adani

Ports and Logistics

Ref.No. AKPL /EHS-EC/MoEF&CC/099/2022-23 Dated: 30.11.2022

To
Deputy Director,
Ministry of Environment, Forests & Climate Change
Integrated Regional office, (IRO)
Green House Complex, Gopal Reddy Road,
Vijayawada, 520010, Andhra Pradesh.

Sub: Submission of Half yearly Compliance Report on conditions of Environmental and CRZ clearances for phase I,II & III Development at Krishnapatnam Port for the period of April to September 2022 – Reg.

Ref: 1. EC& CRZ for Phase I of Krishnapatnam Port Ltr. No: 10-22/2005-IA-III dated 26.07.2006
2. EC & CRZ for Phase II of Krishnapatnam Port Ltr. F.No: 11-62/2009-IA-III dated 13.11.2009
3. EC&CRZ for Phase III of Krishnapatnam Port Ltr. F.No: 10-18/2016-IA-III dated 11.01.2021

Dear Sir,

As per the general condition no 14. Of the Environmental and CRZ clearance cited at 2, and standard condition XI, Miscellaneous condition no. (iv) of the Environmental & CRZ clearance cited at 3, please find herewith attached condition wise six-monthly compliance report of Phase I,II & III developments of Krishnapatnam port along with Environment Monitoring Report for the period from April to September 2022.

Thanking you,
Yours faithfully,
For ADANI KRISHNAPATNAM PORT LIMITED

30.11.2022
G Venugopal Reddy
(Associate GM-EOHS)

Encl: Compliance Report on EC&CRZ Clearance conditions of Krishnapatnam Port Phase I,II & III development along with Environmental Monitoring Report for the period of Apr to Sep 2022

Copy to:
1. The regional Director, CPCB Zonal office, Bengaluru
2. Environment Engineer, A.P Pollution Control Board, Regional Office, Nellore

Adani Krishnapatnam Port Ltd
(Formerly, Krishnapatnam Port Company Ltd)
PO Bag No 1, Muthukur Mandal,
SPSR Nellore District 524344
Andhra Pradesh, India
CIN: U45203AP1996PLC023529

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Environmental Clearance and CRZ Compliance Report of Phase I, II and III

Adani Krishnapatnam Port
SPSR Nellore, Andhra Pradesh

Adani Ports and SEZ Limited

For the period of
April 2022 to September 2022

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Status of the conditions stipulated in Environmental and CRZ clearance

Adani Krishnapatnam Port Limited is being developed in three phases.

1. Phase I, Environmental and CRZ clearance approved on 26-07-2006.
2. Phase II, Environmental and CRZ clearance approved on 13-11-2009.
3. Phase III, Environmental and CRZ clearance approved on 11-01-2021.

The name of the company was changed from " Krishnapatnam Port Company Limited" to "Adani Krishnapatnam Port Limited" in all EC & CRZ clearances on 10.03.2021 (Phase III) and 08.02.2022 (Phase I & II).

Activities/facilities approved as per Environment and CRZ clearance are as below.

Particulars	Phase-I	Phase-II	Phase-III
Reference	No.10-22/2005/IA-III; Dated: 26.07.2006	No.11-62/2009-IA-III; Dated: 13.11.2009	No.10-18/2016-IA-III; Dated:11.01.2021
Coal	51 MMTPA		88 MMTPA
Iron Ore	8 MMTPA		-
General Cargo	9 MMTPA		10.5 MMTPA
Liquid Cargo	-		51.7 MMTPA
Container	2 MTEUsPA		1.1 MTEUsPA
No. of Berths	12		16 (Incl 3 Liquid Berths) and 3 SBMs
Total Capacity	68 MMTPA (Non-Container) + 2 MTEUsPA (Container)		150.2 MMTPA (Non-Container) + 1.1 MTEUsPA (Container)

Compliance Report on Conditions Stipulated in the Environmental and CRZ clearance for Phase – I

Development of Krishnapatnam Port

April 2022 to September 2022

Half yearly Compliance Report on Conditions of Environmental Clearance (EC) for Adani Krishnapatnam Port Phase – I
MoEF Order dated 26.07.2006 - Period of Report "April 2022 to September 2022"

S no	Condition	Compliance status as on 30.09.2022
(A) Specific Conditions:		
1	All the conditions stipulated by Andhra Pradesh State Pollution Control Board in their letter Order No.APPCB/VJA/NLR/633/HO/2004/9/467, dated 25.05.2004 should be strictly implemented.	**This condition is noted, and it is being complied with all the given conditions stipulated in the order.** And periodical compliance reports of the same areregularly submitted to Andhra PradeshPollution Control Board.
2	Detailed plan for protection of the 9 acres of the mangroves should be provided.	**This condition is complied** The said 9 acres of Mangrove area situated in the salt lands are protected and measurements are as follows: a) Display boards have been erected to protect this mangrove area. b) Tidal exchange to the 9 acres mangrove area is ensured by constructing a pipe culvert.
3	The fisherman and salt pan workers should be rehabilitated as per the Rules of Government of Andhra Pradesh.	**This condition is Complied.** Required rehabilitation and Resettlement (R&R) Measures were catered and implemented by the Government of Andhra Pradesh (GoAP) in as much as entire land for port development is being made available on lease basis by GoAP as per terms of the ConcessionAgreement. Rehabilitation measures for the four fishermen villages have been implemented by the GoAP as part of land acquisition by the GoAP for the port development.
4	Adequate shore protection measures, including construction of revetments/rip-raps, should be taken up based on the scientific studies. The action plan for implementing the shore protection measures should be submitted to this Ministry within 6 months from the date of receipt of this letter.	**This condition is Complied.** Hydro dynamic studies were conducted by M/s.HR Wallingford, UK. Shoreline monitoring & Marine biodiversity studies are being carried out regularly for shore protection. a) However, as recommended in report dated Oct 2007, 7 Km of coastline both North & South of the port entrance has been monitored throughM/s. Indian National Centre for Ocean Information Services (INCOIS), Hyderabadusing satellite imagery. b) From the INCOIS Report for the period

		October 2008 to January 2010, the coastline is found to be stable. Long time Shoreline stability study conducted by NIOT, Chennai in 2017-18. the coastline is found to be stable. Annexure - D
5	Green belt area should be developed along the project and budget earmarked.	**This condition is complied.** At present a greenbelt of 191.5 Ha (Phase-I&II) has been developed avenue & median plantations along port boundary, around coal yards.
6	For rail and road connectivity of the project, separate application should be submitted to this Ministry.	**This condition is complied** • 4 lane Road connectivity of 23 kms (widening work of 6 lanes under progress) fromthe NH-16 to the Krishnapatnam Port and same is developed by GoAP. • 20 km long electrified double line rail connectivity from the National Rail Grid to Krishnapatnam Port is formed by Rail VikasNigam Limited (RVNL) joint venture with GoAP, National Mineral Development Corporation (NMDC) ~~and Krishnapatnam Port~~.
7	The Bay is reported to be calm for most of the days of the year. Even on the day of the visit, having a deep depression in South-West Bay of Bengal, the basin was calm, though the Bay experienced high waves. Hence, dredging operation in the estuary should not have any adverse impact on the existing mangroves blocks.	**This condition is complied.** Dredging is completed in phases and Mangrove mapping studies were carried by NIOT, Chennai in the year 2017-18 and found that no adverse impact observed on the existingmangroves.
8	During the rough weather, resulting in high flood tides, dredging operation in the estuary should be stopped.	**This condition is complied.**
9	Regarding the location of stock yardin the salt pan area to be acquired, the proponent should not take up any developmental works in the mangrove area and should ensure that no destruction of mangroves takes place.	**Noted and complied.** Currently there is no stock yards operating at salt pan areas. Salt pan lands are yet to be transferred on leased by GoAP. Developmental works are being regulatedand ensured that no destruction of mangroves takes place.
10	A disaster management plan covering emergency evacuation mechanismetc., to deal with natural disaster events should be prepared and furnished to the Ministry.	**This condition is complied** Disaster Management Plan covers emergency evacuation mechanisms to deal with natural disaster events and it is regularly being updated time to time. The last

		update was on June 2021and submitted to RO, MoEF&CC along with six monthly compliance report.
11	The company must take up and earmark adequate funds for the socio-economic development and forwelfare measures in the area including drinking water supply, vocational training, and fishery	**Being complied** As part of Corporate Social Responsibility (CSR),socio economic development schemes and welfare measures in the form of Roads, Drains,drinking water supply by providing tankers andoverhead tanks, sanitation and public health, roads and street lighting in the R&R Colonies,
12	The fishing activities by the fishermen living in the settlement along the creek should not be hindered and a mechanism may be evolved for the movement of fishing boats vis-a-vis shipping activities.	**This condition is complied** The fishermen have been rehabilitated by the GoAP. Mechanism for movement of fishing boatsvis-à-vis shipping is evolved keeping in mind the safety, security, ISPS and customs requirements.
13	The Relocation of the fishermen and local communities in the area should be done strictly in accordance with the norms prescribed by the State Government. The relocated communities should be provided with all facilities including health care, education, sanitation and livelihood.	**This condition is complied** GoAP Rehabilitated the Fishermen and Local Communities. Krishnapatnam Port provided infrastructure facilities under CSR activities at the Rehabilitation Colony in the form of Roads, Drains, drinking water supply, supply of cooking gas, housing, educational assistance, student hostels, old age homes, financial aid, imparting vocational trainings, women empowerment and public health, Malaria Control measures, Medicaland Health camps in R&R colony covering 4 locations Andal Nagar, Mathura Nagar, Ramalingapuram & Simhadri Nagar.
14	The company should take up green belt program in the project area including an ecological park and the plan may be submitted to the Ministry within one year.	**This condition is complied** Green belt of 191.5 Ha has been developed progressively along port boundary, around coal yards, of avenue & median plantations. Ecological Park developed.
15	The company may suitably modify the alignment of channel entrance including its width, turning circle, taking into consideration the wave traversal, its intensity etc., to facilitate smoother navigation of ships.	**This condition is complied** The channel alignment is firmed up based after undertaking numerical navigation simulation studies dated March 2009 by M/s. HR Wallingford, UK.
16	The breakwater alignment and its design should be further modified based on relevant model studies, borehole data etc., keeping in view the tranquility condition required for	**This condition is complied** The alignment and design of breakwaters are firmed up based on geotechnical investigations,geotechnical stability analysis, Numerical model studies undertaken by M/s.

	berthing and maneuvering of ships and subsequent cargo handling operations.	HR Wallingford, UK. 3D model studies of tranquility conducted at Lanka Hydraulic Laboratories, Sri Lanka and Physical model studies of breakwaters at IIT Chennai.
17	The height of dumping in thedumping site should be restricted to30 cm against 90 cm proposed.	**This condition is complied** Bathymetry of dumping site is being monitoredperiodically to avoid build up. Last Bathymetry of dumping location carried out on 28.03.2021 andnegligible deposition observed.
18	The project proponent will not undertake any destruction of mangroves during construction and operation of the project.	**This condition is complied** Existing mangrove areas are being protected and conserved with suitable barricading, erection of display boards and ensuring the tidal flow. The construction of Phase-I development was completed on 01.09.2009 and commercial operations started on 20.03.2009.
19	Sewage arising in the port area should be disposed off through septic tank — soak pit system or should be treated along with the industrial effluents to conform to the standards stipulated by Andhra Pradesh Pollution Control Board and should be utilized/ re-cycled for gardening, plantation and irrigation.	**This condition is complied** 540 KLD of SewageTreatment Plants (STP) are being utilized for the green belt within port premises. Septic tank and soak pit systems are being followed at offices and isolated buildings.
20	Adequate plantation should becarried out along the roads of the Port premises and a green belt should be developed.	**This condition is complied.** Greenbelt Plantation is also undertaken along roadsides as avenue and median plantation.
21	Project proponent should prepare and regularly update the Disaster Management Plan from time to time.	**This condition is complied** Disaster Management Plan is regularly being updated time to time. The latest update done and submitted in June 2021
22	Fire Fighting arrangements areexamined to the new proposal.	**This condition is complied** a) Port has developed dedicated fire-fighting system with required equipment and trainedprofessionals. b) Developed Fire contingency plan and implementing the same. c) Port Tugs are also having firefighting equipment
23	There should be no withdrawal of ground water in CRZ area, for this project. The proponent should ensure that as a result of the proposed constructions, ingress ofsaline water into ground water does not take place. Piezometers should be installed for regular monitoring forthis purpose	**This condition is complied** There is no withdrawal of ground water. The water requirement is being met from Nakkala kalava & Muthukur reservoir. 1 Piezometer (Automatic water level monitoring system including temperature monitoring)installed at port and regular monitoring being carried out with NABL Accredited Laboratory.

	at appropriate locations on the project site.	
24	The project should not be commissioned till the requisite water supply and electricity to the project are provided by the PWD/Electricity Department.	**This condition is complied** Required necessary permissions like water supply and electricity supply are obtained from concern departments. a) Electrical power has been provided by Andhra Pradesh Transport Corporation (APTRANSCO). b) GoAP ordered to release 1 MLD (Million Liters per day) water to KPCL from Muthukur Reservoir. c) As permitted by GoAP, water from 'Nakkalakalava' 4 MLD is being utilized for dustsuppression & fire-fighting needs.
25	Specific arrangements for rainwater harvesting should be made in the project design and the rainwater so harvested should be optimally utilized. Details in this regard shouldbe furnished to this Ministry'sRegional Office at Bangalore within 3 months.	**This condition is complied.** 12 no. of Rainwater harvesting ponds located atvarious locations in Port premises.
26	The facilities to be constructed in the CRZ area as part of this project should be strictly in conformity with the provisions of the CRZ Notification, 1991 as amended subsequently.	**Noted and Being complied**
27	Green buffer zone should be providedall around the project area in consultation with local forest department and the report submitted to this Ministry's Regional Office at Bangalore.	**This condition is complied** Green belt of 191.5 Ha has been developed along port boundary, around coal yards, avenue & median plantations in consultation with local forest department.
28	No product other than those permissible in the Coastal Regulation Zone Notification, 1991 should be stored in the Coastal Regulation Zone area.	**Noted and Being complied**
(B) General Conditions		
1	Construction of the proposed structures should be undertaken meticulously conforming to the existing Central/local rules and regulations including Coastal Regulation Zone Notification 1991 & its amendments. All the construction designs / drawings relating to the proposed construction activitiesmust	**This condition is complied** The construction designs / drawings are in conformity to the detailed project reports approved by GoAP and consistent with the CRZNotification.

<table>
<tr><td></td><td>have approvals of the concerned State Government Departments / Agencies.</td><td></td></tr>
<tr><td>2</td><td>Adequate provisions for infrastructure facilities such as water supply, fuel, sanitation etc., should be ensured for construction workers during the construction phase of the project so as to avoid felling of trees/mangroves and pollution of water and the surroundings.</td><td>Being complied
Adequate provisions including water supply, fuel and sanitation were ensured for workers at the time of construction.
The construction of Phase-I development was completed on 01.09.2009 and commercial operations started on 20.03.2009.</td></tr>
<tr><td>3</td><td>The project authorities must take necessary arrangements for disposal of solid wastes and for the treatmentof effluents by providing a proper waste water treatment plant outsidethe CRZ area. The quality of treatedeffluents, solid wastes and noise leveletc., must conform to the standardslaid down by the competentauthorities including the Central / State Pollution Control Board and theUnion Ministry of Environment and Forests under the Environment(Protection) Act, 1986, whichever aremore stringent.</td><td>Being complied
a) Solid wastes are being collected,segregated and disposed as under:
<table>
<tr><th>S. No.</th><th>Material</th><th>Method of Disposal</th></tr>
<tr><td>1</td><td>Biodegradable waste</td><td>Canteen waste: Composting & used as manure/ Send to PigFarms</td></tr>
<tr><td>2</td><td>Non-Biodegradable waste</td><td>Disposal to approved recyclers</td></tr>
<tr><td>3</td><td>Used Oils/Used Batteries</td><td>Batteries ar eprocured on buy back basis and Usedoil is being disposedto approved vendors of APPCB</td></tr>
</table>
b) 540 KLD STP's are commissioned and is located outside the CRZ area.
c) Treated effluent sample conformed to APPCB norms and is recycled for GreenBelt development.
d) Ambient Noise levels are regularly being monitored and they comply with standards.</td></tr>
<tr><td>4</td><td>The proponents should provide for a regular monitoring mechanism so asto ensure that the treated effluents conform to the prescribed standards. The records of analysis reports mustbe properly maintained and madeavailable for inspection to theconcerned State / Central officialsduring their visits.</td><td>Being complied
a) Environmental Monitoring is being carried out through an agency accredited by NABLand approved by MoEF&CC. Results ofmonitoring conform to norms and periodical Monitoring Reports are being submitted to APPCB regularly.
b) Records of analysis reports are properly</td></tr>
</table>

		maintained and are being made available forinspection to the concerned state/ central officials during their visits.
5	In order to carry out the environmental monitoring during the operational phase of the project, the project authorities should provide an environmental laboratory well equipped with standard equipment and facilities and qualified manpower to carry out the testing of various environmental parameters.	**Being complied** a) Environmental Monitoring is being carried out through an agency accredited to NABL and approved by MoEF. Under the supervision of the ChiefExecutive Officer (CEO) of the port, Environmental cell with qualified personnel andenvironmental laboratory are established.
6	The sand dunes and mangroves, if any, on the site should not be disturbed in any way.	**Noted and Being complied**
7	A copy of the clearance letter will be marked to the concerned Panchayat/local NGO, if any, from whom any suggestion/representation has been received while processing the proposal.	**This condition is complied.** Copies of Environmental Clearance letters weresubmitted to Sarpanch, Krishnapatnam GramaPanchayat, Nellore on 10thAugust, 2006 and toPresident, Nellore District Mechanized Fishing Boat Operators Association on 10thAugust, 2006.
8	The Andhra Pradesh Pollution Control Board should display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's Office/Tehsildar's Office for 30 days.	**This condition is complied.** Copies of Environmental Clearance letters weresubmitted to APPCB.
9	The funds earmarked for environment protection measuresshould be maintained, in a separate account and there should be no diversion of these funds for any otherpurpose. A year-wise expenditure on environmental safeguards should bereported to this Ministry's Regional Office at Bangalore and the State Pollution Control Board.	**This condition is complied.** The expenditure incurred for the environmentalsafeguards in the year 2021-22 is Rs. 6.39 Crores and for 2022-23 is Rs. 4.72 Crores.
10	Full support should be extended to the officers of this Ministry's Regional Office at Bangalore and theofficers of the Central and State Pollution Control Boards by theproject proponents during theirinspection for monitoring purposes, by furnishing full details and action plans including the action takenreports in respect of mitigative measures and other environmental protection activities.	**Noted and Being complied.**
11	In case of deviation or alteration in	**Noted**

	the project including the implementing agency, a fresh reference should be made to this Ministry for modification in the clearance conditions or imposition of new ones for ensuring environmental protection.	
12	The Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfaction of this Ministry.	**Noted**
13	The Ministry or any other competent authority may stipulate any other additional conditions subsequently, if deemed necessary, for environmental protection, which should be complied with.	**Noted and Being complied.**
14	The project proponent should advertise in at least two local newspapers widely circulated in the region around the project, one of which should be in the vernacular language of the locality concerned, informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board and may also be seenat Website of the Ministry of Environment & Forests at http://www.envfornic.in.The advertisement should be made within7 days from the date of issue of the clearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	**This condition is complied.** Advertisement was published in Local Newspaper namely Andhra Jyothi dated 11.08.2006. A copy of the advertisement was submitted to the Regional Office, Bangalore of MoEF vide our Letter No.KP/MOEF/346 dated 23.08.2007.
15	The project proponents should inform the Regional Office at Bangalore as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of Land Development Work.	**This condition is complied.** Details were furnished to the MoEF&CC, Regional Office, Bangalore, vide our letter no. KP/MOEF/60 dated 16th Feb, 2007. Financial Closure: 16.10.2006 Approval of the Project by GoAP: 17.09.2004 Start of Land Development June, 2006
16	The above mentioned stipulations will be enforced among others underthe Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment(protection)	**Noted and Being complied.**

	Act, 1986, the Hazardous Chemicals (Manufacture, Storageand Import) Rules, 1989, the CoastalRegulation Zone Notification, 1991 and its subsequent amendments andthe Public Liability Insurance Act, 1991 and the Rules made there underfrom time to time. The project proponents should also ensure that the proposal complies with the provisions of the approved Coastal Zone Management Plan of Andhra Pradesh State and the Supreme Court's order dated 18thApril, 1996 inthe Writ Petition No.664 of 1993 to the extent the same are applicable to this proposal.	

Compliance Report on Conditions Stipulated in the Environmental and CRZ clearance for Phase – II

Development of Krishnapatnam Port

April 2022 to September 2022

Half Yearly Compliance report on conditions of Environmental Clearance (EC) for Adani Krishnapatnam Port for Phase – II

MoEF Order dated 13.11.2009 Period of Report "April 2022 to September 2022"

S no	Condition	Compliance status as on 30.09.2022
Specific Conditions:		
1.	All the conditions as stipulated by the Forests & Environment Department, Govt. of Andhra Pradesh vide letter No.2286/CZMA/2009, dated 11.05.2009 shall be strictly complied.	**Noted and Being complied.** The APCZMA recommended the project proposal to MoEF in this letter. All conditions stipulated therein are being strictly complied
2.	All the details / information submittedby the project proponent vide letterNo.KP/MOEF/PH-II/174, dated17.08.2009 shall be strictly complied. The details are as follows: (i) Southern Boundary of proposed dredge disposal area of Phase-II shall be moved towards North tocoincide with Northern Boundary of Phase-I dredge disposal area. (ii) Impact of bridges & conveyor across creeks to be re-examined to avoid impact on mangroves. (iii) To engage INCOIS or other reputed organization to monitor coastal behavior for a longer period. Runoff from Coal Stock piles shallbe collected in dump ponds and recycled for dust suppression and fire protection.	**Being complied**. (i) Southern Boundary of proposed dredge disposal area of Phase-II has been moved towards North to coincide with Northern Boundary of Phase-I dredge disposal area. (ii) Belt Conveyors and Road Bridge crossings have no impact on Mangroves. Railway Bridge Location is reworked to avoid disturbance tomangroves. (iii) M/s. Indian National Centre for Ocean Information Services (INCOIS) was engaged for coastal monitoring. As per their Report for2008-10, the port development has not impacted the coast. Runoff from coal storage yards is routed through peripheral drains, collection pits and guard (Dump) ponds with facility to recycle the water for dust suppression.
3.	The hydro-dynamic studies shall be undertaken to ascertain the impact to the shoreline inthe stretch and ecologically sensitive areas and the report shall be submitted to the Ministry.	**Being complied.** The hydro-dynamic studies to ascertain the impact of port development on the shoreline in the stretch have been carried out through M/s.HR Wallingford, UK. No long-term impact is noticed due to minimal net drift along the coast at Krishnapatnam Port. b) However, as recommended in their report dated October 2007, 7 Km of coast line bothNorth and South of the port entrance

		is monitored through M/s. Indian National Centre for Ocean Information Services (INCOIS), Hyderabad using satellite imagery. c) From the INCOIS report for the period October 2008 to January 2010, the coastlineis found to be stable. Long time Shoreline stability study conducted by NIOT, Chennai in the year 2017-18and same continuing in year 2022-23. the coastline is found to be stable
4.	Ministry has taken a decision that the plantation of mangroves shall be undertaken on an area of 50 ha. as thePhase-II of the project spreads over 800 ha.	**This condition is complied.** 1. Mangrove's development in 50 Ha. is undertaken in the port, in the areas suggested by GoAP. For the current year 2022-23, Rs. 4.95 lakhs is budgeted towards mangrove conservation.
5.	Six monthly monitoring shall be carried out and a comparative analysis shall bemade to examine for any mitigative measures required.	**Being complied.** The Six-monthly Environmental Monitoring Report of AAQ, Noise, Marine and ground water, Marine Sediment and Soil with comparative analysis are examined, findings shows all values are within limits and ensured mitigative measures implemented. Reports are being submitted to Ministry and APPCB and enclosed as Annexure A.
6.	The temperature, salinity and tidal inflowshall be monitored weekly.	**Being complied.** Monitoring is being carried out on weekly basiswith a NABL accredited consultant and same isbeing reported.
7.	The greenbelt of 100 m. width shall bedeveloped around the coal stack yardas per the request in the public hearing.	Being Complied During Public Hearing it was requested to form 100 m width of green belt along boundary. MoEF has been requested vide ltr. No.: KP/MOEF/113 dt. 29th August 2012 to modify this condition suitably. 100 m width Green belt along the port boundary and 20 m wide green belt around coal stack yards is being developed as requested during public hearing.
8.	Impact on the drawl of the water from the Kandaleru Creek shall be regularly monitored and report submitted to the Ministry.	**This condition is complied** Water is not drawn from Kandaleru Creek, and quality of water is being monitored and reported.
9.	Continuous monitoring on disposal of dredged material shall be put in place for both pre and post monsoon periods.	**Being complied** Bathymetry of the disposal area of dredged material i.e., the dumping grounds is being monitored periodically.
10.	No construction work other than	**Noted and Being complied.** Only permitted construction works in CRZ

	those permitted in Coastal Regulation ZoneNotification shall be carried out in Coastal Regulation Zone area.	areawere carried out at site.
11.	Oil spills if any shall be properly collected and disposed as per the Rules.	**Noted and Being complied** Oil Spills, if any, shall be managed as per the approved Oil Spill Contingency Plan. We have procured Oil Boom, Skimmer and chemicals. Staff are trained to cater to Tier-I Oil spills. As per Disaster Management Plan, Indian Coast Guard will be alerted to Coordinate.
12.	The approach channel shall be properly demarcated with lighted buoys for safe navigation and adequate traffic control guidelines shall be framed. Thefishermen shall be suitably educated and informed about the traffic guidelines.	**This condition is complied.** The approach channel is marked with lighted buoys for safe navigation. Adequate traffic control guidelines are framed, and copy was submitted to the Fisheries Department to suitably inform fishermen.
13.	The project proponent shall set up separate environmental managementcell for effective implementation of the stipulated environmental safeguards under the supervision of aSenior Executive.	**This condition is complied.** Environmental Cell has been set-up under the supervision of the CEO. Environmental review meetings are being held regularly for effective implementation of stipulated safeguards. **i) Accreditation to International Management Systems** **ii)** Adani Krishnapatnam Port is accredited to and complying with the following international management Systems: a. ISO 14001 Environmental Management System b. ISO 9001 Quality Management System c. ISO 45001 OH & Safety Management d. ISO 28000 Specification for Security Management System for the Supply Chain. e. ISO 27001 Information Security Management System f. CII certified Adani Krishnapatnam Port as Single use plastic free Port. **iii)** Following environmental protection measures are being implemented in the port: **i) To Improve AAQ**: • Installation and operation of Mechanical Dust Suppression System (MDSS) with 248 nos of sprinklers at coal stacking andwagon loading areas.

		• Deployed 12 no's of Truck mounted water sprinklers for roads and transit areas. • Deployed 2 nos. of Vacuum Road sweeping machines and 6 Hydraulic broom sweeping machines • Deployed 5 nos. of heavy duty Atomized Sprayers • Deploying Hoppers for unloading • Mechanized coal handling at 2 berths within the land so far transferred on lease by GoAP. Conveyor covering with hood. • Developed paved roads and resorted to mechanical sweeping of roads. • Tarpaulin Covering of Railway wagons coal transport vehicles destined outside the port. • Developed wind shield/screen and warehouses of 12 m height on west part of (Fast Track Process) FTP-1 and North side towards Krishnapatnam village incoal yards. • 191.5 Ha. of Greenbelt has been developed along port boundary, around coal yards and avenue & median plantations. • Developed firefighting contingency plan, procured necessary fire tenders and other equipment and deployed trained personnel. • Monitoring AAQ at 7 locations through NABL accredited & MoEF approved agency. Commissioned 3 no's CAAQM Equipment in the port & linked to APPCB website **ii) To Improve Water Quality**: • Developed, collections pits,& guard ponds for coal storage yards runoff drains and provision of superannuated water for recycling for dust suppression. • Developed truck tire washing facility

		opposite MMD store with oil separator and settlement pits and provision for recycling for dust suppression. • Developed 540 KLD STP and treated water is recycled for dust suppression and green belt development. • Monitoring of Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality at regular intervals through NABL accredited & MoEF approved agency. **ii) To Improve Oil Spillage Control:** Developed Oil Spill Contingency plan for Tier-I spills, procured necessary equipment and chemicals and deployedtrained personnel. • Trainings and periodical mock drills are being organized for the work force • Developed on-site emergency plan duly reviewed by former DGFASLI and submitted to District administration forintegrating with Off-Site Emergency plan. **iii) To improve occupational Health:** • Personal Protection Equipment (PPEs) are provided to all the workers and ensuring that all the work force uses thesame regularly • Periodical health checkups at the port dispensary are ensured for workers engaged in coal handling
14.	No destruction of mangrove is permitted. The project proponent shalltake up mangrove plantation / green belt in the project area, wherever possible. Adequate budget shall be provided in the Environment Management Plan for such mangrove development.	**Noted and Being complied.** Developed mangroves afforestation of 50 Ha within the Port area suggested by GoAP. For the current year 2022-23 Rs. 4.95 lakh is budgeted towards Mangrove Protection.
15.	The funds earmarked for environment management plan shall be included in the budget	**This condition is complied.** An amount of Rs. 6.39 Crores has been utilized for Environment management for 2021-22 and budget for 2022-23 Rs. 4.72 Crores

<table>
<tr><td></td><td>and this shall not be diverted for any other purposes.</td><td></td></tr>
<tr><td>16.</td><td>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.</td><td>This condition is complied.
No groundwater is being drawn at CRZ area.</td></tr>
<tr><td>17.</td><td>The Hazardous waste generated shall be properly collected and handled as per the provisions of Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008.</td><td>Being complied.
Hazardous waste like used oils / grease and batteries are being collected and handled as per the provisions of Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2016 and their amendments.</td></tr>
<tr><td>18.</td><td>The wastewater generated from the activity shall be collected, treated andreused properly.</td><td>This condition is complied.
540 KLD STP's are commissioned, and these are in operational. The treated wastewater is recycled forgreenbelt development.</td></tr>
<tr><td>19.</td><td>Sewage Treatment facility should be provided in accordance with the CRZNotification.</td><td>This condition is complied.
540 KLD STP's is commissioned, and the treated effluent is recycled for the dust suppression and greenbeltdevelopment.</td></tr>
<tr><td>20.</td><td>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.</td><td>Noted and Being complied.
Solid wastes are being collected, Segregated and disposed as per the Solid Waste (Management and Handling) Rules, 2016 and their amendment. Disposal method for various materials are as follows;
<table>
<tr><th>S. No.</th><th>Material</th><th>Method of Disposal</th></tr>
<tr><td>1</td><td>Biodegradable waste</td><td>Green belt waste Composting, used as manure and kitchen waste Send to Pig Farms.</td></tr>
<tr><td>2</td><td>Non-Biodegradable waste</td><td>Disposal to approved recyclers</td></tr>
<tr><td>3</td><td>Used Oils/Used</td><td>Disposal to approved recyclers</td></tr>
</table></td></tr>
</table>

		Batteries
:21.	Installation and operation of DG set if any shall comply with the guidelines ofCPCB.	**Being complied.** Diesel Generator Sets being used are in the range of 100 KVA to 500 KVA only as back up foremergency lighting & safety during power breakdowns and these DG sets comply with the guidelines of Central Pollution Control Board (CPCB).
22.	There shall be no reclamation /dredging of areas.	**This condition is complied.** This condition is deleted communication to MoEF vide letter no. F. No.11-62/2009-IA.III Dated: 2nd March, 2010.
23.	Air quality including the VOC shall be monitored regularly as per the guidelines of CPCB reported.	**This condition is complied.** a) This condition pertaining to VOC monitoring is deleted communication to MoEF vide letter F. No. 11-62/2009- IA.III Dated: 2nd March, 2010. b) Air quality monitoring is regularly being carried out at 7 locations through an agencyaccredited by NABL and approved by MoEF&CC. Results of monitoring comply with the norms. Periodical Monitoring Reports are being submitted regularly toAPPCB.
24.	The project proponent shall undertakegreen belt development.	**This condition is complied.** Greenbelt has been developed progressively in the port i.e., 100 m wide greenbelt along periphery and 20 m around coal and iron ore stacks, total Greenbelt required by end of Phase- I &II is 191.5 Ha.
25.	Necessary clearances from all the concerned agencies shall be obtainedbefore initiating the project.	**This condition is complied.** Clearances from the concerned agencies like Krishnapatnam Village Panchayat, Fishing Boat Operators Association, Nellore; NOC from Revenue Department for dispensing HSD, Rail Transport Clearance from Ministry of Railways, Customs Clearance for handling of Cargo, Appointment of Krishnapatnam Port as Conservator from GoAP etc., have already been obtained as part of Phase-I development. Further, clearances from the following statutory authorities have also been obtained. NSPC, ISPS, Coast Guards and NHO.
26.	Project proponent shall install necessary oil spill mitigation measures in the shipyard. The details of the facilities provided shall be informed tothis Ministry within 3 months from the date of receipt of this letter.	**This condition is complied.** a) Oil Spill Contingency Response Plan is in place to cater to Tier —I spills. In pursuance, we have provided the following facilities. i) Spill response equipment and chemicals

		tohandle Tier-1 Oil Spills ii) Shoreline cleaning equipment iii) A team of well-trained professionals to handle Oil Spill Contingencies / emergencies with the coordination of Indian Coast Guard. b) Details were furnished to the MoEF&CC Regional Office, Bangalore, vide our letter no. KP/MoEF/PH-II/20 dated 2nd February, 2010
27.	No hazardous chemicals shall be stored in the Coastal Regulation Zonearea.	**This condition is complied.** No hazardous chemicals are stored in CRZ area.
28.	The project shall not be commissioned till the requisite water supply andelectricity to the project are provided by the PWD / Electricity Department.	**This condition is complied.** Electrical poweris being provided by APTRANSCO
29.	Specific arrangements for rainwater harvesting shall be made in the projectdesign and the rainwater so harvestedshall be optimally utilized.	**This condition is complied.** Rainwater harvesting pits are developed nearbuildings. For the general area, rainwater harvesting ponds are also developed at suitable locations.
30.	The facilities to be constructed in the CRZ area as part of this project shall bestrictly in conformity with the provisions of the CRZ Notification, 1991 and its amendment. The facilities such as office building and residential buildings which do not require waterfront and foreshore facilities shall not be constructed within the Coastal Regulation Zone area.	**This condition is complied.**
General Conditions		
i.	Adequate provision for infrastructure facilities including water supply, fuel and sanitation must be ensured for construction workers during the construction phase of the project to avoid any damage to the environment	**This condition is complied.** Adequate provisions including water supply, andsanitation are ensured for construction workers at the time of Construction phase. It is completed.
ii.	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	**This condition is complied.** Adequate measures are being taken while digging to avoid degradation of water quality.
iii.	Borrow sites for each quarry sites	**Noted and Being complied.**

	for road construction 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.	No excavation or dumping on private property is being carried out.
	(b). No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations.	**This condition is complied**
	(c). Excavation work shall be done in close consultation with the Soil Conservation and Watershed Development Agencies working in the area, and	**This condition is complied**
	(d). Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the dump sites for such materials must be secured so that they shall not leach into the groundwater.	**This condition is complied.** Care is being taken not to contaminate watercourses and Ground water.
iv.	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.	**This condition is complied.** Construction material used by contractors at AKPL is from approved quarries. Royalty receipts are being submitted by contractors.
v.	Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely.	**This condition is complied**
vi.	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 and other environmental protection activities.	**This condition is complied**
vii.	Ministry of Environment & Forests	**This condition is complied**

	or any other competent authority may stipulate any additional conditions or modify the existing ones, if in the interest of environment and the same shall be complied with.	
viii.	The Ministry reserves the right to revoke this clearance if any of the conditions stipulated are not complied with the satisfaction of the Ministry.	**This condition is complied**
ix.	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 and Forests.	**This condition is complied**
x.	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closureand final approval of the project by theconcerned authorities and the date ofstart of land development work.	**This condition is complied.** These details were furnished to the MoEF&CC Regional Office, Bangalore, vide our letter no. KP/MoEF/PH-II/20 dated 2nd February, 2010. Financial Closure: 17.03.2009 Approval of the Project by GoAP: 04.08.2009 Start of land development work: 11.08.2009
xi.	Andhra Pradesh Pollution Control Board shall display a copy of the Clearance letter at the Regional Office, District Industries Centre and Collector's Office / Tehsildar's Office for 30 days.	**This condition is complied.** Copy of Environmental Clearance submitted to APPCB.
	These stipulations would be enforced among others under the provisions of Water (Prevention and Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the Environment (Protection) Act, 1986, the Public Liability (Insurance) Act, 1991 and EIA Notification 1994, including the amendments and rules made thereafter.	**Noted.**
	All other statutory clearances such asthe approvals for storage of diesel from Chief Controller of, Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and Wildlife (Protection) Act, 1972 etc., shall be obtained, as	**This condition is complied.** Statutory clearances are obtained for storage ofDiesel from Chief Controller of Explosives (CCE),Fire Department, Civil Aviation Department, and Forest Conservation Act.

