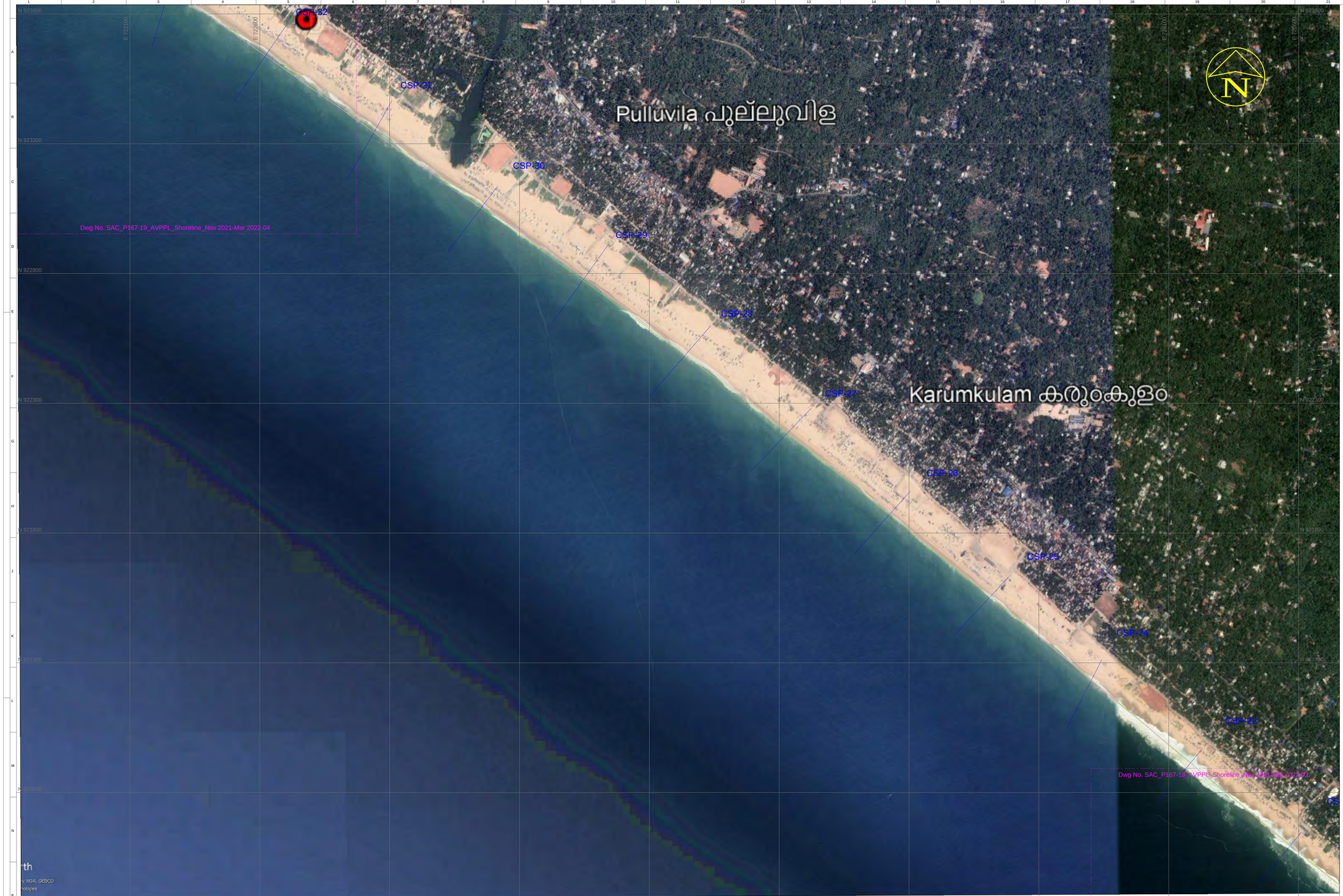
Rev.No.	Description	Date
0	First issue	26.05.2022

Drawn : S. Khaire	Interpreted : A. Thahir	Checked : V. Mehta	Approved : S. Philip

Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-02



Notes :

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Survey Notes

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Drawing Title

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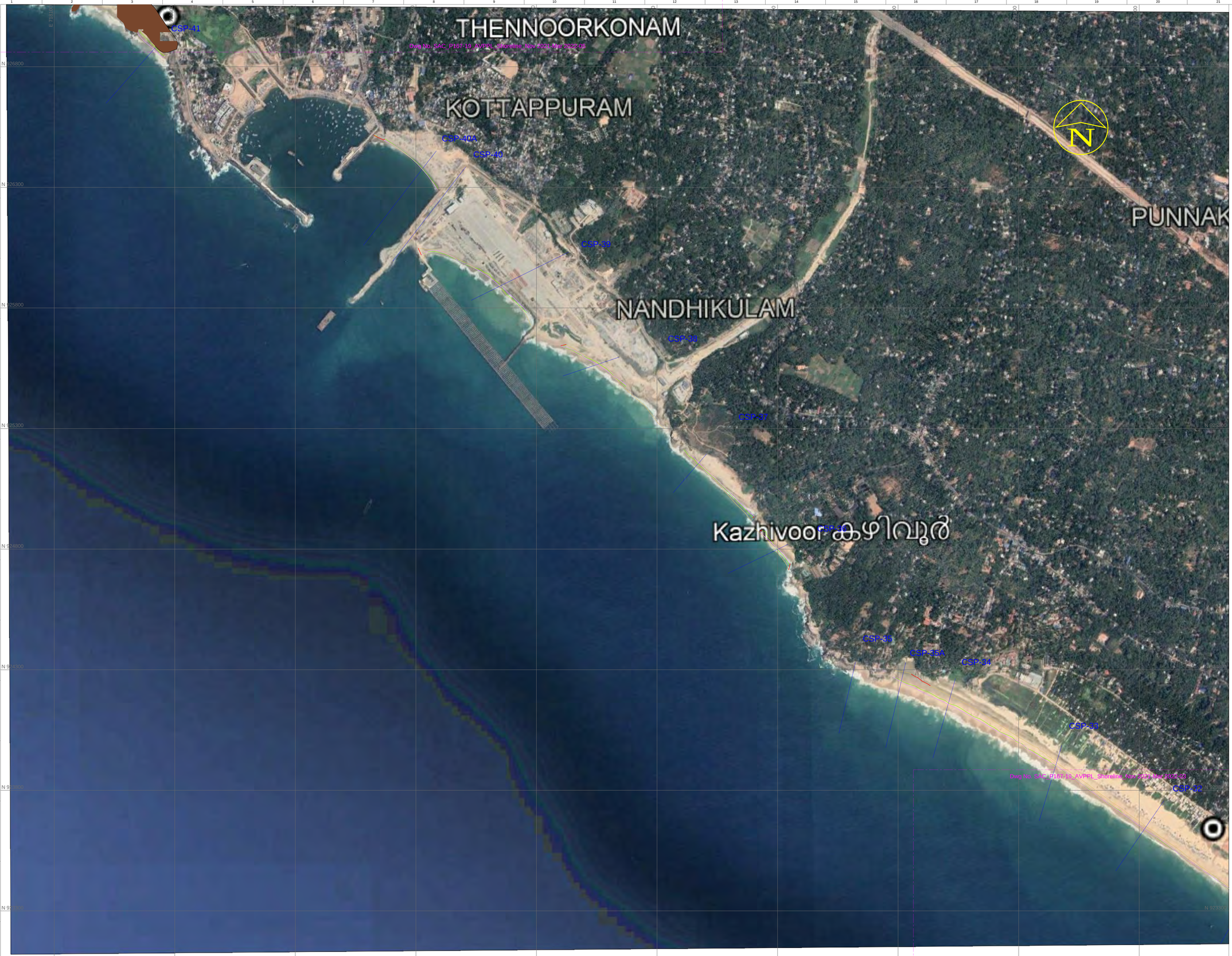
Rev.No.	Description	Date
0	First issue	26.05.2022

Drawn : S. Khaire	Interpreted : A. Thahir	Checked : V. Mehta	Approved : S. Philip

Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-03



Notes :

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- ROCK
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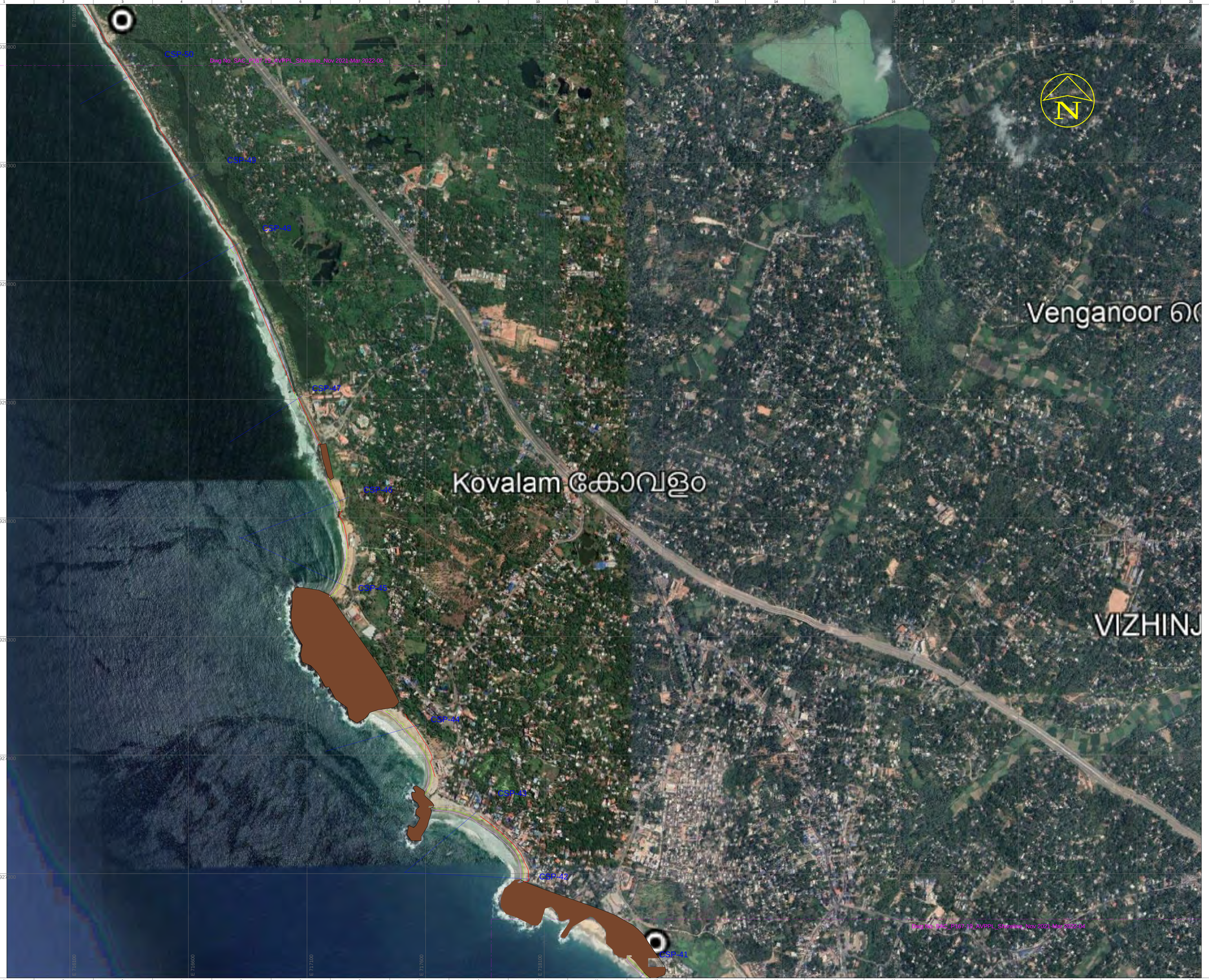
Drawn : S. Khaire	Interpreted : A. Thahir	Checked : V. Mehta	Approved : S. Philip

Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-04



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LEGEND

- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
- SHORELINE DECEMBER 2021
- SHORELINE JANUARY 2022
- SHORELINE FEBRUARY 2022
- SHORELINE MARCH 2022
- SEAWALL

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

Horizontal Coordinate System	:	WGS84
Geodetic Datum / Spheroid	:	WGS84
Semi-Major Axis (a) (meters)	:	6378137.000m
Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.257223563D
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
False Easting	:	500 000 m
False Northing	:	0 m
Scale Factor at CM	:	0.9996
Units	:	Metres

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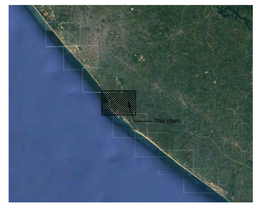
Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan



Client

ADANI VIZHINJAM PORT PVT. LTD.
3rD Floor, Aspinwall House,
Kawdiar Road, Kuravankonam,
Thiruvananthapuram - 695003

Survey Contractor

SHANKAR AND CO.
115, 1st Floor, Neco Chambers
Sector 11, CBD Belapur, Navi Mumbai
Tele/Fax:- 022 27562900
E-mail : info@shankarsurveys.com

Project

Oceanograohic And Bathymetric Data Collection
For Assessment of Shoreline Changes

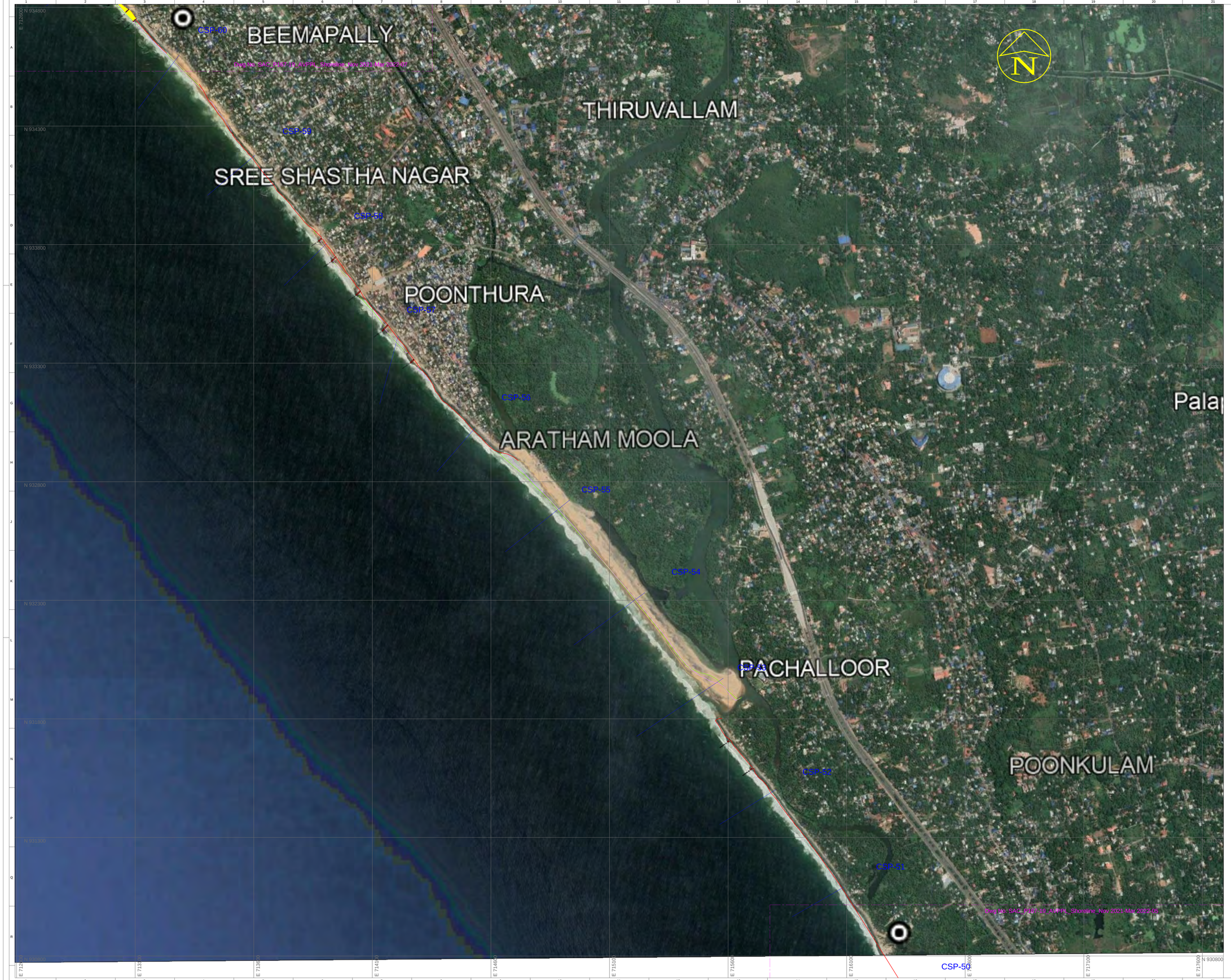
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	26.05.2022

Drawn : S. Khaire | Interpreted : A. Thahir | Checked : V. Mehta | Approved : S. Philip

Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-05



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
- SHORELINE DECEMBER 2021
- SHORELINE JANUARY 2022
- SHORELINE FEBRUARY 2022
- SHORELINE MARCH 2022
- SEAWALL

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

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Geodetic Datum / Spheroid	:	WGS84
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Semi-Minor Axis	:	6356752.314245m
Inverse Flattening	:	298.2572235630
Projection	:	Universal Transverse Mercator
Longitude of Origin (CM)	:	75° E (Zone 43)
Latitude of Origin	:	0° N (Equator)
Hemisphere	:	North
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False Northing	:	0 m
Scale Factor at CM	:	0.9996
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Scale

HORIZONTAL 1 : 5000

100 0 100 200 300 400 500metres

Key Plan

Client

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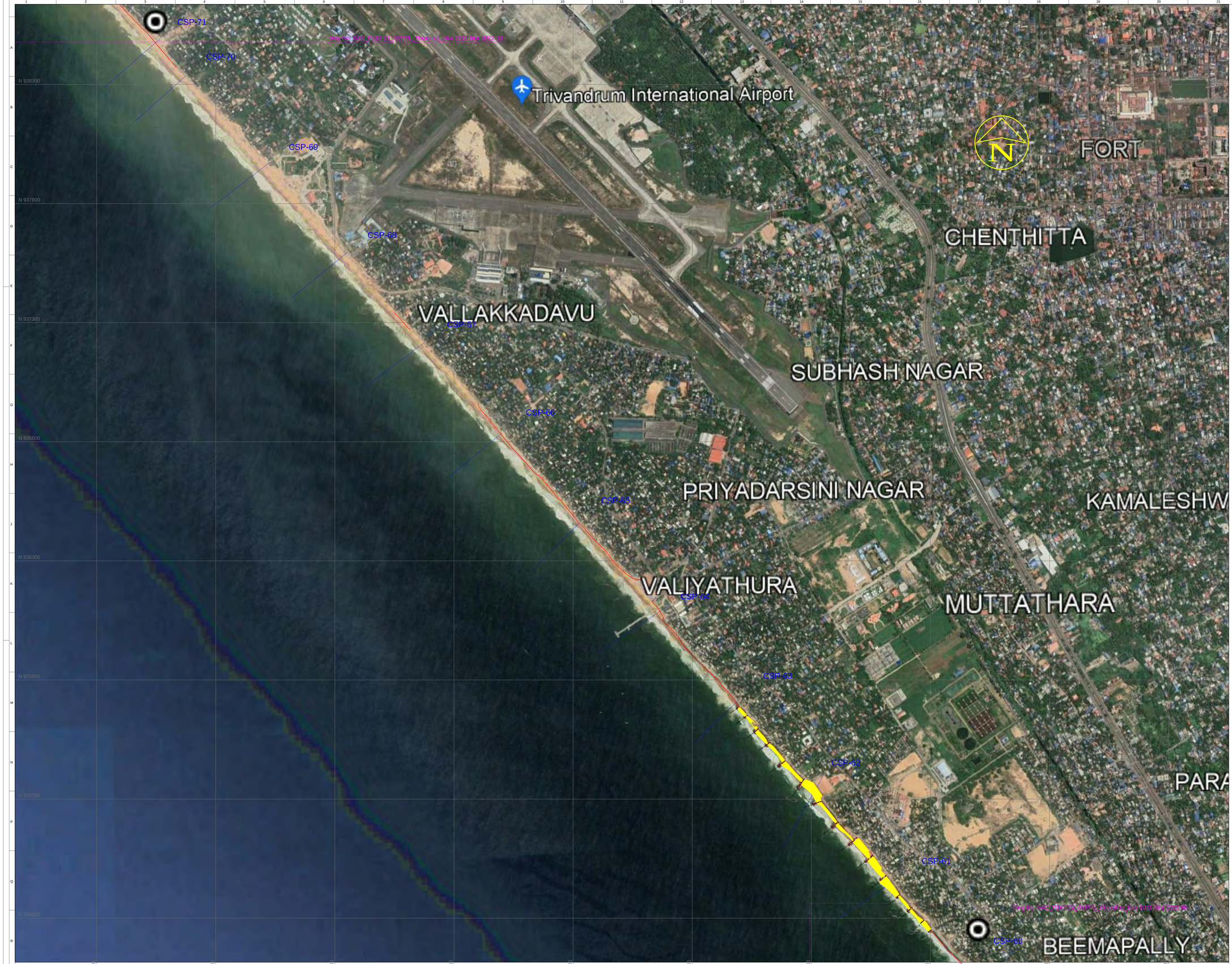
Drawing Title

Shoreline Monitoring Chart

Rev.No.	Description	Date
0	First issue	26.05.2022

Drawn : S. Khaire	Interpreted : A. Thahir	Checked : V. Mehta	Approved : S. Philip

Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-06



Notes :

1. All coordinates are in WGS 84 datum, UTM grid system, Zone 43 North

LEGEND

- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
- SHORELINE DECEMBER 2021
- SHORELINE JANUARY 2022
- SHORELINE FEBRUARY 2022
- SHORELINE MARCH 2022
- SEAWALL

Survey Notes

Surface Positioning : Geomax Zenith (GPS Mode)

Geodetic Parameters :

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Key Plan

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Rev.No.	Description	Date
0	First issue	26.05.2022

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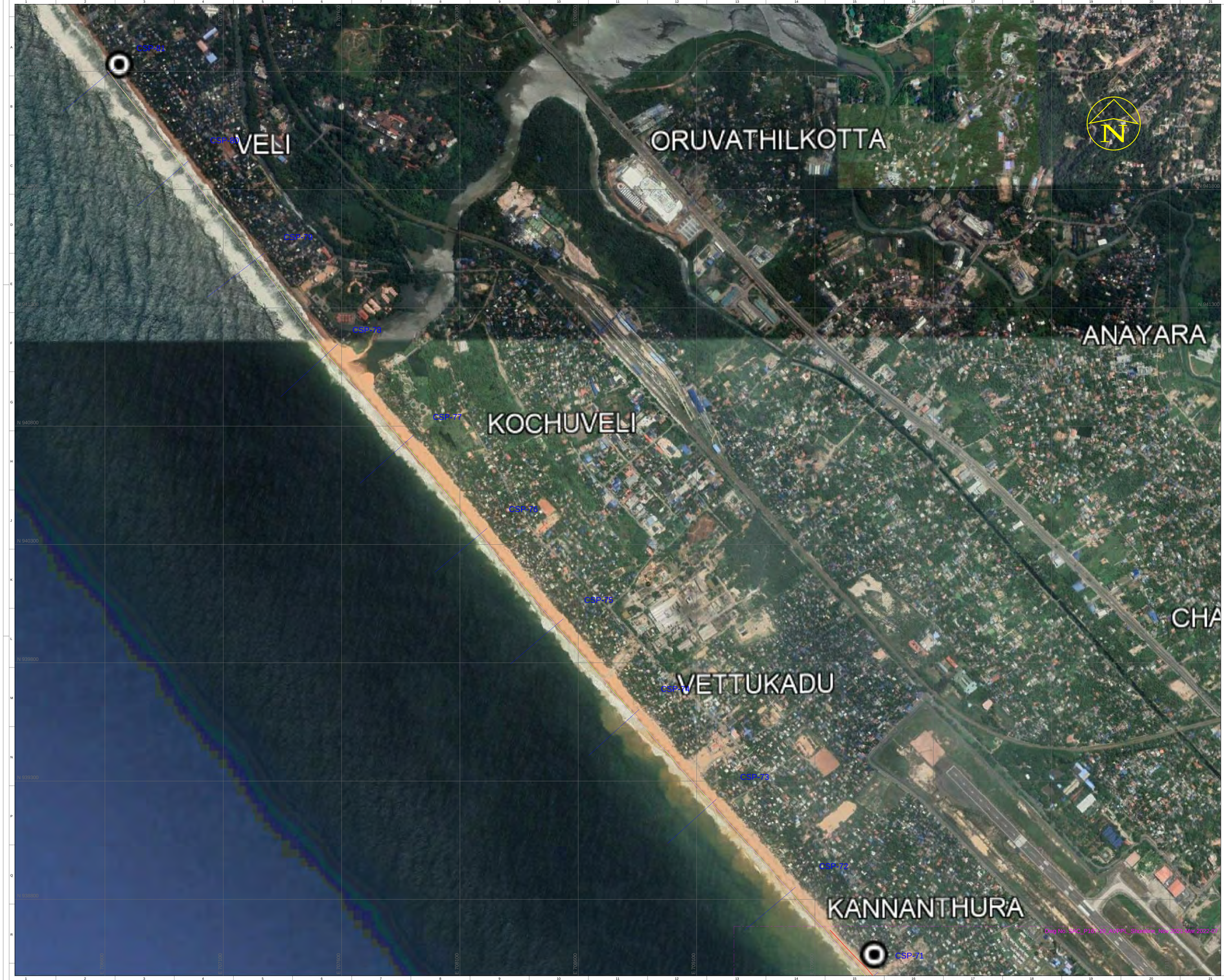
Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-07



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LEGEND

- GROYNES
- BEACH
- ROCK
- SHORELINE NOVEMBER 2021
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Survey Notes

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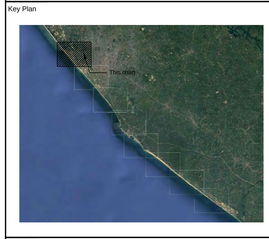

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Dwg No. SAC_P167-19_AVPPL_Shoreline_Nov 2021-Mar 2022-08

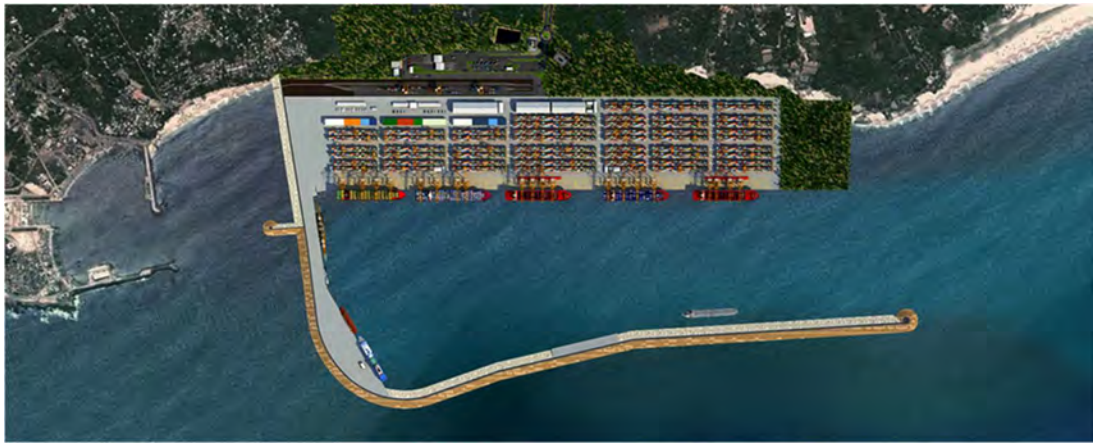
Annexure II

Environment Monitoring Report

(October 2021 to March 2022)

HALF-YEARLY ENVIRONMENT MONITORING REPORT

FOR THE PERIOD OCTOBER 2021 TO MARCH 2022



ADANI VIZHINJAM PORT PVT. LTD.
Vizhinjam, Kerala

Report No.: SEAAL/EMR-AVPPL-2122HY-II

Report Date: 25th April, 2022

This Report presents the discussion and the results of Environmental Monitoring at Adani Vizhinjam Port. The monitoring has been conducted and the report has been prepared & issued by Standards Environmental & Analytical Laboratories, Ernakulum-683 501 to M/s Adani Vizhinjam Port Pvt Limited, Thiruvananthapuram-695 014

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HYR-1	Introduction

Standard^S Environmental & Analytical Laboratories is an organization providing Testing Services, Technical Consultancy for Environmental Pollution Control, Designing, Commissioning & Operation of Effluent & Sewage Treatment Plants to clients of various industries, Hotels, Hospitals & Building Apartments. It provides various training for the industries and for the budding scientists.

Standard^S has been established in 2013 in 2500 sq.ft area in a complex located at K.J Tower, (above SBI Eloor branch), Pathalam, Udyogamandal P.O, Ernakulam District – 683 501. It has been equipped with sophisticated instruments such GC-MS, AAS, UV Spectrophotometer, Flame Photometer and other Supporting Instruments with required accuracy & precision.

Standard^S is guided and lead by highly qualified scientists with rich experiences. Its technical personnel are well trained and competent and dedicated.

Testing Laboratory of Standard^S is accredited as per ISO/IEC 17025:2017 by NABL for testing of Food & Agricultural Products, Water and Environmental Samples, Medical Accessories under Chemical & Biological Disciplines. It is an "A" Grade laboratory certified by Kerala State Pollution Control Board (KSPCB). It delivers reliable testing services on time to the customers after ensuring the compliance of each stage of the testing activities to the stringent Quality Control and Quality Assurance Criteria established by international forums.

Standard^S gives Technical Consultancy in the field of Water & Waste Water Treatment and has completed a number of Turn-Key projects to solve the water pollution issues for different clients and making them compliant to the statutory requirements.

Standard^S had been engaged by Adani Vizhinjam Port Pvt. Ltd. (AVPPL) for performing Environmental Monitoring as per the Plan mentioned in EIA and EC. AVPPL issued Service Order Reference No. 5702002993 dated 30.07.2021 which mentions the matrix, parameters and frequency of environmental monitoring and this service contract began in August 2021. Standard^S carried out said

environmental monitoring strictly as per above mentioned service order, viz. Ambient Air Monitoring (twice in a week), Ambient Noise Monitoring (fortnightly), Marine Ecological Survey including marine water, sediment, phytoplankton and zooplankton analysis (monthly), Ground Water and Surface Water Analysis (monthly), Soil Analysis (yearly).

Standard^{S} submits monthly reports of Environmental Monitoring which includes details of sampling locations, methodology used, analytical results and summary of reports. The monthly environmental monitoring report serves the information about the present environmental status as per terms and conditions mentioned in service order.

This present report is the consolidated half yearly report over the period from October 2021 to March 2022.

The quality assurance and quality control plan include following elements:

- Monitoring and Collection, Preservation & Transportation of samples;
- Sample Registration, Chain of Custody & Report Preparation;
- Laboratory Analysis & Review of Results; and
- Validation of Technical Activities.

HYR-2.1. Monitoring and Collection, Preservation & Transportation of samples:

The authorized Laboratory Sampling Team prepares the checklist for the required Sampling Kits, other auxiliary equipments and Sampling Procedures including Datasheets. The team collects the required item as per the list and visits the sampling site.

The team identifies the appropriate monitoring location as per the agreement and keep the sampling kits at the identified location. The team notes down the environmental conditions of the site in the sampling data sheets and all other required information. Then the team starts the monitoring activity.

Periodically the team inspects the status of the conditions of the sampling kits and records the necessary data on the sampling data sheet as per the requirements.

After the completion of monitoring as per PCB standards, the team collects the samples and preserves them safely and securely in an appropriate labelled container as per the procedure to prevent from contamination and deterioration.

Then the team returns to the laboratory and takes due care to maintain the integrity of the samples during transport. The team submits the samples and sampling data sheets to the Executives - Sample Registration.

HYR-2.2. Sample Registration, Chain of Custody & Report Preparation:

After receiving the samples, the Executive - Sample Registration examines the sample conditions and the sampling data sheets along with the agreement as per the Checklist and records the findings.

The executive registers the samples for testing in the Sample Entry Register and assigns the unique Sample Code for each sample only if all the criteria are fulfilled. The Executive prepares the Job Card for each sample as per the agreement and enters the allotted Sample Code in the Job Card and on the Test Item. The Test Item is identified throughout its life in the laboratory only by the unique Sample Code.

The executive then delivers the sample to the respective section of the Laboratory and the Job Card along with necessary sampling details required for performing the analysis excluding the details of the origin of the samples. The delivery is recorded in the Sample Delivery Register and the same is acknowledged by the Laboratory Technical personnel.

The information available in the Job Card are the test parameters to be performed, test method to be adopted, units in which the analytical results to be expressed, the due date for completion of analysis and the details about sample storage and retention conditions.

The executive submits the other Customer information and Sample details to the Reporting Section for preparing the Test Reports.

After completion of analysis, the technical personnel enter all the results and dates of analysis in the Job Card and submit the same to Reporting Section.

The Reporting Executive decodes the Job Card with the Test Request details, prepares the Draft Report as per the respective report format and submits the draft report to the Authorized Signatory. This draft report is verified and returned back to the Reporting Section for making the final report. Final reports are prepared by the Reporting Executive with necessary corrections if any and authorized by the Authorized Signatory. Then the Final Test Report is delivered to the customer.

HYR-2.3. Laboratory Analysis & Review of Test Results:

After receiving the Test Items along with the Job Card, the Technical Manager allots the Job to the authorized Technical Personnel. The assigned Technical Personnel performs the allotted tests as per the method mentioned in the Job Card as well as the required Quality Control Checks (QC) and submits the results to the Technical Manger. The Technical Personnel conforms that all the required calibration status of the equipment is valid and the Certified Reference Material are valid. Also, the Technical Personnel ensures that the results of daily verification conforming to the specified criteria.

The Technical Manager reviews the results of samples & QC checks and approves the results only if the results of QC checks are compliance to the Acceptance Criteria. Then the Job Card is submitted to the Reporting Section.

HYR-2.4. Validation of Technical Activities:

For the validation of Technical Activities, the laboratory performs Internal Quality Assurance Check, Proficiency Testing and Inter Laboratory Comparison. Quality Assurance Team prepares Annual Internal Quality Assurance Check (IQC) Plan, Inter laboratory Comparison (ILC)/ Proficiency Testing (PT) Plan.

As per the IQA plan, Quality Assurance Team prepare and send the Test Items to the respective section of the Laboratory. After getting the results, Quality Assurance team evaluates the results against the predefined criteria. The results of evaluation are submitted and discussed during Management Review meeting.

Quality Assurance Team identify and register the suitable PT Scheme authorized by NABL. Also, Quality Assurance Team identifies suitable ILC or conducts by covering at least five NABL accredited Laboratories.

If the QA team conducts ILC, then they evaluate the performance and calculate the Z-score after getting the results of the participating laboratories.

The acceptance criteria for the ILC/PT is ±2. The summary of the PT/ILC is prepared and discussed during Management Review Meeting.

The Quality Assurance Team monitors the performance of the Laboratory activities by conducting Internal Quality Audits and Vertical Audit periodically. The Audit reports are prepared and discussed during Management Review Meeting.

HYR-3	Ambient Air Quality Monitoring

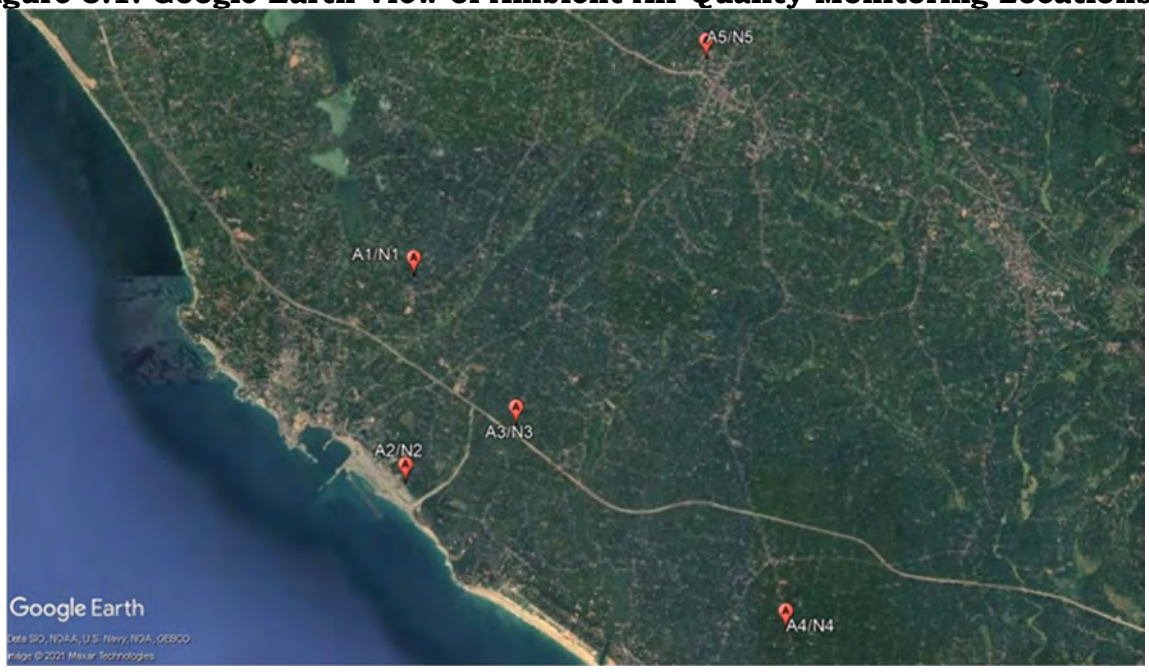
HYR-3.1. Ambient Air Quality Monitoring location details:

This section describes the sampling location, methodology adopted for monitoring and analysis of Ambient Air Quality. The prime objective of the environment monitoring with respect to Ambient Air Quality is to establish the air quality of present condition and its conformity to Applicable Standards. Ambient Air quality monitoring was carried out at five (5) locations including Venganoor, Port Site, Proposed Port Estate Area, Chani and Balarampuram from October 2021 to March 2022.

Table 3.1: Coordinates of Ambient Air Quality Monitoring Locations

Location	Legend	Latitude	Longitude
Venganoor	A1	8°23'55.10"N	77°00'12.19"E
Port Site	A2	8°22'13.73"N	77°00'08.39"E
Proposed Port Estate Area	A3	8°22'41.37"N	77°01'03.17"E
Chani	A4	8°21'01.98"N	77°03'15.11"E
Balarampuram	A5	8°25'43.73"N	77°02'39.99"E

Figure 3.1: Google Earth View of Ambient Air Quality Monitoring Locations



HYR-3.2. Methodology of Sampling and Analysis:

Table 3.2: Ambient Air Quality Monitoring Methodology

Sl. No.	Parameter	Unit	Detection Limit	Method Reference
1.	Particulate Matter (size less than 10 µm) or PM_{10}	µg/m³	5.0	IS 5182 (Part 23): 2006
2.	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$	µg/m³	2.0	EPA 40 CFR Part 50 Appendix-L: 1997
3.	Sulphur Dioxide (SO_2)	µg/m³	2.0	IS 5182 (Part 2): 2001
4.	Nitrogen Dioxide (NO_2)	µg/m³	2.0	IS 5182 (Part 6): 2006
5.	Carbon Monoxide (CO)	mg/m³	1.15	IS 5182 (Part 10):1999 (NDIR Method)
6.	Hydrocarbon (HC)	ppm	0.0003	IS 5182 (Part 17):1979

HYR-3.3. National Ambient Air Quality Standards (NAAQS):

Table 3.3: National Ambient Air Quality Standards dated 16th November 2009

Sl. No.	Pollutant, Unit	Time Weighted Average	Concentration in Ambient Air	
			Industrial, Residential, Rural & other areas	Ecologically Sensitive Areas
1.	Sulphur dioxide (SO_2), µg/m³	Annual	50	20
		24 h	80	80
2.	Nitrogen Dioxide (NO_2), µg/ m³	Annual	40	30
		24 h	80	80
3.	Particulate matter (size less than 10µm) or PM_{10}, µg/ m³	Annual	60	60
		24 h	100	100
4.	Particulate matter (size less than 2.5µm) or $PM_{2.5}$, µg/m³	Annual	40	40
		24 h	60	60
5.	Carbon Monoxide (CO), mg/m³	8 h	02	02
		1 h	04	04
6.	Hydrocarbon (HC), ppm	-	-	-

HYR-3.4. Ambient Air Quality Monitoring Results for the period from October 2021 to March 2022:

Table 3.4: Location – Venganoor (A1)

Venganoor (A1)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-10-2021	44.7	22.8	2.96	3.89	BDL	BDL
07-10-2021	40.6	23.8	2.86	3.67	BDL	BDL
11-10-2021	34.9	18.7	BDL	2.76	BDL	BDL
14-10-2021	39.8	20.6	2.74	3.98	BDL	BDL
18-10-2021	40.3	21.8	2.43	3.96	BDL	BDL
21-10-2021	40.7	20.9	2.59	4.1	BDL	BDL
25-10-2021	38.7	19.3	BDL	3.11	BDL	BDL
28-10-2021	42.1	20.6	BDL	3.43	BDL	BDL
01-11-2021	34.2	15.4	2.22	3.17	BDL	BDL
04-11-2021	29.7	13.2	BDL	2.44	BDL	BDL
08-11-2021	18.5	8.40	BDL	2.21	BDL	BDL
11-11-2021	25.5	10.8	BDL	2.25	BDL	BDL
15-11-2021	45.9	20.6	2.37	3.64	BDL	BDL
18-11-2021	38.7	19.8	2.14	2.83	BDL	BDL
22-11-2021	36.4	22.7	2.21	2.91	BDL	BDL
26-11-2021	40.8	21.9	2.06	2.77	BDL	BDL
29-11-2021	33.5	17.8	BDL	2.81	BDL	BDL
02-12-2021	40.1	20.4	2.93	3.86	BDL	BDL
06-12-2021	34.8	18.6	2.47	2.93	BDL	BDL
09-12-2021	43.5	22.8	2.71	3.46	BDL	BDL
13-12-2021	47.6	18.4	2.53	2.98	BDL	BDL
16-12-2021	50.8	24.5	3.14	4.11	BDL	BDL
20-12-2021	43.8	22.6	2.49	2.97	BDL	BDL
23-12-2021	40.6	23.4	BDL	2.16	BDL	BDL
27-12-2021	47.9	25.5	2.09	2.96	BDL	BDL
30-12-2021	42.6	21.9	2.62	3.14	BDL	BDL
03-01-2022	40.1	20.4	2.36	3.86	BDL	BDL
06-01-2022	45.8	18.6	2.15	2.93	BDL	BDL

Venganoor (A1)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
10-01-2022	57.3	22.8	2.23	3.46	BDL	BDL
13-01-2022	61.9	24.3	2.09	2.98	BDL	BDL
17-01-2022	47.9	24.5	2.66	4.11	BDL	BDL
20-01-2022	53.8	22.6	2.22	2.97	BDL	BDL
24-01-2022	59.5	23.4	BDL	2.16	BDL	BDL
27-01-2022	59.4	30.6	2.1	2.96	BDL	BDL
31-01-2022	58.9	26.5	2.24	3.14	BDL	BDL
03-02-2022	44.5	24.8	2.18	3.12	BDL	BDL
07-02-2022	40.6	22.8	2.48	3.65	BDL	BDL
10-02-2022	54.2	28.5	2.76	4.28	BDL	BDL
14-02-2022	52.2	26.4	2.36	4.01	BDL	BDL
17-02-2022	46.5	24.8	2.72	3.98	BDL	BDL
21-02-2022	58.4	31.2	2.18	2.72	BDL	BDL
24-02-2022	59.6	36.2	BDL	2.11	BDL	BDL
28-02-2022	58.9	32.2	2.28	3.45	BDL	BDL
03-03-2022	53.3	28.5	2.42	3.86	BDL	BDL
07-03-2022	52.4	27.1	2.26	3.72	BDL	BDL
10-03-2022	49.1	26.5	2.90	4.68	BDL	BDL
14-03-2022	54.5	29.3	2.19	3.45	BDL	BDL
17-03-2022	51.6	26.2	2.03	3.80	BDL	BDL
21-03-2022	62.9	32.5	2.89	3.76	BDL	BDL
24-03-2022	55.6	29.2	BDL	2.21	BDL	BDL
28-03-2022	63.6	31.9	2.22	3.79	BDL	BDL
31-03-2022	53.0	27.5	2.08	3.06	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.5: Location – Project Site (A2)

Project Site (A2)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-10-2021	35.3	19.6	4.07	5.12	BDL	BDL
07-10-2021	46.9	23.8	3.57	4.78	BDL	BDL
11-10-2021	40.8	20.6	2.75	3.96	BDL	BDL
14-10-2021	42.4	21.3	BDL	3.86	BDL	BDL
18-10-2021	46.7	19.3	2.78	4.11	BDL	BDL
21-10-2021	35.1	19.1	BDL	3.98	BDL	BDL
25-10-2021	41.9	22.6	2.54	3.99	BDL	BDL
28-10-2021	39.5	21.4	2.28	3.56	BDL	BDL
01-11-2021	40.6	14.3	3.12	3.98	BDL	BDL
04-11-2021	35.3	15.8	2.97	4.12	BDL	BDL
08-11-2021	28.7	11.6	3.23	4.94	BDL	BDL
11-11-2021	48.9	21.6	2.77	3.89	BDL	BDL
15-11-2021	70.1	25.8	3.35	4.23	BDL	BDL
18-11-2021	53.4	24.1	2.78	2.89	BDL	BDL
22-11-2021	45.8	22.3	2.61	4.06	BDL	BDL
26-11-2021	38.7	21.9	2.14	4.28	BDL	BDL
29-11-2021	41.4	22.3	2.29	3.97	BDL	BDL
02-12-2021	44.3	17.9	3.26	3.97	BDL	BDL
06-12-2021	40.1	19.7	3.61	4.45	BDL	BDL
09-12-2021	49.6	21.5	3.74	4.94	BDL	BDL
13-12-2021	53.9	25.9	3.12	3.89	BDL	BDL
16-12-2021	78.3	36.2	4.13	5.98	BDL	BDL
20-12-2021	69.3	32.8	3.97	5.19	BDL	BDL
23-12-2021	80.6	38.9	4.49	6.34	BDL	BDL
27-12-2021	73.4	35.6	4.68	6.98	BDL	BDL
30-12-2021	82.8	37.6	4.91	7.35	BDL	BDL
03-01-2022	52.4	26.9	3.14	4.05	BDL	BDL
06-01-2022	58.7	25.1	4.46	6.13	BDL	BDL
10-01-2022	56.8	28.5	4.71	6.77	BDL	BDL
13-01-2022	60.5	33.6	3.24	4.11	BDL	BDL

Project Site (A2)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
17-01-2022	76.6	42.2	2.96	3.74	BDL	BDL
20-01-2022	52.3	25.5	2.37	2.98	BDL	BDL
24-01-2022	80.7	43.8	3.09	3.96	BDL	BDL
27-01-2022	62.8	30.8	3.18	3.85	BDL	BDL
31-01-2022	82.2	39.9	3.97	5.21	BDL	BDL
03-02-2022	63.1	34.5	3.78	4.22	BDL	BDL
07-02-2022	72.2	38.5	4.92	7.10	BDL	BDL
10-02-2022	65.2	34.7	5.10	7.45	BDL	BDL
14-02-2022	72.2	38.6	4.10	6.23	BDL	BDL
17-02-2022	79.1	44.5	3.25	4.45	BDL	BDL
21-02-2022	60.3	32.6	2.86	3.52	BDL	BDL
24-02-2022	83.5	44.8	3.26	4.10	BDL	BDL
28-02-2022	64.8	35.6	3.65	4.08	BDL	BDL
03-03-2022	68.5	34.5	3.45	4.08	BDL	BDL
07-03-2022	80.5	40.4	5.10	7.37	BDL	BDL
10-03-2022	72.1	37.3	4.92	7.11	BDL	BDL
14-03-2022	66.6	35.8	3.98	6.02	BDL	BDL
17-03-2022	72.6	38.4	3.10	4.96	BDL	BDL
21-03-2022	64.1	32.3	3.32	5.46	BDL	BDL
24-03-2022	60.4	33.1	2.95	4.65	BDL	BDL
28-03-2022	68.2	35.6	3.23	5.12	BDL	BDL
31-03-2022	73.1	38.9	3.01	5.67	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.6: Location – Proposed Port Estate Area (A3)

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-10-2021	25.9	12.8	BDL	3.64	BDL	BDL
07-10-2021	39.7	19.5	2.96	3.18	BDL	BDL

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
11-10-2021	29.3	15.8	BDL	3.27	BDL	BDL
14-10-2021	37.6	17.1	BDL	2.97	BDL	BDL
18-10-2021	39.4	18.3	2.10	3.58	BDL	BDL
21-10-2021	39.8	19.6	BDL	3.17	BDL	BDL
25-10-2021	43.4	20.6	BDL	3.87	BDL	BDL
28-10-2021	41.9	20.2	BDL	3.31	BDL	BDL
01-11-2021	20.6	9.80	2.07	3.43	BDL	BDL
04-11-2021	18.3	8.60	BDL	3.37	BDL	BDL
08-11-2021	16.0	7.50	BDL	2.98	BDL	BDL
11-11-2021	25.9	11.5	2.19	3.52	BDL	BDL
15-11-2021	48.7	21.3	2.65	3.67	BDL	BDL
18-11-2021	36.1	17.6	2.41	3.78	BDL	BDL
22-11-2021	26.5	13.7	2.19	3.22	BDL	BDL
26-11-2021	34.3	16.9	2.47	3.64	BDL	BDL
29-11-2021	30.7	15.3	2.36	3.29	BDL	BDL
02-12-2021	25.8	12.9	2.65	3.86	BDL	BDL
06-12-2021	23.6	10.7	2.17	2.98	BDL	BDL
09-12-2021	39.0	18.1	2.31	3.11	BDL	BDL
13-12-2021	28.0	16.3	2.77	3.94	BDL	BDL
16-12-2021	45.3	22.7	2.62	3.86	BDL	BDL
20-12-2021	41.7	20.6	2.46	3.28	BDL	BDL
23-12-2021	35.6	18.4	2.37	3.22	BDL	BDL
27-12-2021	39.9	20.6	2.64	3.59	BDL	BDL
30-12-2021	40.3	19.6	2.72	3.78	BDL	BDL
03-01-2022	35.6	25.6	2.59	3.98	BDL	BDL
06-01-2022	41.8	25.1	2.64	3.83	BDL	BDL
10-01-2022	52.9	29.5	2.18	2.73	BDL	BDL
13-01-2022	52.1	31.4	2.87	3.66	BDL	BDL
17-01-2022	54.1	33.8	2.63	3.59	BDL	BDL
20-01-2022	51.4	29.5	2.23	2.65	BDL	BDL
24-01-2022	54.7	36.3	2.92	3.85	BDL	BDL
27-01-2022	46.3	28.7	2.81	3.53	BDL	BDL

Proposed Port Estate Area (A3)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
31-01-2022	59.7	36.1	3.37	4.26	BDL	BDL
03-02-2022	44.1	26.4	2.48	3.86	BDL	BDL
07-02-2022	48.5	27.3	3.10	4.12	BDL	BDL
10-02-2022	50.4	32.1	2.36	3.79	BDL	BDL
14-02-2022	54.4	33.8	3.08	4.20	BDL	BDL
17-02-2022	52.2	28.6	2.70	3.89	BDL	BDL
21-02-2022	49.2	31.8	2.46	3.92	BDL	BDL
24-02-2022	56.1	30.7	3.10	3.98	BDL	BDL
28-02-2022	49.3	27.5	2.61	4.02	BDL	BDL
03-03-2022	40.4	22.6	2.94	3.45	BDL	BDL
07-03-2022	49.1	26.1	3.85	4.92	BDL	BDL
10-03-2022	54.1	28.6	2.68	3.88	BDL	BDL
14-03-2022	48.7	25.4	3.16	4.90	BDL	BDL
17-03-2022	58.6	31.2	2.25	3.72	BDL	BDL
21-03-2022	50.5	26.8	2.89	4.01	BDL	BDL
24-03-2022	62.1	33.8	3.25	4.25	BDL	BDL
28-03-2022	47.7	25.3	2.18	3.82	BDL	BDL
31-03-2022	48.4	24.8	2.56	3.79	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.7: Location – Chani (A4)

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-10-2021	52.9	26.8	2.87	4.08	BDL	BDL
07-10-2021	49.6	22.3	BDL	3.97	BDL	BDL
11-10-2021	56.3	25.1	3.11	3.59	BDL	BDL
14-10-2021	50.2	23.8	3.28	4.23	BDL	BDL
18-10-2021	53.8	21.9	2.89	3.76	BDL	BDL
21-10-2021	58.7	24.8	2.84	4.11	BDL	BDL

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
25-10-2021	48.6	23.7	2.53	3.96	BDL	BDL
28-10-2021	47.3	22.8	2.79	3.86	BDL	BDL
01-11-2021	45.3	22.1	BDL	2.14	BDL	BDL
04-11-2021	39.6	18.7	2.33	3.54	BDL	BDL
08-11-2021	37.0	14.9	BDL	2.43	BDL	BDL
11-11-2021	39.0	13.8	2.48	3.97	BDL	BDL
15-11-2021	49.9	27.6	2.07	2.83	BDL	BDL
18-11-2021	47.8	13.5	BDL	2.98	BDL	BDL
22-11-2021	38.3	19.4	2.28	3.11	BDL	BDL
26-11-2021	44.5	22.9	2.37	3.27	BDL	BDL
29-11-2021	41.6	20.8	2.09	2.76	BDL	BDL
02-12-2021	49.1	23.9	BDL	2.44	BDL	BDL
06-12-2021	43.6	21.7	2.49	3.87	BDL	BDL
09-12-2021	36.4	17.2	2.14	2.97	BDL	BDL
13-12-2021	41.8	19.4	2.86	4.12	BDL	BDL
16-12-2021	56.5	28.6	2.21	2.76	BDL	BDL
20-12-2021	49.8	15.7	2.37	3.12	BDL	BDL
23-12-2021	43.9	22.3	2.78	3.95	BDL	BDL
27-12-2021	51.4	24.3	2.98	4.16	BDL	BDL
30-12-2021	48.9	23.9	2.81	3.86	BDL	BDL
03-01-2022	48.6	22.1	2.41	2.85	BDL	BDL
06-01-2022	45.4	23.9	BDL	2.32	BDL	BDL
10-01-2022	48.3	20.5	2.52	2.74	BDL	BDL
13-01-2022	49.5	21.3	2.48	2.73	BDL	BDL
17-01-2022	53.8	25.7	2.83	3.84	BDL	BDL
20-01-2022	50.1	23.6	2.51	2.87	BDL	BDL
24-01-2022	46.2	20.4	2.66	3.12	BDL	BDL
27-01-2022	49.2	24.3	2.42	3.01	BDL	BDL
31-01-2022	51.1	23.9	2.98	3.37	BDL	BDL
03-02-2022	52.1	27.5	2.18	3.10	BDL	BDL
07-02-2022	58.3	30.5	2.23	2.45	BDL	BDL
10-02-2022	47.2	24.8	2.28	3.10	BDL	BDL

Chani (A4)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
14-02-2022	49.0	31.7	2.89	3.14	BDL	BDL
17-02-2022	58.1	36.5	2.36	3.72	BDL	BDL
21-02-2022	47.5	26.4	2.79	3.56	BDL	BDL
24-02-2022	58.4	31.2	2.89	3.46	BDL	BDL
28-02-2022	52.3	33.2	2.65	3.38	BDL	BDL
03-03-2022	58.3	31.5	2.65	3.89	BDL	BDL
07-03-2022	54.8	29.7	2.11	2.72	BDL	BDL
10-03-2022	58.3	32.1	2.64	3.56	BDL	BDL
14-03-2022	63.9	34.5	3.05	3.91	BDL	BDL
17-03-2022	73.4	38.9	2.76	4.08	BDL	BDL
21-03-2022	53.6	29.2	2.24	3.65	BDL	BDL
24-03-2022	72.4	37.4	3.23	5.12	BDL	BDL
28-03-2022	69.8	36.8	2.51	3.88	BDL	BDL
31-03-2022	65.1	33.2	3.33	5.19	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

Table 3.8: Location – Balarampuram (A5)

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
04-10-2021	40.6	21.3	2.37	3.99	BDL	BDL
07-10-2021	31.3	17.6	2.12	3.48	BDL	BDL
11-10-2021	37.4	19.8	2.38	3.99	BDL	BDL
14-10-2021	43.9	23.6	2.68	3.99	BDL	BDL
18-10-2021	40.7	19.6	BDL	2.98	BDL	BDL
21-10-2021	39.5	18.6	2.28	3.87	BDL	BDL
25-10-2021	35.7	19.3	BDL	3.68	BDL	BDL
28-10-2021	34.9	19.1	2.34	3.78	BDL	BDL
01-11-2021	25.6	9.80	BDL	2.51	BDL	BDL
04-11-2021	34.5	13.6	BDL	2.34	BDL	BDL

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
08-11-2021	20.0	3.60	BDL	2.18	BDL	BDL
11-11-2021	21.0	3.20	2.16	2.93	BDL	BDL
15-11-2021	38.1	19.5	BDL	2.03	BDL	BDL
18-11-2021	30.8	12.1	2.23	2.98	BDL	BDL
22-11-2021	36.9	15.2	2.13	2.97	BDL	BDL
26-11-2021	31.3	14.3	2.65	3.88	BDL	BDL
29-11-2021	29.6	12.9	BDL	2.36	BDL	BDL
02-12-2021	31.8	13.1	BDL	2.46	BDL	BDL
06-12-2021	40.7	19.5	2.21	2.84	BDL	BDL
09-12-2021	36.7	10.4	2.09	2.97	BDL	BDL
13-12-2021	40.8	16.1	2.27	3.16	BDL	BDL
16-12-2021	43.9	21.2	2.31	3.24	BDL	BDL
20-12-2021	37.6	18.5	2.43	3.79	BDL	BDL
23-12-2021	45.4	23.7	2.51	3.86	BDL	BDL
27-12-2021	43.1	20.6	2.37	3.49	BDL	BDL
30-12-2021	33.7	17.4	2.12	2.87	BDL	BDL
03-01-2022	42.5	24.4	2.09	2.52	BDL	BDL
06-01-2022	41.1	22.2	2.16	3.03	BDL	BDL
10-01-2022	49.0	26.8	2.64	4.18	BDL	BDL
13-01-2022	50.5	26.1	2.71	4.43	BDL	BDL
17-01-2022	46.8	23.5	2.39	2.77	BDL	BDL
20-01-2022	28.5	17.1	BDL	2.06	BDL	BDL
24-01-2022	46.3	28.9	2.51	3.10	BDL	BDL
27-01-2022	50.5	23.0	2.12	2.64	BDL	BDL
31-01-2022	39.1	19.9	2.81	3.89	BDL	BDL
03-02-2022	58.1	31.2	2.11	2.52	BDL	BDL
07-02-2022	44.1	24.8	2.06	2.95	BDL	BDL
10-02-2022	47.2	25.1	2.78	3.96	BDL	BDL
14-02-2022	62.6	34.7	3.12	4.85	BDL	BDL
17-02-2022	47.9	25.6	2.39	2.77	BDL	BDL
21-02-2022	52.5	28.4	BDL	2.06	BDL	BDL
24-02-2022	46.3	28.9	2.51	3.10	BDL	BDL

Balarampuram (A5)						
Date	Parameters					
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO	HC
	µg/m³	µg/m³	µg/m³	µg/m³	mg/m³	ppm
28-02-2022	56.7	31.1	2.12	2.64	BDL	BDL
03-03-2022	65.2	33.5	2.45	3.68	BDL	BDL
07-03-2022	52.4	27.5	2.15	3.78	BDL	BDL
10-03-2022	41.5	22.1	2.49	4.73	BDL	BDL
14-03-2022	55.8	29.6	2.16	3.39	BDL	BDL
17-03-2022	58.2	31.1	3.04	4.96	BDL	BDL
21-03-2022	46.5	25.1	2.01	2.40	BDL	BDL
24-03-2022	54.2	29.6	2.86	3.79	BDL	BDL
28-03-2022	49.9	26.5	2.08	2.89	BDL	BDL
31-03-2022	68.4	34.9	2.21	3.62	BDL	BDL
NAAQS 2009 Limits	**100**	**60**	**80**	**80**	**4**	**-**

BDL: Below Detectable Limit

HYR-3.5. Monthly Average Results of Ambient Air Quality Monitoring (October 2021 to March 2022)

Table 3.9: Monthly Average Results

Parameter, Unit	NAAQS 2009 Limits	Month	Venganoor (A1)			Port Site (A2)			Proposed Port Estate Area (A3)			Chani (A4)			Balarampuram (A5)		
			Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min
Particulate matter (size less than 10µm) or PM_{10}, µg/ m^3	100	Oct-21	44.7	40.2	34.9	46.9	41.1	35.1	43.4	37.1	25.9	58.7	52.2	47.3	43.9	38.0	31.3
		Nov-21	45.9	33.7	18.5	70.1	44.8	28.7	48.7	28.6	16	49.9	42.6	37.0	38.1	29.8	20.0
		Dec-21	50.8	43.5	34.8	82.8	63.6	40.1	45.3	35.5	23.6	56.5	46.8	36.4	45.4	39.3	31.8
		Jan-22	61.9	53.8	40.1	82.2	64.8	52.3	59.7	49.8	35.6	53.8	49.1	45.4	50.5	43.8	28.5
		Feb-22	59.6	51.9	40.6	83.5	70.1	60.3	56.1	50.5	44.1	58.4	52.9	47.2	62.6	51.9	44.1
		Mar-22	63.6	55.1	49.1	80.5	69.6	60.4	62.1	51.1	40.4	73.4	63.3	53.6	68.4	54.7	41.5
		Half Yearly	**63.6**	**46.4**	**18.5**	**83.5**	**59.0**	**28.7**	**62.1**	**42.1**	**16.0**	**73.4**	**51.1**	**36.4**	**68.4**	**42.9**	**20.0**
Particulate matter (size less than 2.5µm) or PM $_{2.5}$, µg/ m^3	60	Oct-21	23.8	21.1	18.7	23.8	21.0	19.1	20.6	18.0	12.8	26.8	23.9	21.9	23.6	19.9	17.6
		Nov-21	22.7	16.7	8.40	25.8	20.0	11.6	21.3	13.6	7.50	27.6	19.3	13.5	19.5	11.6	3.20
		Dec-21	25.5	22.0	18.4	38.9	29.6	17.9	22.7	17.8	10.7	28.6	21.9	15.7	23.7	17.8	10.4
		Jan-22	30.6	23.7	18.6	43.8	32.9	25.1	36.3	30.7	25.1	25.7	22.9	20.4	28.9	23.5	17.1
		Feb-22	36.2	28.4	22.8	44.8	38.0	32.6	33.8	29.8	26.4	36.5	30.2	24.8	34.7	28.7	24.8
		Mar-22	32.5	28.7	26.2	40.4	36.3	32.3	33.8	27.2	22.6	38.9	33.7	29.2	34.9	28.9	22.1
		Half Yearly	**36.2**	**23.4**	**8.40**	**44.8**	**29.6**	**11.6**	**36.3**	**22.8**	**7.50**	**38.9**	**25.3**	**13.5**	**34.9**	**21.7**	**3.20**
Sulphur dioxide (SO_2), µg/m^3	80	Oct-21	2.96	2.72	BDL	4.07	3.00	BDL	2.96	2.53	BDL	3.28	2.90	BDL	2.68	2.36	BDL
		Nov-21	2.37	2.20	BDL	3.35	2.81	2.14	2.65	2.33	BDL	2.48	2.27	BDL	2.65	2.29	BDL
		Dec-21	3.14	2.62	BDL	4.91	3.99	3.12	2.77	2.52	2.17	2.98	2.58	BDL	2.51	2.31	BDL
		Jan-22	2.66	2.26	BDL	4.71	3.46	2.37	3.37	2.69	2.18	2.98	2.60	BDL	2.81	2.39	BDL
		Feb-22	2.76	2.42	BDL	5.10	3.87	2.86	3.10	2.74	2.36	2.89	2.53	2.18	3.12	2.44	BDL
		Mar-22	2.90	2.37	BDL	5.10	3.67	2.95	3.85	2.86	2.18	3.33	2.72	2.11	3.04	2.38	2.01
		Half Yearly	**3.14**	**2.43**	**BDL**	**5.10**	**3.47**	**BDL**	**3.85**	**2.61**	**BDL**	**3.33**	**2.60**	**BDL**	**3.12**	**2.36**	**BDL**

Parameter, Unit	NAAQS 2009 Limits	Month	Venganoor (A1)			Port Site (A2)			Proposed Port Estate Area (A3)			Chani (A4)			Balarampuram (A5)		
			Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min
Oxides of Nitrogen (NO_x), µg/m³	80	Oct-21	4.10	3.61	2.76	5.12	4.17	3.56	3.87	3.37	2.97	4.23	3.95	3.59	3.99	3.72	2.98
		Nov-21	3.64	2.78	2.21	4.94	4.04	2.89	3.78	3.43	2.98	3.97	3.00	2.14	3.88	2.69	2.03
		Dec-21	4.11	3.17	2.16	7.35	5.45	3.89	3.94	3.51	2.98	4.16	3.47	2.44	3.86	3.19	2.46
		Jan-22	4.11	3.17	2.16	6.77	4.53	2.98	4.26	3.56	2.65	3.84	2.98	2.32	4.43	3.18	2.06
		Feb-22	4.28	3.42	2.11	7.45	5.14	3.52	4.20	3.97	3.79	3.72	3.24	2.45	4.85	3.11	2.06
		Mar-22	4.68	3.59	2.21	7.37	5.60	4.08	4.92	4.08	3.45	5.19	4.00	2.72	4.96	3.69	2.40
		Half Yearly	**4.68**	**3.29**	**2.11**	**7.45**	**4.82**	**2.89**	**4.92**	**3.66**	**2.65**	**5.19**	**3.44**	**2.14**	**4.96**	**3.26**	**2.03**
Carbon Monoxide (CO), mg/m³	4	Oct-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Nov-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Dec-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Jan-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Feb-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Mar-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Half Yearly	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**
Hydrocarbon (HC), ppm	-	Oct-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Nov-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Dec-21	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Jan-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Feb-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Mar-22	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--	--	BDL	--
		Half Yearly	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**	**--**	**BDL**	**--**

HYR-3.6. Graphical representation of Half-Yearly Results (October-2021 to March-2022)