	applicable by project proponents from the respective competent authorities.	
	The project proponent shall advertise in at least two local Newspapers widelycirculated in the region, one of which shall be in the vernacular language informing that the project has been accorded Environmental Clearance and copies of clearance letters are available with the Andhra Pradesh State Pollution Control Board and mayalso be seen on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in The advertisement should be made within 10 days from the date of receipt of theClearance letter and a copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	**This condition is complied.** Advertisement was given in Two Local Newspapers namely Deccan Chronicle dated 22.11.2009 and Andhra Jyothi dated 22.11.2009.A copy of the advertisement was sent to Regional Office, Bangalore of MoEF vide our Letter No.KP/MOEF/PH.II/08 dated 18.01.2009.
	Environmental 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.**
	Any appeal against this Environmental Clearance shall lie with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 of the National Environment Appellate Act, 1997.	**Noted.**
	A copy of the clearance letter shall be sent by the proponent to concerned Panchayat, Zilla Parisad / Municipal Corporation, Urban Local Body and the Local NGO, if any, from whom suggestions /representations, if any, were received while processing the proposal. The clearance letter shall also be put	**This condition is complied**

	on the website of the Company by the proponent.	
	The proponent shall upload the status of compliance of the stipulated EC conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB. The criteria pollutant levels namely; SPM, RSPM, SO2, NOx (ambient levels as well as stack emissions) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gate of the Company in the public domain.	**This condition is complied.** a) Periodic monitoring of various parameters is being carried out by an agency accredited by NABL and approved by MoEF&CC. The results of monitoring comply with the norms. Results of periodic monitoring are being regularly submitted to statutory authorities. b) EMP as per the EIA report is being implemented. c) Environmental Information is being displayed on the port website. d) Six monthly Environmental Monitoring Reports are being submitted to Ministry andAPPCB. e) Ambient Air Quality Parameters are being displayed at the main office.
	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies aswell as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB andthe SPCB.	**Being complied**
	The environmental statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the Company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.	**Being complied.** Report for the previous year (FY 2021-22) was submitted to the APPCB vide letter No. AKPL/ APPCB/EHS/077/2022-2023,dated 26.09.2022.
Specific Conditions vide MoEF&CC order F.No. 11-62/2009-IA.III (Pt) dated 16.03.2016		
i	Construction activity shall be carried out strictly according to the provision of CRZ notification, 2011. No construction work other	**Noted and Being complied.** No construction works other than thatpermitted in Coastal Regulation Zone Notification is being carried out in CRZ Area.

	than those permitted in coastal Regulation Zone Notification shall be carried out in Coastal regulation Zone area.	
ii	All the recommendations and conditions specified by AP Coastal Zone Management Authority (APCZMA) vide letter no.3160/Env/CZMA/2014 dated 14.08.2014 shall be complied with.	**Noted and Being complied**
Recommendations and Conditions of the APCZMA dated 14.08.2014.		
	1. The proposed constructions in the Deep Water Port at Krishnapatnam in SPSR Nellore District shall confirm to norms prescribed in CRZ Notification, 2011 issued by the Ministry of Environment and Forests, Government of India.	**This condition is complied** Norms prescribed in the CRZ Notification, 2011 are being complied in respect of constructions being taken up in the Krishnapatnam Port.
	2. Mining of sand, rock and other substrata material is strictly prohibited, except for the activities permitted under CRZ notification, 2011. No dressing or altering of sand dunes, hills, natural features within the area covered under Coastal regulation Zone. Approved stone quarries shall be identified for extraction of stones and boulders for the construction of roads.	**This condition is complied** No mining of sand, rock and other substratamaterial is being carried out in port area. No dressing or altering of sand dunes, hills,natural features is being carried out. Stones and boulders for the construction of roads etc., is being procured from the GoAP approved quarries.
	3. Harvesting or drawl of ground water within the CRZ area should not be resorted either for construction or during the operational phase of the port within the CRZ area.	**This condition is complied** Withdrawal of Ground water in CRZ area is not resorted to.
	4. Green belt shall be developed all along the land boundary of the proposed project site to act as wind breaks. The treated waste water from the Sewage Treatment Plant shall be utilized for raising the green belt.	**Being complied** Green belt of 191.5 Ha has been developed along port boundary, around coal yards, of avenue & median plantations. Further Greenbelt development is in progress. Treated wastewater from the STP is being utilized for the green belt development and dust suppression.
	5. Mangrove plantations existing in the Port area shall be maintained and protected. There	**This condition is complied** Existing Mangrove areas are being maintained and protected with suitable barricading,

	is about 85 Ha of mangrove plantations existing in the port area. Suitable areas may be identified for planting the mangroves. Wherever, mangroves are planted in the vicinity (Private / Government lands), necessary protection shall be extended.	erection of display boards and ensuring the tidalflow.
	6. Shore protection measures shall be undertaken to prevent erosion of shoreline based on studies conducted by reputed national agency (INCOIS).	**Being complied** a) From the INCOIS report for the period October 2008 to January, 2010, the coastline is found to be stable. b) Shoreline monitoring further carried out in-house also revealed that the coastline is unaffected except for seasonal variations. c) Though the shoreline is stable, still shore protection measures like green cover (casuarina plantation) along the beach is developed.
	7. Necessary measures shall be taken to prevent the pollution of waters inthe creek and Buckingham Canal onaccount of construction of new structures.	**Being complied** • Developed runoff drains, collections pits, guard ponds for coal storage yards with provision for recycling for dust suppression. • Developed truck wash with oil separator and settlement pits with provision for recyclingfor dust suppression. • Developed 540 KLD STP's and treated effluent recycled for dust suppression and green belt. • Developed Oil Spill Contingency plan for Tier- I spills, procured necessary equipment and chemicals and deployed trained personnel. • Surface water quality monitoring is also being carried out by NABL approved agency at regular intervals; reports are being submitted to APPCB, RO, Nellore.
	8. Neither dumping of solid waste in the creeks / BC Canal nor filling upof the creeks are permitted. The debris shall be transported and disposed at a designated disposal site authorized by APPCB.	**This condition is complied.** No dumping of Solid waste is envisaged into the creeks / BCcanal The debris/solid waste is being Collection, Segregate , Stored at a designated location and disposed to authorized vendor.
	9. There shall be no obstruction to ensure the free flow of	**Being complied** Creeks are provided with box culverts to ensure

	water in both directions in the creeks and Buckingham Canal to prevent flooding of upper catchment during rainy season.	the free flow of water in both directions in thecreeks. Free flow of water at BC is ensured.
	10.The port management shall make fresh reference, in case theproposed operations extend beyond the designated area.	**Noted and Being complied**
	11. All the conditions stipulated in the NOC issued through Letter **No.7401/CZMA/2012, dated 02.02.2013** shall be implemented. Full cooperation shall be extended to all inspecting authorities / organizations such as APPCB, CPCB and local Environment Protection organizations etc.	**Noted and Being complied**
Recommendations and Conditions of the APCZMA dated 02.02.2013		
	1. Necessary permission shall be obtained from Government / Director of Ports to develop the infrastructure facilities and copies of such permissions shall be submitted for records.	**This condition is complied**
	2. Permission from inland water transport (IWT) Wing of State irrigation Department shall be obtained to undertake new constructions and also for taking up any modifications of the existing structures on the Buckingham Canal.	**This condition is complied**
	3. Dredged material shall be utilized for reclamation of land purpose of the port hinterland area subject to the suitability of dredged spoils. The disposal of balance sediment material into sea be undertaken as per the EIA report.	**This condition is complied.** Suitable dredged material is being utilized forreclamation as needed. The remaining balance dredge material is only being disposed as per theEIA report.
	4. The project proponent shall submit the compliance report to the Government before commissioning the port and related facilities	**This condition is complied.**

	5. Full cooperation shall be extended to all inspecting authorities / organizations such as APPCB, CPCB and local Environment Protection organizations etc.	**Being complied.** Full cooperation is being extended to all inspecting authorities / organizations such as APPCB, CPCB and local Environment Protection organizations etc.
iii	Automatic/online monitoring system (24x7 monitoring devices) for air pollution as well as water pollution in respect of flow measurement and relevant pollutants in the treatment system to be installed. The data to be made available to the respective SPC and in the Company's website.	**Being complied.** Three continuous AAQM stations are installed and commissioned in the port area and it was linked to APPCB web site. Analysis of treated wastewater from STP is carried out by NABL approved agency; reports are being submitted to APPCB.
iv	All the recommendations mentioned in rapid risk assessment report, disaster management plan and safety guidelines shall be implemented.	**This condition is complied.** All the recommendations of EIA Report (EMP) and safety guidelines are being implemented.

Compliance Report on Conditions Stipulated in the Environmental and CRZ clearance for Phase – III

Development of Krishnapatnam Port

April 2022 to September 2022

Adani Krishnapatnam Port obtained **No Objection Certificate for CRZ** from APCZMA and MoEF&CC granted **Environment & CRZ clearance** for the "Expansion of Krishnapatnam Port (Phase-III)", the project comprises of 16 berths (including 3 jetties for liquid cargo) and 3 SBMs in deep waters to cater to 150.2 MTPA of various types of cargo and 1.1 MTEUsPA of container cargo with dredging of 60 Million cum. AKPL obtained Consent For Establishment (CFE) from APPCB vide order No. 633/APPCB/CFE/RO-NLR/HO/2010 dated 25.02.2021. Phase-III expansion works initiated with dredging for construction of liquid jetty at lee side of the north breakwater.

Half yearly Compliance report on conditions of Environmental & CRZ Clearance for AdaniKrishnapatnam Port for Phase – III
MoEF&CC Order dated 11.01.2021 Period of Report "April 2022 to September 2022"

S no	Condition	Compliance status as on 30.09.2022
Specific Conditions:		
(i)	The Environmental and CRZ Clearance to the project is primarily under provisions of EIA Notification, 2006 andCRZ Notification, 2011. It does nottantamount to approvals/consent/ permissions etc., required to be obtained under any other Act/Rule/regulation. The Project Proponent is under obligation to obtain approvals / clearances under any other Acts/ Regulations or Statutes as applicable to the project.	**Being complied**
(ii)	The project proponent shall abide by allthe commitments and recommendations made in the Form-II, EIA and EMP report, submissions made during Public Hearing and also that have been made during their presentation to EAC.	**Being complied** All the recommendations in the Environment Management Plan of the Environmental Impact Assessment report will be implemented. As part of Phase-I & II, AKPL is conducting Environmental Monitoring covering thefollowing attributes Air, Noise, Marine water, Sediment, Turbidity at deep sea, STP water quality, Soil, Ground water, Surface water, DG set on regular basis, the results

		of the analysis were found to be well within the permissible limits. The six-monthly environmental monitoring from April 2022 to September 2022 is attached.
(iii)	Construction activity shall be carried out strictly according to the provisions of the CRZ Notification, 2011. No construction works other than those permitted in Coastal Regulation Zone Notification shall be carried out inCoastal Regulation Zone area.	**Noted and Being complied** All the construction works are being carried out as per the CRZ Notification, 2011. Only permitted activities in CRZ area are being carried out.
(iv)	All the recommendations and conditions specified by the Andhra Pradesh Coastal Zone Management Authority (APCZMA) vide letter 202/CRZ/IND/201930 dated 21.05.2020 shall be complied with.	**Noted and Being complied**
(v)	The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained. Creek water monitoring program shall be implemented during the construction phase	**Noted and Being complied** **No creek or rivers are blocked** Creek water monitoring implement during the construction phase to ensure the free flow of water.
(vi)	Development of green belt by native species with consultation with state forest department shall be ensured.	**Being complied** Port has developed 191.5 Ha. Of greenbelt including boundary plantation, avenue plantation and plantation in the storage areas. Greenbelt developed in the Port so far is of only native species, all the saplings for the greenbelt development isbeing developed in-house in the nursery by collecting seeds, stem cutting etc., and purchased from the district forest department. Same shall be followed for Phase III greenbelt.
(vii)	The proposed expansion entails 60 million cum of dredging in soft soil. As proposed, the PP shall utilize 26 million cu m of dredged sand for reclamation of low lying areas of port, stock pile 2 million cu m on the coast north of north breakwater for long term coastal protection as recommended by NIOT and disposal of balance 32 million cu mof dredged spoil in the identified dredge disposal area of 56 Km2 beyond (-) 20 m	**Condition is noted and no adverse impacts are observed.** APPCB issued Consent for Establishment (CFE) vide their order No. 633/APPCB/CFE/RO-NLR/HO/2010 dated 25.02.2021. The impact of dredging activities will be monitored by NIOT for 5 years post completion of the project.

	contour. The impact of dredging on the marine environment should be monitored and necessary measures shall be taken on priority basis if any adverse impact is observed. NIOT will oversee the work as scientific body and continue to monitor its impact/benefits for at least 5 years post project completion. Necessary financial assistance to be provided by project proponent to NIOT. The report of the same to be submitted to regional office of MoEFCC by projectproponent.	
viii)	Marine ecological monitoring and its mitigation measures for protection of phytoplankton, zooplanktons, macrobenthos, estuaries, sea-grass, algae, sea weeds, Crustaceans, Fishes, coral reefs and mangroves etc. as givenin the EIA-EMP Report shall be complied with in letter and spirit with the help of reputed organization or individuals of national repute having knowledge in thesaid subject. Necessary financial assistance to be provided by project proponent.	**Being complied.** Periodical Environmental monitoring is being carried out at Adani Krishnapatnam Port by NABL accredited Laboratory which includes Biological parameters Primary productivity, Chlorophyll, Phytoplankton, Zooplankton in marine water, Benthos communities (Macro benthos, Epifauna, infauna) in Marine sediment. The report of the Environmental monitoring is being submitted to the APPCB regularly. In addition, NCSCM is engaged in annual Environmental Monitoring once in four years to carry out monitoring of various parameters covering, Land, Air quality, Noise, Water, Marine, Marine sediment and mangroves.
(ix)	Continuous online monitoring of air andwater covering the total area shall be carried out and the compliance report of the same shall be submitted along with the 6 monthly compliance reports to theregional office of MoEF&CC.	**Being complied.** 03 Nos. Continuous Ambient Air quality monitoring stations have been installed and all are connected to APPCB which are covered in three corners of the port periphery i.e., Gopalapuram, Thamminapatnam and Krishnapatnam.
(x)	The actions shall be in accordance with proposed landscape planning concepts to minimize major landscape changes. The change in land use pattern shall be limited to the proposed port limits and be carried out in such a way as to ensure proper drainage by providing surface drainage systems including storm waternetwork.	**Being complied** All the developmental activities will be as per the Phase-III layout and proper surface drainage system along with storm water network shall be provided to ensure proper drainage in the project area.

(xi)	Suitable preventive measures be taken to trap spillage of fuel / engine oil and lubricants from the construction site. Measures should be taken to contain,control and recover the accidental spillsof fuel during cargo handling.	**Beingcomplied** Port has existing Tier-I oil spill response equipment to combat any oil spill and coordinate with Indian Coast Guard to contain, control, and recover the accidental spills of fuel during cargo handling.
(xii)	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 the RO, MoEF&CC along with half yearly compliance report.	**This condition is complied** Environmental Monitoring Plan preparedin matrix format for the Phase-III expansion and will be implemented at site
xiii)	The company shall draw up and implement Corporate Social Responsibility Plan as per the Company's Act of 2013.	**This condition is complied** Krishnapatnam Port implemented Corporate Social Responsibility over the years by providing facilities for Education, Skill development and employment, Health & welfare, Community development, women empowerment etc., Krishnapatnam Port will augment the existing CSR activities for the proposed
xiv)	As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, the project proponent shall abide by all the commitments made by them to address the concerns raised during the public consultation. The project proponent shall initiate the activities proposed by them, based on the commitment made in the public hearing, and incorporate inthe Environmental Management Plan and submit to the Ministry. All other activities including pollution control, environmental protection and conservation, R&R, wildlife and forest conservation/protection measures including the NPV, Compensatory Afforestation etc., either proposed by the project proponent based on the social impact assessment and R&R action plan carried out during the preparation of EIA report or prescribed by EAC, shall also be	**This condition is complied** Public hearing for Phase-III expansion was waived as it is being developed in the existing land area of 6800 Ac. All the commitments made in the public hearing for Phase-II during 2009 are being complied. All the activities proposed in the Environment Management Plan for Phase-III along with the existing EMP including Pollution control measures, Environmental protection and conservation, R&R, Wildlife and forest conservation/protection measuresincluding the NPV, Compensatory Afforestation, if any., as prescribed shall be implemented.

	implemented and become part of EMP.	
Standard conditions		
Statutory compliance		
i.	Construction activity shall be carried out strictly according to the provisions of CRZ Notification, 2011 and the State Coastal Zone Management Plan as drawn up by the State Government. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area. A certificate of adequacy of available power from the agency supplying power to the project along with the load allowed for the project should be obtained.	**This condition is complied** Only permitted construction works in CRZ area are being carried out as per the provisions of CRZ Notification, 2011. As per the Concession Agreement, GoAP shall provide power supply from the nearest substation as per the request of the company.
i.	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives, Fire Department, Coast Guard, Civil Aviation Department shall be obtained, as applicable by project proponents from the respective competent authorities.	**This condition is complied.** Krishnapatnam Port has obtained licensefrom Chief Controller of Explosives to store petroleum class A & B as a retail outlet inside the Port which is valid up to 31.12.2024.
Air quality monitoring andpreservation:		
i.	The project proponent shall install system to carryout Ambient Air Qualitymonitoring for common/criterion parameters relevant to the main pollutants released (e.g. PM10 and PM2.5 in reference to PM emission, and SO2 and Nox in reference to SO2 and Nox emissions) within and outsidethe project area at least at four locations covering upwind and downwind directions.	**Being complied.** Environmental Monitoring is being carried out by NABL accredited laboratory. Ambient Air Quality for the entire Port area and outside the port area at 7 locations is being monitored covering upwind and downwind directions. Commissioned 3 no's CAAQM Equipment's in the port & linked to APPCB website. As Phase-III is being developed in the existing Port area, the same shall be continued.
ii.	Appropriate Air Pollution Control (APC) system shall be provided for all the dust generating points including fugitive dust from all vulnerable sources, so as to comply prescribed emission standards.	**Being complied.** In the Port operation area, Port has deployed mechanical road sweeping machines for roads, 248 nos. of sprinklers system, 5 nos. of atomizers and 12 nos. mobile water tankers for coal storage

		yards for dust suppression measures, wind screen towards Krishnapatnam village & Godown with 12 m height to act as dust barrier towards Chalivendram village. All the existing measures shall be augmented as per the requirement and implementation of new technologies to control air pollution shall be explored for dust control in the Port.
iii.	Shrouding shall be carried out in the work site enclosing the dock/proposedfacility area. This will act as dust curtain as well achieving zero dust discharge from the site. These curtain or shroud will be immensely effective in restricting disturbance from wind in affecting the dry dock operations, preventing waste dispersion, improving working conditions through provision of shade for the workers.	**Beingcomplied.** Shrouding shall be used in the work site to enclose and act as dust curtain. Wind screens are erected in the Port to minimize the dust spread to the nearby village.
iv.	Dust collectors shall be deployed in all areas where blasting (surface cleaning) and painting operations are to be carried out, supplemented by stacks for effective dispersion.	**This condition is complied**
v.	The Vessels shall comply the emission norms prescribed from time to time.	**Noted.** All the vessels calling at Krishnapatnam Port shall be verified to comply with the MARPOL regulations as prescribed from time to time.
vi.	Diesel power generating sets proposed as source of backup power should be of enclosed type and conform to rules made under the Environment (Protection) Act, 1986. The height of stack of DG sets should be equal to the height needed for the combined capacity of all proposed DG sets. Use of low Sulphur diesel. The location of the DG sets may be decided with in consultation with State Pollution Control Board.	**This condition is complied** All the DG sets at construction area shall be provided with acoustic enclosures and conforms to the rules made under the Environment (Protection) Act, 1986 like DG height, Fuel using low sulphur diesel and regular monitoring on stack emission check as per the prescribed CPCB norms
vii.	A detailed traffic management and traffic decongestion plan shall be drawn up to ensure that the	**Being complied** FP project management is appointed for complying the condition to study and

	current level of service of the roads within a 05 kms radius of the project is maintained and improved upon after the implementation of the project. This plan should be based on cumulative impact of all development and increased habitation being carried out or proposed to be carried out by the project or other agencies in this 05 Kms radius of the site in different scenarios of space and time and the traffic management plan shall be duly validated and certified by the State Urban Development department and the P.W.D./ competent authority for road augmentation and shall also have their consent to the implementation of components of the plan which involve the participation of these departments.	prepare a traffic management and decongestion plan.
Water quality monitoring andpreservation:		
i.	The Project proponent shall ensure that no creeks or rivers are blocked due to any activities at the project site and free flow of water is maintained.	**Beingcomplied** **No creeks or rivers blocked in the port premises** Creek water monitoring shall be implemented during the construction phase on/near the creek to ensure thefree flow of water.
ii.	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality. Silt curtains shall be used to contain the spreading of suspended sediment during dredging within the dredging area.	**Beingcomplied** Appropriate measures taken while undertaking digging activities to avoid any likely degradation of water quality. Dredging is planned in phased manner and Silt curtains shall be used to contain the spreading of suspended sediment during dredging within the dredging area.
iii.	No ships docking at the proposed project site will discharge its on-board waste water untreated in to the estuary/ channel. All such wastewater load will be diverted to the proposed Effluent Treatment Plant of the project site.	**Beingcomplied** No ships are allowed to discharge on board wastewater. However, Port collects garbage, oil waste, sludge etc., through Port reception facility from the Vessel and dispose through authorized recyclers.
iv.	Measures should be taken to contain,	**Beingcomplied.**

	control and recover the accidental spills of fuel and cargo handle.	Port has existing Tier-I oil spill response equipment to combat any oil spill supported by Indian Coast Guard to contain, control and recover the oil spill.
v.	The project proponents will draw up and implement a plan for the management of temperature differences between intake waters and discharge waters.	**Beingcomplied** Not applicable, as there is no intake and outfall proposed in the project.
vi.	Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution whichimpacts marine life. This shall be prevented by suitable precautions andalso by providing necessary mechanisms to trap the spillage.	**Beingcomplied** • Port is equipped with Tier-I, oil spill response equipment to combat spillage of oil, supported by Indian Coast Guard. • Oil Spills, if any at construction area, shall be managed as per the Oil Spill Contingency Plan. We have Procured Oil Boom, Skimmer and chemicals. • Trainings and periodical mock drills are being organized for the work force at workplace. As per Disaster Management Plan, Indian Coast Guard will be alerted and Coordinate.
vii.	Total fresh water use shall not exceed the proposed requirement as provided in the project details. Prior permission from competent authority shall be obtained for use of fresh water.	**This condition is complied** Port has necessary approvals to withdraw 4MLD of water from Nakalakalva Irrigation drain and 1 MLD from Muthukurtank, which will meet the total water requirement of the Port.
viii.	Sewage Treatment Plant shall be provided to treat the wastewater generated from the project. Treated water shall be reused for horticulture, flushing, backwash, HVAC purposes and dust suppression.	**Beingcomplied** Sewage Treatment Plants of 540 KLD capacity are provided. The treated effluent from theSTP is being used for greenbelt development and dust suppression.
ix.	A certificate from the competent authority for discharging treated effluent/ untreated effluents into the Public sewer/ disposal/drainage systems along with the final disposal point should be obtained.	**This condition is complied** The treated domestic water shall be utilized for greenbelt development and dust suppression.
x.	No diversion of the natural course of the river shall be made without prior permission from the Ministry of Water resources.	**Noted and Being complied** The project does not involve any diversion of the natural course of the river.
xi.	All the erosion control measures shall	**Being complied**

	be taken at water front facilities. Earth protection work shall be carried out to avoid erosion of soil from the shoreline/boundary line from the land area into the marine water body.	Port shall stockpile 2 Million Cu.m of dredged material as erosion control measure at the shore north of north breakwater as recommended by NIOT.
Noise Monitoring and prevention		
i.	Noise level survey shall be carried as per the prescribed guidelines and report in this regard shall be submittedto Regional Officer of the Ministry as apart of six-monthly compliance report.	**Being complied** AKPL engaged NABL accredited Environmental monitoring agency to monitor Noise quality and the values are well withinthe limits of CPCB standard. The monthly analysis reports are being submitted to APPCB, Regional office and half yearly report along with six monthly compliance reports to Regional Office, MoEF&CC and APPCB. The same shall be continued as the proposed project and is sampling locations are within the existing Port boundary.
ii.	Noise from vehicles, power machinery and equipment on-site should not exceed the prescribed limit. Equipment should be regularly serviced. Attention should also be given to muffler maintenance and enclosure of noisy equipment.	**Being complied** Noise levels are regularly being monitored and they comply to standards at construction site. All the DG sets are provided with acoustic enclosures and all other equipment & machineries are given periodic maintenance.
iii.	Acoustic enclosures for DG sets, noise barriers for ground-run bays, ear plugs for operating personnel shall be implemented as mitigation measures for noise impact due to ground sources.	**Being complied** All the DG sets proposed in Phase-III are provided with acoustic enclosures and all other equipment & machineries are conducting periodic maintenance. Ear plugs will be provided along with PPE to all the workmen working in noise generating area.
iv.	The ambient noise levels should conform to the standards prescribed under E(P)A Rules, 1986 viz. 75 dB(A) during day time and 70 dB(A) during night time.	**Being complied.** AKPL engaged NABL accredited Environmental monitoring agency to monitor Noise quality and the values are well within the limit of CPCB standard. The noise levels are being monitored at 7 locations.
Energy Conservation measures		
i.	Provide solar power generation on roof tops of buildings, for solar light systemfor all common areas, street lights parking around project area and maintain the same regularly;	**Being complied** During planning stage of the building constructions, possibilities for provision of roof top solar power systems shall be explored.

ii.	Provide LED lights in their offices and port areas.	**Being complied** All the office buildings and other operation buildings are provided with LED lights,
Waste management		
i.	Dredged material shall be disposed safely in the designated areas.	**Being complied** . Dredged material shall be used for reclamation of low lying areas and the remaining material shall be disposed off in the designated disposal site beyond -20m contour identified by NIOT,
ii.	Shoreline should not be disturbed due to dumping. Periodical study on shore line changes shall be conducted and mitigation carried out, if necessary. The details shall be submitted along with the six monthly monitoring reports.	**Being complied** We have appointed NIOT for shoreline monitoring (SO no 5702007591)
iii.	Necessary arrangements for the treatment of the effluents and solid wastes must be made and it must be ensured that they conform to the standards laid down by the competent authorities including the Central or State Pollution Control Board and under the Environment (Protection) Act, 1986.	**Being complied** Port have 540 KLD STP's to treat waste water from domestic usage, the treated effluent conforms to the standards laid by CPCB and the solidwaste generated in the Port is collected, segregated, stored and disposed as per the Solid Waste Management Rules, 2016 and Environment (Protection) Act, 1986.
iv.	The solid wastes shall be managed and disposed as per the norms of the Solid Waste Management Rules, 2016.	**Being complied.** Solid waste generated in the Port and in the construction, site is collected, segregated, stored and disposed as per the Solid Waste Management Rules, 2016 and Environment (Protection) Act, 1986.
v.	Any wastes from construction and demolition activities related thereto shall be managed so as to strictly conform to the Construction and Demolition Waste Management Rules, 2016.	**Being complied.** Construction waste shall be used for levelling and site development works, no demolition works, all the waste generated from Construction and Demolition works will conform to the Construction and Demolition Waste Management Rules, 2016.
vi.	A certificate from the competent authority handling municipal solid wastes should be obtained, indicating the existing civic capacities of handling and their adequacy to cater to the M.S.W. generated from project.	**Being complied**
vii.	Used CFLs and TFLs should be properly collected and disposed	**Being complied** Port replaced all the CFLs and TFLs with

	off/sent for recycling as per the prevailing guidelines/ rules of the regulatory authority to avoid mercury contamination.	LED lights. Used CFLs and TFLs if any, willbe disposed off for recycling as per the E-Waste rules 2016 and their Amendment to avoid any contamination.
viii.	Oil spill contingency plan shall be prepared and part of DMP to tackle emergencies. The equipment and recovery of oil from a spill would be assessed. Guidelines given in MARPOL and Shipping Acts for oil spill management would be followed. Mechanism for integration of terminals oil contingency plan with the overall area contingency plan under the co- ordination of Coast should be covered.	**Being complied** Port has existing Oil Spill Contingency Plan in place for the existing and proposed project. Port has Tier-I Oil Spillresponse equipment for recovery of oil spill in coordination with ICG, Krishnapatnam and follows the guidelines given in MARPOL and Shipping Acts.
Greenbelt		
i.	Green belt shall be developed in area as provided in project details with a native tree species in accordance with CPCBguidelines.	**Being complied** A total of 191.5 Ha. greenbelt has been developed so far in the Port as part of Phase-I & II development with native species. In Phase-III, it is proposed to develop 120 Ha.
ii.	Top soil shall be separately stored and used in the development of green belt.	**Being complied. We are using cocopit, red soil and vermi compost for enriching the top soil.**
Marine ecology		
i.	The dredging schedule shall be so planned that the turbidity developed is dispersed soon enough to prevent anystress on the fish population.	**Being complied** Dredging is planned in phased manner so that the turbidity developed will get dispersed preventing stress on fish population. Marine monitoring studies are conducting with NABL Accredited Laboratory for control of dredging impact.
ii.	While carrying out dredging, an independent monitoring shall be carried out through a Government Agency/Institute to assess the impact and necessary measures shall be taken on priority basis if any adverse impact is observed.	**Being complied** Dredging works for construction of liquid jetty at the lee side of the North breakwater has been started after obtaining CFE from APPCB vide their letter dated 25.02.2021. Marine monitoring studies are conducting with NABL Accredited Laboratory for control of dredging impact.
iii.	A detailed marine biodiversity management plan shall be prepared through the NIO or any other institute of repute on marine, brackish water authority. The report shall be	**Being complied** We have appointed SDMRI for preparing detailed Biodiversity management plan (SO no 5702007267)

	based on a study of the impact of the project activities on the intertidal biotopes, corals and coral communities, molluscs, sea grasses, sea weeds, sub- tidal habitats, fishes, other marine and aquatic micro, macro and mega flora and fauna including benthos, plankton, turtles, birds etc. as also the productivity. The data collection and impact assessment shall be as per standards survey methods and include underwater photography.	
iv.	Marine ecology shall be monitored regularly also in terms of sea weeds, sea grasses, mudflats, sand dunes, fisheries, echinoderms, shrimps, turtles, corals, coastal vegetation, mangroves and other marine biodiversity components including all micro, macro and mega floral and faunal components of marine biodiversity.	Being complied Monitoring of Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality at regular intervals with NABL Laboratory.
v.	The project proponent shall ensure that water traffic does not impact the aquatic wildlife sanctuaries that fall along the stretch of the river.	**Noted.** There are no aquatic wildlife sanctuaries in the vicinity of the Port. However, it is ensured that the water traffic does not impact the marine ecosystem for port operations.
Public hearing and human health issues		
i.	The work space shall be maintained as per international standards for occupational health and safety with provision of fresh air respirators, blowers, and fans to prevent any accumulation and inhalation of undesirable levels of pollutants including VOCs.	**Being compiled,** international standard for Occupational health and safety will be maintained in the work space to prevent any undesirable environmental pollutants.
ii.	Workers shall be strictly enforced to wear personal protective equipment's like dust mask, ear muffs or ear plugs, whenever and wherever necessary/ required. Special visco-elastic gloves will be used by labour exposed to hazards from vibration.	**Being complied** . Adani Krishnapatnam Port strictly enforcing all the workers, employees, stakeholders to wear PPEs at operational areas.
iii.	Safety training shall be given to all	**Being complied.**

	workers specific to their work area and every worker and employee will be engaged in fire hazard awareness training and mock drills which will be conducted regularly. All standard safety and occupational hazard measures shall be implemented and monitored by the concerned officials to prevent the occurrence of untoward incidents/ accidents.	All the employees, workers & contractors are given daily toolbox talks, monthly review meetings with employees engaged in various activities of the Port. Port implemented and monitoring all standard safety and occupational hazard measures to prevent untoward incidents.
iv.	Emergency preparedness plan based on the Hazard identification and Risk Assessment (HIRA) and Disaster Management Plan shall be implemented.	**Being complied.** Port has developed Emergency Preparedness Plan and Disaster Management Plan for the existing facilities. For Phase-III, Emergency Preparedness Plan and DMP will be prepared and implemented as per the proposed facilities.
v.	Provision shall be made for the housing of construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile STP, safe drinking water, medical health care, creche etc. The housing may be in the form of temporary structures to be removed after the completion of the project.	**Being complied** . Temporary housing structures provided to construction workers with necessary infrastructure and medical health care.
vi.	Occupational health surveillance of the workers shall be done on a regular basis.	**Being complied**
Environment responsibility		
i.	The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental / forest /wildlife norms/ conditions. The company shall have defined system of reporting infringements /	**Being complied, Policy attached- Annexure - C**

	deviation / violation of the environmental / forest / wildlife norms / conditions and / or shareholders / stake holders. The copyof the board resolution in this regard shall be submitted to the MoEF&CC as a part of six-monthly report.	
ii.	A separate Environmental Cell both atthe project and company head quarterlevel, with qualified personnel shall be set up under the control of senior Executive, who will directly report to the head of the organization.	**Being complied.** Adani Krishnapatnam Port has formed Environment Cell headed by Associate GM reports to Chief Executive Officer(CEO) and Environment cell with qualified personnel formed at corporate level as well.
iii.	Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.	**Being complied**
iv.	Self-environmental audit shall be conducted annually. Every three years third party environmental audit shall becarried out.	**Being complied**
Miscellaneous		
i.	The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominentlyadvertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's	**This condition is complied.** Advertisement was published in District Newspapers namely "Vartha" in local language & "The New Indian Express" in English dated 21.01.2021.

	website permanently.	
ii.	The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in tum has to display the same for 30 days from the date of receipt.	**This condition is complied.** A copy of the Environmental clearance is submitted to the District Collector vide our letter dated 03.02.2021 and local panchayats vide letter dated 01.02.2021.
iii.	The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.	**This condition is complied.** The status of compliance of the stipulated Environment Clearance conditions along with six monthly monitoring report will be uploaded up on submission of the same to the Regional office, MoEF&CC, Vijayawada..
iv.	The project proponent shall submit six- monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment,Forest and Climate Change at environment clearance portal.	**This condition is complied**
v.	The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.	**This condition is complied.** Report for the previous year (FY 2021-22) was submitted to the APPCB vide letter No. AKPL/ APPCB/EHS/077/2022-2023,dated26.09.2022.
vi.	The criteria pollutant levels namely; PM2.5, PM10, SO2, NOx (ambient levels) or critical sectoral parameters, indicated for the project shall be monitored and displayed at a convenient location near the main gateof the company in the public domain.	**This condition is complied.** Inline to requirement of sign board is placed at the main gate of the company. Regularly sign board is being updated with details of effluent discharge quality,air emission levels and CFO order no. & its validity of CFO.
vii.	The project proponent shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities, commencing the land	**This condition is complied.** Obtained CFE for Phase-III expansion vide their letter no. 633/APPCB/CFE/RO-NLR/HO/2010 dated 25.02.2021.

	development work and start of production operation by the project.	
viii.	The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.	**Noted**
ix.	The project proponent shall abide by all the commitments and recommendations made in the EIA/EMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.	**Agreed.** Public hearing exempted for the Phase-III expansion project. All the recommendations by the EAC committee, EIA/EMP shall be implemented.
x.	No further expansion or modifications in the port area shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change (MoEF&CC).	**Noted and Being complied.** **No** expansion or modifications will not take place without prior approval from concerned authority.
xi.	Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.	**Noted**
xii.	The Ministry may revoke or suspend the clearance, if implementation of anyof the above conditions is not satisfactory.	**Noted**
xiii.	The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.	**Noted**
xiv.	The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.	**Noted**
xv.	The above conditions shall be enforced, inter-alia under the	**Noted**

	provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.	
xvi.	Any appeal against this EC 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**
APCZMA – NOC vide letter no.202/CRZ/IND/2019-30 dated 21.05.2020		
Part A : Specific conditions		
i	The project proponent shall comply with all the conditions stipulated in the Environment & CRZ clearances, CFEs, CFOs issued to M/s. KPCL Phase-I and Phase-II projects in this Phase-III project also	**Noted and being complied.** Krishnapatnam Port strictly complied all the conditions stipulated in the EC, CFE & CFO of both Phase-I & II projects and same will continue to comply the same for the Phase-III expansion project also.
ii	The proposed constructions shall conform to the norms prescribed in CRZ notification issued by the Ministry of Environment and Forests, Government of India as per S. No. 19€, dated 06.01.2011.	**Noted.** All the construction activities will be carried out as per the CRZ notification, 2011.
iii	No activity on ground shall be undertaken without obtaining Environmental clearance from Ministry of Environment and Forests, Government of India as per S. No. 19(E), dated 06.01.2011.	**Noted** MoEF&CC granted Environmental & CRZ clearance vide their letter no. 10-18/2016-IA.III dated 11.01.2021. Obtained CFE from APPCB for Phase-III expansion vide their letter no. 633/APPCB/CFE/RO-NLR/HO/2010 dated - 25.02.2021. Dredging works, laying pipelines, infrastructure and construction of Liquid jetty (L4) initiated after CFE obtained at the Lee side of the North breakwater.
iv	Continuous monitoring of	**Being complied**

	circulation of seawater shall be carried out every six months by engaging a reputed agencies like NIOT. The port shall undertake the study of multi sensor, multi date data to study the sedimentation studies in theinner harbour channel in addition to the in-house studies undertaken as part of regular monitoring of sedimentation in the harbour channel. The monthly reports shall be submitted to APPCB.	Conducting Monitoring of Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality with NABL laboratory.
v	Study on marine biodiversity by engaging a reputed organization/ university having a proven expertise in the relevant field shall be taken up. Similar monitoring mechanism shall be developed for monitoring terrestrial part to determine the impacts.	**Being Complied** Inline to implement the EMP, studies of Marine biodiversity AKPL regularly conducting Monitoring of Marine water quality, Marine sediment quality, Surface Water Quality and ground water quality with NABL laboratory. We have appointed SDMRI for preparing detailed Biodiversity management plan (SO no 5702007267)
vi	The Port authorities shall continue to nourish the beaches located on the north side of the North breakwaters within the port limits, which are vulnerable to sea erosion during the monsoon season and also during cyclone.	**Noted.** After obtained the CFE from APPCB AKPL started Dredging works and construction of liquid jetty at the lee side of the North breakwater. Beach nourishment at north side of the North breakwaters be carried out to control the sea erosion.
vii	The Port shall also undertake the scientific studies by engaging reputed agencies like National Institute of Ocean Technology (NIOT) and Indian Institute of Technology, Chennai to study the feasibility of constructing submerged breakwaters to protect the beach road from seasonal erosion and also during cyclones.	**Being Complied** We appointed NIOT for preparing the feasibility report (SO no 5702007591)
viii	The applicant shall ensure that continuous monitoring systems of all likely affected parameters including air/fish/flora/fauna/water quality/waste water discharges/solid waste disposal/construction material disposal etc., are installed and	**Noted and this condition is being complied.** We have submitted our letter AKPL/APCZMA/2022-23/069 dated 09.09.2022 stating port has engaged NABL accredited, and MoEF&CC approved Environmental monitoring laboratory to monitor Environmental parameters: Air quality (NAAQM parameters), Noise quality, Water, Marine water, Marine

	reports shared with the National Institute of Oceanography (NIO) on continuous basis and a monthly report submitted to the APPCB by the NIO, all through construction period and at least for one year after commencement of operations.	sediment, ground water, soil, STP water quality and DGset emission quality and the analysis reports are submitted to APPCB. .
ix	A team of APPCB scientists and environmental engineers shall be kept continuously informed and apprised of the project by the applicant, so that environmental mitigation measures are adopted on a continuous basis.	**Noted and Being Complied**
x	The project proponent while executing this project shall not disturb any of the ecologically sensitive areas like mangroves, sand heaps, sand dunes etc.	**Noted.** No destruction of Ecologically sensitive areas like mangroves are carried out during construction activities.
xi	No construction shall be taken in the No Development Zone. However, if any permitted activity is to be taken up, the proponent may apply to the competent authority separately. Permanent structures shall be avoided in this zone.	**Noted.** All the construction work shall be carried out in the notified port limit. The Port activities are restricted within CRZ Notification 2011.
xii	Priority to be given to the maintenance of storm water drains from the surrounding area to prevent possible flooding of the surrounding areas.	**Noted.** Proper storm water drain system are constructed and well maintained to prevent flooding.
xiii	Mechanization of Port operations shall be taken up to improve the air quality in the bowl area. SPM and RSPM levels to be maintained within the standards stipulated by the APPCB/CPCB.	**Noted.** AKPL regularly conducting Ambient air quality with NABL laboratory and Mechanized port operation is proposed in the Phase-III expansion.
xiv	Raising and maintenance of greenbelt within and outside the port area to be taken up on priority and necessary assistance shall be extended to the local agencies involved in the implementation of afforestation programme.	**Noted** Shoreline plantation with native species in 100m width at boundary of casuarina trees are carried out in acres.
xv	The project proponent shall submit	**Noted**

	the half yearly compliance reports of CRZ clearance duly audited by the accredited consultants on the degree of compliance by the project proponent during and after construction of the project.	
xvi	Dredged material shall be utilized for nourishment of beaches.	**Noted.**
xvii	Full cooperation shall be extended to all inspecting authorities/organizations such as APPCB, MoEF&CC, CPCB and local Environment Protection Organizations.	**Noted and being complied**
xviii	A team of APPCB scientists and environmental engineers shall be kept continuously informed and apprised of the project by the applicant, so that environmental mitigation measures are adopted on a continuous basis.	**Noted and being complied** AKPL is continuously contacting withAPPCB on support, expertise, and inspection etc.,
xix	The project activity shall be carried out strictly as per the provisions of CRZ Notification, 2011, and shall not affect the coastal ecology of the area including flora and fauna.	**Noted.** All the construction activities shall be carried out as per the CRZ notification, 2011 without affecting the coastal ecology of the area.
xx	The project proponent shall ensure thatthere is no destruction of mangroves during the construction as well as the operation phase of the project.	**Noted.** No mangroves will be destructed in Phase-III expansion works both during construction and operation phase.
xxi	There shall be no dressing or alteration of the sand dunes and natural features, including landscape changes for beautification, recreation and other such purpose.	**Noted**
xxii	All conditions/recommendatio nsstipulated by other statutory authorities shall strictly be complied with, as may beapplicable.	**Noted**
xxiii	The project proponent shall obtain all necessary	**Noted.** Obtained Petroleum Explosive License

	clearances/permissions from the concerned authorities as applicable.	from PESO for construction and handlingof liquid cargo dated 18.01.2021.
xxiv	'Consent for Establishment' and CFO as may be applicable, shall be obtained from State Pollution Control Board under the Air (Prevention and Control of Pollution) Act, 1981 and the Water (Prevention and Control of Pollution) Act, 1974.	**Noted** Obtained CFE for Phase-III expansion vide their letter no. 633/APPCB/CFE/RO-NLR/HO/2010 dated 25.02.2021.
xxv	All waste (liquid and solid) arising from the proposed development will be disposed of as per the norms prescribed by State Pollution Control Board. There shall not be any disposal of untreated effluent into the sea/coastal water bodies.	**Noted.** All the solid waste generated from the construction area are being collected, segregated and disposed as per the Solid Waste Management Rules, 2016.
xxvi	No permanent labour camp, machinery and material storage shall be allowed in CRZ area.	**Noted.** Temporary shelter provide for construction labours and material storage at non CRZ area,
xxvii	There shall no groundwater withdrawal within CRZ without prior approval of theState Groundwater Authority.	**Noted.** Port is not withdrawing groundwater in the CRZ area.
xxviii	Disposal of muck during construction phase should not create any adverse effect on the neighboring communities and be disposed taking the necessary precautions for general safety and health aspects of people, only in approved sites with the approval of competent authority.	**Noted.** Dredging works for construction of liquid jetty at the lee side of the North breakwater has been done. The dredged material used for reclamation of low lying land and beach nourishment at north of north breakwater as shoreline protection.
Part B: General Conditions		
i.	A copy of the clearance letter shall alsobe displayed on the website of the AP Pollution Control Board. The clearance letter shall also be displayed at the AP Pollution Control Board Regional Office, District Industries centre and District Collector office/Mandal Revenue Officefor 30 days.	**This condition is Complied.** A copy of the Environmental clearance is submitted to the Environmental Engineer, APPCB Regional office vide our letter dated 12.01.2021, the District Collector vide our letter dated 03.02.2021 and local panchayats vide letter dated 01.02.2021.
i.	The funds earmarked for environmental protection measures	**Noted and Being Complied**

	shall be kept in separate account and shall not be diverted for other purpose. Year wise expenditure shall be reported to the Andhra Pradesh Coastal Zone Management Authority (APCZMA) and AP Pollution control Board Regional office.	
ii.	Concealing factual data by the project proponent, any officer behalf of the project proponent and consultants hired by the project proponent or submission of false/fabricated data and failure to comply with any of the conditions mentioned above may result in withdrawal of this clearance and attract action under the provisions of Environment (Protection) Act, 1986.	**Noted**
iii.	The above stipulations would be enforced among others under the provisions of the Water (Prevention and Control of Pollution)Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act,1986, the Public Liability (insurance) Act, 1991, the EIA Notification, 2006 and the CRZ Notification, 2011.	**Noted.**
iv.	Full co-operation shall be extended to the officials from the APCZMA, APPCB and Regional office of MoEF&CC, during monitoring of implementation of environmental safeguards stipulated. It shall be ensured that documents/data sought pertinent is made available to the monitoring team. A complete set of all the documents submitted to APCZMA shall be forwarded to the AP Pollution Control Board Regional office.	**Noted and Being Complied**
v.	In the case of any change(s) in the scope of the project, the project	**Noted**

	would requirea fresh appraisal by the APCZMA.	
vi.	The APCZMA reserves the right to add additional safeguard measures subsequently, if found necessary, and to take action including revoking of the environment clearance under the provisions of the Environmental (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time bound and satisfactory manner.	**Noted**
vii.	All other statutory clearances shall be obtained, as applicable by project proponents from the respective competent authorities.	**Noted.**
viii.	The project proponent should advertise in at least two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing that the project has been accorded CRZ clearance and copies of clearance letters are available with the AP Pollution Control Board and may also be seen on the website of APCZMA. The advertisement should be made within seven days from the date of receipt of the clearance letter and a copy of the same should be forwarded to the AP Pollution Control Board Regional office.	**This condition is Complied** Advertisement was published in District Newspapers namely "Vartha" & "The New Indian Express" dated 21.01.2021.
ix.	This clearance is subject to any order passed by any Hon'ble Courts, as may be applicable to this project.	**Noted**
x.	A copy of the clearance letter shall be sent by the proponent to concern panchayat, Zilla Parisad/Municipal corporation, Urban Local Body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	**This condition is Complied.** A copy of the Environmental clearance is submitted to the Environmental Engineer, APPCB Regional office vide our letter dated 12.01.2021, the District Collector vide our letter dated 03.02.2021 and local panchayats vide letter dated 01.02.2021. The Environment & CRZ clearance letteris displayed in the Port website.
xi.	The proponent shall upload the	**Noted.**

	status of compliance of the stipulated conditions, including results of monitored data on their website and shall update the same periodically. It shall simultaneously be sent to the AP Pollution Control Board Regional office and, the concerned District Collector and the APPCB.	The status of compliance of the stipulated Environment Clearance conditions along with six monthly monitoring report will be uploaded in the website of the company up on submission of the same to the Regional office, MoEF&CC, Vijayawada, APPCB, Regional office.
xii.	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 Andhra Pradesh Pollution Control Board as prescribed under the Environmental (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 AP Pollution Control Board regional office, APCZMA and APPCB by email.	**This condition is Complied.** Report for the previous year (FY 2021-22) wassubmitted to the APPCB vide letter No. AKPL/ APPCB/EHS/077/2022-2023,dated 26.09.2022.

ANNEXURE-A

ADANI KRISHNAPATNAM PORT LIMITED

Ports and Logistics

ENVIRONMENTAL MONITORING REPORT

FOR THE PERIOD

APR'22 to SEP'22

Prepared By

M/s. SV ENVIRO LABS & CONSULTANTS

(MOEF Recognized, NABL & NABET Accredited And
ISO 9001, 14001 & OSHAS 18001 Certified Laboratory)
Enviro House, B1, Block-B, Autonagar, Visakhapatnam -12

TABLE OF CONTENTS

CHAPTER – 1

INTRODUCTION

1.0 INTRODUCTION

Adani Krishnapatnam Port is located at Krishnapatnam in Muthukur Mandal, "Sri Potti Sri Ramulu" Nellore District, Andhra Pradesh on the East Coast of India at Latitude $14^{0}15'10"$ N and Longitude 80^{0} 08' 05" E on the Northern bank of Khandaleru (Upputeru). Krishnapatnam Port is situated at about 180 Km North of Chennai (Madras) Port.

The Environmental Clearance (EC) was accorded for the Phase – I development of this Port by the MoEF, GoI vide lr no. 10-22/2005-IA-III dated: 26th July, 2006 and the CFE was accorded by the APPCB vide Order No. APPCB/VJA/NLR/633/HO/2004/9 - 467 dt. 25.05.2004. The Phase - I facility was commissioned during the year 2009.

For the Phase II development of this Port, the Environmental Clearance has been accorded by the MoEF, GoI vide F. No. 11 – 62 / 2009 – IA.III dated: 13th November, 2009 and MoEF&CC extended vide Oder even No. dated 18.08.2015 & 16.04.2018 and amended by MoEF&CC vide order dt 16.3.2016. The CFE accorded by the APPCB vide Order No. 633/PCB/CFE/RO-NLR/HO/2010-390 dt. 08.05.2010 is extended vide APPCB Order dt 02.07.2015 and amended vide APPCB's Orders dt. 14.03.2014, 02.07.2015, 10.02.2016, 04.01.2017 & 22.02.2018.

The CFO has been accorded by the APPCB vide Order No. APPCB/VSP/VJA/NLR/633/CFO/HO/2009-582 dt. 08.06.2009 and same is being periodically renewed. The APPCB has accorded latest CFO renewal Order, vide APPCB's Order No. APPCB/VJA/NLR/11344/CFO/HO/2018 dt. 29.07.2018 & 30.08.2018 which is valid till 31st October, 2023. Further, it is amended for additional one berth and increased coal cargo capacity from 46.5 MTPA to 51 MTPA. As of now, 12 berths are operational with necessary infrastructure with capacity to handle 68 MTPA of non-container cargo and 2.0 MTEUsPA of container cargo are commissioned and being operated.

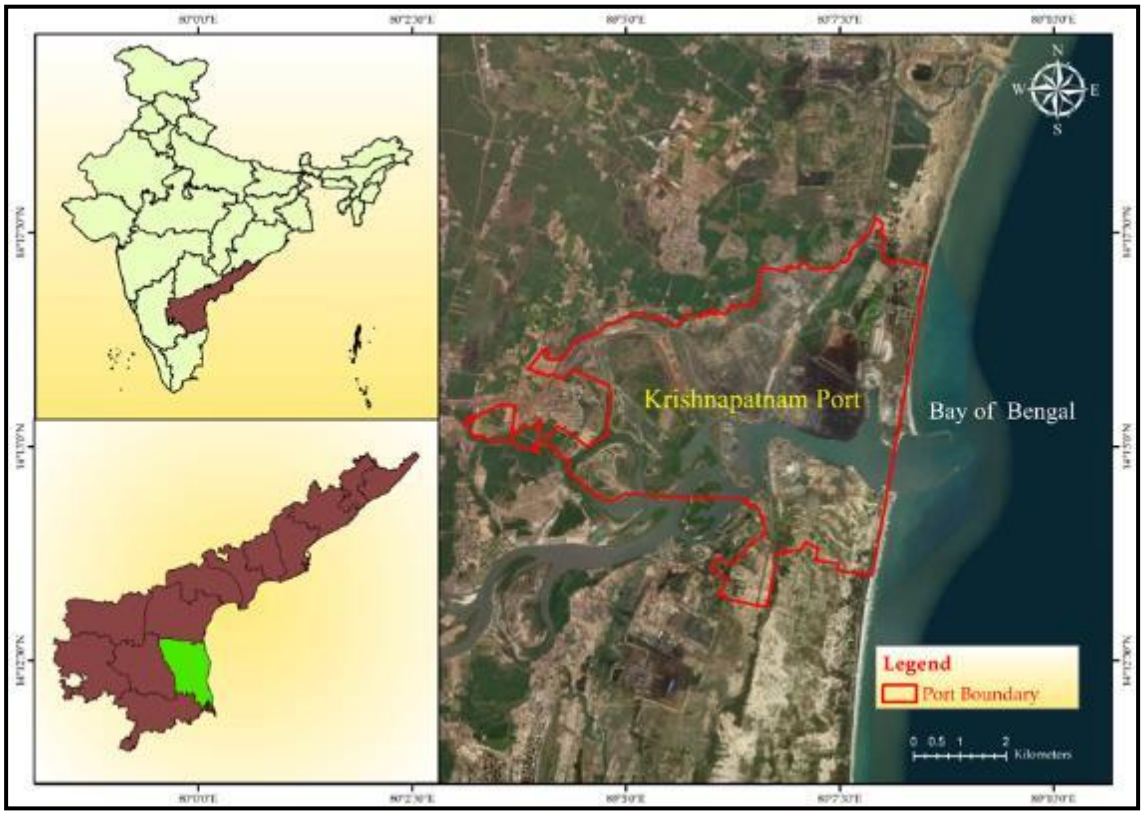
Adani Ports and Special Economic Zone (APSEZ), a part of globally diversified Adani Group, the largest port developer and operator in India. APSEZ acquired KPCL from CVR Group and other investors and changed to Adani Krishnapatnam Port Limited (AKPL).

MoEF&CC granted Environment & CRZ clearance for the "Expansion of Krishnapatnam Port (Phase-III)" vide File No: 1018/2016-IA.III dated 11.01.2021, the project comprising of 16 berths including 3 jetties for liquid cargo and 3 SBMs in deep waters to cater 150.2 MTPA of various types of cargo and 1.1 MTEUsPA of container cargo with dredging of 60 Million cum. AKPL obtained CFE vide order no. 633/APPCB/CFE/RO-NLR/HO/2010 dated 25.02.2021The general Layout plan of the Krishnapatnam Port Phases I, II & III development is shown in this report.

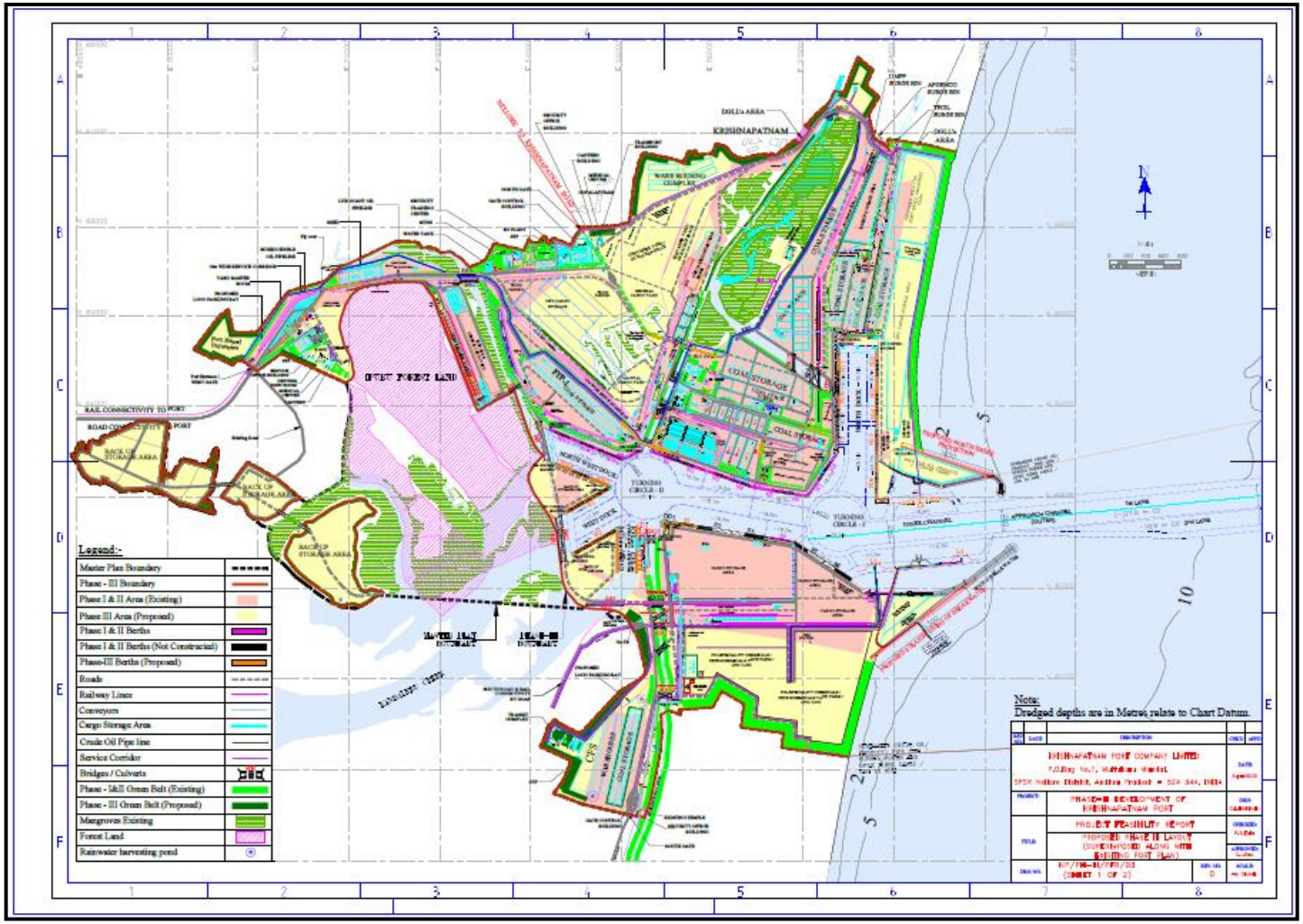
The Environmental Management Plan (EMP) envisaged in the Environmental Impact Assessment (EIA) Report is being scrupulously implemented and augment as needed. Monitoring of Environmental parameters viz., Ambient Air, Ambient Noise, Water Quality (Ground, Surface & Marine), Marine Ecology and Soil as envisaged is being undertaken regularly through an agency having NABL accreditation and approved by MoEF&CC. The

results of monitoring comply with the statutory standards. Periodical Reports with results of monitoring thereof are being regularly submitted regularly to the APPCB and the MoEF&CC, RO as stipulated in the EC/CFE/CFO accorded.

Location Map



ADANI KRISHNAPATNAM PORT LAYOUT



CHAPTER – 2

SCOPE OF WORK

2.0 SCOPE OF WORK

The scope of the baseline studies include monitoring of the following environmental components

1. Ambient Air Quality
2. Marine Water
3. Marine Sediment
4. Noise Level Intensity
5. STP Inlet & Outlet
6. DG Set Emission Quality
7. Ground Water Quality Monitoring
8. Soil Quality

The parameters covered under the scope for each of the above attributes are given below:

SCOPE OF WORK

S.No	Attribute	Scope	Frequency
1.	Ambient Air Quality	Sampling of ambient air at 07 stations for analyzing the following parameters: • PM10 • PM2.5 • SO2 • NOx • NH_3	Monthly Once at each location
2.	Marine Water	Collected at four locations and analyzed the following parameters : • pH • Temperature • Salinity • Density • Turbidity • Total Dissolved solids • Total Suspended solids • Potassium • COD • BOD • Oil & Grease • D.O • Nitrates • Nitrites • Ammonia • Phosphates • Chlorides • Sodium • Sulphates • Silicates • Reactive Silica	Weekly Once at each location

		• Total Phosphorus • Total Nitrogen • Primary Productivity • Chlorophyll • Phytoplankton • Zooplankton • Heavy Metals	
3.	Marine Sediment	Collected at four locations and analyzed for • Sediment Compositions • pH • Nitrogen • Phosphorus • Potassium • Sodium • Benthos Communities • Heavy Metals	Weekly Once at each location
4.	Noise Level Monitoring	Collected at seven locations • Day Leq in dB(A) • Night Leq in dB(A)	Once in a month
5.	STP Inlet and Outlet	• pH • Total Solids • Total Suspended Solids • COD • BOD • Oil & Grease	Once in a month
6.	DG Set Emission Quality	• PM • NOx • HC • CO	Once in six months
7.	Ground Water Quality Monitoring	Collected at Four locations • pH • Electrical Conductivity • Total Dissolved solids • Total alkalinity • Chlorides • Sodium • Potassium • Fluorides • Nitrates • Cyanide • Total Hardness • Salinity	Once in six months

		• Sulphates • COD • Mercury • Cadmium • Arsenic • Selenium • Iron • Lead • Zink • Chromium • Total Coliforms • Fecal coliforms	
8.	Soil Quality Monitoring	Collected at Four locations • pH • EC • Texture • Available Nitrogen • Available Phosphorous • Available Potassium • Exchangeable Sodium • Exchangeable calcium • Exchangeable Magnesium • SAR • Water Soluble Chlorides • Organic Carbon • Lead • Cadmium • Copper • Zinc	Once in six months

CHAPTER – 3

METHODOLOGY

3.0 METHODOLOGY

Methodologies adopted for sampling and analysis for each of the above parameters are detailed below. Methods of monitoring and analysis for various parameters

S.No	Attributes	Measurement Technique		
1.	**Ambient Air Quality**	PM_{10}	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-XXIII)
		$PM_{2.5}$	Fine Particulate Sampler (Gravimetric method)	IS-5182 (Part-XXIV)
		Sulphur dioxide	Modified West and Gaeke	IS-5182 (Part-II)
		Oxides of Nitrogen	Jacob & Hochheiser	IS-5182 (Part-VI)
		NH3	Indophenol Blue Method	-
2.	**Marine Water**	APHA Methods 23rd Edition, 2017		
3.	**Marine Sediment**	ASTM Method		
4.	**STP Inlet and Outlet**	APHA Methods 23rd Edition, 2017		
5.	**Noise Level Intensity**	Digital Noise Level Meter – SL Lutron 4001		
6.	**DG Set Emission Quality**	IS : 11255 Measurement of Emission from Stationary Sources		
7.	**Ground Water Quality**	APHA Methods 23rd Edition, 2017		
8.	**Soil Quality**	IS:2720 & methods of soil analysis, part-1, 2nd edition, 1986 (American Society for Agronomy and Soil Science Society of America).		

CHAPTER – 4

ENVIRONMENTAL MONITORING STUDIES

4.0 ENVIRONMENTAL MONITORING STUDIES – Apr'22 to Sep'2022

S.No	ATTRIBUTE	SCOPE	STUDIES CARRIED OUT
1.	Ambient Air Quality	Collection of ambient air at Seven locations in and outside of port premises	Ambient Air samples collected at 7 locations for PM10, PM2.5, SO2, NOx & NH3 (monthly once) for the period of 01.04.2022 to 30.09.2022.
2.	Marine Water and Surface Water Quality	Collection of Marine Water at six locations. • Port Entrance (Approach Channel) • Turning Circle • Coal Berth • Reclamation Area (Mutable) • Buckingham Canal • Khandaleru Creek	Marine Water samples from Port Entrance, Turning Circle, Coal Berth and Reclamation Area are collection weekly once. Samples for Buckingham Canal and Khandaleru Creek are collected monthly once. All the samples are tested for Physical, Chemical and Microbiological parameters Collected for the period of 01.04.2022 to 30.09.2022.
3.	Marine Water Quality for Turbidity	Collection of Marine Water at seven locations. • Port Entrance (Approach Channel) • Turning Circle • Coal Berth • Reclamation Area (Mutable) • 14°19'26"N & 80°15'43"E	Marine Water samples from Port Entrance, Turning Circle, Coal Berth and Reclamation Area are collection weekly once. Deep Sea water Samples are collected monthly once. Collected for the period of 01.04.2022 to 30.09.2022.

		• 14°16'52"N &80°17'40"E • 14°16'11"N & 80°17'40"E	
4.	Marine Sediment	Collected at • Port Entrance (Approach Channel) • Turning Circle • Coal Berth • Reclamation Area (Mutable)	Collected at four locations and analyzed for the hereunder weekly once. • Sediment Compositions • pH • Nitrogen • Phosphorus • Potassium • Sodium • Benthos Communities • Heavy Metals Collected for the period of 01.04.2022 to 30.09.2022.
5.	Noise Level Intensity	Noise levels were noted at Seven locations inside and outside port premises.	Day and Night Noise levels were noted at • Zero Point • Thamminapatnam • CVR Building • Gopalpuram • Chalivendram • Krishnapatnam • Light House Siding Collected Noise Levels at seven locations for day and night periods once in the month from 01.04.2022 to 30.09.2022.

6.	DG Set Emission Quality	Emission Quality was conducted to DG Sets of port premises	Emission Quality was conducted to DG Sets of port premises, ie PM, NOx, HC & CO (Six months once) for the period of 01.04.2022 to 30.09.2022.
7.	Ground Water Quality Monitoring	Collected at • Port Site • Krishnapatnam village • South side of the port • Gopalapuram village	Ground Water samples from Port site, Krishnapatnam village, South side of the port, Gopalapuram village Bore wells water samples are collected half yearly once. All the samples are tested for Physical, Chemical and Microbiological parameters Collected for the period of 01.04.2022 to 30.09.2022.
8.	STP Inlet and Outlet	Inlet and Outlet samples are collected from STP at Port	STP Inlet and Outlet samples are collected monthly once. Collected for the period of 01.04.2022 to 30.09.2022.
9.	Soil Quality	Collection of Soil sample at Two locations. • Storage area towards west Buckingham canal • Storage area at Port	Soil samples from Storage area towards west, Storage area at Port Area are collection half yearly once. All the samples are tested for Physical, Chemical parameters. Collected for the period of 01.04.2022 to 30.09.2022.

4.1 METEOROLOGICAL DATA

Meteorological data was collected on hourly basis by installing an auto weather monitoring station at Plant site in project office building. The report depicted hereunder represents the data for study period (01.04.2022 to 30.09.2022.)

The following parameters were recorded

- Wind speed
- Wind direction
- Temperature
- Relative humidity
- Rainfall

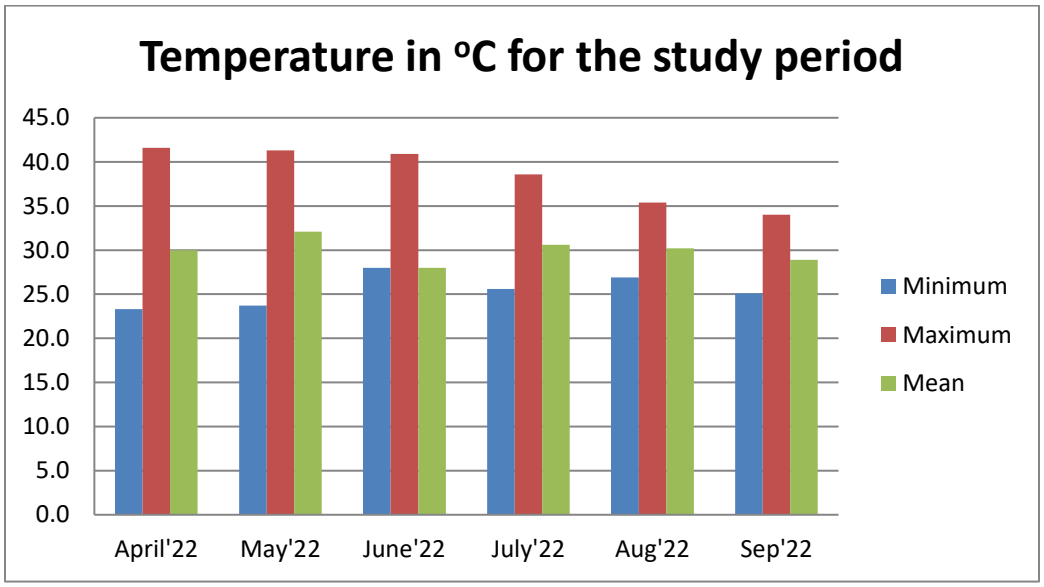
MINIMUM AND MAXIMUM VALUES OF RELATIVE HUMIDITY, TEMPERATURE AND RAINFALL DURING STUDY PERIOD (01.04.2022 to 30.09.2022.).

Temperature in ^{o}C	April'22	May'22	June'22	July'22	Augt'22	Sep'22
Minimum	23.3	23.7	28.0	25.6	26.9	25.1
Maximum	41.6	41.3	40.9	38.6	35.4	34.0
Mean	30.0	32.1	28.0	30.6	30.2	28.9

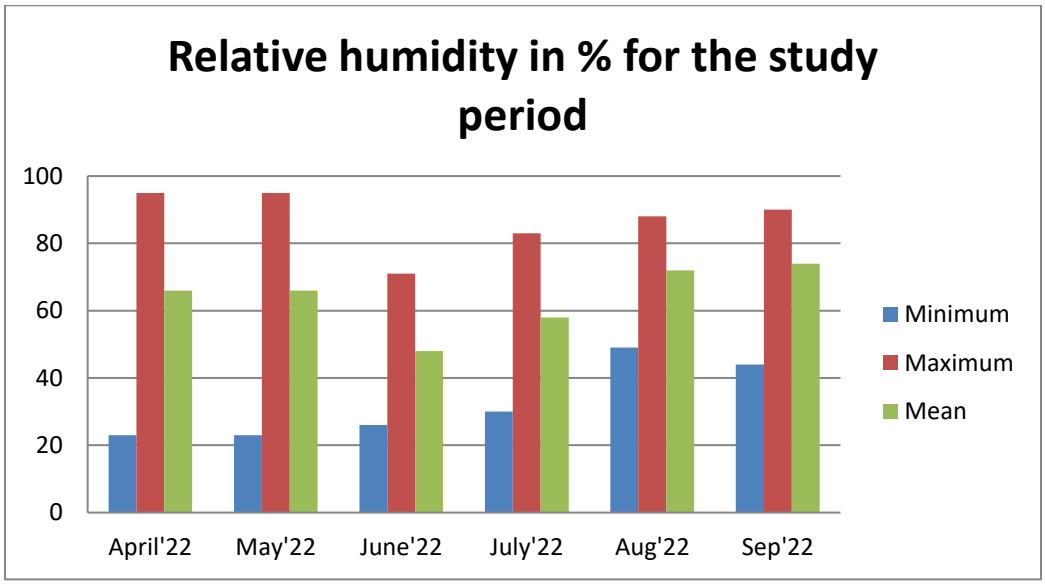
Relative Humidity %	April'22	May'22	June'22	July'22	Augt'22	Sep'22
Minimum	23	23	26	30	49	44
Maximum	95	95	71	83	88	90
Mean	66	66	48	58	72	74

Rainfall in mm	April'22	May'22	June'22	July'22	Augt'22	Sep'22
Minimum	0	0.1	0.1	0.1	0.1	0.1
Maximum	0	8.08	1.27	0.89	5.1	6.4
Cumulative	0	50.9	6.76	17.2	48.5	66.7

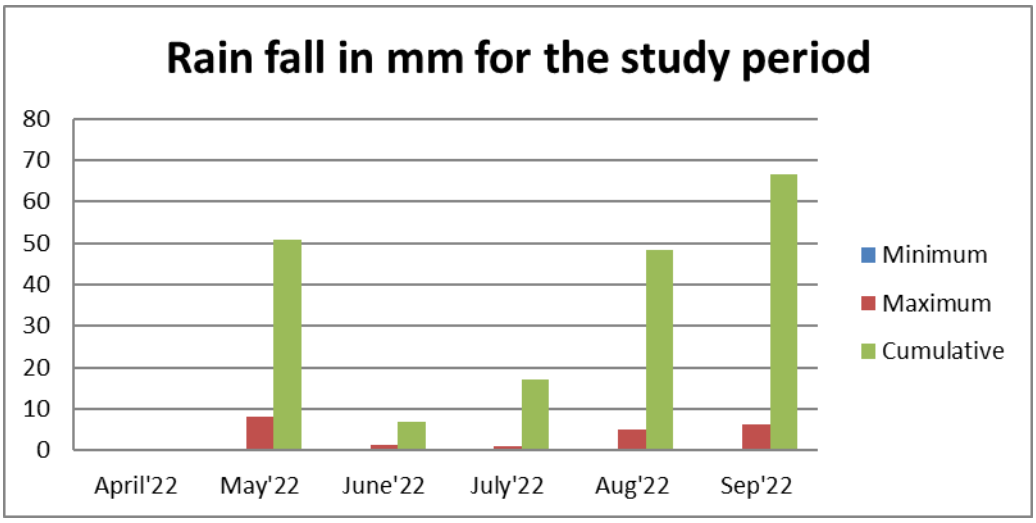
Graphical interpretation of Minimum and Maximum values of and Temperature during study period.



Graphical Interpretation of Minimum and Maximum values of Relative Humidity during study period.



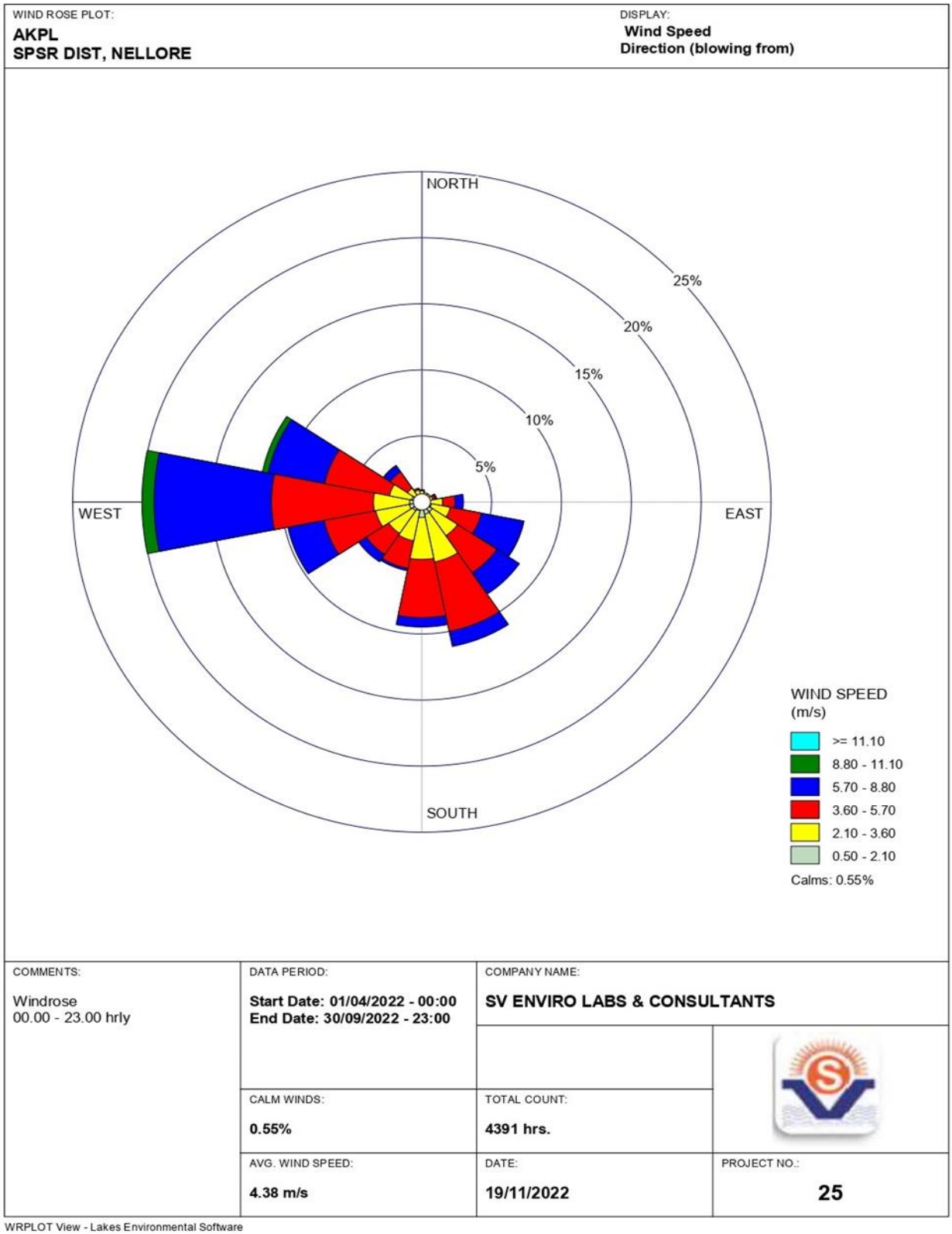
Graphical Interpretation of Minimum and Maximum values of Rainfall during study period.



WIND PATTERN – (April'22 – September'22).