Figure 3.2: Respirable Particulate Matter (PM10)

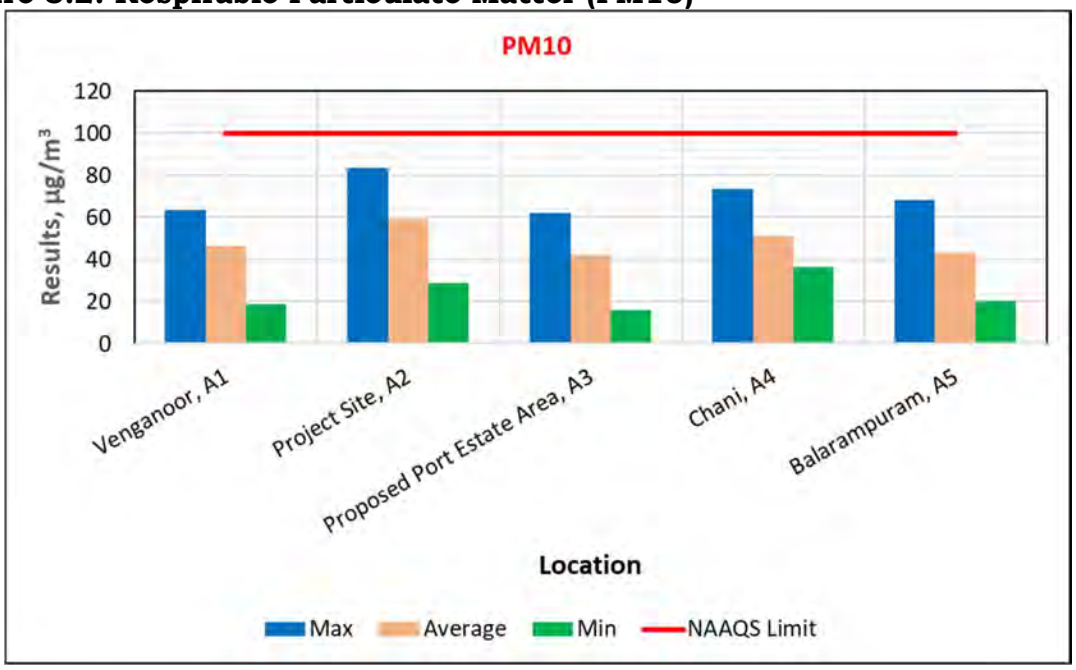


Figure 3.3: Fine Particulate matter (PM2.5)

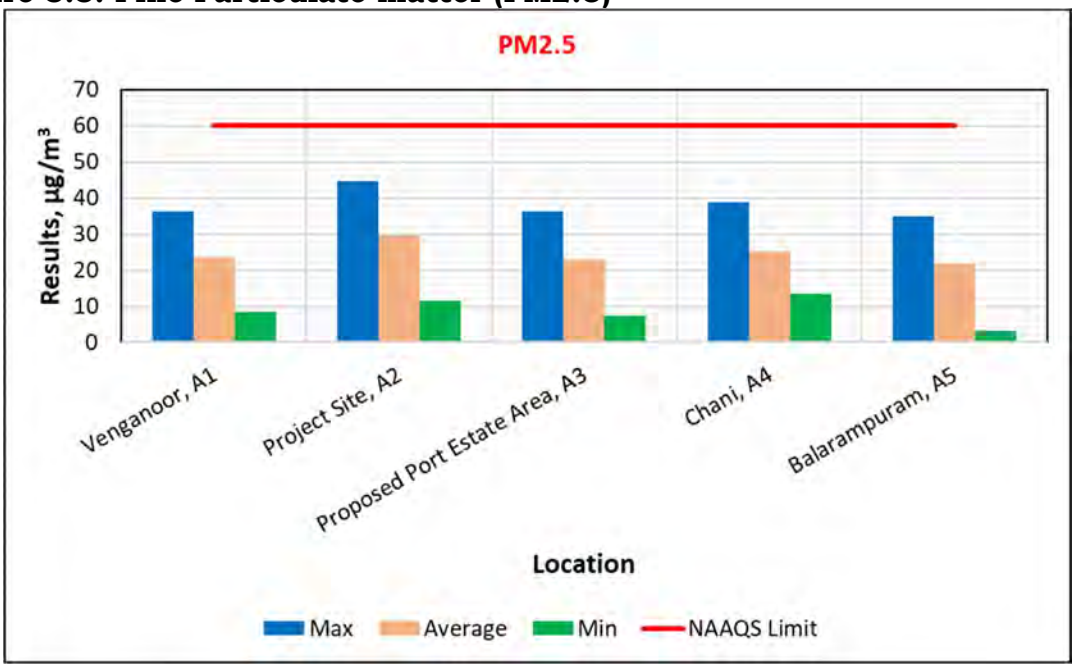


Figure 3.4: Sulphur Dioxide as SO_2

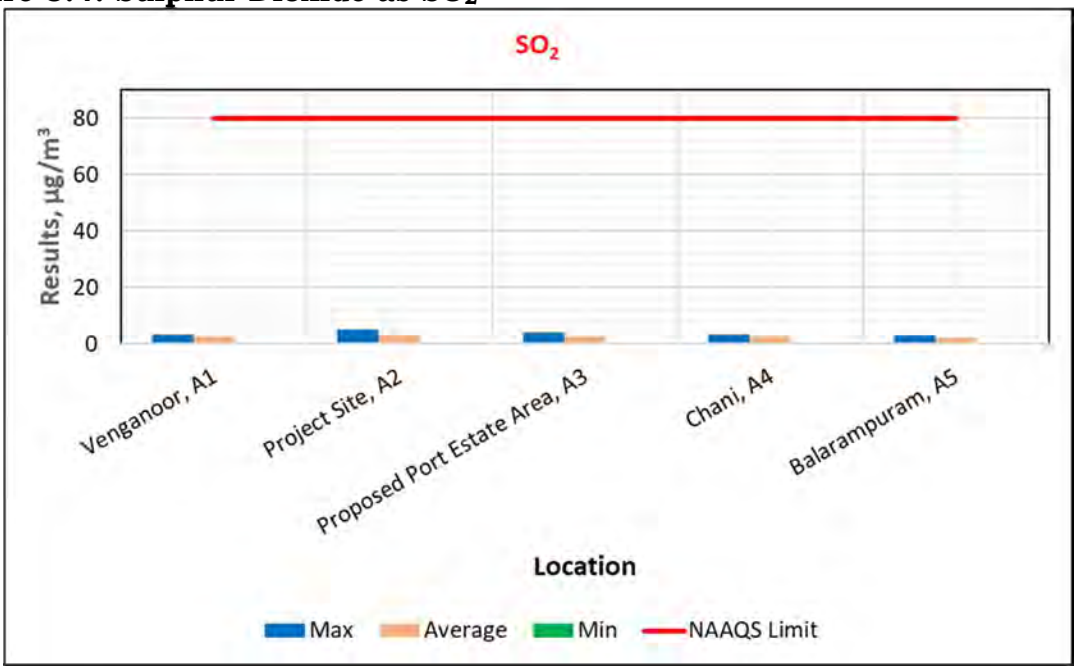
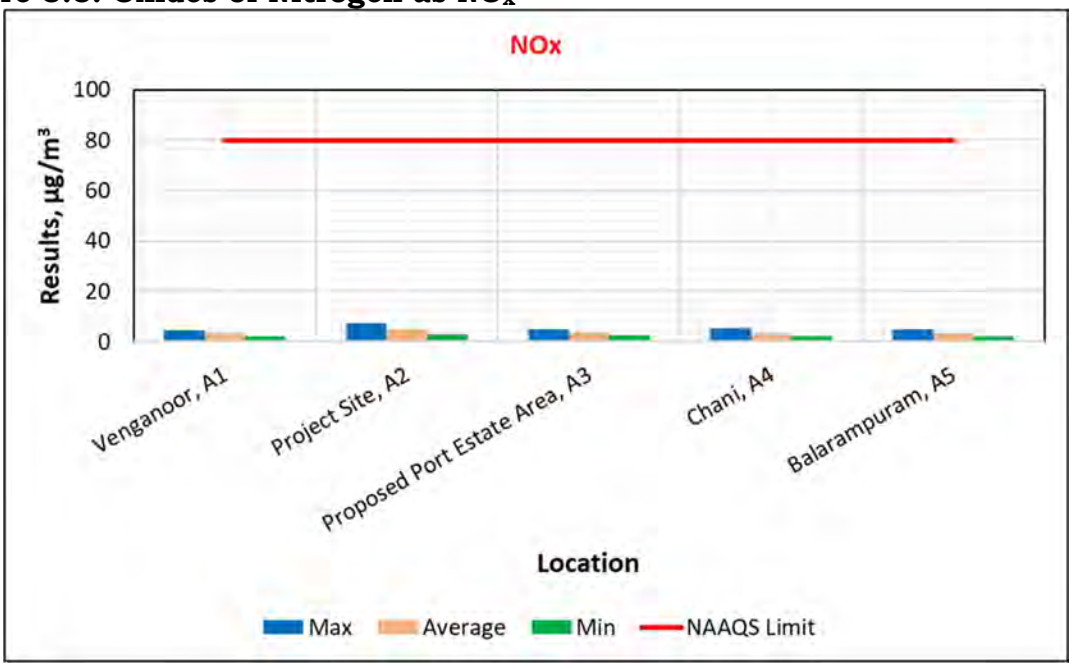


Figure 3.5: Oxides of Nitrogen as NO_x



HYR-3.7. Summary - Ambient Air Quality

During the period of October 2021 to March 2022, following is the summary of ambient air quality results:

a) At the location **Venganoor**:

- PM_{10} was observed in the range between 18.5-63.6µg/m^3 with an average of 46.4µg/m^3
- $PM_{2.5}$ was observed in the range between 8.40-36.2µg/m^3 with an average of 23.4 µg/m^3
- SO_2 was observed in the range between BDL-3.14µg/m^3 with an average of 2.43µg/m^3
- NO_2 was observed in the range between 2.11 – 4.68µg/m^3 with an average of 3.29µg/m^3
- CO & HC were observed below detectable limits

b) At the location **Port Site**:

- PM_{10} was observed in the range between 28.7-83.5µg/m^3 with an average of 59.0 µg/m^3
- $PM_{2.5}$ was observed in the range between 11.6-44.8 µg/m^3 with an average of 29.6µg/m^3
- SO_2 was observed in the range between BDL-5.10µg/m^3 with an average of 3.47 µg/m^3
- NO_2 was observed in the range between 2.89– 7.45µg/m^3 with an average of 4.82µg/m^3
- CO & HC were observed below detectable limits

c) At the location **Proposed Port Area**:

- PM_{10} was observed in the range between 16.0-62.1µg/m^3 with an average of 42.1µg/m^3
- $PM_{2.5}$ was observed in the range between 7.50-36.3µg/m^3 with an average of 22.8µg/m^3

- SO_2 was observed in the range between BDL-3.85µg/m^3 with an average of 2.61µg/m^3
- NO_2 was observed in the range between 2.65 – 4.92µg/m^3 with an average of 3.66µg/m^3
- CO & HC were observed below detectable limits

d) At the location **Chani**:

- PM_{10} was observed in the range between 36.4-73.4µg/m^3 with an average of 51.1µg/m^3
- $PM_{2.5}$ was observed in the range between 13.5-38.9 µg/m^3 with an average of 25.3 µg/m^3
- SO_2 was observed in the range between BDL-3.33 µg/m^3 with an average of 2.60 µg/m^3
- NO_2 was observed in the range between 2.14 – 5.19 µg/m^3 with an average of 3.44 µg/m^3
- CO & HC were observed below detectable limits

e) At the location **Balarampuram**:

- PM_{10} was observed in the range between 20.0-68.4 µg/m^3 with an average of 42.9 µg/m^3
- $PM_{2.5}$ was observed in the range between 3.20-34.9 µg/m^3 with an average of 21.7 µg/m^3
- SO_2 was observed in the range between BDL-3.12 µg/m^3 with an average of 2.36 µg/m^3
- NO_2 was observed in the range between 2.03 – 4.96 µg/m^3 with an average of 3.26 µg/m^3
- CO & HC were observed below detectable limits

f) Overall Comparison of Results from **all Locations**:

- PM_{10} was observed a maximum of 83.5 µg/m^3 at Port Site and a minimum of 16.0 µg/m^3 at Proposed Port Estate Area. The overall average of all locations is 48.3 µg/m^3

- $PM_{2.5}$ was observed a maximum of 44.8 µg/m^3 at Port Site and a minimum of 3.2 µg/m^3 at Balaramapuram. The overall average of all locations is 24.6 µg/m^3
- SO_2 was observed a maximum of 5.1 µg/m^3 at Port Site and a minimum of BDL at all locations. The overall average of all locations is 2.7 µg/m^3

- NO_2 was observed a maximum of 7.45 µg/m^3 at Port Site and a minimum of 2.03 µg/m^3 at Balaramapuram. The overall average of all locations is 3.7 µg/m^3

- CO & HC were observed below detectable limits at all times at all locations.

The obtained results were compared with National Ambient Air Quality Standards (NAAQS), 2009. The results were well within the limits on all monitoring days at all 5 locations during the monitoring months (from October 2021 to March 2022).

Table 3.10: Overall Summary of Results from all Locations

Parameter	Unit	NAAQS 2009 Limits	Max	Avg.	Min
PM10	µg/m^3	100	83.5	48.3	16.0
PM 2.5	µg/m^3	60	44.8	24.6	3.2
SO2	µg/m^3	80	5.10	2.70	BDL
NOx	µg/m^3	80	7.45	3.70	2.03
CO	mg/m^3	4	BDL	BDL	BDL
HC	ppm	--	BDL	BDL	BDL

HYR-4	Ambient Noise Monitoring

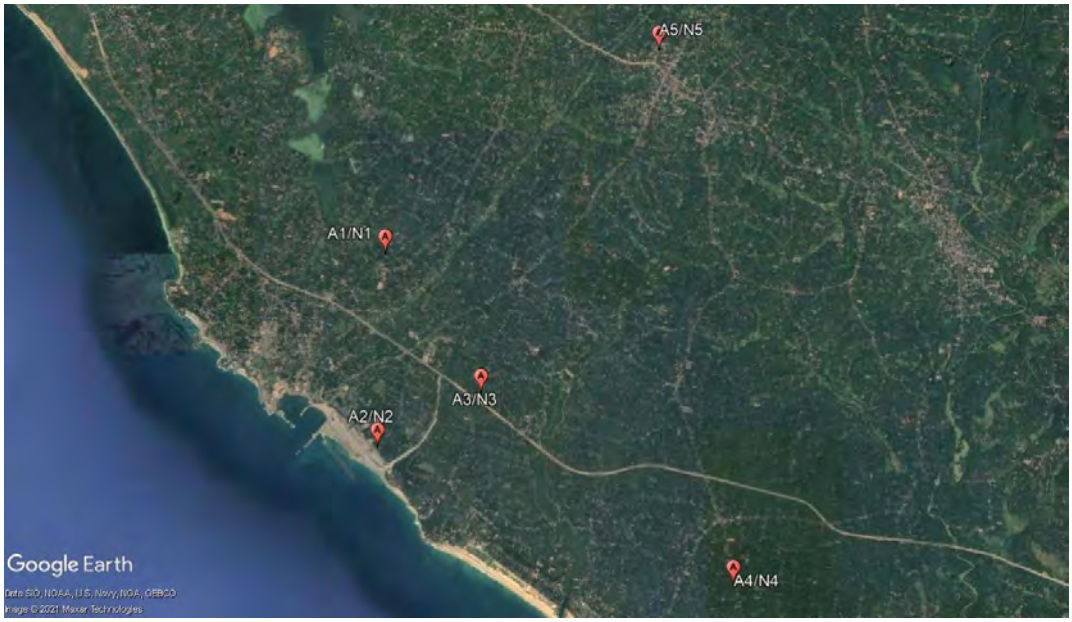
HYR-4.1. Ambient Noise Monitoring location details

This section describes the sampling location, methodology adopted for monitoring ambient noise and analysis of monitored results. Ambient Noise Monitoring during October 2021 to March 2022 was carried out at Venganoor, Port Site, Proposed Port Estate Area, Chani and Balarampuram. Classification of locations as per the Noise Pollution (Regulation & Control) Rules, 2000 (Rules 3 (1) and 4(1)) are as below.

Table 4.1: Coordinates of Ambient Noise Monitoring Locations

Location	Legend	Area Type	Latitude	Longitude
Venganoor	N1	Residential	8°23'55.10"N	77°00'12.19"E
Port Site	N2	Industrial	8°22'13.73"N	77°00'08.39"E
Proposed Port Estate Area	N3	Residential	8°22'41.37"N	77°01'03.17"E
Chani	N4	Residential	8°21'01.98"N	77°03'15.11"E
Balarampuram	N5	Commercial	8°25'43.73"N	77°02'39.99"E

Figure 4.1: Google Earth View of Ambient Noise Monitoring Locations



HYR-4.2. Methodology of Sampling

Ambient Noise Monitoring is being carried out as per IS 9989:1981.

HYR-4.3. Ambient Noise Standards

The results obtained were compared with the standards as per the Noise Pollution (Regulation & Control) Rules, 2000 (Rules 3 (1) and 4(1)) given in the Table 4.2.

Table 4.2: Ambient Noise Standard

Area Code	Area Type	Limits in dB (A) Leq	
		Day (6 a.m. to 10 p.m.)	Night (10 p.m. to 6 a.m.)
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45

HYR-4.4. Ambient Noise Monitoring Results for the period from October 2021 to March 2022.

Table 4.3: Location – Venganoor, N1 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Oct-21	01-10-2021	58.5	43.0	38.8	36.3	47.8	38.3
	15-10-2021	56.6	44.2	37.7	34.6	46.9	37.1
Nov-21	02-11-2021	58.1	43.9	39.1	37.3	48.6	39.0
	16-11-2021	57.5	43.8	38.1	35.1	47.3	38.2
Dec-21	01-12-2021	59.3	44.2	40.6	38.5	50.1	40.2
	15-12-2021	58.6	44.9	39.5	37.6	48.5	40.1
Jan-22	04-01-2022	57.2	45.3	41.7	36.4	49.6	40.9
	18-01-2022	55.3	42.7	37.2	35.8	47.1	37.5

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Feb-22	01-02-2022	54.5	39.7	37.1	35.3	49.8	38.2
	15-02-2022	53.4	39.3	36.4	35.0	48.8	37.9
Mar-22	01-03-2022	56.1	43.3	40.8	37.2	53.8	41.7
	15-03-2022	56.9	44.6	42.3	36.6	54.1	42.5
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.4: Location – Port Site, N2 - (Industrial Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Oct-21	05-10-2021	78.0	63.4	42.1	36.6	64.8	56.0
	19-10-2021	77.8	62.4	43.8	38.2	69.3	56.1
Nov-21	03-11-2021	77.1	62.9	41.5	37.8	65.3	57.2
	17-11-2021	78.6	63.5	44.7	39.3	68.4	55.2
Dec-21	03-12-2021	76.8	61.7	40.9	38.6	67.9	58.4
	17-12-2021	83.9	66.2	57.6	44.8	73.9	58.5
Jan-22	05-01-2022	78.6	59.3	41.8	37.4	65.4	57.1
	19-01-2022	73.5	58.9	42.7	36.3	61.1	52.5
Feb-22	02-02-2022	66.7	50.4	45.4	44.8	61.4	48.6
	16-02-2022	67.8	50.0	46.2	44.5	62.4	48.3
Mar-22	02-03-2022	69.1	55.8	51.4	45.6	62.7	53.1
	16-03-2022	73.3	62.1	54.9	48.7	66.8	57.7
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**75**	**70**

Table 4.5: Location – Proposed Port Estate Area, N3 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Oct-21	06-10-2021	69.1	44.5	42.4	37.9	51.7	41.8
	20-10-2021	67.7	44.8	41.6	36.2	50.2	42.6
Nov-21	05-11-2021	67.3	42.8	40.6	35.8	49.6	39.5
	19-11-2021	65.7	43.2	40.2	38.6	52.1	41.7
Dec-21	07-12-2021	69.3	44.8	42.1	37.6	53.6	41.5
	21-12-2021	62.4	41.3	39.4	37.2	50.4	40.3
Jan-22	07-01-2022	67.4	42.6	39.3	35.1	50.7	39.6
	21-01-2022	64.5	40.9	37.4	33.6	48.4	38.5
Feb-22	04-02-2022	57.0	43.3	38.8	38.5	52.2	41.7
	18-02-2022	55.9	41.5	38.1	37.0	51.1	40.0
Mar-22	04-03-2022	54.3	42.2	40.7	37.3	49.3	39.5
	18-03-2022	53.3	42.7	39.8	37.5	51.2	40.4
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.6: Location – Chani, N4 - (Residential Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Oct-21	12-10-2021	55.9	43.1	38.8	35.7	52.4	40.9
	26-10-2021	54.7	43.5	36.1	34.7	52.7	41.6
Nov-21	09-11-2021	57.9	45.8	39.6	37.2	53.9	42.2
	23-11-2021	56.2	45.3	38.9	36.3	53.7	43.8
Dec-21	08-12-2021	59.8	47.5	41.9	39.6	53.4	43.6
	22-12-2021	58.7	46.9	39.8	38.3	53.2	44.1
Jan-22	08-01-2022	57.3	46.1	39.4	36.2	49.1	41.9

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
	22-01-2022	55.8	44.5	37.4	35.6	50.6	40.7
Feb-22	05-02-2022	57.8	42.8	39.4	38.1	53.0	41.3
	19-02-2022	57.4	42.2	39.1	37.5	52.6	40.7
Mar-22	05-03-2022	54.6	45.4	42.5	37.4	51.4	42.8
	19-03-2022	56.8	43.5	43.1	37.9	53.3	41.9
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**55**	**45**

Table 4.7: Location – Balarampuram, N5 - (Commercial Area)

Month	Date	L_{max} Day time	L_{max} Night time	L_{min} Day time	L_{min} Night time	L_{eq} Day time	L_{eq} Night time
		dB (A)					
Oct-21	13-10-2021	71.6	50.8	40.7	35.1	54.7	47.3
	29-10-2021	70.1	49.2	40.1	35.3	56.7	46.8
Nov-21	10-11-2021	69.7	48.5	39.8	34.3	52.8	46.1
	24-11-2021	68.5	47.3	39.4	34.7	53.9	45.7
Dec-21	10-12-2021	71.4	49.7	41.3	36.4	54.8	48.6
	24-12-2021	70.6	48.3	41.9	36.8	55.7	46.1
Jan-22	11-01-2022	68.5	48.1	40.1	35.9	53.7	46.4
	25-01-2022	67.1	47.8	39.3	36.1	51.8	45.9
Feb-22	08-02-2022	62.5	46.1	42.6	41.0	57.4	44.5
	22-02-2022	63.3	47.2	43.1	42.0	58.2	45.5
Mar-22	08-03-2022	63.1	50.4	48.2	41.6	55.8	47.0
	22-03-2022	60.6	49.1	46.3	40.8	52.4	46.1
As per the Noise Pollution (Regulation & Control) Rules, 2000 [Rules 3 (1) and 4(1)]						**65**	**55**

HYR-4.5. Half Yearly Average Results of Ambient Noise Monitoring (October-2021 to March-2022)

Table 4.8: Half Yearly Average Results

Parameter		Venganoor (N1)	Proposed Port Estate Area (N3)	Chani (N4)	Port Site (N2)	Balarampuram (N5)
		Residential	Residential	Residential	Industrial	Commercial
L_{max} Day time dB (A)	Max	59.3	69.3	59.8	83.9	71.6
	Min	53.4	53.3	54.6	66.7	46.1
	Avg.	56.8	62.8	56.9	75.1	57.9
L_{max} Night time dB (A)	Max	45.3	44.8	47.5	66.2	50.8
	Min	39.3	40.9	42.2	50.0	46.1
	Avg.	43.2	42.9	44.7	59.7	48.5
L_{min} Day time dB (A)	Max	42.3	42.4	43.1	57.6	48.2
	Min	36.4	37.4	36.1	40.9	39.3
	Avg.	39.1	40.0	39.7	46.1	41.9
L_{min} Night time dB (A)	Max	38.5	38.6	39.6	48.7	42.0
	Min	34.6	33.6	34.7	36.3	34.3
	Avg.	36.3	36.9	37.0	41.1	37.5
Leq Day time dB (A)	Max	54.1	53.6	53.9	73.9	58.2
	Min	46.9	48.4	49.1	61.1	51.8
	Avg.	49.4	50.9	52.4	65.8	54.8
Leq Night time dB (A)	Max	42.5	42.6	44.1	58.5	48.6
	Min	37.1	38.5	40.7	48.3	44.5
	Avg.	39.3	40.6	42.1	54.9	46.3

HYR-4.6. Graphical Representation of Half Yearly Results (October-2021 to March-2022)

Figure 4.2: Residential Area Noise Level

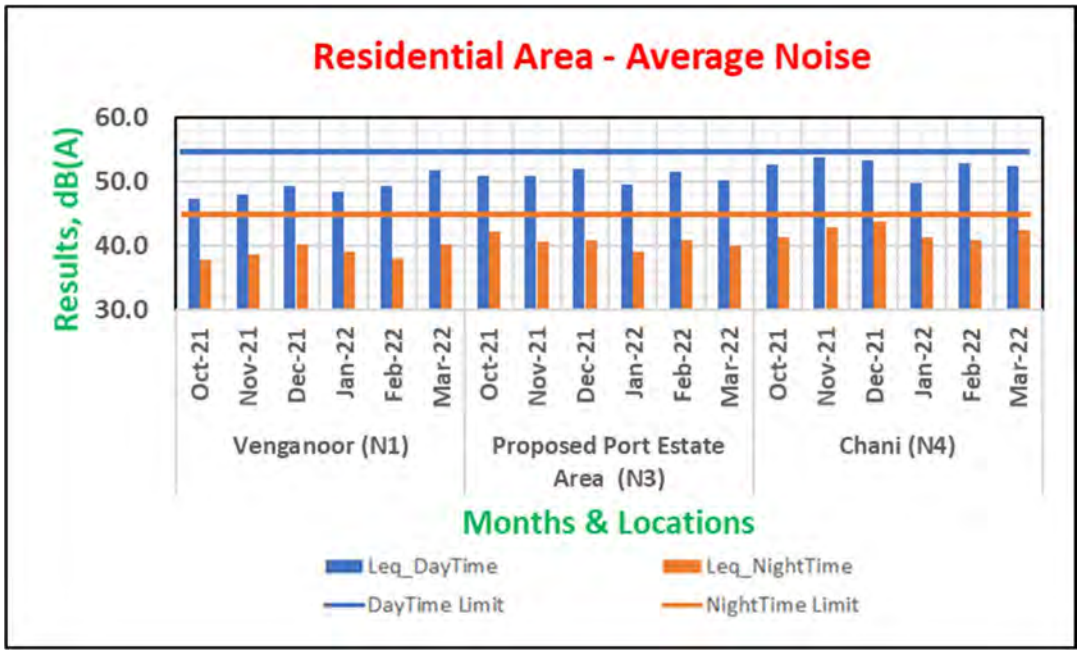


Figure 4.3: Industrial Area Noise Level

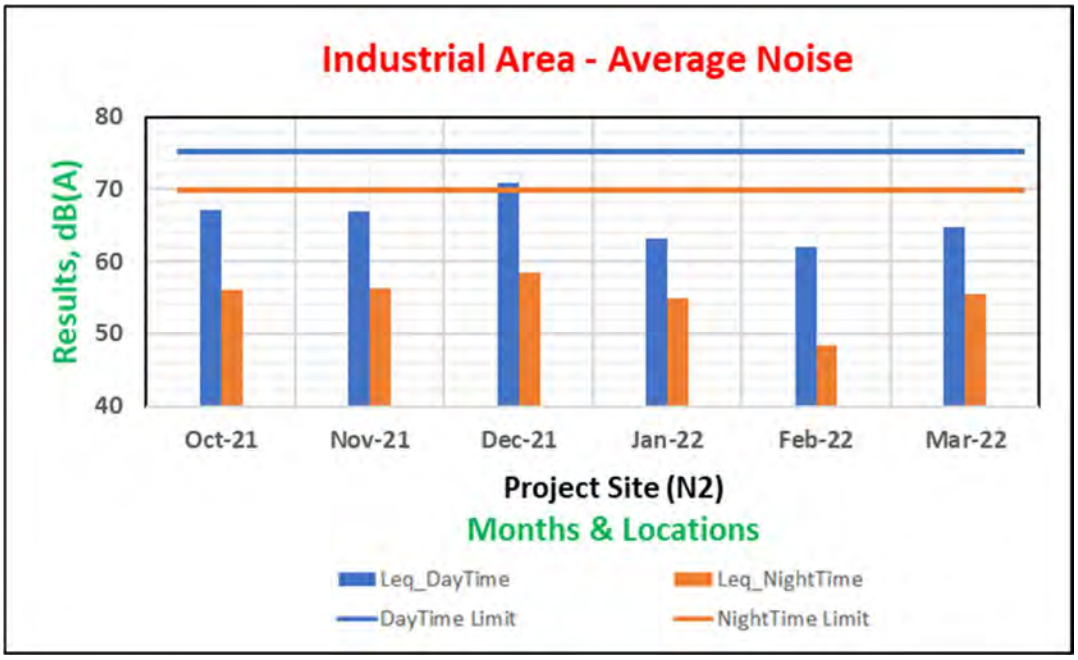
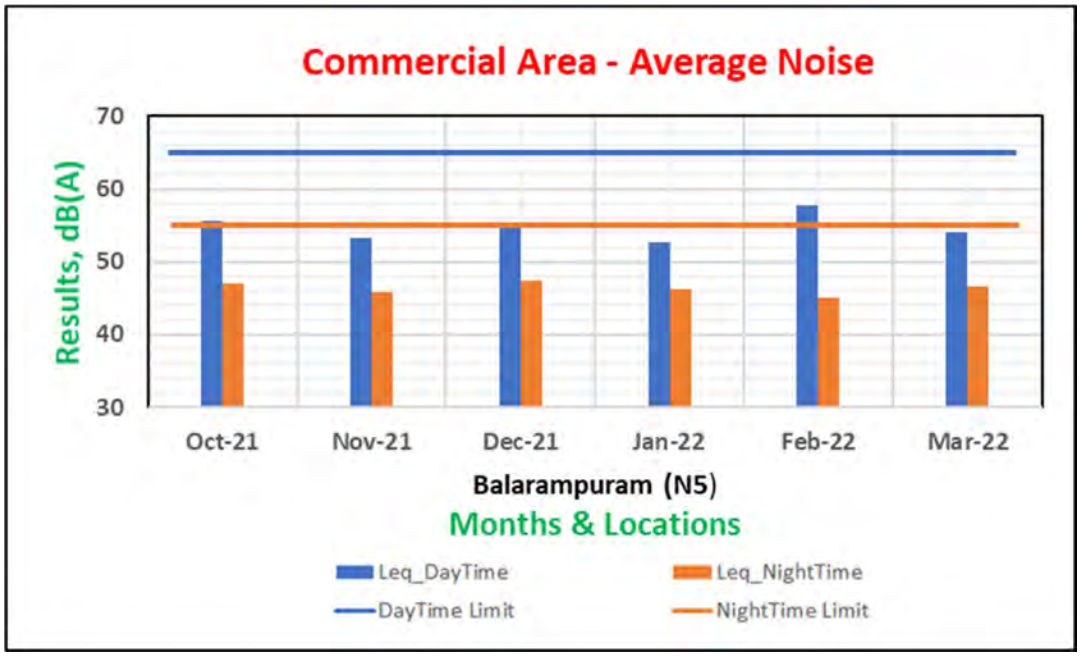


Figure 4.4: Commercial Area Noise Level



HYR-4.7. Summary - Ambient Noise Monitoring

During the period from October 2021 to March 2022, the following is the average noise levels observed.

Table 4.9: Summary - Ambient Noise Monitoring

Parameter		Venganoor (N1)	Proposed Port Estate Area (N3)	Chani (N4)	Port Site (N2)	Balarampuram (N5)
		Residential	Residential	Residential	Industrial	Commercial
		Day Time (Limit: 55) Night Time (Limit: 45)			Day Time (Limit: 75) Night Time (Limit: 70)	Day Time (Limit: 65) Night Time (Limit: 55)
Leq Day time dB (A)	Avg	49.4	50.9	52.4	65.8	54.8
Leq Night time dB (A)	Avg	39.3	40.6	42.1	54.9	46.3

- The average Leq values observed at day time and night time are 49.4 dB(A) and 39.3 respectively at Venganoor

- The average Leq values observed at day time and night time are 65.8 dB(A) and 54.9 respectively at Port Site
- The average Leq values observed at day time and night time are 50.9 dB(A) and 40.6 respectively at Proposed Port Estate Area
- The average Leq values observed at day time and night time are 52.4 dB(A) and 42.1 respectively at Chani
- The average Leq values observed at day time and night time are 54.8 dB(A) and 46.3 respectively at Balaramapuram

The results obtained were compared with Noise Pollution (Regulation & Control) Rule, 2000 (Rule 3(1) and 4(1)) and it is observed that noise readings were within limits at all locations on all monitoring days during the monitoring months (from October 2021 to March 2022).

HYR-5	Marine Water & Sediment Analysis

HYR-5.1. Marine Water and Sediment Sampling Location Details:

This section describes the sampling location, methodology adopted for analysis and the analysis of monitored data for Marine Water and Sediment. Sampling and analysis of marine water at high tide and low tide during from October 2021 to March 2022 carried out at different locations such as Near Kovalam Beach, Proposed Dredging site, South of Break Water, Port Basin, Inner Approach Channel and Kovalam Beach.

Table 5.1: Coordinates of Marine Water and Sediment Sampling Locations

Location	Legend	Latitude	Longitude
Near Kovalam Beach	M1/MS1	8°22'49.29"N	76°58'40.77"E
Proposed Dredging Site	M2/MS2	8°22'31.11"N	76°58'57.92"E
Port Basin	M3/MS3	8°22'06.96"N	76°59'27.85"E
South of Breakwater	M4/MS4	8°21'51.07"N	77°00'00.21"E
Inner Approach Channel	M5/MS5	8°21'12.68"N	77°00'35.14"E
Kovalam Beach	M6/MS6	8°23'08.16"N	76°58'26.09"E

Figure 5.1: Google earth view of Marine Water and Sediment Sampling Locations

HYR-5.2. Methodology of Sampling and Analysis

Table 5.2: Sampling and Analysis Methodology

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
Marine Water Analysis				
1.	Temperature	˚C	1	IS 3025 Part 9 : 1984 RA 2017
2.	pH Value	-	1	IS 3025 Part 11: 1983 RA 2017
3.	Turbidity	N.T.U.	0.1	IS 3025 Part 10: 1984 RA 2017
4.	Electrical Conductivity (at 25°C)	µmho/cm	1	IS 3025 Part 14:1984 RA 2019
5.	Total Suspended Solids	mg/L	1	IS 3025 Part 17: 1984 RA 2017
6.	Total Dissolved Solids	mg/L	1	IS 3025 Part 16: 1984 RA 2017
7.	Dissolved Oxygen	mg/L	0.2	IS 3025 Part 38:1989 RA 2019
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	2	IS 3025 Part 44:1993 RA 2019
9.	Floating Materials – Oil, Grease and Scum (Including Petroleum Products)	mg/L	1	IS 3025 Part 39:1991 RA 2019
10.	Nitrite (as NO_2)	mg/L	0.02	IS 3025 Part 34:1988 RA 2019
11.	Nitrate (as NO_3)	mg/L	1	APHA 23rd Edition 4500 -NO_3 B: 2017
12.	Phenolic Compounds (as C_6H_5OH)	mg/L	0.001	IS 3025 Part 43: 1992 RA 2019
13.	Ammonical Nitrogen (as NH_3-N)	mg/L	1	IS 3025 Part 34:1988 RA 2019
14.	Total Nitrogen (as N)	mg/L	1	IS 3025 Part 34:1988 RA 2019
15.	Total Phosphorous (as P)	mg/L	0.01	IS 3025 Part 31 :1988 RA2019
16.	Reactive Phosphorous	mg/L	0.01	IS 3025 Part 31 :1988 RA2019
17.	Polycyclic Aromatic Hydrocarbon	mg/L	0.000005	SEAAL/INS/RWM/SOP/02
18.	Salinity	ppt	0.0036	APHA 23rdEdition 2520 – B : 2017
19.	Total Chlorophyll	mg/m^3	0.1	APHA 23rd Edn:10200.H
20.	Total Coliforms	MPN/100 ml	2	IS 1622: 1981
21.	Faecal Coliforms	MPN /100ml	2	IS 1622: 1981
22.	Phytoplanktons	No./100ml	--	APHA 23rd Edn:10200.F
23.	Zooplanktons	No./100ml	--	APHA 23rd Edn:10200.G
Sediment Analysis				
1.	Texture	-	--	SEAAL/EN/SLS/SOP/14
2.	Organic Matter	%	0.1	IS 2720 Part 22:1972
3.	Total Phosphorus (as P)	mg/kg	10	IS 10158: 1982

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
4.	Aluminium (as Al)	mg/kg	5	USEPA 7000B : 2017
5.	Chromium (as Cr)	mg/kg	5	USEPA 7000B : 2007
6.	Copper (as Cu)	mg/kg	1.5	EPA 7000B : 2007
7.	Iron (as Fe)	mg/kg	2.5	USEPA 7000B : 2007
8.	Lead (as Pb)	mg/kg	5	EPA 7000B : 2007
9.	Manganese (as Mn)	mg/kg	1.5	EPA 7000B : 2007
10.	Mercury (as Hg)	mg/kg	0.10	SEAAL/EN/SLS/SOP/13
11.	Zinc (as Zn)	mg/kg	1	USEPA 7000B : 2007
12.	Nickel (as Ni)	mg/kg	2.5	EPA 7000B : 2007
13.	Benthic Organism	No./m^2	1	APHA 23rd Edn:10750.B

HYR-5.3. Marine Water Standards

As per the Environment (Protection) Rules, 1986 Schedule I.

Table 5.3: Marine Water Standard

Parameter	Unit	# E(P)A Rules, 1986
pH Value	-	6.5-9.0
Dissolved Oxygen	mg/L	3.0 mg/L or 40% saturation value; whichever is higher
Colour and Odour	-	No visible colour or offensive odour
Floating Materials (Oil, Grease and Scum) (Including Petroleum Products)	mg/L	*Max.* 10
Faecal Coliforms	MPN/100ml	*Max.* 500
Biochemical Oxygen Demand (3 days, 27°C)	mg/L	*Max.* 5
#: Environment (Protection) Rules, 1986, Schedule I, Table 1.4, Primary Water Quality Criteria for Class – IV Water (For Harbour Waters).		

HYR-5.4. Marine Water Analysis Results for the period from October 2021 to March 2022.

Table 5.4: Marine Water Analysis Results

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
1	Temperature (°C)	Oct-21	High tide	28.4	28.4	28.6	28.6	28.4	28.4
			Low tide	28.2	28.3	28.5	28.7	28.6	28.2
		Nov-21	High tide	27.3	27.2	27.2	27.3	27.2	27.2
			Low tide	26.1	26	26.1	26.2	26.0	26.1
		Dec-21	High tide	28.3	28.6	28.9	28.5	28.6	28.9
			Low tide	29.2	29.5	29.1	29.4	29.2	29.6
		Jan-22	High tide	28.0	28.0	28.0	28.0	28.0	28.0
			Low tide	28.0	28.0	28.0	28.0	28.0	28.0
		Feb-22	High tide	28.0	28.0	28.0	28.0	28.0	28.0
			Low tide	30.0	30.0	30.0	30.0	30.0	30.0
		Mar-22	High tide	27.0	27.0	27.0	27.0	27.0	27.0
			Low tide	29.0	29.0	29.0	29.0	29.0	29.0
2	Colour	Oct-21	High tide	1	1	1	1	1	1
			Low tide	1	1	1	1	1	1
		Nov-21	High tide	1	1	1	1	1	1
			Low tide	1	1	1	1	1	1
		Dec-21	High tide	1	1	1	1	1	1
			Low tide	1	1	1	1	1	1
		Jan-22	High tide	1	1	1	1	1	1
			Low tide	1	1	1	1	1	1
		Feb-22	High tide	1	1	1	1	1	1

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low tide	1	1	1	1	1	1
		Mar-22	High tide	1	1	1	1	1	1
			Low tide	1	1	1	1	1	1
3	pH Value	Oct-21	High tide	7.82	7.82	7.83	7.81	7.82	7.82
			Low tide	7.86	7.83	7.85	7.88	7.8	7.86
		Nov-21	High tide	7.91	8.01	8.01	8.05	8.01	7.97
			Low tide	7.86	8.06	7.92	8.02	7.98	8.12
		Dec-21	High tide	7.98	8.03	8.08	7.88	7.78	8.12
			Low tide	7.97	8.04	7.9	8.04	8.03	7.53
		Jan-22	High tide	7.88	7.99	8.09	8.04	7.92	7.96
			Low tide	7.89	8.04	7.98	8.01	8.01	7.82
		Feb-22	High tide	7.80	7.94	7.91	7.96	7.98	7.89
			Low tide	8.01	7.96	7.73	8.03	7.84	8.04
		Mar-22	High tide	7.92	8.00	8.05	8.07	8.09	8.11
			Low tide	7.95	8.02	8.02	8.08	8.06	8.12
4	Turbidity (N.T.U.)	Oct-21	High tide	1.7	3.7	1.7	1.6	2.1	1.7
			Low tide	2.9	1.1	1.2	2.5	0.7	2.9
		Nov-21	High tide	0.8	0.1	0.1	0.2	0.9	0.1
			Low tide	0.1	0.3	0.2	0.9	0.2	0.7
		Dec-21	High tide	0.2	0.4	0.9	0.1	BDL	0.4
			Low tide	0.2	0.2	1.2	0.7	0.5	1.6
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	0.1
			Low tide	BDL	BDL	0.7	BDL	BDL	0.3
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
5	Electrical Conductivity (at 25°C) (µmho/cm)	Oct-21	High tide	57520	56850	56980	57370	57260	57520
			Low tide	57380	57660	57840	57030	56950	57380
		Nov-21	High tide	60750	60845	60680	60855	60875	60755
			Low tide	60800	60868	60645	60910	60745	60700
		Dec-21	High tide	54125	54765	54235	54215	54625	54700
			Low tide	55660	55035	54625	55305	54965	55165
		Jan-22	High tide	62630	62370	62780	62430	62170	61990
			Low tide	62890	62550	62920	62450	62320	62190
		Feb-22	High tide	61470	61430	60830	61110	61600	60940
			Low tide	61190	60800	61810	61060	60920	61480
		Mar-22	High tide	60720	61200	61170	61240	61280	60430
			Low tide	61270	61210	61900	61190	61270	61720
6	Total Suspended Solids (mg/L)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	1.1	1	1.1	1	BDL
			Low tide	1.2	1.2	1.1	1.1	1	1
		Dec-21	High tide	BDL	1.1	BDL	1.2	1	BDL
			Low tide	1	1.3	1.2	1.2	1	1.2
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
7	Total Dissolved Solids (mg/L)	Oct-21	High tide	37380	36949	37037	37288	37215	37380
			Low tide	37292	37470	37590	37065	37010	37292
		Nov-21	High tide	39475	39538	39435	39535	39558	39480
			Low tide	39510	39555	39409	39580	39475	39450
		Dec-21	High tide	35178	35590	35248	35230	35500	35550
			Low tide	35525	35768	35501	35945	35720	35850
		Jan-22	High tide	40688	40535	40800	40570	40405	40290
			Low tide	40875	40650	40890	40590	40500	40420
		Feb-22	High tide	39950	39920	39530	39710	40040	39611
			Low tide	39770	39510	40165	39680	39598	39962
		Mar-22	High tide	39460	39772	40400	39795	39828	39270
			Low tide	39820	39780	40230	39120	39820	40108
8	Dissolved Oxygen (mg/L)	Oct-21	High tide	5.6	6.9	6.3	5.8	5.9	5.6
			Low tide	6.8	6.8	6.7	6.4	6.9	6.8
		Nov-21	High tide	6.2	6.6	6.7	6.2	6.2	6.1
			Low tide	7	6.8	6.9	6.8	7.1	6.8
		Dec-21	High tide	6.4	6.8	6.6	6.5	6.4	6.4
			Low tide	6.9	7	6.9	7.1	6.9	6.9
		Jan-22	High tide	6.6	6.7	6.8	6.7	6.6	6.6
			Low tide	7.1	6.9	7.0	6.9	6.9	7.0
		Feb-22	High tide	6.9	6.7	6.7	6.8	6.7	6.7
			Low tide	7.1	7.1	6.8	7.0	6.9	6.9
		Mar-22	High tide	6.9	6.9	6.8	6.7	6.9	6.9
			Low tide	7.2	7	6.9	6.9	7.1	7.0

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
9	Biochemical Oxygen Demand (3 days, 27°C) (mg/L)	Oct-21	High tide	BDL	BDL	2.98	4.2	5	3.98
			Low tide	BDL	BDL	BDL	2	BDL	BDL
		Nov-21	High tide	BDL	BDL	2	3.0	3.2	2.0
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	2.0	2	2.0
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
10	Floating Materials (Oil, Grease and Scum) (Including Petroleum Products) (mg/L)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
11		Oct-21	High tide	0.15	0.1	0.14	0.19	0.16	0.14

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	Nitrite (as NO_2) (mg/L)		Low tide	0.19	0.14	0.16	0.2	0.19	0.19
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	0.140	0.020	0.080	0.050
			Low tide	0.14	BDL	0.030	BDL	0.030	0.060
		Feb-22	High tide	BDL	BDL	BDL	0.020	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
12	Nitrate (as NO_3) (mg/L)	Oct-21	High tide	2.78	2.72	3.06	2.78	2.86	2.78
			Low tide	2.82	2.92	3.7	3.19	4.45	2.82
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	1.24	1.41	BDL	1.21	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	1.24	1.41	BDL	1.21	BDL	BDL
		Jan-22	High tide	BDL	BDL	1.08	2.10	1.18	1.38
			Low tide	1.20	BDL	1.18	2.12	1.20	1.45
		Feb-22	High tide	BDL	BDL	BDL	2.08	BDL	BDL
			Low tide	BDL	BDL	BDL	2.14	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	1.10	BDL	BDL	BDL	BDL	BDL
13		Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	Phenolic Compounds (as C_6H_5OH) (mg/L)	Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
14	Ammonical Nitrogen (as NH_3-N) (mg/L)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
15	Total Nitrogen (as N)	Oct-21	High tide	2.6	4.38	3.95	4.2	3.94	2.6
			Low tide	5.08	5.04	4.25	5.91	5.44	5.08
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
	(mg/L)		Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
16	Total Phosphorous (as P) (mg/L)	Oct-21	High tide	0.38	0.42	0.35	0.29	BDL	0.38
			Low tide	0.33	0.33	0.37	0.44	0.34	0.33
		Nov-21	High tide	0.3	0.38	0.29	0.22	BDL	0.28
			Low tide	0.32	0.25	0.30	0.32	0.28	0.30
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
17	Reactive Phosphorous (mg/L)	Oct-21	High tide	0.12	0.14	0.12	0.1	BDL	0.12
			Low tide	0.11	0.11	0.12	0.14	0.11	0.11
		Nov-21	High tide	0.12	0.12	0.10	0.12	BDL	0.11
			Low tide	0.14	0.10	0.11	0.11	0.1	0.14

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
18	Polycyclic Aromatic Hydrocarbon (mg/L)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
19	Salinity (ppt)	Oct-21	High tide	34.46	34.008	34.096	34.358	34.284	34.46
			Low tide	34.365	34.554	34.676	34.129	34.075	34.365
		Nov-21	High tide	34.077	34.137	34.033	34.143	34.156	34.08
			Low tide	34.109	34.152	34.011	34.178	34.074	34.046
		Dec-21	High tide	33.956	34.408	34.033	34.019	34.309	34.362

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
			Low tide	34.334	34.599	34.309	34.791	34.55	34.691
		Jan-22	High tide	34.509	34.340	34.600	34.380	34.220	34.110
			Low tide	34.670	34.460	34.680	34.390	34.320	34.240
		Feb-22	High tide	34.460	34.440	34.060	34.240	34.550	34.130
			Low tide	34.290	34.050	34.680	34.210	34.120	34.400
		Mar-22	High tide	34.187	34.492	34.473	34.517	34.542	34.003
			Low tide	34.536	34.498	34.936	34.485	34.536	34.822
20	Total Chlorophyll (mg/m^3)	Oct-21	High tide	0.6	0.8	0.5	0.2	0.6	0.2
			Low tide	0.8	0.9	0.8	0.3	0.7	0.3
		Nov-21	High tide	0.7	0.8	0.6	0.5	0.4	0.5
			Low tide	0.9	0.8	0.7	0.6	0.6	0.6
		Dec-21	High tide	0.5	0.7	0.7	0.6	0.5	0.6
			Low tide	0.8	0.9	0.9	0.6	0.7	0.7
		Jan-22	High tide	0.6	0.5	0.5	0.7	0.7	0.7
			Low tide	0.7	0.8	0.8	0.9	0.9	0.9
		Feb-22	High tide	0.5	0.5	0.6	0.6	0.5	0.6
			Low tide	0.7	0.6	0.8	0.9	0.7	0.7
		Mar-22	High tide	0.7	0.4	0.7	0.7	0.4	0.6
			Low tide	0.9	0.8	0.8	0.9	0.5	0.9
21	Total Coliforms (MPN Index/100 mL)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter /unit	Month/Tide		Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
22	Faecal Coliforms (MPN Index/100 mL)	Oct-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Nov-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Dec-21	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Jan-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Feb-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL
		Mar-22	High tide	BDL	BDL	BDL	BDL	BDL	BDL
			Low tide	BDL	BDL	BDL	BDL	BDL	BDL