Predominant Wind directions	Distribution in Percentage
ENE	17.1 %
E	11.6%
NE	10.1%
ESE	9.5%

Wind rose diagram for 00.00 – 23.00 hrs (24hrly)



4.2 AMBIENT AIR QUALITY MONITORING

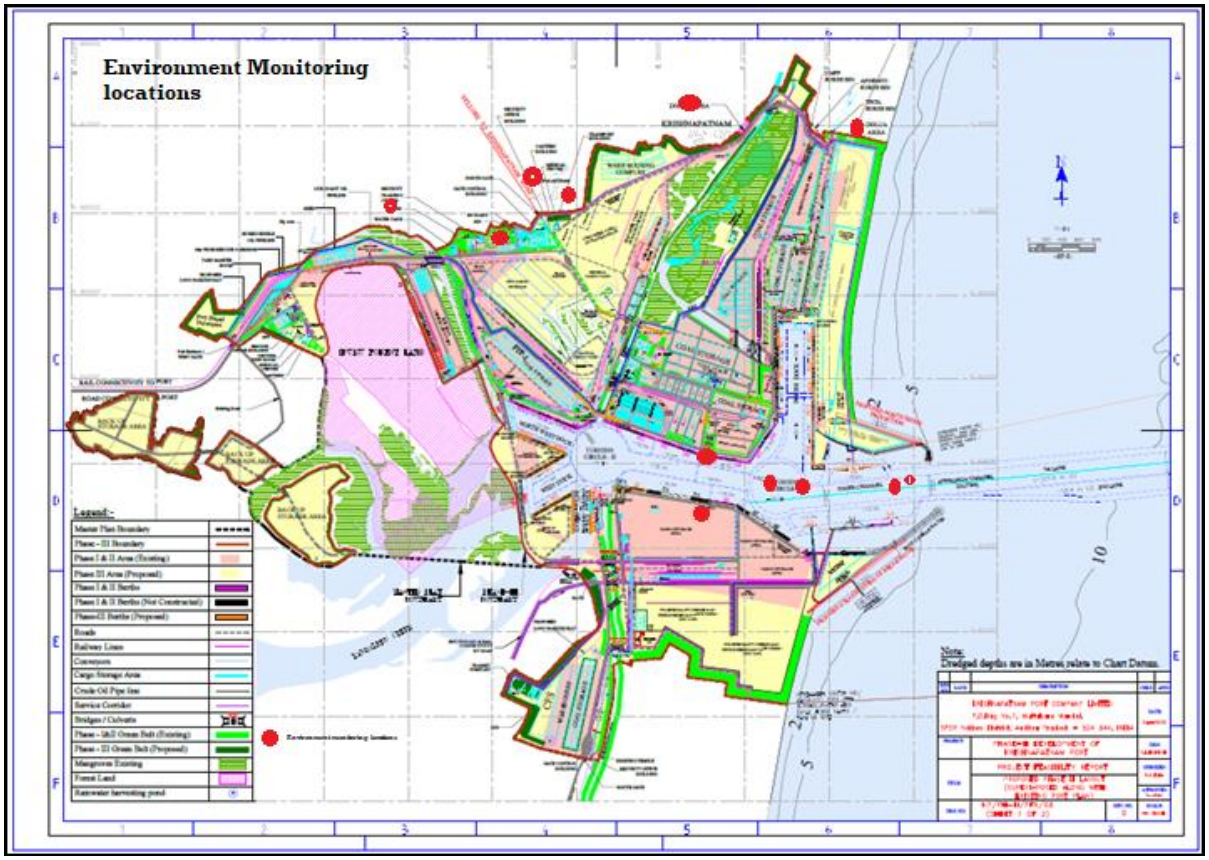
The ambient air quality was assessed through a network of 07 AAQM stations within 10 Km radius of project site (5 stations in buffer zone &2 location inside plant area).

The locations of ambient air quality stations given below:

DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

Station code	Location	Direction w.r.t. Project site	Environmental setting
A1	At Zero Point	W	Industrial
A2	At Thamminapatnam Village	S	Industrial
A3	At CVR Building	WNW	Residential
A4	At Gopalpuram Village	NW	Residential
A5	At Chalivendram	WNW	Residential
A6	At Krishnapatnam	NNW	Residential
A7	At Light House	SW	Residential

AMBIENT AIR SAMPLING STATIONS LOCATION MAP



Summary of Analysis of Ambient Air Quality in the Study Area at A1 –Zero Point for the period of April'22 to Sep'22

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_2 (µg/m^3)	NH3 (µg/m^3)
April'22	57.6	23.1	11.6	13.5	BDL
May'22	59.2	25.3	12.4	14.6	BDL
June'22	56.4	23.2	11.8	13.6	BDL
July'22	53.8	21.4	10.6	12.2	BDL
Aug'22	57.6	24.9	12.1	14.2	BDL
Sep'22	55.0	23.0	11.4	13.2	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area at A2 –Thamminipatnam for the period of April'22 to Sep'22

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	57.6	23.1	11.6	13.5	BDL
May'22	59.2	25.3	12.4	14.6	BDL
June'22	56.4	23.2	11.8	13.6	BDL
July'22	53.8	21.4	10.6	12.2	BDL
Aug'22	57.6	24.9	12.1	14.2	BDL
Sep'22	55.0	23.0	11.4	13.2	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area at A3 –CVR for the period of April'22 to Sep'22

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	67.6	27.8	15.5	16.9	BDL
May'22	64.1	25.4	14.3	15.8	BDL
June'22	61.6	24.0	13.2	14.4	BDL
July'22	63.2	24.8	14.1	15.2	BDL
Aug'22	60.1	23.1	12.8	14.6	BDL
Sep'22	64.9	24.2	13.9	15.6	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area at A4 –Gopalpuram for the period of April'22 to Sep'22

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	57.4	22.7	11.5	13.0	BDL
May'22	60.2	24.5	12.6	13.8	BDL
June'22	57.8	22.6	11.7	12.9	BDL
July'22	54.6	21.2	10.8	11.9	BDL
Aug'22	56.2	23.1	12.4	13.3	BDL
Sep'22	52.2	21.3	11.9	12.0	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area at A5 –Chalivendram for the period of April'22 to Sep'22.

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	55.9	21.8	12.6	13.5	BDL
May'22	58.6	23.4	13.5	14.7	BDL
June'22	54.6	21.8	12.4	13.2	BDL
July'22	52.4	19.6	11.2	12.8	BDL
Aug'22	55.1	20.9	12.1	13.8	BDL
Sep'22	51.4	19.0	11.6	12.4	BDL
NAAQS Standards	100	60	80	80	400

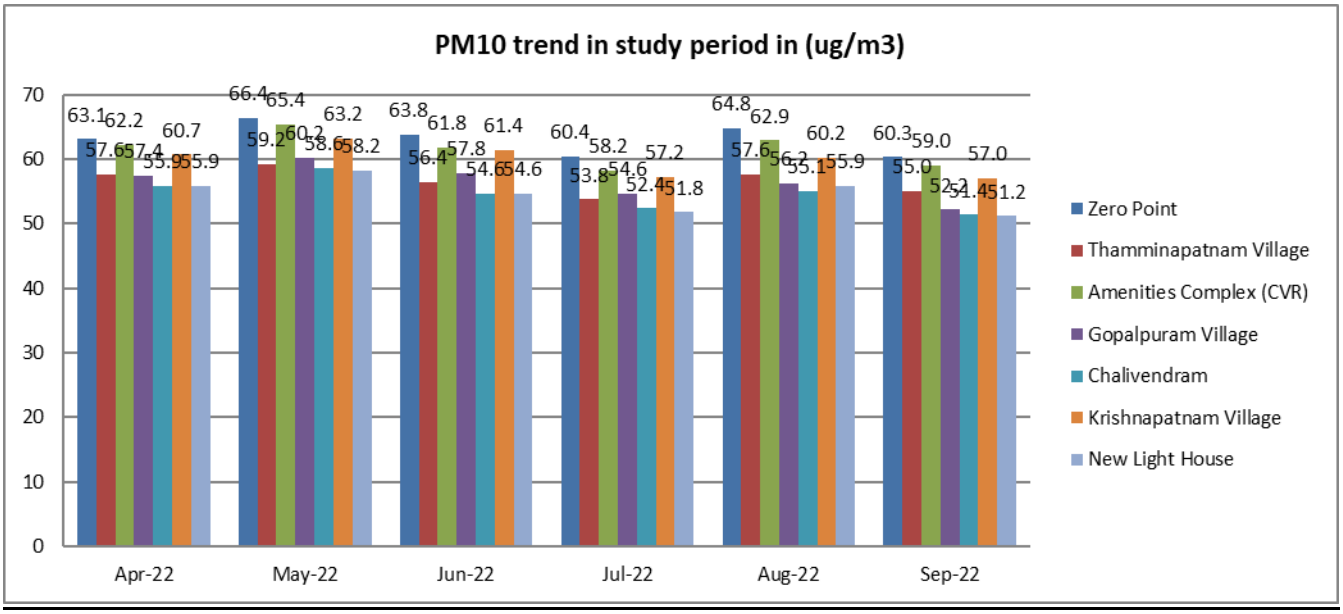
Summary of Analysis of Ambient Air Quality in the Study Area at A6 –Krishnapatnam for the period of April'22 to Sep'22

	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	60.7	24.6	13.8	15.1	BDL
May'22	63.2	26.1	14.6	16.0	BDL
June'22	61.4	24.8	13.5	14.6	BDL
July'22	57.2	22.4	12.0	13.5	BDL
Aug'22	60.2	23.6	12.8	13.7	BDL
Sep'22	57.0	22.3	11.9	12.3	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area at A7 –Light House for the period of April'22 to Sep'22

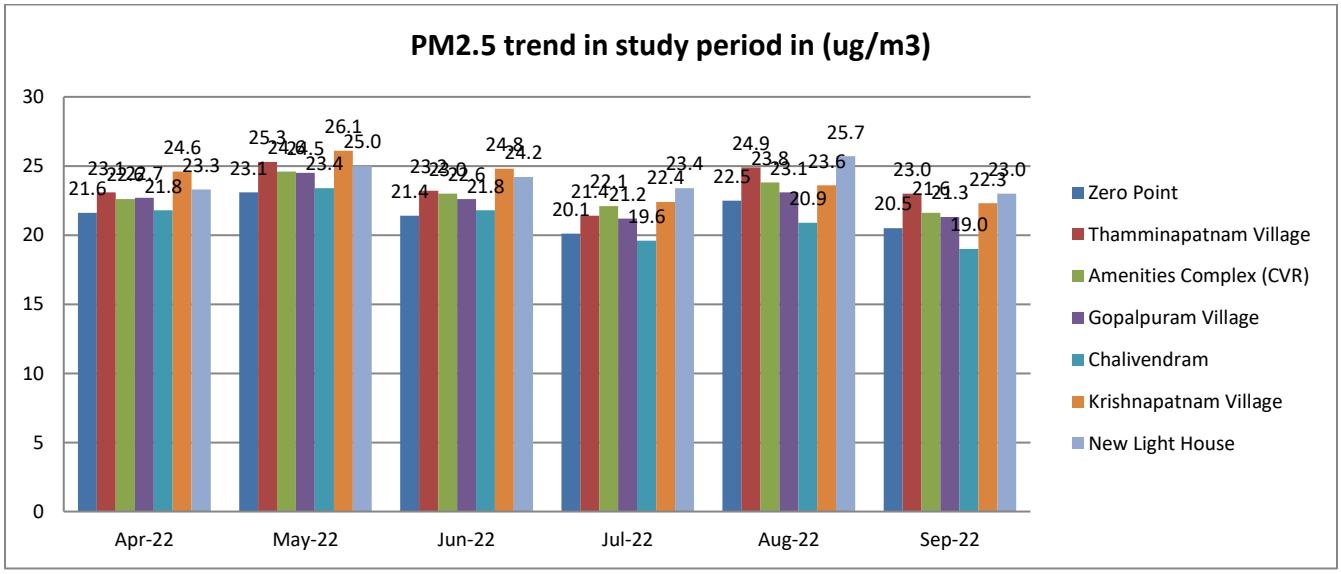
	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)	SO_2 (µg/m^3)	NO_X (µg/m^3)	NH3 (µg/m^3)
April'22	55.9	23.3	10.6	13.1	BDL
May'22	58.2	25.0	11.4	14.1	BDL
June'22	54.6	24.2	10.8	13.4	BDL
July'22	51.8	23.4	9.6	12.2	BDL
Aug'22	55.9	25.7	10.5	13.2	BDL
Sep'22	51.2	23.0	9.8	12.0	BDL
NAAQS Standards	100	60	80	80	400

Summary of Analysis of Ambient Air Quality in the Study Area – PM10 for April'22 to Sep'22



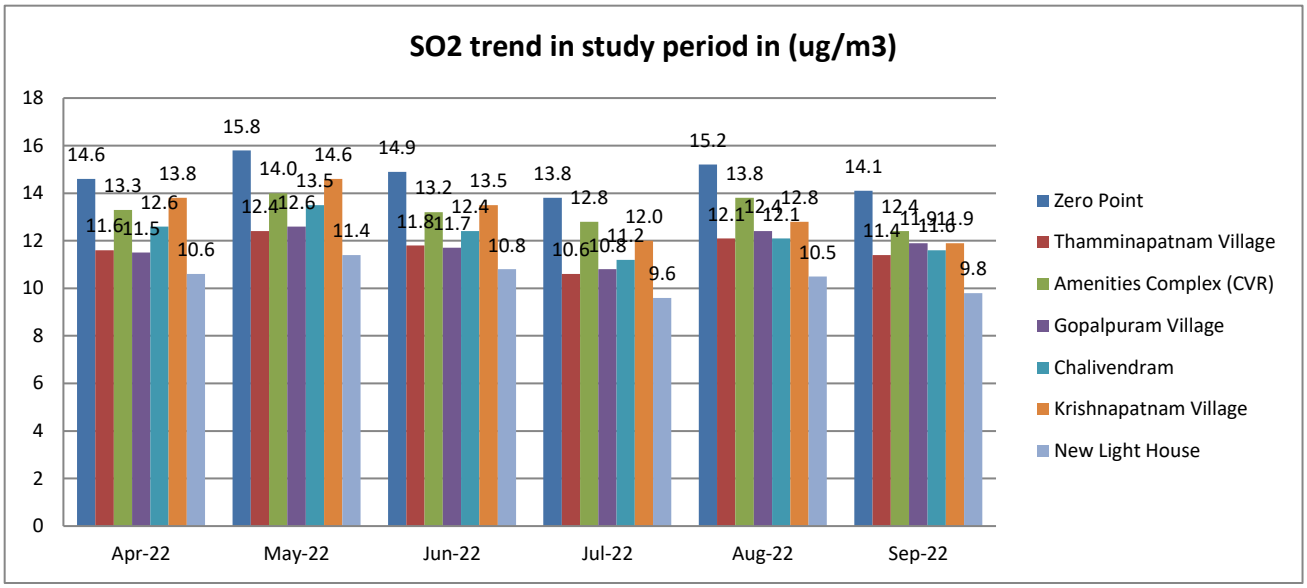
- ***PM10 varied between 51.2 to 66.4 µg/m,3 Minimum: New Light House***
- ***Maximum: CVR, NAAQ Standard: 100µg/m³***

Summary of Analysis of Ambient Air Quality in the Study Area – PM2.5 for April'22 to Sep'22



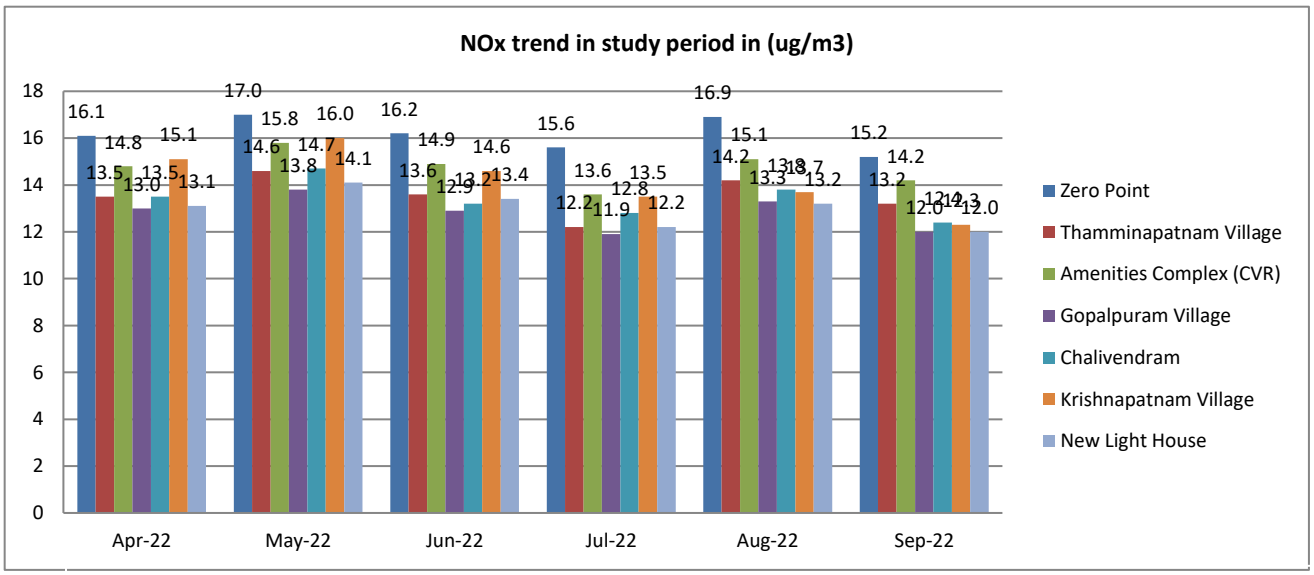
- ***$PM_{2.5}$ Varied between 19.0 to 26.1 µg/m3, Minimum: Chalivendram***
- ***Maximum ; Krishnapatnam Village , NAAQ Standard : 60 µg/m³***

Summary of Analysis of Ambient Air Quality in the Study Area – SO2 for April'22 to Sep'22



- ***SO_2 Varied between 9.6 to 15.8 µg/m^3, Minimum : New Light House***
- ***Maximum : Zero Point, NAAQ Standard : 80 µg/m^3***

Summary of Analysis of Ambient Air Quality in the Study Area – NOx for April'22 to Sep'22



- ***NOx Varied between 11.9 to 17.0 µg/m^3, Minimum : Gopalpuram village***
- ***Maximum : Zero Point, NAAQ Standards : 80 µg/m^3***

4.3 AMBIENT NOISE LEVEL INTENSITY

Collection of ambient noise levels at six locations (5 locations at nearby villages & 1 location near plant). Spot noise levels where measured with a precalibrated Noise Level Meter – SL Lutron 4001 for day and night periods.

DETAILS OF NOISE MONITORING LOCATIONS

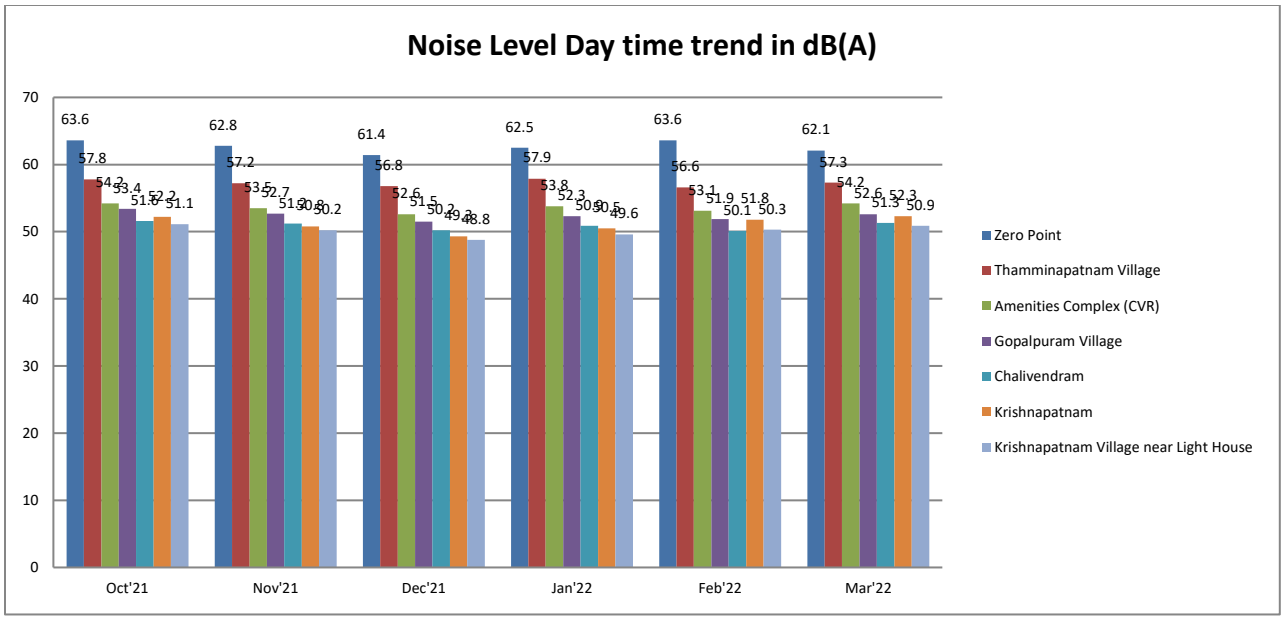
STATION CODE	LOCATIONS	DIRECTION w.r.t PROJECT SITE
N1	At Zero Point	W
N2	At Thamminapatnam Village	S
N3	At CVR Building	WNW
N4	At Gopalpuram Village	NW
N5	At Chalivendram	WNW
N6	At Krishnapatnam	NNW
N7	At Light House	SW

The noise monitoring locations are depicted in

The noise levels monitored during the study period are given hereunder in form of Leq day, Leq night compared with CPCB Standards.

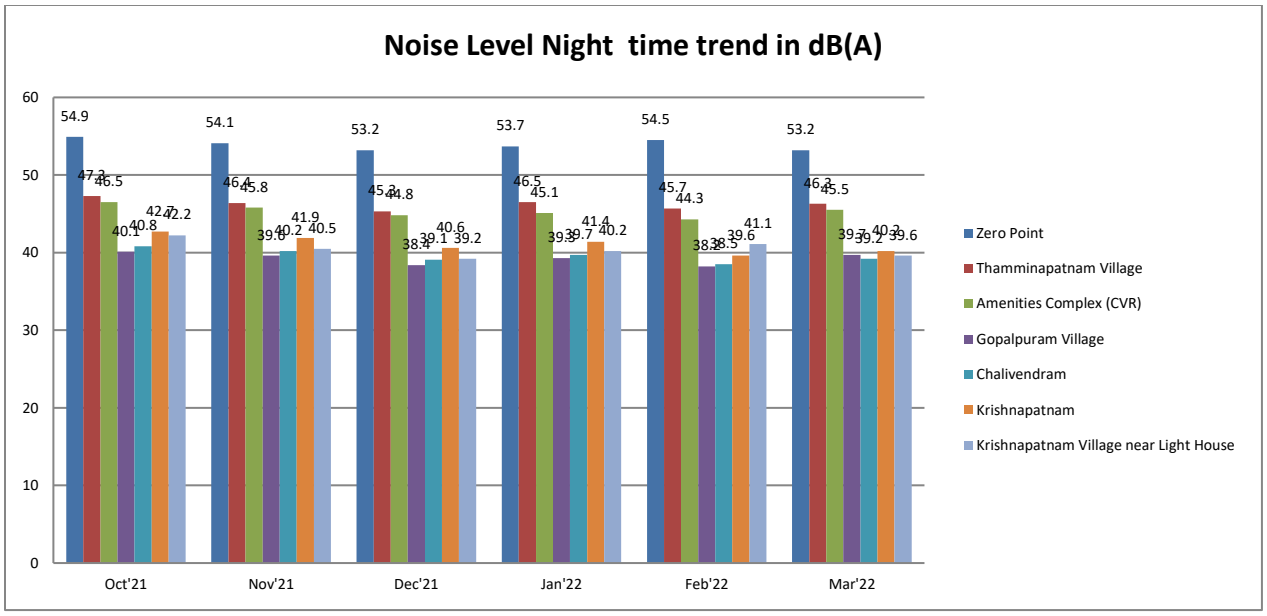
Location Code	Environmental Setting	CPCB norms Leq (Dba)	
		Day	Night
N1	Industrial	75	70
N2	Industrial	75	70
N3	Residential	55	45
N4	Residential	55	45
N5	Residential	55	45
N6	Residential	55	45
N7	Residential	55	45

Noise Level Data for the above locations are shown in the table



Location	April'22	May'22	June'22	July'22	Aug'22	Sep'22
Zero Point	63.2	62.6	63.4	62.8	64.1	63.2
Thamminapatnam Village	56.3	55.8	56.2	55.4	57.8	56.1
Amenities Complex (CVR)	55.3	54.4	55.6	54.6	56.2	55.8
Gopalpuram Village	51.5	50.6	51.8	50.3	51.2	50.8
Chalivendram	50.7	51.2	52.7	51.7	50.2	51.2
Krishnapatnam	51.5	52.4	53.2	52.8	51.1	52
Krishnapatnam Village near Light House	51.6	50.7	51.6	50.2	51.3	52.8

- ***Industrial Day time noise level varied between 50.2 to 64.1 dB(A)***
- ***Residential Day time noise level varied between 50.2 to 53.2 dB(A)***
- ***NAAQ Standard: Industrial -75 Db(A):Residential –55dB(A)***



Location	April'22	May'22	June'22	July'22	Aug'22	Sep'22
Zero Point	54.1	53.4	54.6	53.2	54.2	53.2
Thamminapatnam Village	45.4	44.2	45.8	44.8	46.4	45.9
Amenities Complex (CVR)	46.2	45.3	46.2	45.4	47.5	46.3
Gopalpuram Village	39.0	38.6	39.4	38.7	40.1	39.9
Chalivendram	38.2	39.4	40.6	39.1	38.5	39
Krishnapatnam	39.9	40.6	41.3	40	39.4	40.1
Krishnapatnam Village near Light House	41.2	40.5	41.8	40.6	41.2	42.3

- ***Industrial Night time noise level varied between 40.5 to 54.6 dB(A)***
- ***Residential Night time noise level varied between 38.2 to 41.3 dB(A)***
- ***NAAQ Standard: Industrial -70 Db(A) ,Residential-45 dB(A)***

4.4 Marine Water and Surface Water Quality

4.4.1 Sampling Locations

Marine water sampling is carried out once in every week at Four sampling locations in the port. In addition to marine quality sampling, surface water quality sampling is also carried out at two locations in the creek once in every month. The marine water and surface water sampling locations are given below

MARINE WATER QUALITY AND SURFACE WATER MONITORING LOCATIONS

Location Code	Location
Marine Water Quality Sampling Location	
MW1	Coal Berth
MW2	Turning Circle
MW3	Approach Channel
MW4	Reclamation Area (Mutable)
Surface Water Sampling Location	
SW1	Kandaleru Creek
SW2	Buckingham Canal

- Analysis results of the water samples collected from the above locations are enclosed

The methodology for sample collection and preservation techniques was followed as per the Standard Operating Procedures (SOP) mentioned in table hereunder:

Standard Operating Procedures (SOP) For Water Sampling

Parameter	Sample Collection	Sample Size	Storage/ Preservation
pH	Grab sampling Plastic /glass container	50 ml	Refrigeration, can be stored for 7 days
Electrical Conductivity	Grab sampling Plastic /glass container	50 ml	Refrigeration, can be stored for 7 days
Total suspended solids	Grab sampling Plastic /glass container	100 ml	Refrigeration, can be stored for 7 days
Total Dissolved Solids	Grab sampling Plastic /glass container	100 ml	Refrigeration, can be stored for 7 days
BOD	Grab sampling Plastic /glass container	500 ml	Refrigeration, 48 hrs
Hardness	Grab sampling Plastic /glass container	100 ml	Add HNO_3 to pH<2, refrigeration; 6 months
Chlorides	Grab sampling Plastic /glass container	50 ml	Not required; 28 days
Sulphates	Grab sampling Plastic /glass container	100 ml	Refrigeration; 28 days
Nitrates	Plastic containers	100 ml	Refrigeration; 48 hrs
Fluorides	Plastic containers only	100 ml	Not required; 28 days
Alkalinity	Plastic/ glass containers	100 ml	Refrigeration; 14 days
Ammonia	Plastic/ glass containers	100 ml	Add H_2SO_4 to pH>2, refrigeration, 28 days
Heavy Metals (Ar, Cd, Mn, Cu, Fe, Zn, Pb etc.)	Plastic/ Glass rinse with 1+1 HNO_3	500 ml	Filter, add HNO_3 to pH>2; Grab sample; 6 months

Source: Standard Methods for the Examination of Water and Wastewater, Published By APHA, 27nd Edition,2017

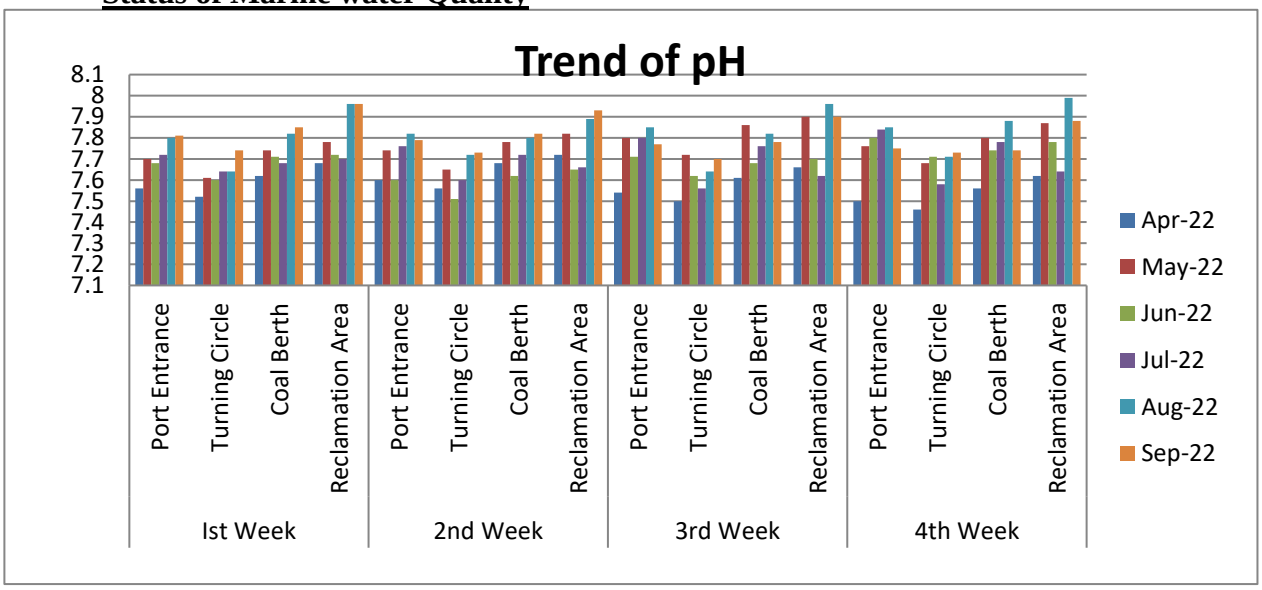
The analytical techniques used for water analysis is given in the table hereunder:

Analytical Techniques forWater Analysis

S.No	Parameter	Method
1.	pH	APHA, 4500-H+B, 23rd Ed., 2017
2.	Colour	APHA, 2120-C/2120-B, 23rd Ed., 2017
3.	Odour	APHA, 2150, 23rd Ed., 2017
4.	Temperature	APHA, 2550-A+B, 23rd Ed., 2017
5.	Oil & Grease	APHA, 5520-D, 23rd Ed., 2017
6.	Total Suspended Solids	APHA, 2540-D, 23rd Ed., 2017
7.	Total Dissolved Solids	APHA, 2540-C, 23rd Ed., 2017
8.	Total Residual Chlorine	APHA, 4500-Cl B, 23rd Ed., 2017
9.	Biochemical Oxygen Demand	APHA, 5210-B, 23rd Ed., 2017 4500-OC, 23rd Ed.,
10.	Chemical Oxygen Demand	APHA, 5220-B, 23rd Ed., 2017
11.	Free Ammonia	IS 3025
12.	Ammonical Nitrogen	APHA, 4500-NH_3 B, 23rd Ed., 2017
13.	Total Kjeldhal Nitrogen	APHA, 4500-Norg B, 23rd Ed., 2017
14.	Zinc	APHA, 3111-B, 23rd Ed., 2017
15.	Lead	APHA, 3111-B, 23rd Ed., 2017
16.	Cadmium	APHA, 3111-B, 23rd Ed., 2017
17.	Mercury	APHA, 3112-B, 23rd Ed., 2017
18.	Arsenic	APHA, 3114-B, 23rd Ed., 2017
19.	Copper	APHA, 3111-B, 23rd Ed., 2017
20.	Nickel	APHA, 3111-B, 23rd Ed., 2017
21.	Cyanide	APHA, 4500-CNB, 23rd Ed., 20172
22.	Fluoride	APHA, 4500-FD, 23rd Ed., 2017 (SPANDS Methods)
23.	Phosphates	APHA, 4500-PD, 23rd Ed., 2017
24.	Sulphates	APHA, 4500-SO_4^{2-} E, 23rd Ed., 2017
25.	Sulphide	APHA, 4500-S^{2-}, 23rd Ed., 2017
26.	Manganese	APHA, 3111-B, 23rd Ed., 2017
27.	Iron	APHA, 3111-B, 23rd Ed., 2017
28.	Phenolic Compounds	APHA, 5530-B, 23rd Ed., 2017
29.	Bio Assay Test	IS 6582

Marine water samples have been collected in the port and the results of the same are shown below in **Table.**

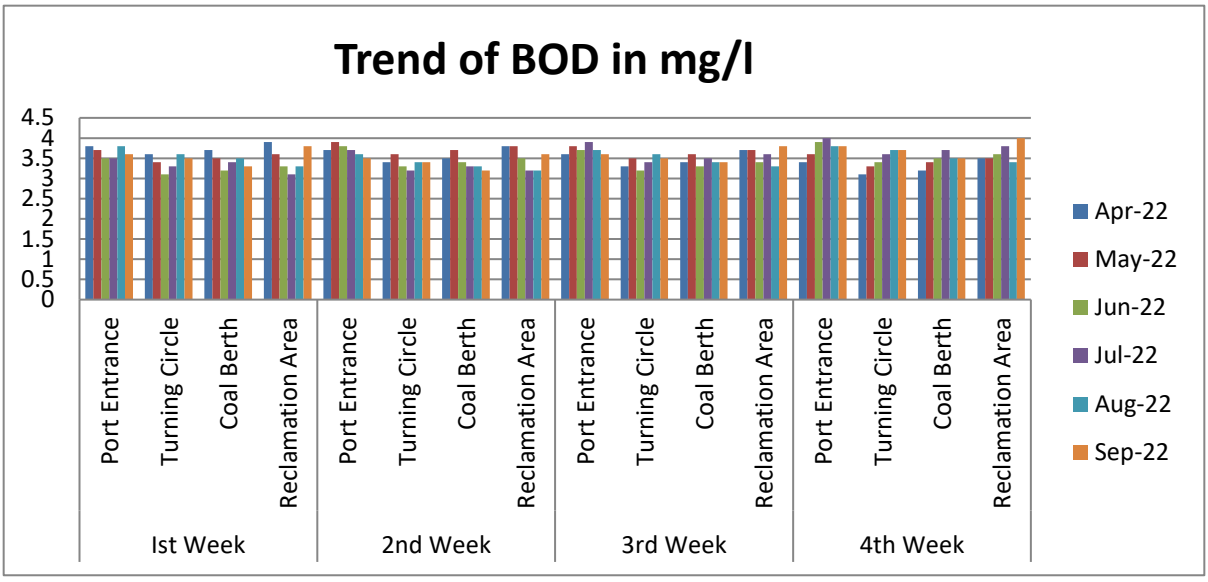
Status of Marine water Quality



pH of Marine water varied between 7.46 to 7.99

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	7.56	7.52	7.62	7.68	7.60	7.56	7.68	7.72
May'22	7.70	7.61	7.74	7.78	7.74	7.65	7.78	7.82
June'22	7.68	7.60	7.71	7.72	7.60	7.51	7.62	7.65
July'22	7.72	7.64	7.68	7.7	7.76	7.60	7.72	7.66
Aug'22	7.80	7.64	7.82	7.96	7.82	7.72	7.80	7.89
Sep'22	7.81	7.74	7.85	7.96	7.79	7.73	7.82	7.93

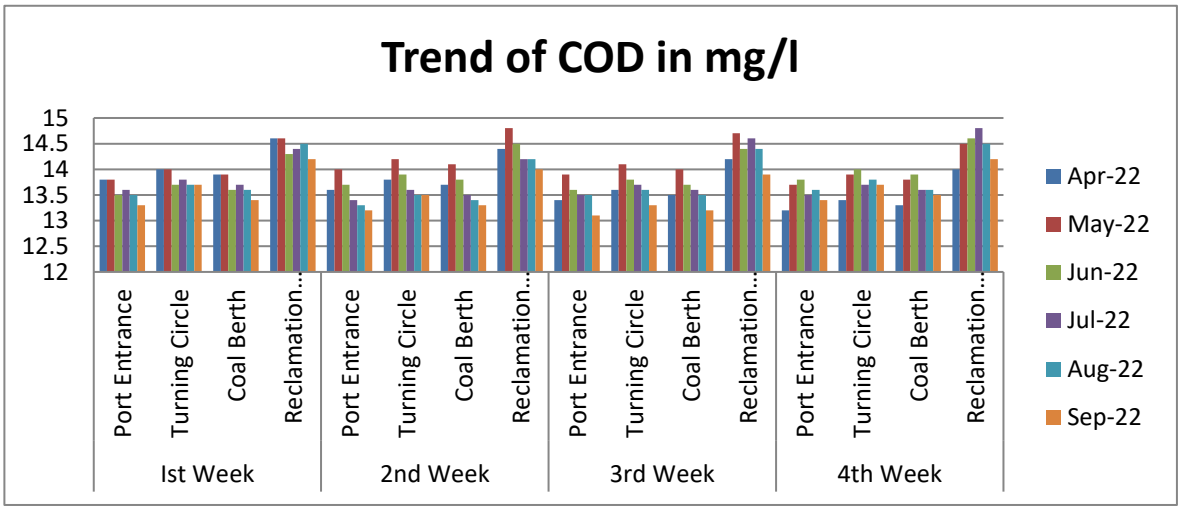
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	7.54	7.50	7.61	7.66	7.50	7.46	7.56	7.62
May'22	7.80	7.72	7.86	7.90	7.76	7.68	7.80	7.87
June'22	7.71	7.62	7.68	7.70	7.80	7.71	7.74	7.78
July'22	7.80	7.56	7.76	7.62	7.84	7.58	7.78	7.64
Aug'22	7.85	7.64	7.82	7.96	7.85	7.71	7.88	7.99
Sep'22	7.60	7.56	7.62	7.67	7.75	7.73	7.74	7.88



❖ **BOD of Marine Water varied between 3.1 to 4.0 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	3.8	3.6	3.7	3.9	3.7	3.4	3.5	3.8
May'22	3.7	3.4	3.5	3.6	3.9	3.6	3.7	3.8
June'22	3.5	3.1	3.2	3.3	3.8	3.3	3.4	3.5
July'22	3.5	3.3	3.4	3.1	3.7	3.2	3.3	3.2
Aug'22	3.8	3.6	3.5	3.3	3.6	3.4	3.3	3.2
Sep'22	3.6	3.5	3.3	3.8	3.5	3.4	3.2	3.6

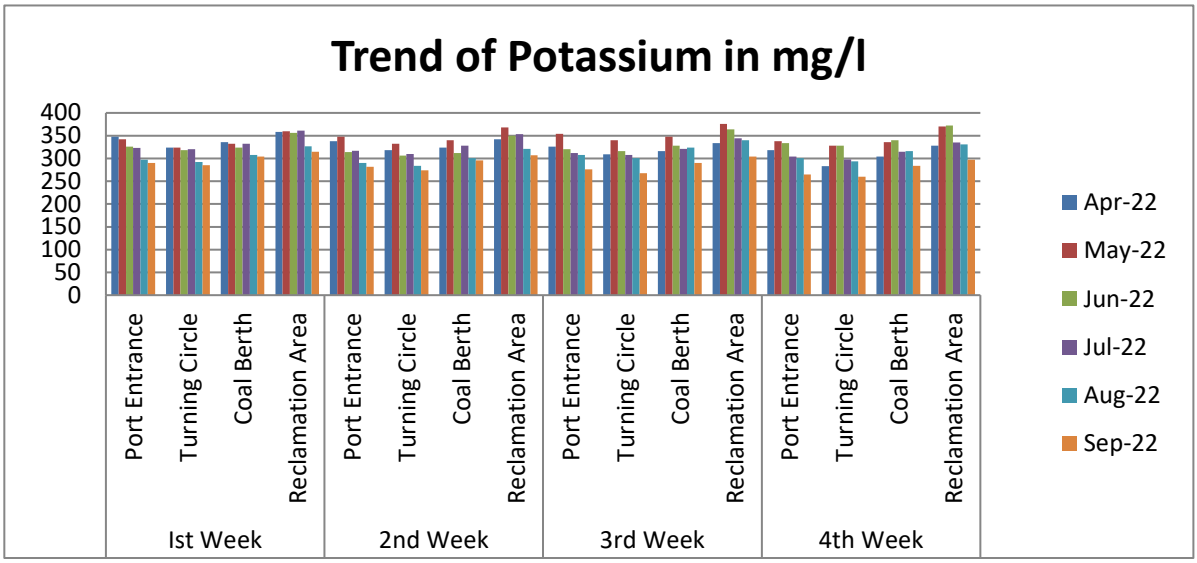
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	3.6	3.3	3.4	3.7	3.4	3.1	3.2	3.5
May'22	3.8	3.5	3.6	3.7	3.6	3.3	3.4	3.5
June'22	3.7	3.2	3.3	3.4	3.9	3.4	3.5	3.6
July'22	3.9	3.4	3.5	3.6	4.0	3.6	3.7	3.8
Aug'22	3.7	3.6	3.4	3.3	3.8	3.7	3.5	3.4
Sep'22	3.6	3.5	3.4	3.8	3.8	3.7	3.5	4.0



❖ **COD of Marine Water varied between 13.1 to 14.8 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	13.8	14.0	13.9	14.6	13.6	13.8	13.7	14.4
May'22	13.8	14.0	13.9	14.6	14.0	14.2	14.1	14.8
June'22	13.5	13.7	13.6	14.3	13.7	13.9	13.8	14.5
July'22	13.6	13.8	13.7	14.4	13.4	13.6	13.5	14.2
Aug'22	13.5	13.7	13.6	14.5	13.3	13.5	13.4	14.2
Sep'22	13.3	13.7	13.4	14.2	13.2	13.5	13.3	14.0

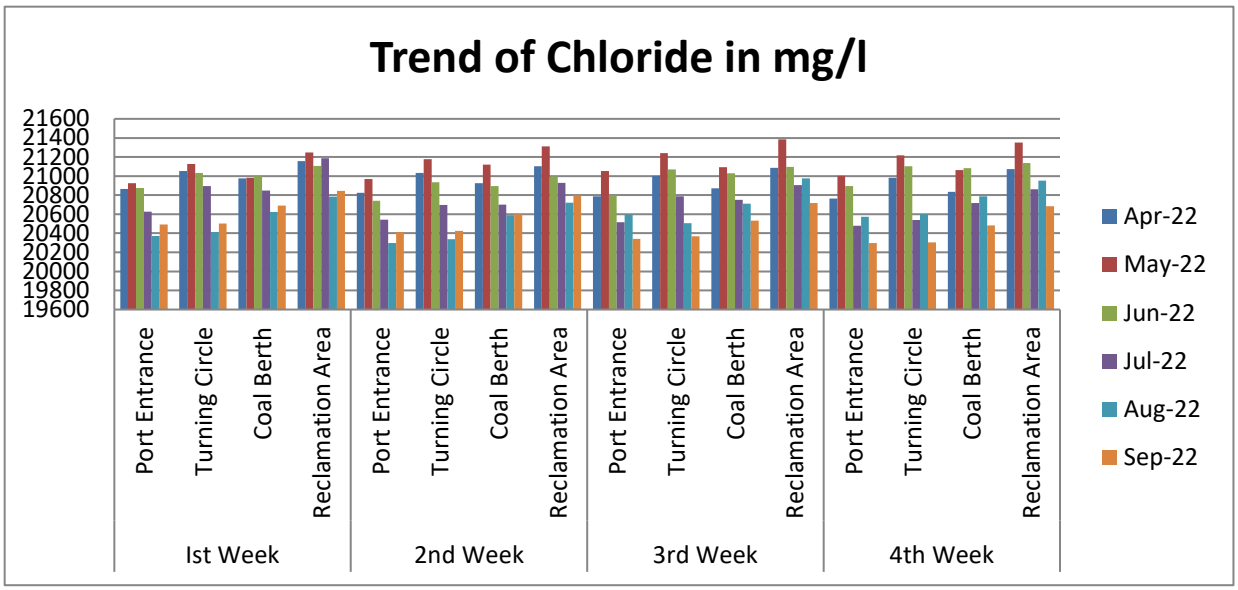
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	13.4	13.6	13.5	14.2	13.2	13.4	13.3	14.0
May'22	13.9	14.1	14.0	14.7	13.7	13.9	13.8	14.5
June'22	13.6	13.8	13.7	14.4	13.8	14.0	13.9	14.6
July'22	13.5	13.7	13.6	14.6	13.5	13.7	13.6	14.8
Aug'22	13.5	13.6	13.5	14.4	13.6	13.8	13.6	14.5
Sep'22	13.1	13.3	13.2	13.9	13.4	13.7	13.5	14.2



❖ **Potassium Concentration in Marine water varied between 260 to 376 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	348	324	336	358	338	318	324	342
May'22	342	324	332	360	348	332	340	368
June'22	326	318	324	356	314	306	312	350
July'22	323	320	332	361	317	310	328	353
Aug'22	297	292	308	327	290	284	301	321
Sep'22	290	285	304	315	282	274	296	307

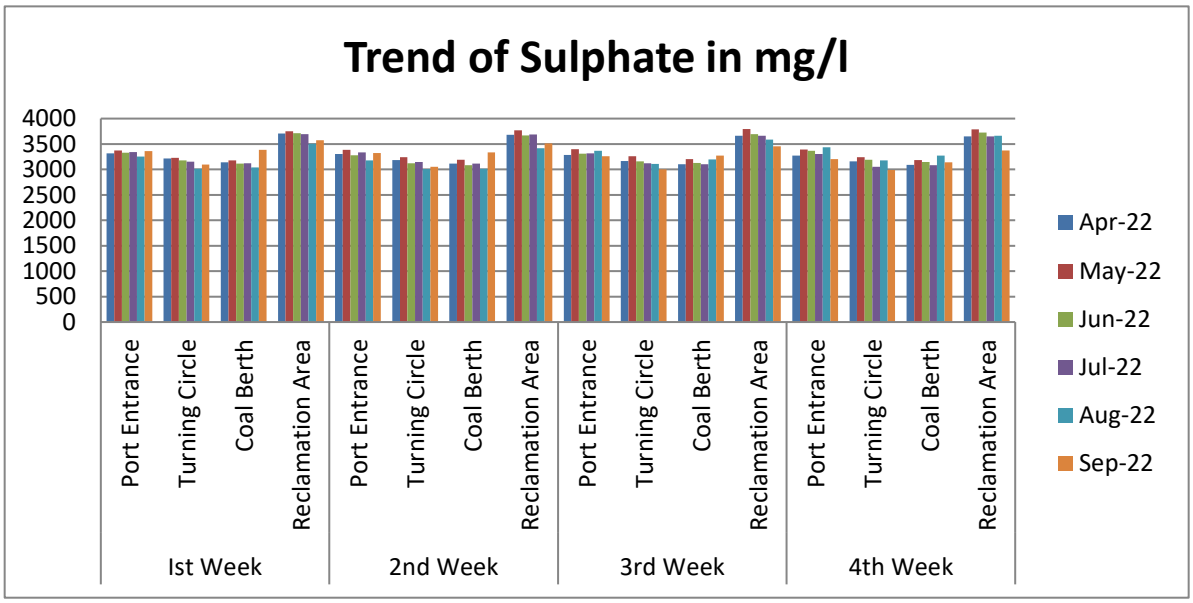
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	326	309	316	334	318	283	304	328
May'22	354	340	348	376	338	328	336	370
June'22	320	316	328	364	334	328	340	372
July'22	312	308	321	344	304	298	315	335
Aug'22	308	301	324	340	301	294	316	331
Sep'22	276	268	290	304	265	260	284	297



❖ **Chloride concentration in Marine water varied between 20298 to 21384 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	20866	21052	20976	21158	20824	21032	20924	21104
May'22	20926	21126	20982	21248	20968	21178	21120	21312
June'22	20874	21034	20998	21107	20742	20936	20896	20995
July'22	20628	20894	20848	21186	20542	20698	20701	20928
Aug'22	20371	20411	20624	20783	20298	20339	20589	20721
Sep'22	20492	20501	20689	20843	20413	20426	20601	20799

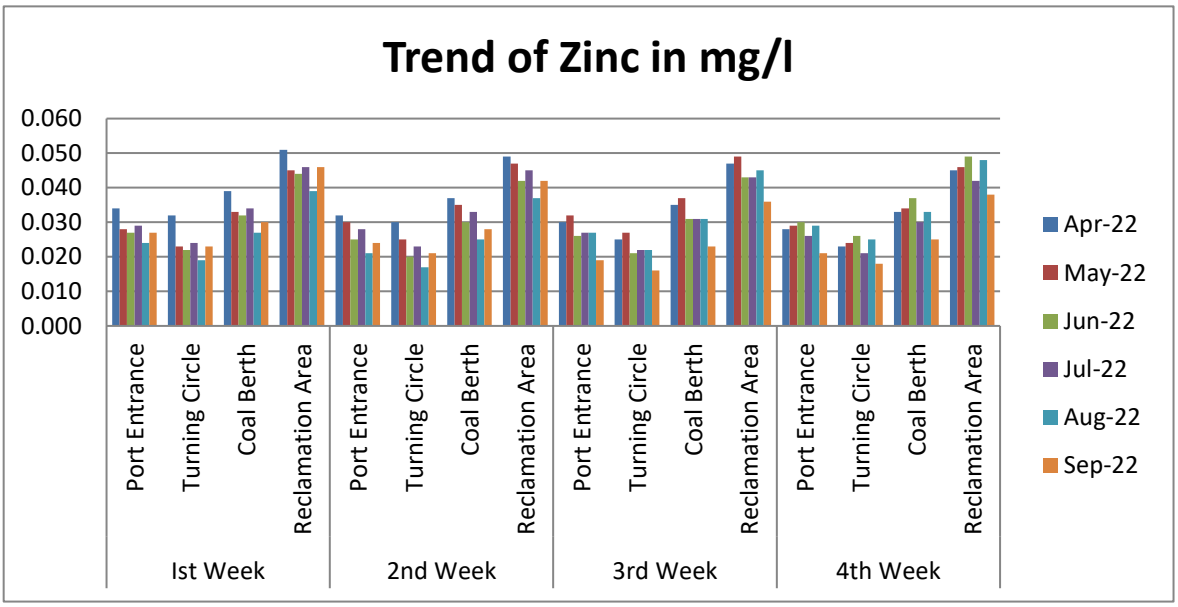
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	20786	21004	20872	21086	20764	20982	20834	21072
May'22	21052	21240	21092	21384	21004	21216	21063	21352
June'22	20802	21068	21028	21098	20896	21102	21082	21136
July'22	20516	20786	20752	20904	20478	20538	20716	20862
Aug'22	20596	20506	20711	20976	20572	20599	20786	20951
Sep'22	20342	20369	20532	20716	20299	20303	20481	20684



❖ **Sulphate concentration in Marine water varied between 2991 to 3793 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	3318	3216	3140	3704	3304	3186	3118	3680
May'22	3372	3227	3180	3752	3384	3241	3192	3772
June'22	3328	3180	3118	3712	3280	3124	3082	3668
July'22	3341	3152	3120	3696	3336	3146	3114	3688
Aug'22	3254	3014	3042	3503	3176	3005	3015	3418
Sep'22	3362	3098	3388	3573	3324	3054	3336	3511

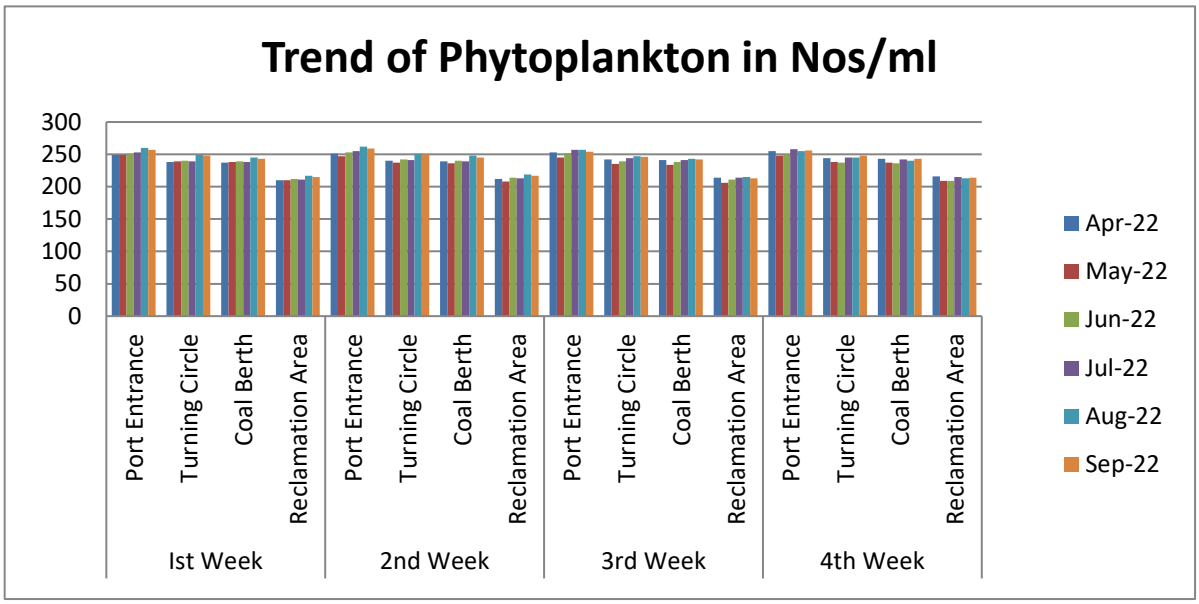
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	3286	3168	3104	3664	3274	3156	3088	3648
May'22	3396	3257	3206	3793	3390	3238	3186	3786
June'22	3312	3162	3126	3694	3369	3188	3144	3728
July'22	3318	3124	3102	3664	3304	3051	3084	3650
Aug'22	3368	3109	3196	3584	3436	3175	3272	3661
Sep'22	3262	3003	3271	3452	3201	2991	3139	3372



❖ **Zinc concentration in Marine water varied between 0.016 to 0.051 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	0.034	0.032	0.039	0.051	0.032	0.030	0.037	0.049
May'22	0.028	0.023	0.033	0.045	0.030	0.025	0.035	0.047
June'22	0.027	0.022	0.032	0.044	0.025	0.020	0.030	0.042
July'22	0.029	0.024	0.034	0.046	0.028	0.023	0.033	0.045
Aug'22	0.024	0.019	0.027	0.039	0.021	0.017	0.025	0.037
Sep'22	0.027	0.023	0.030	0.046	0.024	0.021	0.028	0.042

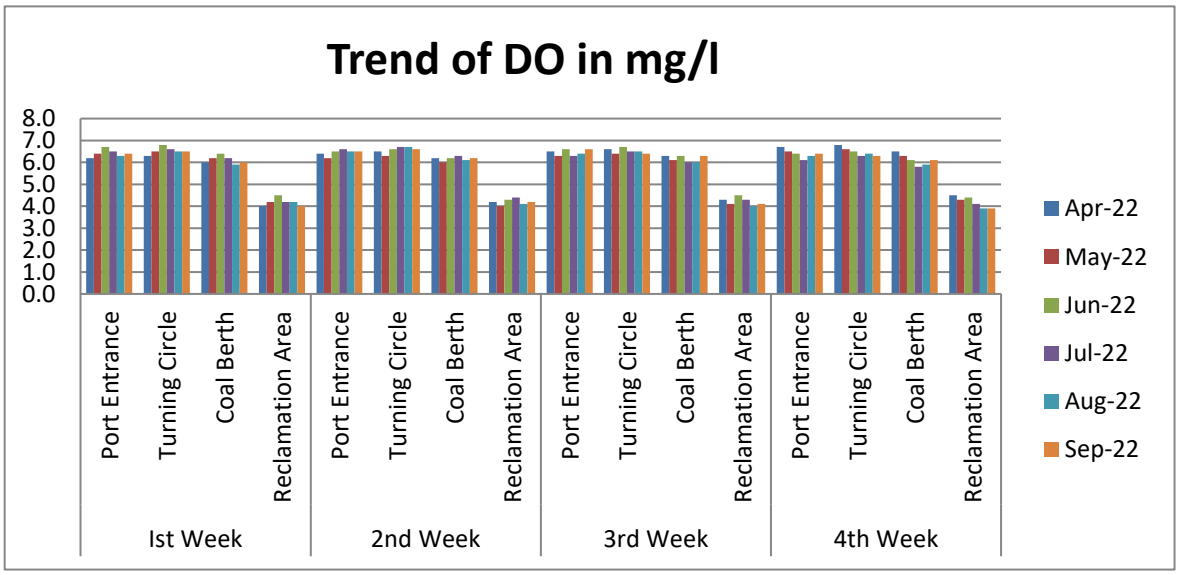
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	0.030	0.025	0.035	0.047	0.028	0.023	0.033	0.045
May'22	0.032	0.027	0.037	0.049	0.029	0.024	0.034	0.046
June'22	0.026	0.021	0.031	0.043	0.030	0.026	0.037	0.049
July'22	0.027	0.022	0.031	0.043	0.026	0.021	0.030	0.042
Aug'22	0.027	0.022	0.031	0.045	0.029	0.025	0.033	0.048
Sep'22	0.019	0.016	0.023	0.036	0.021	0.018	0.025	0.038



- **Phytoplankton in Marine water varied between 206 to 262 No./ml**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	249	238	237	210	251	240	239	212
May'22	249	239	238	210	247	237	236	208
June'22	251	240	239	212	253	242	240	214
July'22	253	239	238	211	255	241	239	213
Aug'22	260	249	245	217	262	251	248	219
Sep'22	257	248	243	215	259	250	245	217

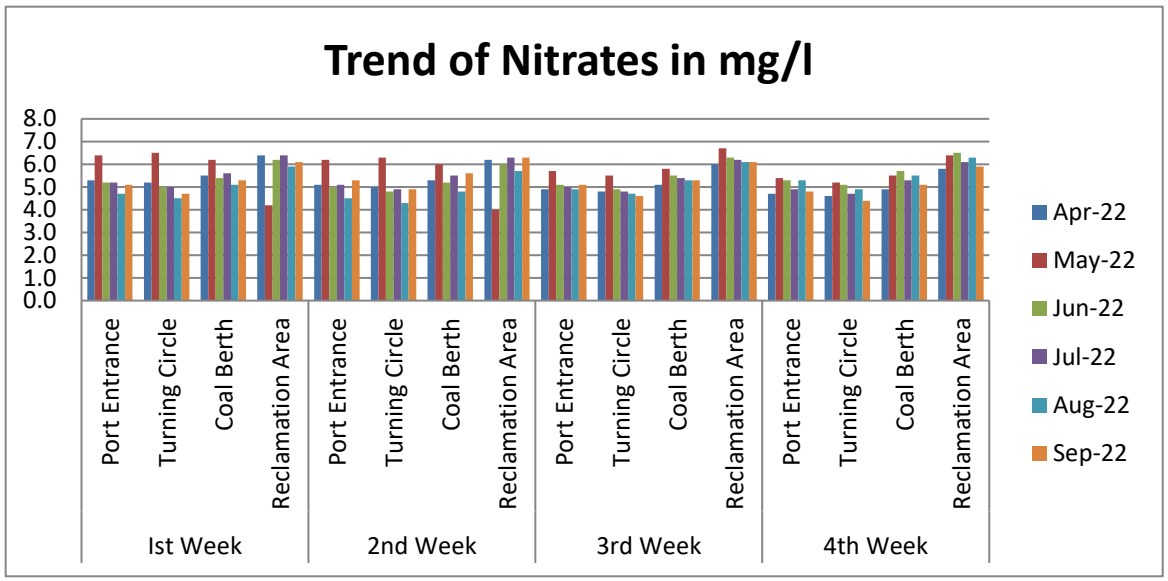
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	253	242	241	214	255	244	243	216
May'22	245	235	234	206	248	238	237	209
June'22	252	239	238	211	250	237	236	209
July'22	257	244	241	214	258	245	242	215
Aug'22	257	247	243	215	255	245	240	213
Sep'22	254	246	242	213	256	248	243	214



❖ **DO in Marine water varied between 3.9 to 6.8 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	6.2	6.3	6.0	4.0	6.4	6.5	6.2	4.2
May'22	6.4	6.5	6.2	4.2	6.2	6.3	6.0	4.0
June'22	6.7	6.8	6.4	4.5	6.5	6.6	6.2	4.3
July'22	6.5	6.6	6.2	4.2	6.6	6.7	6.3	4.4
Aug'22	6.3	6.5	5.9	4.2	6.5	6.7	6.1	4.1
Sep'22	6.4	6.5	6.0	4.0	6.5	6.6	6.2	4.2

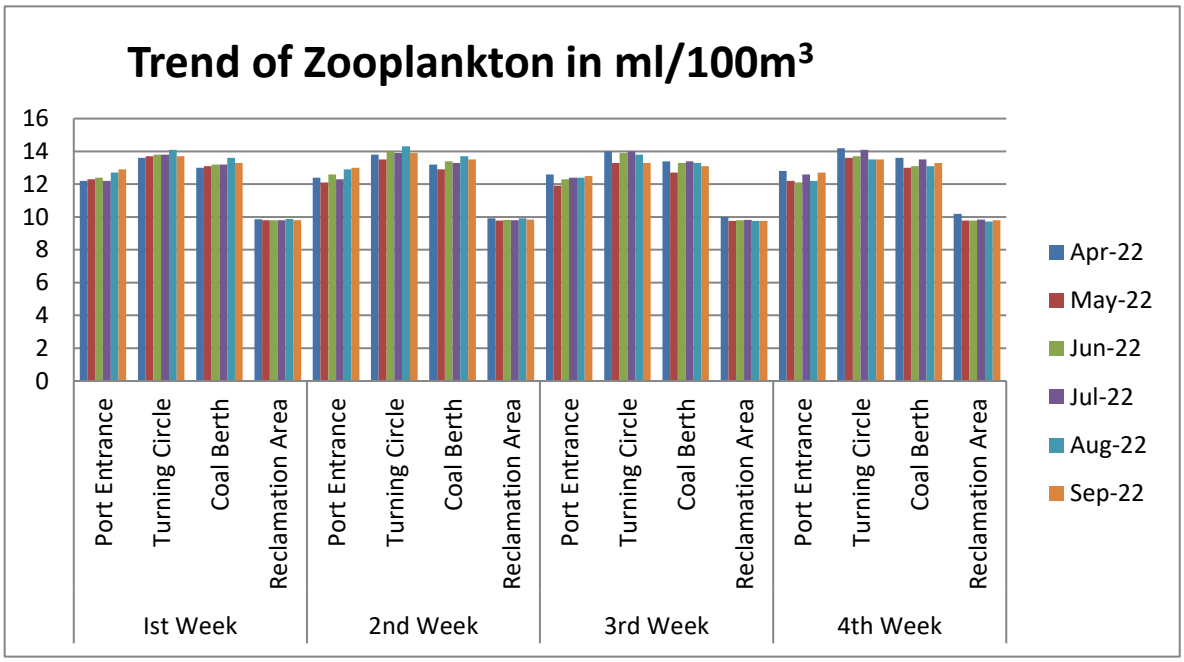
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	6.5	6.6	6.3	4.3	6.7	6.8	6.5	4.5
May'22	6.3	6.4	6.1	4.1	6.5	6.6	6.3	4.3
June'22	6.6	6.7	6.3	4.5	6.4	6.5	6.1	4.4
July'22	6.3	6.5	6	4.3	6.1	6.3	5.8	4.1
Aug'22	6.4	6.5	6.0	4.0	6.3	6.4	5.9	3.9
Sep'22	6.6	6.4	6.3	4.1	6.4	6.3	6.1	3.9



- **Nitrates in Marine water varied between 4.0 to 6.7 mg/l**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	5.3	5.2	5.5	6.4	5.1	5.0	5.3	6.2
May'22	6.4	6.5	6.2	4.2	6.2	6.3	6.0	4.0
June'22	5.2	5.0	5.4	6.2	5.0	4.8	5.2	6.0
July'22	5.2	5.0	5.6	6.4	5.1	4.9	5.5	6.3
Aug'22	4.7	4.5	5.1	5.9	4.5	4.3	4.8	5.7
Sep'22	5.1	4.7	5.3	6.1	5.3	4.9	5.6	6.3

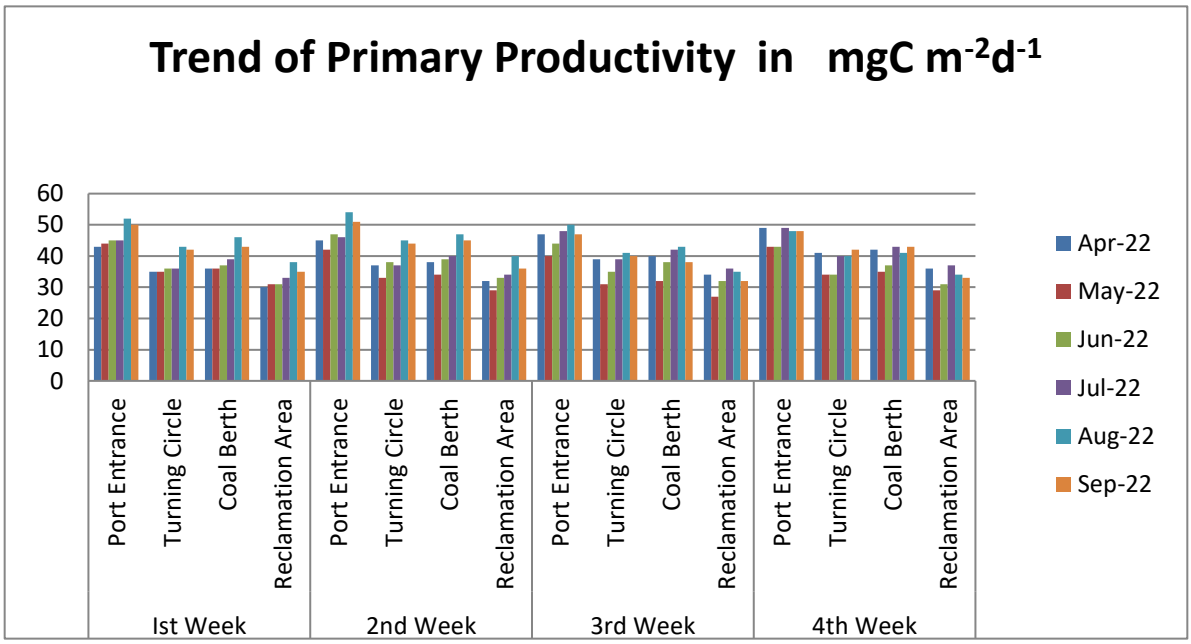
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	4.9	4.8	5.1	6.0	4.7	4.6	4.9	5.8
May'22	5.7	5.5	5.8	6.7	5.4	5.2	5.5	6.4
June'22	5.1	4.9	5.5	6.3	5.3	5.1	5.7	6.5
July'22	5.0	4.8	5.4	6.2	4.9	4.7	5.3	6.1
Aug'22	4.9	4.7	5.3	6.1	5.3	4.9	5.5	6.3
Sep'22	5.1	4.6	5.3	6.1	4.8	4.4	5.1	5.9



❖ **Zoo plankton in Marine water varied between 9.73 to 14.3 ml/100m^3**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	12.2	13.6	13.0	9.86	12.4	13.8	13.2	9.92
May'22	12.3	13.7	13.1	9.80	12.1	13.5	12.9	9.78
June'22	12.4	13.8	13.2	9.81	12.6	14.0	13.4	9.83
July'22	12.2	13.8	13.2	9.80	12.3	13.9	13.3	9.81
Aug'22	12.7	14.1	13.6	9.88	12.9	14.3	13.7	9.92
Sep'22	12.9	13.7	13.3	9.80	13.0	13.9	13.5	9.85

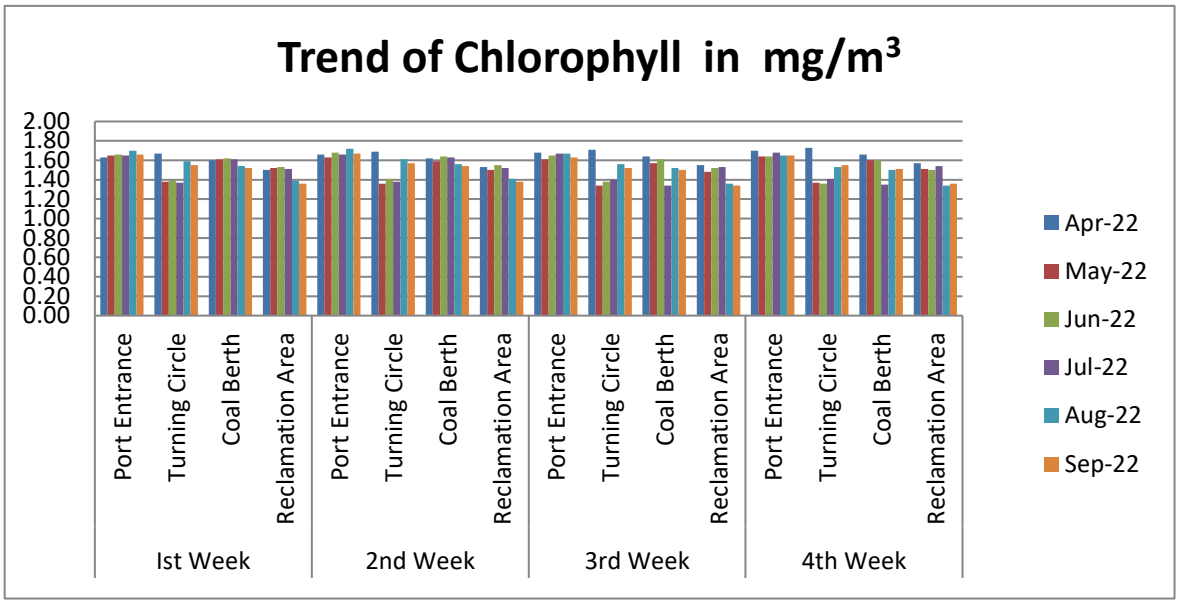
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	12.6	14.0	13.4	10.0	12.8	14.2	13.6	10.2
May'22	11.9	13.3	12.7	9.76	12.2	13.6	13.0	9.79
June'22	12.3	13.9	13.3	9.80	12.1	13.7	13.1	9.78
July'22	12.4	14.0	13.4	9.83	12.6	14.1	13.5	9.85
Aug'22	12.4	13.8	13.3	9.77	12.2	13.5	13.1	9.73
Sep'22	12.5	13.3	13.1	9.76	12.7	13.5	13.3	9.80



❖ **Primary Productivity in Marine water varied between 27 to 54 mgC $m^{-2}d^{-1}$**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	43	35	36	30	45	37	38	32
May'22	44	35	36	31	42	33	34	29
June'22	45	36	37	31	47	38	39	33
July'22	45	36	39	33	46	37	40	34
Aug'22	52	43	46	38	54	45	47	40
Sep'22	50	42	43	35	51	44	45	36

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	47	39	40	34	49	41	42	36
May'22	40	31	32	27	43	34	35	29
June'22	44	35	38	32	43	34	37	31
July'22	48	39	42	36	49	40	43	37
Aug'22	50	41	43	35	48	40	41	34
Sep'22	47	40	38	32	48	42	43	33



❖ **Chlorophyll in Marine water varied between 1.34 to 1.73 mg/m^3**

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1.63	1.67	1.60	1.50	1.66	1.69	1.62	1.53
May'22	1.65	1.38	1.61	1.52	1.63	1.36	1.59	1.50
June'22	1.66	1.39	1.62	1.53	1.68	1.41	1.64	1.55
July'22	1.65	1.37	1.61	1.51	1.66	1.38	1.63	1.52
Aug'22	1.70	1.59	1.54	1.39	1.72	1.61	1.56	1.41
Sep'22	1.66	1.55	1.52	1.36	1.67	1.57	1.54	1.38

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1.68	1.71	1.64	1.55	1.70	1.73	1.66	1.57
May'22	1.61	1.34	1.57	1.48	1.64	1.37	1.60	1.51
June'22	1.65	1.38	1.61	1.52	1.64	1.36	1.60	1.50
July'22	1.67	1.40	1.34	1.53	1.68	1.41	1.35	1.54
Aug'22	1.67	1.56	1.52	1.36	1.65	1.53	1.50	1.34
Sep'22	1.63	1.52	1.50	1.34	1.65	1.55	1.51	1.36

Summary of Marine water quality results for six months of period April 22 – Sep 22

- pH - values are in the range 7.46 to 7.99
- BOD -values are in the range 3.1 to 4.0 mg/l
- COD - values are in the range 13.1 to 14.8 mg/l
- Potassium - values are in the range 260 to 376 mg/l
- Chloride - values are in the range 20298 to 21384 mg/l
- Sulphates - values are in the range to 2991 to 3793 mg/l
- Zinc - values are in the range 0.016 to 0.051 mg/l
- Phytoplankton - values are in the range 206 to 262 No./ml
- DO - values are in the range 3.9 to 6.8 mg/l
- Nitrates - values are in the range 4.0 to 6.7 mg/l
- Zoo plankton - values are in the range 9.73 to 14.3 ml/100m^3
- Primary productivity - values are in the range 27 to 54 mgC $m^{-2}d^{-1}$
- Chlorophyll - values are in the range 1.34 to 1.73 mg/m^3

4.5 Marine Water Turbidity

Marine water turbidity is carried out on one day every week at each of the four locations of Marine Water quality sampling (MT1, MT2 ,MT3 and MT4). Turbidity levels are monitored during Low Tide, Medium Tide and High Tide.

MARINE TURBIDITY MONITORING LOCATIONS

Sampling Code	Name of the Location
MT1	Coal Berth
MT2	Turning circle
MT3	Approach channel
MT4	Reclamation Area (Mutable)

4.5.1 Marine Deep Sea Turbidity

Marine water turbidity is carried out in the deep water i.e., at the dredged material disposal area on one day every month at three locations.