HYR-5.5. Graphical representation of Results for marine water

Figure 5.2: Marine Water Analysis for Temperature

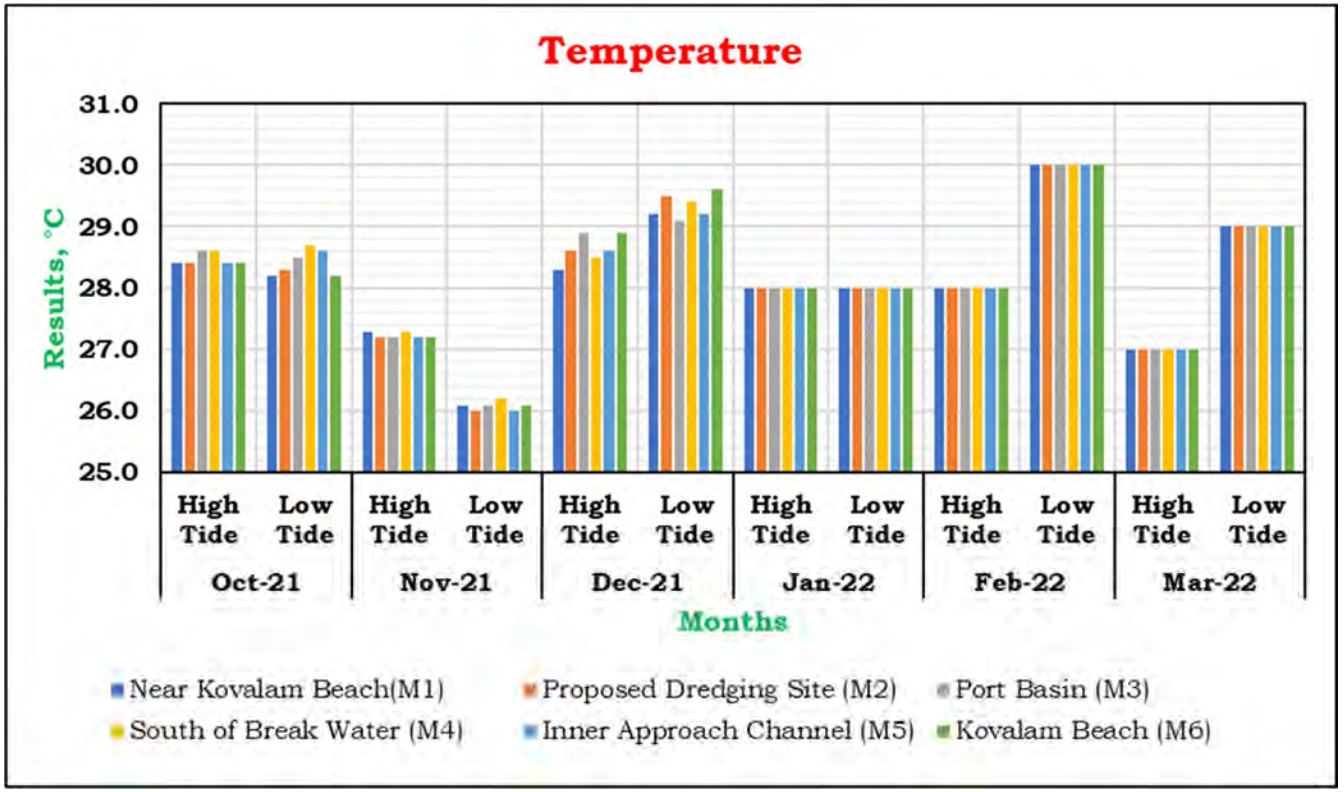


Figure 5.3: Marine Water Analysis for pH

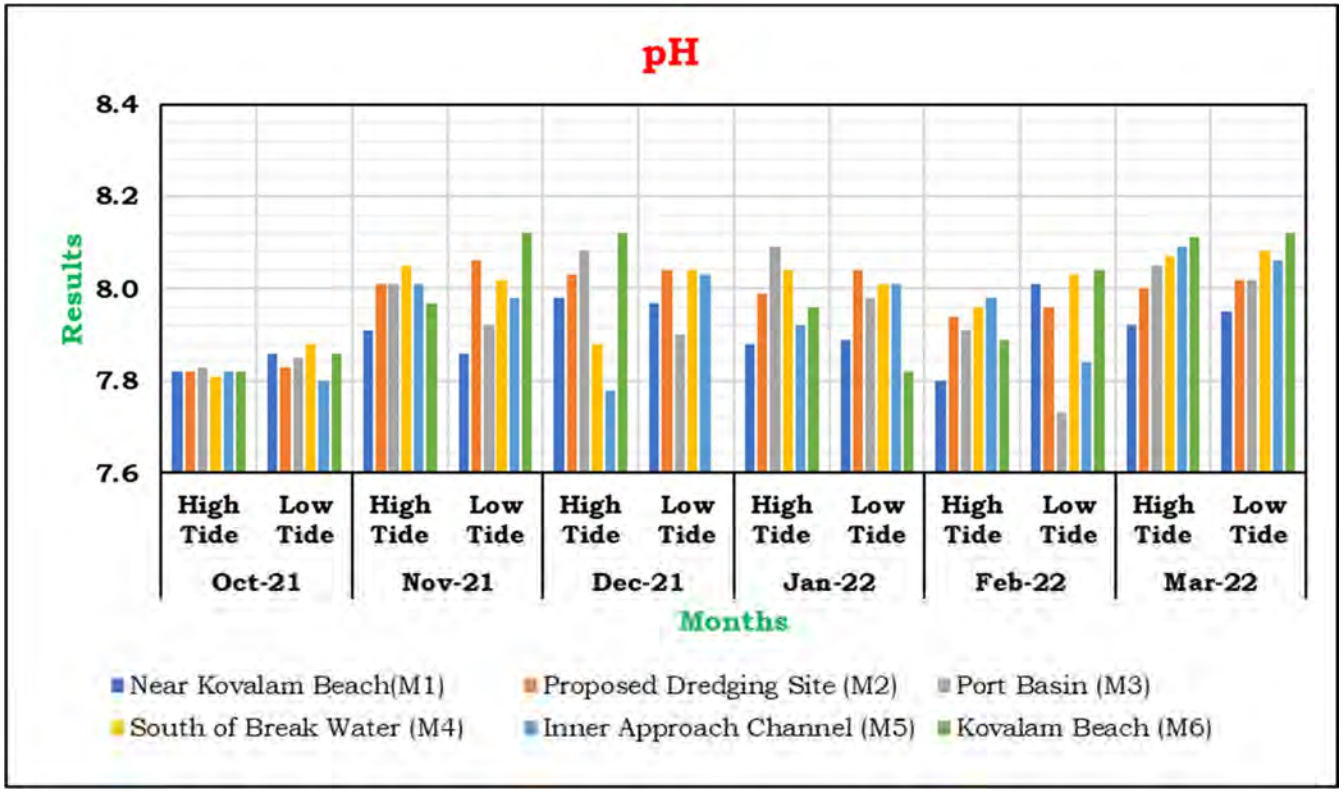


Figure 5.4: Marine Water Analysis for Turbidity

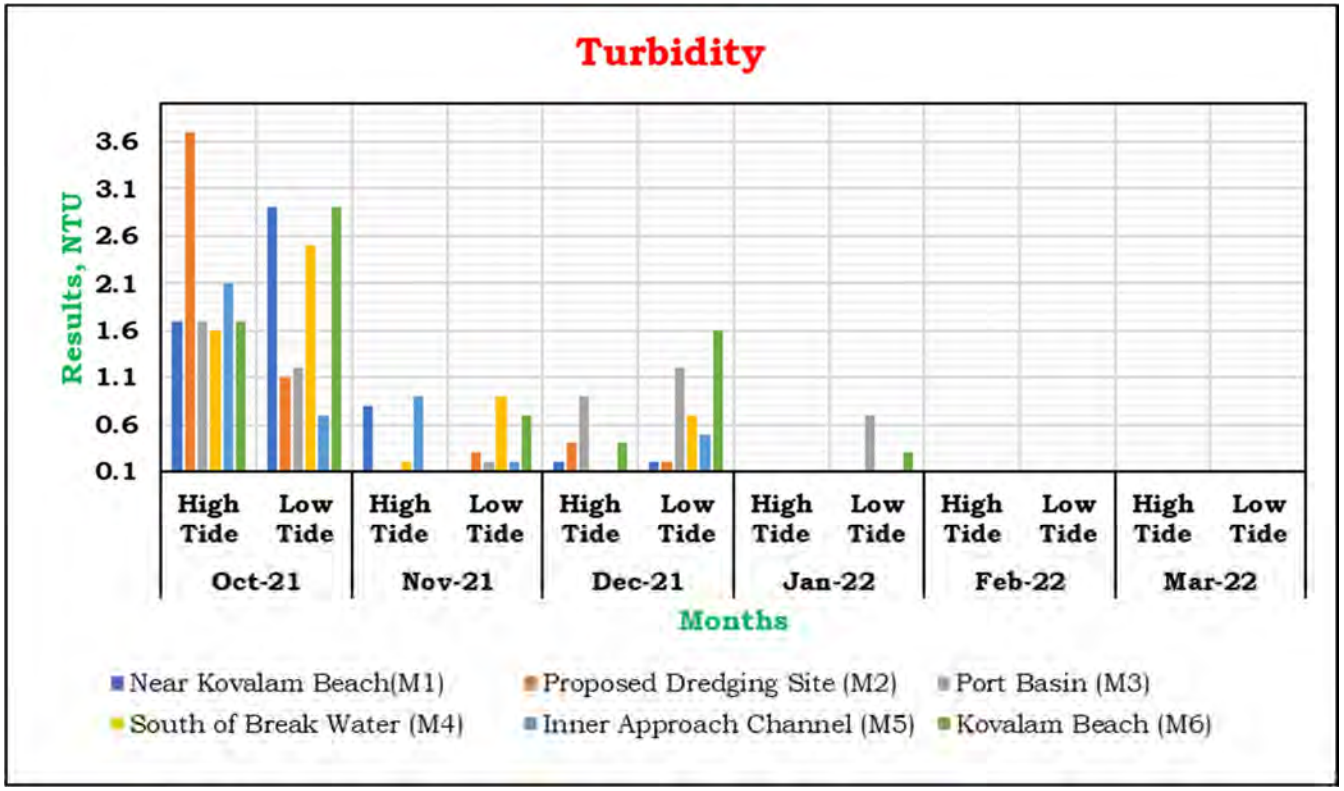


Figure 5.5: Marine Water Analysis for Electrical Conductivity

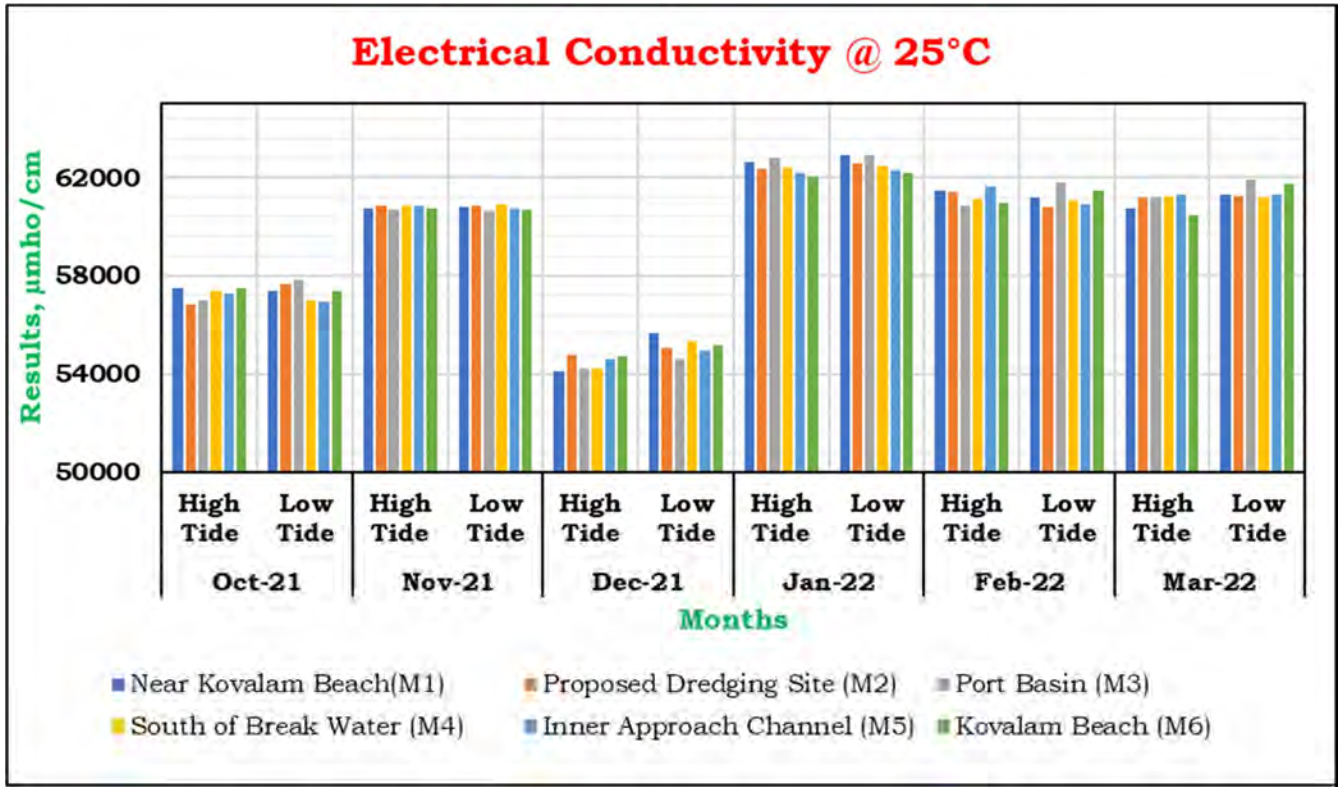


Figure 5.6: Marine Water Analysis for Total Suspended Solids

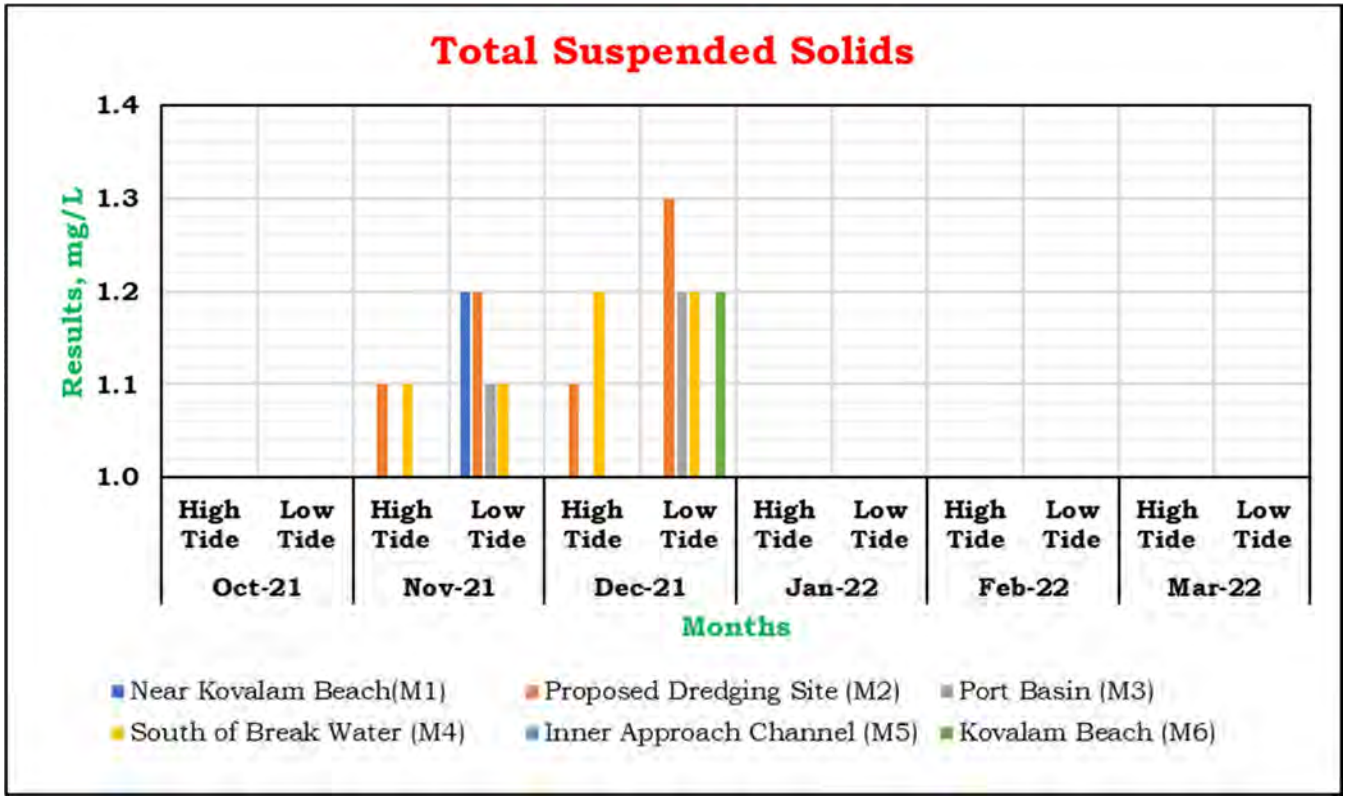


Figure 5.7: Marine Water Analysis for Total Dissolved Solids

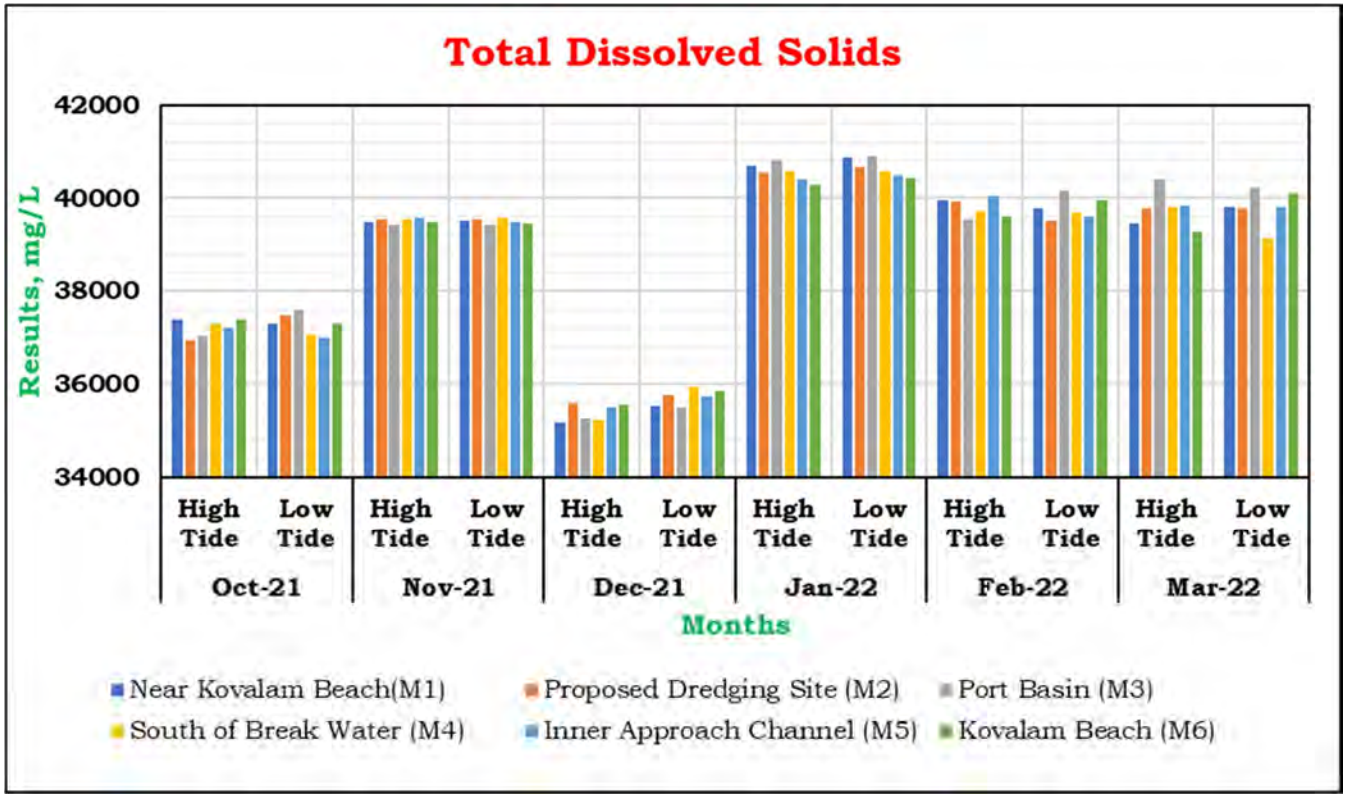


Figure 5.8: Marine Water Analysis for Dissolved Oxygen

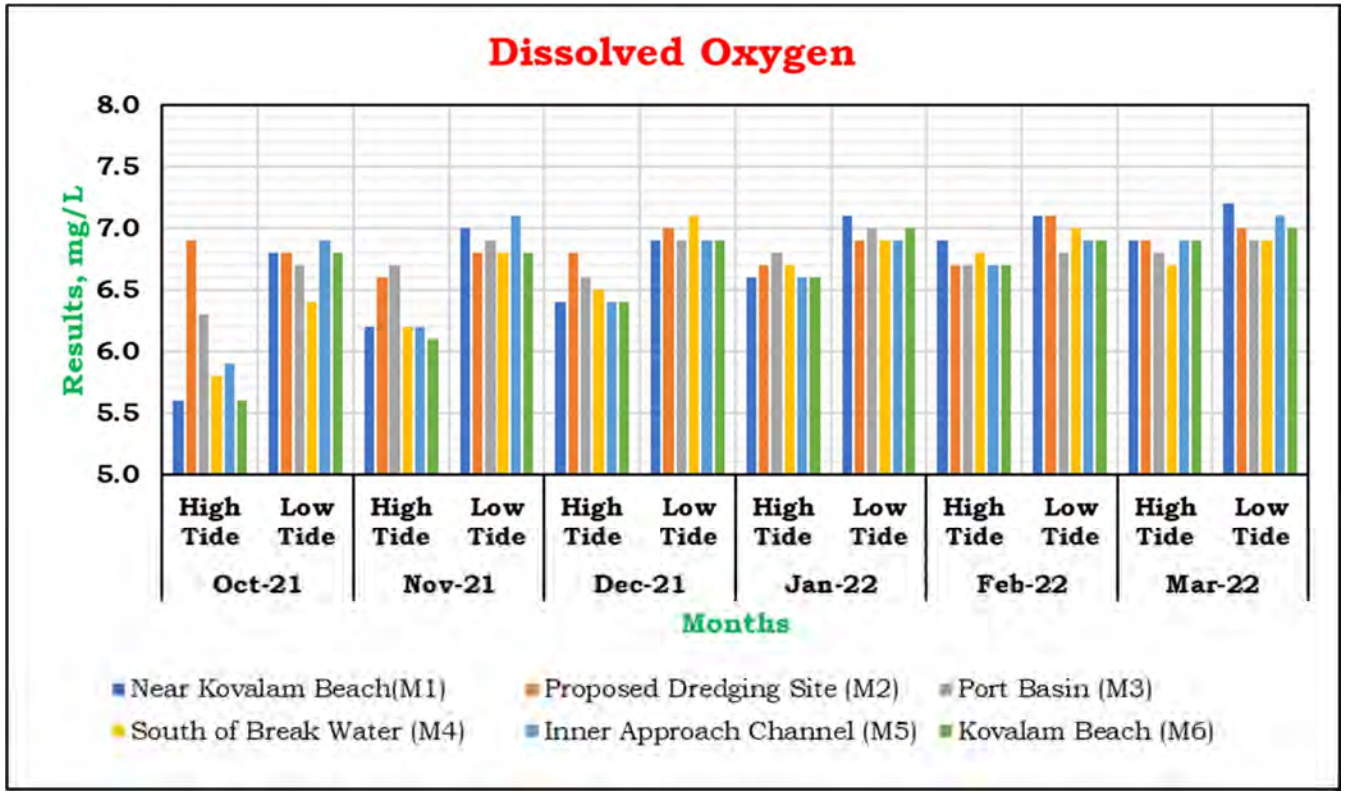


Figure 5.9: Marine Water Analysis for Nitrate as NO_3

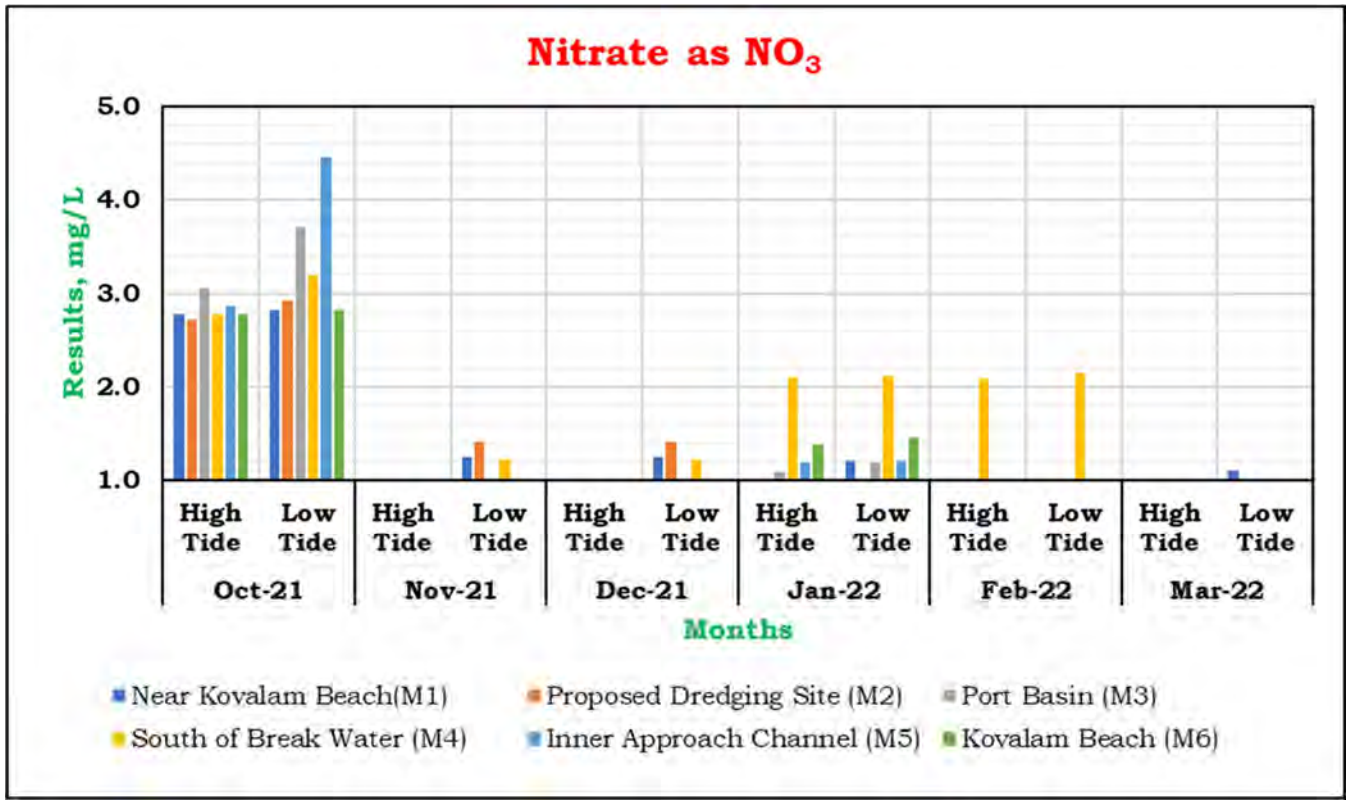


Figure 5.10: Marine Water Analysis for Total Nitrogen as N

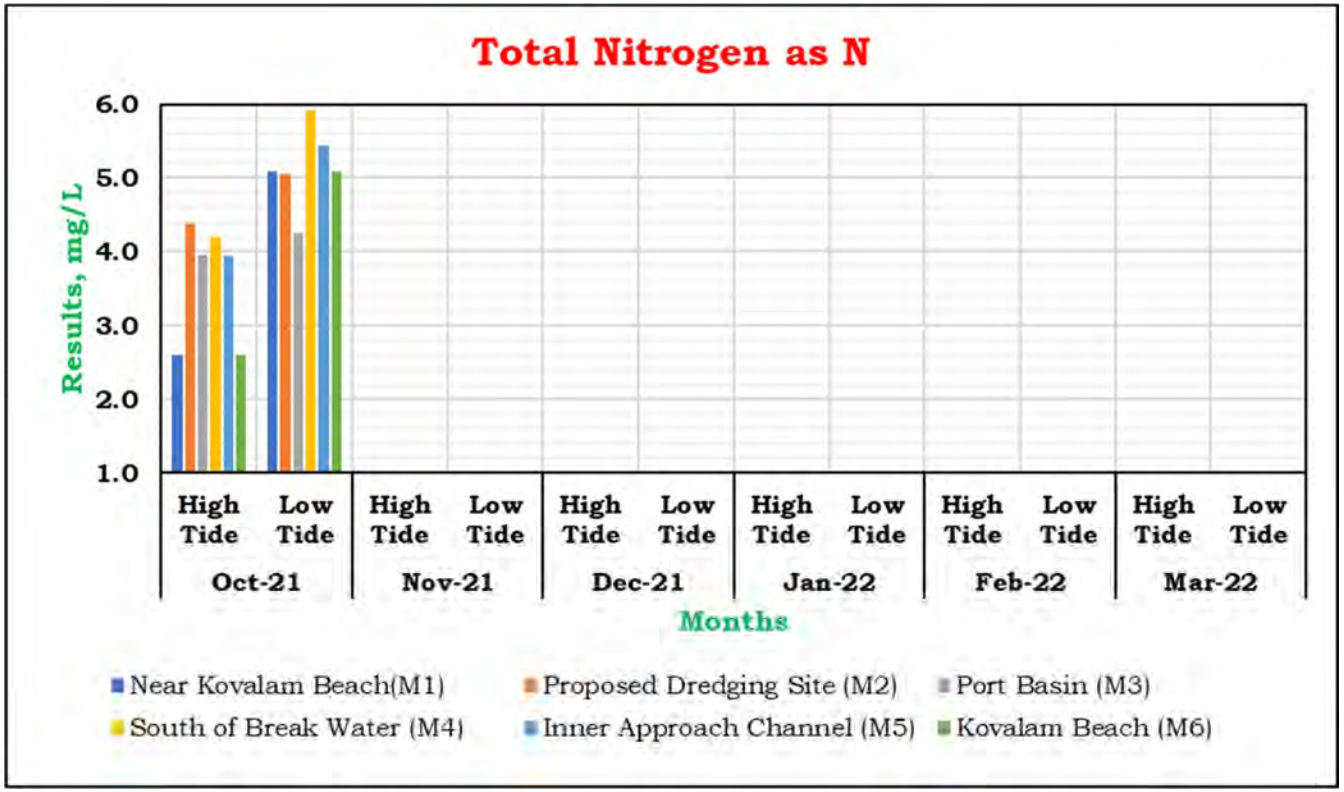


Figure 5.11: Marine Water Analysis for Salinity

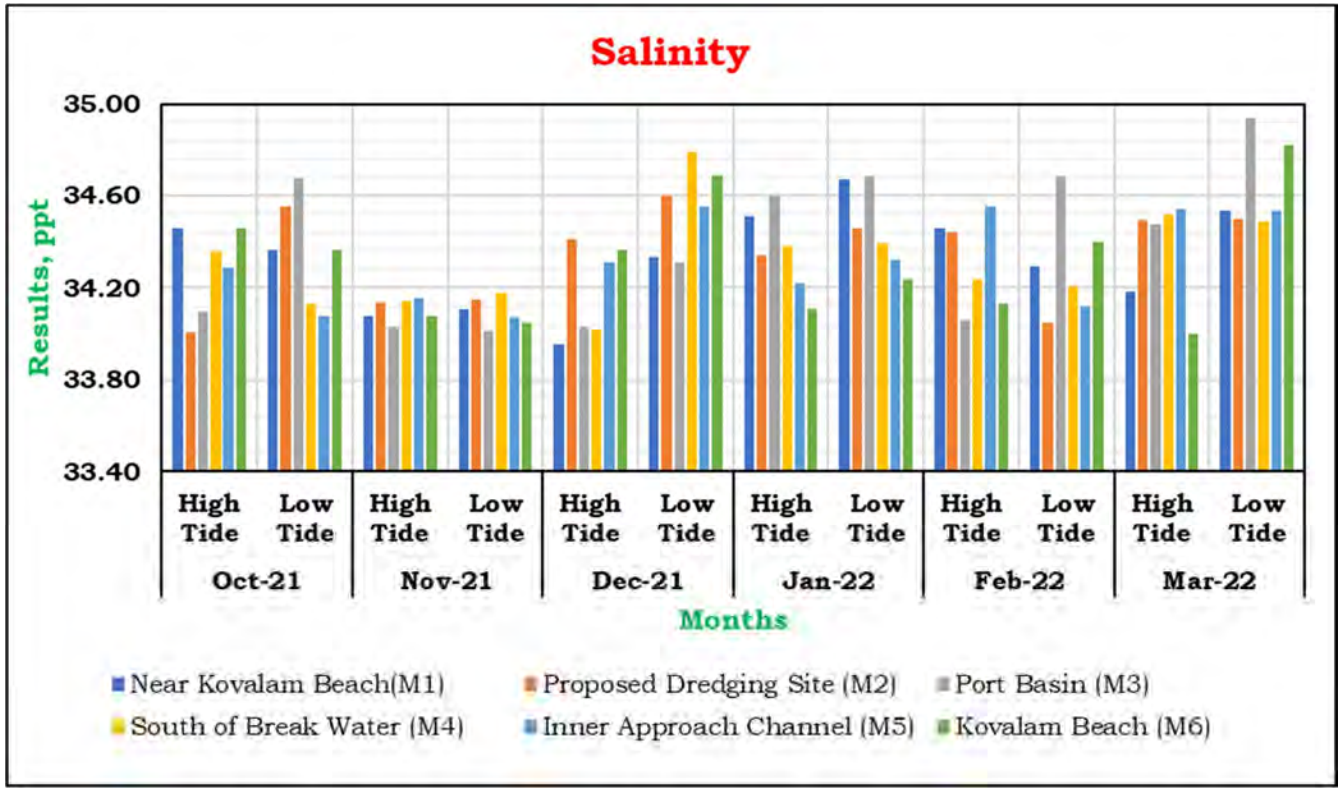
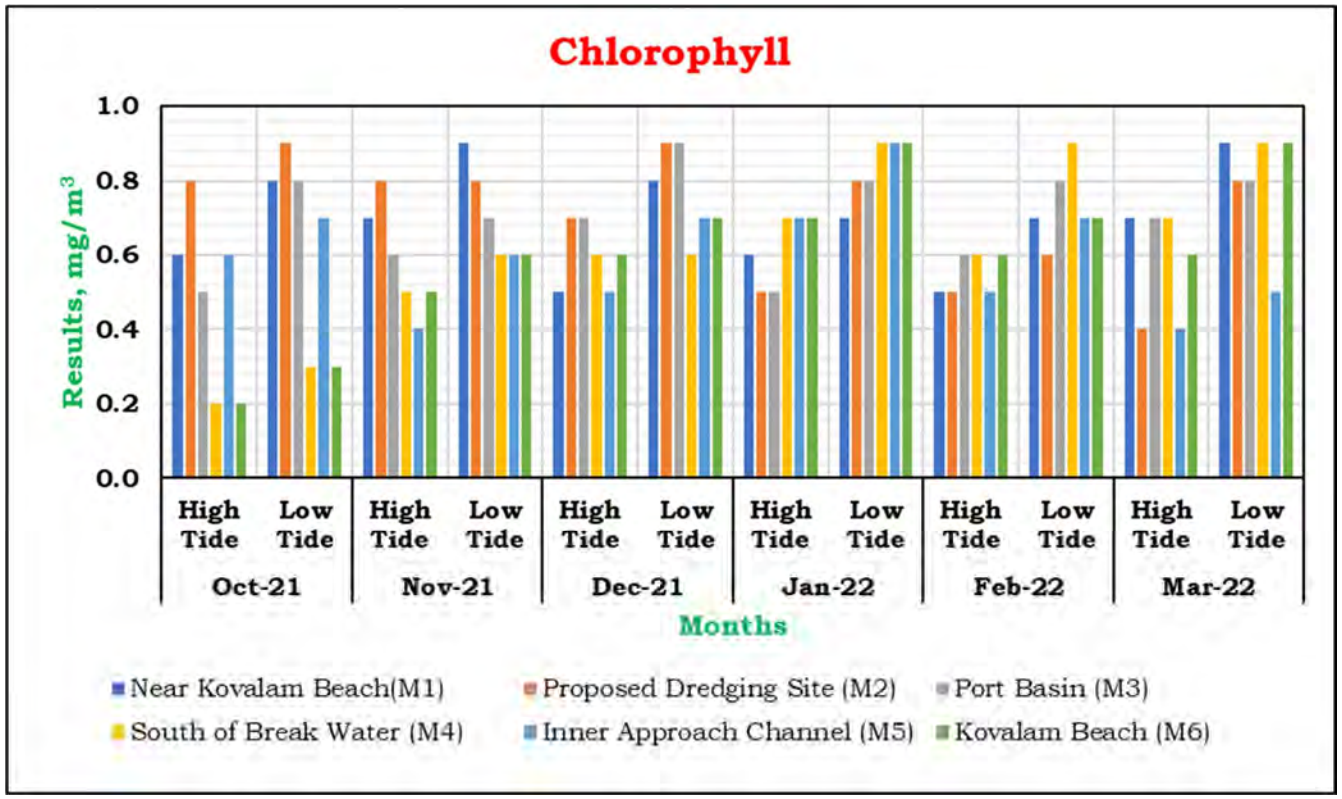


Figure 5.12: Marine Water Analysis for Chlorophyll



HYR-5.6. Summary - Marine water analysis:

During the months from October 2021 to March 2022, following is the summary of the marine water analysis:

a) At the location **Near Kovalam Beach** (low tide & high tide),

- Temperature was observed in the range from 26.1 to 30.0°C
- No visible colour was observed
- pH was observed in the range from 7.8 to 8.01
- Turbidity was observed from BDL to 2.9 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54125 to 62890 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.2 mg/L
- Total Dissolved Solids were observed in the range from 35178 to 40875 mg/L
- Dissolved Oxygen was observed in the range from 5.6 to 7.2 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.19 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 2.82 mg/L
- Total Nitrogen (as N) was observed in the range from BDL to 5.08 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.38 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.14 mg/L
- Salinity was observed in the range from 33.956 to 34.67 ppt
- Total Chlorophyll was observed in the range from 0.5 to 0.9 mg/m^3
- Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

b) At the location **Proposed Dredging Site** (low tide & high tide),

- Temperature was observed in the range from 26 to 30.0°C

- No visible colour was observed
- pH was observed in the range from 7.82 to 8.06
- Turbidity was observed from BDL to 3.7 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54765 to 62550 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.3 mg/L
- Total Dissolved Solids were observed in the range from 35590 to 40650 mg/L
- Dissolved Oxygen was observed in the range from 6.6 to 7.1 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.14 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 2.92 mg/L
- Total Nitrogen (as N) was observed in the range from BDL to 5.04 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.42 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.14 mg/L
- Salinity was observed in the range from 34.008 to 34.599 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.9 mg/m^3
- Biological Oxygen Demand, Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

c) At the location **Port basin** (low tide & high tide),

- Temperature was observed in the range from 26.1 to 30.0°C
- No visible colour was observed
- pH was observed in the range from 7.73 to 8.09
- Turbidity was observed from BDL to 1.7 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54235 to 62920 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.2 mg/L

- Total Dissolved Solids were observed in the range from 35248 to 40890 mg/L
- Dissolved Oxygen was observed in the range from 6.3 to 7.0 mg/L
- Biochemical Oxygen Demand (3 days, 27°C) was observed in the from BDL to 3.0 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.16 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 3.7 mg/L
- Total Nitrogen (as N) was observed in the range from BDL to 4.25 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.37 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.12 mg/L
- Salinity was observed in the range from 34.011 to 34.936 ppt
- Total Chlorophyll was observed in the range from 0.5 to 0.9 mg/m^3
- Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

d) At the location **South of Break Water** (low tide & high tide),

- Temperature was observed in the range from 26.2 to 30.0°C
- No visible colour was observed
- pH was observed in the range from 7.81 to 8.08
- Turbidity was observed from BDL to 2.5 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54215 to 62450 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.2 mg/L
- Total Dissolved Solids were observed in the range from 35230 to 40590 mg/L
- Dissolved Oxygen was observed in the range from 5.8 to 7.1 mg/L
- Biochemical Oxygen Demand (3 days, 27°C) was observed in the from BDL to 4.2 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.20 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 3.19 mg/L

- Total Nitrogen (as N) was observed in the range from BDL to 5.19 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.44 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.14 mg/L
- Salinity was observed in the range from 34.019 to 34.791 ppt
- Total Chlorophyll was observed in the range from 0.2 to 0.9 mg/m^3
- Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

e) At the location **Inner Approach Channel** (low tide & high tide),

- Temperature was observed in the range from 26.0 to 30.0°C
- No visible colour was observed
- pH was observed in the range from 7.78 to 8.09
- Turbidity was observed from BDL to 2.1 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54625 to 62320 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.0 mg/L
- Total Dissolved Solids were observed in the range from 35500 to 40500 mg/L
- Dissolved Oxygen was observed in the range from 5.9 to 7.1mg/L
- Biochemical Oxygen Demand (3 days, 27°C) was observed in the from BDL to 5.0 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.19 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 4.45 mg/L
- Total Nitrogen (as N) was observed in the range from BDL to 5.44 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.34 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.11 mg/L
- Salinity was observed in the range from 34.074 to 34.55 ppt
- Total Chlorophyll was observed in the range from 0.4 to 0.9 mg/m^3

- Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

f) At the location **Kovalam Beach** (low tide & high tide),

- Temperature was observed in the range from 26.1 to 30 °C
- No visible colour was observed
- pH was observed in the range from 7.53 to 8.12
- Turbidity was observed from BDL to 2.9 N.T.U.
- Electrical Conductivity (at 25°C) was observed in the range from 54700 to 62190 µmho/cm
- Total Suspended Solids were observed in the range from BDL to 1.2 mg/L
- Total Dissolved Solids were observed in the range from 35550 to 40420 mg/L
- Dissolved Oxygen was observed in the range from 5.6 to 7.0 mg/L
- Biochemical Oxygen Demand (3 days, 27°C) was observed in the from BDL to 4.0 mg/L
- Nitrite (as NO_2) was observed in the range from BDL to 0.19 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 2.82 mg/L
- Total Nitrogen (as N) was observed in the range from BDL to 5.08 mg/L
- Total Phosphorous (as P) was observed in the range from BDL to 0.38 mg/L
- Reactive Phosphorous (as P) was observed in the range from BDL to 0.14 mg/L
- Salinity was observed in the range from 34.003 to 34.822 ppt
- Total Chlorophyll was observed in the range from 0.2 to 0.9 mg/m^3
- Floating materials, Phenolic Compounds (as C_6H_5OH), Ammonical Nitrogen (as NH_3-N), Polycyclic Aromatic Hydrocarbon, Total Coliforms and Faecal Coliforms were observed below the detection limits.

HYR-5.7. Maximum Values observed - Marine water analysis:

During the period from October 2021 to March 2022, the following is the maximum value observed.

Table 5.5: Maximum Values observed

Sl. No.	Parameter /unit	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
1	Temperature (°C)	30.0	30.0	30.0	30.0	30.0	30.0
2	Colour	1	1	1	1	1	1
3	pH Value	8.01	8.06	8.09	8.08	8.09	8.12
4	Turbidity (N.T.U.)	2.9	3.7	1.7	2.5	2.1	2.9
5	Electrical Conductivity (at 25°C) (µmho/cm)	62890	62550	62920	62450	62320	62190
6	Total Suspended Solids (mg/L)	1.2	1.3	1.2	1.2	1.0	1.2
7	Total Dissolved Solids (mg/L)	40875	40650	40890	40590	40500	40420
8	Dissolved Oxygen (mg/L)	7.2	7.1	7.0	7.1	7.1	7.0
9	Biochemical Oxygen Demand (3 days, 27°C) (mg/L)	BDL	BDL	3.0	4.2	5.0	4.0
10	Floating Materials (Oil, Grease and Scum) (Including Petroleum Products) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
11	Nitrite (as NO_2) (mg/L)	0.19	0.14	0.16	0.20	0.19	0.19
12	Nitrate (as NO_3) (mg/L)	2.82	2.92	3.70	3.19	4.45	2.82

Sl. No.	Parameter /unit	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break Water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
13	Phenolic Compounds (as C_6H_5OH) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
14	Ammonical Nitrogen (as NH_3-N) (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
15	Total Nitrogen (as N) (mg/L)	5.08	5.04	4.25	5.91	5.44	5.08
16	Total Phosphorous (as P) (mg/L)	0.38	0.42	0.37	0.44	0.34	0.38
17	Reactive Phosphorous (mg/L)	0.14	0.14	0.12	0.14	0.11	0.14
18	Polycyclic Aromatic Hydrocarbon (mg/L)	BDL	BDL	BDL	BDL	BDL	BDL
19	Salinity (ppt)	34.670	34.599	34.936	34.791	34.550	34.822
20	Total Chlorophyll (mg/m^3)	0.9	0.9	0.9	0.9	0.9	0.9
21	Total Coliforms (MPN Index/100 mL)	BDL	BDL	BDL	BDL	BDL	BDL
22	Faecal Coliforms (MPN Index/100 mL)	BDL	BDL	BDL	BDL	BDL	BDL

HYR-5.8. Sediment Analysis Results

Table 5.6: Sediment Analysis Results

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
1	Texture	-	Oct-21	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
			Nov-21	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
			Dec-21	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
			Jan-22	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
			Feb-22	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
			Mar-22	Sandy	Sandy	Sandy	Sandy	Sandy	Sandy
2	Organic Matter	%	Oct-21	0.2	0.28	3.2	0.3	0.28	0.38
			Nov-21	0.22	0.3	2.95	0.25	0.32	0.4
			Dec-21	0.28	0.32	3.01	0.28	0.35	0.38
			Jan-22	0.22	0.59	4.57	0.21	0.23	0.34
			Feb-22	1.27	0.27	0.28	0.40	0.22	0.42
			Mar-22	1.02	0.29	0.32	0.38	0.19	0.38
3	Total Phosphorus (as P)	mg/kg	Oct-21	22.8	102	134	45.6	27.2	59.7
			Nov-21	118	485	588	132	127	275
			Dec-21	261	129	8.07	204	271	247
			Jan-22	291	294	116	25.5	159	232
			Feb-22	470	315	161	209	186	106
			Mar-22	455	348	145	185	178	110
4	Aluminium (as Al)	mg/kg	Oct-21	420	480	1080	285	370	1185
			Nov-21	834	653	686	994	740	772

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
			Dec-21	4232	6553	1201	630	1341	1281
			Jan-22	2542	4222	4688	1381	1521	2114
			Feb-22	2661	2051	896	3142	1189	1679
			Mar-22	2680	1986	910	3158	1201	1578
5	Chromium (as Cr)	mg/kg	Oct-21	BDL	BDL	BDL	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL	BDL	BDL	BDL
6	Copper (as Cu)	mg/kg	Oct-21	BDL	BDL	BDL	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL	BDL	BDL	BDL
7	Iron (as Fe)	mg/kg	Oct-21	5655	5129	10625	4080	3358	10140
			Nov-21	9488	5848	17434	7007	7794	7802
			Dec-21	8033	9692	2485	2363	4424	7056
			Jan-22	8491	8646	4749	3735	5841	7071
			Feb-22	10964	9033	6116	10552	6316	8330
			Mar-22	11120	9065	6110	9986	6294	7896
8	Lead (as Pb)	mg/kg	Oct-21	BDL	BDL	BDL	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
			Jan-22	BDL	BDL	BDL	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL	BDL	BDL	BDL
9	Manganese (as Mn)	mg/kg	Oct-21	11.2	12.6	11.5	12.1	11.9	10.8
			Nov-21	9.8	10.4	13.5	11.9	9.62	12.8
			Dec-21	8.37	14.7	8.37	15.7	4.84	8.88
			Jan-22	3.83	6.73	5.12	8.24	3.91	6.75
			Feb-22	3.15	4.14	3.17	6.20	2.10	3.21
			Mar-22	4.22	3.45	3.86	5.40	2.96	4.01
10	Mercury (as Hg)	mg/kg	Oct-21	BDL	BDL	BDL	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL	BDL	BDL	BDL
11	Zinc (as Zn)	mg/kg	Oct-21	12.3	10.6	9.70	8.40	9.50	13.9
			Nov-21	13.5	8.62	13.90	9.70	11.40	10.2
			Dec-21	9.49	16.6	15.90	17.70	10.10	11.00
			Jan-22	3.92	7.42	8.36	5.61	3.76	6.12
			Feb-22	3.13	4.12	6.78	4.89	5.66	6.33
			Mar-22	2.93	3.78	6.70	4.95	5.80	5.86
12	Nickel (as Ni)	mg/kg	Oct-21	BDL	BDL	BDL	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL	BDL	BDL	BDL

Sl. No.	Parameter	Unit	Month	Near Kovalam Beach (MS1)	Proposed Dredging Site (MS2)	Port Basin (MS3)	South of Break Water (MS4)	Inner Approach Channel (MS5)	Kovalam Beach (MS6)
			Feb-22	BDL	BDL	BDL	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL	BDL	BDL	BDL
Benthic Organism									
13	Micro Benthic Organism	No./m^2	Oct-21	64200	63100	46200	54200	53900	67700
			Nov-21	81200	61600	53400	66700	56200	69400
			Dec-21	84600	66800	56100	72100	64300	74600
			Jan-22	78900	72300	61400	67500	59300	68900
			Feb-22	81300	69700	64700	61300	63400	66300
			Mar-22	84600	66800	69300	63100	68400	61700
14	Macro Benthic Organism	No./m^2	Oct-21	57300	53400	30700	51800	42500	54600
			Nov-21	63400	54200	33900	57600	49300	57300
			Dec-21	61700	57900	37800	61300	56100	61800
			Jan-22	59300	61800	45900	55600	59800	51200
			Feb-22	62500	63100	47200	58200	61600	53900
			Mar-22	61900	67200	52800	54700	62400	59300
15	**Total Benthos**	**No./m^2**	Oct-21	**121500**	**116500**	**76900**	**106000**	**96400**	**122300**
			Nov-21	**144600**	**115800**	**87300**	**124300**	**105500**	**126700**
			Dec-21	**146300**	**124700**	**93900**	**133400**	**120400**	**136400**
			Jan-22	**138200**	**134100**	**107300**	**123100**	**119100**	**120100**
			Feb-22	**143800**	**132800**	**111900**	**119500**	**125000**	**120200**
			Mar-22	**146500**	**134000**	**122100**	**117800**	**130800**	**121000**

HYR-5.9. Graphical representation of Results for Sediment analysis

Figure 5.13: Sediment Analysis for Organic Matter

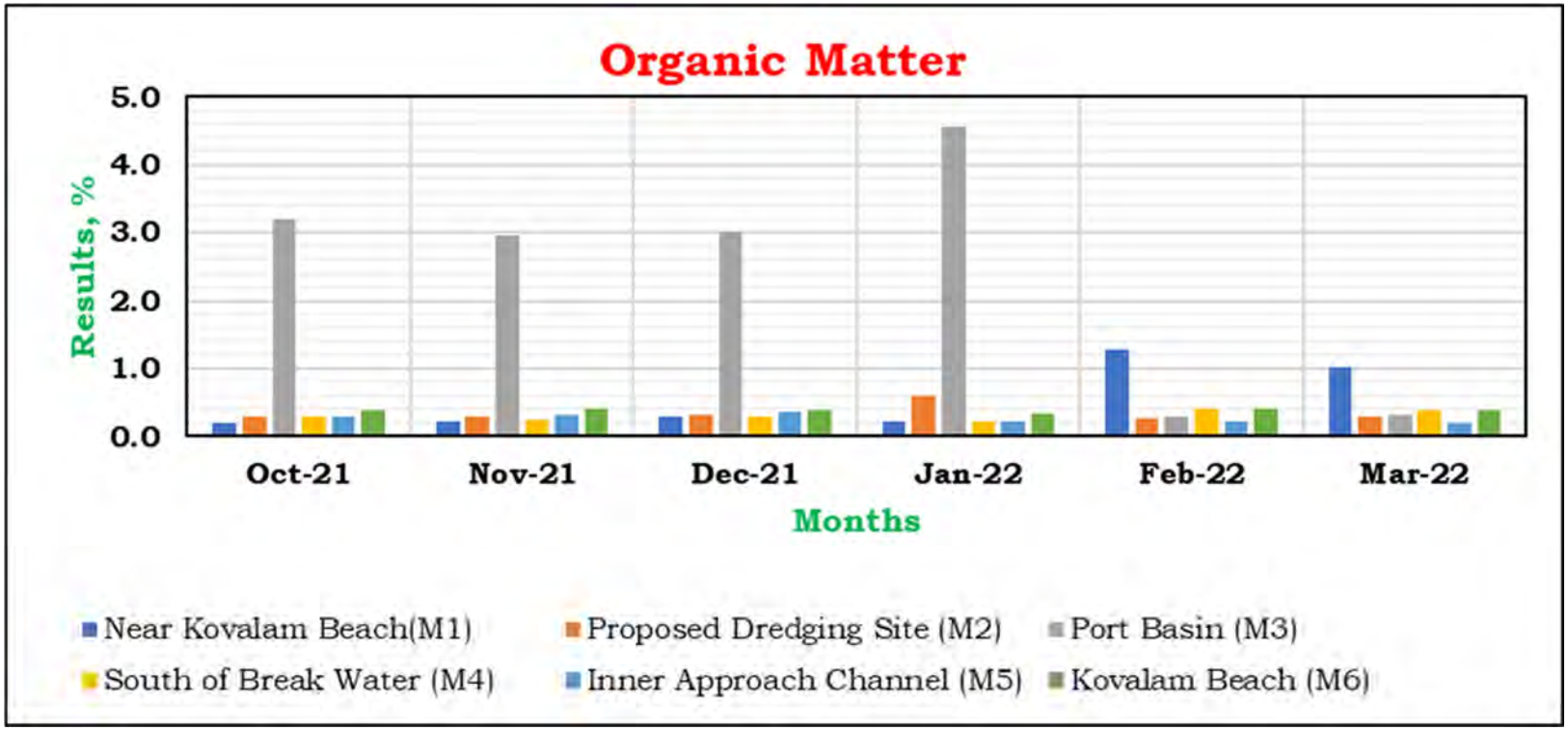


Figure 5.14: Sediment Analysis for Total Phosphorous as P

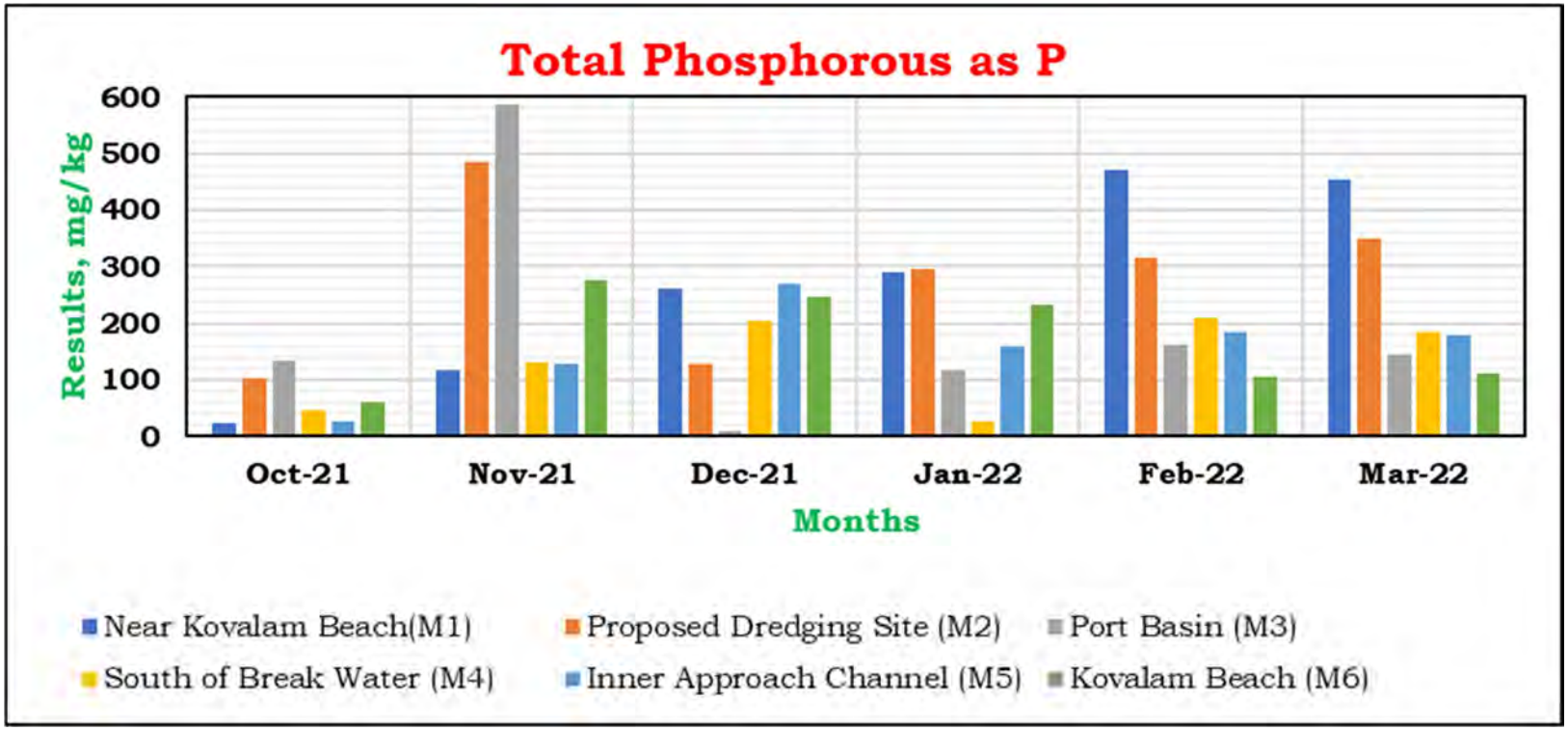


Figure 5.15: Sediment Analysis for Aluminium as Al

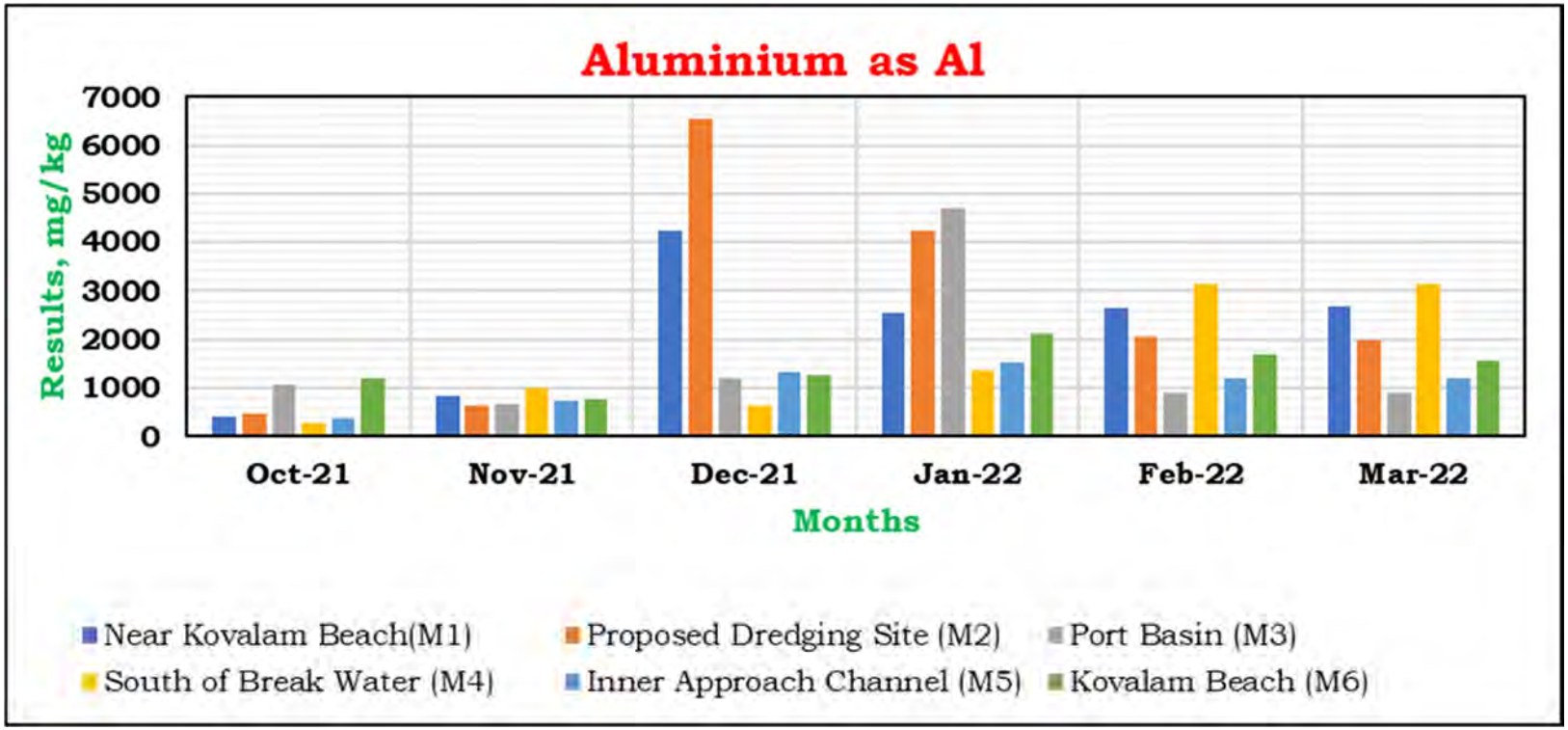


Figure 5.16: Sediment Analysis for Iron as Fe

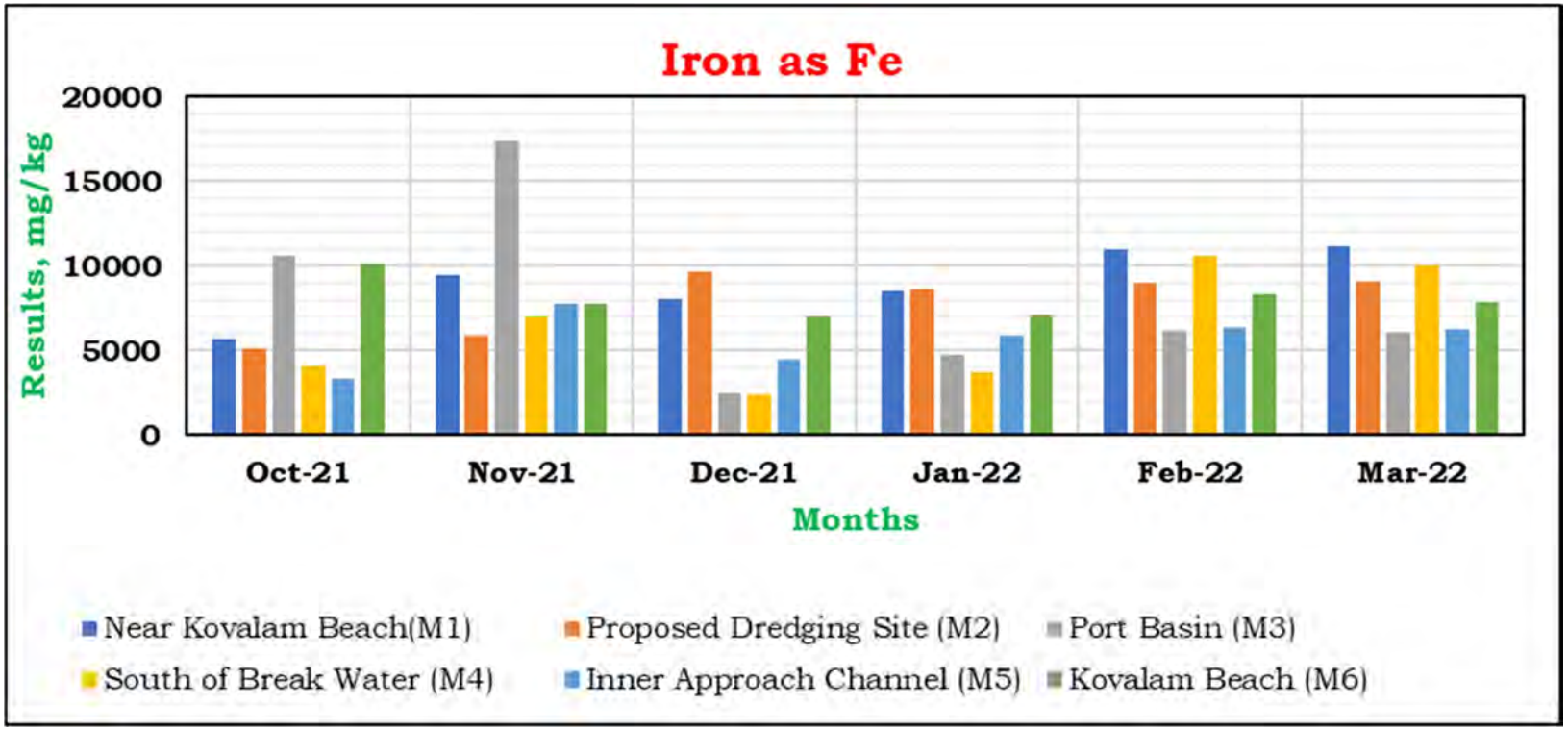


Figure 5.17: Sediment Analysis for Manganese as Mn

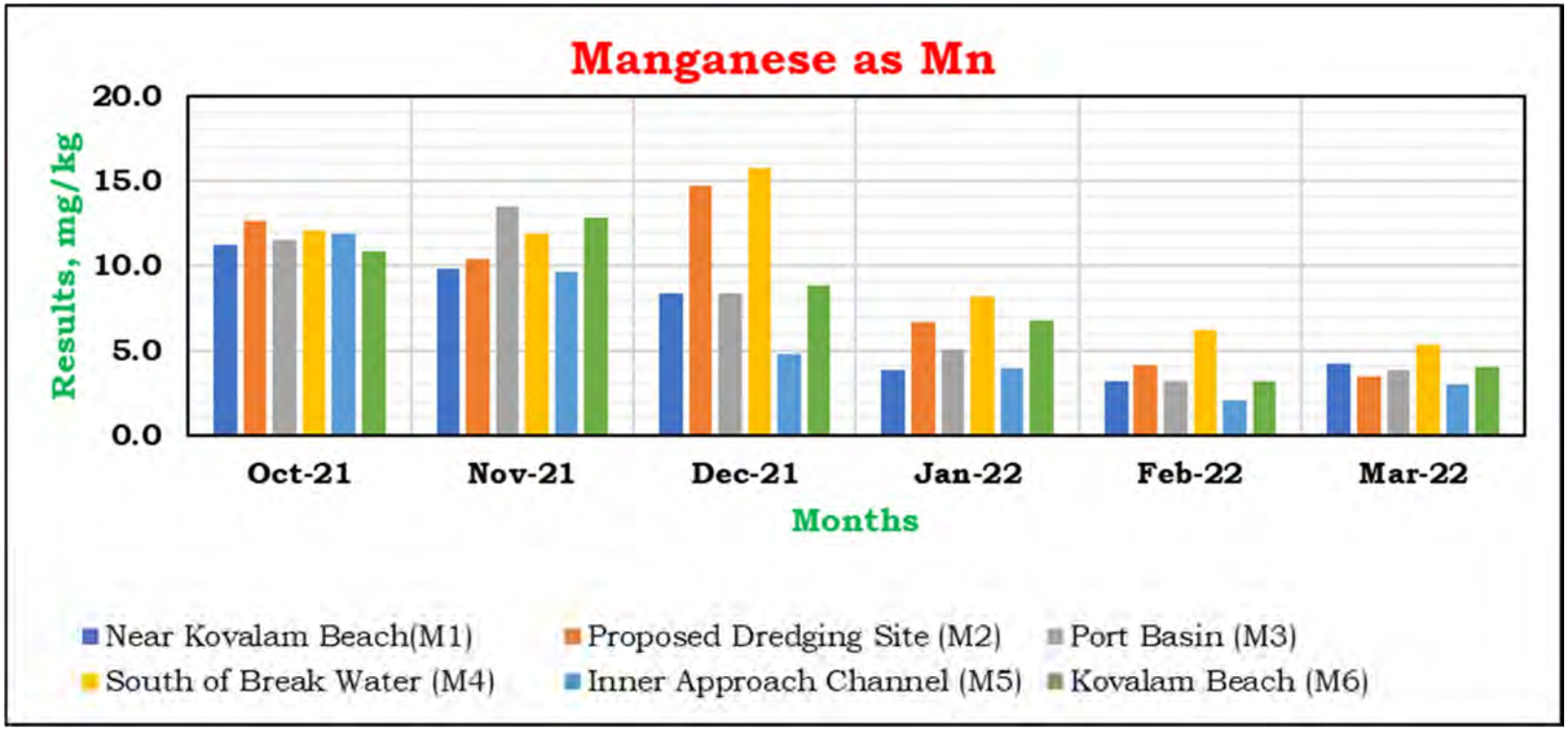


Figure 5.18: Sediment Analysis for Zinc as Zn

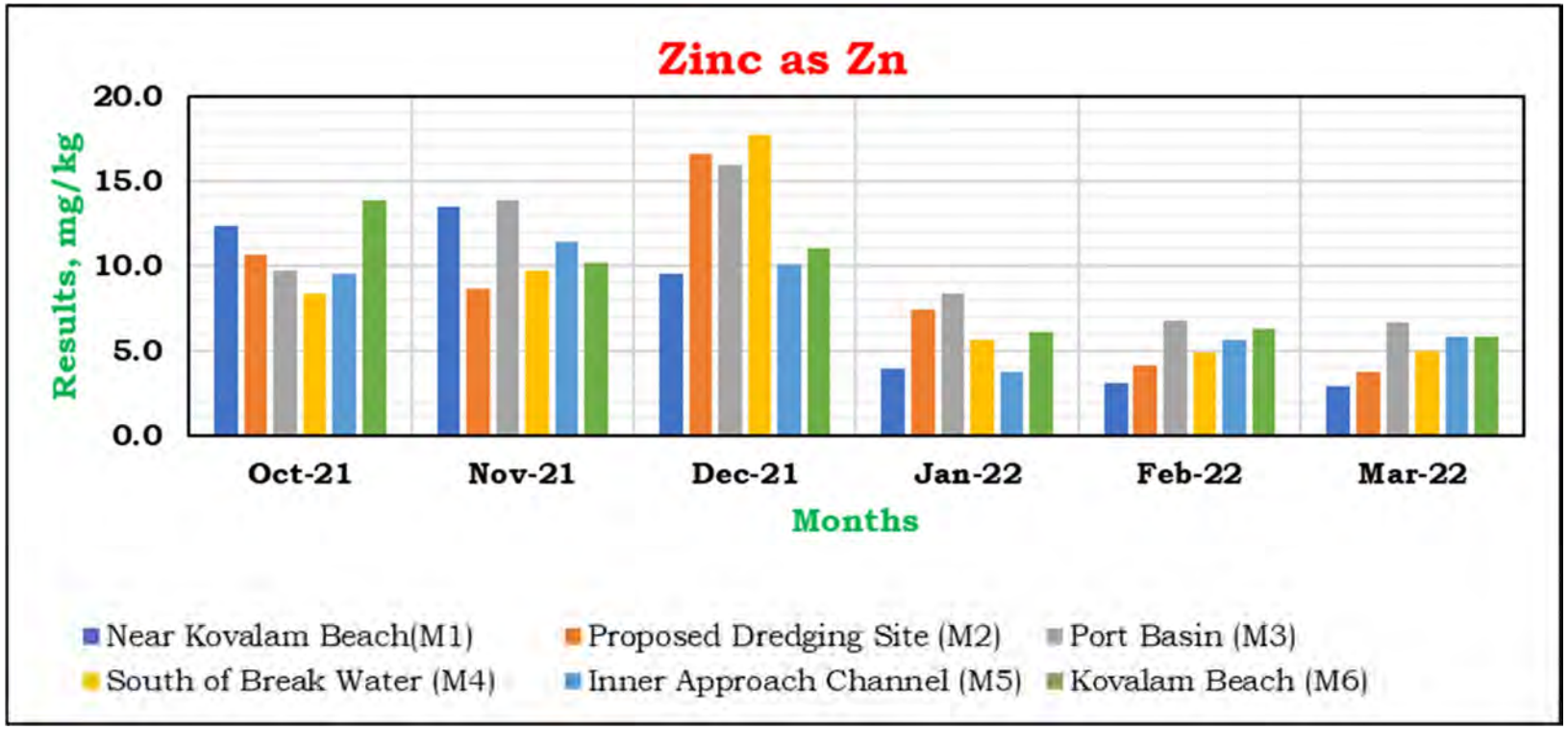
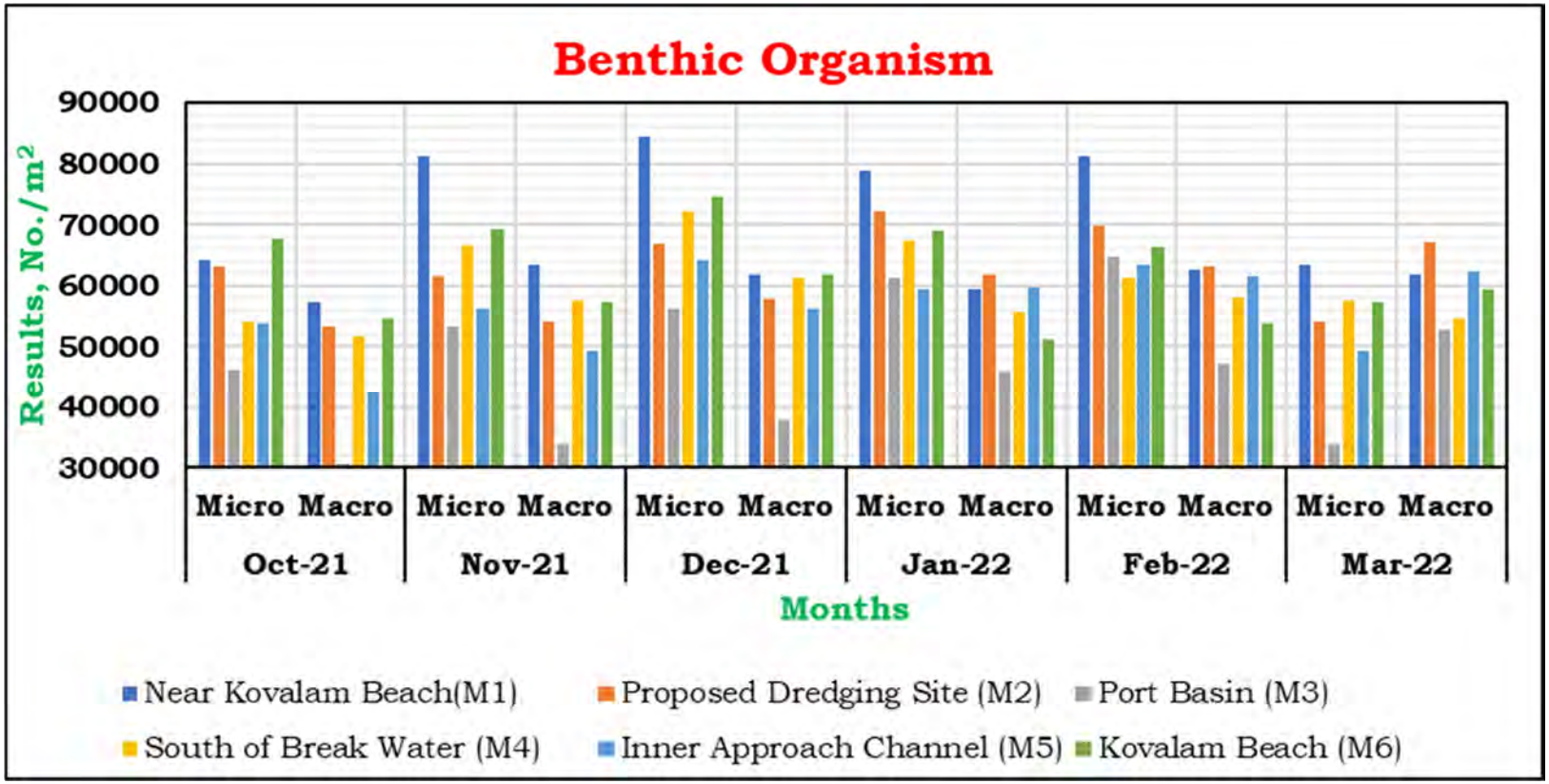


Figure 5.19: Sediment Analysis for Benthic Organism



HYR-5.10. Summary - Sediment Analysis:

During the months from October 2021 to March 2022, following is the summary of sediment analysis:

a) At the location **Near Kovalam Beach**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.2 to 1.27 %
- Total Phosphorus (as P) was observed in the range from 22.8 to 470mg/kg
- Aluminium (as Al) was observed in the range from 420 to 4232 mg/kg
- Iron (as Fe) was observed in the range from 5655 to 11120 mg/kg
- Manganese (as Mn) was observed in the range from 3.15 to 11.2 mg/kg
- Zinc (as Zn) was observed in the range from 2.93 to 13.5 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 64200 to 84600/m^2
- Macro benthic organisms were observed in the range from 57300 to 63400/m^2

b) At the location **Proposed Dredging Site**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.27 to 0.59 %
- Total Phosphorus (as P) was observed in the range from 102 to 485 mg/kg
- Aluminium (as Al) was observed in the range from 480 to 6553 mg/kg
- Iron (as Fe) was observed in the range from 5129 to 9692 mg/kg
- Manganese (as Mn) was observed in the range from 3.45 to 14.7 mg/kg
- Zinc (as Zn) was observed in the range from 3.78 to 16.6 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 61600 to 72300/m^2

- Macro benthic organisms were observed in the range from 53400 to 67200/m^2

c) At the location **Port Basin**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.28 to 4.57 %
- Total Phosphorus (as P) was observed in the range from 8 to 588 mg/kg
- Aluminium (as Al) was observed in the range from 686 to 4688 mg/kg
- Iron (as Fe) was observed in the range from 2485 to 17434 mg/kg
- Manganese (as Mn) was observed in the range from 3.17 to 13.5 mg/kg
- Zinc (as Zn) was observed in the range from 6.7 to 15.9 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 46200 to 69300/m^2
- Macro benthic organisms were observed in the range from 30700 to 52800/m^2

d) At the location **South of Break Water**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.21 to 0.4 %
- Total Phosphorus (as P) was observed in the range from 26 to 209 mg/kg
- Aluminium (as Al) was observed in the range from 285 to 3158 mg/kg
- Iron (as Fe) was observed in the range from 2363 to 10552 mg/kg
- Manganese (as Mn) was observed in the range from 5.4 to 15.7 mg/kg
- Zinc (as Zn) was observed in the range from 4.89 to 17.7 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 54200 to 72100/m^2
- Macro benthic organisms were observed in the range from 51800 to 61300/m^2

e) At the location **Inner Approach Channel**,

- The observed texture was sandy

- Organic matter was observed in the range from 0.19 to 0.35 %
- Total Phosphorus (as P) was observed in the range from 27 to 271mg/kg
- Aluminium (as Al) was observed in the range from 370 to 1521 mg/kg
- Iron (as Fe) was observed in the range from 3358 to 7794 mg/kg
- Manganese (as Mn) was observed in the range from 2.1 to 11.9 mg/kg
- Zinc (as Zn) was observed in the range from 3.76 to 11.4 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 53900 to 68400/m^2
- Macro benthic organisms were observed in the range from 42500 to 62400/m^2

f) At the location **Kovalam Beach**,

- The observed texture was sandy
- Organic matter was observed in the range from 0.34 to 0.42 %
- Total Phosphorus (as P) was observed in the range from 60 to 275 mg/kg
- Aluminium (as Al) was observed in the range from 772 to 2114 mg/kg
- Iron (as Fe) was observed in the range from 7056 to 10140 mg/kg
- Manganese (as Mn) was observed in the range from 3.21 to 12.8 mg/kg
- Zinc (as Zn) was observed in the range from 5.86 to 13.9 mg/kg
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits
- Micro benthic organisms were observed in the range from 61700 to 74600/m^2
- Macro benthic organisms were observed in the range from 51200 to 61800/m^2

g) Summary – Comparison of Results of **All Locations**,

- The observed texture was sandy in all locations
- Maximum value of Organic matter observed was 4.57 % at Port Basin
- Maximum value of Total Phosphorus (as P) observed was 588 mg/kg at Port Basin

- Maximum value of Aluminium (as Al) observed was 6553 mg/kg at Proposed Dredging Site
- Maximum value of Iron (as Fe) observed was 17434 mg/kg at Port Basin
- Maximum value of Manganese (as Mn) observed was 15.7 mg/kg at South of Break Water
- Maximum value of Zinc (as Zn) observed was 17.7 mg/kg at South of Break Water
- Chromium (as Cr), Copper (as Cu), Lead (as Pb), Mercury (as Hg) and Nickel (as Ni) were observed below the detection limits at all locations
- Maximum value of Micro benthic organisms observed was 84600/m^2 at Near Kovalam Beach
- Maximum value of Macro benthic organisms observed was 67200/m^2 at Proposed Dredging Site.