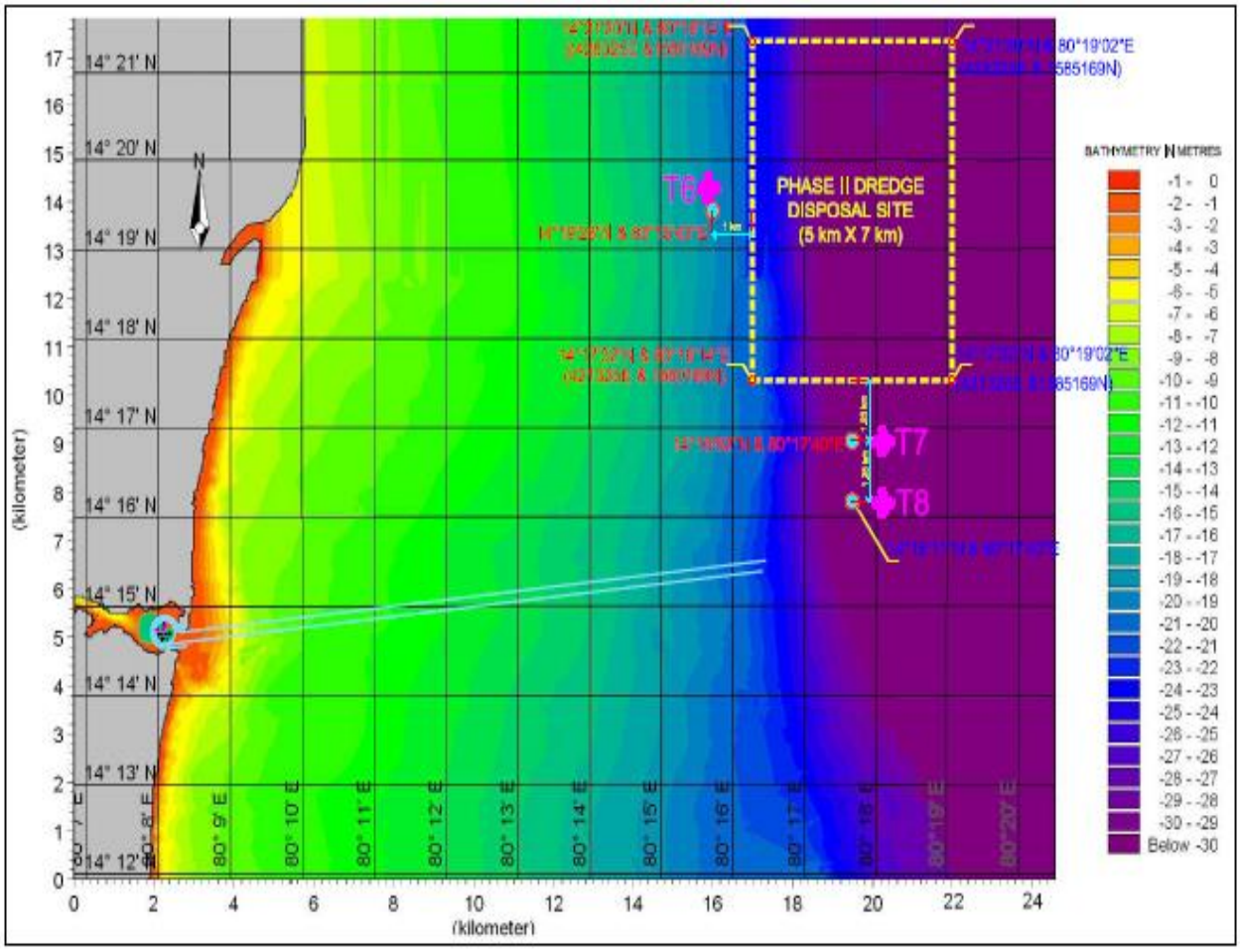
4.5.2 Sampling Locations

Turbidity levels are monitored during Low Tide, Medium Tide and High Tide. Monitoring locations listed below **.**

MARINE DEEP SEA TURBIDITY MONITORING LOCATIONS

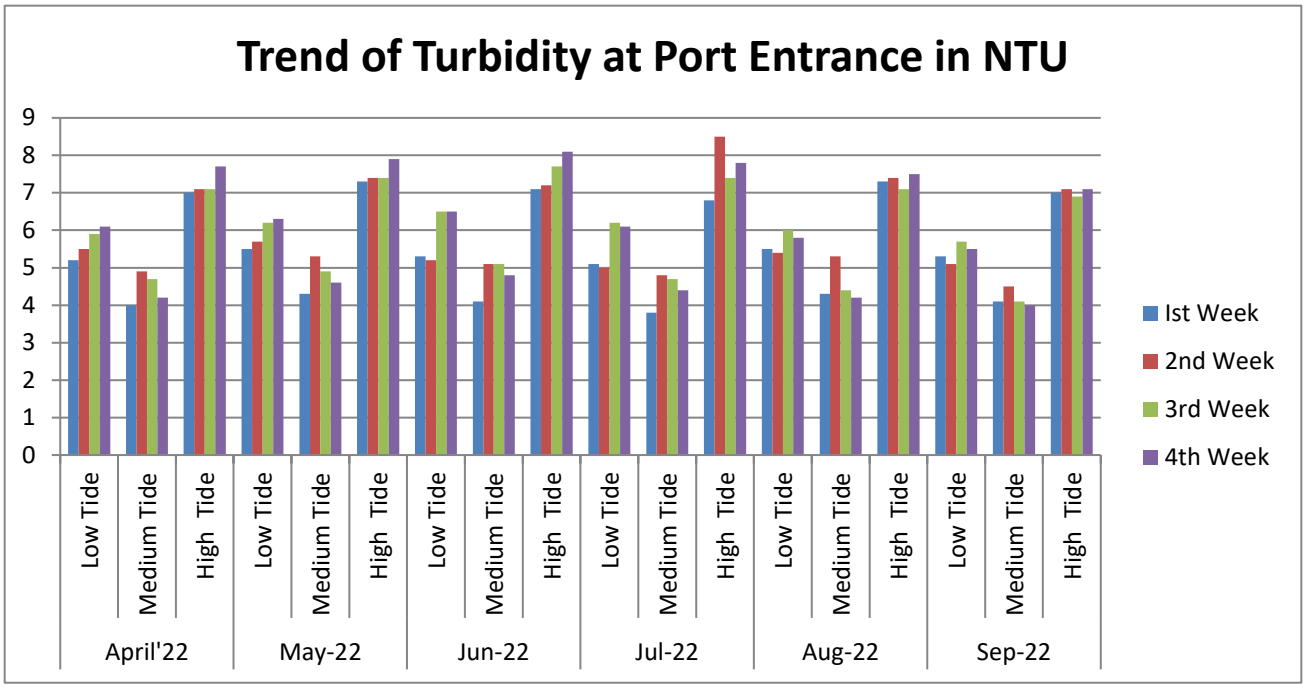
Location Code	Geographical Co-ordinates
DS1	$14^0$19'26"N ; $80^0$15'43"E
DS2	$14^0$16'52"N ; $80^0$17'40"E
DS3	$14^0$16'11"N ; $80^0$17'40"E

KRISHNAPATNAM PORT DEEP SEA MONITORING LOCATIONS

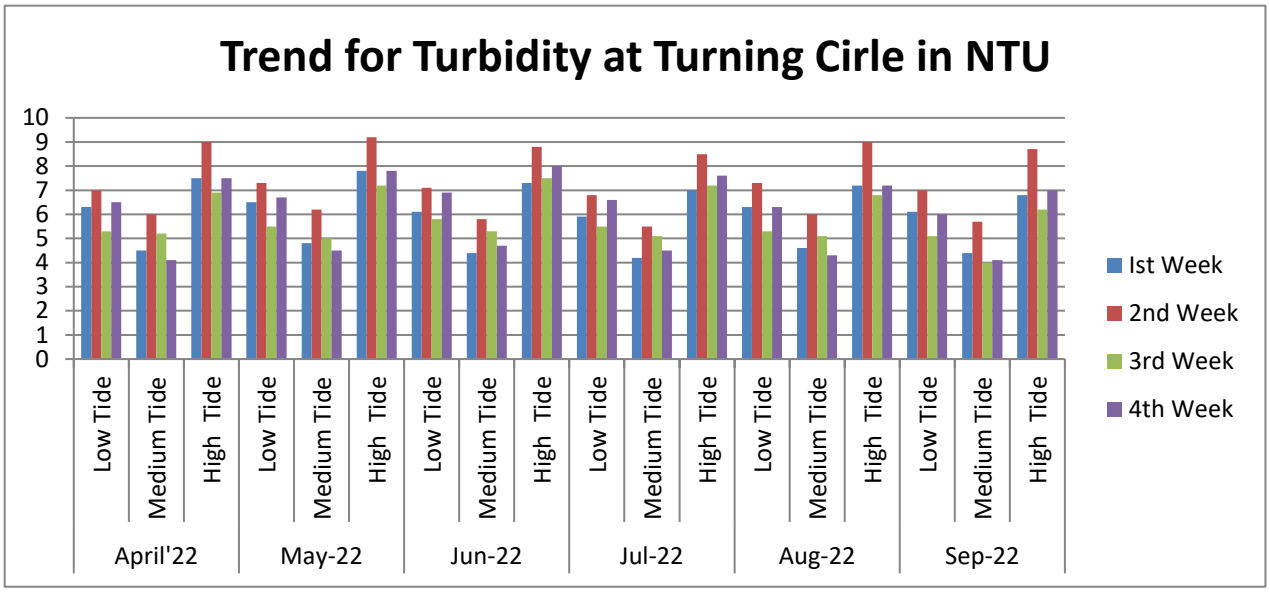


CODE	PARAMETERS	CO-ORDINATES OF MONITORING STATION
♣	Turbidity Monitoring	
T6		14°19'26"N & 80°15'43"E
T7		14°16'52"N & 80°17'40"E
T8		14°16'11"N & 80°17'40"E

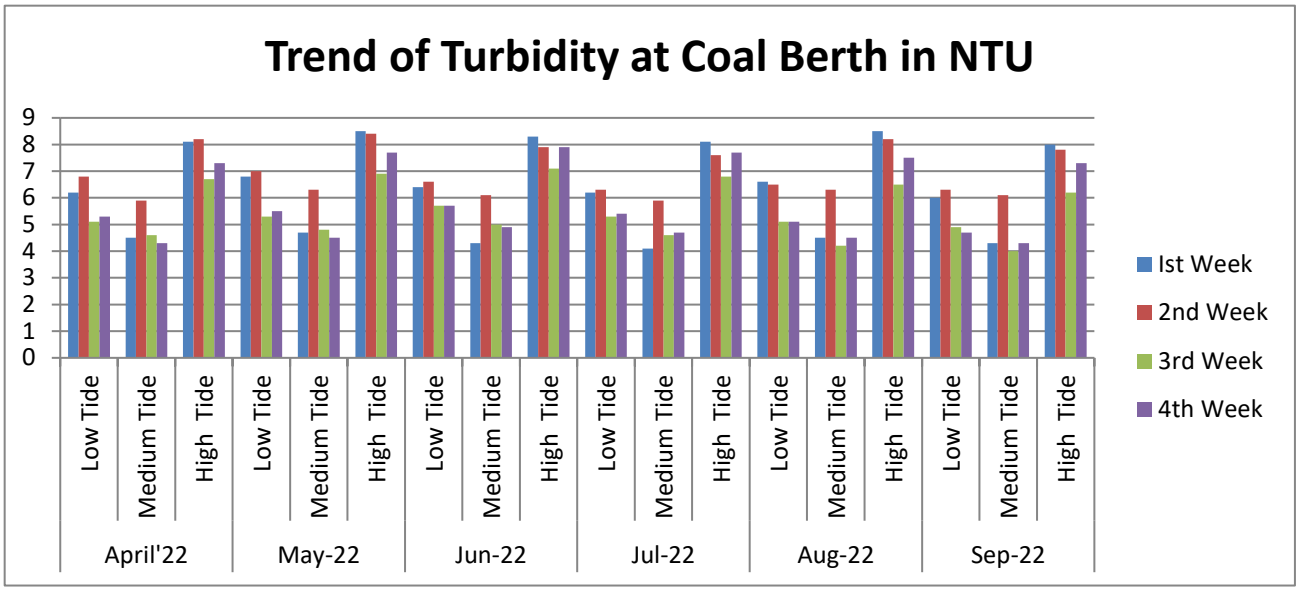
Status of Turbidity in Marine Water



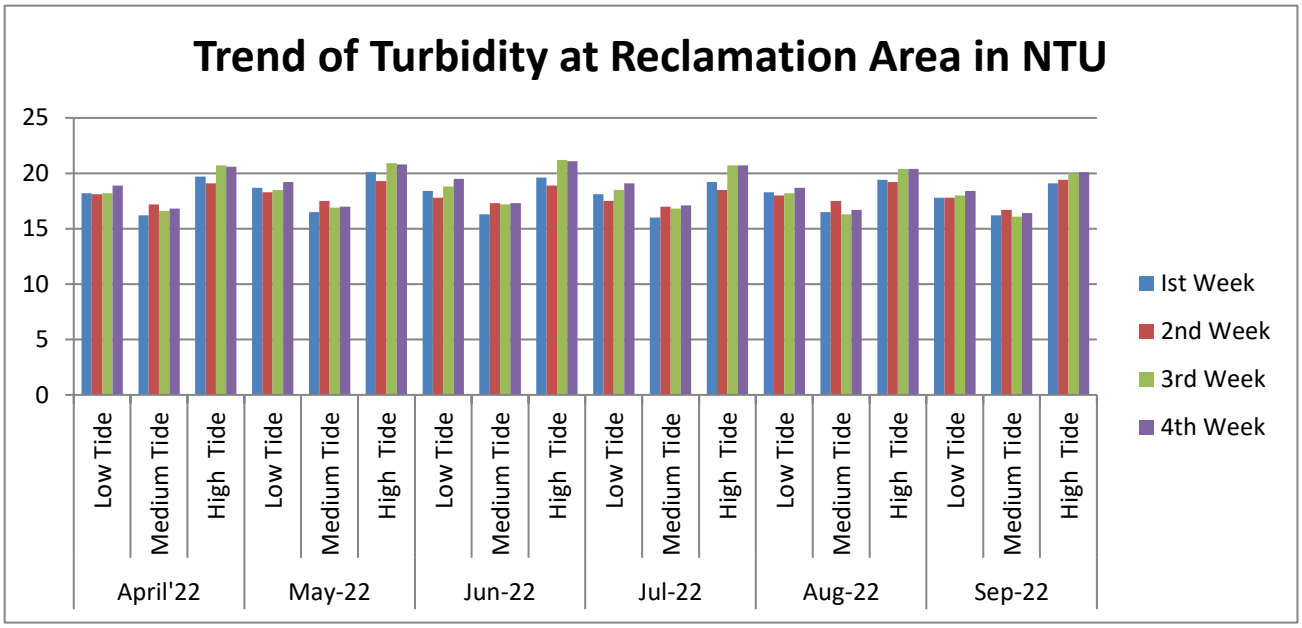
Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	5.2	5.5	5.9	6.1	July'22	Low Tide	5.1	5.0	6.2	6.1
	Medium Tide	4.0	4.9	4.7	4.2		Medium Tide	3.8	4.8	4.7	4.4
	High Tide	7.0	7.1	7.1	7.7		High Tide	6.8	8.5	7.4	7.8
May'22	Low Tide	5.5	5.7	6.2	6.3	Aug'22	Low Tide	5.5	5.4	6.0	5.8
	Medium Tide	4.3	5.3	4.9	4.6		Medium Tide	4.3	5.3	4.4	4.2
	High Tide	7.3	7.4	7.4	7.9		High Tide	7.3	7.4	7.1	7.5
June'22	Low Tide	5.3	5.2	6.5	6.5	Sep'22	Low Tide	5.3	5.1	5.7	5.5
	Medium Tide	4.1	5.1	5.1	4.8		Medium Tide	4.1	4.5	4.1	4.0
	High Tide	7.1	7.2	7.7	8.1		High Tide	7.0	7.1	6.9	7.1



Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	6.3	7.0	5.3	6.5	July'22	Low Tide	5.9	6.8	5.5	6.6
	Medium Tide	4.5	6.0	5.2	4.1		Medium Tide	4.2	5.5	5.1	4.5
	High Tide	7.5	9.0	6.9	7.5		High Tide	7.0	8.5	7.2	7.6
May'22	Low Tide	6.5	7.3	5.5	6.7	Aug'22	Low Tide	6.3	7.3	5.3	6.3
	Medium Tide	4.8	6.2	5.0	4.5		Medium Tide	4.6	6.0	5.1	4.3
	High Tide	7.8	9.2	7.2	7.8		High Tide	7.2	9.0	6.8	7.2
June'22	Low Tide	6.1	7.1	5.8	6.9	Sep'22	Low Tide	6.1	7.0	5.1	6.0
	Medium Tide	4.4	5.8	5.3	4.7		Medium Tide	4.4	5.7	4.0	4.1
	High Tide	7.3	8.8	7.5	8.0		High Tide	6.8	8.7	6.2	7.0



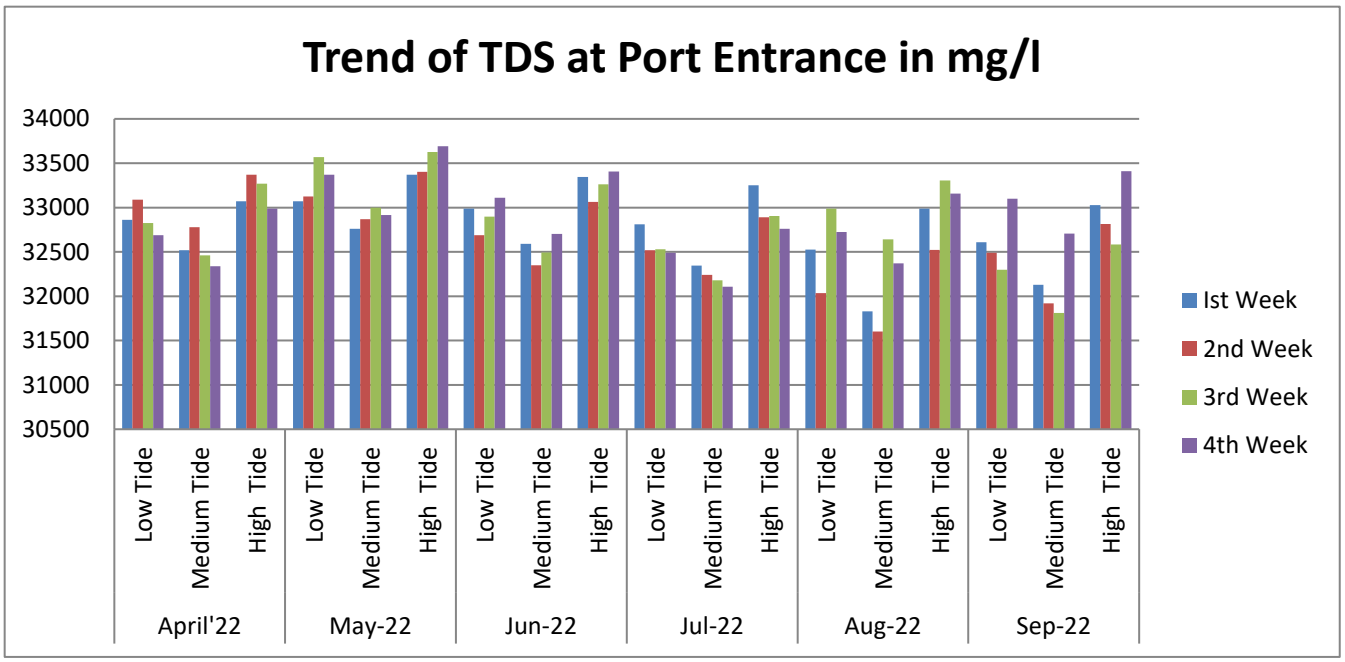
Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	6.2	6.8	5.1	5.3	July'22	Low Tide	6.2	6.3	5.3	5.4
	Medium Tide	4.5	5.9	4.6	4.3		Medium Tide	4.1	5.9	4.6	4.7
	High Tide	8.1	8.2	6.7	7.3		High Tide	8.1	7.6	6.8	7.7
May'22	Low Tide	6.8	7.0	5.3	5.5	Aug'22	Low Tide	6.6	6.5	5.1	5.1
	Medium Tide	4.7	6.3	4.8	4.5		Medium Tide	4.5	6.3	4.2	4.5
	High Tide	8.5	8.4	6.9	7.7		High Tide	8.5	8.2	6.5	7.5
June'22	Low Tide	6.4	6.6	5.7	5.7	Sep'22	Low Tide	6.0	6.3	4.9	4.7
	Medium Tide	4.3	6.1	5.0	4.9		Medium Tide	4.3	6.1	4.0	4.3
	High Tide	8.3	7.9	7.1	7.9		High Tide	8.0	7.8	6.2	7.3



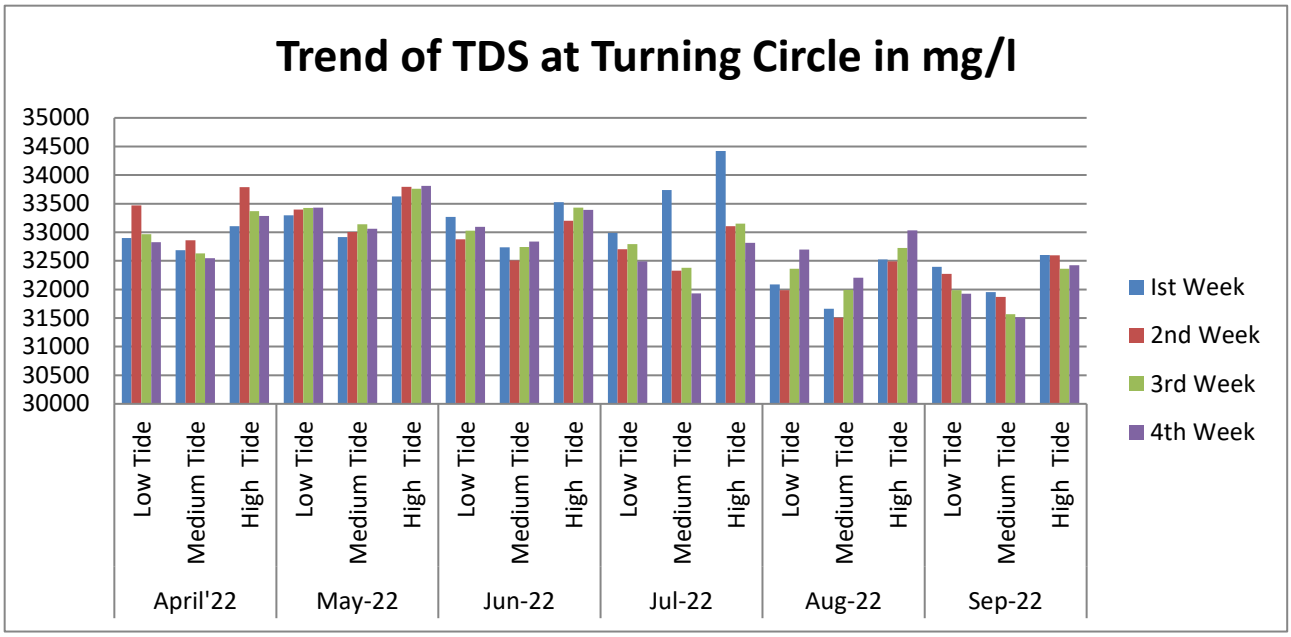
Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	18.2	18.1	18.2	18.9	July'22	Low Tide	18.1	17.5	18.5	19.1
	Medium Tide	16.2	17.2	16.6	16.8		Medium Tide	16.0	17.0	16.8	17.1
	High Tide	19.7	19.1	20.7	20.6		High Tide	19.2	18.5	20.7	20.7
May'22	Low Tide	18.7	18.3	18.5	19.2	Aug'22	Low Tide	18.3	18.0	18.2	18.7
	Medium Tide	16.5	17.5	16.9	17.0		Medium Tide	16.5	17.5	16.3	16.7
	High Tide	20.1	19.3	20.9	20.8		High Tide	19.4	19.2	20.4	20.4
June'22	Low Tide	18.4	17.8	18.8	19.5	Sep'22	Low Tide	17.8	17.8	18.0	18.4
	Medium Tide	16.3	17.3	17.2	17.3		Medium Tide	16.2	16.7	16.1	16.4
	High Tide	19.6	18.9	21.2	21.1		High Tide	19.1	19.4	20.0	20.1

Summary of Turbidity: Coal berth varied between 4.0 to 8.5 NTU: Turning circle varied between 4.0 to 9.2 NTU and Approach channel varied between 3.8 to 8.5 NTU: Reclamation Area varied between 16.0 to 21.2 NTU

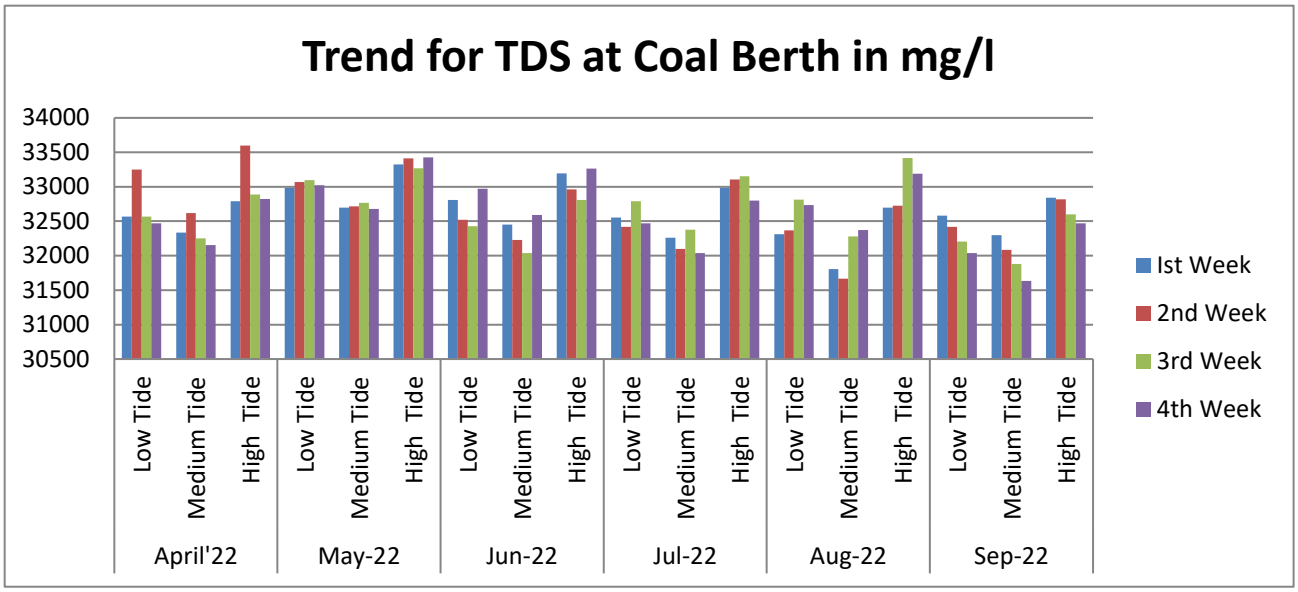
Status of Total Dissolved Solids in Marine Water



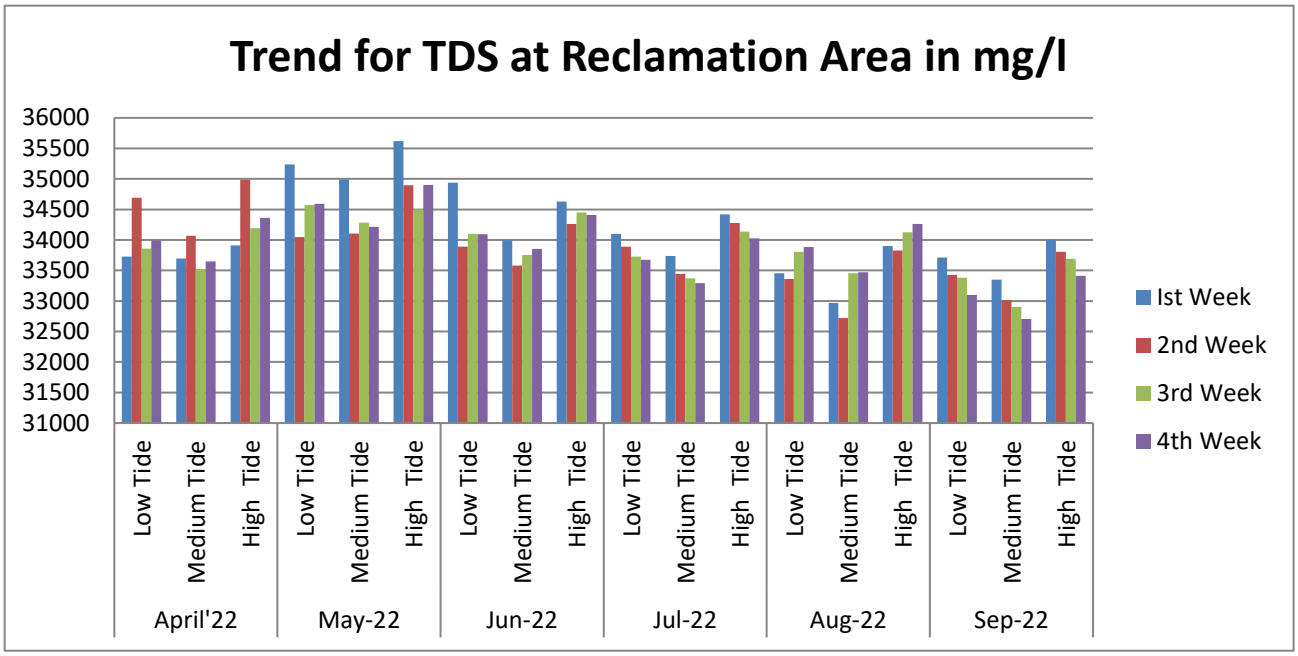
Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	32860	33089	32826	32689	July'22	Low Tide	32810	32518	32528	32489
	Medium Tide	32520	32779	32460	32339		Medium Tide	32344	32241	32180	32107
	High Tide	33069	33369	33269	32989		High Tide	33250	32890	32906	32760
May'22	Low Tide	33069	33126	33569	33369	Aug'22	Low Tide	32526	32036	32989	32726
	Medium Tide	32762	32869	32999	32916		Medium Tide	31831	31601	32641	32369
	High Tide	33371	33402	33628	33690		High Tide	32989	32521	33306	33158
June'22	Low Tide	32989	32690	32896	33110	Sep'22	Low Tide	32610	32489	32298	33098
	Medium Tide	32590	32350	32492	32701		Medium Tide	32130	31920	31810	32705
	High Tide	33346	33062	33262	33406		High Tide	33026	32815	32582	33411



Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	32899	33469	32967	32826	July'22	Low Tide	32986	32706	32790	32490
	Medium Tide	32688	32859	32628	32544		Medium Tide	33736	32330	32377	31929
	High Tide	33105	33789	33369	33286		High Tide	34421	33105	33152	32814
May'22	Low Tide	33298	33398	33425	33429	Aug'22	Low Tide	32089	31989	32362	32698
	Medium Tide	32914	33008	33140	33063		Medium Tide	31660	31506	31991	32208
	High Tide	33626	33792	33759	33810		High Tide	32525	32488	32725	33036
June'22	Low Tide	33269	32875	33026	33096	Sep'22	Low Tide	32398	32274	31989	31925
	Medium Tide	32738	32509	32742	32840		Medium Tide	31953	31872	31568	31512
	High Tide	33528	33201	33428	33389		High Tide	32603	32596	32361	32421



Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	32568	33248	32569	32468	July'22	Low Tide	32554	32419	32790	32472
	Medium Tide	32336	32617	32250	32155		Medium Tide	32260	32097	32377	32039
	High Tide	32790	33596	32890	32825		High Tide	32985	33105	33152	32799
May'22	Low Tide	32986	33069	33098	33024	Aug'22	Low Tide	32310	32369	32813	32736
	Medium Tide	32698	32718	32767	32677		Medium Tide	31806	31665	32278	32374
	High Tide	33325	33411	33269	33426		High Tide	32698	32725	33418	33189
June'22	Low Tide	32811	32520	32426	32969	Sep'22	Low Tide	32580	32421	32204	32036
	Medium Tide	32450	32226	32036	32592		Medium Tide	32296	32084	31879	31634
	High Tide	33194	32962	32807	33262		High Tide	32839	32819	32601	32468

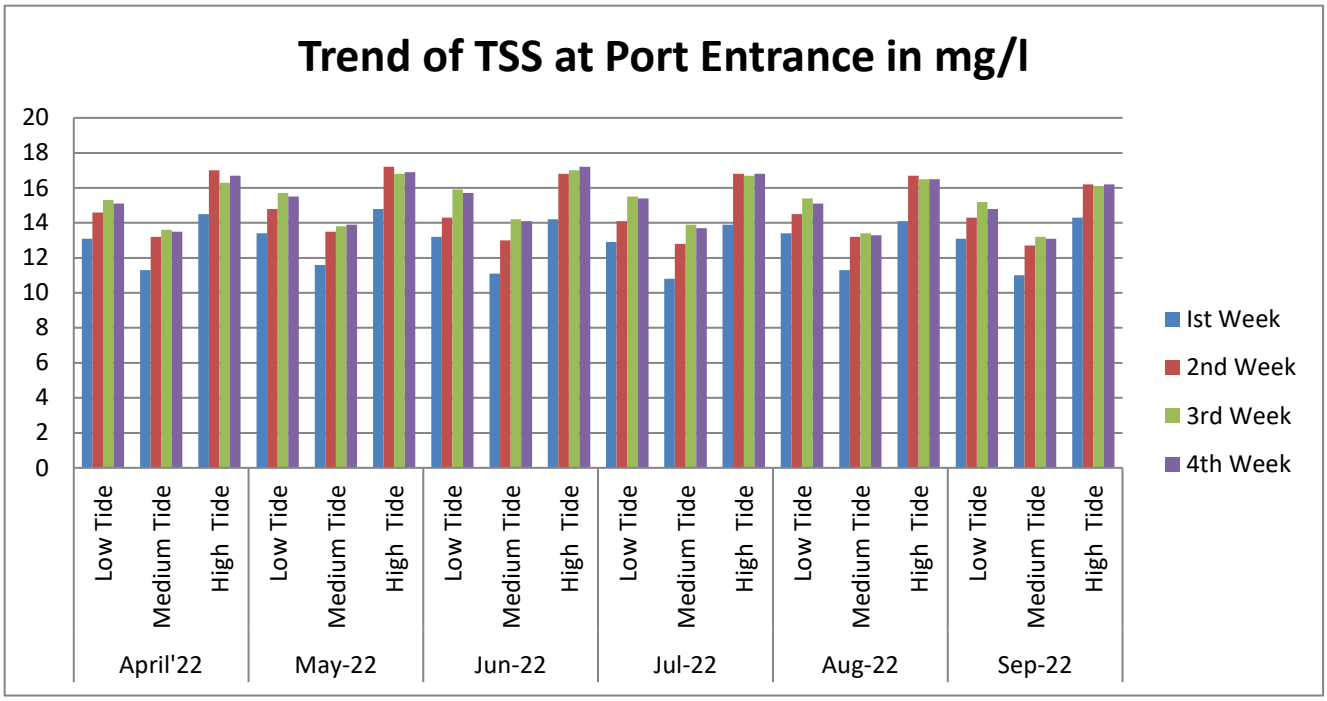


Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	33726	34690	33856	33989	July'22	Low Tide	34098	33890	33728	33676
	Medium Tide	33695	34069	33524	33651		Medium Tide	33736	33446	33370	33290
	High Tide	33909	34985	34196	34362		High Tide	34421	34276	34137	34027
May'22	Low Tide	35236	34046	34569	34592	Aug'22	Low Tide	33456	33358	33804	33887
	Medium Tide	34992	34107	34281	34213		Medium Tide	32967	32722	33452	33469
	High Tide	35620	34896	34498	34899		High Tide	33901	33826	34126	34262
June'22	Low Tide	34936	33890	34098	34092	Sep'22	Low Tide	33712	33428	33382	33098
	Medium Tide	33993	33579	33751	33851		Medium Tide	33352	33014	32906	32705
	High Tide	34629	34264	34452	34408		High Tide	34007	33806	33688	33411

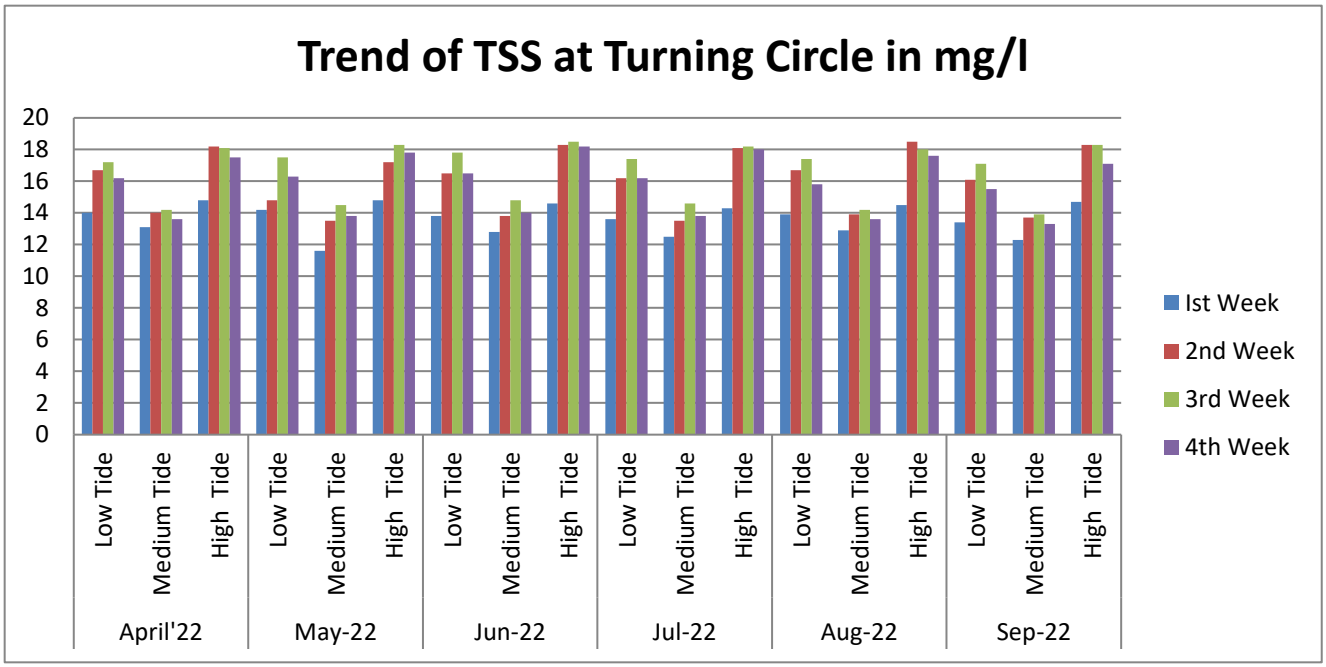
Summary of TDS of Marinne water quality results

- **TDS** - Values are in the range of 31601 to 33690 mg/l at Port Entrance (Approach Channel).
  - Values are in the range of 31506 to 34421 mg/l at Turning Circle
  - Values are in the range of 31634 to 33596 mg/l at Coal Berth
  - Values are in range of 32705 to 35620 at Reclamation Area