HYR-5.11. Marine Water Analysis for Phytoplankton and Zooplankton

Table 5.7: Total Phytoplankton and Zooplankton Results

Parameter	Month	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
Total Phytoplankton No/100 mL	Oct-21	53958	75548	43312	55855	52462	48232
	Nov-21	57180	66878	56194	50869	50117	42117
	Dec-21	63327	73037	62139	56360	56810	47202
	Jan-22	67259	71882	64417	61276	64490	57179
	Feb-22	65963	73292	70502	66984	63777	49896
	Mar-22	63653	73962	74337	64869	62523	51356
Total Zooplankton No/100 mL	Oct-21	7918	14651	10251	17314	14910	13789
	Nov-21	8085	15562	9517	15628	14068	13663
	Dec-21	8002	11652	8833	14436	12740	11569
	Jan-22	7588	11355	8433	13102	12458	10947
	Feb-22	8459	9076	9536	11571	9144	11610
	Mar-22	9129	8992	9086	11126	8996	11720

HYR-5.12. Graphical representation of Results for Marine Phytoplankton and Zooplankton

Figure 5.20: Marine Water Analysis for Total Phytoplankton

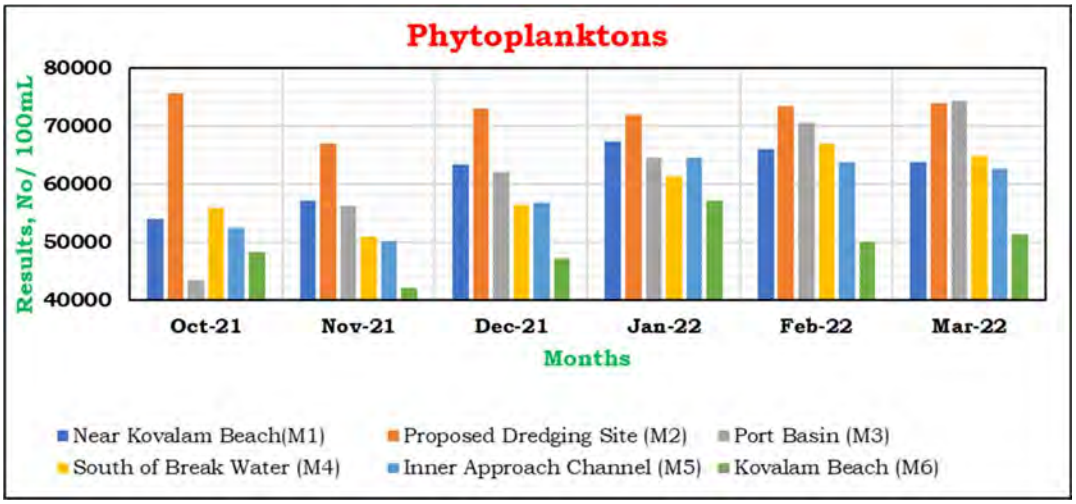
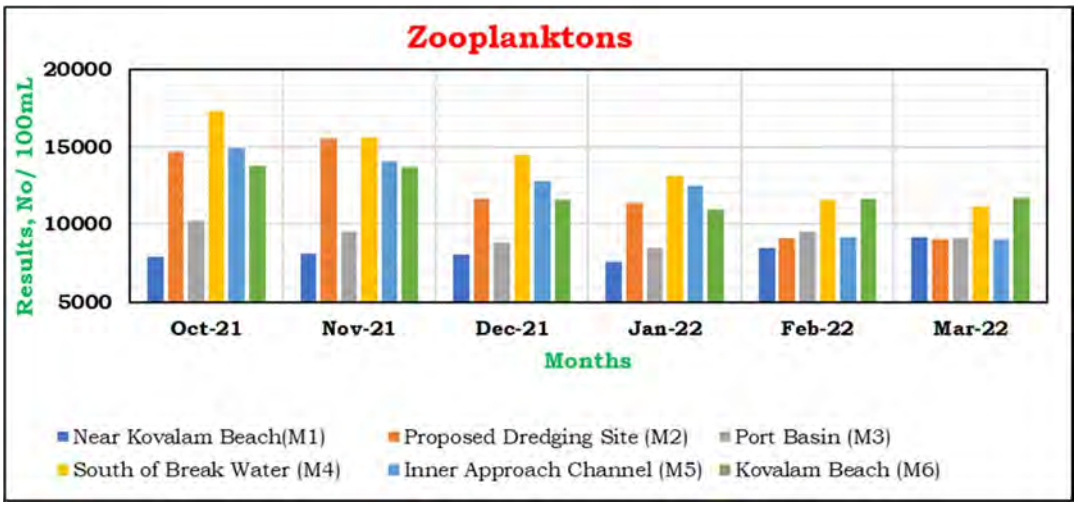


Figure 5.21: Marine Water Analysis for Total Zooplankton



HYR-5.13. Summary-Marine Water Analysis for Phytoplankton and Zooplankton

During the months from October 2021 to March 2022, following is the summary of Marine Water Analysis for Phytoplankton and Zooplankton:

Table 5.8: Summary-Marine Water Analysis for Phytoplankton and Zooplankton Results

Parameter	Range	Near Kovalam Beach (M1)	Proposed Dredging Site (M2)	Port Basin (M3)	South of Break water (M4)	Inner Approach Channel (M5)	Kovalam Beach (M6)
Total Phytoplankton No/100 mL	From	53958	66878	43312	50869	50117	42117
	To	67259	75548	74337	66984	64490	57179
Total Zooplankton No/100 mL	From	7588	8992	8433	11126	8996	10947
	To	9129	15562	10251	17314	14910	13789

a) At the location **Near Kovalam Beach**,
- Total Phytoplankton were observed in the range from 53958 to 67259 No/100 mL
- Total Zooplankton were observed in the range from 53958 to 67259 No/100 mL

b) At the location **Proposed Dredging Site**,
- Total Phytoplankton were observed in the range from 66878 to 75548 No/100 mL
- Total Zooplankton were observed in the range from 8992 to 15562 No/100 mL

c) At the location **Port Basin**,
- Total Phytoplankton were observed in the range from 43312 to 74337 No/100 mL
- Total Zooplankton were observed in the range from 8433 to 10251 No/100 mL

d) At the location **South of Break Water**,

- Total Phytoplankton were observed in the range from 50869 to 66984 No/100 mL
- Total Zooplankton were observed in the range from 11126 to 17314 No/100 mL

e) At the location **Inner Approach Channel**,

- Total Phytoplankton were observed in the range from 50117 to 64490 No/100 mL
- Total Zooplankton were observed in the range from 8996 to 14910 No/100 mL

f) At the location **Kovalam Beach**,

- Total Phytoplankton were observed in the range from 42117 to 57179 No/100 mL
- Total Zooplankton were observed in the range from 10947 to 13789 No/100 mL

g) Summary – Comparison of Results of **All Locations**,

- Maximum value of Total Phytoplankton observed was 75548 No/100 mL at Proposed Dredging Site
- Maximum value of Total Zooplankton observed was 17314 No/100 mL at South of Break water.

HYR-6	Ground Water & Surface Water Analysis

HYR-6.1. Ground Water & Surface Water Location Details:

This section describes the sampling location, methodology adopted for analysis and analysis results of Ground Water and Surface Water during the period from October 2021 to March 2022.

Ground water sampling was carried out at three locations including Port Site, PAF Area and Proposed Port Estate Area.

Surface water sampling was carried out at three locations including Poovar West Canal, Vizhinjam Branch Canal and Vellayani Lake.

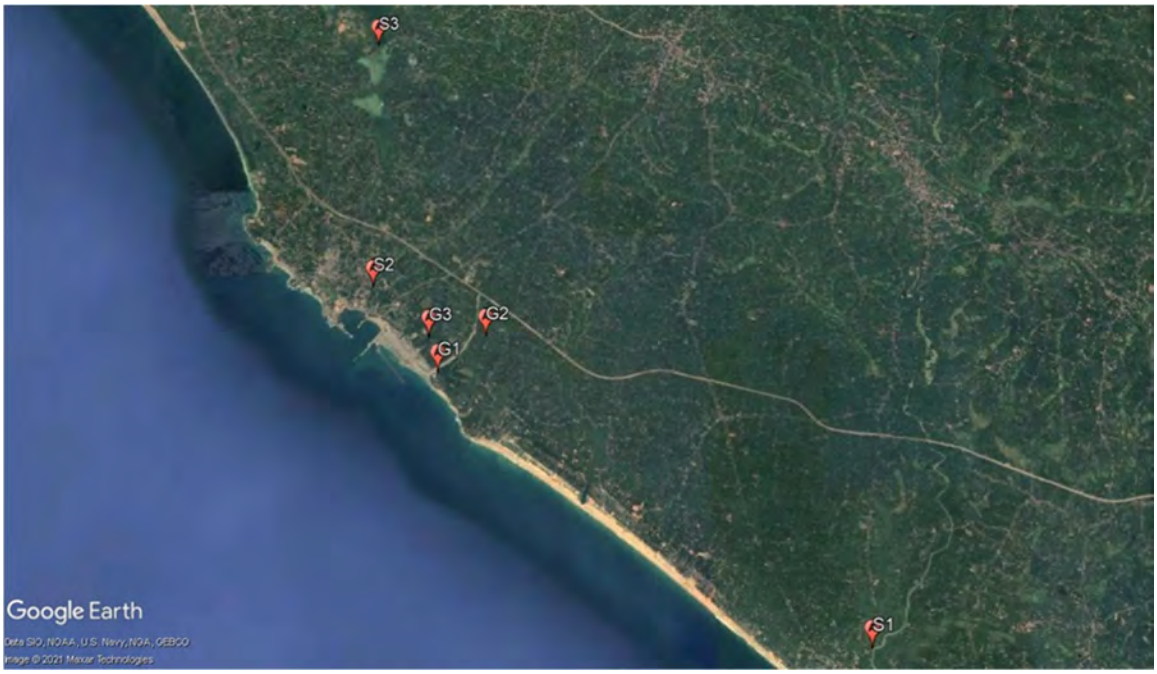
Table 6.1: Coordinates of Ground Water Location

Location	Legend	Latitude	Longitude
Project Site	G1	8°22'03.72"N	77°00'16.92"E
Proposed Port Estate Area	G2	8°22'24.96"N	77°00'45.84"E
PAF Area	G3	8°22'24.60"N	77°00'11.16"E

Table 6.2: Coordinates of Surface Water Location

Location	Legend	Latitude	Longitude
Poovar West Canal	S1	8°19'22.66"N	77°04'31.70"E
Vizhinjam Branch Canal	S2	8°22'55.59"N	76°59'36.29"E
Vellayani Lake	S3	8°25'32.27"N	76°59'35.29"E

Figure 6.1: Google earth views of Ground Water & Surface Water Sampling Locations



HYR-6.2. Methodology of Sampling and Analysis:

Table 6.3: Ground Water & Surface Water Methodology

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
Surface and Ground Water Analysis				
1.	Colour	Hazen Units	1	IS 3025 Part 4: 1983 RA 2017
2.	Odour	-	--	IS 3025 Part 5: 1983 RA 2018
3.	pH Value	-	1	IS 3025 Part 11: 1983 RA 2017
4.	Turbidity	N.T.U.	0.1	IS 3025 Part 10: 1984 RA 2017
5.	Electrical Conductivity (at 25°C)	µmho/cm	0.001	IS 3025 Part 14:1984 RA 2019
6.	Total Dissolved Solids	mg/L	1	IS 3025 Part 16: 1984 RA 2017
7.	Dissolved Oxygen	mg/L	0.2	IS 3025 Part 38:1989 RA 2019
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	2	IS 3025 Part 44:1993 RA 2019

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
9.	Oil & Grease	mg/L	1	IS 3025 Part 39: 1991 RA 2019
10.	Aluminium (as Al)	mg/L	0.03	IS 3025 Part 55:2003 RA 2019
11.	Ammonia (as NH_3- N)	mg/L	1	IS 3025 Part 34:1988 RA 2019
12.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	0.01	IS 13428 Annex K:2005
13.	Barium (as Ba)	mg/L	0.17	APHA 23rd Edition 3111D:2017
14.	Boron (as B)	mg/L	0.2	IS 3025 Part 57 :2005 RA 2017
15.	Calcium (as Ca)	mg/L	1	IS 3025 Part 40: 1991 RA 2019
16.	Chloramines (as Cl_2)	mg/L	1	APHA 23rd Edition 4500 Cl,G:2017
17.	Chloride (as Cl)	mg/L	1	IS 3025 Part 32: 1988 RA 2019
18.	Copper (as Cu)	mg/L	0.016	IS 3025 Part 42: 1992 RA 2019
19.	Fluoride (as F)	mg/L	0.1	APHA 23rd Edition 4500 -F- B, D: 2017
20.	Iron (as Fe)	mg/L	0.1	IS 3025 Part 53: 2003 RA 2019
21.	Magnesium (as Mg)	mg/L	1	IS 3025 Part 46: 1994 RA 2019
22.	Manganese (as Mn)	mg/L	0.016	IS 3025 Part 59: 2006 RA 2017
23.	Mineral Oil	mg/L	0.50	IS 3025 Part 39: 1991 RA 2019
24.	Nitrate (as NO_3)	mg/L	1	APHA 23rd Edition 4500 -NO_3 B: 2017
25.	Phenolic Compounds (as C_6H_5OH)	mg/L	0.001	IS 3025 Part 43: 1992 RA 2019
26.	Selenium (as Se)	mg/L	0.001	APHA 23rd Edition 3114C:2017
27.	Silver (as Ag)	mg/L	0.03	APHA 23rd Edition 3111B:2017
28.	Sulphate (as SO_4)	mg/L	1	IS 3025 Part 24: 1986 RA 2019
29.	Sulphide (as H_2S)	mg/L	0.01	IS 3025 Part 29 : 1986 RA 2019
30.	Total Phosphate (as PO_4)	mg/L	0.1	IS 3025 Part 31:1988 RA 2019
31.	Total Alkalinity (as $CaCO_3$)	mg/L	1	IS 3025 Part 23: 1986 RA 2019
32.	Total Hardness (as $CaCO_3$)	mg/L	1	IS 3025 Part 21: 2009 RA 2019
33.	Calcium Hardness (as $CaCO_3$)	mg/L	1	IS 3025 Part 40: 1991 RA 2019
34.	Zinc (as Zn)	mg/L	0.008	APHA 23rd Edition 3111B:2017
35.	Sodium (as Na)	mg/L	1	IS 3025 Part 45: 1993 RA 2019
36.	Potassium (as K)	mg/L	0.5	IS 3025 Part 45: 1993 RA 2019
37.	Sodium Absorption Ratio	-	1	IS 11624 : 1986
38.	Cadmium (as Cd)	mg/L	0.003	IS 3025 Part 41: 1992 RA 2019
39.	Cyanide (as CN)	mg/L	0.01	IS 3025 Part 27: 1986 RA 2019
40.	Lead (as Pb)	mg/L	0.01	IS 3025 Part 47: 1994 RA 2019
41.	Mercury (as Hg)	mg/L	0.001	IS 3025 Part 48: 1994 RA 2019
42.	Molybdenum (as Mo)	mg/L	0.07	APHA 23rd Edition 3111D:2017
43.	Nickel (as Ni)	mg/L	0.02	IS 3025 Part 54: 2003 RA 2019
44.	***Pesticide Residues***			
i.	Alachlor	µg/L	0.005	SEAAL/INS/RWM/SOP/01

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
ii.	Atrazine	µg/L	0.005	SEAAL/INS/RWM/SOP/01
iii.	Aldrin/Dieldrin	µg/L	0.005	SEAAL/INS/RWM/SOP/01
iv.	Alpha HCH	µg/L	0.005	SEAAL/INS/RWM/SOP/01
v.	Beta HCH	µg/L	0.005	SEAAL/INS/RWM/SOP/01
vi.	Butachlor	µg/L	0.005	SEAAL/INS/RWM/SOP/01
vii.	Chlorpyrifos	µg/L	0.005	SEAAL/INS/RWM/SOP/01
viii.	Delta HCH	µg/L	0.005	SEAAL/INS/RWM/SOP/01
ix.	2,4D chlorophenoxyacetic acid	µg/L	0.005	SEAAL/INS/RWM/SOP/01
x.	DDT (o,p & p,p- Isomers of DDT, DDE, DDD)	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xi.	Endosulfan (□,□ & Sulphate)	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xii.	Ethion	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xiii.	γ HCH (Lindane)	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xiv.	Isoproturon	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xv.	Malathion	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xvi.	Methyl Parathion	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xvii.	Monocrotophos	µg/L	0.005	SEAAL/INS/RWM/SOP/01
xviii.	Phorate	µg/L	0.005	SEAAL/INS/RWM/SOP/01
45.	Polychlorinated Biphenyls (PCB)	mg/L	0.000005	SEAAL/INS/RWM/SOP/03
46.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/L	0.000005	SEAAL/INS/RWM/SOP/02
47.	Total Arsenic (as As)	mg/L	0.002	IS 3025 Part 37:1988 RA 2019
48.	Total Chromium (as Cr)	mg/L	0.05	IS 3025 Part 52 :2003 RA 2019
49.				
a)	Bromoform	mg/L	0.005	SEAAL/INS/RWM/SOP/04
b)	Dibromochloromethane	mg/L	0.005	SEAAL/INS/RWM/SOP/04
c)	Bromodichloroethane	mg/L	0.005	SEAAL/INS/RWM/SOP/04
d)	Chloroform	mg/L	0.005	SEAAL/INS/RWM/SOP/04
50.	*E.coli*	MPN/100 ml	2	IS 1622: 1981
51.	Total Coliforms	MPN/100 ml	2	IS 1622: 1981
52.	Faecal Coliforms	MPN/100 ml	2	IS 1622: 1981

HYR-6.3. Ground Water Analysis Results for the period from October 2021 to March 2022:

Table 6.4: Ground Water Analysis Results

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
Organoleptic & Physical Parameters							
1.	Colour	Hazen Units	*Max.* 5	Oct-21	1	1	1
				Nov-21	1	1	1
				Dec-21	1	1	1
				Jan-22	1	1	1
				Feb-22	1	1	1
				Mar-22	1	1	1
2.	Odour	-	Agreeable	Oct-21	Agreeable	Agreeable	Agreeable
				Nov-21	Agreeable	Agreeable	Agreeable
				Dec-21	Agreeable	Agreeable	Agreeable
				Jan-22	Agreeable	Agreeable	Agreeable
				Feb-22	Agreeable	Agreeable	Agreeable
				Mar-22	Agreeable	Agreeable	Agreeable
3.	pH Value	-	6.5 to 8.5	Oct-21	6.51	6.61	5.41
				Nov-21	6.62	6.48	5.72
				Dec-21	6.52	7.55	6.58
				Jan-22	7.44	7.25	6.71
				Feb-22	6.55	7.21	6.07
				Mar-22	7.80	7.70	6.20
4.	Turbidity	N.T.U.	Max. 1	Oct-21	0.3	5.2	0.3
				Nov-21	BDL	57.9	1.0
				Dec-21	2.7	1.3	40.7
				Jan-22	BDL	9.7	0.3
				Feb-22	BDL	1.3	BDL
				Mar-22	BDL	BDL	BDL
5.	Total Dissolved Solids	mg/L	Max. 500	Oct-21	442	185	441
				Nov-21	484	174	410
				Dec-21	395	527	205
				Jan-22	156	168	496
				Feb-22	148	125	480
				Mar-22	166	128	538

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
General Parameters concerning substances undesirable in excessive amounts							
6.	Aluminium (as Al)	mg/L	Max. 0.03	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	0.02	0.03
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
7.	Ammonia (as NH_3-N)	mg/L	Max.0.5	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	0.68	BDL
				Dec-21	BDL	0.68	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	0.45	BDL	BDL
				Mar-22	0.24	0.22	0.28
8.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	Max. 0.2	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
9.	Barium (as Ba)	mg/L	Max. 0.7	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
10.	Boron (as B)	mg/L	Max. 0.5	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
11.	Calcium (as Ca)	mg/L	Max. 75	Oct-21	28.8	18.4	11.2
				Nov-21	33.6	15.2	12.8
				Dec-21	14.4	36.0	19.2
				Jan-22	14.4	14.4	11.2
				Feb-22	8.8	8.0	12.8
				Mar-22	8.8	8.0	14.4
		mg/L	Max. 4.0	Oct-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
12.	Chloramines (as Cl_2)			Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
13.	Chloride (as Cl)	mg/L	Max.250	Oct-21	105	39.3	157
				Nov-21	139	23.9	163
				Dec-21	157	186	33.2
				Jan-22	49.5	44.5	180
				Feb-22	48.9	26.9	195
				Mar-22	47.5	29.7	192
14.	Copper (as Cu)	mg/L	Max.0.05	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
15.	Fluoride (as F)	mg/L	Max. 1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	0.24
				Mar-22	BDL	BDL	0.21
16.	Iron (as Fe)	mg/L	Max.0.3	Oct-21	0.34	2.16	0.35
				Nov-21	0.13	1.07	0.12
				Dec-21	0.21	0.19	1.22
				Jan-22	0.23	0.49	0.18
				Feb-22	0.14	0.17	BDL
				Mar-22	0.32	0.28	0.35
17.	Magnesium (as Mg)	mg/L	Max. 30	Oct-21	11.9	BDL	11.9
				Nov-21	12.2	6.33	12.7
				Dec-21	15.9	14.9	5.46
				Jan-22	3.41	5.36	21.4
				Feb-22	1.95	3.41	18.9
				Mar-22	5.36	3.41	19.5
18.	Manganese (as Mn)	mg/L	Max.0.1	Oct-21	0.06	0.08	BDL
				Nov-21	0.08	0.03	BDL
				Dec-21	0.09	0.05	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Jan-22	0.09	0.05	BDL
				Feb-22	0.05	BDL	BDL
				Mar-22	0.05	BDL	BDL
19.	Mineral Oil	mg/L	Max.0.5	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
20.	Nitrate (as NO_3)	mg/L	Max.45	Oct-21	14.6	12.8	21.1
				Nov-21	1.49	2.87	BDL
				Dec-21	1.38	2.26	BDL
				Jan-22	1.30	1.18	2.88
				Feb-22	1.11	2.58	2.89
				Mar-22	BDL	BDL	31.5
21.	Phenolic Compounds (as C6H5OH)	mg/L	Max. 0.001	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
22.	Selenium (as Se)	mg/L	Max. 0.01	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
23.	Silver (as Ag)	mg/L	Max. 0.1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
24.	Sulphate (as SO_4)	mg/L	Max. 200	Oct-21	40.0	29.6	44.3
				Nov-21	43.8	23.0	31.9
				Dec-21	27.2	43.2	20.5
				Jan-22	5.78	14.4	26.1
				Feb-22	4.39	8.56	22.9

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Mar-22	2.19	6.05	26.4
25.	Sulphide (as H_2S)	mg/L	Max. 0.05	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
26.	Total Alkalinity (as $CaCO_3$)	mg/L	Max.200	Oct-21	62.3	34.2	2.01
				Nov-21	117	63.7	3.98
				Dec-21	2.01	68.3	40.2
				Jan-22	37.8	39.8	11.9
				Feb-22	25.9	25.9	3.98
				Mar-22	23.9	21.9	3.98
27.	Total Hardness (as $CaCO_3$)	mg/L	Max. 200	Oct-21	120	67.3	83.6
				Nov-21	134	64.0	84.0
				Dec-21	102	153	71.4
				Jan-22	50.0	58.0	116
				Feb-22	30.0	34.0	110
				Mar-22	44.0	34.0	112
28.	Zinc (as Zn)	mg/L	Max. 5	Oct-21	0.107	0.098	0.123
				Nov-21	0.110	0.088	0.150
				Dec-21	0.100	0.100	0.240
				Jan-22	0.100	0.100	0.240
				Feb-22	0.110	0.180	0.230
				Mar-22	0.100	0.150	0.180
Parameters Concerning Toxic Substances							
29.	Cadmium (as Cd)	mg/L	Max. 0.003	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
30.	Cyanide (as CN)	mg/L	Max.0.05	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
31.	Lead (as Pb)	mg/L	Max. 0.01	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
32.	Mercury (as Hg)	mg/L	Max. 0.001	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
33.	Molybdenum (as Mo)	mg/L	Max. 0.07	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
34.	Nickel (as Ni)	mg/L	Max.0.02	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
35. Pesticide Residues							
i.	Alachlor	µg/L	20	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
ii.	Atrazine	µg/L	2	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
	Aldrin/Dieldrin	µg/L	0.03	Oct-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
iii.				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
iv.	Alpha HCH	µg/L	0.01	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
v.	Beta HCH	µg/L	0.04	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
vi.	Butachlor	µg/L	125	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
vii.	Chlorpyrifos	µg/L	30	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
viii.	Delta HCH	µg/L	0.04	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
ix.	2,4D chlorophenoxyacetic acid	µg/L	30	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
x.	DDT (o,p & p,p-Isomers of DDT, DDE, DDD)	µg/L	1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xi.	Endosulfan (α,β & Sulphate)	µg/L	0.4	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xii.	Ethion	µg/L	3	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xiii.	γ HCH (Lindane)	µg/L	2	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xiv.	Isoproturon	µg/L	9	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xv.	Malathion	µg/L	190	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
				Mar-22	BDL	BDL	BDL
xvi.	Methyl Parathion	µg/L	0.3	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xvii.	Monocrotophos	µg/L	1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
xviii.	Phorate	µg/L	2	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
36.	Polychlorinated Biphenyls (PCB)	mg/L	Max.0.0005	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
37.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/L	Max.0.0001	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
38.	Total Arsenic (as As)	mg/L	Max. 0.01	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
39.		mg/L	Max. 0.05	Oct-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
	Total Chromium (as Cr)			Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
40.Trihalomethanes							
a)	Bromoform	mg/L	Max. 0.1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
b)	Dibromochloromethane	mg/L	Max. 0.1	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
c)	Bromodichloroethane	mg/L	Max. 0.06	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
d)	Chloroform	mg/L	Max. 0.2	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
Bacteriological Analysis							
41.	E.coli	MPN Index /100 ml	Not Detectable	Oct-21	BDL	BDL	BDL
				Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL
42.	Total Coliforms			Oct-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Acceptable Limit as per IS 10500: 2012	Month	Port Site (Open well) G1	Proposed Port Estate Area (Open well) G2	PAF Area (Open well) G3
		MPN Index /100 ml	Not Detectable	Nov-21	BDL	BDL	BDL
				Dec-21	BDL	BDL	BDL
				Jan-22	BDL	BDL	BDL
				Feb-22	BDL	BDL	BDL
				Mar-22	BDL	BDL	BDL

HYR-6.4. Graphical representation of Results for Ground Water Analysis:

Figure 6.2: Ground Water Analysis for pH

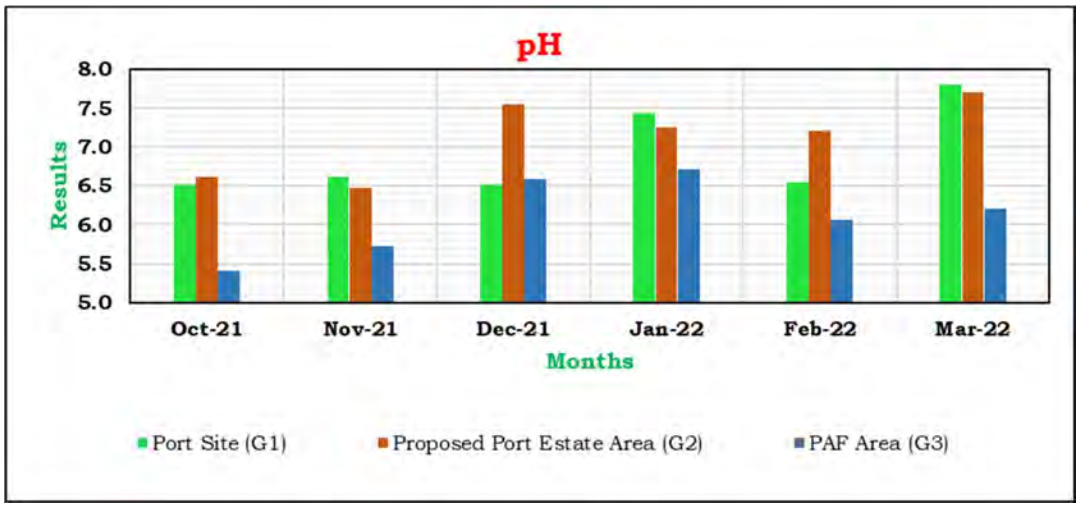


Figure 6.3: Ground Water Analysis for Turbidity

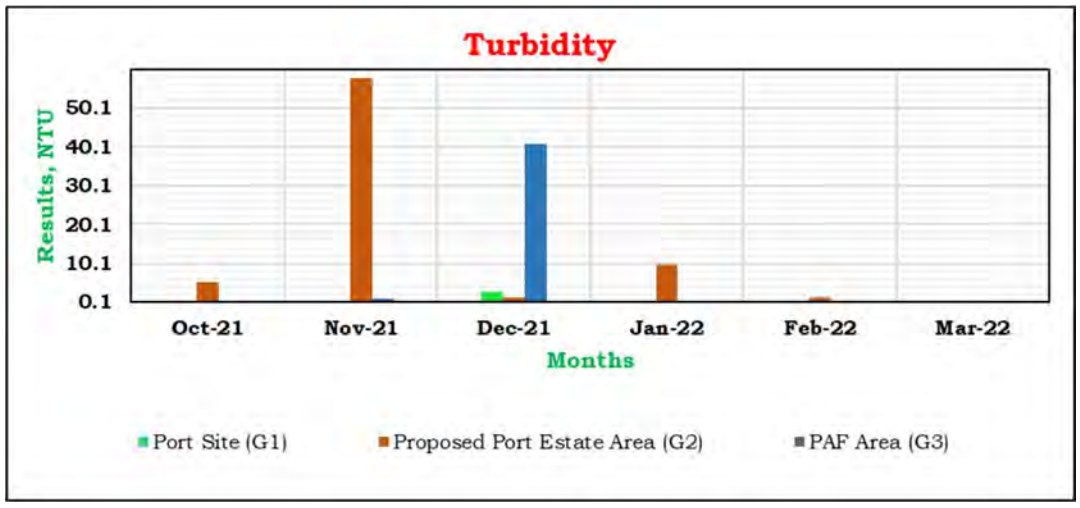


Figure 6.4: Ground Water Analysis for Total Dissolved Solids

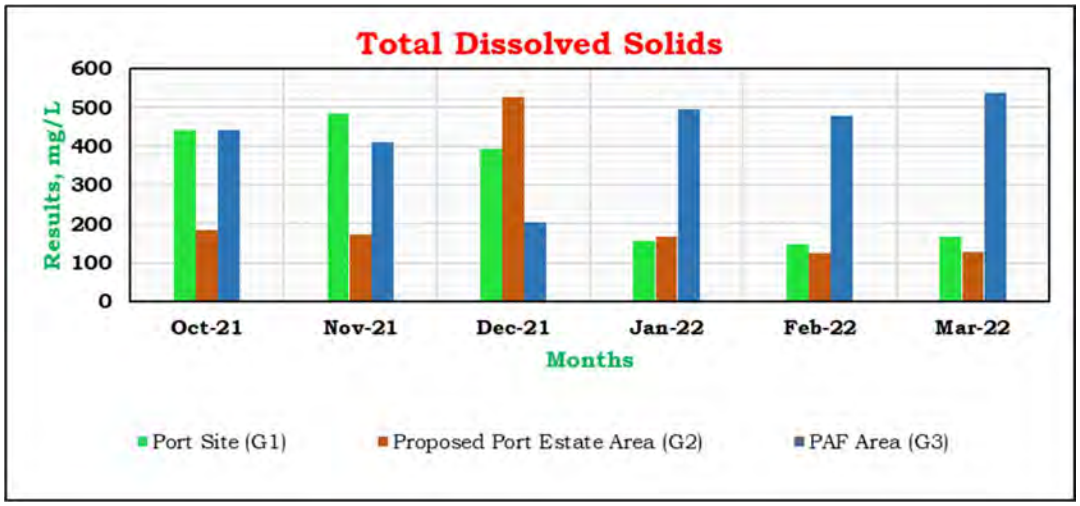


Figure 6.5: Ground Water Analysis for Chloride

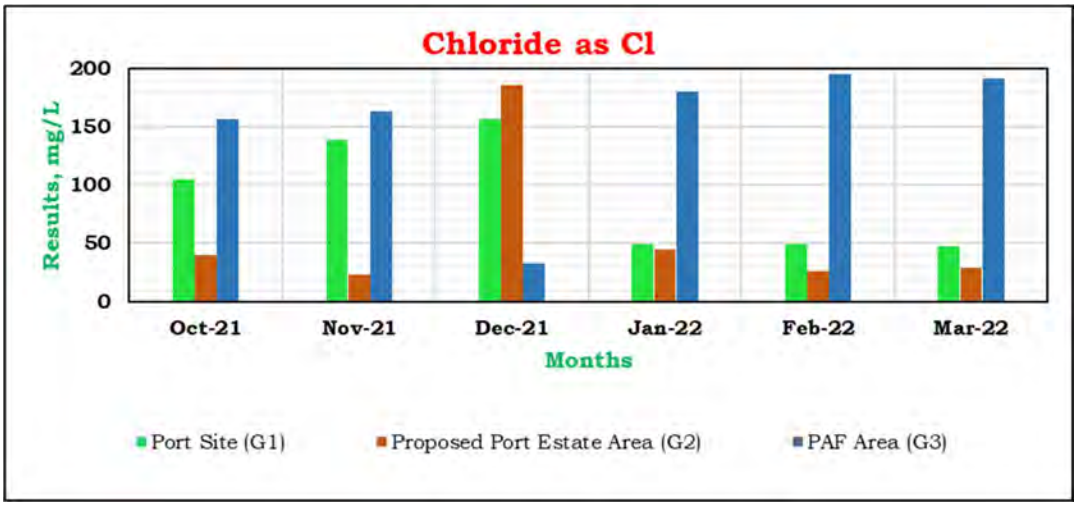


Figure 6.6: Ground Water Analysis for Sulphate as SO_4

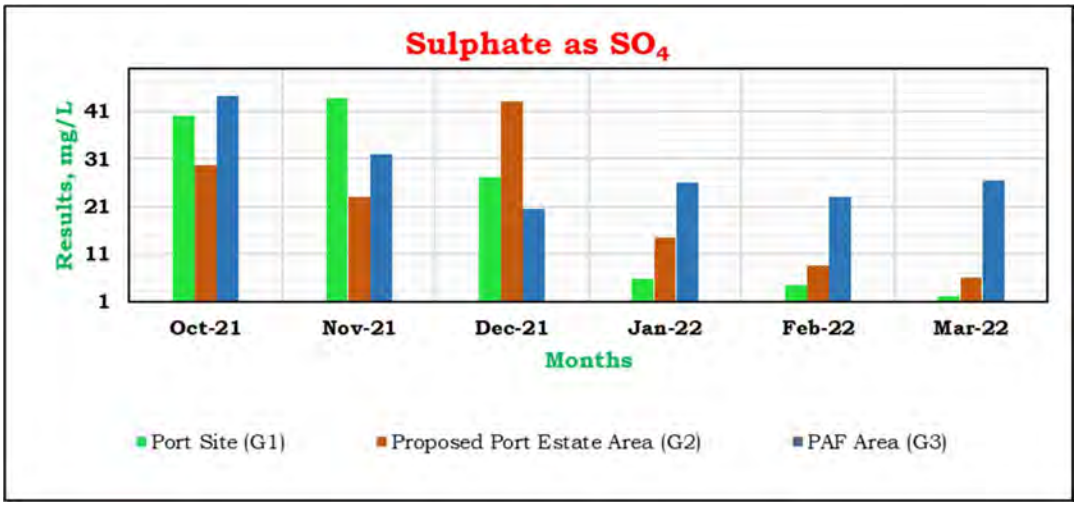


Figure 6.7: Ground Water Analysis for Fluoride as F

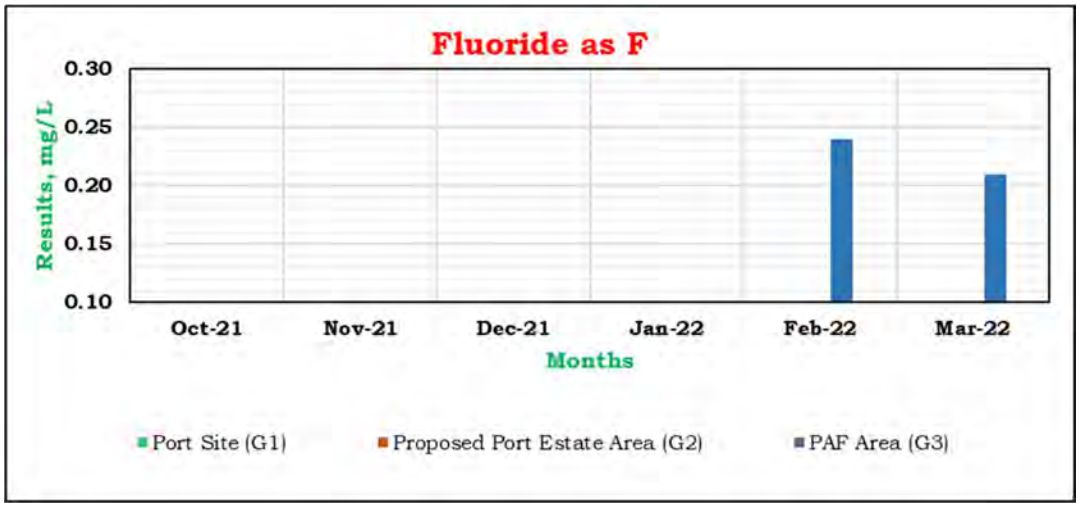


Figure 6.8: Ground Water Analysis for Nitrate as NO_3

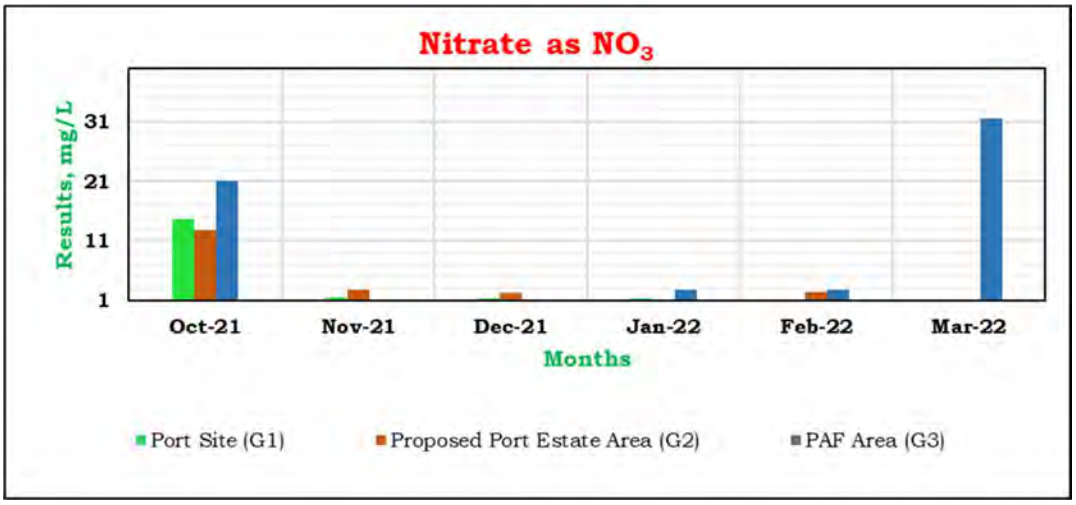


Figure 6.9: Ground Water Analysis for Calcium as Ca

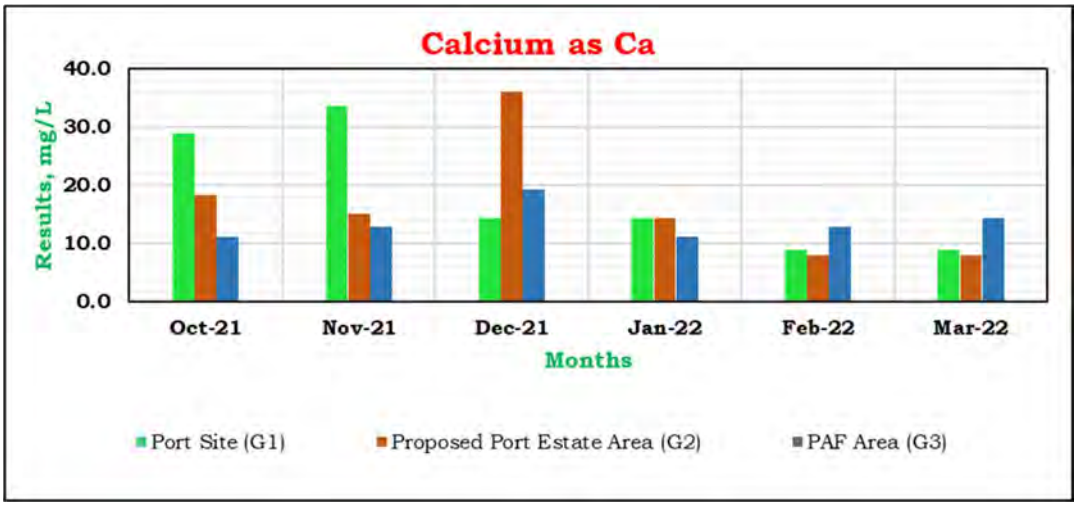


Figure 6.10: Ground Water Analysis for Magnesium as Mg

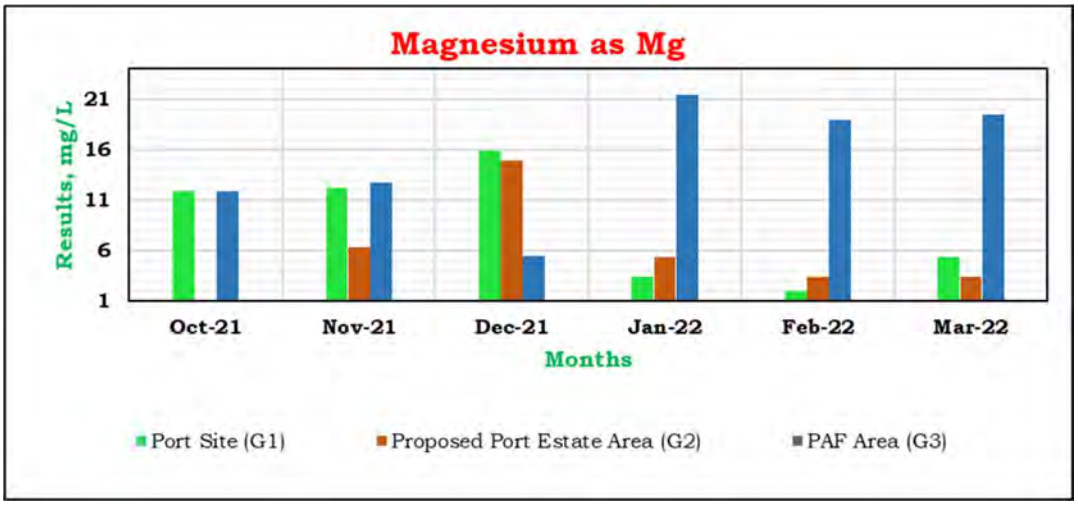


Figure 6.11: Ground Water Analysis for Iron as Fe

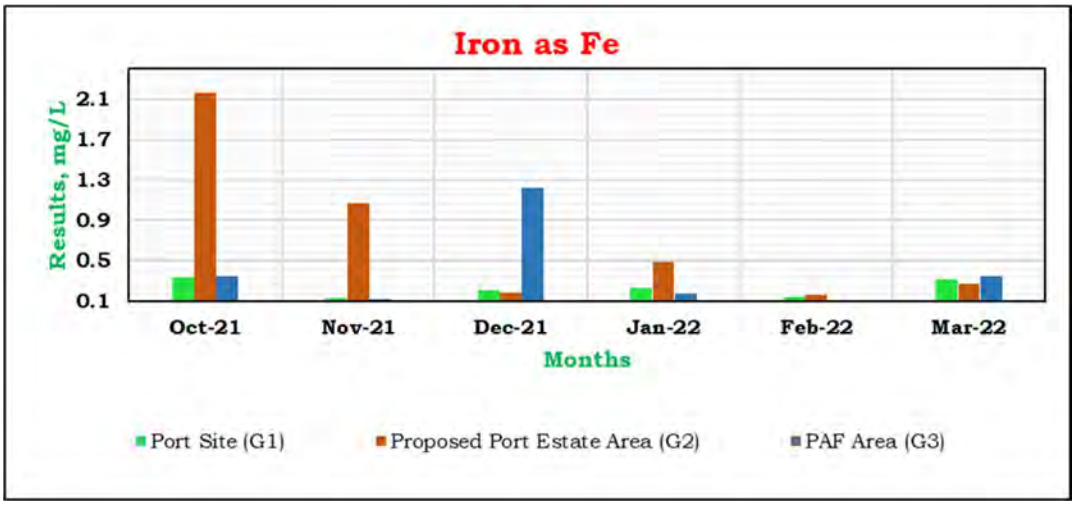


Figure 6.12: Ground Water Analysis for Total Alkalinity as $CaCO_3$

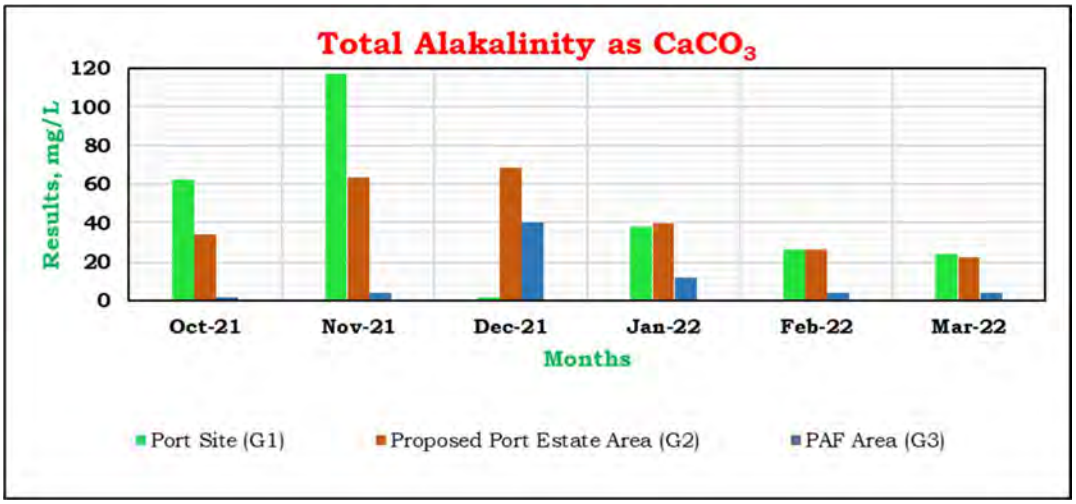


Figure 6.13: Ground Water Analysis for Total Hardness as $CaCO_3$

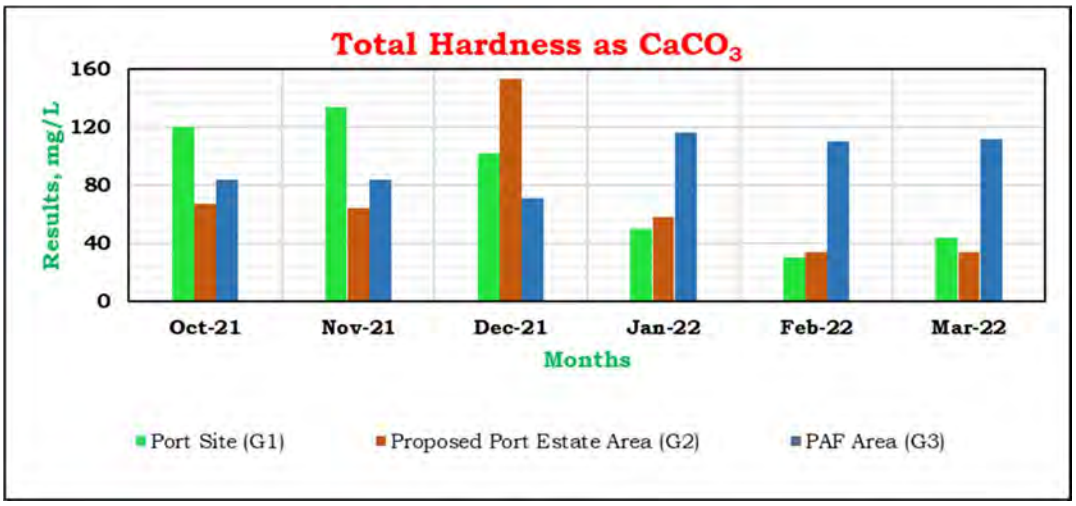
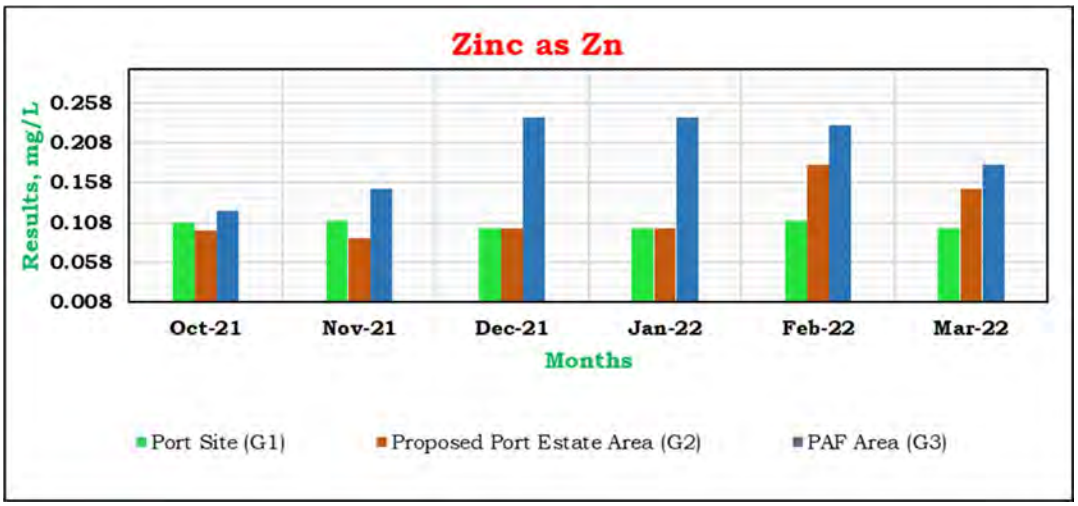


Figure 6.14: Ground Water Analysis for Zinc as Zn



HYR-6.5. Summary- Ground Water Analysis

During the period from October 2021 to March 2022, following is the summary of ground water analysis:

a) At the location **Port Site** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from 6.51 to 7.80
- Turbidity was observed in the range from BDL to 2.7 N.T.U.
- Total Dissolved Solids were observed in the range from 156 to 484 mg/L
- Ammonia (as NH_3-N) was observed from BDL to 0.45 mg/L
- Calcium (as Ca) was observed in the range from 8.8 to 33.6 mg/L
- Chloride (as Cl) was observed in the range from 47.5 to 157 mg/L
- Iron (as Fe) was observed in the range from 0.13 to 0.34 mg/L
- Magnesium (as Mg) was observed in the range from 1.95 to 15.9 mg/L
- Manganese (as Mn) was observed in the range from 0.05 to 0.09 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 14.6 mg/L
- Sulphate (as SO_4) was observed in the range from 2.19 to 43.8 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 2.01 to 117 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 30 to 134 mg/L
- Zinc (as Zn) was observed in the range from 0.10 to 0.11 mg/L
- Aluminium (as Al), Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Fluoride (as F), Copper (as Cu), Mineral Oil, Phenolic Compounds(as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

b) At the location **Proposed Port Estate Area** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from 6.48 to 7.70
- Turbidity was observed in the range from BDL to 57.9 N.T.U.

- Total Dissolved Solids were observed in the range from 125 to 527 mg/L
- Aluminium (as Al) was observed from BDL to 0.02 mg/L
- Ammonia (as NH_3-N) was observed from BDL to 0.68 mg/L
- Calcium (as Ca) was observed in the range from 8.0 to 36.0 mg/L
- Chloride (as Cl) was observed in the range from 23.9 to 186 mg/L
- Iron (as Fe) was observed in the range from 0.17 to 2.16 mg/L
- Magnesium (as Mg) was observed in the range from BDL to 14.9 mg/L
- Manganese (as Mn) was observed in the range from BDL to 0.08 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 12.8 mg/L
- Sulphate (as SO_4) was observed in the range from 6.05 to 43.2 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 21.9 to 68.3 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 34 to 153 mg/L
- Zinc (as Zn) was observed in the range from 0.088 to 0.15 mg/L
- Fluoride (as F), Anionic Detergents, Barium (as Ba), Boron (as B), Chloramines (as Cl_2), Copper (as Cu), Mineral Oil, Phenolic Compounds(as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

c) At the location **PAF Area** (Open Well),

- Colour observed was 1 Hazen unit and the odour was agreeable
- pH was observed in the range from 5.41 to 6.71
- Turbidity was observed in the range from BDL to 40.7 N.T.U.
- Total Dissolved Solids were observed in the range from 205 to 538 mg/L
- Aluminium (as Al) was observed from BDL to 0.03 mg/L
- Ammonia (as NH_3-N) was observed from BDL to 0.28 mg/L
- Calcium (as Ca) was observed in the range from 11.2 to 19.2 mg/L
- Chloride (as Cl) was observed in the range from 33.2 to 195 mg/L
- Fluoride (as F) was observed in the range from BDL to 0.24 mg/L
- Iron (as Fe) was observed in the range from BDL to 1.22 mg/L
- Magnesium (as Mg) was observed in the range from 5.46 to 21.4 mg/L

- Nitrate (as NO_3) was observed in the range from BDL to 31.5 mg/L
- Sulphate (as SO_4) was observed in the range from 20.5 to 44.3 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 2.01 to 40.2 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 71.4 to 116 mg/L
- Zinc (as Zn) was observed in the range from 0.123 to 0.24 mg/L
- Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Copper (as Cu), Manganese (as Mn), Mineral Oil, Phenolic Compounds(as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected.

d) Summary – Comparison of Results of **All Locations**,

- Colour observed was 1 Hazen unit and the odour was agreeable in all locations
- Maximum value of pH observed was 7.8 at Port Site
- Maximum value of Turbidity observed was 57.9 N.T.U. at Proposed Port Estate Area
- Maximum value of Total Dissolved Solids observed was 538 mg/L at Proposed Port Estate Area
- Maximum value of Aluminium (as Al) observed was 0.03 mg/L at PAF area
- Maximum value of Ammonia (as NH_3-N) observed was 0.68 mg/L at Proposed Port Estate Area
- Maximum value of Calcium (as Ca) observed was 36 mg/L at Proposed Port Estate Area
- Maximum value of Chloride (as Cl) observed was 195 mg/L at PAF area
- Maximum value of Fluoride (as F) observed was 0.24 mg/L at PAF area
- Maximum value of Iron (as Fe) observed was 2.16 mg/L at Proposed Port Estate Area

- Maximum value of Magnesium (as Mg) observed was 21.4 mg/L at PAF area
- Maximum value of Nitrate (as NO_3) observed was 31.5 mg/L at PAF area
- Maximum value of Sulphate (as SO_4) observed was 44.3 mg/L at PAF area
- Maximum value of Total Alkalinity (as $CaCO_3$) observed was 117 mg/L at Port Site
- Maximum value of Total Hardness (as $CaCO_3$) observed was 153 mg/L at Proposed Port Estate Area
- Maximum value of Zinc (as Zn) observed was to 0.24 mg/L at PAF area
- Anionic Detergents, Barium (as Ba), Boron (as B) Chloramines (as Cl_2), Copper (as Cu), Mineral Oil, Phenolic Compounds(as C_6H_5OH), Selenium (as Se), Silver (as Ag), Hydrogen Sulphide (as H_2S), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Molybdenum (as Mo), Nickel (as Ni), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues, Trihalomethanes, Polychlorinated Biphenyls (PCB) and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits at all locations
- Bacteriological parameters such as *E.coli* and Total Coliforms were not detected at all locations.

HYR-6.6. Surface Water Analysis Results for the period from October 2021 to March 2022:

Table 6.5: Surface Water Analysis Results

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
Physical Parameters						
1.	Colour	Hazen Units	Oct-21	1	1	1
			Nov-21	1	1	1
			Dec-21	1	1	1
			Jan-22	1	1	1
			Feb-22	1	1	1
			Mar-22	1	1	1
2.	Odour	-	Oct-21	Agreeable	Agreeable	Agreeable
			Nov-21	Agreeable	Agreeable	Agreeable
			Dec-21	Agreeable	Agreeable	Agreeable
			Jan-22	Agreeable	Agreeable	Agreeable
			Feb-22	Agreeable	Agreeable	Agreeable
			Mar-22	Agreeable	Agreeable	Agreeable
3.	pH Value	-	Oct-21	6.64	7.01	6.96
			Nov-21	6.52	6.82	6.69
			Dec-21	6.73	7.28	6.94
			Jan-22	7.04	7.22	7.25
			Feb-22	6.75	7.18	7.02
			Mar-22	7.26	7.72	7.43
4.	Turbidity	N.T.U.	Oct-21	41.9	83.9	1.6
			Nov-21	8.2	24.9	1.3
			Dec-21	5.4	5.8	3.2
			Jan-22	1.5	2.0	7.6
			Feb-22	0.1	0.6	2.9
			Mar-22	1.8	4.2	1.5
5.	Electrical Conductivity (at 25°C)	µmho/cm	Oct-21	122	230	195
			Nov-21	205	452	225
			Dec-21	205	260	237
			Jan-22	628	255	234
			Feb-22	1054	270	267
			Mar-22	1018	245	244
6.	Total Dissolved Solids	mg/L	Oct-21	78	148	117
			Nov-21	101	220	120
			Dec-21	102	130	119
			Jan-22	408	166	152
			Feb-22	474	135	120
			Mar-22	510	135	134

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
Chemical Parameters						
7.	Dissolved Oxygen	mg/L	Oct-21	7	7.2	6.8
			Nov-21	6.9	7.1	7.1
			Dec-21	7	7.2	6.9
			Jan-22	6.9	6.9	7.1
			Feb-22	6.8	6.9	6.7
			Mar-22	6.9	6.9	6.9
8.	Biochemical Oxygen Demand (3 days, 27°C)	mg/L	Oct-21	BDL	2.4	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
9.	Oil & Grease	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
10.	Free Ammonia	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	0.280	0.160	0.810
			Mar-22	BDL	BDL	BDL
11.	Anionic Detergents (as MBAS) Calculated as LAS mol.wt. 288.38	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
12.	Barium (as Ba)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
13.	Boron (as B)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
14.	Calcium (as Ca)	mg/L	Oct-21	4	10.4	7.2

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Nov-21	4.00	11.2	7.20
			Dec-21	7.20	10.4	7.20
			Jan-22	8.00	8.00	5.60
			Feb-22	9.60	8.80	6.40
			Mar-22	16.0	9.60	6.40
15.	Chloride (as Cl)	mg/L	Oct-21	17.1	27.2	29.2
			Nov-21	32.9	67.9	28.9
			Dec-21	32.2	39.3	37.2
			Jan-22	182	33.6	49.5
			Feb-22	220	36.9	35.9
			Mar-22	212	36.6	37.6
16.	Copper (as Cu)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
17.	Fluoride (as F)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	0.39	BDL	BDL
18.	Iron (as Fe)	mg/L	Oct-21	5.47	3.59	1.09
			Nov-21	5.47	3.59	1.09
			Dec-21	0.71	0.64	0.92
			Jan-22	0.29	0.61	1.95
			Feb-22	0.180	0.370	0.800
			Mar-22	0.650	0.480	1.05
19.	Magnesium (as Mg)	mg/L	Oct-21	2.98	3.48	3.48
			Nov-21	2.98	3.48	3.48
			Dec-21	1.99	2.98	3.47
			Jan-22	11.6	4.87	4.87
			Feb-22	11.6	2.92	2.92
			Mar-22	9.74	3.41	4.38
20.	Manganese (as Mn)	mg/L	Oct-21	0.12	BDL	0.10
			Nov-21	0.09	BDL	0.12
			Dec-21	0.16	BDL	0.09
			Jan-22	0.16	BDL	0.09
			Feb-22	BDL	BDL	0.09
			Mar-22	BDL	BDL	0.101
21.	Mineral Oil	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
22.	Nitrate (as NO_3)	mg/L	Oct-21	8.67	12.7	1.92
			Nov-21	1.55	1.97	BDL
			Dec-21	1.55	1.89	BDL
			Jan-22	2.85	2.16	1.1
			Feb-22	1.15	1.68	1.21
			Mar-22	2.99	BDL	BDL
23.	Phenolic Compounds (as C_6H_5OH)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
24.	Selenium (as Se)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
25.	Silver (as Ag)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
26.	Sulphate (as SO_4)	mg/L	Oct-21	8.04	21.6	7.27
			Nov-21	4.91	12.9	5.58
			Dec-21	4.33	4.58	5.52
			Jan-22	14.1	4.98	3.92
			Feb-22	15.9	4.39	4.21
			Mar-22	19.6	1.00	1.18
27.	Total Phosphate (as PO_4)	mg/L	Oct-21	0.63	1.55	0.58
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	0.120	0.140
			Mar-22	BDL	0.160	0.100
28.	Total Alkalinity (as $CaCO_3$)	mg/L	Oct-21	10	20.1	16.1
			Nov-21	13.9	31.8	27.9
			Dec-21	10.1	18.1	14.1
			Jan-22	21.9	29.8	29.8
			Feb-22	19.9	27.9	27.9

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Mar-22	17.9	27.9	19.9
29.	Total Hardness (as $CaCO_3$)	mg/L	Oct-21	22.4	46.5	24.2
			Nov-21	22	50	30
			Dec-21	26.5	50	32.6
			Jan-22	68	40	34
			Feb-22	80	34	28
			Mar-22	80.0	38.0	34.0
30.	Calcium Hardness (as $CaCO_3$)	mg/L	Oct-21	10.2	26.5	18.4
			Nov-21	10	28	18
			Dec-21	18.4	26.5	18.4
			Jan-22	20	20	14
			Feb-22	24	22	16
			Mar-22	40.0	24.0	16.0
31.	Zinc (as Zn)	mg/L	Oct-21	0.14	0.12	0.09
			Nov-21	0.11	0.14	0.12
			Dec-21	0.05	0.10	0.05
			Jan-22	0.05	0.10	0.05
			Feb-22	0.045	0.03	BDL
			Mar-22	0.052	BDL	BDL
32.	Sodium (as Na)	mg/L	Oct-21	11.79	17.9	15.67
			Nov-21	15.3	37.1	16.0
			Dec-21	17.8	21.8	18.7
			Jan-22	83.2	21.1	22.1
			Feb-22	94.9	19.7	21.1
			Mar-22	135	22.3	20.1
33.	Potassium (as K)	mg/L	Oct-21	2.8	5.53	3.7
			Nov-21	3.2	6.45	3.42
			Dec-21	3.24	3.7	3.37
			Jan-22	5.49	3.21	2.66
			Feb-22	5.58	2.56	2.44
			Mar-22	7.81	3.40	2.52
34.	Sodium Adsorption Ratio	-	Oct-21	6.3	6.81	6.78
			Nov-21	1.421	2.279	1.266
			Dec-21	1.507	1.53	0.575
			Jan-22	4.397	1.45	1.651
			Feb-22	4.50	1.47	1.73
			Mar-22	6.40	1.57	1.50
35.	Cadmium (as Cd)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
36.	Cyanide (as CN)	mg/L	Oct-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
37.	Lead (as Pb)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
38.	Mercury (as Hg)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
39. Pesticide Residues						
i.	Alachlor	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
ii.	Atrazine	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
iii.	Aldrin/Dieldrin	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
iv.	Alpha HCH	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
v.	Beta HCH	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
vi.	Butachlor	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
vii.	Chlorpyrifos	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
viii.	Delta HCH	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
ix.	2,4D chlorophenoxyaceti c acid	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
x.	DDT (o,p & p,p-Isomers of DDT, DDE, DDD)	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xi.	Endosulfan (α,β & Sulphate)	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xii.	Ethion	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xiii.	γ HCH (Lindane)	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xiv.	Isoproturon	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xv.	Malathion	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xvi.	Methyl Parathion	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xvii.	Monocrotophos	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
xviii.	Phorate	µg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
40.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL

Sl. No.	Parameters	Unit	Month	Poovar West Canal (S1)	Vizhinjam Branch Canal (S2)	Vellayani Lake (S3)
41.	Total Arsenic (as As)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
42.	Total Chromium (as Cr)	mg/L	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
Biological Analysis						
43.	Total Coliforms	MPN Index/100 ml	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL
44.	Faecal Coliforms	MPN Index/100 ml	Oct-21	BDL	BDL	BDL
			Nov-21	BDL	BDL	BDL
			Dec-21	BDL	BDL	BDL
			Jan-22	BDL	BDL	BDL
			Feb-22	BDL	BDL	BDL
			Mar-22	BDL	BDL	BDL

HYR-6.7. Graphical representation of Results for Surface Water Analysis:

Figure 6.15: Surface Water Analysis for pH value

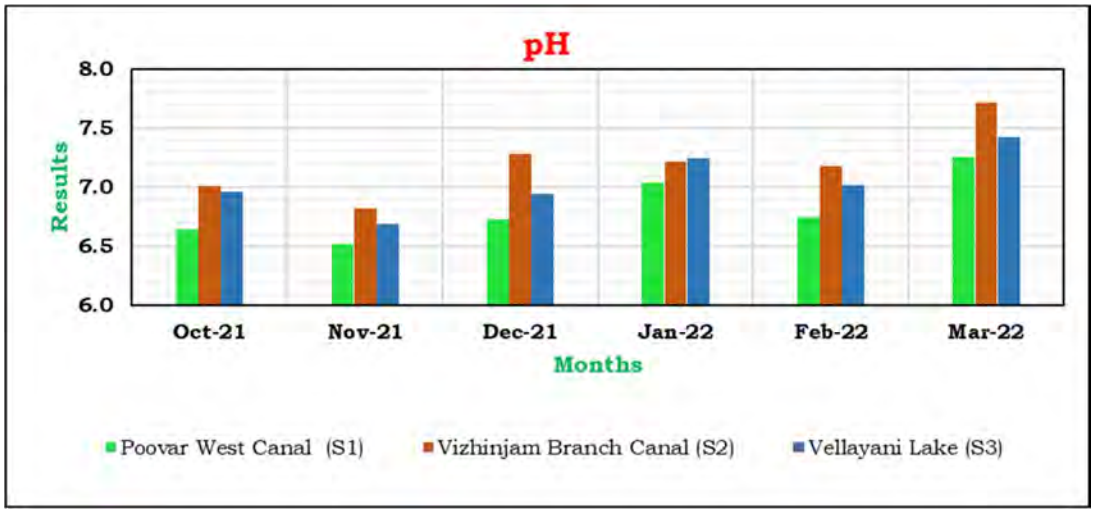


Figure 6.16: Surface Water Analysis for Turbidity

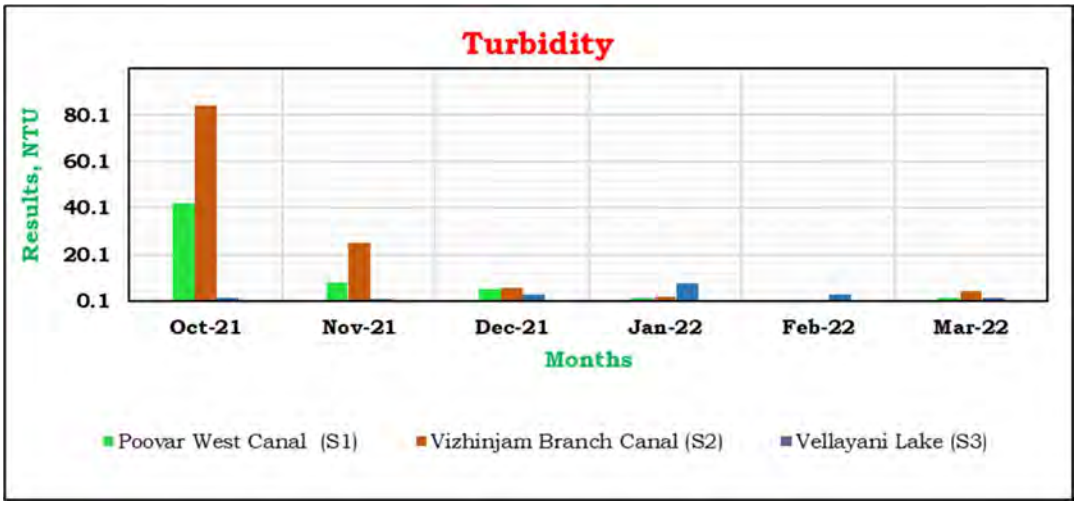


Figure 6.17: Surface Water Analysis for Electrical Conductivity @ 25 °C

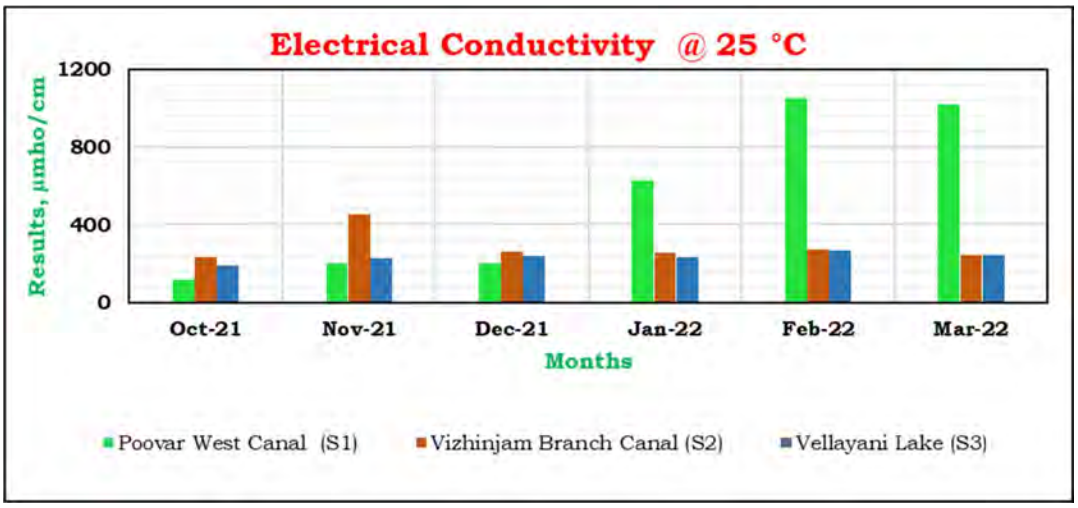


Figure 6.18: Surface Water Analysis for Total Dissolved Solids

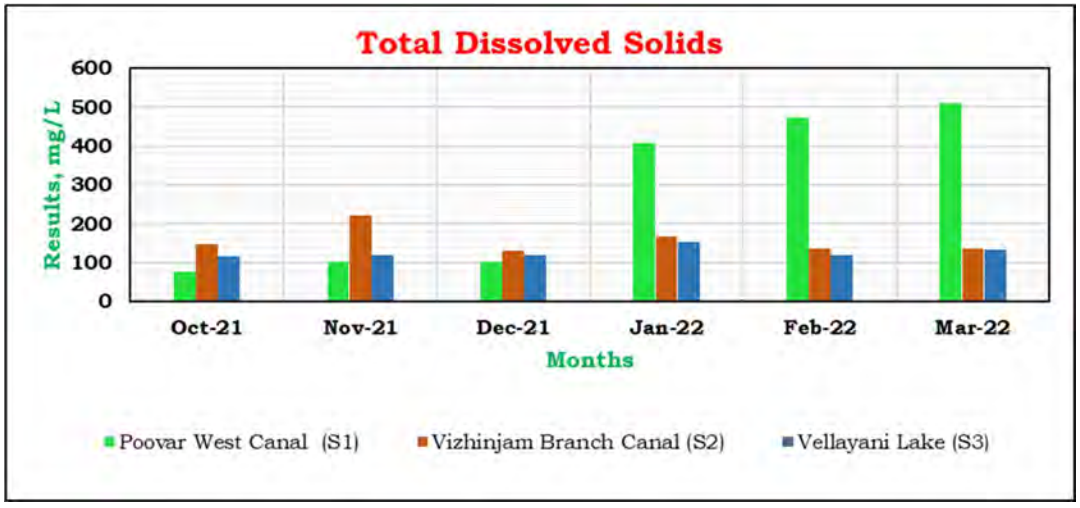


Figure 6.19: Surface Water Analysis for Dissolved Oxygen

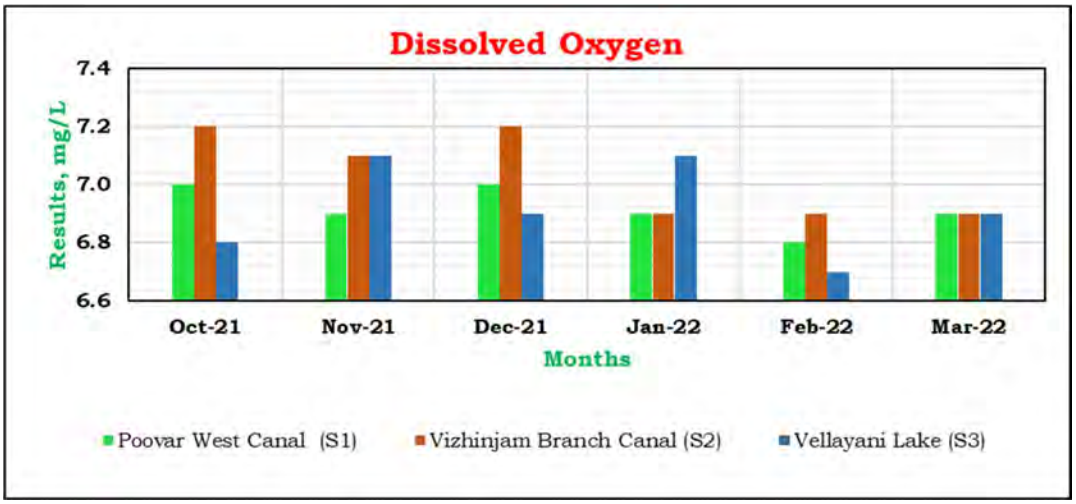


Figure 6.20: Surface Water Analysis for Chloride as Cl

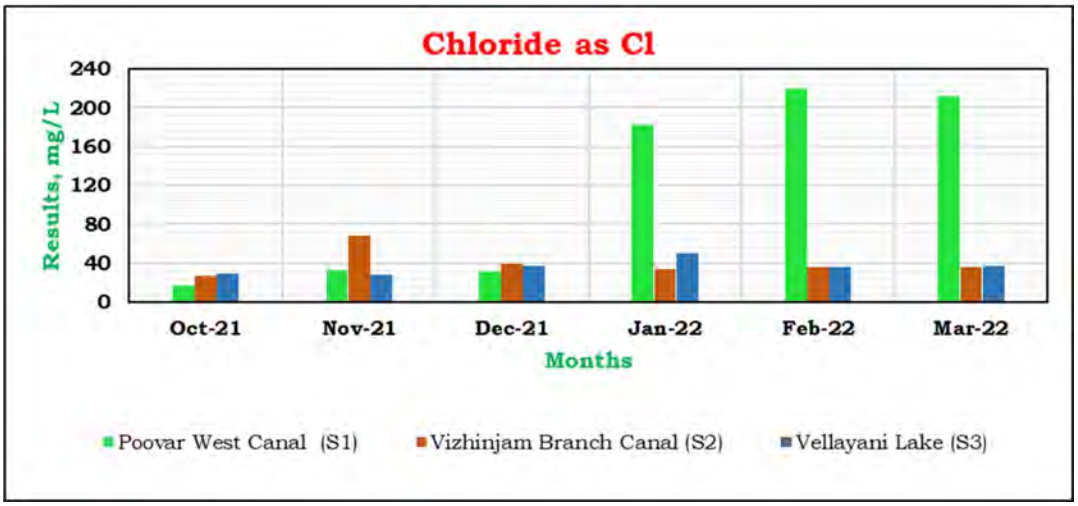


Figure 6.21: Surface Water Analysis for Sulphate as SO_4

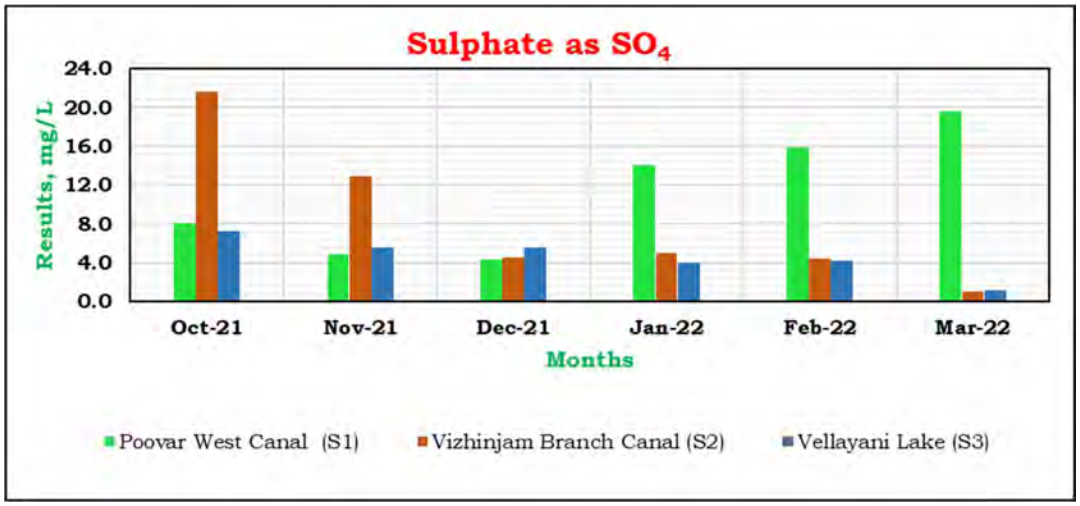


Figure 6.22: Surface Water Analysis for Nitrate as NO_3

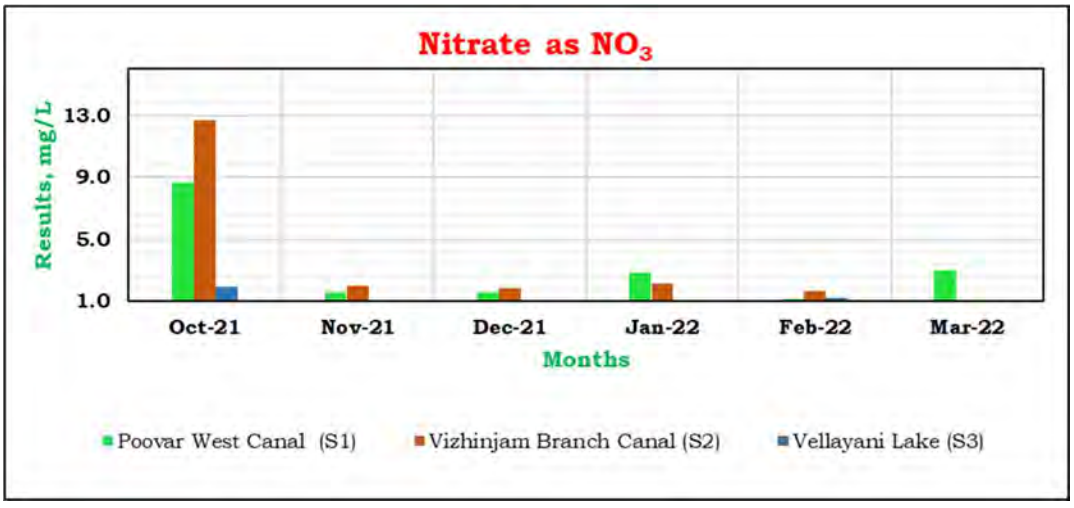


Figure 6.23: Surface Water Analysis for Calcium as Ca

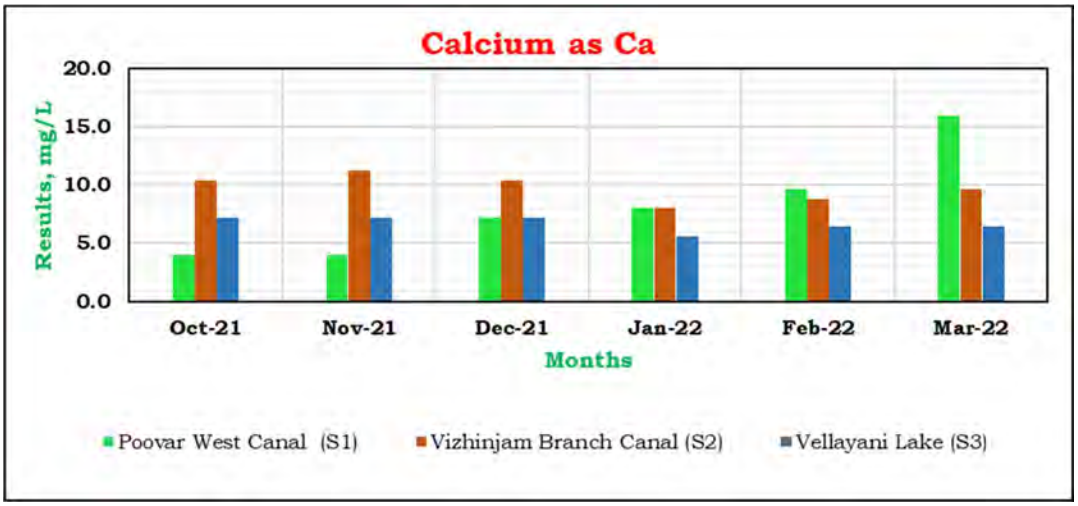


Figure 6.24: Surface Water Analysis for Magnesium as Mg

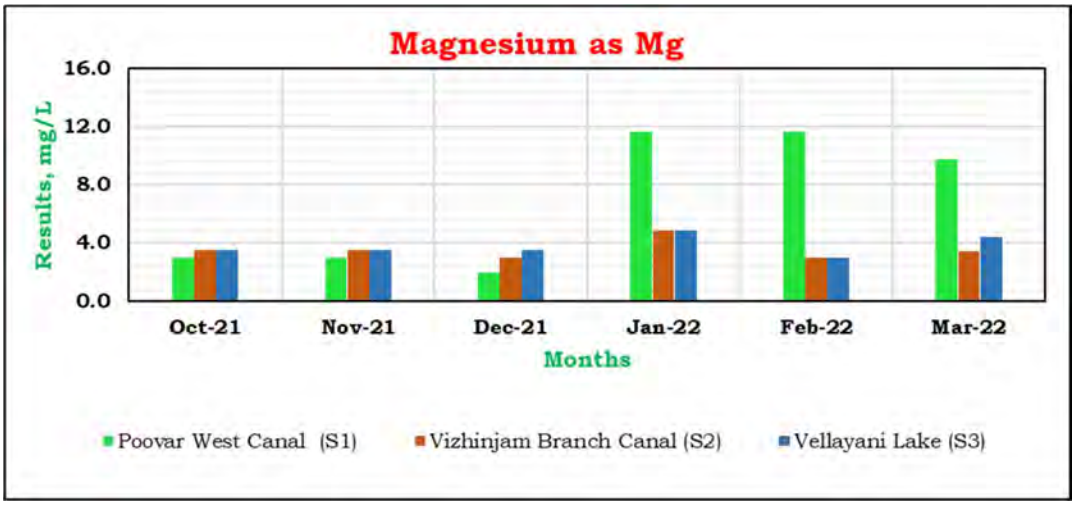


Figure 6.25: Surface Water Analysis for Manganese as Mn

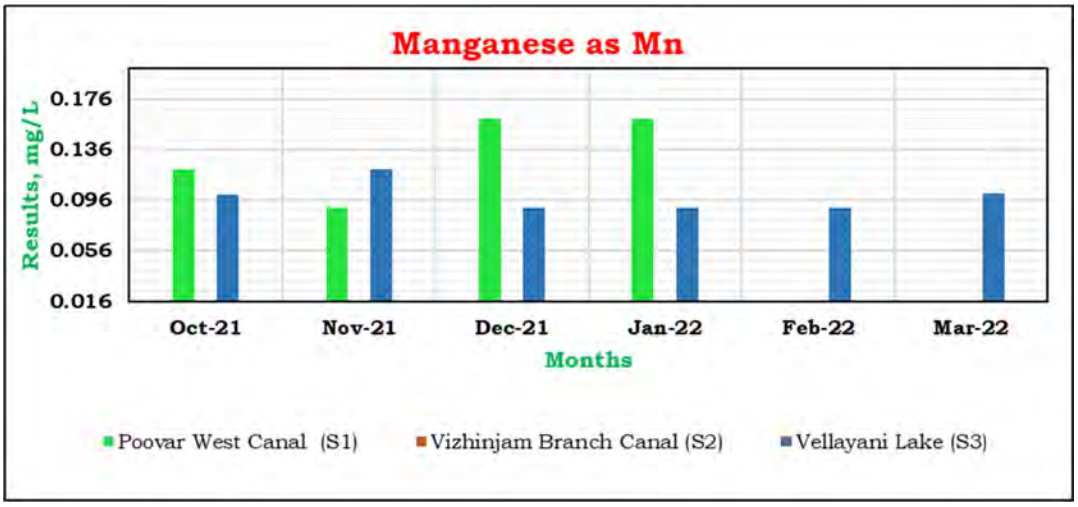


Figure 6.26: Surface Water Analysis for Iron as Fe

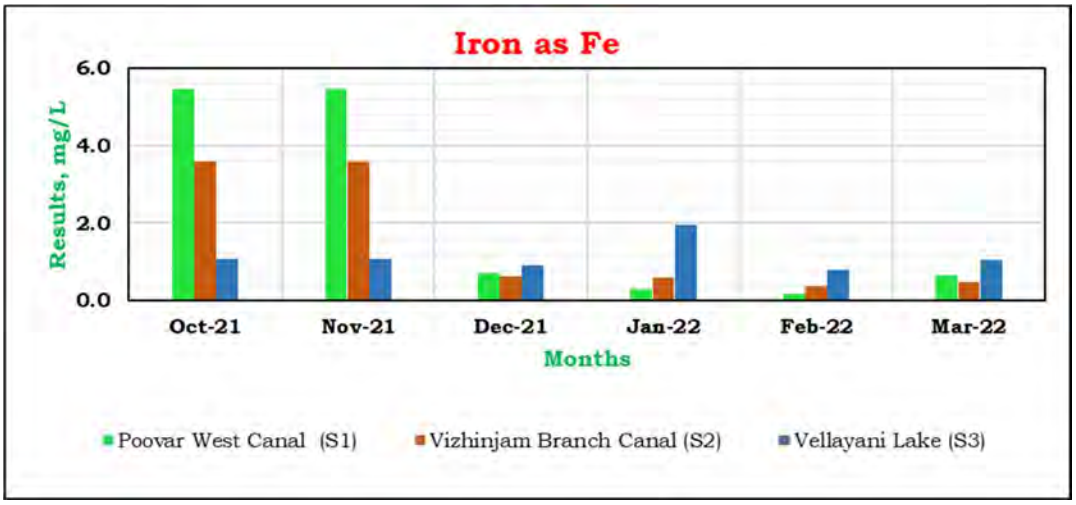


Figure 6.27: Surface Water Analysis for Zinc as Zn

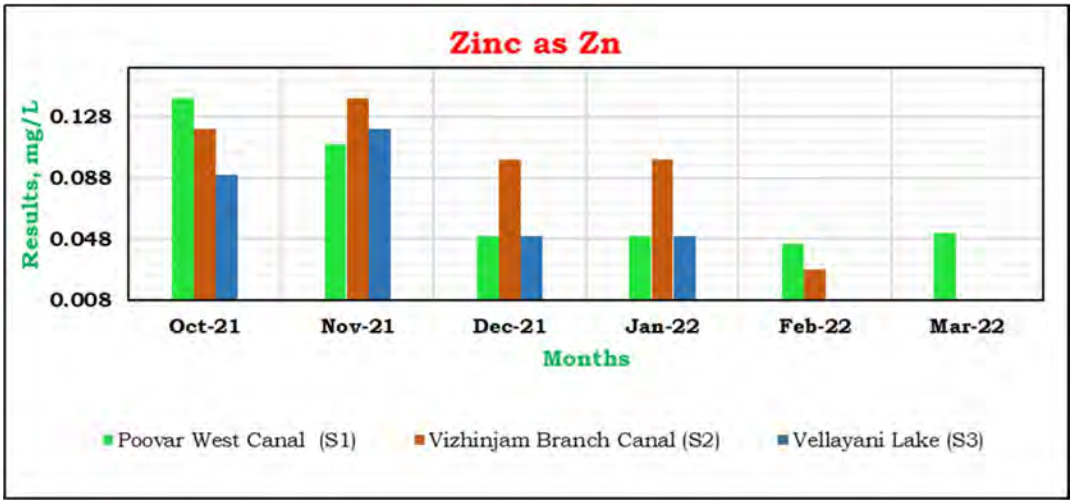


Figure 6.28: Surface Water Analysis for Total Phosphorous as P

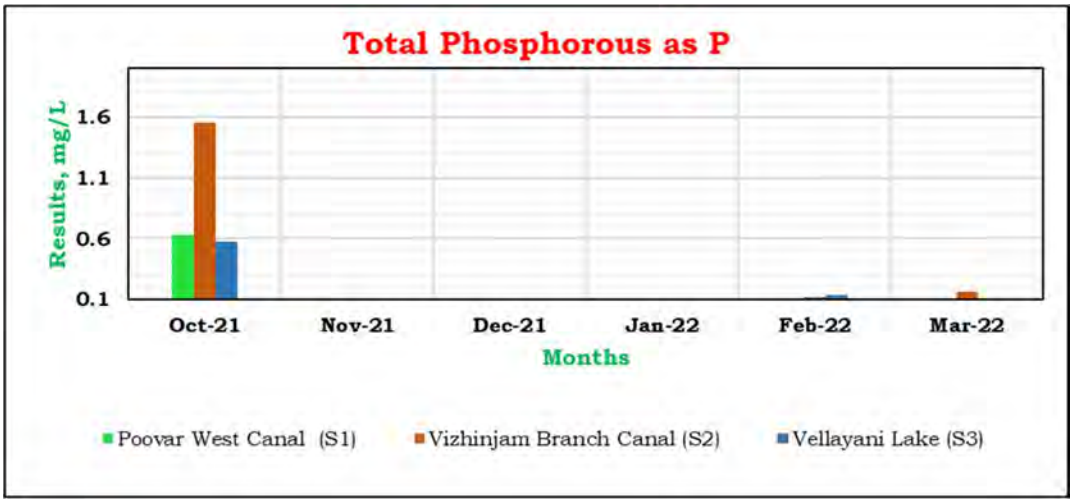


Figure 6.29: Surface Water Analysis for Total Alkalinity as $CaCO_3$

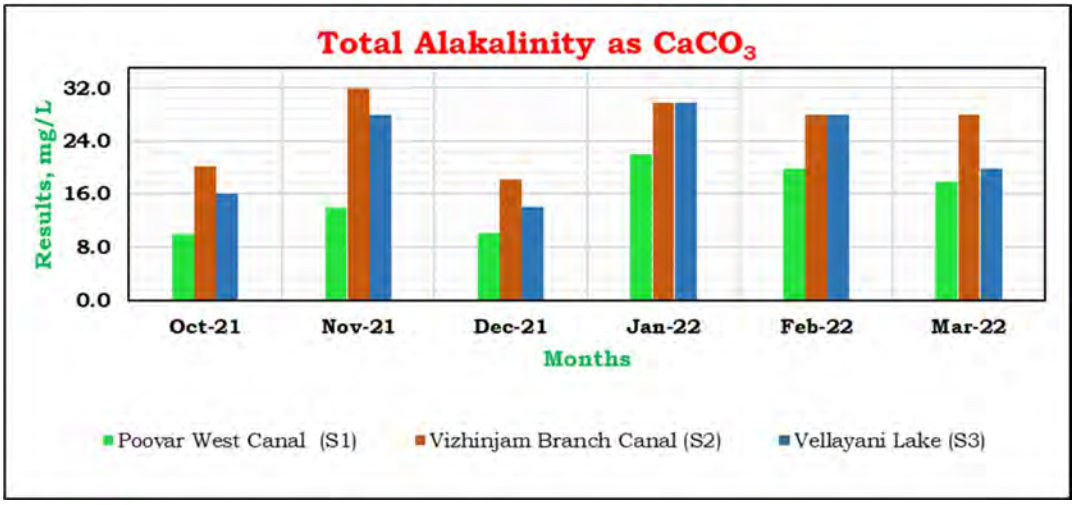


Figure 6.30: Surface Water Analysis for Total Hardness as $CaCO_3$

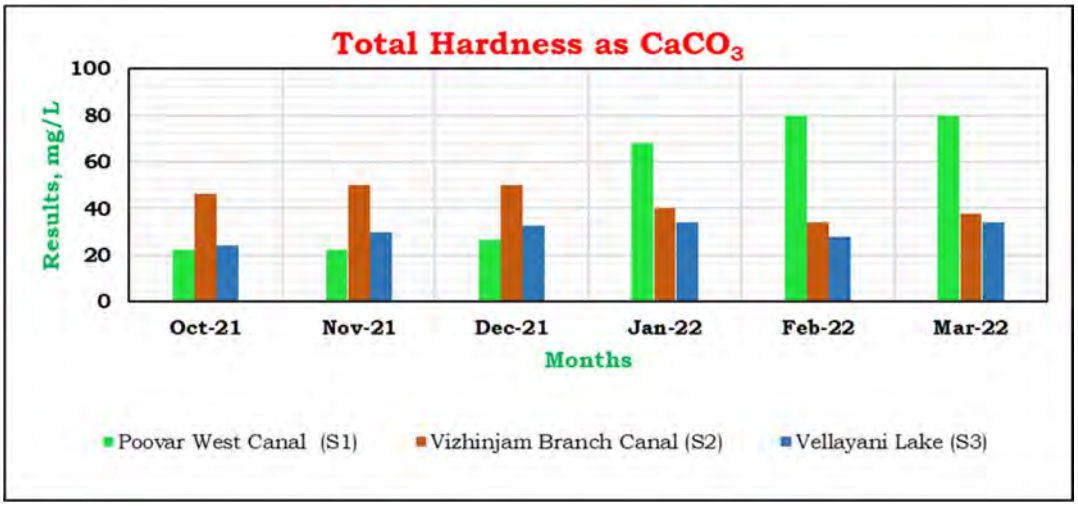


Figure 6.31: Surface Water Analysis for Calcium Hardness as $CaCO_3$

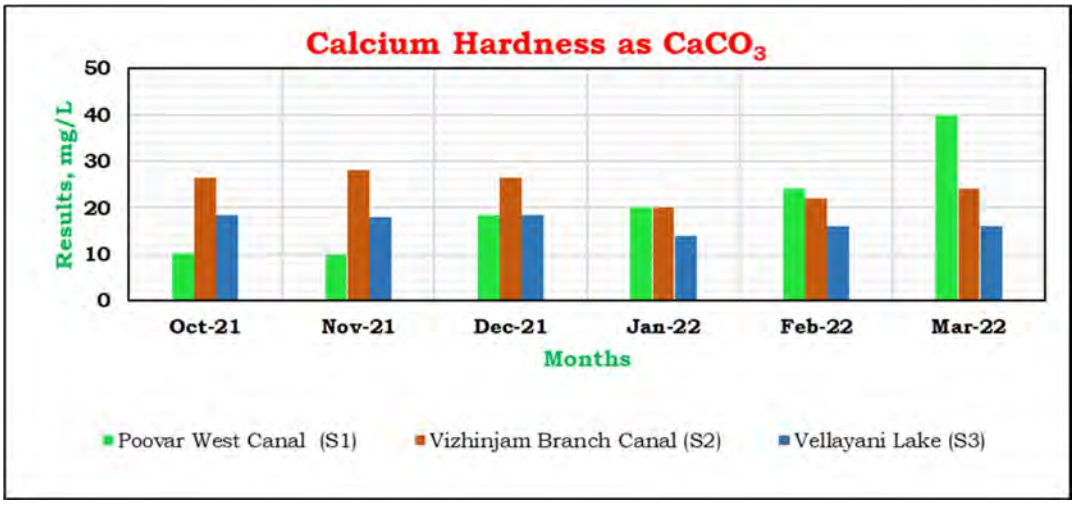


Figure 6.32: Surface Water Analysis for Sodium as Na

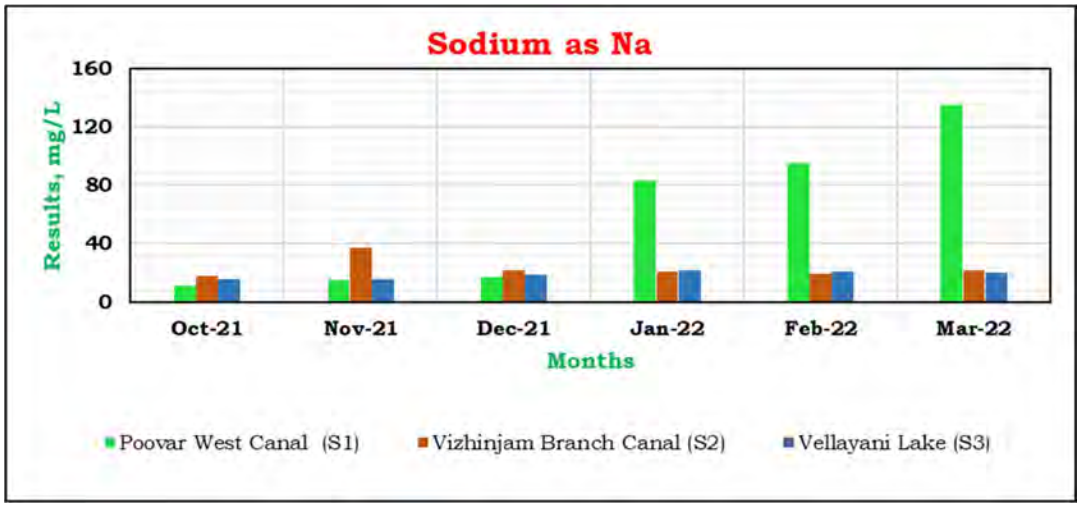


Figure 6.33: Surface Water Analysis for Potassium as K

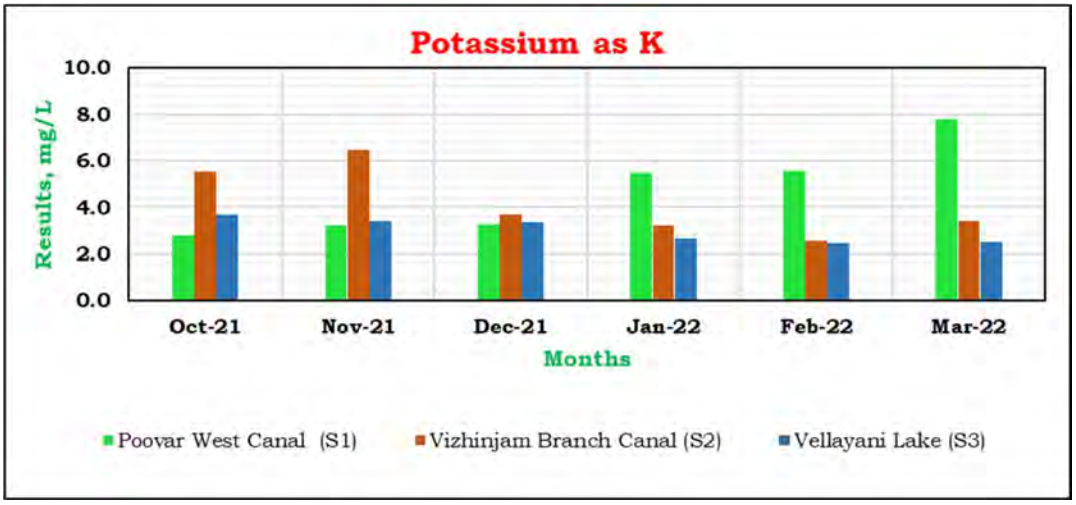
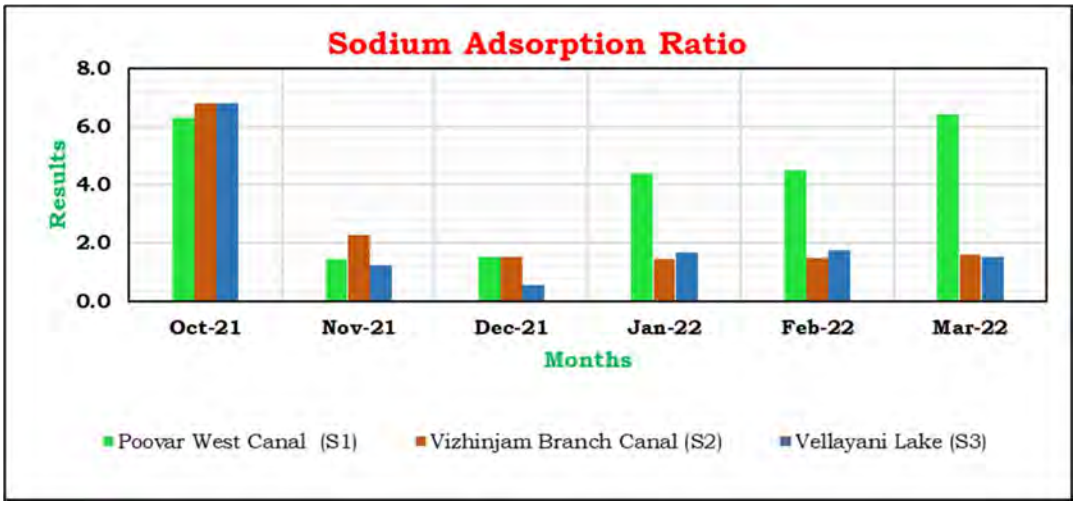


Figure 6.34: Surface Water Analysis for Sodium Adsorption Ratio



HYR-6.8. Summary of Surface water

During the period from October 2021 to March 2022, following is the summary of surface water analysis:

a) At the location **Poovar West Canal**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 6.52 to 7.26
- Turbidity was observed in the range from 0.1 to 41.9 N.T.U.
- Total Dissolved Solids were observed in the range from 78 to 510 mg/L
- Electrical Conductivity was observed in the range from 205 to 1054 µmho/cm
- Dissolved Oxygen was observed in the range from 6.8 to 7.0 mg/L
- Calcium (as Ca) was observed in the range from 4.0 to 16.0 mg/L
- Chloride (as Cl) was observed in the range from 17.1 to 220 mg/L
- Iron (as Fe) was observed in the range from 0.18 to 5.47 mg/L
- Magnesium (as Mg) was observed in the range from 1.99 to 11.6 mg/L
- Manganese (as Mn) was observed in the range from 0.09 to 0.16 mg/L
- Nitrate (as NO_3) was observed in the range from 1.15 to 8.67 mg/L
- Sulphate (as SO_4) was observed in the range from 4.33 to 19.6 mg/L
- Total Phosphate (as PO_4) was observed in the range from BDL to 0.63 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 10.0 to 21.9 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 22 to 80 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 10 to 40 mg/L
- Sodium (as Na) was observed in the range from 11.79 to 135 mg/L
- Potassium (as K) was observed in the range from 2.8 to 7.81 mg/L
- Sodium Absorption Ratio was observed in the range from 1.421 to 6.403
- Zinc (as Zn) was observed in the range from 0.045 to 0.14 mg/L
- Free Ammonia was observed in the range from BDL to 0.28 mg/L
- Fluoride was observed in the range from BDL to 0.39 mg/L
- Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Mineral Oil,

Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits

- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

b) At the location **Vizhinjam Branch Canal**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 6.82 to 7.28
- Turbidity was observed in the range from 0.6 to 83.9 N.T.U.
- Total Dissolved Solids were observed in the range from 130 to 220 mg/L
- Electrical Conductivity was observed in the range from 230 to 452 µmho/cm
- Dissolved Oxygen was observed in the range from 6.9 to 7.2 mg/L
- Biochemical Oxygen Demand (3 days, 27°C) was observed in the range from BDL to 2.4 mg/L
- Calcium (as Ca) was observed in the range from 8.0 to 11.2 mg/L
- Chloride (as Cl) was observed in the range from 27.2 to 67.9 mg/L
- Iron (as Fe) was observed in the range from 0.37 to 3.59 mg/L
- Magnesium (as Mg) was observed in the range from 2.98 to 4.87 mg/L
- Nitrate (as NO_3) was observed in the range from 1.68 to 12.7 mg/L
- Sulphate (as SO_4) was observed in the range from 1.0 to 21.6 mg/L
- Total Phosphate (as PO_4) was observed in the range from BDL to 1.55 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 18.1 to 31.8 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 34.0 to 40.0 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 20.0 to 28.0 mg/L
- Sodium (as Na) was observed in the range from 17.9 to 37.09 mg/L
- Potassium (as K) was observed in the range from 2.56 to 6.45 mg/L
- Sodium Absorption Ratio was observed in the range from 1.45 to 6.81
- Zinc (as Zn) was observed in the range from BDL to 0.14 mg/L

- Free Ammonia was observed in the range from BDL to 0.16 mg/L
- Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Manganese (as Mn), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

c) At the location **Vellayani Lake**,

- Colour was observed 1 Hazen unit
- Odour was agreeable
- pH was observed in the range from 6.69 to 7.43
- Turbidity was observed in the range from 1.3 to 7.6 N.T.U.
- Total Dissolved Solids were observed in the range from 117 to 152 mg/L
- Electrical Conductivity was observed in the range from 195 to 267 µmho/cm
- Dissolved Oxygen was observed in the range from 6.7 to 7.1 mg/L
- Calcium (as Ca) was observed in the range from 5.6 to 7.2 mg/L
- Chloride (as Cl) was observed in the range from 28.9 to 49.5 mg/L
- Iron (as Fe) was observed in the range from 0.45 to 0.99 mg/L
- Magnesium (as Mg) was observed in the range from 1.48 to 3.93 mg/L
- Manganese (as Mn) was observed in the range from 0.09 to 0.94 mg/L
- Nitrate (as NO_3) was observed in the range from BDL to 1.92 mg/L
- Sulphate (as SO_4) was observed in the range from 1.18 to 7.27 mg/L
- Total Phosphate (as PO_4) was observed in the range from BDL to 0.58 mg/L
- Total Alkalinity (as $CaCO_3$) was observed in the range from 14.1 to 29.8 mg/L
- Total Hardness (as $CaCO_3$) was observed in the range from 24.2 to 34.0 mg/L
- Calcium Hardness (as $CaCO_3$) was observed in the range from 14.0 to 18.4 mg/L
- Sodium (as Na) was observed in the range from 15.67 to 22.1 mg/L
- Potassium (as K) was observed in the range from 2.44 to 3.7 mg/L
- Sodium Absorption Ratio was observed in the range from 0.575 to 6.78

- Zinc (as Zn) was observed in the range from BDL to 0.12 mg/L
- Free Ammonia was observed in the range from BDL to 0.81 mg/L
- Biochemical Oxygen Demand (3 days, 27°C), Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected

d) Summary – Comparison of Results of **All Locations**,

- Colour was observed 1 Hazen unit at all locations
- Odour was agreeable at all locations
- Maximum value of pH observed was 7.43 at Vellayani Lake
- Maximum value of Turbidity observed was 83.9 N.T.U. at Vizhinjam Branch Canal
- Maximum value of Total Dissolved Solids observed was 510 mg/L at Poovar West Canal
- Maximum value of Electrical Conductivity observed was 1054 µmho/cm at Poovar West Canal
- Maximum value of Dissolved Oxygen observed was 7.2 mg/L at Vizhinjam Branch Canal
- Maximum value of Biochemical Oxygen Demand (3 days, 27°C) observed was 2.4 mg/L at Vizhinjam Branch Canal
- Maximum value of Calcium (as Ca) observed was 16 mg/L at Poovar West Canal
- Maximum value of Chloride (as Cl) observed was 220 mg/L at Poovar West Canal
- Maximum value of Iron (as Fe) observed was 5.47 mg/L at Poovar West Canal
- Maximum value of Magnesium (as Mg) observed was 11.6 mg/L at Poovar West Canal
- Maximum value of Manganese (as Mn) observed was 0.94 mg/L at Vellayani Lake

- Maximum value of Nitrate (as NO_3) observed was 12.7 mg/L at Vizhinjam Branch Canal
- Maximum value of Sulphate (as SO_4) observed was 21.6 mg/L at Vizhinjam Branch Canal
- Maximum value of Total Phosphate (as PO_4) observed was 1.55 mg/L at Vizhinjam Branch Canal
- Maximum value of Total Alkalinity (as $CaCO_3$) observed was 31.8 mg/L at Vizhinjam Branch Canal
- Maximum value of Total Hardness (as $CaCO_3$) observed was 80 mg/L at Poovar West Canal
- Maximum value of Calcium Hardness (as $CaCO_3$) observed was 40 mg/L at Poovar West Canal
- Maximum value of Sodium (as Na) observed was 135 mg/L at Poovar West Canal
- Maximum value of Potassium (as K) observed was 7.81mg/L at Poovar West Canal
- Maximum value of Sodium Absorption Ratio observed was 6.81 at Vizhinjam Branch Canal
- Maximum value of Zinc (as Zn) observed was 0.14 mg/L at Poovar West Canal & at Vizhinjam Branch Canal
- Maximum value of Free Ammonia observed was 0.81 mg/L at Vellayani Lake
- Oil & Grease, Anionic Detergents, Barium (as Ba), Boron (as B), Copper (as Cu), Fluoride (as F), Mineral Oil, Phenolic Compounds (as C_6H_5OH), Selenium (as Se), Silver (as Ag), Cadmium (as Cd), Cyanide (as CN), Lead (as Pb), Mercury (as Hg), Total Arsenic (as As), Total Chromium (as Cr), Pesticide Residues and Polynuclear Aromatic Hydrocarbons (PAH) were observed below detectable limits at all locations
- Bacteriological parameters such as Total Coliforms and Faecal Coliforms were not detected at all locations.

HYR-7	Soil Analysis

HYR-7.1. Soil Sampling Location Details:

This section describes the sampling location and analysis results of Soil during January 2022. Soil sampling was carried out at four locations including Port Site, Proposed Port Estate Area, Along with road Network (Mulloor) and Along with Rail Network (Balarampuram).

Table 7.1: Coordinates of Soil Sampling Location

Location	Legend	Latitude	Longitude
Port Site	P	8°22'03.00"N	77°00'16.92"E
Proposed Port Estate Area	C	8°21'02.16"N	77°03'15.84"E
Along with road Network (Mulloor)	M	8°22'23.88"N	77°00'37.08"E
Along with Rail Network (Balarampuram)	B	8°25'28.92"N	77°02'23.64"E

Figure 7.1: Google earth views of Soil Sampling Locations

HYR-7.2. Methodology of Soil Sampling and Analysis

Table 7.2: Soil Sampling Methodology

Sr. No.	Parameter	Unit	Detection Limit	Method Reference
Soil Analysis				
1.	Texture	-	--	SEAAL/EN/SLS/SOP/14
2.	Particle Size Distribution	%	0.1	SEAAL/EN/SLS/SOP/14
3.	pH (1:5 Suspension)	-	1	IS 10158: 1982
4.	Electrical Conductivity (1:5 Suspension at 25^{0}C)	µS/cm	1	IS 14767: 2000
5.	Porosity	%	5	SEAAL/EN/SLS/SOP/02
6.	Total Kjeldhal Nitrogen (as TKN)	mg/kg	50	IS 14684: 1999
7.	Available Phosphorus (as P)	mg/kg	1	SEAAL/EN/SLS/SOP/04
8.	Available Potassium (as K)	mg/kg	0.5	SEAAL/EN/SLS/SOP/03
9.	Total Organic Carbon	g/100g	0.1	IS 2720 Part 22:1972
10.	Organic Matter	g/100g	0.1	IS 2720 Part 22:1972
11.	Available Sodium	mg/kg	0.2	SEAAL/ENS/SLS/SOP/03
12.	Lead (as Pb)	mg/kg	5	EPA 7000B : 2007

HYR-7.3. Soil Analysis Results for the period January 2022:

Table 7.3: Soil Analysis Results

Date of Sampling	**14-01-2022**

Parameter	Unit	Results			
		Port Site (P)	**Proposed Port Estate Area (C)**	**Along with road Network (Mulloor) (M)**	**Along with Rail Network (Balarampuram) (B)**
Texture	-	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Particle Size Distribution - Gravel	%	1.36	1.06	1.84	3.81

Parameter	Unit	Results			
		Port Site (P)	Proposed Port Estate Area (C)	Along with road Network (Mulloor) (M)	Along with Rail Network (Balarampuram) (B)
Particle Size Distribution - Sand	%	71.64	63.67	69.23	58.86
Particle Size Distribution - Silt	%	14.81	18.12	16.47	21.38
Particle Size Distribution - Clay	%	12.19	17.15	12.46	15.95
pH (1:5 Suspension)	-	7.05	6.86	6.83	6.04
Electrical Conductivity (1:5 Suspension at 25 °C)	µS/cm	374	285	306	360
Porosity	%	20.0	30.0	26.0	51.0
Infiltration (Void Ratio)	-	6.82	5.13	6.59	4.92
Total Kjeldhal Nitrogen (as TKN)	mg/kg	2400	1086	1046	4002
Available Phosphorus (as P)	mg/kg	208	376	420	1246
Available Potassium (as K)	mg/kg	29.5	28.5	21.4	41.9
Total Organic Carbon	%	0.50	1.03	1.00	5.55
Organic Matter	%	0.88	1.77	1.73	9.57
Available Sodium	mg/kg	184	169	190	175
Lead (as Pb)	mg/kg	2.73	2.91	3.27	1.22

BDL: Below Detectable Limit

HYR-7.4. Graphical Representation of Results for Soil Analysis:

Figure 7.2: Soil Analysis for Particle Distribution

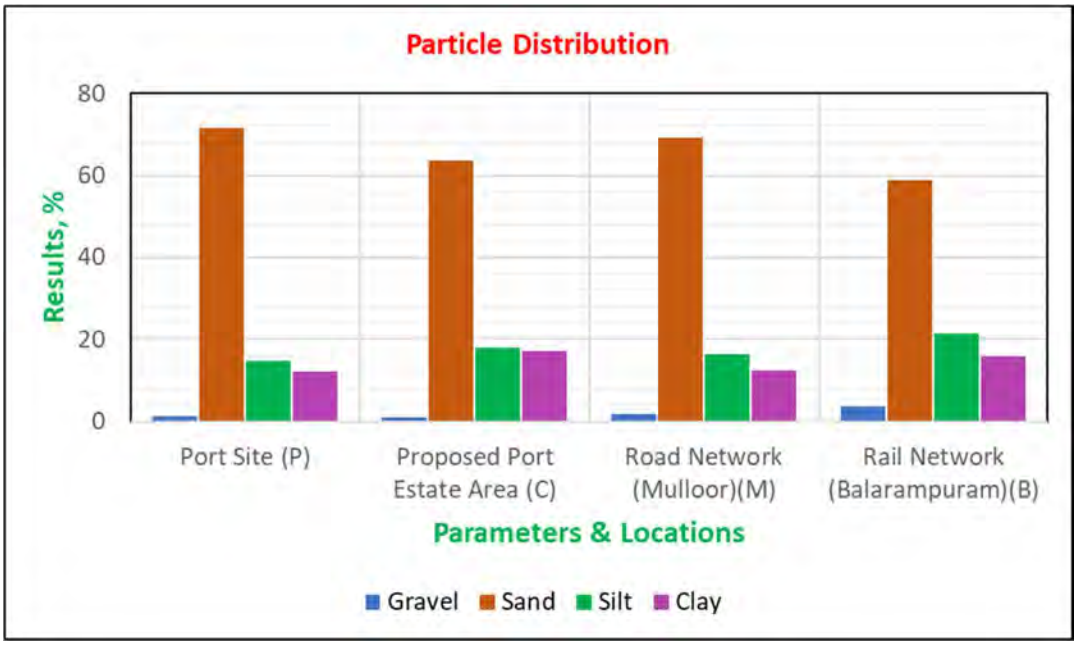


Figure 7.3: Soil Analysis for pH

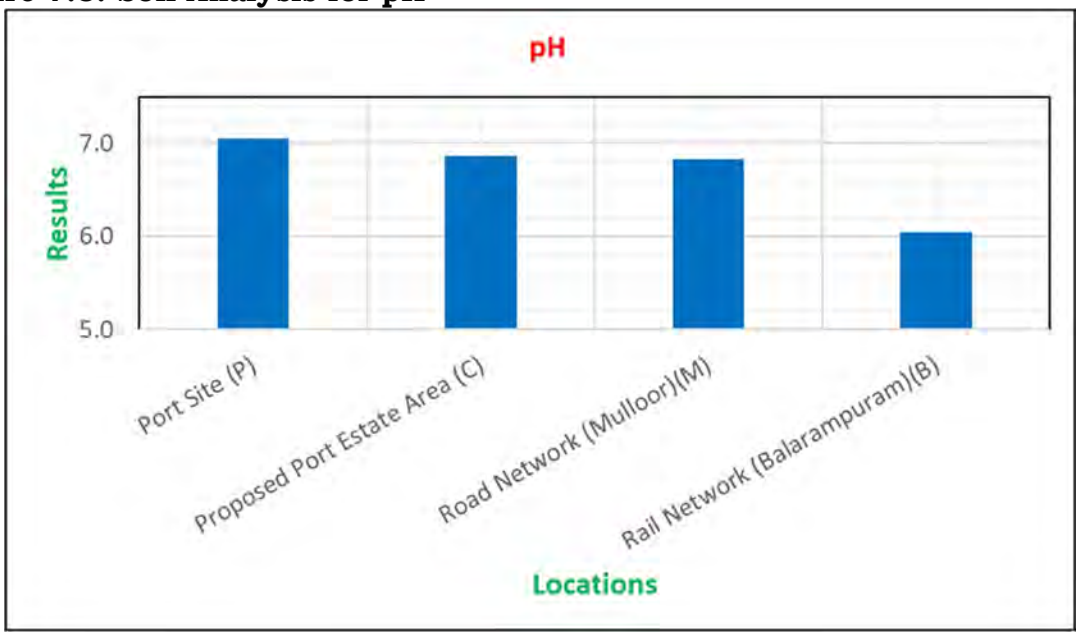


Figure 7.4: Soil Analysis for Electrical Conductivity

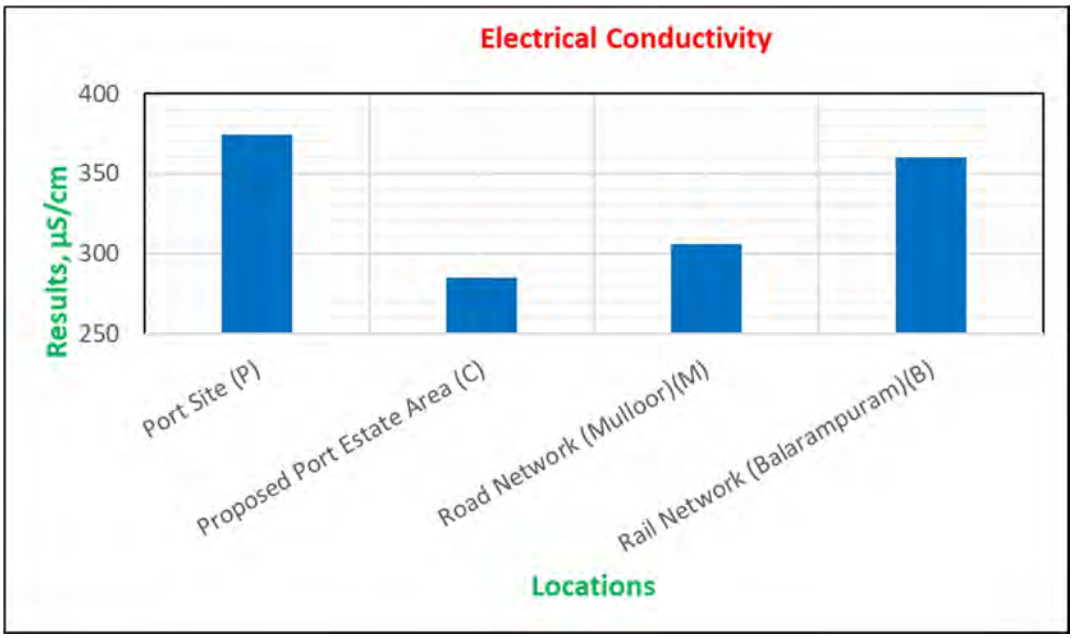


Figure 7.5: Soil Analysis for Porosity

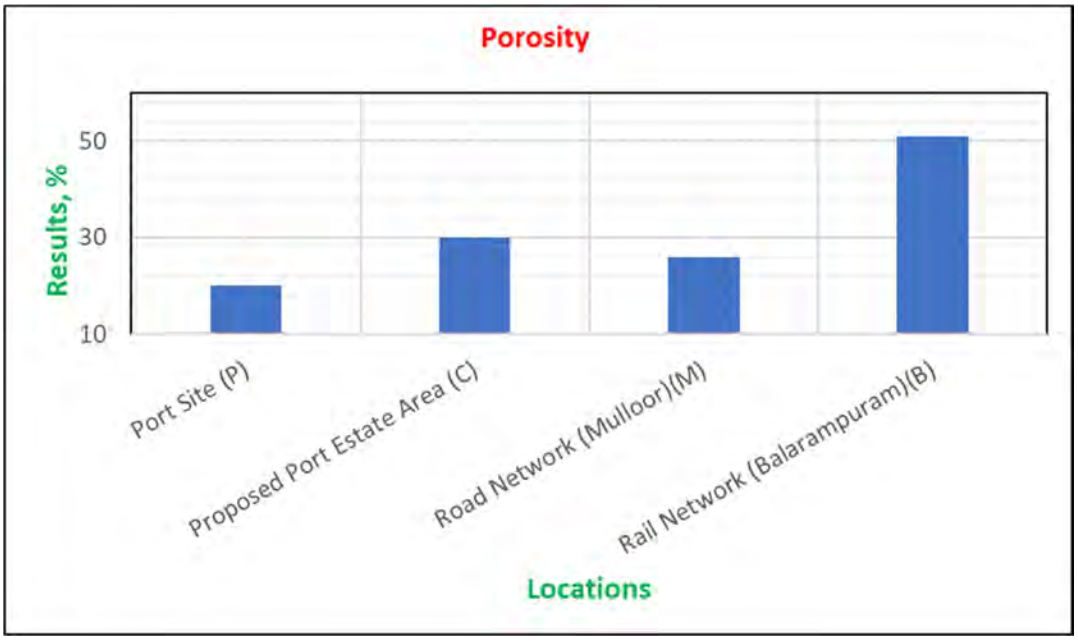


Figure 7.6: Soil Analysis for Infiltration Ratio

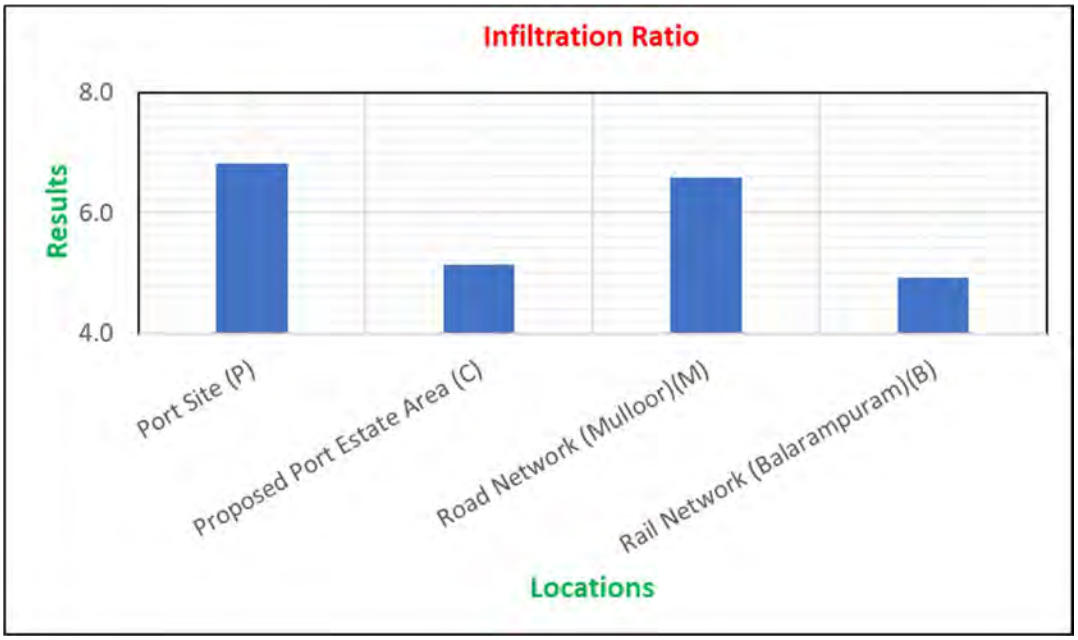


Figure 7.7: Soil Analysis for Total Kjeldhal Nitrogen

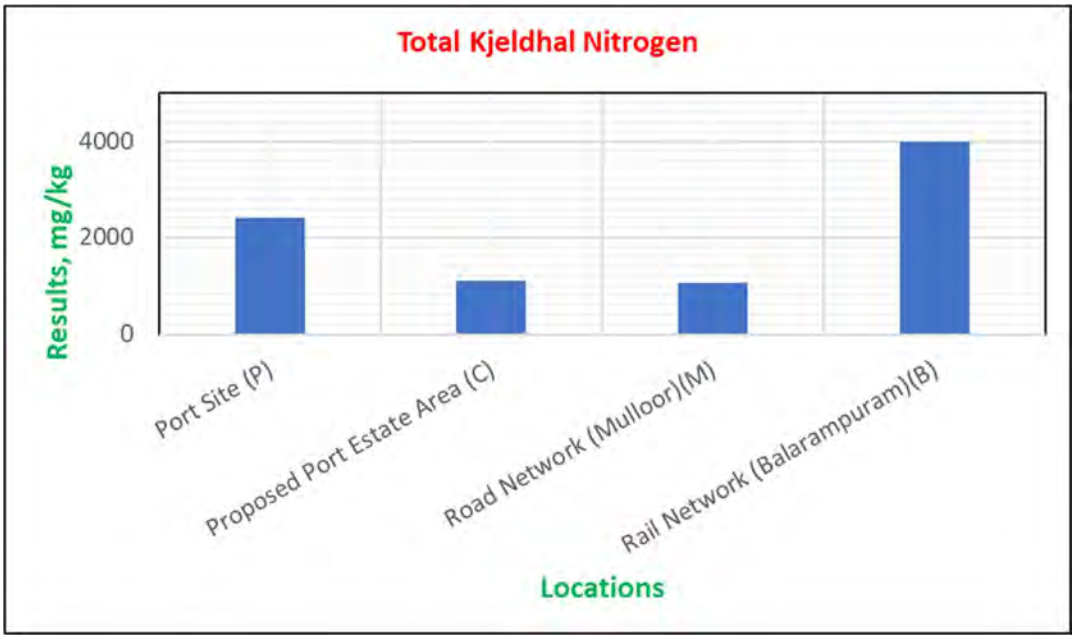


Figure 7.8: Soil Analysis for Available Phosphorous (as P)

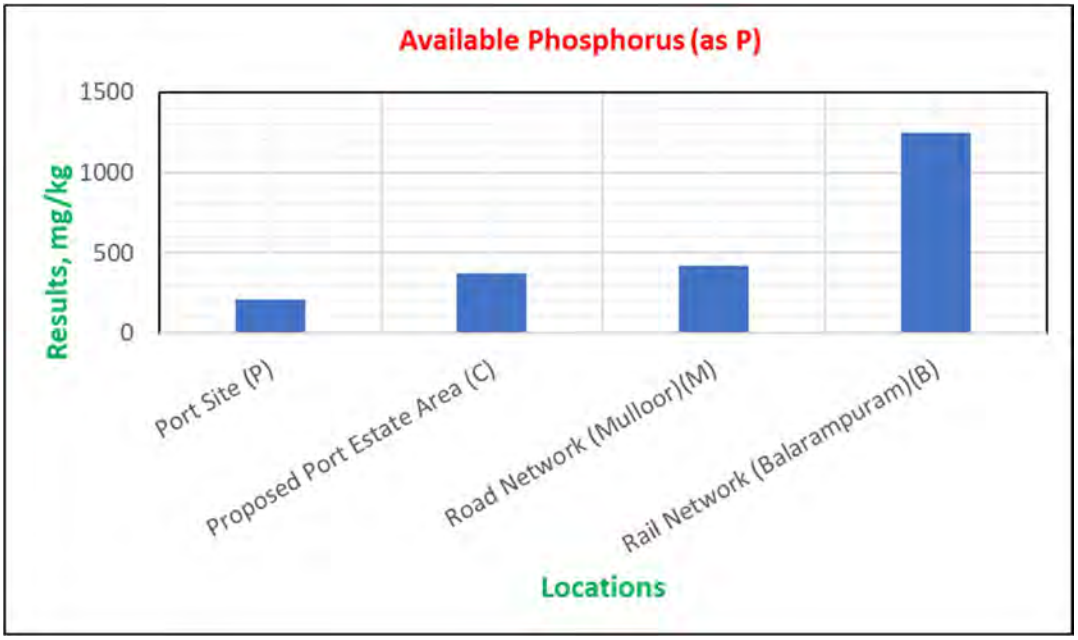


Figure 7.9: Soil Analysis for Available Potassium (as K)

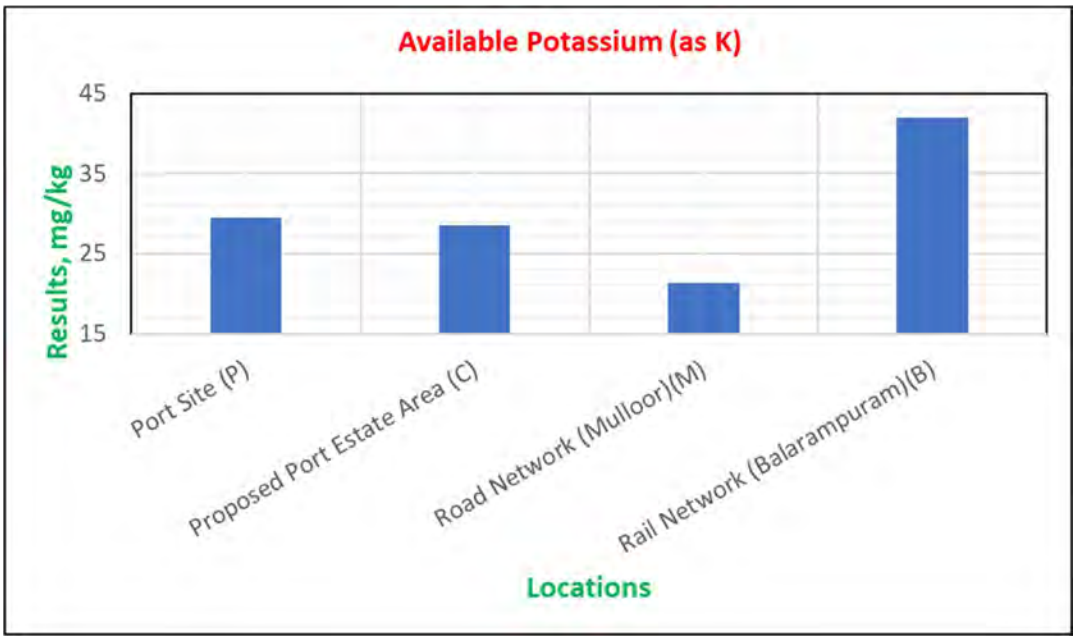


Figure 7.10: Soil Analysis for Total Organic Carbon

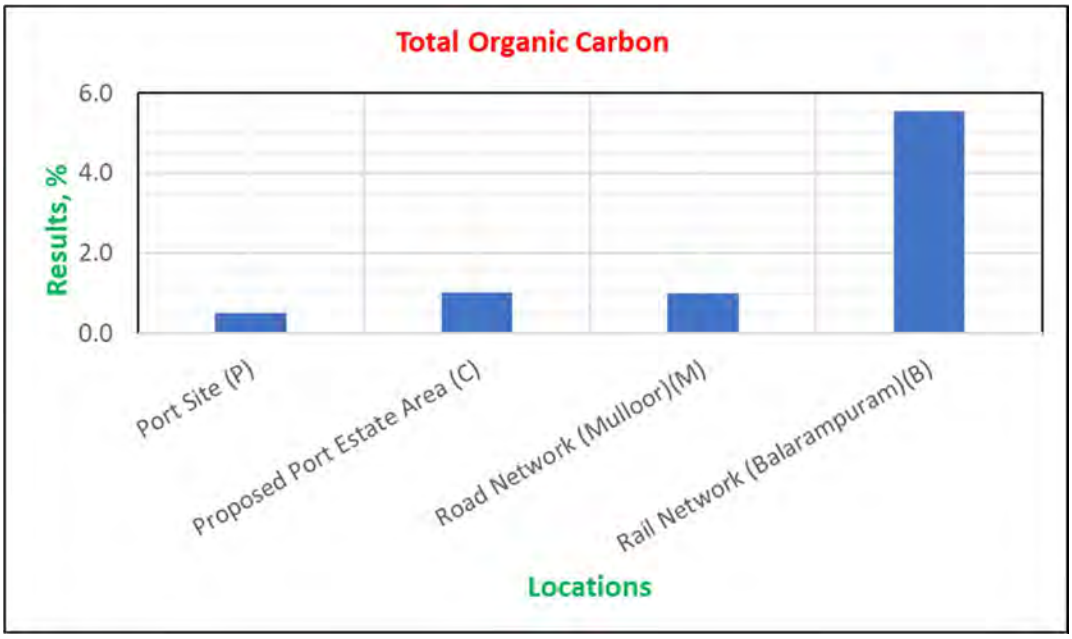


Figure 7.11: Soil Analysis for Organic Matter

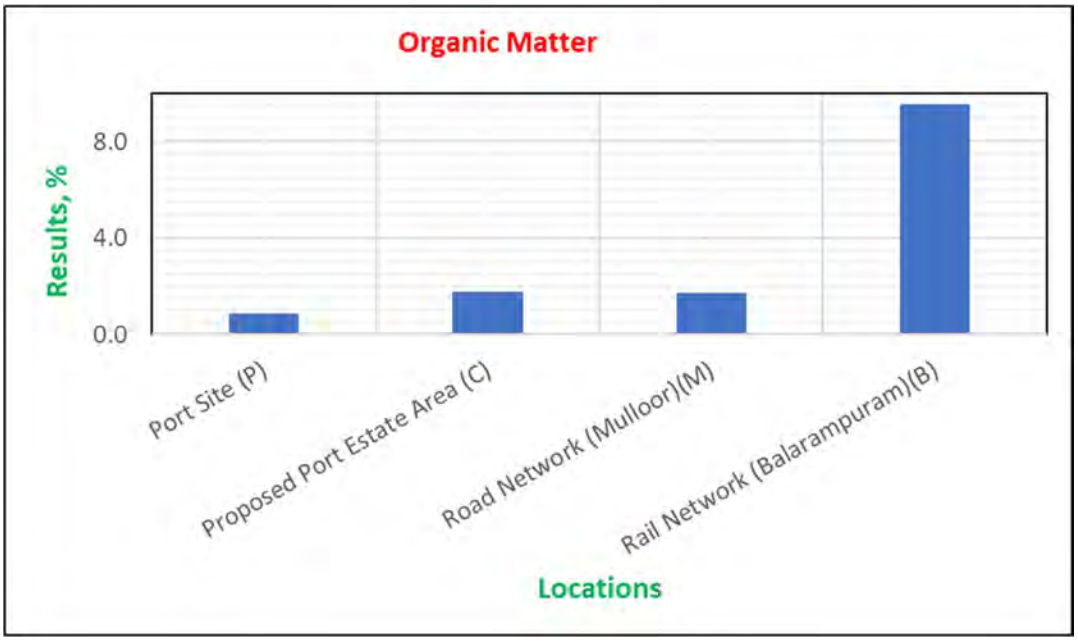


Figure 7.12: Soil Analysis for Available Sodium

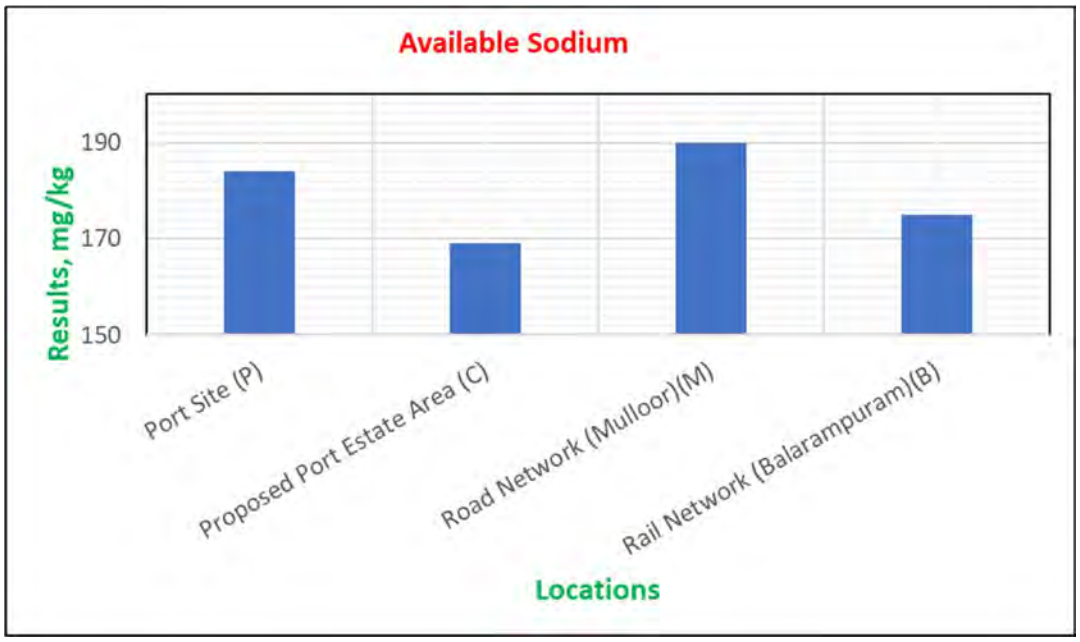
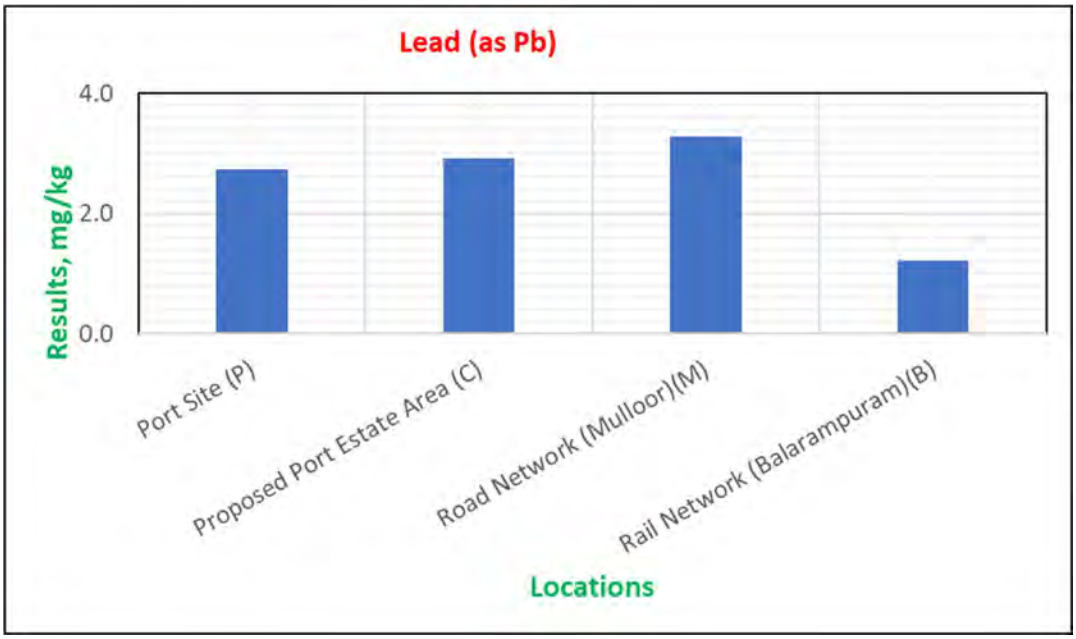


Figure 7.13: Soil Analysis for Lead (as Pb)



HYR-7.5. Summary of Soil Analysis:

- Texture was sandy loam at all locations
- Maximum value of Particle Size Distribution - Gravel observed was 3.81% at Along with Rail Network (Balarampuram)
- Maximum value of Particle Size Distribution - Sand observed was 71.64% at Port Site
- Maximum value of Particle Size Distribution - Silt observed was 21.38% at Along with Rail Network (Balarampuram)
- Maximum value of Particle Size Distribution - Clay observed was 17.15% at Proposed Port Estate Area
- Maximum value of pH (1:5 Suspension) observed was 7.05 at Proposed Port Estate Area
- Maximum value of Electrical Conductivity (1:5 Suspension at 25 °C) observed was 374 µS/cm at Proposed Port Estate Area
- Maximum value of Porosity observed was 51.0% at Along with Rail Network (Balarampuram)
- Maximum value of Infiltration (Void Ratio) observed was 6.82 at Port Site
- Maximum value of Total Kjeldhal Nitrogen (as TKN) observed was 4002 mg/kg at Along with Rail Network (Balarampuram)
- Maximum value of Available Phosphorus (as P) observed was 1246 mg/kg at Along with Rail Network (Balarampuram)
- Maximum value of Available Potassium (as K) observed was 41.9 mg/kg at Along with Rail Network (Balarampuram)
- Maximum value of Total Organic Carbon observed was 5.55% at Along with Rail Network (Balarampuram)
- Maximum value of Organic Matter observed was 9.57 % at Along with Rail Network (Balarampuram)
- Maximum value of Available Sodium observed was 190 mg/kg at Along with Rail Network (Mulloor)
- Maximum value of Lead (as Pb) observed was 3.27 mg/kg at Along with Rail Network (Mulloor)

End of Report

Annexure III

CSR Activities by AVPPL

(October 2021 to March 2022)

CSR REPORT VIZHINJAM

(OCTOBER 2021- MARCH 2022)

Adani Vizhinjam Port Pvt Ltd, 2nd Floor
Vipanchika Tower, Thycaud, Trivandrum-695014

CSR REPORT VIZHINJAM

(FOR THE PERIOD FROM OCTOBER 2021- MARCH -2022)

Amid COVID restrictions Adani Foundation has done many activities with strict COVID protocol in the following heads during the reporting period.