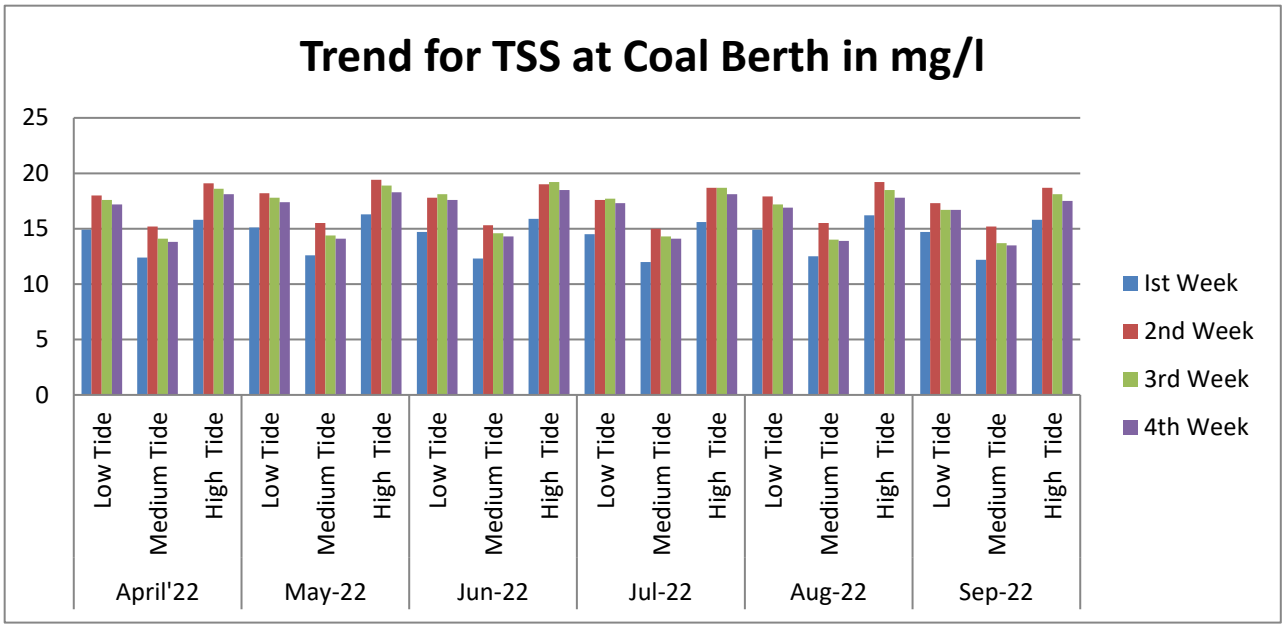
Status of Total Suspended Solids in Marine Water



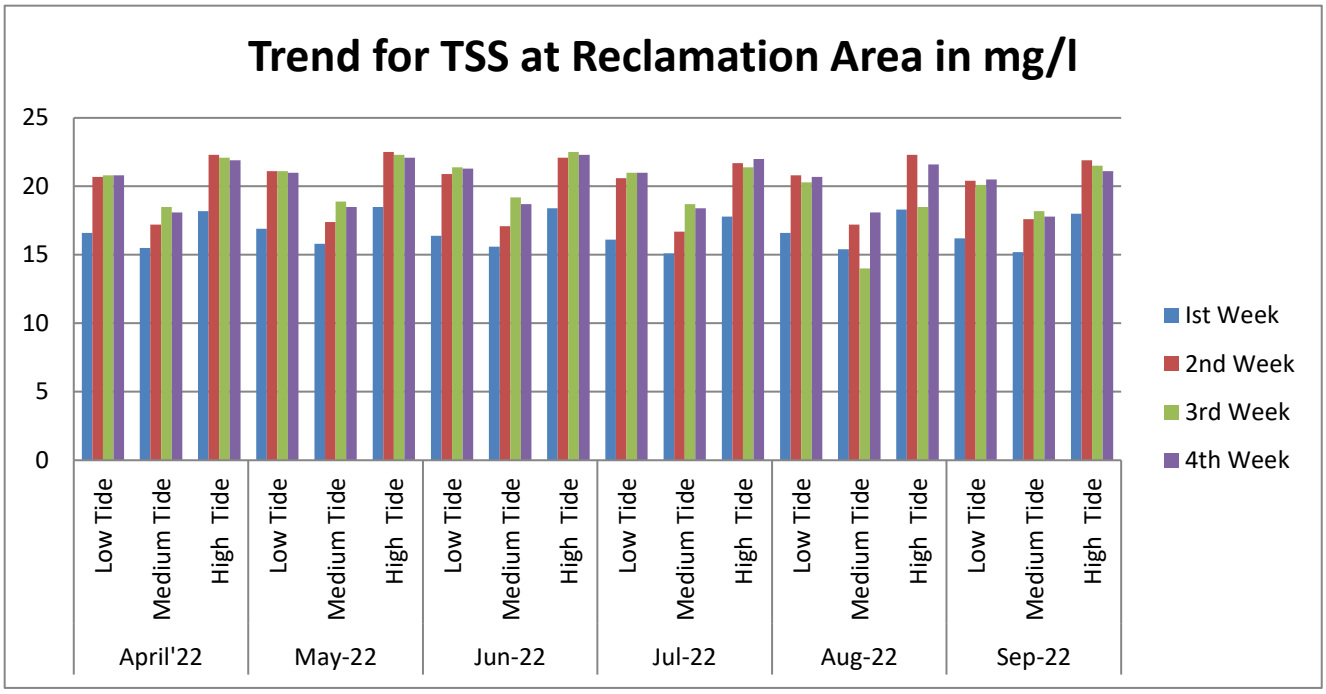
Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	13.1	14.6	15.3	15.1	July'22	Low Tide	12.9	14.1	15.5	15.4
	Medium Tide	11.3	13.2	13.6	13.5		Medium Tide	10.8	12.8	13.9	13.7
	High Tide	14.5	17.0	16.3	16.7		High Tide	13.9	16.8	16.7	16.8
May'22	Low Tide	13.4	14.8	15.7	15.5	Aug'22	Low Tide	13.4	14.5	15.4	15.1
	Medium Tide	11.6	13.5	13.8	13.9		Medium Tide	11.3	13.2	13.4	13.3
	High Tide	14.8	17.2	16.8	16.9		High Tide	14.1	16.7	16.5	16.5
June'22	Low Tide	13.2	14.3	15.9	15.7	Sep'22	Low Tide	13.1	14.3	15.2	14.8
	Medium Tide	11.1	13.0	14.2	14.1		Medium Tide	11.0	12.7	13.2	13.1
	High Tide	14.2	16.8	17.0	17.2		High Tide	14.3	16.2	16.1	16.2



Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	14.0	16.7	17.2	16.2	July'22	Low Tide	13.6	16.2	17.4	16.2
	Medium Tide	13.1	14.0	14.2	13.6		Medium Tide	12.5	13.5	14.6	13.8
	High Tide	14.8	18.2	18.1	17.5		High Tide	14.3	18.1	18.2	18.0
May'22	Low Tide	14.2	14.8	17.5	16.3	Aug'22	Low Tide	13.9	16.7	17.4	15.8
	Medium Tide	11.6	13.5	14.5	13.8		Medium Tide	12.9	13.9	14.2	13.6
	High Tide	14.8	17.2	18.3	17.8		High Tide	14.5	18.5	18.0	17.6
June'22	Low Tide	13.8	16.5	17.8	16.5	Sep'22	Low Tide	13.4	16.1	17.1	15.5
	Medium Tide	12.8	13.8	14.8	14.0		Medium Tide	12.3	13.7	13.9	13.3
	High Tide	14.6	18.3	18.5	18.2		High Tide	14.7	18.3	18.3	17.1

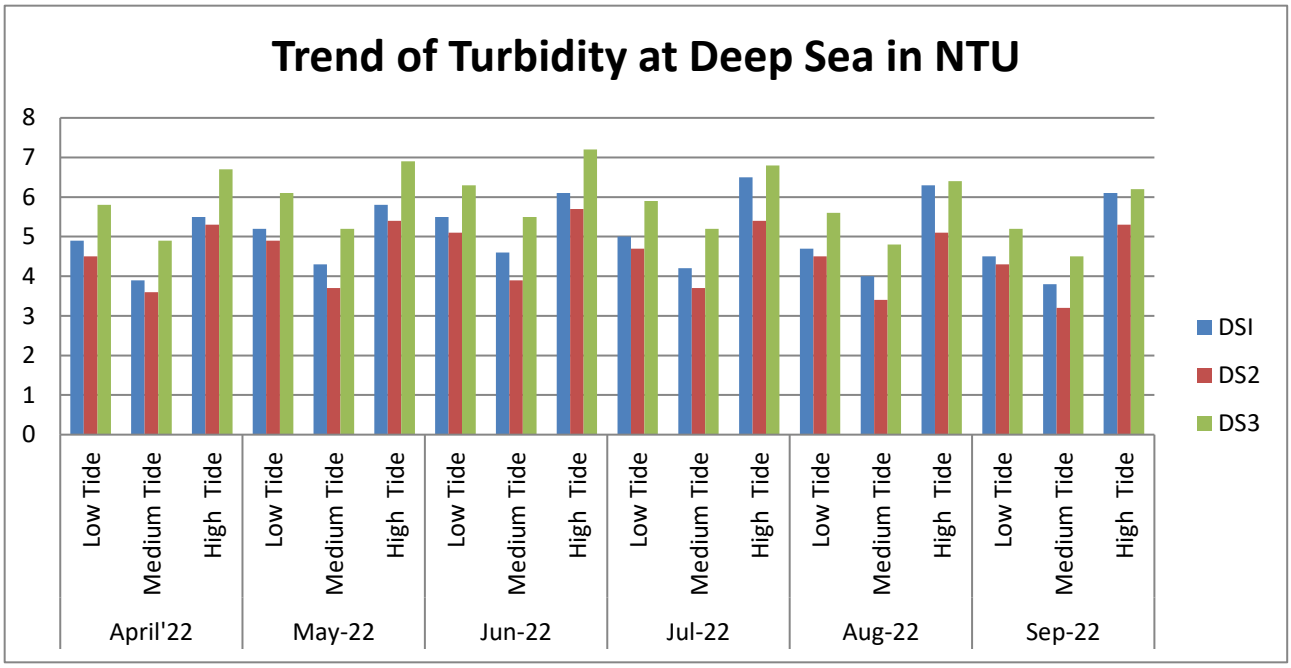


Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	14.9	18.0	17.6	17.2	July'22	Low Tide	14.5	17.6	17.7	17.3
	Medium Tide	12.4	15.2	14.1	13.8		Medium Tide	12.0	15.0	14.3	14.1
	High Tide	15.8	19.1	18.6	18.1		High Tide	15.6	18.7	18.7	18.1
May'22	Low Tide	15.1	18.2	17.8	17.4	Aug'22	Low Tide	14.9	17.9	17.2	16.9
	Medium Tide	12.6	15.5	14.4	14.1		Medium Tide	12.5	15.5	14.0	13.9
	High Tide	16.3	19.4	18.9	18.3		High Tide	16.2	19.2	18.5	17.8
June'22	Low Tide	14.7	17.8	18.1	17.6	Sep'22	Low Tide	14.7	17.3	16.7	16.7
	Medium Tide	12.3	15.3	14.6	14.3		Medium Tide	12.2	15.2	13.7	13.5
	High Tide	15.9	19.0	19.2	18.5		High Tide	15.8	18.7	18.1	17.5

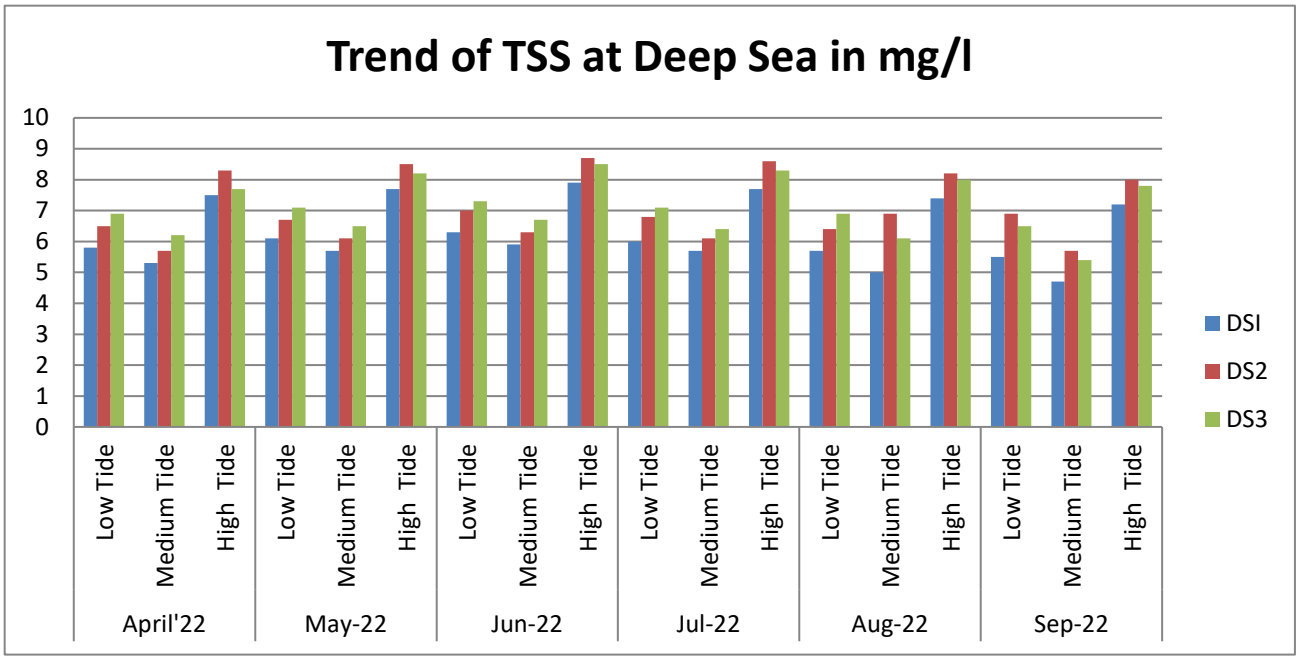


Month		Ist Week	2nd Week	3rd Week	4th Week	Month		Ist Week	2nd Week	3rd Week	4th Week
April'22	Low Tide	16.6	20.7	20.8	20.8	July'22	Low Tide	16.1	20.6	21.0	21.0
	Medium Tide	15.5	17.2	18.5	18.1		Medium Tide	15.1	16.7	18.7	18.4
	High Tide	18.2	22.3	22.1	21.9		High Tide	17.8	21.7	21.4	22.0
May'22	Low Tide	16.9	21.1	21.1	21.0	Aug'22	Low Tide	16.6	20.8	20.3	20.7
	Medium Tide	15.8	17.4	18.9	18.5		Medium Tide	15.4	17.2	14.0	18.1
	High Tide	18.5	22.5	22.3	22.1		High Tide	18.3	22.3	18.5	21.6
June'22	Low Tide	16.4	20.9	21.4	21.3	Sep'22	Low Tide	16.2	20.4	20.1	20.5
	Medium Tide	15.6	17.1	19.2	18.7		Medium Tide	15.2	17.6	18.2	17.8
	High Tide	18.4	22.1	22.5	22.3		High Tide	18.0	21.9	21.5	21.1

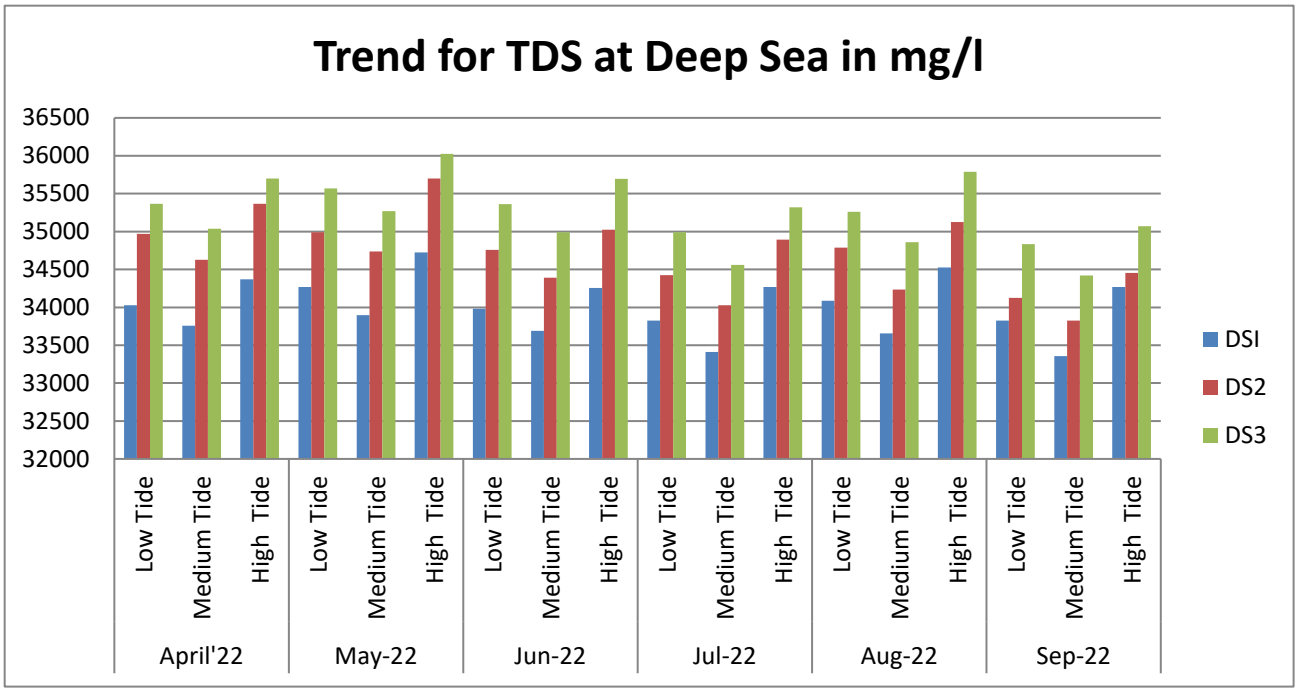
Status of Deep Sea Water Quality



Month		DSI	DS2	DS3	Month		DSI	DS2	DS3
April'22	Low Tide	4.9	4.5	5.8	July'22	Low Tide	5.0	4.7	5.9
	Medium Tide	3.9	3.6	4.9		Medium Tide	4.2	3.7	5.2
	High Tide	5.5	5.3	6.7		High Tide	6.5	5.4	6.8
May'22	Low Tide	5.2	4.9	6.1	Aug'22	Low Tide	4.7	4.5	5.6
	Medium Tide	4.3	3.7	5.2		Medium Tide	4.0	3.4	4.8
	High Tide	5.8	5.4	6.9		High Tide	6.3	5.1	6.4
June'22	Low Tide	5.5	5.1	6.3	Sep'22	Low Tide	4.5	4.3	5.2
	Medium Tide	4.6	3.9	5.5		Medium Tide	3.8	3.2	4.5
	High Tide	6.1	5.7	7.2		High Tide	6.1	5.3	6.2



Month		DSI	DS2	DS3	Month		DSI	DS2	DS3
April'22	Low Tide	5.8	6.5	6.9	July'22	Low Tide	6.0	6.8	7.1
	Medium Tide	5.3	5.7	6.2		Medium Tide	5.7	6.1	6.4
	High Tide	7.5	8.3	7.7		High Tide	7.7	8.6	8.3
May'22	Low Tide	6.1	6.7	7.1	Aug'22	Low Tide	5.7	6.4	6.9
	Medium Tide	5.7	6.1	6.5		Medium Tide	5.0	6.9	6.1
	High Tide	7.7	8.5	8.2		High Tide	7.4	8.2	8.0
June'22	Low Tide	6.3	7.0	7.3	Sep'22	Low Tide	5.5	6.9	6.5
	Medium Tide	5.9	6.3	6.7		Medium Tide	4.7	5.7	5.4
	High Tide	7.9	8.7	8.5		High Tide	7.2	8.0	7.8



Month		DSI	DS2	DS3	Month		DSI	DS2	DS3
April'22	Low Tide	34026	34969	35368	July'22	Low Tide	33825	34426	34989
	Medium Tide	33756	34628	35039		Medium Tide	33410	34029	34558
	High Tide	34369	35365	35698		High Tide	34269	34892	35321
May'22	Low Tide	34269	34992	35570	Aug'22	Low Tide	34089	34788	35262
	Medium Tide	33896	34738	35269		Medium Tide	33658	34236	34861
	High Tide	34726	35698	36025		High Tide	34526	35125	35789
June'22	Low Tide	33982	34759	35360	Sep'22	Low Tide	33825	34125	34836
	Medium Tide	33689	34389	34989		Medium Tide	33358	33826	34421
	High Tide	34255	35026	35697		High Tide	34269	34456	35069

4.6 Marine Sediment Quality

4.6.1 Sampling Locations

The Marine sediment sampling is carried out once in every week at four locations in the port listed below**.**

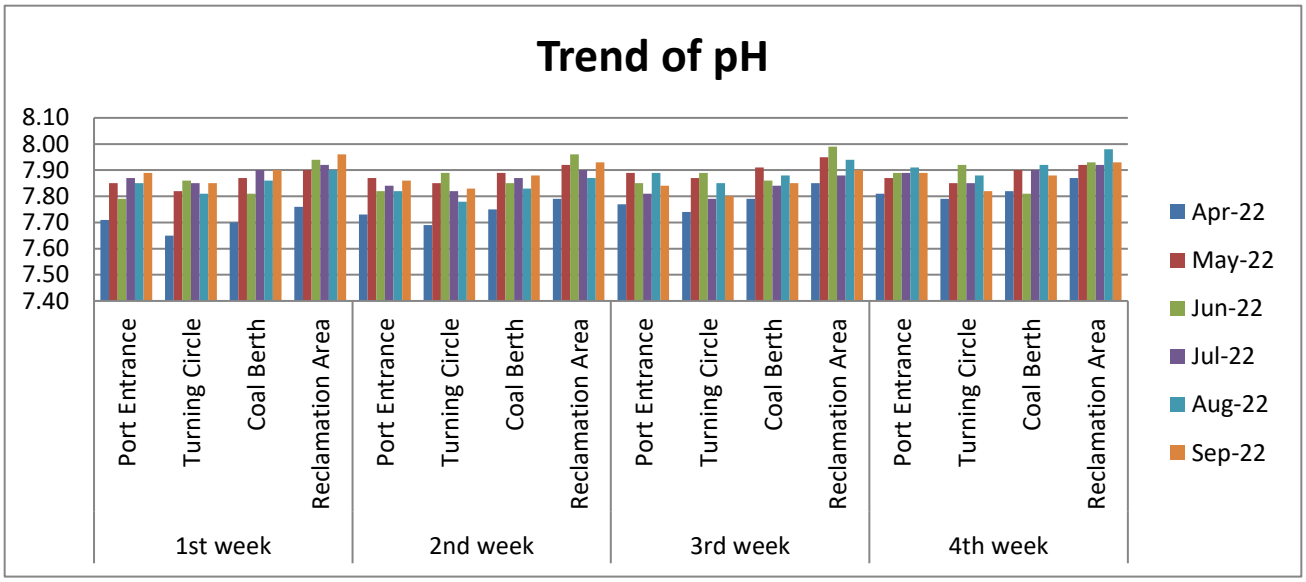
MARINE SEDIMENT MONITORING LOCATIONS

SI.No	Location
1	Port Entrance
2	Turning Circle
3	Coal Berth
4	Reclamations Area

4.6.2 Method of Sampling

Marine sediment samples are collected using Van Veen Grab Sampler for analyzing Physical, Chemical and Biological parameters and presence of Heavy metals.

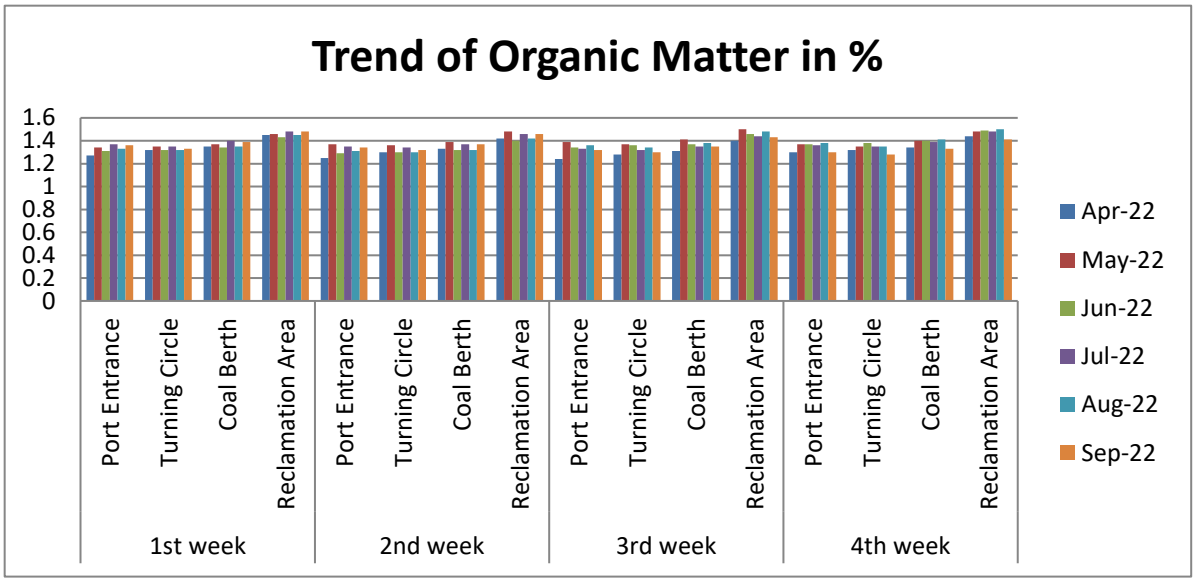
Status of Marine Sediments Quality



pH in Marine sediment varied between 7.65 to 7.99

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	7.71	7.65	7.70	7.76	7.73	7.69	7.75	7.79
May'22	7.85	7.82	7.87	7.90	7.87	7.85	7.89	7.92
June'22	7.79	7.86	7.81	7.94	7.82	7.89	7.85	7.96
July'22	7.87	7.85	7.90	7.92	7.84	7.82	7.87	7.90
Aug'22	7.85	7.81	7.86	7.90	7.82	7.78	7.83	7.87
Sep'22	7.89	7.85	7.90	7.96	7.86	7.83	7.88	7.93

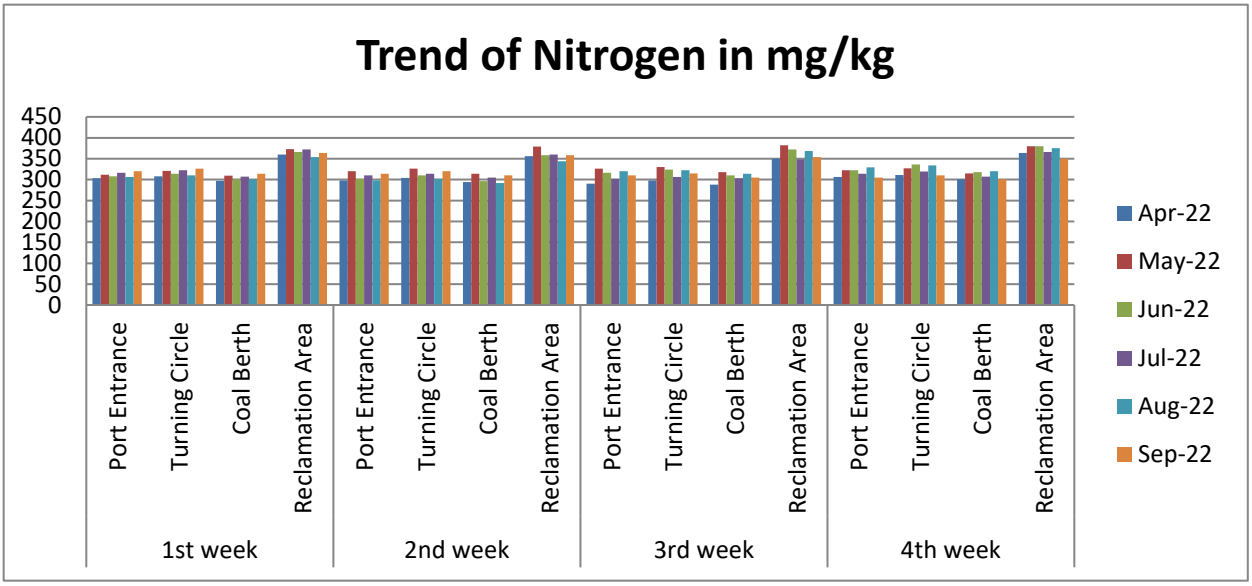
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	7.77	7.74	7.79	7.85	7.81	7.79	7.82	7.87
May'22	7.89	7.87	7.91	7.95	7.87	7.85	7.90	7.92
June'22	7.85	7.89	7.86	7.99	7.89	7.92	7.81	7.93
July'22	7.81	7.79	7.84	7.88	7.89	7.85	7.90	7.92
Aug'22	7.89	7.85	7.88	7.94	7.91	7.88	7.92	7.98
Sep'22	7.84	7.80	7.85	7.90	7.89	7.82	7.88	7.93



Organic Matter in Marine sediment varied between 1.24 to 1.50 %

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1.27	1.32	1.35	1.45	1.25	1.30	1.33	1.42
May'22	1.34	1.35	1.37	1.46	1.37	1.36	1.39	1.48
June'22	1.31	1.32	1.34	1.43	1.29	1.30	1.32	1.40
July'22	1.37	1.35	1.40	1.48	1.35	1.34	1.37	1.46
Aug'22	1.33	1.32	1.35	1.45	1.31	1.30	1.32	1.42
Sep'22	1.36	1.33	1.39	1.48	1.34	1.32	1.37	1.46

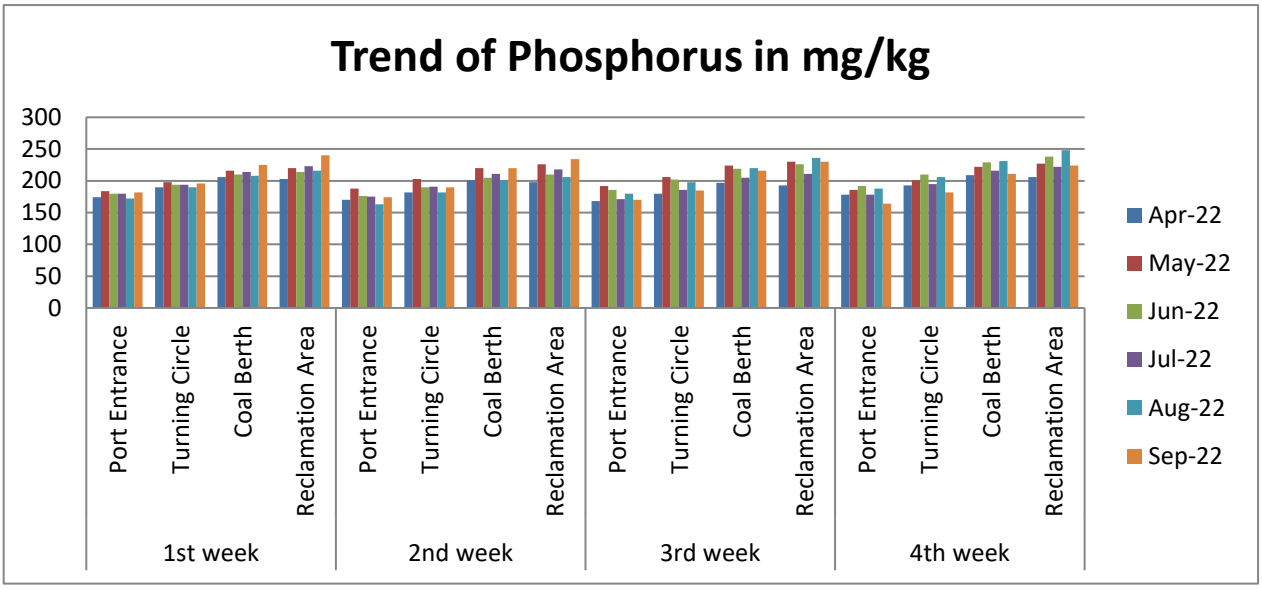
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1.24	1.28	1.31	1.40	1.30	1.32	1.34	1.44
May'22	1.39	1.37	1.41	1.50	1.37	1.35	1.40	1.48
June'22	1.34	1.36	1.37	1.46	1.37	1.38	1.40	1.49
July'22	1.33	1.32	1.35	1.44	1.36	1.35	1.39	1.48
Aug'22	1.36	1.34	1.38	1.48	1.38	1.35	1.41	1.50
Sep'22	1.32	1.30	1.35	1.43	1.30	1.28	1.33	1.41



Nitrogen In Marine sediment varied between 288 to 382 mg/kg

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	303	308	297	360	298	304	294	356
May'22	312	321	309	373	320	326	314	379
June'22	308	314	301	366	302	310	296	358
July'22	316	322	307	372	310	314	305	360
Aug'22	306	310	301	354	298	302	292	344
Sep'22	320	326	314	364	314	320	310	358

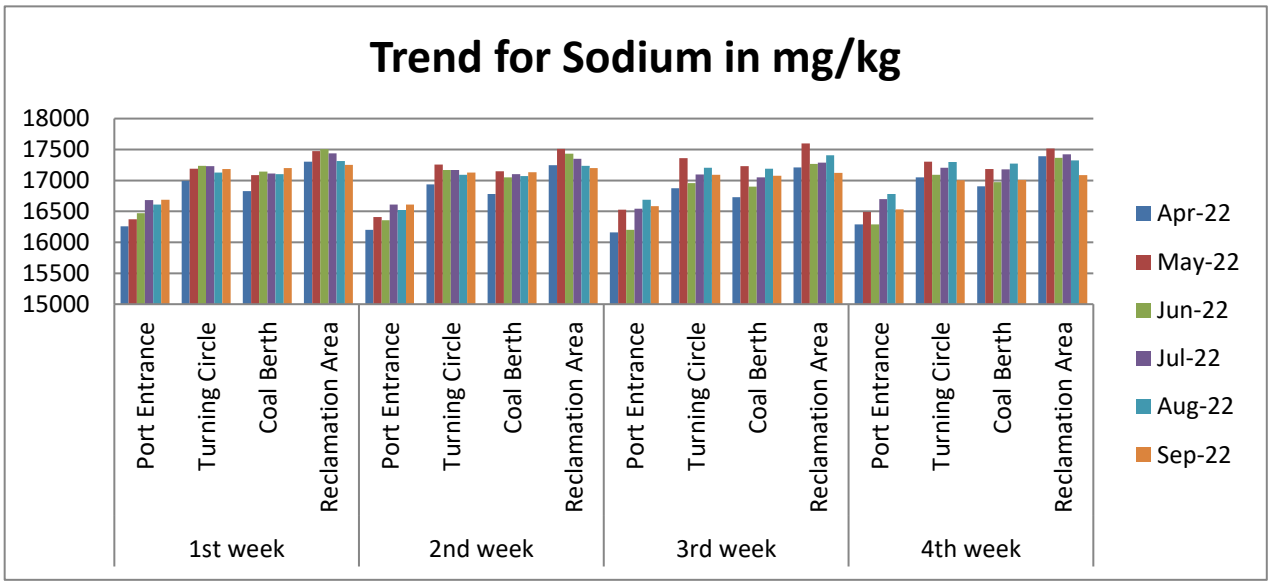
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	290	298	288	350	306	311	301	364
May'22	326	330	318	382	322	327	315	380
June'22	316	324	310	372	322	336	318	380
July'22	302	306	303	348	314	319	307	366
Aug'22	320	322	314	368	329	334	320	375
Sep'22	310	315	305	354	305	310	301	350



Phosphorous in Marine sediment varied between 163 to 248 mg/kg

Month	1st Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	174	190	206	203	170	182	201	198
May'22	184	198	216	220	188	203	220	226
June'22	180	194	210	214	176	190	205	210
July'22	180	194	214	223	175	191	211	218
Aug'22	172	190	208	216	163	182	201	206
Sep'22	182	196	225	240	174	190	220	234

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	168	180	197	193	178	193	209	206
May'22	192	206	224	230	186	201	222	227
June'22	186	202	219	226	192	210	229	238
July'22	171	186	205	211	178	195	216	222
Aug'22	180	198	220	236	188	206	231	248
Sep'22	170	185	216	230	164	182	211	224



Sodium in Marine sediment varied between 16159 to 17598 mg/kg

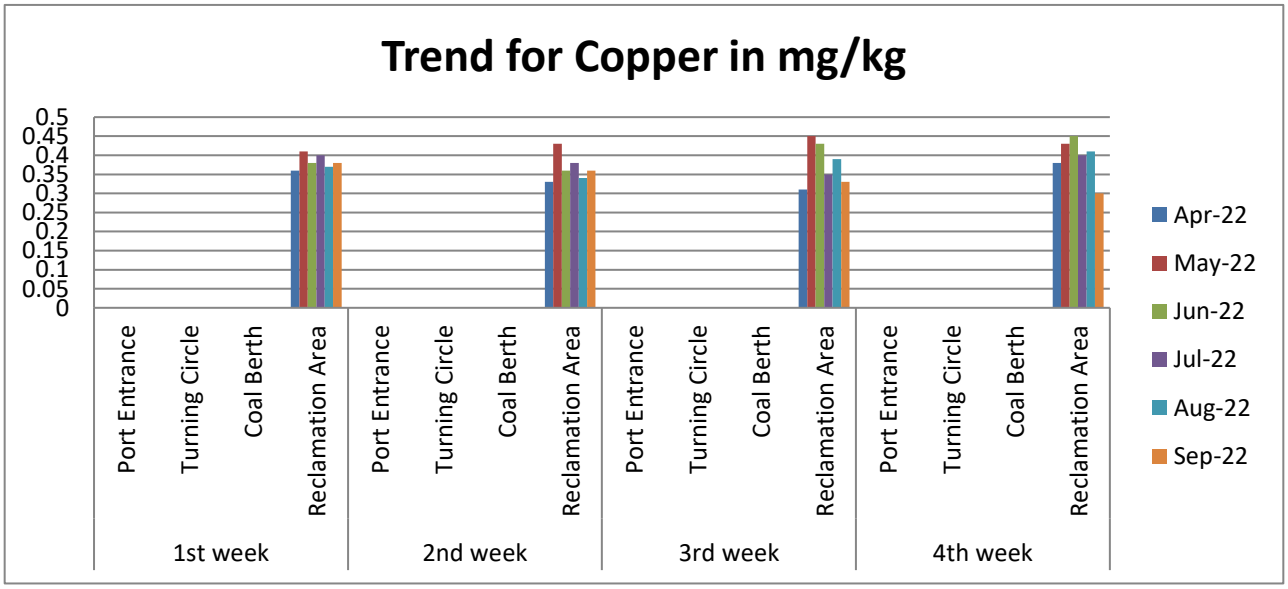
Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	16259	16995	16830	17305	16203	16934	16780	17245
May'22	16375	17189	17084	17472	16410	17256	17148	17510
June'22	16469	17238	17142	17506	16358	17169	17052	17432
July'22	16682	17229	17113	17437	16610	17170	17104	17352
Aug'22	16610	17126	17104	17316	16524	17089	17071	17234
Sep'22	16690	17182	17199	17253	16612	17127	17134	17199