1. Education
2. Community Health
3. Sustainable Livelihood Development
4. Community Infrastructure Development
5. Others

1. Education

1.1. Literature Meet

a). Gandhi Jayanthi - 2nd October 2021

October 2nd Gandhi Jayanthi was celebrated as a day for promotion of Gandhian ideologies among children of Vizhinjam. A program namely 'Gandhi Darshan & Children' was organized at CSR office, Mukkola, Vizhinjam. Eminent Gandhian Shri. K. G Jagadeesan who was the former Secretary Kerala Gandhi Samraka Nidhi, Present Trustee central Gandhi Samaraka Nidhi New Delhi was the chief speaker of the day. A total of thirty children, teachers, poets, and men of literature were attended the function.

The Function Started with a prayer and offering of Floral Tributes to Gandhiji in the midst of Gandhian chant "Raghu Pathi Ragava…. "sung by Kumari. Sreya J Lal a popular child artist of Vizhinjam. This is followed by inaugural function presided over by CSR Southern Region Head Dr. Anil Balakrishnan followed by felicitation by Senior officers of CSR.

The Theme of the day was presented in lucid language by K.G. Jagadeesan. He talked at length regarding the life and experience of Mahatma Ji and the role he played to motivate children of all ages. The program ended with a chant "Vaishnava Janatho …." Which added and ambiance of devotion and respect to our father of nation. The meet also decided to start a 'Gandhiyan

Forum' as a subunit of regular literature meet with the help of Gandhi Smaraka Nidhi.

b). Session on "Kaviya Sallapam – Hindi Poems and poets" – A pleasant interaction of Poetry (23rd October 2021)

Another literature meet **"Kavya Sallapam"** in Hindi was organized on 23rd October 2021 for literature students. The program was arranged in association with Kerala Hindi Prachar Sabha Trivandrum Unit. Shri. Gopakuamr president, Kerala Hindi Prachar Sabha handled the classes on 'Hindi Poems, Hindi Literature & knowledge regarding courses managed by Kerala Hindi Prachar Sabha'.

The program started with an introduction by program manager Shri. Sebastian Britto followed by brief address by Teachers of Various Schools on Hindi Literature and its importance for children.

During the session shri. Gopakumar detailed about the Various poetic scope in Hindi Literature including the Doha's of Kabir Das which need to be compulsory learn and the themes to be practiced by children in their lifetime. The session was attended by 65 students in and around Vizhinjam

c). Exposure Visit and get-together - Exposure Visit to Art and Craft Village

As part of the monthly poets and men of Literature meet a visit cum craft training session was organized for the literature meet students at Kerala Arts & Craft Village, Vellar, Thiruvananthapuram on 11th December 2021. The visit cum training was participated by 23 students & 8 staff members. The officials of the Art Village explain various art forms exhibited in the village and provided a training session in dry flower making. The craft village is a unique point were craft items all over Kerala were exhibited for sale as well

as for training purpose. The whole craft village is spread over 8.5 acres of land owned by Govt. of Kerala and operated by Uralungal Society. The visit has culminated with a culture program of children. Sreya J Lal, one of the literatures meet participant from Venganoor had sung various songs with extra ordinary brilliance and as noted by various officials who had attended the occasion. The program ended by 4.30 pm and all the literature students were asked to submit the report of the day through WhatsApp group on literature.

d). Literature Magazine

A collection of the creatives of literature meet participants were collated and designed as a publication named "Salabhangal- Butterflies". The Final proof reading and designs were completed. Progressing the Techno-commercial procedures to print the same during the period.

e). Christmas/New Year Celebration

Christmas/New year celebration was conducted at CV Smaraka Grandhasala on 31-12-2021. All literature students participated in the event. The events started with the address of program manager on the importance of

Christmas and its impact on life all the human beings. The programme was included with Cake cutting, cultural programmes of participants and Christmas/New year wishes by poets and men of literature.

1.2. Distribution of Digital Device to Community Students

As the entire education system of Kerala switched to virtual system, many poor students who do not have access to television, phone or internet left out of the system. Adani Foundation came forward and started to distribute digital devices to the community students to attend the virtual sessions and had provided 194 tablets during last month.

During the reporting period Adani Foundation provided 50 digital devices to the poor community students in Kottappuram ward. Ward counsellor, Mr. Paniyadima was inaugurated the programme. Representatives of various Residents Associations in Kottappuram ward were also participated in the programme. The students and their parents acknowledge the helping hand of Adani Foundation.

1.3. Topper.Com – Education Support Programme

Adani Foundation is in the process of collaborating with "toppr.com", which has customized content for board curriculum, competitive, entrance and scholarship examinations - JEE, NEET, CLAT, NDA, NTSE, NSO, IMO, KVPY and so on for the school students. This facility will be made available **free of cost** to the students of Adani Vidya Mandirs as well as to the eligible students recommended by unit CSR teams. The content is available for classes 7 to 12 except commerce stream. The advance pack that they offer to Adani Foundation include videos, concepts, exercises, questions search, **dedicated mentors/councilors**, unlimited practice sessions, test preparation and Ask Doubts 24x7.

As part of the programme AVPPL/AF provided a list of 249 students from Vizhinjam with the following prescribed eligibility

1. The students from **English Medium Schools** having English textbooks for their major subjects.
2. Students have at least **one smartphone/tablet/laptop/desktop** at home with an **internet/data connection.**
3. The students from a low-income group, where family income is equal to/less than **3 Lakhs** per annum.
4. Students from the grades **7th to 12th** (For 11th and 12th grades - Science only)

This initiative will help our students to have clarity on the subjects that are taught, to correct pandemic / online induced learning gaps and to get set for the entrance exams of their choice.

To orient the modality of the toppr.com, a webinar was conducted on 11th October 2021, participated all the concerned teachers and Coordinators from Vizhinjam. Further to that a discussion was also conducted at St. Mary's School, Vizhinjam on 25th October 2021 to reinforce the effective use of the platform. Fr. Micheal Thomas, Local Manager, and the Vicar of the Vizhinjam Parish presided over the discussion. AF representatives and the in-charge

teachers were actively participated in the discussion. It was decided to form a WhatsApp group of all the teachers and students to monitor the effectives of the programme.

All the students have been using the application. This will help the students to compete with mainstream students.

1.4. Teachers Empowerment Programme:

As the COVID pandemic getting control, Govt. of Kerala ordered to reopen the schools from 1st November 2021. To cop up with the situation, St. Mary's Higher Secondary School requested Adani Foundation to support the scheduled Teachers Empowerment Programme. Adani Foundation Team trained the teachers on 26th October 2021, participated by 46 teachers. All the possible post COVID situations faced by the teachers, School and students were discussed in the programme. An action plan was also prepared for the school for the rest of the academic year.

1.5. Aakash/Adani Foundation – Entrance coaching Support Programme (ANTHE)

As part of the national initiative of Adani Foundation in collaborating with "Aakash- India's Best entrance coaching institute to train poor fishing community students, AVPPL/AF provided a list of 141 students from

Vizhinjam. The students will be selected for two yearlong training after a qualifying selection test. Aakash is India's best coaching institute for NEET (UG), IIT, JEE main, JEE advance and many other competitive examinations. The two yearlong training will equip many fishing community students to achieve their goals.

Orientation sessions were also organized to familiarize the modalities of the selection test for the students of St. Mary's HSS, VP HSS Venganoor, HSS for girls Venganoor, Govt. HSS Kottukal, Pallithura HSS and Govt. V& HSS Manacud various school during the period.

The selection test - Aakash National Talent Hunt Exam (ANTHE 2021) was done on 15th December 2021 and the result was published on 2nd January 2022. The list of the selected students are as follows

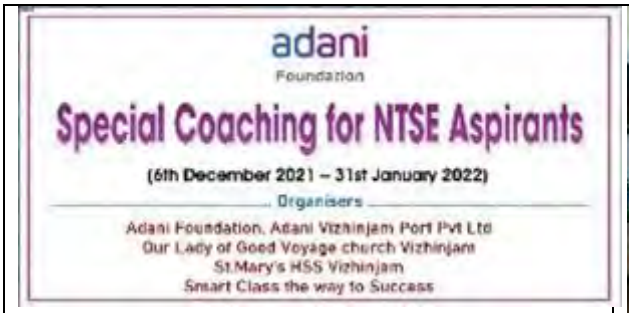
Sl No	School Name	Participants	Qualified	Not Qualified
1	Govt. Vocational HSS Kottukal	20	19	1
2	HSS For Girls Venganoor	34	33	1
3	Govt. V & HSS Manacaud	1	1	0
4	Rosamystica HSS Mukkola	01	01	0
5	Govt. HSS, Pallithura	33	30	3
6	St. Mary's HSS Vizhinjam	49	49	0
7	SFS senior Secondary School Vizhinjam	01	01	0
8	VPS HSS Venganoor	02	02	0
Total		**141**	**136**	**5**

These 136 students can be onboard for two year's training by the end of April 2022.

1.6. Special Coaching Support for NTSE Aspirants 2021-22

Every year some selected students appears for NTSE from St. Mary's HSS, Vizhinjam but couldn't qualifying the second round of examination. This year the school selected 12 students for appearing the examination and requested AF support for providing special coaching. AF entrusted a special team – SMART CLASS –the way Success for providing the training. The inauguration of the programme was held on 6th December 2021. The programme was inaugurated by Mr. Paniyadima, Ward Councillor and blessed by Rev. Dr. Micheal Thomas, Vicar Vizhinjam Parish and Manager St. Mary's School. The programme was presided over by the Mr. Yesudasan, PTA president, St. Mary's School.

The school also selected 13 students from 9th class for the training session, for them the training will be a base for the next year examination. The intensive coaching programme is conducting for 2 hours every day before or after the usual school classes. The programme will be continued till the end of January 2022 as the NTSE is scheduled on 31st January 2022, but due to the wide spread of COVID cases the examination postponed by the government. A format was prepared to gather the information and feedback of the programme



1.7. Support for Students Police Cadet units

During the period state Government sanctioned Student Police Cadet (SPC) units to three schools in Vizhinjam, St. Mary's Higher Secondary School, VPHSS Venganoor and HSS for girls Venganoor. The Student Police Cadet Project is a school-based youth development initiative that trains high school students to evolve as future leaders of a democratic society by inculcating within them respect for the law, discipline, civic sense, empathy for vulnerable sections of society and resistance to social evils. The project also enables youth to explore and develop their innate capabilities, thereby empowering them to resist the growth of negative tendencies such as social intolerance, substance abuse, deviant behavior, and anti-establishment violence. Equally, it strengthens within them commitment towards their family, the community, and the environment.

A governing body must be constituted at each school level for the functioning of SPC. Representative from Adani Foundation has been coopted one of the governing body members in all the three schools. The inaugurations of the SPC units were conducted in all the schools during the period. Adv. M. Vincent, MLA for Kovalam constituency inaugurated the SPC in all the three schools. Adani Foundation was one of the special invitees for the programme.

Support was also provided under the CSR of AVPPL/AF to conduct 2 days Christmas vacation camps for SPC cadets in St. Mary's School and HSS for girls Venganoor by providing Resource Persons for training sessions food, refreshments for cadets.

1.8. Intensive Exam preparation programme (Evening Class) at Kottappuram

AVPP-AF under its CSR conducted Evening school for the students of fishing community at Kottappuram St. Mary's School for the last two years and it was a great success. This helped the fishing community students to stay-back in the schools and prepare for SSLC and Plus two exams, leading

to better results.

As requested by church authorities and the PTA of St. Mary's Higher Secondary School, Vizhinjam Adani Foundation has been initiated "Evening School" programme this year also. This has been conducting by understanding their backwardness in education due to broken families, poor facilities in their house/huts, alcoholic parents, and other socio-economic backwardness. The programme is going on at 3 locations namely St. Mary's Higher Secondary School, Vizhinjam, St. Alphonsa Shrine, Thulavila and Ursuline Primary School, Kottappuram under the leadership of Vizhinjam Parish. Teachers Forum under the Education Ministry of Vizhinjam Parish, PTA Committee and Adani Foundation are monitoring the programme. 5 special teachers for SSLC students and 3 for plus two students are deputed as mentor teachers from Teachers Forum. The classes have been conducting on every day 6 pm to 9 pm at three locations. Special classes are organizing on difficult subjects like English, Maths, chemistry, and Physics.

A total of 105 students including 74 SSLC and 31 Plus two have been benefiting the programme. Refreshments are also providing for the students as part of the programme.

2. COMMUNITY HEALTH

Following are the major activities conducted under Community Health.

1. Service of Mobile Health Care Unit (MHCU)
2. SuPoshan
3. Kitchen Garden - Safe to Eat Vegetables for All Homes (SEVAH)
4. Farm School
5. Cancer Care Support
6. Community Awareness Programme
7. Patient care support programme
8. Convergence of Govt. Schemes
9. Cleaning Campaign
10. E-Sharm Registration for Community People
11. International Women's Day celebration 2022

2.1. Service of Mobile Health Care Unit (MHCU)

Summary

- During the period from Oct 2021 to March 2022, the Vizhinjam MHU has visited 10 sites weekly and has provided 10165 treatments out of which 2611 were male and 7554 were female.
- Total 1179 New registrations were marked during the period
- 168 home visits were done during the period for supporting the bedridden patients.
- 646 gluco tests were done and 288 positive cases were identified
- In addition to the general health checkups, done 6 special medical camps during the period
- 11 community awareness programmes were also conducted during the period
- 3175 face masks and 60 immunity hygiene kits were distributed to the community people as part of the Jeevan Sureksha mask campaign and COVID mitigation measures.
- Assistance was provided to CHC, Vizhinjam for administering palliative COVID vaccination drive

Detailed Report

Month wise patient break-up for the period from October 2021 to March 2022

SN	Month	Male	Female	Total
1	Oct	497	1227	1724
2	Nov	568	1439	2007
3	Dec	439	1457	1896
4	Jan	360	1080	1440
5	Feb	352	1074	1426
6	March	395	1277	1672
Total		**2611**	**7554**	**10165**

Month wise details of Gluco tests during the period from October 2021 to March 2022

Month	Total Tests			Total Positive cases of Blood Sugar		
	Male	Female	Total	Male	Female	Total
Oct	82	142	224	33	83	116
Nov	49	89	138	18	41	59
Dec	14	22	36	6	11	17
Jan	16	20	36	6	9	15
Feb	19	38	57	7	23	30
March	45	110	155	15	36	51
Total	**225**	**421**	**646**	**85**	**203**	**288**

Case study - 1

MACREETHAMMA, Aged 82, FEMALE

PALLITHURA HARBOUR VIZHINJAM P O

This is Macreethamma, 82 years old and she is from Pallithura Vizhinjam village, Macreethamma is having medicines for the Blood pressure and diabetes. She is staying with the last daughter, she has six children, and all have got married and she is with the last daughter family, her husband passed away before four years. Her last daughter has two children, and they are studying, and husband of her daughter is going for fishing. Macreethamma is taking all her expenses through the income of the widow pension.

Macreethamma is very strong and hardworking lady, she was going for selling fish in the market and she was taking care of the children very well, now her health is not well, but he loves doing all the work, sometimes Macreethamma cooks food at home when her daughter is sick.

And she was not having any idea of Diabetes and blood sugar, When Helpageindia organized a lifestyle decease general health camp at Pallithura, she was force to attend the camp and when she checked her sugar it was high and also the blood pressure, and doctor gave an awareness of it and by understanding she regularly started medicine, and now she is having a control on it and she regularly come and check her BP and sugar and get her medicines, and once she told the Doctor that since you come here and treat us we are here alive still otherwise the disease has taken out all from the world. And she received her COVID vaccinations, and she is very much happy for the services that we are doing.

Case study - 2

FRANCIS XAVIER

Age: 58 Male

Karayadivilla colony Kottappuram Vizhinjam Trivandrum Kerala

Francis Xavier 58 years old, a bedridden due to stroke is staying at Karayadivilla colony Vizhinjam in Harbour ward, Trivandrum. His colony is consisting of many houses together congested and the families staying there depend on fishing for the livelihood. He and his wife stayed with two daughters they both are married and living in the same house. His wife is a home maker.

On 2018 November 28th when the disaster cyclone okhi took place Francis was at sea for fishing, and after the cyclone only Francis was back to home after three days of being at sea without food and water, three co-fishing workers dead body also was not found till now, And when Francis was back from the sea he had stroke too and hospitalized for many days and could not recover from the stroke his right side half body paralyzed and now he is bedridden.

Before he was not having his own house and from the government, he got a scheme and with that he took a loan also for making the house but unlucky now he is not able to repay the loan and his house is under recovery notice from the bank, and his wife has requested the MLA for some help and still now not have received any help, Francis heaving the tension of this mainly.

And he is trying his level best to get up himself and be back like old days to repay his debts, Doctor has asked him to do the physiotherapy but due to the lack of money for the traveling and its very risk to carry him from his house to the main road because there is no proper way for his house also.

The family has also requested the Fisheries Minister Saji Cherian for some help but still not received any reply form him also. Very tough for the family to go on, we have decided to visit him once in a month and to do the needful.

Regular MHU activities	
Medical Consulting	Dispencing the medicine to the beneficiaries

collecting the medicines	Beneficiaries waiting toconsult doctor
BP Checkup	Gluco tests being done

OP Registration	

Home visit being done	BP checking at home visits

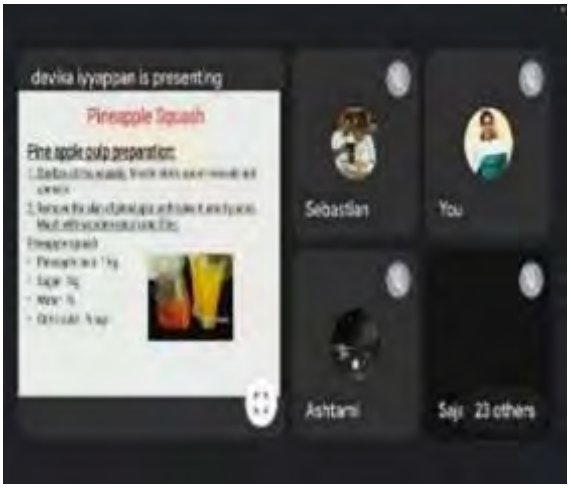
Awareness session on Cancer	Awareness session on Diabetes hypertension
Hygiene kits	Distributing hygiene kits by Dr. Anil Bala Krishnan Group head Adani CSR

2.2. SUPOSHAN (SDG No.2 and SDG No4)

SuPoshan is the health care initiative of Adani Foundation aimed to curb malnutrition and anemia among children below 5 years of age and women in reproductive age. After the wind, up process of SuPoshan activities in Vizhinjam for 3 years it is extended the SuPoshan project to Adimalathura in Kottukal Panchayat as the second phase of Vizhinjam international seaport expansion is progressing to that area. During the reporting period, following were the major activities

World Food Day

As part of World Food Day, organized a webinar on "Food Processing and preservation techniques" on 15th October 2021. The class was led by Dr. Devika, Subject Matter Specialist, Home Science, Mitraniketan, KVK-ICAR, Vellanad, Thiruvanathapuram. The class threw light on various food processing techniques which can be used in the households. Also shared recipes from organic fruits available at our households and their preservation ways. Trainer also shared the livelihood ideas and initiation from the food preservation and techniques. The total participation were 32 members from fishermen community. Also visited Food fest organized by ICDS department at Govt. L P School, Vizhinjam in accordance with the celebration of ICDS 46th years anniversary.



Global Hand Washing Day

As part of Global Handwashing Day on 16th October 2021 organized hand washing demo by the community volunteers. Hand washing demo was organized among adolescent children from Venganoor, Harbour and Kottapuram wards. The community volunteers also gave awareness class on the importance of hand wash especially in the COVID pandemic period, how hand wash affects our healthy lifestyle, and practicing hand wash and promotion in the community and family level.

Nutrition Kit Distribution

As part of National Nutrition Month, with the support of Employee Volunteer Program nutrition kits has been distributed to underweight children in September month. The second turn of nutrition kit was given 10 underweight children of Harbour, Mullor, Vizhinjam and Venganoor wards. The kit was useful for the kids as they were planned up by a Nutrionist. All the parents took their initiatives in cooking variety of recipes with the items in nutrition kit. Parents prepared dishes according to the webinar they attended on the right usage of the items in Poshan kit distributed to underweight children in September month. The session was handled by Mrs. Vichithra V T, Clinical Nutritionist, ICDS Project, and Athiyannoor and class was beneficial as its promo toted the Healthy eating habits, benefits of healthy eating, Variety of nutritious food, balanced diet, rainbow food, My plate – children's edition.

Parents prepared dishes according to the webinar they attended on the right usage of the items in Poshan kit distributed to underweight children in September month. The three-month distribution of nutrition kit ends by November month. 1 SAM Children turned to MAM, 3 Severe underweight children turned to Moderate underweight children, 1 Moderate Underweight child turned to healthy, 2 Moderate acute malnourished turned to healthy, 2 MUW children and 1 MAM stays MAM and MUW as they suffered from fever. Following table shows the transition of children

Name of child	Ward	Gender	Age	September Month Measurements				October Month Measurements				November Month Measurements			
				Height	Weight	MUAC	Category	Height	Weight	MUAC	Category	Height	Weight	MUAC	Category
Adhil	Vengaloor	M	2 y 4 m	84	8.7	12	MAM	86	9.4	12.2	MAM	87	13	12.7	Healthy
Devathmika	Vengaloor	F	1 y 9 m	71	7	12	MAM	72	7.1	12.1	MAM	72.8	8	12.4	MAM
Vismay	Mullor	M	2 y 9 m	96	10	12.5	MAM	96	11	12.8	MAM	96	11.5	13	Healthy
Afsa Fathima	Harbour	F	2 y 10 m	90.2	10.6	14.5	MUW	90.2	10.5	14.1	MUW	91	11	14.6	MUW
Vaishnav	Vengaloor	M	2 y 6 m	88.6	11.2	13.8	MUW	88.6	12	14	MUW	88.9	13	14.5	Healthy
Nahda	Harbour	F	1 y 4 m	69	7	13.5	SUW	69	7.5	14.4	SUW	69.5	8	17	MUW
Furkhan	Harbour	M	3 y	82	10	14	SUW	85	11	14.1	SUW	86	10	15	MUW
Mufeeda	Harbour	F	1 y 9 m	78	8	13	SUW	78	10	13.1	SUW	80	11	15	MUW
Murshida	Harbour	F	6 m	56	5	12.5	MAM	56	7	12.9	MAM	58.5	8.5	14	MUW
Thajunizha	Vizhinjam	F	1 y 1 m	63	6	11.5	SAM	67	6.5	11.6	MAM	66.8	7	12	MAM

Kitchen Garden Training

Adani Foundation is on mission of setting pesticide free organic vegetable garden in all households of Vizhinjam. As the first phase, done kitchen garden in 260 households and second phase it extended to 500 households. On 08-12-2021 conducted technical training kitchen garden for 5 Anganwadi workers in setting up Kitchen Garden in Anganwadis. The training was conducted by Mr. Rakesh, Senior project Officer. The session was on the importance of kitchen garden, items and working pattern of Kitchen Garden Kit. The kit was also distributed on the day for the preparatory work before sapling reach the center. After the technical training on kitchen garden for 5 Anganwadi workers in setting up Kitchen Garden

in Anganwadis. All the teachers took their initiatives in setting the kitchen garden and started harvesting the vegetables. This would help the children consume pesticide free vegetables and grow healthy.

SuPoshan Calendars

In this reporting period, had a meeting and greeting with Mrs. Kavitha Rani, newly appointed District Programme Officer (ICDS), Trivandrum, Department of Women & Child Development, Government of Kerala and given SuPoshan New Year Plantable Calendar. The meeting was fruitful as ASO elaborated the activities of SuPoshan in Vizhinjam area. The officer was interested in knowing about SuPoshan and the link of Anganwadi workers and ICDS Supervisors to SuPoshan Project. The department lend their support and guidance to SuPoshan. ASO also met Mr. Rajesh Jha Sir, CEO & MD, Adani Vizhinjam Port Private Limited and given SuPoshan Calendar.

Health Awareness to SPC Cadets

Student Police Cadet project has started in nearby schools of Vizhinjam Project this year. On 29-12-2021 a training session was conducted for Special Police Cadet students on Adolescent Problems. The session was handled by Mrs. Reshmi S, Deputy District Education Media Officer, District Medical Office, Trivandrum. The session was mainly on health that include nutrition, role of My Plate, Intake of Nutrient rich foods, healthy lifestyle that include importance of physical activity and healthy living practice, Mental Health that include good mental health and situation in life, and Human Body and Sexuality that include removing miss concepts related to sexuality and attaining good and accurate knowledge on the same. Also thrown light on puberty stage of both boys and girls. The session was very effective as it included all the phases and problems in the adolescent period.

Extension of SuPoshan Project to Kottukal Gram Panchayat

Orientation Meeting for Community Volunteers

As part of extension of SuPoshan Project to Kottukal Panchayath, conducted Orientation Meeting for Community Volunteers on 05-11-2021 at Community Hall, Punnakulam, Kottukal Panchayath. The program was successful as there were 44 volunteers attended the orientation. The day started off with an inaugural session by Mr. Jerome Das, President Kottukal Garam Panchayath, Introductory speech by Dr. Anil Balakrishnan, Southern CSR Head, Adani Foundation, felicitations by Mr. Rakesh R S, Senior Project Officer, Adani Foundation and Mrs. Geetha, Ward Member, Office Ward, Kottukal Panchayath.

The first session was handled by Mr. George Zen P T, Livelihood Coordinator, Adani Foundation. The session covered details on CSR Activity of Adani Vizhinjam Port Private Limited. Second session was handled by Mr. Vinod, Liaoning Officer on Role of a Community Volunteer in Disaster Management. Mr. Anurag, Centre Head, Adani Skill Development Centre, Ms. Meera Mariyam, SuPoshan Officer and Mrs. Maya G, Community health briefed the activities and programs of Adani Skill Development Centre, SuPoshan and Community Health respectively.

Afternoon, the participants were divided into four groups for discussion and given the topics for discussion on Health, Education, Employment and Waste Management and how improvement can be made in the areas of Kottukal Panchayath. Each group discussed and presented their ideas. Mr. Sebastian Britto, Senior Program Manager was the moderator for the presentation and concluded the findings and points.

The findings were divided in two immediate and long-term interventions. These findings were documented and submitted to the panchayat officials. As per the need from Panchayath, it was decided to implement SuPoshan program, digital literacy program, community awareness programmes and livelihood initiatives of Adani Foundation on immediate basis.

Selection of SuPoshan Sanginis

Based on the assessment conducted by the AF team during the training, segregated the list of volunteers into proposed SuPoshan sanginis, Digital Literacy Resource Persons, Community volunteers and livelihood team. The assessment

was done according to the participation, educational background and interest, scoring was also done accordingly for each volunteer. Also collected feedback from community volunteers regarding the orientation program. As per the scoring, finalized 12 community health volunteers as Sanginis for SuPoshan program in 32 anganwadis of Kottukal Panchayath. On 13-11-2021 conducted a meeting for finalized 12 Health Volunteers at Chinnanvila Colony Anganwadi, Punnakulam. The session was handled by Mr. Sebastian Britto on briefing about SuPoshan program. After that ASO had face to face interaction with health volunteers on the pattern of work, duties and honorarium of SuPoshan Sanginis. Finally, 10 sanginis were selected for SuPoshan program at Kottukal Panchayath.

Training for SuPoshan Sanginis

As part of extension of SuPoshan Project to Kottukal Panchayath, scheduled trainings for selected sanginis each week. The first training was conducted on 09-12-2021 at Chinnanvila Colony Anganwadi, Punnakulam. The first session in the training was handled by Ms. Meera Mariyam on briefing about SuPoshan program. The session also gave light on 10 effective interventions to reduce malnutrition. The ways include infant and child feeding practices such as initiation of breastfeeding within one hour of birth, exclusive breastfeeding during first six months, timely introduction of completely foods at six months, age- appropriate foods for children from six months to two years, access to health services and healthy environment such as immunization and bi-annual vitamin A supplementation with de-worming, appropriate feeding for children during and after illness, therapeutic feeding for children with severe acute malnutrition in facility and community, Improve access to safe drinking water and sanitation commodities, Care for adolescents and women before and after pregnancy such as preventing pregnancies too-early too- many and too soon, adequate food, nutrition and support for women(before, during and after pregnancy). The second session was handled by Mrs. Anandalekshmi, Anganwadi Worker of Centre No. 52, Chinnanvila Colony, Punnakulam gave insight on the history of Anganwadi in Kerala, Aims of Anganwadi, Details on beneficiaries, registration of pregnant women, details of Take-home ration and the duties done by each anganwadi

centers. The training ended with clearing queries and questions on both the sessions.

The second training was conducted on 17-12-2021 at Centre No. 59, Adimalathura Anganwadi. The session was Handled by Mr. George Zen, Livelihood Coordinator, Adani Foundation. The session was on Participatory Rural Approach that threw light on to incorporate the knowledge and opinion of rural people in panchayat in planning and management of development projects and program. The session also gave idea of working together a s a team, dimensions of participation such as planning, implementation, monitoring and evaluation. Sanginis also under the role of a leader and qualities of being a leader in the community. The session concluded by revising the last week topic and notes.

Launch of SuPoshan

As part of extension of SuPoshan Project to Adimalathura, launched SuPoshan at Kottukal Panchayath on February 25th, 2022, at Community Hall, Punnakulam. Mr. George Zen, Livelihood Coordinator welcomed the gathering. The program was inaugurated by Mrs. Geetha, Vice President, Kottukal Gram Panchayath. Mrs. Kavitha Rani Ranjith, District Program Officer, ICDS Trivandrum. Presidential address was delivered by Mr. Sebastian Britto, Program Manager, Adani Foundation. ICDS Supervisor Mrs. Krishneednu, Ward members Mrs. Ambili, Mrs Sulochana, Mr. Rakesh, Senior Project Officer, Adani Foundation gave felicitations. The guest lends their full support to Adani Foundation on the implementation of Project. Sangini uniform, Bags, Stadiometer and Weighting Machine machines were distributed to the selected Sanginis. Anganwadi workers from 32 Anganwadi and newly selected 10 sangini participated in the program.

Training for SuPoshan Sanginis

On 25-02-2022, ASO conducted field level training for the selected sanginis of Kottukal Panchayath at Community Hall, Punnakulam. The session was on Household Survey to be started in February month on collecting demographic details. The session also handled how to take anthropometric survey, height, and weight of a child. The session also gave idea of working together as a team, field level activities and meeting anganwadi workers and the community in charge people.

Breakup of Community Engagement programs at Kottukal Gram Pancyat during the period

Sl.No	Programme	Number
1	Household visits	1103
2	Family based counseling	73
3	Anganwadi visits	92
4	Anthropometric Measurements	327
	Total	**1595**

Training on Growth Monitoring

SuPoshan Sanginis undergone training on growth monitoring on 17-03-2022.The training was led by Mrs. Vijithra V J, Nutritionist, ICDS, Athiyanoor Block. The training session was on Growth, Development, social and Adaptive Milestones, Stages in Human Growth and Development, Growth monitoring, Body Mass Index, Malnutrition and its Management, Stunting, Wasting and Anemia and its Management. The session also gave opportunity for sanginis to do demonstrations on Growth Monitoring by using stadiometer, Infant meter, Weighting machine and MUAC Tape. All the ten Sanigines were actively participated in the training

Poshan Pakhwada

POSHAN Abhiyaan endeavors to improve nutritional outcomes in a holistic manner. Behavioral change at individual and community level is an important component to achieve the desired goals of the Abhiyaan. In pursuance of this objective, Poshan Pakhwada is celebrated in convergence with all stakeholders during the month of March from 21st March 2022 to 4th April 2022. Vizhinjam site celebrated Poshan Pakhwada in the first week by monitoring growth for 0-5 years children by accessing Height, weight and MUAC. During the first week, SuPoshan Sanginis have done growth monitoring in 327 children and identified 3 Moderate Acute Malnourished children and 9 Underweight Children. Sanginis gave counselling and awareness to the parents on Healthy Eating Habits, using green leafy vegetables in children's food menu, Avoiding junk foods and proper growth monitoring. ASO gave awareness session at 2 Anganwadis in Vizhinjam on "Life Skill Education" for adolescent clubs.

SuPoshan - **International Women's Day**

Vizhinjam site celebrated International Women's Day on March 8, 2022, with this year's theme "Gender equality today for a sustainable tomorrow", which aims to recognize women who are working to build a more sustainable future. "Break The Bias" as this year's concept. which explains the values of their theme as, "A world free of bias, stereotypes, and discrimination. A world that is diverse, equitable, and inclusive. A world where difference is valued and celebrated." SuPoshan at Vizhinjam celebrated women's day by giving awareness session on "Gender Equality at Home. The session was taken by Mrs. Rashmi, Deputy District Media Officer, District Medical Office, Trivandrum. Adani Foundation distributed SuPoshan Tablets for 10 Sanginis for their SuPoshan activities at Kottukal Panchayath. Adani Foundation also gifted Sanginis a pair of bangles made by a women group from Rajasthan. After that the women enjoyed their day by playing games and activities.

2.3. Safe to Eat Vegetables for All Homes (SEVAH) - 1000 Household homestead vegetable garden-2020-21

The kitchen Garden initiative of AF progressing commendably with 760 households. After the successful implementation of Kitchen Garden in 260 households, implemented kitchen garden for 500 household during the period. 500 input kits received from Vegetable and Fruit Promotion Council of Kerala (VFPCK) distributed to 500 families. Along with 12500 planting materials were also distributed as follows

Planting materials distributed for 500 beneficiaries

Sl no	Plant item	Total saplings required
1	Bhindi	2000
2	Brinjal round	1000
3	Brinjal long	1000
4	Tomato	2000
5	Cluster beans	1500
6	Yard long Beans	1500
7	Cabbage	1000
8	Chilli long	2000
9	Capsicums	500
10	Cauliflower/beet root	500
	Total	**12500**

The input kit comprises of inputs like

Sl. No	Item	Qty
1	Grow Bags	25
2	Organic Manure	2 kg
3	Vermi Compost	2 kg
4	Coir pit Compost	1 kg
5	Bevaria (Bio Pesticide)	200 gm
6	Verticillium	200 gm
7	Psequdomonas	200 gm
8	Vam	100 gm
9	Neem Oil	100 ml

As targeted 500 homes were given with 12500 seedlings of various vegetable supplied by VFPCK as follows

.Items	No of plants per Beneficiary	Vegnaoor -20	Mariyan Nagar -21	Mulloor -60	Venganoor -65	Vayalinkara -29	Harbour & Vizhinjam-122	Kottappuram-76	Harbour -60	Mulloor -47	Total Plants
Bhindi	3	60	63	180	195	87	366	228	180	141	1500
Brinjal - long	3	60	63	180	195	87	366	228	180	141	1500
Salad Cucumber	3	60	63	180	195	87	366	228	180	141	1500
Tomato	3	60	63	180	195	87	366	228	180	141	1500
Cluster beans	3	60	63	180	195	87	366	228	180	141	1500
Yard long Beans	3	60	63	180	195	87	366	228	180	141	1500
Chilly - long	3	60	63	180	195	87	366	228	180	141	1500
Cauliflower	2	40	42	120	130	58	244	152	120	94	1000
Cabbage	2	40	42	120	130	58	244	152	120	94	1000
Total	**25**	**500**	**525**	**1500**	**1625**	**725**	**3050**	**1900**	**1500**	**1175**	**12500**

Field Management on Kitchen Garden

leaders were given training to monitor the growth as well as continuously manage collection of monthly savings and to record them in the monitoring sheet as well as savings passbook respectively. They have been monitoring the activities by continuous field visits and group meetings

The remarkable achievement of this phase is

Kitchen Garden @Non-Traditional Fishermen Hamlets

1. Vayalinkara a hamlet of fisherman community has implemented kitchen Garden in 28 homes. The peculiarity in the region is that this is a nontraditional agriculture zone. As 100% of the family members depending on sea for their income. The leadership quality shown by the coordinator is one of the reasons for the successful implementation in this region in particular.

2. The similar salient achievement is the implementation of kitchen Garden Kuzhipallam Kottappuram fishermen community Hamlet for 40 families and 24 families at Mariyan Nagar Kottappuram.

Inferences

- The total number of beneficiaries for the year 2022 is 500
- The Average production per ward being 4340 kg
- Per Capita Productivity equals 42.4 kg per month.
- Average rate of vegetables 7 items of reference is 47 Rs.
- The Per Capita savings being 1992.8 Rs per month.

Average Rate of Vegetable for the month of March 2022

Sl No	**Item**	**Rate Per/Month**
1	Brinjal Long	40 per Kg
2	Bindi	20 per kg
3	Chilli	60 per kg
4	Tomato	45 per kg
5	Cabbage	50 per kg
6	Cauliflower	65 per kg
7	Yard Long Beans	50 per kg
		330 / 7 = 47 Rs

Harvest Data for March 2022

Sl No	Ward	No of Beneficiaries	Total Yield this Month	Per Capita Yield	Average KG Rate	Total Amount Saved P/M
1	Venganoor	85	3400	40	47	1880
2	Kottappuram	126	7900	62	47	2914
3	Mulloor	107	4580	42	47	1974
4	Vizhinjam	122	3420	28	47	1316
5	Harbour	60	2400	40	47	1880
	Total	**500**	**21700/5=4340**	**212/5=42.4**		**9964/5 =1992.8 Rs**

2.4. Farm school

The farm school serves as a community school for agricultural learning. It is set in a majestic landscape with a bamboo house as training house and a lawn set in the shape of a leaf, symbolizing the solar energy receptor and plant food factory, thus ultimately the factory feeding humanity, and key oxygen producing organ for mother earth. Farm school has the functional specification of 1. Horticultural garden and honey production unit, Crop Museum (to house possible Crop Introduction for Vizhinjam), Vegetable and nutrition Garden, Vegetable nursery, Hi tech banana Farming.

Harvesting is in progress for all vegetables as follows during the period

Sl No	Item	Quantity (Kg)					
		Nov	Dec	Jan	Feb	March	Total
1	Clove Beans	10.35	12.00				22.35
2	Winged Beans	3.55	6.00	3.15			12.70
3	Cluster Beans	10.20	15.00	22.50	3.50	3.50	54.70
4	Chilli	9.25	15.00	2.45	3.50	3.35	33.55
5	Brinjal Long	1.00			12.75	0.75	14.50

6	Brinja					6.25	6.25
7	Chilli (Baji)	0.75					0.75
8	Yard Long Beans		20.00			1.00	21.00
9	Salad Cucumber		8.00	7.20	19.50	10.50	45.20
10	Groundnut		12.00				12.00
11	Sweet Potato		20.00	4.00			24.00
12	Bitter Guard			26.50			26.50
13	Long Beans			5.75	48.70		54.45
14	Snake Guard			20.30			20.30
15	Amaranths			2.00	2.00	15.80	19.80
16	Capsicum				0.75		0.75
17	Palak *cheera*				3.00	6.25	9.25
18	Arrowroot				7.50		7.50
19	Ladies Finger (Bindi)					38.25	38.25
20	Banana					49.50	49.50
21	Cabbage					6.25	6.25
22	Tapioca					34.00	34.00
23	Kaveri Banana					5.50	5.50
24	Popplu Banana					16.75	16.75
25	Cucumber					111.95	111.95
Total		**35.10**	**108.00**	**93.85**	**101.20**	**309.60**	**647.75**

Training

The training at farm school is in progress initiated through decentralized first phase orientation on various courses coming up at farm school. The courses being

1. Banana Grover and its value-added products
2. Tuber crop Grover and its value-added products
3. Kitchen Garden Establishment and subsequent maintance
4. Ornamental Garden & Landscaping implementation and maintance.

The orientation training is a first process of identification of interested beneficiary for coming up training classes at Farm School. During the period completed orientation training for 250 beneficiaries.

adani
Foundation
Training on
FARM SCHOOL

Sales counter and ornamental garden at Farm School

CSR of AVPPL has constructed an ecofriendly sales counter in front of farm school campus. This is mainly intended as an outlet for vegetables of farm school and other accessories sales of Viz Mart products & Services. At ornamental Garden the sitting place has been establish for the park uses sit and enjoy the aesthetic beauty of nature for a cup of Coffee or Tea.

Vegetable Cultivation Yard

The 30 cents of Vegetable cultivation yard are getting ready for cultivation during the period.

Extension to more area

The extension work on Farm School has been progressing in the front portion. A total of 70 cents of land were prepared for the purpose of

1. Ornamental Garden
2. Vegetable Garden
3. Fresh Water Fish
4. Myowaki Forest

Farm School on Dooradarshan Kerala

The activities of existing farm school were made into two episodes' program for telecasting @ Kirshidarshan program of DD Kerala. The First Episode has given importance for farm school training and upcoming field level activities including kitchen garden. The program was titled as "Thuramughathe Krishipadaganal ". All the ongoing activities of farm school were clearly mentioned in this program. Second episode was on role of Karmasena in fostering farm school as well as other activities of agricultural importance.

Fruit Orchard – Farm School-II @ Electrical Substation

The activities @ Farm school 2 – Substation site is in full swing completed all works relating to sourcing of water and related irrigation systems. The planting materials were arranged from various institutes of Agriculture repute.

A total of 200 fruit trees of various categories were planted. The planted fruit trees are of high-quality hybrids or graft materials with an early bearing quality. The items planted were as follows

Sl No	Items	Planted
1	Mango	20
2	Jack Fruit	20
3	Rambutan	20
4	Sapota	20

5	Jamun	20
6	Pomegranate	20
7	Nelli	20
8	Guava	20
9	Papaya	20
10	Pineapple	20

In addition to fruit plants an ornamental garden is setup in front in the middle of 7 feet tall palms like foxtail, royal, travelers etc. The add on landscaping work has given an aesthetic beauty to the existing fruit orchard.

2.5. Cancer Care Support - providing nutritious Food supplements & Medicines to the poor patients

The project area of Vizhinjam has a high incidence of cancer. More than 152 cases were reported during the year 2022 by Abhayam Charitable Society, among those 91 Cancer patients are in the critical stage of terminal illness. AVPPL/AF has been implementing a Cancer Care Programme which includes providing nutritious food supplements, medicines, urine bags, diapers, wheelchairs, water beds & walkers to the poor cancer patients, palliative care for the critical cancer patients, cancer awareness programmes & Cancer detection camps in association with regional Cancer Centre and follow-up support for referral patients from the camps

As part of providing nutritious food supplements, medicines, urine bags, diapers, wheelchairs, water beds & walkers to the poor cancer patients and

palliative care for the critical cancer patients, AVPPL/AF has been providing support to 21 critical Cancer patients during the period. This is in addition to regular house visits to the families of the suffering patients for consoling and for providing further mental strength. Free medicines and home-based palliative care with the support of Abhayam Charitable Society were also providing as part of the programme

Medicines procured for Cancer Care patients during the period

Sl No	**Medicine Name**	**Quantity (No's)**
1	Ivepred -4 mg	180
2	Resebron Plus-700 mg	360
3	Shelcal with Vitamin D3-500 mg	4360
4	Tamoxifen - 20 mg	520
5	Letero -2.5 mg	180
6	Creon-250 mg	180
7	Lenmid-10 mg	150
8	Tenvir-300 mg	450
9	Eltroxin 100 mg	200
10	Calcium D3	360
11	Temozolamide-200 mg	50
12	Lacosamide-200 mg	360
13	BioD3 Plus	180
14	Ezotol M	180
15	Gefitinib I P 250 mg	90

All the medicines procured as per the recommendation of Oncology Department of Regional Centre, Trivandrum. The medicines procured were handed over to Abhayam Charitable Society on 13.01.2022 for the distribution while providing home based palliative care.

Distribution of Diapers

Adani Foundation has handed over 6 packets of diapers to Abhayam Charitable Society for their cancer care activities, especially palliative care support. The material was handed over to Sr. Lucia, the in charge of Abhayam Charitable Society on 25.02.2022 at their office in community hall of Vizhinjam Parish

Adani foundation has handed over 2 packets of diapers & 4 boxes of Urine Bags to Abhayam Charitable Society for their cancer care activities, especially palliative care support. The material was handed over to Sr. Lucia of Abhayam Charitable Society on 08.03.2022.

Cancer Awareness Class

As a part of the community Health initiatives, a cancer awareness programme for community volunteers was organized in association with Regional Cancer Centre Trivandrum on 18.03.2022 at Adani Skill Development Centre Mukkola. The programme was inaugurated by the Program Manager Adani Foundation. Dr. Kalavathy, Associate Professor Community Oncology Department, RCC handled the awareness session, participated 75 community Volunteers. The training equipped the team on basics of early detection of all kinds of cancer aliment. The programme was aiming to support people to identify the early symptoms thus to take a decision regarding further consultation for Cancer Detection, which will be conduct on 25.03.2002.

Cancer Detection Camp

In continuation to the awareness programme, a cancer detection Camp was organized at the Parish Hall of Vizhinjam in association with Abhayam Charitable Society & Vizhinjam Parish on 25.03.2022. The camp was inaugurated by Rev. Dr. Michel Thomas, Parish Priest, Vizhinjam and the meeting was presided over by Mr. Paniyadima Ward councilor kottappuram. Dr. Anil Balakrishnan, Head CSR,

Southern Region felicitated the event. 112 people were screened, and 23 suspicious cases referred to Regional Cancer Centre, Trivandrum for further checkups. The cancer screening was headed by Dr. Jiji Thomas & Dr. Kalavathy, Community Oncology Department, Regional Cancer Centre, Trivandrum. The Follow-up treatment support for the identified patients has been ensured from Regional Cancer center, Trivandrum as part of the CSR activities. It was also discussed a program for screening support from RCC for all the people in the 5 wards with a special focus to Kottappuram, Vizhinjam & Harbour.

List of people referred for further checkups

sl No	Name	Age	Ward	Phone No	Test	Remark
1	Jyothi	49	Venganoor	9995927687	Mamogram	Appointment @ RCC
2	Arogyamma	42	Kottappuram	7510841434	Mamogram	Appointment @ RCC
3	Saritha	33	Mulloor	6238154093	Breast Ultrasound	Appointment @ RCC
4	Ambili	31	Mulloor	Nil	Breast Ultrasound	Appointment @ RCC
5	Ancy	29	Kottappuram	9778348659	Pap smear	Appointment @ RCC
6	Christy	36	Kottappuram	7558028863	Leukoplakia-Biopsy	Appointment @ RCC
7	Alex Mary	40	Kottappuram	9747203625	Pap smear	Appointment @ RCC
8	Asha Rani	36	Mulloor	8086583936	Pap smear	Appointment @ RCC
9	Deepa	33	Venganoor	9207879731	Pap smear	Appointment @ RCC
10	Praseetha	40	Vizhinjam	9778385845	Breast Ultrasound, Pap Smear	Appointment @ RCC
11	Treesa	47	Kottappuram	8089729150	Pap smear	Appointment @ RCC
12	Usha	48	Mulloor		Abdominal ultrasound	Appointment @ RCC

13	Liji Mol	44	Mulloor	7560809595	Breast Ultrasound	Appointment @ RCC
14	Kochuthresya	47	Kottappuram	9895981760	Pap smear	Appointment @ RCC
15	Saina	42	Mulloor	9400370075	Breast Ultrasound	Appointment @ RCC
16	Jyothi	35	Kottappuram	9539693261	Breast Ultrasound	After 3 months
17	Agnes	43	Kottappuram	9567188134	Leukoplakia Lower lip	(31-03-2021) RRC
18	Suni	38	Vizhinjam	8590040601	Abdominal ultrasound	Appointment @ RCC
19	Mariya Das	60	Kottappuram	9995290443	Leukoplakia-Biospsy	Take Tooth then after 2 weeks Biopsy
20	Vrinda	30	Mulloor	7907791022	Leukoplakia-Biospsy	Appointment @ RCC
21	Jasmine Rose	53	Vizhinjam	8330868430	lesion in scalp	Possible Melanoma
22	Vijaya	28	Kottappuram	9072867830	Nil	Appointment @ RCC
23	Elizabeth	54	Salvation Army	8714221415	Pap smear	Appointment @ RCC

2.6. Community Awareness Programme

As we are living with Covid19, to ensure community mobilization of all members of the community regarding. Culture of Cleanliness, Govt Schemes, Covid Awareness Classes, & Port Progress.AF has started the community awareness programme in Vizhinjam with strict COVID protocol. One of the volunteer's groups, promoted under the CSR of AVPPL/AF- Vanitha Karshika Karma Sena is coordinating the programme. Most of the members who are actively participating in the community awareness are from widow's category as part of our Widow's engagement programme. 36 community awareness programmes were conducted during the period on health, hygiene, and waste management in which 675 community people participated.

2.7. Patient care support programme

As part of the patient care support programme community volunteers and MHU medical team have been visiting the houses of bedridden patients and providing free checkups, medicines, and counselling support. Community volunteers have been monitoring the oxygen level also of the patients regularly. 48 house visits were done during the period

Wheelchair & Back Rest -Support

Mr. Ayyappan, 42 years old from Kanjikkaravilakthu Veedu Mullor Vizhinjam village, who is bedridden due to a sudden stroke which happens three years back. He is staying at a house along with his sister. They have two children. The wife left the husband alone and went away with their family. This is a big burden for the patient.

CSR Team conducted a house visit top this family in distress. Understanding their need, a wheelchair & Back Rest was provided. Now MHU is providing tablets as per the request and referred for further treatments.

Walker -Support

Mr. Rajayyan, 82 years old from Nellikunnu Thekkekizyakkarikathu Veedu Mullor Vizhinjam village, he is bedridden due to a sudden stroke which happens one Year back. He is staying at a house along with his wife, they have two children. Her wife Thankam 78 years old.

CSR Team conducted a house visit to this family in distress. Understanding their need, a walker was provided to Rajayyan. Now MHU is providing tablets as per the request and referred to palliative professional for his Physiotherapy & further treatments.

2.8. Convergence of Govt. Schemes

The convergence of Govt. Grant-in-aids schemes in CSR activities progressing well during the reporting period. Information regarding various schemes have been sharing through the WhatsApp groups named "Phoenix – for Widows and divorced" and 'Shalabhangal- Butterflies for children below 18yrs old. Information regarding Education Grants -Medical, Engineering Entrance Coaching & Civil Service Coaching, ASDC Courses, Samunnathi, Department of Collegiate Education Scholarship, Voters Portal Registration, Women & Child Development Projects, E-Sharm-Workers with less than 15 thousand salary to get benefits of "Ayushman Bharat Yojana", Mikavu-Education award For Fishermen Children, Pre-Metric Scholarship, Pre-Metric Education, Nursery School Grant, Higher Education scholarship project, Kerala State Housing Board- Grihasree Housing Scheme**,** KUFOS B-Tech –Food Technology Course, Ayyankali Memorial Talent Search and Development Project, Tutorial Grant, Boarding Grant, Kerosene Permit for fishermen outboard Engines, free drinking water connection for BPL families, short film competition on National Voter's Day, Subsidy scheme for Auto rickshaw, two-wheeler and small enterprises implemented by the Municipal Corporation of Thiruvananthapuram, Pension Mustering, Minority Welfare NTSE Coaching programme of , Kerala State Minorities Development Department, Finance Corporation Loan for individual beneficiaries for the financial aid to the marriage of their daughters, Professional Diploma course in Pharmacy, Health Inspector & Paramedical Courses, Bank loan scheme for Kerala Self-employment registered unemployed, Kerala study room scheme for SC, NORKA Roots Pravasi Scholarship

Scheme for children, Department of Women & Child Development Schemes, Ayyankali Urban Employment Scheme for Livestock, Courses conducted Adani Skill Development Centre and the job Fair for Youth with disabilities, Social Security Mission-Data Entry Operator, Kerala Academy for Skills Excellent-Job Fair, Rajya Sabha Recruitment 2022, Central Skill Development Ministry-Job Fair, ISRO-Summer Camp, Cancer Awareness Programme, and Cancer Detection Camp were provided during the period.

2.9. Clean Campaign

AVPPL/AF has been conducting community cleaning campaign in association with Trivandrum Municipal corporation and many other grass roots level organisations. One of the livelihood groups, promoted under the CSR of AVPPL/AF- Karsheeka Karma Sena is coordinating the campaign. Most of the members who are actively participating in the cleaning campaign are from widow's category as part of the Widow's engagement programme. During the period, Karma Sena cleaned Laksham Veedu Colony near CSR office,Vizhinjam, Vayalinkara, Karimpallikkara, Sea Food park area and Valiyakadappuram in Kottappuram ward Vizhinjam Police station area, Chappath, Karimpallikkara and Kanjiramvila Laksham Veedu colony area engaging 519 women-days

2.10. **E-Sharm Registration for Community People**

e-SHRAM portal has been developed for creating a National Database of Unorganized Workers, which is seeded with Aadhaar. It will have details of name, occupation, address, educational qualification, skill types and family details etc. for optimum realization of their employability and extend the benefits of the social security schemes to them. Any worker who is working in unorganized sector and aged between 16-59, is eligible to register on the eSHRAM portal e.g. migrant workers, gig workers, platform workers, agricultural workers, MGNREGA workers, Fishermen, Milkmen, ASHA workers, Anganwadi workers, Street Vendors, Domestic workers, Rickshaw pullers and other workers engaged in similar other occupations in the unorganized sector. It is the first-ever national database of Unorganized workers including migrant workers, construction workers, dig and platform workers, etc. AF team extended support to 21 community people to register the portal during the period

2.11. International Women's Day 2022

CSR of Adani Vizhinjam Port Private Limited has celebrated international women's day of year 2022 with full honors. The programme was organized with full admiration for this year's theme on **"Gender equality today for a sustainable tomorrow"** that recognizes and celebrates women and girls who highlights the issue of gender equal world, a world that has no room for bias, stereotypes, differences, and everyone is treated equally, celebrated, and valued.

A programme on this front was organized at CSR office Vizhinjam for women and students attached to Adani Foundation through various activities and programmes. The programme was inaugurated by Mr. Sushi Nair, Head, Corporate affairs, Adani vizhinjam Ports Private Ltd. Speaking on the occasion he spoke at length regarding the evolution of women's day theme and its relevance. This was followed by presentation on woman's day message by CSR programme manager, Mr. Sebastain

Britto. Addressing the audience, he emphasizes for gender equal homes and that International Women's Day is an occasion which and recognizes women's all-round achievement in cultural, political, and socioeconomic. Sr. Lucia Rtd. Govt. Nursing Superintendent by profession was honored on this occasion for her generous service among cancer patients of Vizhinjam. She had been awarded with a memento and a shall of respect from Head Corporate Affairs. This was followed by women day presentation by guest speaker of the day, Mrs. Reshmi, Deputy District Education Media Officer, Dist.: Medical Office Trivandrum on equality and mutual respect among genders on decision making, and health awareness among women.

This programme was followed by cultural and sports events for women. The event ended by 2.30 pm with a Kerala high feast served among all participants prepared by VIZ mart women's Canteen group.

3. SUSTAINABLE LIVELIHOOD DEVELOPMENT (SLD)

The projects under SLD included

1. Competitive Exam Preparation coaching programme
2. Digital Literacy Training programme – E learning
3. Skill Development Programme &
4. Livelihood Development Programme – Group and individual support

SUSTAINABLE LIVELIHOOD DEVELOPMENT (SLD)

3.1 "Coaching for success" – Competitive Exam Coaching Programme

Virtual Training Classes

Online training sessions along with daily mock test is going on with an average of 129 students' participation. Weekly mock test, timetable and study materials are shared through google drive link. A total of 630 students were accessed the E-learning platform developed for Competitive Exam Preparation in the previous year and same training strategy are following in this year also for the registered candidates.

E-Learning Activities

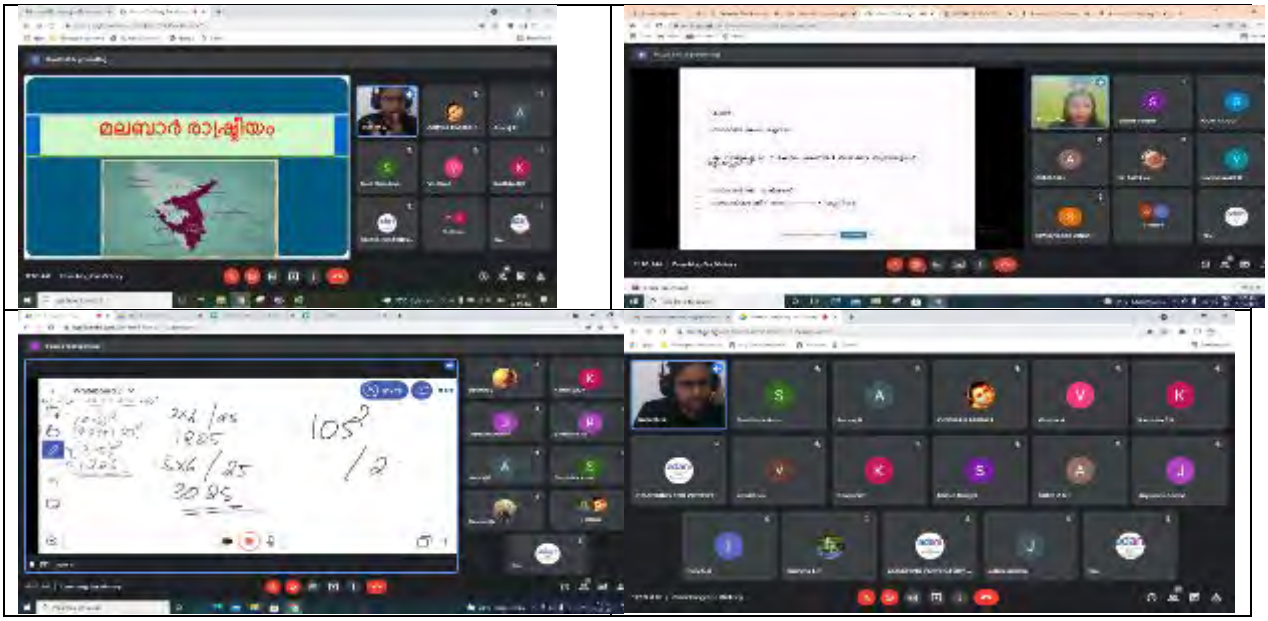
In addition to the virtual classes, other e-learning activities have been progressing simultaneously as follows.

- Study materials like Rank file pages, easy study methods from You Tube and voice clips related to the daily test topics links has been shared on a regular basis.
- Different vacancy announcements from Central and State government have also been circulating through online platform
- Necessary support has been provided for students, who are not having proper internet facility or devices for applying various job opportunities.
- Adani Foundation is providing G -SUITE ID for the registered students for online classes as well as for utilizing the resources in a more advanced method.
- Daily online test for a score of 30 has been conducting on a regular basis.
- After the successful completion of every day mock test the top scorers will be announced by the coordinator in the group.
- From this year onwards, a 100 marks mock test purely based on the previous question papers are conducted in regular weekends and the results will be announced through the groups.

Daily 2hr sessions through Google Meet virtual platform has been arranging with different tutors and regularly conducting mock test based on the announced topics. The training has been focusing on the following topics,

i. General English.
ii. Mathematics.
iii. Indian Constitution.
iv. Malayalam.
v. General Knowledge.

As a result of intensive coaching, 78 candidates passed in the Preliminary Examination for the 10^{th} & 12^{th} Level. 32 candidates were attended the Last Grade Servant main examination. 100 more students have attended various competitive exams and expecting results



3.2 Digital Literacy E-Learning Programme

The current year 2021-22, ASDC targeted 2000 beneficiaries and out of these 1900 beneficiaries completed the course through Learning Management System, a new online study platform developed by ASDC. The programme covers internet banking, social media, mobile banking, Digi locker, MS office, cyber security, barcode etc.... The programme helped in making the people to equip on online transactions, bill payments like KSEB, water bills, school fee payments and e-commerce activities during this pandemic restriction.

The Digital Literacy Batch beneficiaries installed many useful mobile applications like BHIM App, SAKSHAM App and Digi-Locker. All the 1900 beneficiaries completed the module wise assessment and downloaded E-Certificates from the LMS platform. Trainers conducted online sessions regularly and updated the module scores of each beneficiary in the SOP as part of effective monitoring.

3.3. SKILL DEVELOPMENT PROGRAMME

Employability Skilling Programmes

- During the reporting period the following courses were completed at the transit campus of ASDC/ASAP at Mukkola,

Sl. No.	Course Name	Eligibility	Duration	Certification	Venue of Classes	Participants
1	General Duty Assistant-GDA	10th	460 hrs	ASDC	ASDC Building, Mukkola	74
2	Beauty Therapist - BT	8th	390 hrs	ASDC	CSR Office, Mukkola	75
3	Data Entry Operator - DEO	10th	440 hrs	ASDC	ASDC Building, Mukkola	82
4	Retail Sales Associate – RSA	10th	320 hrs	ASDC	ASDC Building, Mukkola	63

5	Self Employed Tailor - SET	10th	340 hrs	ASDC	VizMart, Vizhinjam	38
5	**Total**					**332**

General Duty Assistant- GDA

Guest Sessions: in addition to the regular training sessions, ASDC has been providing Guest sessions to the trainees. Following sessions were given to the GDA batches

Sl.No	Date	Topic	Resource Person	Place
1	12.02.2022	Pill Management, Needle stick injury management, and infection control	Ms. Rejitha RS, Infection Control Nurse cum Supervisor of the Jubilee Memorial Hospita	Jubilee Memorial Hospital
2	21.02.2022	wound dressing and its methods	Ms. Lakshmi, in charge of surgical ward of Jubilee Memorial Hospital, Trivandrum	Jubilee Memorial Hospital
3	10.03.2002	Nursing Etiquettes	Sr. Saritta, Nursing Superintend of the Jubilee Memorial Hospital	Jubilee Memorial Hospital
4	12.03.2022	Geriatric Care	Ms. Sini Antony, Infection Control Nurse of Jubilee Memorial Hospital, Trivandrum	Jubilee Memorial Hospital
5	14.03.2022 & 15.03.2022	Employer Engagement Programme	officials from Season Two Senior Living Centre	Transit Campus, Mukkola

Placements: During the reporting period following GDA trainees were placed as follows

Sl. No	Name of the Trainee	Date of Interview	Job Role	Organization	Salary Package
1	Jincy	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
2	Anumol	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
3	Annie	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
4	Gilani	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
5	Jeena	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
6	Shery	28-10-2021	Patient Care Assistant	KIMS Hospital	8,000 – 11,000
7	Hashim M	06-11-2021	Patient Care Assistant	ASHA Home Care	16,000/-
8	Vincy V	10-11-2021	Hospitality	Ananthapuri Hospital	6,000/-
9	Rajimol R K	10-11-2021	Hospitality	Ananthapuri Hospital	5,000/-
10	Jincy D	10-11-2021	Hospitality	Ananthapuri Hospital	5,000/-
11	Ashtami V B	10-11-2021	Hospitality	Ananthapuri Hospital	5,000/-
12	Geena R	01-11-2021	Patient Care Assistant	KIMS Hospital	10,000/-
13	Gilani Gilbert	01-11-2021	Patient Care Assistant	KIMS Hospital	10,000/-
14	Jenis Jose	27-12-2021	Lab Assistant	SPARSH Medi Clinic	5,000/-
15	Rejitha V	27-12-2021	Hospitality	SPARSH Medi Clinic	6,000/-

On the Job Training for GDA batches have been conducting at Jubilee Memorial Hospital, Trivandrum.

Beauty Therapist

Guest sessions for Beauty Therapist trainees

Sl.No	Date	Topic	Resource Person	Place
1	22.10.2021	Self-Employment	Mrs. Sindhu Rajeev	Transit Campus, Mukkola
2	23.11.2021	New Methods and Techniques in Facial Procedure	Mrs. Sajini, Beauty Therapist	Transit Campus, Mukkola
3	28.01.2022	Facial and Make Up methods	Ms. Surabhi, Experienced Beautician Trainer	Transit Campus, Mukkola
4	22.02.2022	Hair Styling and its methods	Mr. Sharath, Technical Advisor, Matrix Cosmetics Company, Trivandrum	Transit Campus, Mukkola
5	21.03.2022	Tattoo Designing	Mr. Roshan, Tattoo Designing trainer, Trivandrum	Transit Campus, Mukkola

Placements details of Beauty Therapist Trainees during the period

Sl. No	Course Name	Name of Trainee	Job Role	Parlor Name	Salary
1	Beauty Therapist	Vaishali M A	Beauty Therapist	Wow, Trivandrum	4,000/-
2	Beauty Therapist	Sindhya C G	Beauty Therapist	Fairness, Trivandrum	6,000/-
3	Beauty Therapist	Saranya B	Beauty Therapist	Soniya, Trivandrum	4,000/-
4	Beauty Therapist	Sreenila S	Beauty Therapist	Kalypso, Trivandrum	4,000/-
5	Beauty Therapist	Alfina Maheen F	Beauty Therapist	Munnas, Trivandrum	4,000/-
6	Beauty Therapist	Bindhu P	Beauty Therapist	Munnas, Trivandrum	5,000/-
7	Beauty Therapist	Sudheera Beevi N	Beauty Therapist	Monolisa, Trivandrum	5,000/-
8	Beauty Therapist	Drishya P	Beauty Therapist	Monolisa, Trivandrum	4,000/-
9	Beauty Therapist	Ancy A	Beauty Therapist	Lips & Lashes, Trivandrum	6,000/-
10	Beauty Therapist	Jennifer	Beauty Therapist	Fair Flow Beauty Parlor	4,000 – 6,000
11	Beauty Therapist	Anju B L	Beauty Therapist	Golden Feather Beauty Parlor	5,000 – 8,000
12	BeautyTherapist	Sruthi L S	Beauty Therapist	Shamnas Beauty Parlor	6,000/-
13	Beauty Therapist	Leena	Beauty Therapist	Nadiya Beauty Parlor, Puthiyathura	5,000/-
14	Beauty Therapist	Haleema	Beauty Therapist	Queen Beauty Parlor, Kovalam	3,500/-
15	Beauty Therapist	Sruthi	Beauty Therapist	Queen Beauty Parlor, Kovalam	3,500/-
16	Beauty Therapist	Anjana S	Beauty Therapist	Kalypso, Trivandrum	4,000/-
17	Beauty Therapist	Alfina	Beauty Therapist	Kalypso, Trivandrum	4,000/-
18	Beauty Therapist	Sanjana	Beauty Therapist	Style, Trivandrum	4,000/-
19	Beauty Therapist	Sreenila	Beauty Therapist	Soniya, Trivandrum	3,500/-
20	Beauty Therapist	Divya S	Beauty Therapist	Soniya, Trivandrum	3,500/-

21	Beauty Therapist	Devi Gayathri	Beauty Therapist	Mirror, Trivandrum	3,000/-
22	Beauty Therapist	Sheeja	Beauty Therapist	Fair, Trivandrum	7,000/-
23	Beauty Therapist	Bindhu S	Beauty Therapist	Smitha, Trivandrum	3,500/-
24	Beauty Therapist	Rinu Robert	Beauty Therapist	Smitha, Trivandrum	4,000/-

Self-Employment

Many of the BT trainees were opted self-employment after successfully completing the training. As of now 19 trainees trained in previous batches are self-employed. Through this training programme, they got the opportunity to earn some money for their family as freelancer.

Self Employed – Started New Parlor

ASDC Vizhinjam along with the BT trainees are appreciating Mrs. Sindhu Rajeev for taking initiative to start her own Beauty Parlor on 1st November 2021 in Kottukalkonam, Trivandrum. She was our last batch BT trainee, successfully completed the course. She joined our training programme with intensive dream to become a Beauty Therapist. After completing our training programme she realizes her capability to start her own parlor for better earnings and for the fulfillment of her dream. She started the bank loan procedure from the last month of training and got the same as a blessing. A special note is that she gave a placement offer for her classmate Mrs. Viswakala in her new parlor and become an employer also. ASDC Vizhinjam team members also participated

Data Entry Operator

Details of Guest Sessions provided for Data Entry Operator trainees

Sl.No	Date	Topic	Resource Person	Place
1	25.11.2021	Cyber Space & Internet	Mrs. Rajana, Software Developer, Trivandrum	Transit Campus, Mukkola
2	17.12.2021	Employer Engagement Programme	Mr. Abhijit, Head HR, ICONS BPO Sector, Ernakulam.	Transit Campus, Mukkola

3	26.03.2022	Software Testing	Ms. Bismi Raju, Software Testing Manager, Binary Foundation, Trivandrum.	Transit Campus, Mukkola

Placements details of Data Entry trainees during the period

Sl. No	Course Name	Name of Trainee	Job Role	Place	Salary
1	Data Entry Operator	Jency	Customer Care Executive	Ernakulum	12,000/-
2	Data Entry Operator	Sindhuyathra	Customer Care Executive	Ernakulum	12,000/-
3	Data Entry Operator	Monica Lopez	Customer Care Executive	Ernakulum	12,000/-
4	Data Entry Operator	Prejith M	Customer Care Executive	Ernakulum	12,000/-
5	Data Entry Operator	Vinod T	Customer Care Executive	Ernakulum	12,000/-
6	Data Entry Operator	Soraj	Customer Care Executive	Ernakulum	12,000/-
7	Data Entry Operator	Stancy S J	Customer Care Executive	Trivandrum	10,000/-
8	Data Entry Operator	Divya J S	Customer Care Executive	Trivandrum	10,000/-
9	Data Entry Operator	Viji V S	Customer Care Executive	Trivandrum	10,000/-

10	Data Entry Operator	Dhanya V	Customer Care Executive	Trivandrum	10,000/-
11	Data Entry Operator	Divya	Customer Care Executive	Trivandrum	10,000/-
12	Data Entry Operator	Suni	Customer Care Executive	Trivandrum	10,000/-
13	Data Entry Operator	Reshma R	Customer Care Executive	Trivandrum	10,000/-
14	Data Entry Operator	Aswani C S	Customer Care Executive	Trivandrum	10,000/-
15	Data Entry Operator	Remya A V	Customer Care Executive	Trivandrum	10,000/-
16	Data Entry Operator	Robin Joseph	Customer Care Executive	Trivandrum	10,000/-

Retail Sales Associate

Guest Session provided to Retail Sales Associate trainees during the period

Sl.No	Date	Topic	Resource Person	Place
1	06.11.2021	Retail and Marketing	Mr. Biju, Marketing Manager, Kinnil Hyper Market, Trivandrum	Transit Campus Mukkola

Placements details of Retail Sales Associate Trainees during the period

Sl. No	**Course Name**	**Name of Trainee**	**Job Role**	**Place**	**Salary**
1	Retail Sales Associate	Pranav M	Customer Service Representative	Ison Xperiences, Ernakulam	11,485/-
2	Retail Sales Associate	Midhun M	Customer Service Representative	Ison Xperiences, Ernakulam	11,485/-

3	Retail Sales Associate	Abiraj A	Customer Service Representative	Ison Xperiences, Ernakulam	11,485/-
4	Retail Sales Associate	Kiran R L	Fun Consultant	Reliance Brands Limited	20,000/-

Self Employed Tailoring (SET)

ASDC started a new domain course, Self Employed Tailor (SET) at Vizhinjam site. The classes are started running from 2nd February 2022 onwards at VizMart, Vizhinjam with lab facility having 30 Sewing Machines and other equipment. Ms. Preeja J U was deployed as the Voucher Based trainer for the SET batches having 38 beneficiaries. This course is conducting as 2 bathes with 17 and 21 trainees respectively.

Soft Skill Training

Soft Skill portions like Communication skills, Language skills have been providing to the domain trainees as per the SOP. M. Kavitha is handling the soft skill portions for the ongoing domain batches.

General Activities

Induction Week Programme

ASDC have been conducting one weeklong induction training to the new students to identify the skill set of the aspirants before starting the course. The programme covers the following topics

- About Adani SAKSHAM.
- About Domain Courses like GDA, BT, DEO & RSA.
- Aptitude, Attitude, Necessity, Domain Knowledge tests.
- About Career Orientation & Placements activities.
- About Livelihood generation etc...

General sessions provided for trainees & Faculties during the period

Sl.No	Date	Topic	Resource Person	Place
1	14.10.2021	Placements on Skill Industry	Mr. Santosh Loni, Zonal Head, Adani Skill Development Centre	Online
2	21.10.2021	Media Communication	Mr. Shiju Sreedhar, MESC Animator Trainer	Transit campus, Mukkola
3	23.10.2021	English Communication	Mrs. Lemna Vinod, Head of the Department, KNM College, Kanjiramkulam	Transit campus, Mukkola
4	25.10.2021	Placements on Different Job Roles	Mrs. Neena K, HR Consultant, Larn Learning Solutions, Calicut	Online
5	15.11.2021	Future of Learning Management System in India	Ms. Hiral Pandya, Senior Manager Training, Adani Skill Development Centre.	Online
6	2.12.2021	World AIDS Day	Mr. Hema Chandran C P, Senior Outreach Worker, Kerala State AIDS Control Society, Trivandrum	Transit campus, Mukkola
7	11.12.2021	Stress Management	Ms. Reena R Pillai, Soft Skill Trainer.	Transit campus, Mukkola
8	14.12.2021	Tie-Ups Opportunities and Challenges	Mr. Danish Sheik Qureshi, Zonal Head, Adani Skill Development Centre	Online
9	03.12 & 07.12.2021	D-Link Network Associate	Mr. Sudhanshu Ojah, Trainer D-Link	Online
10	08.01.2022	CPR and First Aid	Dr. Nishana, Consultant, Parvathy Hospital, Balaramapuram	Transit campus, Mukkola

Community Placements

ASDC Vizhinjam Centre along with the CSR team is taking initiative for placing the interested and qualified candidates from the community also. We sorted the profiles available from the community through CSR team and redirect them to the current openings in different industries for the interview purpose. Mr. Sreejith, placement manager is leading the activity with the team. We are providing assistance for preparing Resume, Interview methods clarification etc...

Following are the list of Community peoples placed in different industries through the guidance of ASDC team,

COMMUNITY PLACEMENTS						
SL NO	**CANDIDATE NAME**	**LOCATION**	**ORGANIZATION NAME**	**JOBROLE**	**JOINING DATE**	**SALARY**
1	Reenu Lopez	Mariyan Nagar	KIMS Hospital	Patient Care Assistant	03-11-2021	10000
2	Bheema M S	Vizhinjam	KIMS Hospital	Patient Care Assistant	07-11-2021	10000
3	Ragi	Mullur	Jayalekshmi Silks	Billing	23-11-2021	12300
4	Lekshmi S P	Venganoor	Asha Homecare	Patient Care Assistant	18-11-2021	18000
5	Francis N	Vizhinjam	Lulu Mall	Fish Monger	30-11-2021	19000
6	Sherly Leon	Adimalathura	KIMS Hospital	Patient Care Assistant	10-11-2021	10000

Industrial Visits

As part of the skill training programme, ASDC provides Industrial Visits to the trainees. Big Bazar, Shopping Centre, Trivandrm is the partner for industrial visits. During the reporting period two such visits were arranged. This will help the trainees in getting realtime experience in the rules, activities, and the sales methods of the corresponding industry.

Christmas Celebration

Various celebrations are also observing as per the calendar. Christmas celebration and women's day celebrations were the main events during the period.

Community Skill Park (CSP)

The construction of the proposed 30,000 sqft Community Skill Park by Govt. of Kerala under ASAP is progressing with two hostels during the period and will be ready by the end of July 2022 for operation. The park will be operated by ASDC for a period of 10 years as per the agreement signed between ASDC and ASAP. ASDC Chief Operating Officer, Sh. Jatin Trivedi and Zonal Head South Region Mr. Danish Sheikh Qureshi along with Dr. Anil Balakrishnan, Head CSR, Southern region visited the site and reviewed the progress during the period. As part of the visit the following decision were taken

- The CSP building will be handed over to ASDC by the end of June 2022.
- The courses may include Port Related courses, High End Health related courses, Green Energy etc.
- For Port Related certified courses, ASAP has no objection in tying up with Vikram Simhapuri University through ASDC Krishnapatnam for certificates.
- ASAP also have no objection for establishing tie up with KASE for initiating programmes like SANKALP.

CSP building has the facility of 30,000 sq.ft. with 4 large classrooms, 3 Lab rooms, 1 IT Lab, 1 Seminar room and 2 Admin Halls in the ground floor and G-1 whereas G-2 is open for any other kind of training. These classrooms can be partitioned as per the requirement for conducting the courses as hybrid or separate. The existing courses like General Duty Assistant, Retail Sales Associate and Data Entry Operator can be run at G-2 floor. New courses are planned to conduct in the Ground and G-1 floor. The detailed blueprint will be shared by the ASAP team to ASDC.

International Placements

ASDC started initiative to tie-up with various agencies for international placement for community skill park courses. A meeting was conducted in this regard with MWT Global officials on 24th March 2022 during the period Discussion was mainly done about the opportunities and the processing for health-related jobs in Australia. A plan will be finalized within six months

3.4. LIVELIHOOD UPDATES

Status of existing livelihood groups during the reporting period

Sl No	Group	Type of Business/ Status up to March 2020	Business Status during the Month
1	Clean 4 U (5 Members)	• Hi Tech Cleaning for Flats, Hospitals, Offices, water tank, Vehicle and Public Institutions • Hosted a new web site www.clean4u.info for the customer registration • The turnover during the year was Rs.4,10,000/-	• The clients included offices, hospitals, flats... • Average turnover for the period is close to Rs. 4,10,934/ • Supplied contract cleaning cum housekeeping staff to CSR, ASDC, HOWE Guest House and ITD Company. • Cleaning and disinfection work were done at 30 locations and 60 houses
2	Anaswara Poultry Unit (7Members)	• Hitech poultry with 14 cages of 630 chicken for 7 member • The total revenue for the group for the financial year is Rs. 4,00,000/-	• Ongoing • Average earning per family for the period is Rs. 39,749/-

3	Thripti Poultry Unit (7 Members)	• Hitech poultry with 14 cages capacity of 630 chicken for 7-member group • The total revenue for the group for the financial year is Rs. 4,41,000/-	• Ongoing • Average monthly earning per family for the period is Rs. 41,612/-
4	Harbour Canteen Unit (5 Members)	Canteen unit specially for traditional seafood's The total revenue for the group for the financial year is Rs. 20,19,600/-	• Only parcel service • Daily turnover of Rs. 5,200/- to Rs. 5,500/- and gets an average profit of Rs.430 per day • Canteen runs in the building of Harbour Engineering Department • Average turnover for the period is close to Rs. 4,07,606/-
5	Sreebhadra Big Shopper Unit (3 Members)	Big shopper / Cloth Bag / Nonwoven Bag Unit The group has made a turnover of Rs.1,44,000/-for the current financial year	• Supplying cloth bags face mask etc. • The facemasks have been stitching as part of the CSR activities. • Turnover for the period is close to Rs.58,613/-
6	Eco Shop unit (3 members)	Selling of fresh vegetables at VizMart • The turnover of the group for the last six months was Rs. 8,80,000/-	• Procuring vegetables from the local farmers and selling at VizMart. • Working as per COVID protocols • They have been getting Rs. 1,300 – Rs. 1,700 business daily. • Average turnover for the period is close to Rs. 1,77,984/ •
7	Vizhinjam Karshika Karmasena (4 Members)	Clearing of vegetation and other agri works Turn over for the last three months was 90,000/-	• The clean Campaign including community cleaning and the cleaning of public places are coordinating by the Group. • Selling fertilizer, growbags, etc also progressing. • Average turnover for the period is close to Rs. 4,23,452/-

8	Prime Events (5 Members)	• Power Laundry Unit and Steam Pressing • Consultancy partner for VizMart – Livelihood market	• Steam pressing and hi-tech power laundry progressing • Resume service after COVID lockdown by keeping all the protocols • Average turnover for the period is close to Rs. 98,232/- •
9	Data Plus (3 Members)	• Data entry Photostat, projects, designing and online jobs • The group has made a turnover of Rs.7,40.000 for the financial year	• Digital Literacy programme has been successfully supported by the group • Average turnover for the period is close to Rs. 6,65,000/
10	Thattukkada Unit (3 members)	• Shop for preparation & Selling of steam based snacks • The shop has made a turnover of 3,60,000/- for the financial year	• The unit provide only the breakfast. • As per Covid 19 guidelines, parcel services are still going on. • Daily turnover reached to Rs. 2600- 2800/- • Average turnover for the period is close to Rs. 3,27,612/
11	You Me & Tea Café (3 members)	• Canteen unit, traditional Kerala Foods . • Made a turnover of Rs. 7,50,000/-in 7 months	• Concentrated in parcel service • Reopened the shop after COVID restrictions • Progressing the monthly turnover averages daily turnover reached to 2,500-3,000. • Selling of Milk and Milk products as an outlet is also progressing. • Average turnover for the period is close to Rs. 4,78,675/
12	SRM Stitching & Garments unit (3 Members)	• Spot stitching and garments • The group has made a turnover of Rs. 2,14,000/- in six month time	• Express stitching and selling of ladies' garments are the services • Daily turnover is Rs. 1000 - 1500. • Average turnover for the period is close to Rs. 63,036/

13	Turn to fresh - organic shop (3 members)	• Virgin coconut oil, natural pickles, and other provisional items • The group has made a turnover of Rs. 1,00,000/- in 3 months.	• Wholesale dealer for provisions tie up with Paul Raj & Company • The Nestle Products and mineral water is also progressing as a separate counter • Monthly turnover is close to Rs. 47,810/- • Average turnover for the period is close to Rs. 3,36,013/-
14	Frozen Days (3 Members)	• Fresh juice, ice creams and milk products	• Shutdown the counter due to covid restrictions.
15	Elite Gift and Fancy shop (3 Members)	• Gift items, fancy items, handicrafts, etc. • The group has made a monthly turnover of Rs. 60,000/-. In last 4 months	Shutdown the counter due to covid restrictions
16	SWAP Data Services (3 Members)	• Providing online services like PAN card, notice printing and designing, art works, Photostat, Money Transfer etc...	• Providing data services and Photostat • They have been getting 6300/- Monthly turnover. • Average turnover for the period is close to Rs. 1,10,223/
17	SPANDHAN AM Patient Care Unit (5 Members)	• Providing patient care services for bedridden patients in houses as well as in nearby hospitals.	• Office is functioning at Viz Mart • Four members got placed in home-based patient care.
18	Samudra Activity Group	• Making of fresh fish pickles and other pickle items.	• Registration activities are under process.

Details of Total Turnover for 17 Livelihood groups

Sl.No.	Name of IG activity of SHG's/JLG/FPC's	Financial Year of inception	Income for the year in Rs.	Cumulative income (from inception of the groups)	
				No. of groups/JLG/FPC's	Amount in Rs.
1	Stiching/ weaving - (SRM Stitching Unit)	05.09.2019	126,072.00	1	564,118.00

2	Cleaning Services - Clean 4 U	10.04.2017	821,868.00	1	2,248,868.00
3	Poultry Units - Anaswara &Thripthi	20.01.2018	158,998.00	2	1,600,730.00
4	Canteen/Hotel Unit - Harbour , Canteen/Hotel Unit - U Me & Tea Shop, Canteen/Hotel Unit - Thattukada	13.07.2017 05.09.2019 16.07.2019	2,445,639.00	3	9,359,547.00
5	Eco friendly bag unit - Sreebhadhra Bags	05.11.2017	117,226.00	1	402,426.00
6	Vegetation Cleaning unit - Vanitha Karsheeka Karma Sena	05.09.2019	846,904.00	1	2,433,244.00
7	Laundry Service - Prime Events/Power laundry	06.02.2018 (Prime Events) 12.11.2019 (Laundry)	196,465.00	1	1,813,803.00
8	Data Entry and online services - Data Plus & SWAP	22.03.2018 (Data Plus) 01.12.2020 (SWAP)	220,447.00	2	2,003,875.00
9	Sale of Organic/Provisions - Turn to Fresh Organic Shop &/Provisions - Samudra Activity group	05.09.2019 (Turn to fresh) 03.12.2020	672,026.00	2	768,903.00
10	Sale of fancy items - Elite Fancy shop	03.12.2020	17,600.00	1	148,000.00
11	Sale of organic Vegetable - Eco Shop	10.08.2018	355,969.00	1	2,449,757.00
12	Patient Care Services - Spandanam	01.03.2021	84,000.00	1	228,000.00
		Total	**60,63,214.00**	**17**	**2,40,21,271.00**

VIZMART

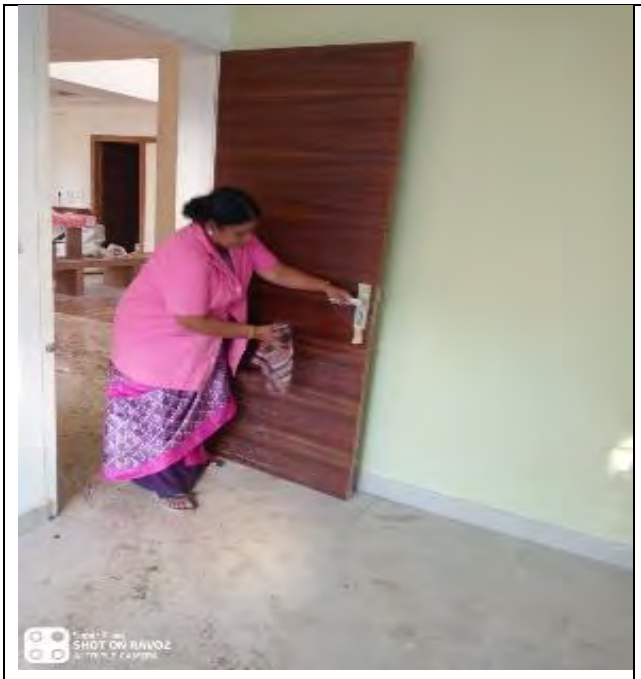
Viz Mart, the consotium and the market place for livelihood groups slowly getting momentum after the third wave of COVID spred in Kerala during the period. The mobile application has been using for home delivery. Billing and stock maintaining were shifted to soft mode. The course on self-employed tailoring started at Viz Mart.

Another selling counter for Viz Mart at Farm School premises is also progressing during the period.

A selling counter for milk and milk products are progressing at Viz Mart as official agent for MILMA, Govt. agency for milk and milk products

All the farm maintenance, plant protection, watering, maintenance of fruit orchard is taken care by Vanitha Karsheeka Karma Sena, one of the livelihood groups formed under the CSR of AVPPL/AF. The cleaning of port premises is also taken care by the Karma Sena. The cleaning of Chappath Magazine area of Vizhinjam port is progressing during the month.

One of the livelihood group members and the Convener of Viz Mart Mrs. Suraja selected to interact with Priti Madam, Chairperson of Adani Foundation on the occasion of International Women's Day celebrations. A life story of Mrs. Suraja was prepared in document and a team from HO captured her life story. The interaction programme was done on 3rd March 2022 at HO and telecasted the programme on 8th March 2022. The same was showed to the community people on 8th March 2022 as part of International Women's Day celebration at Vizhinjam.



Individual- micro–Enterprise Initiatives

AF has been supporting group enterprise since 2017 onwards, last year a new initiative of individual enterprise support programme started, under this programme the following enterprises were progressing during the reporting period.

Sl.No	Number of Individual Beneficiaries	Cumulative income (from inception of the groups)	Average Income / Month in Rs.
1	Chinnu Stores - Sheeja	3,13,182.00	39,368.86
2	Sindhu Tailoring shop - Sindhu	60,440.00	7,348.57
3	Petty Tea Shop - Sulekhs	2,69,530.00	38,504.29
4	Stiching bag & Chappals - Peter	46,587.00	6,764.50
5	Petty Tea Shop - Baby	2,02,150.00	28,646.17
6	Street shop - Baby	1,20,010.00	20,001.67
7	Mrs. Nirmala - Fish Vending	1,57,200.00	25,840.00

8	Mrs. Jespi - Fish Vending	1,65,100.00	24,020.00
9	Mrs. Gulastic Amma	2,53,250.00	41,050.00

4. COMMUNITY INFRASTRUCUTRE DEVELOPMENT

4.1. Pilot project on clean drinking water for Vizhinjam

Availability of clean drinking water in Vizhinjam persists even after it was made into Corporation in 2010. To provide pure drinking water AVPPL/AF was decided to install five clean drinking ware plants in the nearby five divisions of Vizhinjam having 2000L/hour capacity each on a pilot basis. The total cost of the project is Rs. 52.5 lakhs of which the equipment cost of Rs. 30 lakhs from the CSR of Tata Chemicals whereas the infra and installation cost of Rs. 22.5 lakhs are from CSR of AVPPL/AF. The future maintenance will be the responsibility of community beneficiaries. The infra work and the installation for the water kiosk completed at 3 locations. New plan, BoQ and estimates are received from the architectural consultant for remaining two locations and sent for further TCD procedures.

A village level committee was constituted at harbour area, selected 10-member committee to monitor day to day maintenance of the kiosk.

4.2. Community Health Centre, Vizhinjam

The construction work of Community Health Center at Vizhinjam has been resumed after the COVID restrictions. The project cost is Rs. 7.79 cr where the Government component of Rs.482 lakhs and CSR component of 297 lakhs from Adani Foundation. Adani Foundation handed over the first installment of Rs.1.18 crores to the Harbour Engineering Department on 03.10.2018. Initiated the process to transfer the second installment of Rs. 1.18 crores to HED. The work reached overhead water tank column RCC during the period

4.3. HALP School, Harbour Road, Vizhinjam

The works of rain roof and sanitation facilities in HALP School are completed. The inauguration cum handing over ceremony will be organised, when COVID

restriction over. The work included side roofing; toilet blocks for boys, washing facility for staff and installation of water pump.

4.4. LPS School, Kidarakkuzhy

In Kidarakkuzhy LP School, the following works are completed

- Toilet block for boys & staff, Urinals for boys, Soak pit & septic tank

4.5. Mudippura Nada LP School, Venganoor

The works on construction of stage platform and washing facility have been completed in Mudippuranada School under CSR. The formal handing over may be conducted immediately after the covid lockdown issues are over.

4.6. Gangayar Canal

The proposed maintenance to ensure proper water flow and desilting of Gangayar had been entrusted Minor Irrigation Department under the supervision of Harbour Engineering Department. The initial project cost was Rs.89 lakhs, in equal share of AVPPL and VISL. AVPPL transferred Rs. 45 lakhs as half share through VISL to Minor Irrigation Department. After tendering it quoted raises to Rs. 119 lakhs. Initiated the process to transfer the additional amount of Rs. 15 lakhs to VISL during the month. The work includes

- Desilting of waste up to 1 km from the mouth of the canal
- Core wall (Break water) to block sand iteration at the southern side of the exiting Fishing Harbour
- Installation of three Silt breakers at a distance of 500 m & a footbridge
- Fencing of both sides

The status of the work during the period is as followings

- Completed the desilting of waste up to 1 km from the mouth of the canal
- Progressing the Rock mining work to construct the Core wall (Break water) to block sand iteration at the southern side of the exiting Fishing Harbour

- Progressing the preliminary works to Install Silt breakers
- The construction of footbridge completed.
- The construction of1 silt trap completed. The second sit trap work is in progress.
- The sidewall construction is progressing.
- The silt removal completed for a depth of 1 m. There is significant increase in the flow of water.

4.7. Other major projects under progress

Sl N	Project	
1	Model Anaganwadi, Vizhinjam (Nr. Police Station)	• 1500 Sqft Montessori model Anganwadi at Govt. Vizhinjam LP School compound. • The plan and the location approved by social welfare department • Land permission received from Social Welfare department. • As the Land Contour mapping yet to receive from Social Welfare department, it is decided to prepare a detailed architectural drawing by our consultant • As per the plan, estimate and BoQ received 7 quotations for the work, but the rates quoted are much higher side. So additional approval for fund may be required
2	MRF	• As per the request received from Trivandrum Municipal Corporation it is decided to construct an MRF at harbor ward. Land for the same will be allotted by Harbour Engineering Department. The operation of the unit will be done by

		Trivandrum Municipal Corporation under the technical support of Suchithwa Mission and Clean Kerala Company. A Haritha Karma Sena will be formed for the daily collection of waste after the commissioning of the proposed unit. The MRF will include • 3500 sqft building • Shredding Machine • Baling Machine • Dust remover and • Conveyor belt • Compound wall • Internal roads • Estimate, BOQ and plans are ready • A MoU is under preparation to demystify the role of all the stakeholders • NFA approved and started the process to transfer the fund to VISL.
3	Kottukal School	• A roof top classroom in the existing building • As per the structural certificate plan and estimate are prepared • As per the plan, estimate and BoQ received 7 quotations for the work, but the rates quoted are much higher side. So additional approval for fund may be required
4	Library Uchakkada	• A two-storey building in the existing foundation • BoQ, plan and estimate are prepared • As per the plan, estimate and BoQ received 7 quotations for the work, but the rates quoted are much higher side. So additional approval for fund may be required

4.8. Vayalinkara – Model Village Plan

A model village development work completed at Vayalinkara area. A village level committee was constituted to support AF is monitoring the day-to-day progress. The villagers, especially housewives are also joined with the contractors in the construction activities. This has increased the ownership of community in the development of their areas.

5. OTHERS

5.1. A Community Response Initiative – Tele interaction with Community People

To reduce the COVID induced stress of the people and to connect them to the proper service channel, AF has introduced an initiative of '**Tele interaction with community People**" since the first wave of COVID-19. As part of this programme CSR team members have been interacted with community people on a daily basis over phone and extended support in the form of connecting like health department, Trivandrum Corporation, Primary Health Centre, Community health Centre, ASHA workers, DISHA Health Help Line, Police Department, Political and Local leaders etc. Local volunteers are also provided support specially to distributed urgent

medicines according to the instructions of CSR team members. A total of 295 cases were handled during the period.

5.2. **Community Grievances**

- **Cleaning of "Gangayar Canal"**

The dredging department of HOWE is cleaning the sand accumulated at the mouth of Gangayar Canal joining sea at Valiyakadappuram every day.

- **Reporting the progress of Vizhinjam Port to community stakeholder**

As per the environmental audit compliance, the progress of Port activities has been circulated to the community groups during the month with following progress through virtual platforms

Project Component (Phase I)	**Status**
Container Berth (800 mtr long)	Piling & Beams completed for 800 mtr. Slabs will be installed once breakwater work advances.
Breakwater (3.1 km long)	Progressing at 1250 mtr. Rock sourcing and stockpiling are in progress.
Fishery berth & Harbour	Work will commence in consultation with local fishermen and Government
Port yard and buildings	• Port Operation Building completed. Inauguration done on 30-09-2020 by Hon'ble Minister for Ports, GoK. • All other buildings are at advanced stage of completion. • Yard development works are in progress
Port Access Road (2 Km)	In progress. Finishing works for 2 nos bridges are progress.
Main Electrical Substation and Port Electrical System	Construction completed. Commissioning will be done soon.

Table depicting the details of members informed

Sl.No	**Group**	**No. of Families**						
		Oct	**Nov**	**Dec**	**Jan**	**Feb**	**March**	**Total**
1	Competitive Exam Coaching	112	136	126	129	126	126	**755**
2	Open House	26	32	22	22	33	31	**166**
3	Literature Group	42	42	42	42	48	48	**264**

4	Digital Literacy Resource Persons	7	7	27	24	24	24	**113**
5	Digital Literacy Community Group	311	208	139	90	135	255	**1138**
6	Phoenix – Widows Group	52	52	52	52	52	52	**312**
7	Children's Group	116	116	116	116	116	116	**696**
8	SuPoshan Group	9	10	10	10	10	10	**59**
9	Swachhagraha	109	109	109	109	109	109	**654**
10	Community Volunteers	32	32	32	32	32	32	**192**
11	Community Awareness programme (offline)	75	240	500	0	0	0	**815**
12	Livelihood Group Kottukal Panchayat	0	0	12	12	12	12	**48**
Total		**891**	**984**	**1187**	**638**	**697**	**815**	**5212**

5.3. Staff Development Programmes

Session on amendments in CSR Act

An online session was organized by Adani Foundation on the latest amendments in CSR act and rule on 09.10.2021. All the staff from Vizhinjam were participated in the capacity building programme. The sessions were handled by Dr. Anil Balakrishnan, Mr Rushin Patel

Staff Development Programme – Team building get-together

As the world bids goodbye to a year to welcome another, the CSR and Skill team of Adani Foundation Vizhinjam organizes a team building exercise and a get together lunch with all staff members sharing their part to cook their favorite food Tapioca and chicken curry, on New Year. The celebration organized at CSR office Mukkola was deliberately intended to create the joyous occasion, together with imparting a positive vibe, and mutual cohesion among all staff members.

The get together on shared cooking and dining together generates happy beginnings with renewed energy in a good working atmosphere. As past two years (2020 and 2021) have been challenging because of the Covid-19., this exercise imparts new hope for 2022 to be a great year, with memories of the day on everyone's mind.

5.4. Cleaning of Drains at Seafood Park area, Vayalinkara

Due to heavy rain during the month of November, four out of 39 houses were flooded in Vayalinakara area. The deputy Collector of Trivandrum instructed VISL to clean the area by imposing section133, as it is affecting the life of the people. As per the instruction of VISL Vanitha Karasheeka Karma Sena, one of the livelihood group formed under the CSR of AVPPL/AF completed the following works during the period

6. Cleaning and deepening of Natural drain with machine- in the seafood park area
7. Cleaning the vegetation in the seafood park area
8. Cleaning and deepening of Natural drain in between seafood park and ASAP building site

A hearing in this regard was called by the additional divisional magistrate, Trivandrum on 30th December 2021 at the collectorate, attended the hearing and submitted on the documents related to the work.

5.5. Visit of Dr. Arja Srikanth, Senior Vice President

Senior Vice President, Corporate Affairs, Adani Ports and SEZ Ltd, Dr. Arja Srikanth visited the CSR activities of Adani Vizhinjam Port Pvt Ltd on 20-11-2021. The places he visited includes, Viz Mart, ASDC, Farm School, Thumboormozhi Waste bins, and Govt. UPS Mulloor. He wished his best compliments to the entire CSR team for conceptualizing & executing Adani Foundation activities holistically in the fields of Health, Education, Sanitation, livelihood skills, community infrastructure, cleanliness in and around Vizhinjam port.

He put forwarded some recommendation to include as follows

- Integration of Farm School with SuPoshan, school children & housewives.

- Encouraging rooftop gardening, Nutri gardens, supply of fresh organic vegetables from farm school to locals through app-based home delivery.
- Intensive multi cropping farm techniques, using vertical and horizontal spaces and youngster's visits
- Multi skilling for skill development programmes
- Viz Mart shall be a source of employment generator with local integration.
- Clean4U can expand its wings and create employment for many more youth.
- Skilling local youth suiting to port operations like HMV for container truck driving, Crane operators, export & Import duty assistant, seaweed cultivation, cage culture etc.

9. Cleaning and deepening of Natural drain with machine- in the seafood park area
10. Cleaning the vegetation in the seafood park area

5.6. Cleaning the area in connection with Annual Feast celebration of Vizhinjam Parish

Honorable MLA for Kovalam, Adv. M. Vincent was called a Various Departments meeting on 22nd November 2021 at Animation Centre, Kovalam regarding the preparation for the coming Annual Feast celebrations of Sindhu Yathra Matha Church, Vizhinjam (Kottappuram Church). The proposed annual feat is scheduled from 31st December 2021 to 9th January 2022. The representatives of Vizhinjam Parish presented the expected services from various departments and institutions for the smooth functioning of the said annual feast, requested Adani group the following help and services

1. Allot a JCB as and when the need arises for cleaning.
2. Clean St. Aloysius ground (Valiya Kadappuram) including vegetation clearing, level the ground and pave good sand.
3. Clean Gangayar canal and ensure proper water flow
4. Provide 24-hour medical service of our Mobile Health Care unit during the festival at Midwifery Centre, Thulavila, Vizhinjam

As per the request all the cleaning work has been completed during the period.

5.7. Christmas Celebration

Christmas celebrations were conducted at Vizmart on 21 -12-2021. All Livelihood group members participated in the event. The events started with the address of program manager on the importance of Christmas and its impact on life all the human beings.

Christmas celebrations were conducted at CSR Office on 22 -12-2021. All CSR & ASDC staff members participated in the event.

5.8. Slit dumping

As to speed up the desilting work of Gangayar canal, VISL permitted Minor Irrigation Department to dump desilting waste to the acquired area, thereafter to pack the waste with scientific sand mining by Suchitha Mission, Govt. of Kerala. But the entrusting contractor dumped the waste carelessly, the leaches were come to Panavilacode temple area and a complaint was raised by the temple committee.

CSR team visited the area and proper instruction was given to the contractor, remove the waste with immediate effect and resolved the issue.

5.9. Still Photo shoot of CSR activities from AF-HO

Adani Foundation has been initiating various CSR activates since 2016. As part of the documentation purpose Adani Foundation head office scheduled a photoshoot covering all the CSR activities going on at Vizhinjam. A designated person visited Vizhinjam site during 11th January 2022 to 14th January 2022 to cover the activities.

5.10. Port Visit – Office bearers of Vizhinjam Parish

In continuation of the discussion regarding the temporary fencing at worksite of Vizhinjam port near Valiyakadappuram, the representive of Vizhinjam Parish Council Members, Rev. Fr. Micheal Thomas, President and Mr. Devasahayam, Secretary were visited the port site on 16th February 2022. After visiting the sites, the team had a discussion over the following matters

- Temporary fencing at Port construction site near Valiyakadappuram
- Septage clearance of Vayalinkara area
- Request for the funds to construct retain wall of community hall
- Request for the funds to construct a new school building at St. Mary's Higher Secondary school, Vizhinjam
- Request for the funds to conduct evening class at St. Mary's Higher Secondary school, Vizhinjam

5.11. Releasing of 5-year Compendium of CSR activities (2016- 2021)

The 5-year compendium of CSR activities of AVPPL was released on 10th February 2022 by the Honorable Minister for Ports, Museum, archeology and Archives, Govt. of Kerala Mr. Ahmed Devarkoil at his chamber. The release was done by handing over the first copy to Mr. Sushil Nair, Head Corporate Affairs, AVPPL. Dr. Anil Balakrishnan, Southern Regional Head, Adani Foundation, representatives of AVPPL, CSR team were present in the function. Minister congratulates the team for the good work done for the community at Vizhinjam.

The distribution of the 5year compendium to the concerned officials and leaders is progress during the month.

Press Coverage

വിഴിഞ്ഞത്ത് പ്ളാസ്റ്റിക് മാലിന്യ സംസ്കരണ പദ്ധതി വരുന്നു

വിഴിഞ്ഞം• പ്ലാസ്റ്റിക് മാലിന്യ സംസ്കരണത്തിന് വിഴിഞ്ഞത്ത് ബൃഹത് പദ്ധതി വരുന്നു. വിഴിഞ്ഞം ഉൾപ്പെടെ നഗരസഭയുടെ അഞ്ചു വാർഡുകളിൽ നിന്നു ശേഖരിക്കുന്ന പ്ലാസ്റ്റിക് മാലിന്യം പൊടിയാക്കി വിൽപനയ്ക്കു സജ്ജമാക്കുന്നതാണ് പദ്ധതി.മാലിന്യ ശേഖരണ സംസ്കരണ കേന്ദ്രം(എംആർഎഫ്) എന്നു ചുരുക്കപ്പേരിലാണ് പദ്ധതി. മത്സ്യബന്ധന തുറമുഖ പദ്ധതിയുടെ മാസ്റ്റർ പ്ലാൻ വികസനത്തിൽ ഉൾപ്പെടുത്തി സമർപ്പിച്ചിട്ടുള്ള പദ്ധതി നിർമാണം അദാനി ഫൗണ്ടേഷനും വിഴിഞ്ഞം രാജ്യാന്തര തുറമുഖ കമ്പനി(വിസിൽ) യും ചേർന്ന്. ക്ലീൻ കേരള മിഷന് നടത്തിപ്പ് ചുമതലയുള്ള പദ്ധതിയിൽ നഗരസഭയുടെ ഹരിതകർമ സേനക്കാണ് മാലിന്യ ശേഖരണ ചുമതല.

കേരള കൗമുദി

വിഴിഞ്ഞത്ത് പ്ലാസ്റ്റിക് പൊടിക്കും, റോഡുകൾക്ക് പളപളാന്ന് മിന്നാൻ

▸ഷൻകാവുങ്ങൽ

വിഴിഞ്ഞം: പ്ലാസ്റ്റിക് മാലിന്യ സംസ്കരണത്തിനായി വിഴിഞ്ഞത്ത് പ്ലാന്റ് വരുന്നു. സമാനമായ രണ്ടിടത്തെങ്കിലും കൂടി പ്ലാന്റുകൾ സ്ഥാപിക്കാനും പദ്ധതിയുണ്ട്. പ്ലാസ്റ്റിക് മാലിന്യം പ്ലാസ്റ്റിക്കേതര വസ്തുക്കൾ എന്നിവ വേർതിരിച്ച് സംസ്കരിച്ച് റോഡ് ടാറിംഗിനായി ഉപയോഗിക്കാനാണ് പദ്ധതി.

KAUMUDI SPECIAL

പ്ലാസ്റ്റിക് സംസ്കരണ പ്ലാന്റിന്റെ മാതൃക

കെട്ടിടം 3500 ചതുരശ്ര അടി

വിഴിഞ്ഞം ഓഷ്യൻ ഐലാന്റ് സ്പോർട്സ് സമിതിക്ക് ഹാർബർ എൻജിനീയറിംഗ് വകുപ്പ് നൽകുന്ന 15 സെന്റിലാണ് പ്ലാന്റ് സ്ഥാപിക്കുന്നത്. 3500 ചതുരശ്ര അടി വിസ്തീർണത്തിലാണ് ഇവിടെ കെട്ടിടം നിർമ്മിക്കുന്നത്. 90 ലക്ഷം രൂപയാണ് നിർമ്മാണച്ചെലവ്. ഇതിൽ 70 ലക്ഷം രൂപ കെട്ടിടനിർമ്മാണത്തിനും 20 ലക്ഷം രൂപ പ്ലാന്റിനാവശ്യമായ യന്ത്രങ്ങൾക്കുമാണ്. 45 ലക്ഷം രൂപ മാനേജ്മെന്റ് കമ്പനിയും 45 ലക്ഷം രൂപ വിസിൽ കമ്പനിയുമാണ് നൽകുന്നത്.

സൃപദ്ധതി

നിലവിലെ ഒരു ടൺ പ്ലാസ്റ്റിക് പൊടിയാക്കാൻ കഴിയുന്ന വിധത്തിലാണ് പ്ലാന്റിന്റെ നിർമ്മാണം. പ്രാഥമികവാസികളായ നിരവധി പേർക്ക് തൊഴിൽ ലഭിക്കുന്നതിനൊപ്പം, നഗരസഭയ്ക്കും സമീപത്തെ തീരദേശ പഞ്ചായത്തുകൾക്കും ഇതിലൂടെ വലിയ വരുമാനവും ഇതിലൂടെ ലഭിക്കും. ശാസ്ത്രീയമായ പ്ലാസ്റ്റിക് കത്തിച്ചുണ്ടാക്കുന്ന വിഷപ്പുകയിൽ നിന്ന് പ്ലാസ്റ്റിക്കിലെ ചൂടിൽ ഉരുകിച്ചേരുന്ന രീതിയാണ് സ്വീകരിക്കുന്നത്. ഇതിലൂടെ ഉണ്ടാകുന്ന പുകയും വിഷവാതകങ്ങളും ഫിൽട്ടറുകളിലൂടെ കടത്തിവിട്ട് ശുദ്ധീകരിച്ചതിനുശേഷമാണ് അന്തരീക്ഷത്തിലേക്ക് തള്ളുന്നത്. ഇതിനായി പ്രത്യേക ഫാനുകളും ഘടിപ്പിച്ചിട്ടുണ്ട്. പ്ലാന്റിന്റെ പ്രവർത്തനത്തിനായി ഒരു ഓപ്പറേറ്ററുടെ സേവനമാണ് ആവശ്യമുള്ളത്. ഇതിനായി വിഴിഞ്ഞത്തെ തൊഴിൽരഹിതരായ യുവതീയുവാക്കൾക്ക് പരിശീലനം നൽകുന്നതിനുള്ള സൗകര്യവും വിഴിഞ്ഞത്ത് ഒരുക്കുന്നുണ്ട്.

കേരള കൗമുദി

ഗംഗയാറിന് ഇനി പുതിയമുഖം

▸ഷൻകാവുങ്ങൽ

വിഴിഞ്ഞത്തെ ഗംഗയാർത്തോട് നവീകരണപ്രവൃത്തിയുടെ ഭാഗമായി വലിയ കരിങ്കല്ലുകൾ ഇറക്കിയപ്പോൾ

പ്രയോജനമില്ലാതെ പദ്ധതികൾ

പദ്ധതി ചെലവ് 1.15 കോടി

വെള്ളക്കെട്ടിന് പരിഹാരം

നവീകരണത്തിലൂടെ തീരദേശത്ത് പകർച്ചവ്യാധികൾ പകരുമോയെന്ന നാട്ടുകാരുടെ പേടി മാറും.

വിഴിഞ്ഞം രാജ്യാന്തരതുറമുഖ കമ്പനി (വിസിൽ) നേതൃത്വത്തിലാണ് പദ്ധതി നടപ്പിലാക്കുന്നത്.

അദാനി തുറമുഖ കമ്പനി സാമൂഹ്യ പ്രതിബദ്ധതാ റിപ്പോർട്ട് പ്രകാശനം

■ ഒരു വർഷം ശരാശരി അര ലക്ഷത്തോളം പേർക്ക് വിവിധ സേവനങ്ങൾ ലഭ്യമാക്കുന്നതായി അദാനി ഫൗണ്ടേഷൻ

വിഴിഞ്ഞം • അഞ്ചു വർഷത്തിനിടെ അദാനി വിഴിഞ്ഞം തുറമുഖ കമ്പനി നടപ്പിലാക്കിയ സാമൂഹ്യ പ്രതിബദ്ധതാ പ്രവർത്തനങ്ങളുടെ റിപ്പോർട്ട് തുറമുഖ മന്ത്രി അഹമ്മദ് ദേവർ കോവിൽ പ്രകാശനം ചെയ്തു. അദാനി തുറമുഖ കമ്പനി കോർപറേറ്റ് വിഭാഗം മേധാവി സുശീൽ നായർക്ക് ആദ്യ പ്രതി നൽകി. അദാനി ഗ്രൂപ്പ് സാമൂഹ്യ പ്രതിബദ്ധതാ വിഭാഗം ദക്ഷിണ മേഖല മേധാവി ഡോ. അനിൽ ബാലകൃഷ്ണൻ, കോർപറേറ്റ് വിഭാഗം പ്രവർത്തകർ ,സാമൂഹ്യ പ്രതിബദ്ധതാ വിഭാഗം പ്രവർത്തകർ എന്നിവർ പങ്കെടുത്തു. ആകെ 50.56 കോടി രൂപയുടെ പ്രവർത്തനങ്ങളാണ് നടപ്പിലാക്കിയത്.

ഇതിൽ 18.06 കോടി രൂപ വിഴിഞ്ഞത്തും പരിസരപ്രദേശങ്ങളിലുമായി നടത്തിയ സാമൂഹിക പ്രതിബദ്ധത പ്രവർത്തനങ്ങൾക്കും 32.5 കോടി രൂപ പ്രളയ, ഓഖി, കോവിഡ് ദുരിതാശ്വാസ പ്രവർത്തനങ്ങൾക്കായി സർക്കാരിനും നൽകിയതാണ്. വിവിധ സാമൂഹ്യ പ്രതിബദ്ധതാ പ്രവർത്തനങ്ങളിലൂടെ ഒരു വർഷം ശരാശരി അര ലക്ഷത്തോളം പേർക്ക് വിവിധ സേവനങ്ങൾ ലഭ്യമാക്കുന്നതായി അദാനി ഫൗണ്ടേഷൻ പ്രതിനിധികൾ പറഞ്ഞു.

List of Cancer Patients supported with monthly Nutritious food supplements, medicine, urine bags and diapers

Sl No	Patient Name	Age	Ward	Disease
1	Abhijith	10	Mulloor	Bone Cancer, Kidney Failure
2	Helen	42	Venganoor	Breast Cancer
3	Adhilian Antony	3	Kottappuram	Eye- Cancer
4	Aron	13	Kottappuram	Heart Problem
5	Dasan	52	Kottappuram	Mouth Cancer
6	Adish	6	Vizhinjam	Cerebral Plassey
7	Vinod	46	Venganoor	Blood Cancer
8	Abhijith	11	Mulloor	Blood cancer
9	Selvi	45	Kottappuram	Bone- Cancer
10	Indira	53	Mulloor	Breast Cancer
11	Paniyamma	40	Vizhinjam	Bone Cancer

12	Varghees	56	Kottappuram	Mouth cancer
13	Rani Francis	43	Vizhinjam	Breast Cancer
14	Sreejith	21	Mulloor	Thyroid Cancer
15	Manoharan	54	Kottappuram	Lungs Cancer
16	Suresh	34	Vizhinjam	Heart Disease & Stroke
17	Ameer Hamsa	43	Vizhinjam	Kidney Failure
18	Ayyappan	42	Mulloor	Lungs Cancer
19	Franklin	56	Kottappuram	Breast Cancer
20	Fegy	18	Venganoor	Throat Cancer
21	Adhilian Antony	3	Kottappuram	Blood Cancer
22	Adish	5	Vizhinjam	Cerebral Plessey
23	Feno	4	Kottappuram	Blood Cancer
24	Rusy	40	Kottappuram	Breast Cancer
25	Yesudas	44	Kottappuram	Mouth Cancer
26	Manoharan	65	Kottappuram	Lungs Cancer
27	Ambali	40	Kottukal	Blood Cancer
28	Titus	64	Kottappuram	Blood Cancer
29	Arogyam	50	Kottappuram	Throat Cancner
30	Murukan	56	Kottappuram	Throat Cancer

The List of bed ridden Patients visited by Community Volunteers

Sl No	**Name**	**Age**	**Ward**	**Disease**	**Support**
October					
1	Latha	58	Veganoor	Bedridden	Medicines
2	Sainaba	60	Harbour	Stroke	Medicines
3	Shahul Hameed	80	Harbour	Bedridden	Medicines
4	Rajayyan	81	Kottappuram	Bedridden	Mental Support & Medicines
5	Skariyas	70	Venganoor	Stroke	Medicines
6	Rahiyanath	60	Harbour	Bedridden	Medicines
7	Moosakutty	75	Harbour	Bedridden	Medicines
8	Karmeli	85	Vizhinjam	Bedridden	Medicines

9	Suresh	38	Vizhinjam	Bedridden	Medicines
10	Thankam	68	Vizhinjam	Bedridden	Medicines
11	Vasanthakumari	70	Vizhinjam	Bedridden	Medicines
12	Ameer Hamsan	43	Vizhinjam	Bedridden	Medicines
13	Gopalakrishnan	68	Mulloor	Bedridden	Medicines
14	Puspa Valli	60	Mulloor	Bedridden	Medicines
November					
15	Suresh	28	Vizhinjam	Stroke	Medicines & Mental Support
16	Manoharan	65	Kottappuram	Lungs Cancer	Foods
17	Marthamma	55	Kottappuram	Bedridden	Medicines
18	Muthappan	68	Kottappuram	Bedridden	Mental Support & Medicines
19	Rose Mary	70	Venganoor	Stroke	Medicines
20	Sebastian	44	Harbour	Bedridden	Medicines
21	Elzamma	72	Harbour	Bedridden	Medicines
22	Shylaja	85	Vizhinjam	Bedridden	Medicines
23	Ayyappan	53	Vizhinjam	Cancer	Medicines & Foods
24	Dasan	55	Vizhinjam	Cancer	Medicines & Food
December					
25	Ayyappan	42	Mulloor	Stroke	Treatment Support Medicines& Mental Support
26	Manoharan	65	Kottappuram	Lungs Cancer	Foods & Mental Support
27	Dasan	52	Kottappuram	Mouth Cancer	Foods & Mental Support
28	Sreelatha	54	Venganoor	Bone Cancer	
29	Nabeezath	80	Harbour	Bedridden	Medicines
30	Paymoonamma	75	Harbour	Bedridden	Medicines
January					
31	Rajayyan	62	Mulloor	Stroke	Treatment Support Medicines& Mental Support
32	Manoharan	65	Kottappuram	Lungs Cancer	Foods & Mental Support
33	Ayyappan	42	Mulloor	Heart Disease	Food ,Medicines & Mental Support
34	Somarajan	62	Mulloor	Stokr	Medicines & Mental Support

February					
35	Rajam	56	Mulloor	Dialysis Patient	Treatment Support Medicines& Mental Support
36	Benedict	60	Kottappuram	Stroke	Medicines
37	Chencheelamma	98	Kottappuram	Bedridden	Medicines & Mental Support
38	Saraswathy	58	Kottappuram	Bedridden	Medicines & Mental Support
39	Ayyappan	42	Mulloor	Bedridden	Food, Medicines & Mental Support
40	Aron	13	Kottappuram	Heart Problem	Food & Mental Support
41	Alma	10	Kottappuram	Heart Problem	Food & Mental Support
March					
42	Skariyas	57	Kottappuram	Bedridden Patient	Medicines& Mental Support
43	Francis Xavier	58	Kottappuram	Dialysis Patients	Medicines
44	Chencheelamma	98	Kottappuram	Bedridden Patient	Medicines & Mental Support
45	Bharathi	58	Kottappuram	Bedridden Patient	Medicines & Mental Support
46	Ayyappan	42	Mulloor	Bedridden	Food, Medicines & Mental Support
47	Aron	13	Kottappuram	Heart Problem	Food & Mental Support
48	Alma	10	Kottappuram	Heart Problem	Food & Mental Support

Annexure IV

Compliance to Conditions of KCZMA Recommendation

Annexure IV

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendation for Environment and CRZ Clearance (EC) for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
(i)	The developmental works and the construction of the structures may be undertaken as per the plans approved by the concerned local Authorities, local administration, conforming to the existing local and central rules and regulations including the existing provisions of CRZ Notification.	**Complied** All the construction activities are being carried out as per existing Central/local rules. Necessary permissions under CRZ Notification 2011 & its amendments have been obtained. Further, necessary approvals from concerned Statutory Departments/Agencies have been obtained for the construction designs/drawings relating to construction activities as mentioned hereunder: • Consent to Establish (CTE) No. PCB/HO/TVM/ICE/08/2015 dated 15.09.2015 valid up to 31.07.2018 was renewed from State Pollution Control Board vide Consent No. PCB/HO/TVM/ICE-R/02/2018, dated 19.07.2018 valid up to 31.07.2023. • Airport Authority of India NOC vide NOC no AAI/SR/NOC/RHQ dated 7.12.2015. • CTE for consumer pump inside the Vizhinjam port premises was obtained on 07.03.2021 (Consent No.: PCB/TVM-DO/NTA/PTP/15/2021) for the period of 5 years valid up to 28.02.2026. • Consent to Operate (CTO) for Explosives Storage at Chappath area was obtained on 20.07.2021 (Consent No.: PCB/TVM-DO/ICO/NTA/HCS/49/2021) valid up to 31.12.2024. • As per the exemption granted by GoK G.O. No. 310/2015/LSGD dated 01/10/2015, AVPPL is not required to obtain any further building permits/permission to construct port related building within the port premises.
(ii)	Since the project envisages development of roads, infrastructural facilities, dredging of the lake and kayals proper environmental safety measures must be ensured.	**Complied** All safety measures are being adopted. Full time Environment & Safety professionals are employed by AVPPL, contractors & subcontractors to oversee the implementation of environmental safety measures. Organizational Structure for Environment, Health, and Safety (EHS) & CSR for construction phase is enclosed as **Annexure VIII**. All work plans are

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendation for Environment and CRZ Clearance (EC) for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		executed after assessing the defined EHS plans. It is also submitted that dredging of lakes or kayals are not envisaged as part of this project.
(iii)	The project proponent must obtain necessary clearance separately from the Kerala State Pollution Control Board, Health Department and other appropriate Authorities when such implementation programmes are undertaken.	**Complied** CTE has been obtained from Kerala State Pollution Control Board vide Consent No. PCB/HO/TVM/ICE/08/2015, dated 15.09.2015 valid up to 31.07.2018. Subsequently, the CTE was renewed vide Consent No. PCB/HO/TVM/ICE-R/02/2018 dated 19.07.2018 valid up to 31.07.2023.
(iv)	The construction should be undertaken, if any with least damages to the existing mangroves. A buffer zone of 50m shall be provided for mangroves present in the area.	**Not Applicable** There are no mangroves in the vicinity of the project area.
(v)	The project proponent must take necessary arrangements for disposal of solid wastes and for the treatment of effluents / wastes. It must be ensured that the effluents/solid wastes are not discharged into the backwater area/sea.	**Being Complied** As prescribed in EIA during construction stage, the contractors have been made responsible for management of Solid Waste. Necessary arrangement has been made for collection, segregation and disposal of Solid Waste as per Solid Waste Management Rules, 2016, as amended. A dedicated integrated solid waste management facility is planned which will be constructed along with project. No solid waste is being disposed of in the CRZ area. Currently no effluent is generated. Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner is being planned and will be implemented in line with CRZ Notification along with the commissioning of the project.
(vi)	The project proponent should provide necessary facilities for official of the Kerala Coastal	**Being Complied** NGT Expert committee and Shoreline monitoring cell visited the site visited the site on 21.10.2021 during

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendation for Environment and CRZ Clearance (EC) for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
	Zone Management Authority (KCZMA) for inspection of the project site and its premises at any time.	the compliance period. All necessary facilities/support was extended to the officials during the compliance review/site visit; and the same will be provided during any future planned inspection of the project site. All necessary support will be extended to officials of KCZMA during inspection of the project/site visit; at any time.

(vii)	The KCZMA may be duly informed of any construction/developmental works/major activities undertaken in the CRZ area of the project	**Being Complied**
		• Member Secretary KCZMA is also the member secretary of NGT appointed committee; the committee meets every six months to review the compliance of Environmental & CRZ Clearance.
		• Regular meetings are held with officials of KCZMA to appraise them on various project related activities.
		• HYCRs are being furnished to KCZMA including the details of the development works.
		
		Following construction activities have taken place till March 2022:
		• No dredging was carried out during the compliance period from October 2021 to March 2022. The dredged material till 31.03.2022 amounting to 2.90 Mm^3 has been utilized for reclamation of 36 Ha area. The dredged material has been used for reclamation.
		• Berth Construction: Piling (617 nos.) and casting of pile muffs (617 nos.) have been completed.
		• Breakwater construction is in progress
		• Boundary wall work along available front has been completed at various locations; remaining construction work is, on hold due to local issues or not handed over to AVPPL due to disputes.
		• Following buildings construction work are completed:
		  ○ Gas Insulated Substation (GIS) substation
		  ○ Substation building (Inside port)

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendation for Environment and CRZ Clearance (EC) for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		○ Port Operations Building (POB) ○ Port Canteen ○ Toilet Block-2 ○ Training Room and Custom Check Building • Following construction work is in progress: ○ RMU buildings-yard ○ RMU buildings-berth ○ Workshop Building ○ Gate Complex ○ Driver Rest Room ○ DG Shed Building ○ Water Tank & Pump House ○ Security Building ○ Port User Building (PUB) Building ○ Parking Shed for fire tenders ○ Storm Water Drain ○ Yard Development ○ Approach Road ○ Paver Blocks ○ Electrical Works
(viii)	Environmental clearance must be obtained from the Ministry of Environment & Forests.	**Complied** Environment & CRZ Clearance (EC) has been obtained from Ministry of Environment & Forest vide MoEF letter dated 03.01.2014 (F.No.11-122/2011-IA.III). As per EIA Notification 2006 and Office Memorandum (O.M.) dated 12.04.2016, the validity of the EC is for seven years up to 03.01.2021. As per the provisions of MoEF&CC, the validity of the EC may be further extended for a maximum period of three years. VISL had submitted online application and required relevant documents on parivesh for extension of EC on 08.10.2020, 03.11.2020 and 19.11.2020. The Proposal (IA/KL/MIS/178082/2020) was considered in the 246th and 247th EAC meeting of Infra-1 committee of MoEF&CC held on 20.10.2020 and 23.11.2020; wherein VISL and NABET accredited consultant-L&T-

Half Yearly Compliance of Conditions Stipulated in KCZMA Recommendation for Environment and CRZ Clearance (EC) for the Period October 2021 to March 2022		
S. No.	**Conditions**	**Compliance Status as on 31.03.2022**
		IEL had made a presentation to the committee members. Thereafter, MoEF&CC vide letter No. IA/KL/MIS/178082/2020 dated 29.12.2020 (Copy of the same was submitted along with the compliance report for the period October 2020 to March 2021) have increased the validity of EC of Vizhinjam port by 3 years till 02.01.2024. Further, taking into account the outbreak of COVID-19 pandemic, MoEF&CC has amended the 2006 EIA Notification such that the period from the 01.04.2020 to the 31.03.2021 shall not be considered for the purpose of calculation of validity of existing ECs. Therefore, the EC of Vizhinjam port is valid till 02.01.2025.
(ix)	An adequate financial provision has to be made for environmental protection measures.	**Complied** A total of approx. Rs. 40 Crore has been set aside for environment protection measures as per the EIA report. Till date, an amount of Rs. 21.39 Crores has been spent on environmental protection measures. The activity wise fund break up and expenditure is enclosed as **Annexure VII**.
(x)	Scrutiny fee of Rs. 10,00,000/- (Rupees Ten lakh only) to be remitted under the head account 1425-800-97 applications for scrutiny fee etc. for CRZ clearance, in the district/Sub Treasury concerned, if private parties are involved in the project and the challan receipt in original be forwarded to the Science & Technology Department quoting this letter.	**Not Applicable** The condition is not applicable since the application for EC was submitted by Vizhinjam International Seaport Ltd. (VISL), a Government of Kerala (GoK) undertaking.

Annexure V

Compliance of the Commitments made during Public Hearing

Annexure V

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
1	Good compensation package for all livelihood issues have been included for all related PAPs for all affected sectors including the fisheries sector. Strict adherence to EMP compliance with all relevant rules and regulations will be done	**Being Complied** In consultation with the fishermen, enhanced livelihood compensation of Rs. 101.86 Crores was sanctioned by GoK, instead of Rs. 8.55 crores; as suggested earlier in the EIA stage. Till date an amount of Rs. 99.94 crores have been disbursed till 30.03.2022 for a total number of 2640 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free of cost as well during the port construction period. Verification of the documents of few balance LAPs is in progress. *(Source: VISL)* There are 5 identified EMP areas: Port Site, Road/Rail Corridor, Warehouse Area, PAF (Project Annex Facility) and Backup Areas. Recommendations of the construction stage EMP for these areas are being implemented and strict adherence to EMP compliance with all relevant rules and regulations is being done. Status of construction stage EMP in matrix format is enclosed as **Annexure VI**.
2	Land under the Jamaath which includes Karimppaly, Magham, Varuthari Pally, etc. need to be protected and should not be acquired.	**Complied** These lands have not been acquired.
3	Compensation for the land acquired (rail/road connectivity and back up areas) are paid promptly and any for additional land required also will be paid in the same way.	**Complied** Compensation for all the procured land has been disbursed along with R&R package. Same policy will be followed for the remaining extent of land acquisition also viz-a-viz applicable. *(Source: VISL)*
4	Additional fish landing centre will be constructed	**Being Complied** The work for construction of the fish landing centre (Rs. 16.00 crores) and the fishery breakwater (Rs. 131.12 crores) has been initiated as part of the funded work component of the concession agreement with AVPPL.

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		Based on CWPRS, Pune studies on tranquillity at the proposed new fishing harbour, the landing centre needs to be relocated after construction of an extension of seaward breakwater of the old fishing harbour. GoK is finalising the way forward to build the additional fish landing centre to facilitate the local fishermen. *(Source: VISL)*
5	Existing harbour will be improved under the CSR provisions of the project	**Being Complied** Tender for modernization of the existing fishing harbour was invited by Harbour Engineering Department (HED) and work awarded. However, the works could not be initiated due to sectoral protests among different fishermen groups. GoK have formed a high-level committee for finalising the master plan of the old fishing harbour in consultation with all stakeholders. *(Source: VISL)*
6	Fisherman will get first preference to cross the ship channel	**Will be Complied** Will be complied as per the applicable laws
7	GoK/VISL will monitor the shore line changes during construction and operational phases. If necessary, intervention to arrest erosion will be carried out.	**Being Complied** Based on the Shoreline Monitoring Plan prepared by L&T Infra Engineers Ltd (L&T IEL) under the guidance of National Institute of Ocean Technology (NIOT), Shoreline monitoring for a stretch of 40 km (20 km on both sides of the project site) is being done and reports are being regularly submitted to MoEF&CC as a part of the HYCR. Broadly the scope covers: • Wave Observations • Onshore Cross beach profiling • Offshore Cross beach profiling • Littoral Environmental Observations (LEO) • Beach Sampling • Multi-beam Echo Sounder (MBES) survey • River cross section surveys • Grab Sampling • Current Observations • Tide Observations • Weather Observations • Water Sampling • Turbidity Shoreline Monitoring Report for the period

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		October 2021 to March 2022 is enclosed as **Annexure I**. L&T IEL had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by NIOT. Five mathematical modelling reports have been prepared by L&T IEL so far and submitted to MoEF&CC; as detailed below: **Data Period** / **Submitted With HYCR for the Period** Feb 2015 to Feb 2017 — Apr 2017 to Sep 2017 Mar 2017 to Feb 2018 — Apr 2018 to Sep 2018 Mar 2018 to Feb 2019 — Apr 2019 to Sep 2019 Mar 2019 to Feb 2020 — Apr 2020 to Sep 2020 Mar 2020 to Feb 2021 — Apr 2021 to Sep 2021 From all the data analyses and model studies carried out by L&T IEL, it can be concluded that there was minimal variation on shoreline, beach morphology and water quality compared to the previous years and that the port construction has not caused any unnatural changes to these parameters in the vicinity of the port.
8	Water supply provision to the Vizhinjam fishing village	**Complied** Water Supply Scheme for provision to the local people has been commissioned in April 2013 by VISL by expending an amount of Rs. 8.10 crores. For Operation & Maintenance (O&M) of the same an amount of Rs. 5.38 crores has been spent up to 31.03.2021. From 04.04.2019 onwards, O&M of the scheme is being done by Kerala Water Authority (KWA). An additional amount of Rs. 1.74 Crores has been sanctioned and deposited by VISL to KWA to extend connections for drinking water supply facilities to the community at Kottapuram Village. The work is in progress by KWA. *(Source: VISL)*
10	Railway work will be initiated after Environment Clearance (EC)	**Will be Complied** Konkan Railway Corporation Limited (KRCL) has been engaged as a consultant for turnkey execution of the project. Out of the total rail

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		route length of 10.7 km, 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway. Geophysical and geomorphological studies and hydrogeological studies have also been completed. EC amendments in this regard is in process. *(Source: VISL)*
11	Job Opportunity - Preference will be given to local people during construction stage	**Being Complied** Preference is being given to local people based on Skill & competency during the construction stage. Out of an average of 442 persons (employees, staff and construction workers) engaged at site for different construction activities during the compliance period, 267 people are from Kerala and out of them 103 are from nearby wards of the project site.
13	Take all possible measures for judicial use of lighting system as part of the Green Port concept to reduce the carbon footprint	**Will be Complied** Is being considered with appropriate planning.
16	Waste management is included in the EMP and C&D waste management is part of the SWMP.	**Being Complied** Adequate budgetary provision has been kept for waste management as part of EMP as well as CSR. As mentioned in EIA, contractors have been made responsible for management of Waste. All contractors working at site are following the waste management practices in line to waste management rules 2016, as amended. A dedicated integrated solid waste management facility is planned which will be constructed along with project. Additionally, as a part of CSR activities, AVPPL are taking up activities with respect to solid waste management (Refer **Annexure III**).
17	Upgradation of PHC at Vizhinjam will be carried out	**Being Complied** The construction work of Community Health Center at Vizhinjam has been resumed after the COVID restrictions. The project cost is Rs. 7.79

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		Crores where the Government component of Rs. 4.82 Crores and CSR component of Rs. 2.97 Crores from Adani Foundation. Adani Foundation handed over the first instalment of Rs. 1.18 crores to the Harbour Engineering Department (HED) on 03.10.2018. **Community Health Centre, Vizhinjam**
19	Appropriate compensation will be given to the resort owners as per the regulatory advice of KCZMA and MoEF since the resorts are seen to be located in No Development Zone (NDZ) as per CRZ Notification 2011	**Being Complied** Resort owners evicted have been compensated for land and not for the structures since they were in violation of CRZ notification. Remaining land of 2.865 Ha to be acquired by Land Acquisition (LA) process for which notification has been published and action initiated by the District Collector Thiruvananthapuram. *(Source: VISL)*
20	Rail, Road, Coastal and Inland Waterways connectivity will be ensured to the rest of Kerala and other Indian Peninsula Ports	**Being Complied** This is one of the objectives of the project and this will be fully materialised once all phases of the project are implemented. Presently, development of dedicated road connectivity approach road (2.0 km) from the port to the NH-47 Bypass is in progress. For Railway Connectivity, Detailed Project Report (DPR) has been approved by Southern Railways for 10.7 km rail connectivity to Balaramapuram railway station through a tunnel. Hydrological, Geophysical and geomorphological studies have been completed. EC amendments in this regard

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S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		is in process. *(Source: VISL)*
21	Waste Management, Water Treatment plants, etc. will be part of an operational EMP	**Being Complied** Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner is being planned and will be implemented in line with CRZ Notification along with the commissioning of the project.
23	VISL will ensure that appropriate dredging and reclamation methodology as suggested in EIA report will be adopted to contain the turbidity within applicable limits.	**Being Complied** No dredging was carried out during the compliance period from October 2021 to March 2022. The dredged material till 31.03.2022 amounting to 2.90 Mm^3 has been utilized for reclamation of 36 Ha area. The dredged material has been used for reclamation. Turbidity buoys at 3 locations identified by NIOT had been deployed in the month of November 2019 and continuous monitoring was carried out to assess the real time turbidity. The turbidity details for the compliance period are given in **Annexure I**.
24	Appropriate measures relating to maintenance of health, hygiene, safety and security will be implemented as per EIA report	**Being Complied** Appropriate institutional mechanism for maintenance of health, hygiene, safety, security has been put in place. An officer of VISL has been designated as Head (EHS & CSR) for effective implementation of the stipulated EHS safeguards & CSR activities. AVPPL, the concessionaire executing the project has also appointed officers for EHS & CSR. In addition to the above, independent environment, health and safety consultants have been appointed as required in the concession agreement signed with AVPPL. Organizational Structure for Environment, Health, and Safety (EHS) & CSR for construction phase is enclosed as **Annexure VIII**. It is also ensured that contractors working at site also deploy EHS professional to implement suggested EMP measures. Proper provisions for maintenance of health, hygiene, safety, security for workforce has also been provided/ensured.
25	VISL will ensure that livelihood issues of Mussel	**Being Complied** Government Orders have been issued for

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	collectors are addressed as per the EIA report	disbursal of Rs. 12.65 Crore for 271 mussel collectors. Till date 262 Mussel collectors have collected the compensation amount totalling to Rs. 12.35 Crore. Although they were offered alternate livelihood plan through cage fishing, they opted for one-time settlement citing the risks involved in such fishing. The remaining 9 mussel collectors have not approached VISL for compensation. *(Source: VISL)*
26	VISL will ensure all the project components i.e., including road/rail connectivity are implemented in time. In addition the planned CSR and EMP measures will also be implemented and monitored to ensure the socio-economic development of the region.	**Being Complied** Refer point 20 above. CSR activities are detailed in **Annexure III**. Status of construction stage EMP in matrix format is enclosed as **Annexure VI**.
27	The implementation of the EMP/RAP/CSR will be ensured through the institutional and regulatory mechanism with regular monitoring and periodic compliance reports to the MoEF	**Being Complied** Refer point 24 above. Regular monitoring of Environment Parameters are being carried out. Detailed Monitoring Reports for the period October 2021 to March 2022 is enclosed as **Annexure II**. Half Yearly Compliance Reports (HYCRs) which are six monthly reports on the status of compliance of the stipulated clearance conditions including results of monitored data are regularly submitted to all the concerned regulatory authorities/agencies. As per the MoEF&CC Notification dated 26.11.2018, wherein submission of HYCRs by email/soft copy is declared acceptable, therefore the HYCR for the period April 2021 to September 2021 has been submitted to the MoEF&CC, Regional Office (Bangalore), Zonal office of the CPCB (Bangalore), KSPCB & KCZMA via email dated 29.11.2021 (a copy of the email is enclosed as **Annexure IX**).
28	Special care will be taken to	**Being Complied**

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	minimise the tree felling in the backup area and to plan the development in tune with the topography.	Being complied with the extent possible, but in line with the technical requirements of the project. Due permission is taken for tree felling from concerned department (Forest Department). AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School. The plantation is in third year of development.
31	The number of fishermen who will be temporarily affected in the Adimalathura stretch have been assessed and livelihood restoration measures have been framed for the construction period	**Being Complied** Earlier it was proposed that the fishermen at Adimalathura will be compensated for the construction period of three years, treating them as temporarily affected. However, based on the request of the fishermen (stating that demarcation of the shipping channel and movement of ships would affect them permanently) their compensation has been enhanced considering seven years of livelihood loss. The GoK order to this effect has been issued on 31.05.2018 and compensation has been disbursed to 600 eligible fishermen amounting to a total of Rs. 35.13 Crore. *(Source: VISL)*
33	An Area Development Plan (ADP) is being prepared by CEPT University (Ahmedabad) for planned development of the region to avoid haphazard development.	**Being Complied** The final Integrated Area Development Plan prepared through CEPT University, Ahmadabad in consultation with Town Planning, Tourism, Industry and other line departments was reviewed by the expert committee constituted by GoK. Tourism management plan would be discussed with tourism department for a way forward. *(Source: VISL)*
34	Maximum 3 ships are expected per day in phase I. Appropriate traffic mechanism to cross the ship channel for fisherman with	**Will be Complied** Restrictions on fishing will be as per the applicable laws.

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	first priority will be practised as is happening in Cochin Port where fishing harbour, container berth, navy, shipyard, inland water transport etc are co-existing	
36	Implementation of CSR measures and planned development of the region through well designed area development plan will arrest the formation of slums and the like.	**Being Complied** Details of CSR activities carried out during the compliance period are given in **Annexure III**. Refer point 33 above for area development plan.
37	"Inconvenience Allowances" during construction period of three years to the fisherman (As per EIA Report)	**Complied** An amount of Rs. 27.18 Crores have been sanctioned by the GoK as inconvenience compensation in the form of kerosene in November 2017. The entire Rs. 27.18 Crore has been given till 31.03.2022 to the disbursal agency identified for the work. *(Source: VISL)*
38	As per the Entitlement Framework, Hardship Allowance is suggested in the EIA/EMP for resort workers who lost their job due to acquisition of the resort	**Complied** Compensation for livelihood loss; Rs 6.08 Crores out of allocated Rs. 6.11 Crores has been disbursed to 211 out of 213 number of resorts workers and settled completely. The remaining two workers were unable to provide the requisite necessary documents and therefore could not be confirmed for disbursement. *(Source: VISL)*
40	Ensure that all EMP related aspects are properly implemented during construction and operational phase	**Being Complied** As the project is in construction stage, construction stage EMP is being implemented. Operation stage EMP will be implemented during operation stage. Refer **Annexure VI** for status of Construction stage EMP.
41	A dedicated port road directly connecting to NH-47 bypass is envisaged.	**Being Complied** This is part of the concession agreement and is in the process of being developed. Refer point 26 above.
43	The port project will not affect the inflow of Neyyar river and AVM canal	**Not Applicable** Not affected, since both are away from the project site.
44	The port road will be access controlled for the exclusive use of container and related	**Not Applicable** The port road will not be access controlled and connectivity for the local residents will not be

Compliance of the Response/Commitments made during Public Hearing		
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	port movements. The suggestion for a new approach road can be considered on technical feasibility and subject to surrendering of adequate land by the beneficiaries	affected.
46	Reconstruction of Roads in the nearby area- Adequate provisions have been made for the old fishing harbour and its linkage roads as it will be adopted as a part of best practice and beautification process	**Being Complied** Being complied on a routine basis through HED; the maintenance agency for the fishing harbour and the coastal road network.
47	The development of the warehouse area will be taken up	**Will be Complied** This is part of the proposed port estate development.
49	CSR activity suggested a skill development centre to equip the local people to adapt to the industrial needs of port/tourism and fisheries so that they can be appropriately employed based on their merit. However during construction period the EIA study has suggested to adequately employ local population to the maximum extent possible	**Being Complied** Additional Skill Acquisition Program (ASAP) is a GoK initiative aimed at imparting skill courses to students for improving their employability. No Objection Certificate (NoC) has been granted to ASAP to proceed with the construction of a Community Skill Park (CSP) in an area of 1.5 acres of land at Vizhinjam. It will operate on a PPP model wherein 25,000 sq. ft. building with facilities for students' hostel are being constructed by GoK under ASAP with ADB assistance, whereas the operation of the centre with logistics and other high-end courses is vested with Adani Skill Development Centre. Preference is being given to local people based on skill and competency during the construction stage. Tender for fixing transaction advisor has been invited. *(Source: VISL)* Preference is being given to local people based on Skill & competency during the construction stage. Out of an average of 442 persons (employees, staff and construction workers) engaged at site for different construction activities during the compliance period, 267 people are from Kerala and out of them 103 are

Compliance of the Response/Commitments made during Public Hearing		
S. No.	**Responses/Commitments**	**Status as on 31.03.2022**
		from nearby wards of the project site.
51	Only prohibited area for fishing is inside the breakwater. However fishing will be restricted along ship channel and port limits subject to safety norms and operational requirements.	**Will be Complied** Restrictions on fishing will be as per the applicable laws.
52	The existing notification of the Vizhinjam Port includes the Vizhinjam Fishing harbour. The revised Notification will include the Vizhinjam Deep Water Port based on revised Port limit provided in the EIA report. Except inside the breakwater of the Deep Water Port in all other areas of the port limit fishing is allowed with all safety and operational restrictions.	**Will be Complied** GoK notified the limits of the Vizhinjam International Deepwater Multipurpose Seaport and altered the limits of the existing Vizhinjam Port (Vizhinjam Fishing harbour) vide G.O. (P) No. 22/2019/F&D dated 21.05.2019. Vizhinjam fishing harbour is excluded from revised notification. Restrictions on fishing will be as per the applicable laws.
53	There will only be a movement of 8 barges per day during the construction period of 3 years and the same will not be a hindrance for the fisherman to cross since this is far less than the number of ships being crossed by them daily in the international ship channel.	**Noted for Compliance** Barge movement will be planned as per the requirements in such a way that it will not be a hindrance to fishermen.
56	The cruise terminal proposed in the project, will promote tourism in the Kovalam-Poovar belt and the region may become the cruise hub/tourism gate way of India in future	**Noted for Compliance** Once the first phase of port becomes operational, it would naturally attract cruise tourism. Based on the development of cruise business, dedicated cruise berths will be planned in a phased manner. Action is also being taken in consultation with the State tourism department, to design port linked tourism packages covering the Kovalam-Vizhinjam-Poovar tourism corridor.

Annexure VI

Status of Environment Management Plan

Annexure VI

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
1	Capital dredging	Marine water quality Marine ecology	○ Check turbidity levels with baseline levels as reference during entire monitoring programme ○ Preparation of Dredge/reclamation Management plan ○ Discharge of waste into sea will be prohibited ○ Oil Spill control measures will be adopted ○ Ensure that slop tanks will be provided to barges/ workboats for collection of liquid/ solid waste ○ Marine environmental monitoring as per environmental monitoring programme	**Being Compiled** ○ No dredging was carried out during the compliance period from October 2021 to March 2022. The dredged material till 31.03.2022 amounting to 2.90 Mm^3 has been utilized for reclamation of 36 Ha area. The dredged material has been used for reclamation. ○ Turbidity buoys at 3 locations identified by NIOT are carrying out real time turbidity measurement. ○ Dredging Management plan has been prepared ○ Discharge of waste into sea is prohibited ○ After duly incorporating the comments of Indian Coast Guard (ICG), the final facility Level Oil Spill Disaster Contingency Plan (OSDCP) in line with the National Oil Spill-Disaster Contingency Plan (NOS-DCP) has been submitted to ICG for approval vide letter No. AVPPL/ICG/2020-21/1134 dated 22.05.2020. After final review by PRT (West), ICG has made specific remarks on the compliance of OSDCP prepared in line with NOS-DCP guidelines; directing AVPPL to submit the OSDCP for approval only after pollution response equipment are in place. Considering that the procurement of pollution response equipment will be in line with the development of the port, the final OSDCP will be

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				○ submitted to ICG for approval prior to commissioning of the port; when the pollution response equipment are in place. ○ Marine Environmental Monitoring at 5 locations as per the Environment Monitoring Plan prescribed in EIA has commenced since August 2016, one additional marine water monitoring location has been added from October 2017 after suggestion from NGT committee and the parameters are comparable with baseline. ○ Six monthly monitoring reports are regularly submitted to regulatory authorities as a part of Half Yearly Environmental & CRZ clearance Compliance Reports (HYCRs).
2	Material transport and construction activities	Air Quality	○ Most of the Breakwater stones will be transported from the quarries to the nearest harbour. From there through Barges it will be transported to project site. This is will avoid substantiate flow of Heavy Vehicles during construction Phase thereby minimizing impact on Air and Noise Quality in the project region. ○ To reduce impacts from	**Being Complied** ○ Rock placing for breakwater construction is being undertaken using the stones brought through barges from nearby harbours (Kollam and Muthulapuzhi). ○ It is ensured that all vehicles entering the Port have a valid PUC certification ○ Adequate sized construction yard has been provided for storage of construction materials, equipment tools, earthmoving equipment, etc. ○ The dumpers have speed governors ensuring adherence to speed limit ○ Signage for speed control are displayed inside port area

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			exhausts, emission control norms will be enforced / adhered. o All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards o Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt o Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment etc. o Provide enclosures on all sides of construction site o Movement of material will be mostly during non-peak hours. o On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic o Water sprinkling will be carried	o Water sprinkling is carried out for supressing dust o It is ensured that all trucks transporting material are covered by tarpaulin. o Regular awareness programme on various Environment aspects is being imparted to workers and employees.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			out to suppress fugitive dust ○ Environmental awareness program will be provided to the personnel involved in developmental works ○ Use of tarpaulin covers and speed regulations for vehicles engaged in transportation	
		Noise	○ Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB ○ Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A) ○ Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used ○ Any equipment emitting high noise, wherever possible, will be	**Being Complied** ○ Noise levels are being monitored every fortnight and are found to be well within the permissible limits within the project area. ○ Contractors are also monitoring the Noise level in their work area and results are within the stipulated limits. ○ Protective gear like earplugs, muffs are provided to workers exposed to noise level beyond threshold limits. ○ Acoustic Barriers and Enclosures shall be set up wherever necessary for noisy equipment. ○ No pilling activity carried out during the compliance period from October 2021 to March 2022. ○ No dredging activity carried out during the compliance period from October 2021 to March 2022.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			oriented so that the noise is directed away from sensitive receptors ○ Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers ○ High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts ○ Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. ○ Ambient noise levels will be monitored at regular intervals	
		Disturbance to Natural Drainage pattern	○ Port development is mostly on reclaimed land ○ Rainwater/surface water harvesting pond included in design ○ Existing drainage near port boundary (backup area) will be	**Being Complied** ○ Measures have been taken for maintaining the natural flow of the streams debouching in the construction site, by laying drain pipes beneath the temporary road. ○ A study has been conducted to access the rainwater harvesting potential and recommend for planning accurate, successful and implementable rainwater

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			integrated with port storm water drainage & management plan o Existing drains / Streams that are passing in ware house area will not be closed/ diverted. And these streams will be de-silted and enhanced to improve their carrying capacities	harvesting management system within the proposed sites for the sustainable development of existing groundwater resources and thereby suitable rainwater harvesting structures are recommended. In order to capture, store and reuse a percentage of the estimated runoff, rainwater collection and storage sumps are recommended at suitable locations. o Provision for installing Sewage Treatment Plant (STP) facility of adequate capacity in phased manner is being planned and will be implemented in line with CRZ Notification along with the commissioning of the project. o Drains/streams passing through the warehouse area are not closed/diverted.
		Vegetation and Strain on existing infrastructure	o Port development is planned mostly on reclaimed land; o Land use at backup area, PAF Zone and warehouse area will be mostly coconut plantation and low mixed plantation o Adequate green belt will be developed in port and its associated (backup area, PAF, warehouse and road & rail connectivity).	**Being Complied** o Care is taken to limit the felling of trees to the bare minimum. Due permission is taken for trees being cut down as a result of the port development from concerned department (Forest Department). o AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). The plantation is now in its

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			○ Temporary workers camp with self-sufficient infrastructure facilities.	Third Year. Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School. ○ Plantation of saplings along the road margins, road medians and port boundary are being carried out as part of the master plan development/greenbelt development plan. ○ Presently, during the present compliance period, the contractors have demobilized and there are no workers residing in the labour camps. It is ensured that labourers who are staying outside the labour camps are provided with necessary infrastructure facilities.
		Existing Traffic	○ NH-47 bypass under construction around 2.0 km from the proposed Port site and the Transportation of construction materials will be carried out during non- peak hours. Hence a dedicated road of 45 M RoW is proposed to connect site with NH Bypass ○ Regularization of truck movement ○ Majority of rock for breakwater construction will be transported through sea route via barges from nearby quarry sites	**Being Complied** ○ Presently, development of dedicated road connectivity approach road (2.0 km) from the port to the NH-47 Bypass is in progress. ○ Traffic monitoring & regularization is being carried out for maximum efficiency. ○ Transportation of construction materials is being carried out taking into account the non-peak traffic timing and local restrictions during festivals, strikes, etc. ○ Rock placing for breakwater construction is being carried out using the stones brought through barges from nearby harbours (Kollam and Muthulapuzhi).

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			○ A dedicated rail network of approximately 15 km is proposed from port to Nemom railway station	○ Konkan Railway Corporation Limited (KRCL) has been engaged as a consultant for turnkey execution of the project. Out of the total rail route length of 10.7 km, 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report (DPR) has been approved by Southern Railway. Geophysical and geomorphological studies and hydrogeological studies have also been completed. EC amendments in this regard is in process. *(Source: VISL)*
3.	Land Reclamation	Existing Water Resources like Groundwater and surface water	○ Land to be reclaimed will be separated from adjoining land by creating containment bund. ○ Return sea water will be sent back to sea through appropriate channels.	**Being Complied** ○ No dredging was carried out during the compliance period from October 2021 to March 2022. The dredged material till 31.03.2022 amounting to 2.90 Mm^3 has been utilized for reclamation of 36 Ha area. ○ The dredged material has been used for reclamation. ○ During dredging return sea water is sent back to sea through appropriate channels. ○ The existing drains are maintained for unhindered disposal of surface drainage water.
4.	Solid Waste Management	Soil quality	○ Construction waste will be used within port site for filling of low lying areas. ○ Composted bio-degradable waste will be used as manure in	**Being Complied** ○ Construction waste is used within port site for filling of low lying areas in line to C&D Waste Management Rules 2016, as amended. ○ Contractors working at the site have been made

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			greenbelt. ○ Other recyclable wastes will be sold. ○ Excavated soil at backup, PAF Zone and ware house area will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. ○ General refuse generated on-site will be collected in waste skips and separated from construction waste. ○ Burning of refuse at construction sites will be prohibited. ○ All control measure will be taken to avoid the contamination of groundwater during construction phase	responsible for management of Solid Waste during construction stage. They are complying with the provisions pertaining to management of Solid Waste in line to Solid Waste Management Rules 2016, as amended. ○ An Organic Waste Converter (OWC) has been installed at site and is operating for bio-degradable waste; output is being used as manure in greenbelt development. ○ General refuse waste is being stored separately and sent to approved recyclers and/or sold. ○ No burning of refuse at construction sites is being done. ○ There is no disposal of waste in the project area which may lead to groundwater contamination.
5.	Handling of hazardous wastes	Human safety and property loss	○ Adequate safety measures as per OSHA standards will be adopted ○ Construction site will be secured by fencing with controlled/limited entry points. ○ Hazardous materials such as	**Being Complied** ○ Adequate safety measures as per OSHA standards are adopted as and when necessary as per the HSE Plan. ○ Construction site is being secured by fencing wherever possible with controlled/limited entry points. Boundary wall construction is ongoing at available fronts. ○ Medical facilities including first aid are available for

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			lubricants, paints, compressed gases, and varnishes etc., will be stored as per the prescribed/approved safety norms. ○ Medical facilities including first aid will be available for attending to injured workers. ○ Handling and storage as per statutory guidelines. ○ Positive isolation procedures will be adhered ○ Hazardous wastes will be disposed through approved KSPCB/CPCB vendors.	attending to injured workers. Ambulance is also available at site for shifting the injured to the nearby hospitals. ○ Handling and storage of Hazardous Materials is being done as per statutory guidelines. ○ Hazardous waste is disposed through approved KSPCB/CPCB vendors.
6.	Water Resources	Water scarcity / Pollution	○ Water requirement during the construction is expected to be around 0.10 MLD ○ Water will be sourced from Vellayani lake ○ Avoid/minimise the loss during conveyance ○ Optimized utilization of the water ○ Care will be taken to prevent the	**Being Complied** ○ KWA set up a 3.00 MLD water supply scheme for the project with the source of water being Vellayani Lake. The net availability of treated water from this supply scheme is 2.49 MLD of potable water out of which 1.49 MLD of water shall be distributed to the local people as part of social welfare measures of VISL. The balance 1.0 MLD was to be used for port related activities. However, at present, the entire treated water from the scheme is

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			runoff from the construction site to the nearby natural streams, if any	being utilised by the community. o The water for construction purposes for the port is being sourced from the open market/private suppliers. On an average about 50 KLD water is being consumed for construction related activities during the compliance period (October 2021 to March 2022). o Care is being taken to prevent the runoff from the construction site to the nearby natural streams.
7.	Fishing	Fishermen and fishing villages	o Signboards will be placed at the construction activities in order to make fishermen aware of the ongoing construction activities o Necessary marker buoys will be installed o Interactions will be initiated with the fishing community before commencement of construction works	**Being Complied** o Signboards have been placed for demarcation of construction area. o Navigational buoys/marker buoys are placed in the marine area for fishing boats to maintain a safe distance from the areas of breakwater construction. o Using the technological advancement the dedicated CSR team of AVPPL are in constant touch with the fishermen/fishing community members to facilitate the flow of various project related information/updates. o AVPPL CSR team also provides regular updates to the committee which has been formed by the local church representatives adjoining to the port area, who in turn pass on port project execution information to the fishermen.
8.	Tourism	Effect on tourism	o Tourism activity is observed at	**Being Complied**

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			Kovalam located about 2.0 km towards the North of Proposed Port. Mathematical Modelling studies on shoreline changes show the insignificant impact due to the port development on the existing coastline. However, the Shoreline monitoring during construction as well as operation Phases were proposed. ○ A cruise terminal and related facilities is part and parcel of the project. This is to largely compensate the losses made ○ For all acquired properties and land adequate compensation will be provided based on legally valid documents	○ The tourism activity in the nearby Kovalam area is not impacted by the construction of the port. ○ Shoreline monitoring for a stretch of 40 km (20 Km on both sides of the project site) is being done and reports are regularly submitted to regulatory authorities. ○ Once the first phase of port becomes operational, it would naturally attract cruise tourism. Based on the development of cruise business, dedicated cruise berths will be planned in a phased manner. Action is also being taken in consultation with the State tourism department, to design port linked tourism packages covering the Kovalam-Vizhinjam-Poovar tourism corridor ○ Resort owners evicted have been compensated for land and not for the structures since they were in violation of CRZ notification. Remaining land of 2.865 Ha to be acquired by Land Acquisition (LA) process for which notification has been published and action initiated by the District Collector Thiruvananthapuram. *(Source: VISL)*
9	Breakwater	Change in shoreline	○ Shoreline monitoring shall be carried out ○ Suitable Shoreline protection measures will be implemented based on the observations	**Being Complied** ○ Comprehensive Shoreline Monitoring is being carried out under the technical Guidance of NIOT and Six monthly monitoring reports are being submitted regularly as part of EC & CRZ Compliance. The existing

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				Shoreline Monitoring consists of: ○ Wave Observations ○ Onshore Cross beach profiling ○ Offshore Cross beach profiling ○ Littoral Environmental Observations (LEO) ○ Beach Sampling ○ Multi-beam Echo Sounder (MBES) survey ○ River cross section surveys ○ Grab Sampling ○ Current Observations ○ Tide Observations ○ Weather Observations ○ Water Sampling ○ Turbidity Measurements ○ L&T Infrastructure Engineering Ltd. (L&T IEL) had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by National Institute of Ocean Technology (NIOT). ○ Several mathematical modelling reports have been prepared by L&T IEL so far and submitted to MoEF&CC. These mathematical modelling reports have affirmed that the shoreline change is in line with prediction in the EIA study. As per these reports, from all the data analyses and model studies carried out by L&T IEL, it

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				can be concluded that there was minimal variation on shoreline, beach morphology and water quality compared to the previous years and that the port construction has not caused any unnatural changes to these parameters in the vicinity of the port.
10	Effect on existing fishing harbour	Movement of fishing boats	○ Detailed modelling studies have been carried out on tranquillity conditions in the fishing harbour with port development. The studies reveal that the tranquillity conditions will be improved in fishing harbour with construction of the port. Further minor accretion happening within the fishing harbour will be arrested ○ Traffic of Marine vessel/ fishing boats will be planned without affecting each other ○ Adoption of fishing harbour to manage it to perform as per International standard ○ A new fishing harbour provided under CSR	**Being Complied** ○ Wave, current and tide data are being monitored along with the shoreline monitoring of 40 km stretch. Based on the above, the modelling studies done at the EIA stage has been further evaluated. ○ During operation phase traffic of Marine vessel/fishing boats will be planned without affecting each other as per the applicable laws. ○ The work for construction of the fish landing centre (Rs. 16.00 crores) and the fishery breakwater (Rs. 131.12 crores) has been initiated as part of the funded work component of the concession agreement with AVPPL. ○ Based on CWPRS, Pune studies on tranquillity at the proposed new fishing harbour, the landing centre needs to be relocated after construction of an extension of seaward breakwater of the old fishing harbour. GoK is finalising the way forward to build the additional fish landing centre to facilitate the local fishermen. *(Source: VISL)*

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			initiatives because of additional tranquillity creator. ○ Loss of livelihood will be either taken care of in the new port premises or adequately compensated mostly in the form of employment	○ In consultation with the fishermen, enhanced livelihood compensation of Rs. 101.86 Crores was sanctioned by GoK, instead of Rs. 8.55 crores; as suggested earlier in the EIA stage. An amount of Rs. 99.94 crores have been disbursed till 31.03.2022 for a total number of 2640 Livelihood Affected Persons (LAPs) whose verification was complete in all respects; this includes boat owners to whom kerosene is supplied free of cost as well during the port construction period. Verification of the documents of few balance LAPs is in progress. *(Source: VISL)*
11	Shoreline changes	Erosion/accretion	Final shoreline Impact management plan will be prepared in consultation with agencies like CESS/INCOIS, NGO and local bodies and will implemented.	**Being Complied** ○ NIOT has been engaged to give technical advice on aspects related to shoreline monitoring & shoreline evolution. ○ Comprehensive Shoreline Monitoring is being carried out under the technical Guidance of NIOT and six monthly monitoring reports are being submitted regularly as part of EC & CRZ Compliance. ○ Wave, current and tide data are being monitored a 40 km stretch. ○ L&T IEL had prepared Mathematical Modelling Reports based on Shoreline Monitoring data; which were vetted by NIOT.

Status of Environment Management Plan-Port Site-Construction Stage Potential Impacts and Mitigation Measures of Various Project Activities				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				○ Several mathematical modelling reports have been prepared by L&T IEL so far and submitted to MoEF&CC. These mathematical modelling reports have affirmed that the shoreline change is in line with prediction in the EIA study. As per these reports, from all the data analyses and model studies carried out by L&T IEL, it can be concluded that there was minimal variation on shoreline, beach morphology and water quality compared to the previous years and that the port construction has not caused any unnatural changes to these parameters in the vicinity of the port.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
1	Environmental Management and Monitoring Facility Equipment for EMP (Meters, Vehicles and Buildings)	○ This will include institutional requirements, training, environmental management and monitoring. Provision for purchasing required equipment.	**Noted for Compliance** ○ An Environment Management Cell has been established to look after day to day affairs like Monitoring, Training ○ Appropriate institutional mechanism for maintenance of health, hygiene, safety, security has been put in place. An officer of VISL has been designated as Head (EHS & CSR) for effective implementation of the stipulated EHS safeguards & CSR activities. AVPPL, the concessionaire executing the project has also appointed officers for EHS & CSR, Horticulture. In addition to the above, independent environment, health and safety consultants have been appointed as required in the concession agreement signed with AVPPL. Organizational Structure for Environment, Health, and Safety (EHS) & CSR for construction phase is enclosed as **Annexure VIII**. ○ It is also ensured that contractors working at site also deploy EHS professional to implement suggested EMP measures. Proper provisions for maintenance of health, hygiene, safety, security for workforce in labour colony has also been provided/ ensured. ○ Necessary equipment will be purchased; adequate provisions have been made in the budget for the same. ○ Third party environmental monitoring has commenced since August 2016 and the monitoring results are satisfactory.
2	Altered Road	○ Retaining walls and gabions should be provided	**Noted for Compliance** ○ AVPPL had awarded the work to Kerala State Remote

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
	embankment		Sensing and Environment Centre (KSREC) to undertake study on Groundwater impact due to construction of port approach road. ○ KSREC have studied the impact due to construction of port approach road. ○ Recommendations of KSREC are being implemented and suitable mitigation measures as suggested in the KSREC report are being adopted during construction.
3	Dust	○ Water should be sprayed during the construction phase, at mixing sites, and temporary roads. ○ In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to prevent dust. ○ Vehicles delivering materials should be covered to reduce spills and dust blowing off the load.	**Being Compiled** ○ Regular Water Sprinkling is done on the approach road by water tankers. ○ Water spraying is carried out at regular intervals after compaction ○ Tarpaulin cover is used in vehicles delivering materials.
4	Air Pollution	○ Vehicles and machinery are to be maintained so that emissions conform to National and State standards. ○ All vehicles and machineries should obtain Pollution Under Control Certificates (PUC).	**Being Complied** ○ Ambient air quality monitoring is carried out at 5 locations as per the Environment Monitoring Plan prescribed in EIA and has commenced since August 2016, the results obtained are within the limits prescribed by National Ambient Air Quality Standards (NAAQS) ○ It is ensured that all vehicles entering port have Pollution

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
			Under Control (PUC) Certificate.
5	Noise	○ Machinery and vehicles will be maintained to keep their noise to a minimum. ○ Construction of noise barriers of an average length of 100m and eight feet height wherever necessary. ○ Proper maintenance of the rail track and rail wagon, by frequent lubrication to avoid frictional noise. ○ Regular monitoring shall be carried out as per the Environmental Monitoring Plan.	**Being Compiled** ○ All the machinery and vehicles are maintained to keep the noise at minimum ○ Noise monitoring is being done since August 2016, and the readings are within the limits at port site ○ Regular monitoring of ambient Noise is carried out since August 2016 as per the Environmental Monitoring Plan prescribed in EIA and results are within the prescribed limit at port site.
6	Loss of low lying land and ponds	○ Impacted ponds can be enhanced by constructing bridged structures like Gabions to avoid plugging of springs. ○ Mitigation/Compensation shall be affected for the completely impacted ponds. ○ At Chainage km 6.500 the Railway alignment goes below the Existing NH and then at km 6.600 it will hit pond. The pond will be excavated partially and the soil material shall be used to fill in the western part and an equivalent area lost may be excavated to compensate the loss of effective pond area.	**Will be complied** ○ AVPPL had awarded the work to KSREC to undertake study on Groundwater impact due to construction of port approach road and also suggest mitigation measures. ○ For impacted ponds in road alignment an elevated road is planned as suggested by KSREC. Other suitable mitigation measures as suggested in the KSREC report will be adopted during construction. ○ Konkan Railway Corporation Limited (KRCL) has been engaged as a consultant for turnkey execution of the project. Out of the total rail route length of 10.7 km, 9.0 km is planned to be passing through an underground tunnel to minimize the disturbance to the local population. Detailed Project Report

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
			(DPR) has been approved by Southern Railway. Geophysical and geomorphological studies and hydrogeological studies have also been completed. EC amendments in this regard is in process. *(Source: VISL)*
7	Flood Impacts and Cross Drainage Structures	○ Formation level should be raised according to the design and the cross drainage structures suitably planned for the flood events.	**Being Complied** ○ During the construction, care was taken such that the formation level is as per suitable design and the cross drainage structures are also being implemented.
8	Alteration of drainage	○ In sections along watercourses, earth and stone will be properly disposed of so as not to block rivers and streams, thereby preventing any adverse impact on water quality. ○ All necessary measures shall be taken to prevent earthworks and stone works from impeding cross drainage at streams and canals or existing irrigation and drainage systems in conformity to the Contractors visual integration and management plan and EMP.	**Will be Complied** ○ AVPPL had awarded the work to KSREC to undertake study on Groundwater impact due to construction of port approach road and also suggest mitigation measures. ○ For impact on water quality, suitable mitigation measure as suggested in the KSREC report will be adopted.
9	Contamination from Wastes	○ All justifiable measures will be taken to prevent the wastewater produced during construction from entering directly into rivers and irrigation systems.	**Being Complied** ○ Measures are being taken up to prevent the wastewater produced during construction from entering directly into rivers and irrigation systems. ○ An STP will be developed along with the port and the

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
			○ sewerage and storm water flow from two streams near the port will be treated in the proposed STP. ○ No waste water is disposed into the water bodies.
10	Borrow pits	○ Borrow pits are to be identified, opened and closed after consultations and proper documentation.	**Will be Complied as and when required**
11	Quarrying and Material sources	○ Quarrying will be carried out at approved and licensed quarries only.	**Will be Complied** The road constructed so far has been made with material available on site.
12	Soil Erosion and Soil Conservation	○ On slopes and other suitable places along the two proposed corridors, trees and grass should be planted. ○ On sections with filling and deep cutting their slopes should be covered by sod, or planted with grass, etc. ○ If existing irrigation and drainage system, ponds are damaged, they will be suitably repaired. ○ Retaining walls and gabions shall be suitably provided.	**Will be Complied** ○ AVPPL had awarded the work to KSREC to undertake study on Groundwater impact due to construction of port approach road. KSREC has submitted the final report with recommendations and AVPPL is in the process of constructing the approach road to port. ○ Suitable mitigation measures as suggested in the KSREC report will be adopted during construction.
13	Loss of agricultural topsoil	○ Arable land should not be used for topsoil borrowing. ○ Topsoil will be kept and reused after excavation is over. ○ Any surplus to be used on productive	**Being Complied** ○ Arable land is not being used for topsoil borrowing ○ The topsoil excavated is being stored and will be reused during development of greenbelt.

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
		agricultural land.	
14	Compaction of Soil and Damage to Vegetation	○ Construction vehicles should operate within the Corridor of Impact avoiding damage to soil and vegetation.	**Being Complied** ○ Construction vehicles are being operated only alongside the road boundary; thereby avoiding damage to soil and vegetation.
15	Loss of trees and Avenue Planting	○ Areas of trees cleared will be replaced according to Compensatory Afforestation Policy under the Forest Conservation Act - 1980. ○ Landscaping shall be done at major junctions.	**Being Compiled** ○ AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). The plantation is now in its Third Year. Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School. ○ Plantation of saplings along the road margins, road junctions and road medians are being carried out as part of the master plan development/greenbelt development plan.
16	Vegetation clearance	○ Tree clearing within the ROW should be avoided beyond that which is directly required for construction activities and/ or to reduce accidents. ○ Especially in plantation and house garden areas both along road and rail alignment.	**Being Complied** ○ Care is taken to limit the felling of trees to the bare minimum. ○ Due permission is taken for trees being cut down as a result of the port development from concerned department (Forest Department).
17	Fauna	○ Construction workers should protect natural resources and animals. Hunting of	**Being Complied** ○ Regular awareness sessions are conducted for the

Environmental Management Plan – Rail*/Road Corridors *No Construction work was carried out during the compliance period in the rail corridor			
S. No.	**Environmental Impacts and Issues**	**Mitigation Measures**	**Status as on 31.03.2022**
		birds and other local animals is prohibited.	construction workers regarding importance of natural resources and animals. ○ Hunting of birds & other local animals is strictly prohibited
18	Traffic Jams and congestion	○ If there is traffic congestion during construction, measures should be taken to relieve it as far as possible with the co-operation of the traffic police.	**Being Complied** ○ In order to avoid traffic congestion, if any, during the construction of the road, measures will be taken to relieve it as far as possible with the co-operation of the traffic police.
19	Health and Safety	○ All contractors' staff and workers must wear high visibility purpose made overalls or trousers/waist coat at all times. All operators working with any materials above head height (even in trenches) must wear hard hats all at times on the worksite.	**Being Compiled** ○ All the workers are provided with Personal Protective Equipment's (PPE) and it is ensured that they wear it all the time ○ Also all the contractors working at site have a dedicated health and safety person to oversee the work carried out.
20	Pollution of Streams parallel or along the alignments	○ Construction material/waste should be disposed of properly so as not to block or pollute streams or ponds with special attention to confining concrete work.	**Being Complied** ○ Construction materials/waste are being disposed properly; so as not to block or pollute streams or ponds.
21	Cultural Remains	○ Construction should be stopped until authorised department assess the remains to preserve Archaeological relics and cultural structures like Temples, mosques and churches. ○ Archaeologists will supervise the excavation to avoid any damage in the relics.	**Will be Complied** ○ A cultural heritage management plan including a procedure to be followed in case of chance find is being prepared. Same will be implemented for preservation of Archaeological sites and any cultural/archaeological structure found.

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
1	Material transport and construction activities	Air Quality/Dust	○ To reduce impacts from exhausts, emission control norms will be enforced / adhered. ○ All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards. ○ Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt. ○ Providing adequately sized construction yard for storage of construction materials, equipment, tools, earthmoving equipment, etc. ○ Provide enclosures on all sides of construction site ○ Movement of material will be mostly during non-peak hours. ○ On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic ○ Water should be sprayed during the construction phase, at mixing sites, and temporary roads. ○ In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried	**Complied** ○ Monthly Environment Monitoring is being carried out and all the parameters are within the stipulated limit ○ It is ensured that all vehicles entering the area have a valid PUC certification ○ It is ensured that all the vehicles entering the site are following speed limit ○ Tarpaulin cover is used in vehicles ○ Water sprinkling is carried out to arrest dust generation. ○ Environment awareness programs are being carried out for staff/contractors on a regular basis.

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			out at regular intervals to prevent dust. ○ Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. ○ Environmental awareness program will be provided to the personnel involved in developmental works. ○ Use of tarpaulin covers and speed regulations for vehicles engaged in transportation.	
		Noise	○ Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB. ○ Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A). ○ Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used ○ Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors. ○ Noise attenuation will be practiced for noisy equipment by employing suitable techniques	**Complied** ○ Ambient Noise is being monitored fortnightly for Day & Night time and results are within the prescribed limit. ○ Construction equipment machinery procurement is done in accordance with specifications conforming prescribed standard. ○ Personnel engaged in construction activity are provided with appropriate PPE's (Earplugs/muffs)

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			such as acoustic controls, insulation and vibration dampers. ○ High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimize noise impacts. ○ Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. ○ Ambient noise levels will be monitored at regular intervals	
2	Construction of Buildings, Roads, Sheds, etc.	Vegetation and Strain on existing infrastructure	○ Most of the land is covered with coconut trees and few other trees. Trees that are cut down will be accounted for and the same no. of trees of the same or some other species will be replanted at another location to compensate for the loss of greenery.	**Being Complied** ○ Care is taken to limit the felling of trees to the bare minimum. Due permission is taken for trees being cut down as a result of the port development from concerned department (Forest Department). ○ AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). The

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				plantation is now in its Third Year. Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School.
		Water Environment	○ The streams 1 and 2 will be made to avoid entering the warehouse area by diverging them into the Karichal River. ○ A tunnel like arrangement with RCC structures will be used so as to not affect the streams (3 and 4) that will go through the warehouse area. The streams will be made to go under the warehouse areas through the tunnel. ○ Another option is to divert the stream through the boundary ○ An application has been filed with the irrigation department for permission.	**Will be Complied** ○ Will be appropriately planned in consultation with the concerned departments
			○ The low lying area in the region is already made use by the local people, and has been degraded. There are no active ecological systems in the area. As far as possible, during operation phase the network of streams that add to the low lying area of the region will be diverted or channeled under the constructed buildings to avoid impact to the low lying area.	**Will be Complied** ○ Will be appropriately planned in consultation with the concerned departments

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			○ Filling of low lying areas (if required) shall be done	
			○ Construction waste such as cement, paint, and other construction waste will flow into the downstream parts of the streams and Karichal River. Construction will be avoided during rainy season. Good housekeeping practices, such as cement being stored in dry areas will be taken care of. Labour camps will be provided with proper support services.	**Will be Complied**
		Disturbance to Natural Drainage pattern	○ As mentioned above, formidable measures will be taken to avoid the disturbance to the natural flow of water. If some structure or building comes in the way of the existing flow of water, the flow will be redirected to the closest stream in the drainage pattern. ○ In sections along watercourses, earth and stone will be properly disposed of so as not to block rivers and streams, thereby preventing any adverse impact on water quality. ○ All necessary measures shall be taken to prevent earthworks and stone works from impeding cross drainage at streams and canals or existing irrigation and drainage systems in	**Will be Complied**

Environment Management Plan – Warehouse Area* (Construction Phase) *Minimal work was carried out in Warehouse area during compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			conformity EMP.	
		Existing Traffic	○ Transportation of construction materials will be carried out during non- peak hours. ○ Regularization of truck movement. ○ Existing roads shall be strengthened and shall be used for the construction material transportation.	**Will be Complied**
3	Solid Waste Management	Soil quality	○ Construction waste will be used within warehouse site for filling of low lying areas. ○ Composted bio-degradable waste will be used as manure in greenbelt. Other recyclable wastes will be sold. ○ Excavated soil will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. ○ General refuse generated on-site will be collected in waste skips and separated from construction waste. ○ Burning of refuse at construction sites will be prohibited.	**Will be Complied**

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
1	Material transport and construction activities	Air Quality/Dust	○ To reduce impacts from exhausts, emission control norms will be enforced / adhered. ○ All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards. ○ Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt. ○ Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment, etc. ○ Provide enclosures on all sides of construction site ○ Movement of material will be mostly during non-peak hours. ○ On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic ○ Water should be sprayed during the construction phase, at mixing sites, and temporary roads ○ In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to prevent dust.	**Complied** ○ Monthly Ambient Air Monitoring is being carried out and all the parameters are within the stipulated limits. ○ It is ensured that all vehicles entering the area have a valid PUC certification ○ Vehicles entering the site are following speed limit. ○ Tarpaulin cover is used for vehicles transporting the construction material ○ Water sprinkling is carried out on the temporary roads by contractors ○ Environment awareness program is provided to the personnel engaged in development work

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			○ Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. ○ Environmental awareness program will be provided to the personnel involved in developmental works. ○ Use of tarpaulin covers and speed regulations for vehicles engaged in transportation.	
		Noise	○ Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB. ○ Procurement of machinery / construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A). ○ Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used ○ Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors. ○ Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers. ○ High noise generating activities such as piling	**Complied** ○ Ambient Noise is being monitored fortnightly for Day & Night time and results are within the prescribed limits. ○ Construction equipment machinery procurement is done in accordance with specifications conforming prescribed standard. ○ Personnel engaged in construction activity are provided with appropriate PPE's (Earplugs/muffs)

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts. o Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. o Ambient noise levels will be monitored at regular intervals	
2	Construction of Buildings, Roads, Parking features, etc.	Vegetation and Strain on existing infrastructure	o Most of the land is covered with coconut trees and few other trees. Trees that are cut down will be accounted for and the same no. of trees of the same or some other species will be replanted at another location to compensate for the loss of greenery. o There are very few existing buildings and infrastructure on the PAF zone area land which will be acquired and people in that area will be rehabilitated.	**Being Complied** o Due permission is taken for trees being cut down as a result of the port development from concerned department (Forest Department). o AVPPL, in collaboration with Forest department, have carried out compensatory afforestation of approximately 15,540 trees on 12.05 Ha land; as identified by social Forest Department in Sainik School, Trivandrum (at an aerial distance of 24 km from the Vizhinjam Port project site). The plantation is now in its Third Year. Rs. 80.50 Lakhs has been spent towards Phase-I of the compensatory afforestation at Sainik School.

Project Annex Facility (PAF) Zone - Construction Phase *Construction work was carried out in a limited way during the compliance period in PAF Zone				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
				○ Land acquisition has been completed by following due process.
		Existing Traffic	○ Transportation of construction materials will be carried out during non-peak hours. ○ Regularization of truck movement. ○ The existing roads shall be strengthened and shall be used for the construction material transportation.	**Being Complied** ○ Transportation of construction materials is being carried out taking into account the non-peak traffic timing and local restrictions during festivals, strikes, etc. ○ Traffic monitoring & regularization is being carried out for maximum efficiency. ○ Existing roads are being used for transportation of construction material.
		Solid Waste	○ Construction waste will be used within port site for filling of low lying areas. ○ Composted bio-degradable waste will be used as manure in greenbelt. Other recyclable wastes will be sold. ○ Excavated soil will be stockpiled in a corner of the site in bunded area to avoid run off with storm water. ○ General refuse generated on-site will be collected in waste skips and separated from construction waste. ○ Burning of refuse at construction sites will be prohibited.	**Being Complied** ○ Construction waste is used within port site for filling of low lying areas in line to C&D Waste Management Rules 2016, as amended. ○ No burning of refuse at construction sites is being done. ○ Contractors working at the site have been made responsible for management of Solid Waste during construction stage. They are complying with the provisions pertaining to management of Solid Waste in line to Solid Waste Management Rules 2016, as amended.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
1	Material transport and construction activities	Air Quality	○ To reduce impacts from exhausts, emission control norms will be enforced / adhered. ○ All the vehicles and construction machinery will be periodically checked to ensure compliance to the emission standards ○ Construction equipment and transport vehicles will be periodically washed to remove accumulated dirt ○ Providing adequately sized construction yard for storage of construction materials, equipment tools, earthmoving equipment, etc. ○ Provide enclosures on all sides of construction site ○ Movement of material will be mostly during non-peak hours. ○ On-site vehicle speeds will be controlled to reduce excessive dust suspension in air and dispersion by traffic ○ Water sprinkling will be carried out to suppress fugitive dust ○ Environmental awareness program will be provided to the personnel involved in developmental works ○ Use of tarpaulin covers and speed regulations for vehicles engaged in transportation	**Being Complied** ○ Ambient air quality monitoring is carried out at 5 locations (including one location at port site) as per the Environment Monitoring Plan prescribed in EIA and has commenced since August 2016, the results obtained are within the limits prescribed by NAAQS ○ It is ensured that all vehicles entering the port have PUCs ○ Water sprinkling is being carried out at regular intervals over the temporary road during transportation of materials. ○ All the trucks transporting material are covered by tarpaulin cover. ○ Signage's for speed control are placed within the port area ○ Adequate storage for construction material is provided within the port area on reclaimed land ○ Environmental awareness program is being regularly carried out for contractors working at site.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
		Noise	○ Noise levels will be maintained below threshold levels stipulated by Central/Kerala State Pollution Control Board (CPCB)/KSPCB ○ Procurement of machinery/construction equipment will be done in accordance with specifications conforming to source noise levels less than 75 dB (A) ○ Well-maintained construction equipment, which meets the regulatory standards for source noise levels, will be used ○ Any equipment emitting high noise, wherever possible, will be oriented so that the noise is directed away from sensitive receptors ○ Noise attenuation will be practiced for noisy equipment by employing suitable techniques such as acoustic controls, insulation and vibration dampers ○ High noise generating activities such as piling and drilling will be scheduled at daytime (6.00 am to 10 pm) to minimise noise impacts ○ Personnel exposed to noise levels beyond threshold limits will be provided with protective gear like earplugs, muffs, etc. ○ Ambient noise levels will be monitored at regular intervals	**Being Compiled** ○ All the machinery and vehicles are maintained to keep the noise at minimum ○ Regular Ambient Noise monitoring is being carried as per the Environmental Monitoring Plan prescribed in EIA since August 2016, and the readings are within the limits at port site. ○ Personnel exposed to noise levels beyond threshold limits are provided with protective gear. ○ No pilling activity carried out during the compliance period from October 2021 to March 2022. ○ No dredging activity carried out during the compliance period from October 2021 to March 2022.

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
2	Construction Activities	Water Environment	○ Formation level should be raised according to the design and the cross drainage structures suitably planned for the flood events. ○ All justifiable measures will be taken to prevent the wastewater produced during construction from entering directly into the water bodies.	**Being Compiled** ○ During the construction, care was taken such that the formation level is as per suitable design and the cross drainage structures are also being implemented. ○ An STP will be developed along with the port and the sewerage and storm water flow from two streams near the port will be treated in the proposed STP. ○ No waste water is disposed into the water bodies.
		Land Environment	○ On slopes and other suitable places along the two proposed corridors, trees and grass should be planted. ○ On sections with filling and deep cutting their slopes should be covered by sod, or planted with grass, etc. ○ If existing irrigation and drainage system, ponds are damaged, they will be suitably repaired. ○ Retaining walls and gabions shall be suitably provided.	**Being Complied** ○ Plantation of saplings along the port boundary are planned as part of the master plan development/greenbelt development plan. ○ Retaining walls or gabions are suitably provided.
			○ Arable land should not be used for topsoil borrowing. ○ Topsoil will be kept and reused after excavation is over.	**Will be Complied** ○ Topsoil is not being used for borrowing. ○ If any topsoil needs to be excavated, the same will be stored in a designated area

BACK UP AREA – Construction Phase Construction of buildings is ongoing in reclaimed area during the compliance period				
S. No.	**Activity**	**Relevant Environmental Components likely to be impacted**	**Proposed Mitigation Measures**	**Status as on 31.03.2022**
			○ Any surplus to be used on productive agricultural land.	and will be utilized for greenbelt development as per the greenbelt development plan.
			○ Construction vehicles should operate within the Backup Areas avoiding damage to soil and vegetation.	**Being Complied** ○ Construction vehicles are being operated only alongside the road and port boundaries; thereby avoiding damage to soil and vegetation.
			○ Areas of trees cleared will be replaced according to Compensatory Afforestation Policy under the Forest Conservation Act - 1980. ○ Landscaping shall be done at major junctions.	Refer point No.15 of Environment Management Plan – Road/Rail Corridors
			○ Tree clearing within the backup areas should be avoided beyond that which is directly required for construction activities and/or to reduce accidents.	**Will be Complied** ○ Tree clearing is done only for the purpose of development of port and/or for avoiding causalities due to natural calamities where the trees were standing very dangerously.

Annexure VII

EMP Expenditure

adani	Adani Vizhinjam Port Private Ltd	From : October 2021 To : March 2022
Vizhinjam International Deepwater Multipurpose Seaport EMP Expenditure		

EMP Expenditure: **Annexure VII**

S. No.	Environmental Management Plan	Commitment in EIA	Oct 2016 to Mar 2017	Apr 2017 to Sep 2017	Oct 2017 to Mar 2018	Apr 2018 to Sep 2018	Oct 2018 to Mar 2019	Apr 2019 to Sep 2019	Oct 2019 to Mar 2020	Apr 2020 to Sep 2020	Oct 2020 to Mar 2021	Apr 2021 to Sep 2021	Oct 2021 to Mar 2022	Total Till date
		(in Rs. Crores)												
1	Cost of Contractors EMP for all planned EMP implementation measures (Action plan report)	1	0.08	0.08	0.12	0.47	0.32	-	-	-	-	-	-	1.07
2	Cost of Capacity building-Training and Institutional strengthening (Training workshop)	0.2	-	-	-	0.003	-	0.01	-	0.025	-	-	-	0.038
3	Compensatory afforestation for the green cover lost for the port and its associated facilities (2500 plants per Ha for 25 Ha area)	1.25	-	-	-	0.8	-	-	-	-	-	-	-	0.8
4	Air quality monitoring at sensitive locations	0.252	0.27	0.28	0.72	0.21	0.27	0.30	0.29	0.152	0.298	0.27	0.298	3.358
5	Water quality monitoring at major water bodies	0.054												
6	Noise monitoring at sensitive locations	0.009												
7	Soil quality monitoring at sensitive locations	0.002												
8	Marine water quality and sediment and marine biology	1.08												
9	Shoreline changes	0.3	1.059	1.08	1.36	1.68	1.65	1.02	1.52	1.295	1.363	1.84	1.035	14.902
10	Cost of Median planting with a suitable species of creepers and metallic wire mesh fencing along the road (2000 m long median planting)	0.83	-	-	-	-	-	-	-	-	-	-	0.312	0.312

adani	Adani Vizhinjam Port Private Ltd	From : October 2021 To : March 2022

Vizhinjam International Deepwater Multipurpose Seaport
EMP Expenditure

S. No.	Environmental Management Plan	Commitment in EIA	Oct 2016 to Mar 2017	Apr 2017 to Sep 2017	Oct 2017 to Mar 2018	Apr 2018 to Sep 2018	Oct 2018 to Mar 2019	Apr 2019 to Sep 2019	Oct 2019 to Mar 2020	Apr 2020 to Sep 2020	Oct 2020 to Mar 2021	Apr 2021 to Sep 2021	Oct 2021 to Mar 2022	Total Till date
		(in Rs. Crores)												
11	Solid waste management (sector wise)-Collection disposal system	2.5	-	-	-	-	-	0.01	-	-	-	-	0.04	0.05
12	Storm water Management	5	-	-	0.05	-	-	-	-	-	-	-	-	0.05
13	Marine Life Protection out of Oil Spill (Provision for scavenger boat) One tugboat with booms and skimmer and dust exhausting equipment	20	-	-	-	-	-	-	-	-	-	-	-	0
14	Cost of scavenger boat including manpower (Cost of boat)	0.2	-	-	-	-	-	-	-	-	-	-	-	0
15	Dust Sweeper (2 Nos.)	0.6	-	-	-	-	-	-	-	-	-	-	-	0
16	Air Pollution Control (Four water tankers for wetting of road surface and springing system)	1	-	-	0.21	0.03	0.03	0.03	0.15	0.1	0.135	-	0.125	0.81
17	Water and waste water treatment plants	4	-	-	-	-	-	-	-	-	-	-	-	0
18	Battery of toilets with bimonthly maintenance provision	1	-	-	-	-	-	-	-	-	-	-	-	0
19	Desilting and strengthen of Streams	0.5	-	-	-	-	-	-	-	-	-	-	-	0
20	Enhancement of water bodies (ponds along road & rail)	0.1	-	-	-	-	-	-	-	-	-	-	-	0
21	Enhancement of religious structures (Temple)	0.05	-	-	-	-	-	-	-	-	-	-	-	0
22	Cultural property rehabilitation cost for sacred grove	0.01	-	-	-	-	-	-	-	-	-	-	-	0
	TOTAL	**39.937**	**1.409**	**1.44**	**2.46**	**3.193**	**2.27**	**1.37**	**1.96**	**1.572**	**1.796**	**2.11**	**1.81**	**21.39**

Annexure VIII

Environment Health, Safety & CSR Organizational Structure

Annexure VIII

Environment Health, Safety & CSR Organizational Structure:

S. No.	Name	Designation	Experience	Qualification	Organization
1.	Prasad Kurien	GM-Environment	30 years	B-Tech Civil Engg., M-Tech Env Engg., PMP	VISL
2.	Dr. Nehru Kumar Vaithilingam	Environmental Expert (Independent Engineer)	27 years	BE Civil Engg., ME Env Engg., PhD Env	Indian Institute of Technology Madras
3.	Anil Balakrishnan	Head – CSR	24 Years	MSW, Phd.	Adani Foundation
4.	Hebin C	Head – Environment	15 Years	MS, Oceanography & Coastal Area Studies	AVPPL
5.	Jesse Benjamin Fullonton	Assistant Manager - Environment	11 Years	BSc. Chemical Tech; Msc. Env. Tech	AVPPL
6.	Kanwar P Malik	Head - Horticulture	17 Years	BSc - Agriculture	AVPPL
7.	Arumugam S	Assistant Manager - Safety, Environment and Health	3 Years	M.Tech – Industrial Safety Engineering	AVPPL
8.	Sebastian Britto. A.G	Programme Manager	25 Years	MA, Economics	Adani Foundation
9.	Rakesh R.S	Sr. Project Officer	24 Years	MBA, Bsc Agriculture	Adani Foundation
10.	Stephen Vinod	Project Officer	21 Years	BA, Economics	Adani Foundation
11.	George Zen	Consultant – Livelihood	36 Years	BA, Sociology	Adani Foundation
12.	Maya G	Project Officer Community Health	12 Years	BA, IT-TTC	Adani Foundation
13.	Meera Mariyam Skariah	Asst. SuPoshan Officer	4 Years	MSW	Adani Foundation
14.	Shaji Joseph	Safety Executive	13 Years	Diploma in mechanical & Diploma in fire and safety	HOWE

Annexure IX

Email Submission of HYCR for the Period

April 2021 to September 2021

Jesse Benjamin Fullonton

From: PRASAD KURIEN <prasad.kurien@vizhinjamport.in>
Sent: Monday, November 29, 2021 10:38 AM
To: rosz.bng-mefcc@gov.in
Cc: Ssuresh.cpcb@nic.in; tvpmro@gmail.com; Kushal.vashist@gov.in; Hebin Chenthamarakshan; Rajesh Kumar Jha; MS KCZMA; zobangalore.cpcb@nic.in; Jesse Benjamin Fullonton; rosz.bng-mef@nic.in; pamidisuneel@gmail.com; CEO VISL; MD VISL
Subject: EP12.1/7/2013-14/Ker-Apr-2021-Sep 2021
Attachments: EC_F. No. 11-1222011-IA.III dated 03.01.2014-HYCR-Apr2021-Sep2021_27.11.2021.pdf

***CAUTION**: This mail has originated from outside Adani. Please exercise caution with links and attachments.*

Dear Sir/Madam,

MoEF&CC had issued Environmental Clearance and CRZ Clearance (EC) on 3rd January 2014 to the proposed Vizhinjam International Multipurpose Deepwater Seaport at Vizhinjam in Thiruvananthapuram District of Kerala State. (EC No. F.No.11 - 122/2011 - IA. III) and subsequently extended the EC validity up to 2nd January 2024 with the same terms and conditions.

Kindly find attached the Half yearly **compliance report** (HYCR) for the period from April 2021 to Sep 2021 for records and reference.

Acknowledgement on receipt of the email with contents is highly appreciated.

With Regards,
--
Prasad Kurien
General Manager-Environment
Vizhinjam International Seaport Limited
Thiruvananthapuram

Acc:- Compliance report

VIZHINJAM INTERNATIONAL SEAPORT LIMITED

(A Government of Kerala Undertaking)

Vizhinjam International Deepwater Multipurpose Seaport

Half Yearly Compliance Report (HYCR) of Conditions of Environmental and CRZ Clearance for the Period October 2021 to March 2022

May 2022