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	16159	16876	16728	17210	16289	17052	16904	17389
May'22	16526	17362	17232	17598	16489	17306	17184	17516
June'22	16203	16956	16901	17269	16289	17092	16973	17363
July'22	16542	17098	17052	17289	16698	17205	17178	17424
Aug'22	16690	17205	17189	17406	16782	17298	17270	17324
Sep'22	16584	17092	17075	17124	16532	17002	17011	17085

Potassium in Marine sediment varied between 301 to 385 mg/kg

Month	1st Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	316	360	324	362	303	352	313	355
May'22	331	374	340	374	337	380	345	378
June'22	320	362	329	365	314	354	323	360
July'22	329	362	338	371	324	354	334	365
Aug'22	322	350	332	358	313	348	324	350
Sep'22	340	365	344	370	335	360	340	364

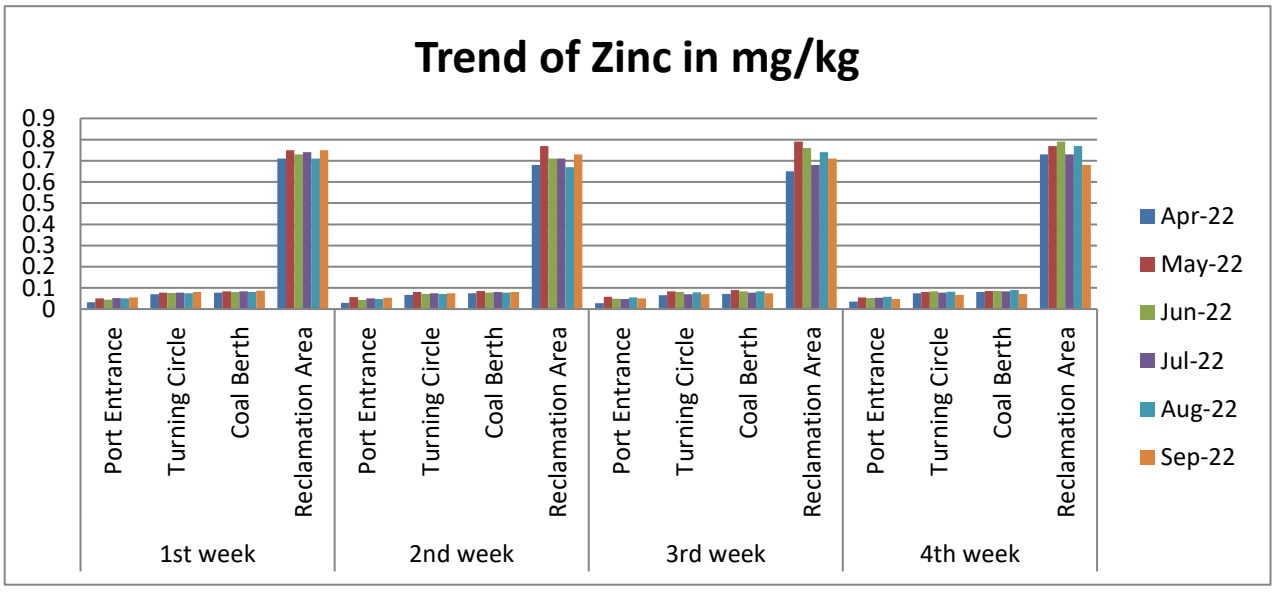
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	301	346	308	352	322	366	328	365
May'22	340	385	349	382	336	381	345	377
June'22	332	370	340	379	341	382	350	385
July'22	320	350	330	362	327	358	337	369
Aug'22	334	360	344	370	346	372	351	379
Sep'22	331	354	332	358	325	350	326	352



Copper in Marine Sediment varied between 0.30 to 0.45 mg/kg

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	< 0.01	< 0.01	< 0.01	0.36	< 0.01	< 0.01	< 0.01	0.33
May'22	< 0.01	< 0.01	< 0.01	0.41	< 0.01	< 0.01	< 0.01	0.43
June'22	< 0.01	< 0.01	< 0.01	0.38	< 0.01	< 0.01	< 0.01	0.36
July'22	< 0.01	< 0.01	< 0.01	0.40	< 0.01	< 0.01	< 0.01	0.38
Aug'22	< 0.01	< 0.01	< 0.01	0.37	< 0.01	< 0.01	< 0.01	0.34
Sep'22	< 0.01	< 0.01	< 0.01	0.38	< 0.01	< 0.01	< 0.01	0.36

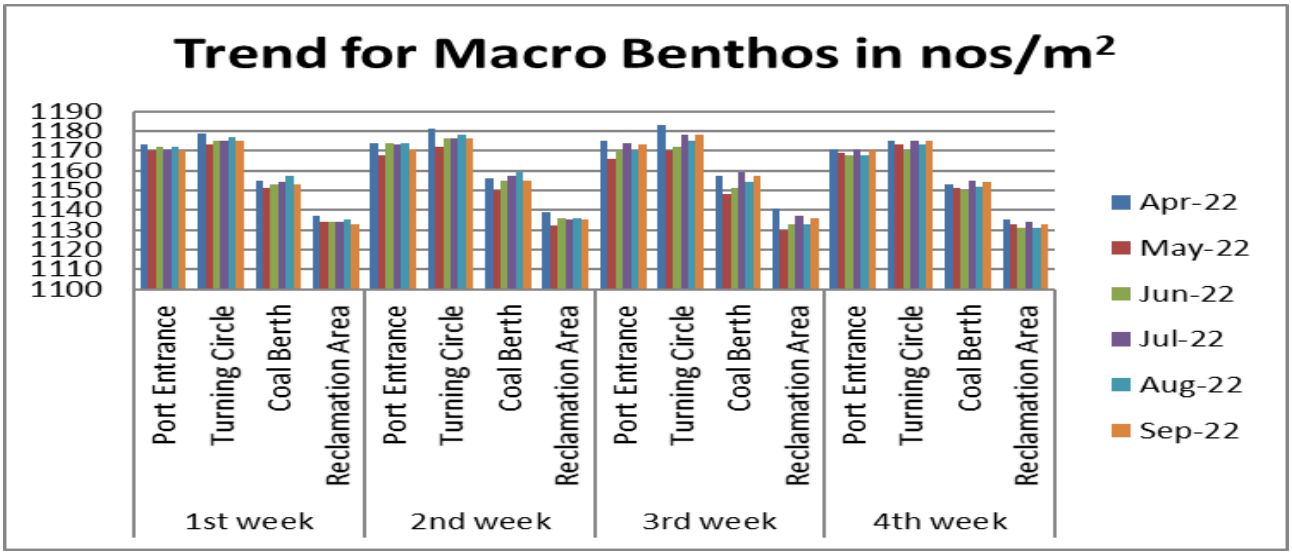
Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	< 0.01	< 0.01	< 0.01	0.31	< 0.01	< 0.01	< 0.01	0.38
May'22	< 0.01	< 0.01	< 0.01	0.45	< 0.01	< 0.01	< 0.01	0.43
June'22	< 0.01	< 0.01	< 0.01	0.43	< 0.01	< 0.01	< 0.01	0.45
July'22	< 0.01	< 0.01	< 0.01	0.35	< 0.01	< 0.01	< 0.01	0.40
Aug'22	< 0.01	< 0.01	< 0.01	0.39	< 0.01	< 0.01	< 0.01	0.41
Sep'22	< 0.01	< 0.01	< 0.01	0.33	< 0.01	< 0.01	< 0.01	0.30



Zinc in Marine sediment varied between 0.028 to 0.79 mg/kg

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	0.032	0.070	0.078	0.71	0.030	0.067	0.075	0.68
May'22	0.050	0.078	0.083	0.75	0.056	0.081	0.085	0.77
June'22	0.045	0.076	0.080	0.73	0.043	0.072	0.077	0.71
July'22	0.052	0.078	0.083	0.74	0.050	0.074	0.080	0.71
Aug'22	0.051	0.075	0.080	0.71	0.048	0.071	0.078	0.67
Sep'22	0.055	0.080	0.086	0.75	0.053	0.074	0.080	0.73

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	0.028	0.065	0.072	0.65	0.035	0.074	0.080	0.73
May'22	0.058	0.083	0.089	0.79	0.055	0.080	0.085	0.77
June'22	0.049	0.080	0.083	0.76	0.052	0.083	0.085	0.79
July'22	0.048	0.070	0.077	0.68	0.053	0.077	0.083	0.73
Aug'22	0.055	0.079	0.084	0.74	0.058	0.082	0.089	0.77
Sep'22	0.050	0.070	0.074	0.71	0.048	0.067	0.071	0.68



Macro Benthos in Marine Sediment varied between 1130 to 1183 nos/m^2

Month	Ist Week				2nd Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1173	1179	1155	1137	1174	1181	1156	1139
May'22	1170	1173	1151	1134	1168	1172	1150	1132
June'22	1172	1175	1153	1134	1174	1176	1155	1136
July'22	1171	1175	1154	1134	1173	1176	1157	1135
Aug'22	1172	1177	1157	1135	1174	1178	1159	1136
Sep'22	1170	1175	1153	1133	1171	1176	1155	1135

Month	3rd Week				4th Week			
	Port Entrance	Turning Circle	Coal Berth	Reclamation Area	Port Entrance	Turning Circle	Coal Berth	Reclamation Area
April'22	1175	1183	1157	1141	1171	1175	1153	1135
May'22	1166	1170	1148	1130	1169	1173	1151	1133
June'22	1170	1172	1151	1133	1168	1170	1150	1131
July'22	1174	1178	1159	1137	1171	1175	1155	1134
Aug'22	1170	1175	1154	1133	1168	1173	1152	1131
Sep'22	1173	1178	1157	1136	1170	1175	1154	1133

Summary of marine sediments quality results for Six months of April'22 - Sep'22

- Organic matter - value are in the range 1.24 to 1.50 %
- Nitrogen -value are in the range 288 to 382 mg/kg
- Phosphorous - value are in the range 163 to 248 mg/kg
- Sodium - value are in the range 16159 to 17598 mg/kg
- Potassium - value are in the range 301 to 385 mg/kg
- Copper - value are in the range 0.30 to 0.45 mg/kg
- Zinc -value are in the range 0.028 to 0.79 mg/kg
- Macro Benthos - value are in the range 1130 to 1183 nos/m^2

4.7 GROUND WATER QUALITY

4.7.1 Sampling Locations

Ground Water sampling is carried out once in six months at four locations in and around the Port. The Ground water sampling locations are listed below**.**

GROUND WATER QUALITY MONITORING LOCATIONS

Location Code	Location
GW1	Port Site
GW2	South Side of the Port
GW3	Gopalapuram Village
GW4	Krishnapatnam Village

TEST REPORT OF GROUND WATER SAMPLES

DATE OF COLLECTION : 25-05-2022

S. No.	Parameter	Unit	Port Site (Bore Well)	Krishnapatnam Village	South Side of the Port	Gopalpuram Village	IS: 10500-2012 Specification
1.	pH	--	7.16	7.28	7.31	7.25	6.5 – 8.5
2	Electrical Conductivity	µmhos	1638	924	1495	972	-
3	TDS	mg/l	984	558	920	583	500
4	Total Alkalinity as $CaCO_3$	mg/l	264	224	348	207	200
5	Chlorides as Cl^-	mg/l	445	209	369	191	250
6	Sodium	mg/l	180	92.7	192	94.0	-
7	Potassium	mg/l	45	18.2	41	21	-
8	Fluorides as F^-	mg/l	0.68	0.51	0.75	0.49	1.0
9	Nitrates as NO^-_3	mg/l	7.04	6.97	5.69	5.82	45
10	Cyanide as CN	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.05
11	Total Hardness as $CaCO_3$	mg/l	146	89.5	123	102	200
12	Salinity	ppt	0.089	0.042	0.072	0.039	-
13	Sulphates as SO^{-2}_4	mg/l	124	71.9	77.1	82.5	200
14	COD	mg/l	< 10.0	< 10.0	< 10.0	< 10.0	-
15	Mercury as Hg	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	0.001
16	Cadmium as Cd	mg/l	< 0.001	< 0.001	< 0.001	< 0.001	0.003
17	Arsenic as As	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.01
18	Selenium	mg/l	< 0.05	< 0.05	< 0.05	< 0.05	-
19	Iron as Fe	mg/l	0.09	0.10	0.12	0.08	0.3
20	Lead as Pb	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.01
21	Zinc as Zn	mg/l	0.14	0.08	0.10	0.15	5.0
22	Chromium as Cr^{6+}	mg/l	< 0.01	< 0.01	< 0.01	< 0.01	0.05
23	Total Coliforms	CFU/ml	Not Detected	Not Detected	Not Detected	Not Detected	Shall not be detected in 100ml
24	Fecal Coliforms	CFU/ml	Not Detected	Not Detected	Not Detected	Not Detected	Shall not be detected in 100ml

Note: . All the above parameters have been tested as per APHA 23rd Edition, 2017.

4.8 SOIL QUALITY

For studying soil profile of the region, sampling locations are selected to assess the existing soil characteristics in and around the port area representing various land use conditions.

4.8.1 Sampling Locations

A total two number of samples collected from the sampling sites. The details of the soil sampling locations are given below.

The soil samples are collected and analyzed once in six months.

SOIL QUALITY MONITORING LOCATIONS

Location Code	Name of the Location
S1	Storage area towards west Buckingham Canal
S2	Storage Area at Port

TEST REPORT OF SOIL SAMPLES

DATE OF COLLECTION : 25-05-2022

S. NO.	PARAMETER	UNIT	S1	S2
1.	pH(1:5)	--	7.46	7.56
2.	EC(1:5)	µmhos	510	669
3.	Texture			
	a. Sand	%	68.4	73.1
	b. Silt	%	13.2	13.5
	c. Clay	%	18.4	13.4
4	Available Nitrogen	kg/ha	242	256
5	Available Phosphorus	kg/ha	16	18
6	Available Potassium	kg/ha	510	527
7	Exchangeable Sodium	mg/kg	188	203
8	Exchangeable Calcium	mg/kg	117	153
9	Exchangeable Magnesium	mg/kg	31	40
10	SAR (SAR)	-	1.8	1.7
11	Water Soluble Chlorides	mg/kg	149	164
12	Organic Carbon	%	0.40	0.47
13	Lead	mg/kg	7.8	6.2
14	Cadmium	mg/kg	0.15	0.12
15	Copper	mg/kg	6.75	7.1
16	Zinc	mg/kg	6.9	7.4

4.9 STP INLET AND OUTLET ANALYSIS

Frequency: STP Inlet and Outlet samples are collected monthly once.

TEST REPORT OF STP INLET

S.No	Parameter	Unit	April'22	May'22	June'22	July'22	Aug'22	Sep'22
1	pH	-	7.16	7.08	7.18	7.10	7.24	7.18
2	Total Solids	mg/l	2040	1956	2076	1930	2025	1884
3	Total Dissolved Solids	mg/l	1910	1832	1944	1804	1886	1754
4	Total Suspended Solids	mg/l	130	124	132	126	139	130
5	COD	mg/l	299	276	294	268	284	246
6	BOD 3day 27°C	mg/l	114	102	110	102	112	104
7	Oil & Grease	mg/l	4.3	4.0	4.2	3.8	4.0	3.2

TEST REPORT OF STP OUTLET

S.No	Parameter	Unit	April'22	May'22	June'22	July'22	Aug'22	Sep'22
1	pH	-	7.60	7.50	7.66	7.58	7.69	7.54
2	Total Solids	mg/l	1705	1596	1688	1575	1655	1566
3	Total Dissolved Solids	mg/l	1692	1586	1674	1564	1639	1554
4	Total Suspended Solids	mg/l	13.0	10.0	14.0	11.0	16.0	12.0
5	COD	mg/l	74.3	62.4	80.6	58.6	69.1	60.0
6	BOD 3day 27°C	mg/l	22.0	20.0	22.0	21.0	24.0	20.0
7	Oil & Grease	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

5.0 STACK EMISSION MONITORING

Sampling of Flue gas emissions of DG Sets was done and their emissions were determined. The Detailed report has been enclosed here.

SAMPLE PARTICULARS : **DG SET EMISSION**

SOURCE OF COLLECTION : 1) 500 KVA DG SET (CT YARD)
2) 500 KVA DG SET (CT YARD)
3) 320 KVA DG SET (Admin Block)
4) 320 KVA DG SET (SOUTH PORT)
5) 250 KVA DG SET (SS-2)

DATE OF MONITORING : 25-08-2022

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT				
			1	2	3	4	5
1.	Diameter of the Stack	mts	0.16	0.16	0.16	0.16	0.16
2.	C/s Area of Stack	sq.mt	0.02	0.02	0.02	0.02	0.02
3.	Pitot Coefficient	-	0.87	0.87	0.87	0.87	0.87
4.	Sp: gravity of Fluid	-	1.0	1.0	1.0	1.0	1.0
5.	Temperature @ DGM	^{0}C	30	31	33	34	34
6.	Stack temperature	^{0}C	164	168	157	163	135
7.	Nozzle Diameter	mm	10	10	10	10	10
8.	Exit Velocity	m/sec	11.2	15.3	13.8	14.2	11.9
9.	Gas Quantity	m^3/hr	806	1101	993	1022	856
10.	Duration of Sampling	minutes	30	30	30	30	30
11.	Fuel used	-	Diesel				

EMISSION RATE

S.NO.	PARAMETER	UNIT	METHOD	RESULT				
				1	2	3	4	5
1.	Particulate Matter – PM	g/kw-hr	IS:11255-P-1	0.16	0.22	0.17	0.20	0.15
2.	Oxides of Nitrogen – NOx	g/kw-hr	IS:11255-P-2	1.40	1.46	1.39	1.49	1.63
3.	Carbon Monoxide – CO	g/kw-hr	IS:11255-P-7	0.43	0.48	0.79	0.85	0.64
4.	Hydrocarbons - HC	g/kw-hr	IS:11255	0.14	0.19	0.18	0.19	0.14

SAMPLE PARTICULARS : **DG SET EMISSION**

SOURCE OF COLLECTION : 6) 250 KVA DG SET (MCG)
7) 250 KVA DG SET (GARRAGE)
8) 160 KVA DG SET (SS)

DATE OF START : 22-02-2022

TEST REPORT

S.No.	DESCRIPTION	UNIT	RESULT		
			6	7	8
1.	Diameter of the Stack	mts	0.16	0.16	0.16
2.	C/s Area of Stack	sq.mt	0.02	0.02	0.02
3.	Pitot Coefficient	-	0.87	0.87	0.87
4.	Sp: gravity of Fluid	-	1.0	1.0	1.0
5.	Temperature @ DGM	^{0}C	33	32	30
6.	Stack temperature	^{0}C	131	124	120
7.	Nozzle Diameter	mm	10	10	10
8.	Exit Velocity	m/sec	12.5	11.6	10.2
9.	Gas Quantity	m^3/hr	900	835	734
10.	Duration of Sampling	minutes	30	30	30
11.	Fuel used	-	Diesel		

EMISSION RATE

S.NO.	PARAMETER	UNIT	METHOD	RESULT		
				6	7	8
1.	Particulate Matter – PM	g/kw-hr	IS:11255-P-1	0.13	0.11	0.10
2.	Oxides of Nitrogen – NOx	g/kw-hr	IS:11255-P-2	1.70	1.57	1.31
3.	Carbon Monoxide – CO	g/kw-hr	IS:11255-P-7	0.73	0.68	0.53
4.	Hydrocarbons - HC	g/kw-hr	IS:11255	0.21	0.14	0.12

ANNEXURES

ANNEXURE1

NATIONAL AMBIENT AIR QUALITY STANDARDS
CENTRAL POLLUTION CONTROL BOARD
NOTIFICATION
New Delhi, the 18th November, 2009

No.B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in super session of the Notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and Other Area	Ecologically sensitive area (notified by Central Govt.)	
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), µg/m³	Annual*	50	20	• Improved West and Geake • Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO_2), µg/m³	Annual*	40	30	• Modified Jacob & Hochheiser (Na-Arsenite) • Chemiluminescence
		24 hours**	80	80	
3	Particulate Matter (size less than 10 µm) or PM_{10} µg/m³	Annual*	60	60	• Gravimetric • TOEM • Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5 microns) or $PM_{2.5}$ µg/m³	Annual*	40	40	• Gravimetric • TOEM • Beta attenuation
		24 hours**	60	60	
5	Ozone (O_3) µg/m³	8 hours **	100	100	• UV photometric • Chemiluminescence • Chemical method
		1 hour **	180	180	
6	Lead (Pb) µg/m³	Annual*	0.5	0.5	• ASS / ICP method after sampling on EPM 2000 or equivalent filter paper • ED – XRF using
		24 hours**	1.0	1.0	
7	Carbon Monoxide (CO) mg/m³	8 hours**	2	2	Non Dispersive Infra RED (NDIR) Spectroscopy
		1 hour**	4	4	
8	Ammonia (NH_3) µg/m³	Annual*	100	100	• Chemiluminescence • Indophenol blue method
		24 hours**	400	400	
9	Benzene (C_6H_6) µg/m³	Annual*	5	5	• Gas chromatography based continuous analyser • Adsorption and desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only ng/m³	Annual*	1	1	Solvent extraction followed by HPLC / GC analysis
11	Arsenic (As) ng/m³	Annual*	6	6	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni) ng/m³	Annual*	20	20	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper

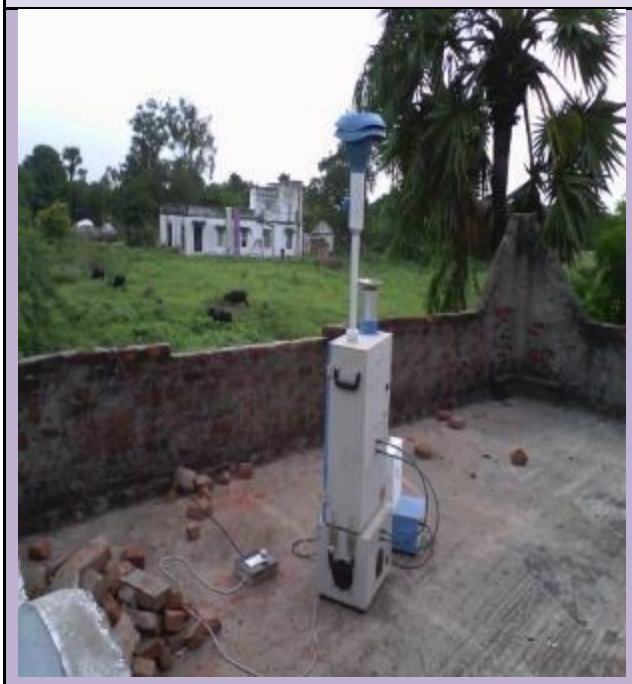
* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

PHOTOGRAPHS

AMBIENT AIR QUALITY SAMPLING LOCATIONS

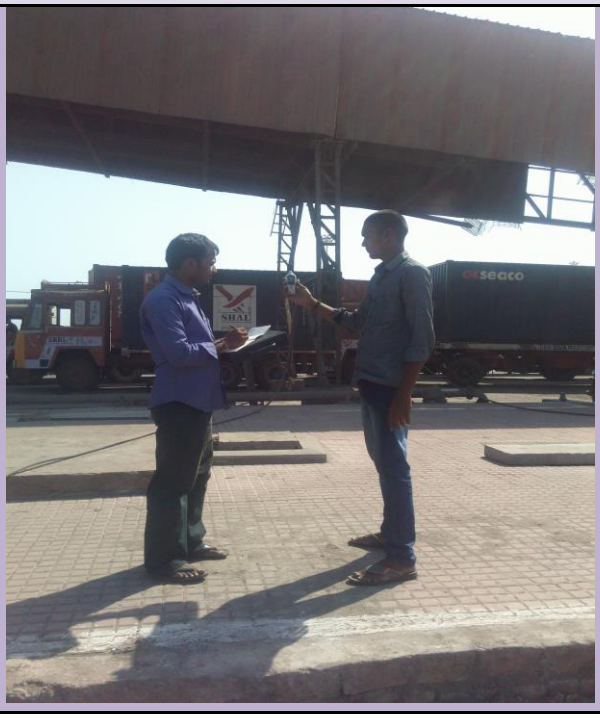
Thamminipatnam village	**Gopalapuram village**
	
Chalivendram	**Krishnapatnam village**
	

AMBIENT AIR QUALITY SAMPLING LOCATIONS

New Light House	Zero Point
	
Amenities Complex (CVR)	
	
WATER SAMPLING	**SEDMENT SAMPLING**

PHYTOPLANKTON SAMPLING

NOISE MONITORING



9 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) or an Impact Management Plan is an important section of EIA report. The preparation of EMP is required to take appropriate measures to mitigate and manage any potential effect on the environment during construction and operation phases of the project. The EMP would decrease the expected potential impacts and degradation of the environment during all phases of the project.

For the present study, EMP has been developed and discussed in the following section. The EMP has been developed for the management of air quality, noise control, solid and hazardous waste, greenbelt development, ecological biodiversity and community development. The management plan has been divided based on the construction and operation phases of the proposed project. The Post-project monitoring plan is developed and represented in **Chapter 6** that should be adhered in order to ensure the effectiveness of the Environmental Management Plan.

Based on the predicted impacts and the mitigation measures as discussed in **Chapter 4** and the regulatory requirements that need to be complied with, the Environmental Management Plan has been developed.

9.1 Environmental Management Plan- During Construction Phase

The KPCL facility has existing infrastructure and adequate environmental management plans which have been implemented as part of Phase-I and Phase-II developments. The existing management measures are sufficient to handle the impacts due to the Phase-III development during the construction phase. However, certain additional measures are proposed which can be adopted in addition to the EMP in the existing facility.

General Requirements

It is recommended that KPCL shall prepare minimum requirements for Contractors and sub-contractors for the proposed project development to adhere to the Environmental Management Systems (EMS). An Environmental Management System is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. All the main contractors are required to incorporate the minimum environmental management requirements into their work method statement. Prior to the commencement of construction activities, contractors must submit the following information to KPCL:

- Contractor's Health, Safety Environmental (HSE) management manual including waste management and emergency preparedness plan
- Construction schedule
- Responsible employees at site
- Nominating a site Health, Safety and Environmental (HSE) Officer
- List of equipment to be used
- List and Material Safety Data Sheets (MSDS) of hazardous material/substances to be used in the site
- Construction work method statements covering the risk mitigation measures and environmental management plan.

9.1.1 Land use Planning- Terrestrial

The proposed expansion spreads over an area of 1094 ha (2073 acres) which is available within the port masterplan boundary. There will not be any disturbance to the Ipuru Reserve Forest. The dredged materials will be used for reclamation and shore protection works. There is no acquisition of land from outside notified port boundary and hence R&R is not applicable which in turn implies that management plan for land environment is not envisaged.

9.1.2 Air Quality Management- Terrestrial

The impacts in air environment were identified and discussed in the **Chapter 4**. The baseline concentrations of air quality parameters were found to be within NAAQ standards and the construction phase will have only minimal increments of pollutants. KPCL has well-established dust suppression systems for the Phase-I&II developments of the port; and in addition to those, the following measures are to be implemented for the Phase-III development:

- The fugitive dust emissions that arise due to movement of vehicles for construction activities during windy periods should be minimized. Dust emission during construction will be minimized through strict enforcement of onsite speed controls as well as limiting unnecessary traffic within the project site.
- The vehicles inside the port should maintain vehicle speeds of 20 kmph. The material loads entering and exiting the project site should be covered as appropriate. All the vehicles and equipments should be maintained and serviced from time to time so as to avoid air pollution.
- All the vehicles entering the port should be checked for a valid Pollution Under Control (PUC) Certificate.

- The contractors shall be advised to use the vehicles that comply with the Bharat Stage-VI norms laid down by CPCB that is in effect from April 2020.
- The vehicles older than 15 years or which emit more pollution shall be removed from the site with prior intimation to the Contractor/ site supervisor.
- The vehicles that transports raw materials of construction and the storage yards shall be covered with tarpaulin to avoid air-borne emissions.
- The stationary emission sources should be operated at minimal loads to minimize emissions. The vehicles and the equipment producing excessive exhaust should be repaired or replaced prior to the commencement of the project activities.
- Low sulphur fuel shall be used to avoid emissions from construction equipment and DG sets.
- The dust suppression systems such as water sprinklers should be installed in the traffic routes and the storage areas of construction materials during the dry seasons.
- In case of piling operations, wet drilling methods may be adopted. The foundation / excavation works for the infrastructure on the land environment shall be carried out in wet condition or sprinkle water to control dust. During windy conditions, install screens in order to avoid dust nuisance in the neighbouring areas.
- The contaminated water should not be used for water sprinkling applications. The asphalt and petroleum-based products should not be used for dust suppression.

Diesel Engine Emission Management

All the diesel engine equipment and generators should comply with CPCB vehicle engine test protocols and test reports should be submitted to KPCL prior to deployment to the site and annually. As far as possible, engines shall not be operated on idling mode. Any vehicle emitting high level of smoke should not be working at site. The emission tests at the cost of contractor should be conducted, if required, for equipment/vehicles that release high levels of smoke. Engines exceeding Bharat Stage–VI emission limits should be subjected to maintenance. Maintenance or fitness certificate from an approved equipment manufacturer/ dealer shall be submitted to KPCL.

9.1.3 Noise Quality Management- Terrestrial

- All construction activities shall be carried out during daytime and night time; activities during night time should be minimum extent possible.

- The noise levels should be monitored not to exceed the standard limits of 75 dB (A) during the daytime and 70 dB (A) at the night time during any time of construction. This will help in ensuring the minimal impact on ambient noise level.
- The construction equipment should maintain noise levels according to the ambient noise standards prescribed by CPCB in order to prevent disturbance to the surrounding environment.
- The equipment should be maintained with proper bolts and fasteners to avoid unnecessary noise.
- The construction truck drivers shall be sensitized to turn off the vehicle engines while offloading the construction materials.
- The contractor should inform the KPCL officials before taking up the pile driving operations and the auguring technique to be used whereas hammering technique should be avoided since it would cause high noise levels.
- The acoustic and muffler systems should be used for equipment's.
- There is no demolition and blasting works involved in the project and so noise levels will be maintained within the prescribed limits.
- The vehicles shall be provided with silencers.
- The noise level due to dredging activities will be minimum as modern dredgers will be used for the purpose.
- Regular monitoring shall be taken up by KPCL to demonstrate compliance with the noise level standards for the industrial facility 75 dB(A) within the port premises.
- Handheld noise monitoring equipment shall be used to monitor the noise quality during the construction phase of the project.

9.1.4 Soil Quality and Groundwater Quality Management - Terrestrial

The soil environment will get affected during the construction activities and the following measures shall be taken up during the construction activities:

- The terracing and levelling shall be done at the project site to reduce the runoff velocity, increase the infiltration of rainwater and reduce soil erosion.
- Construction vehicles will be restricted to designated areas to avoid soil compaction within the project site.
- Transportation of building materials and construction debris will primarily be undertaken during weekdays, during off peak hours to avoid stress on the soil environment.

The contractor shall apply appropriate measures to control runoff, erosion and sediment including but not limited to the following:

- Divert natural runoff around construction areas prior to any site disturbance;
- Install protective measures on site prior to construction, for example, storm water basins or sediment traps,
- Temporary diversion pipe outlets beyond the fill toe line to avoid erosion of embankments; install “cut-off drains” where long cut/fill batter slopes occur to control water runoff speed
- Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, hay bales or bunds;
- Restrict vehicular movements over cleared areas;
- Limit equipment and vehicular movements to/within the approved construction zone;
- Construct temporary access tracks to cross concentrated water flow lines at right angles;
- Plan construction access to make use, if possible, for the final road alignment;
- Use vehicle-cleaning devices, for example, ramps or wash down areas;
- Remove debris from drainage part and sediment control structures;

For the reclamation activities, the following recommendations shall be undertaken:

- The dredged materials should be tested for quality, method of reuse such as land reclamation and disposal at identified disposal ground beyond -20 m CD contour.
- Supervisor shall be appointed to supervise the dredging and the reclamation activities.
- Screens/ trenches shall be provided on the land environment (reclamation site) to avoid spillage or free-flow of dredged soil back into the marine/creek environment.
- The soil that is used for reclamation/levelling shall be properly compacted and checked for adequate strength.
- The loose soils/contaminated soils shall be removed as it will cause contamination in the surrounding environment.

9.1.5 Management Plan for Creek Straightening

The Kandaleru creek will be straightened by a straight cut across the existing sand bar and reclamation of the meandering arm of the creek. The impacts of creek straightening were studied by NIOT. The water level changed in the rerouted channel is reduced by 2 cm and the depth averaged velocity reduced from 0.3 m/s to 0.15 m/s. There was no significant change in the flow as observed from the model study. There was no change in the flow of Buckingham Canal or Upputeru creek.

9.1.6 Mangrove Management Plan

Objectives of the Mangrove Management Plan

The following are the objectives of the Mangrove Management Plan

1. Limit the direct impacts on the mangroves caused by the construction and operation of the proposed development.
2. Mitigate the indirect impacts to the mangrove ecosystem of the study area.
3. Maintain the abundance, diversity, the distribution (extent and the productivity) of the mangrove ecosystem.

A detailed Mangrove Mapping Study to comply with the Amended ToR condition No. (iv) "Status of Mangroves should be studied using the satellite imageries from 1991 to till date" vide F.No. 10-18/2016-IA-III dated 24th November 2017 has been carried out by National Institute of Ocean Technology (NIOT) and the same is attached as **Appendix 2.** According to the study by NIOT, it was revealed that the mangrove cover in the area is increased over the years from 2016 when compared to the previous years from 1997 to 2015, due to the afforestation activities by KPCL.

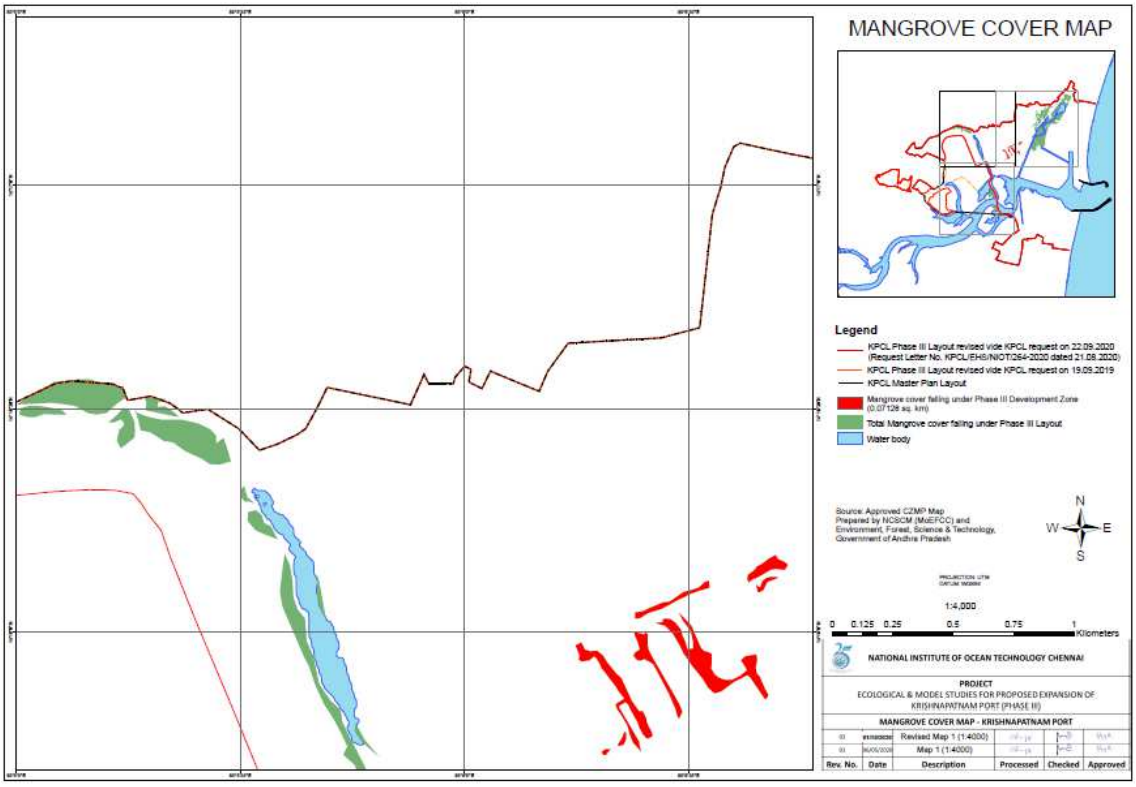
As per the recommendations by EAC (infra-2) meeting on 23rd July 2020, the Phase-III expansion layout has been revised by excluding the forest land area of 418 Ha. Hence the mangroves associated with the forest area is not included in the current proposal. Therefore, according to the study by NIOT for the revised layout, it was observed that an area of 0.07128 Sq.Km (7.128 Ha.) falls within the proposed Phase-III expansion area. The same is presented in **Based on** the mangrove cover mapped by NIOT, the sparse mangroves inside the Phase-III expansion area is demarcated and will not be utilised for the developmental activities. The mangrove area marked in the revised layout is represented in **Figure 9-2.**

Figure 9-1. These mangroves inside the proposed expansion area will not be disturbed as part of the development as similar to the mangrove area (50 Ha.) which is conserved as part of Phase-II and Phase-III development in the existing facility. The construction of bridges and fly-overs over the

mangrove area will be taken up with the help of stilts/trestles so that there is no direct impact on the mangroves.

Based on the mangrove cover mapped by NIOT, the sparse mangroves inside the Phase-III expansion area is demarcated and will not be utilised for the developmental activities. The mangrove area marked in the revised layout is represented in **Figure 9-2.**

Figure 9-1 Mangroves mapped as per NIOT

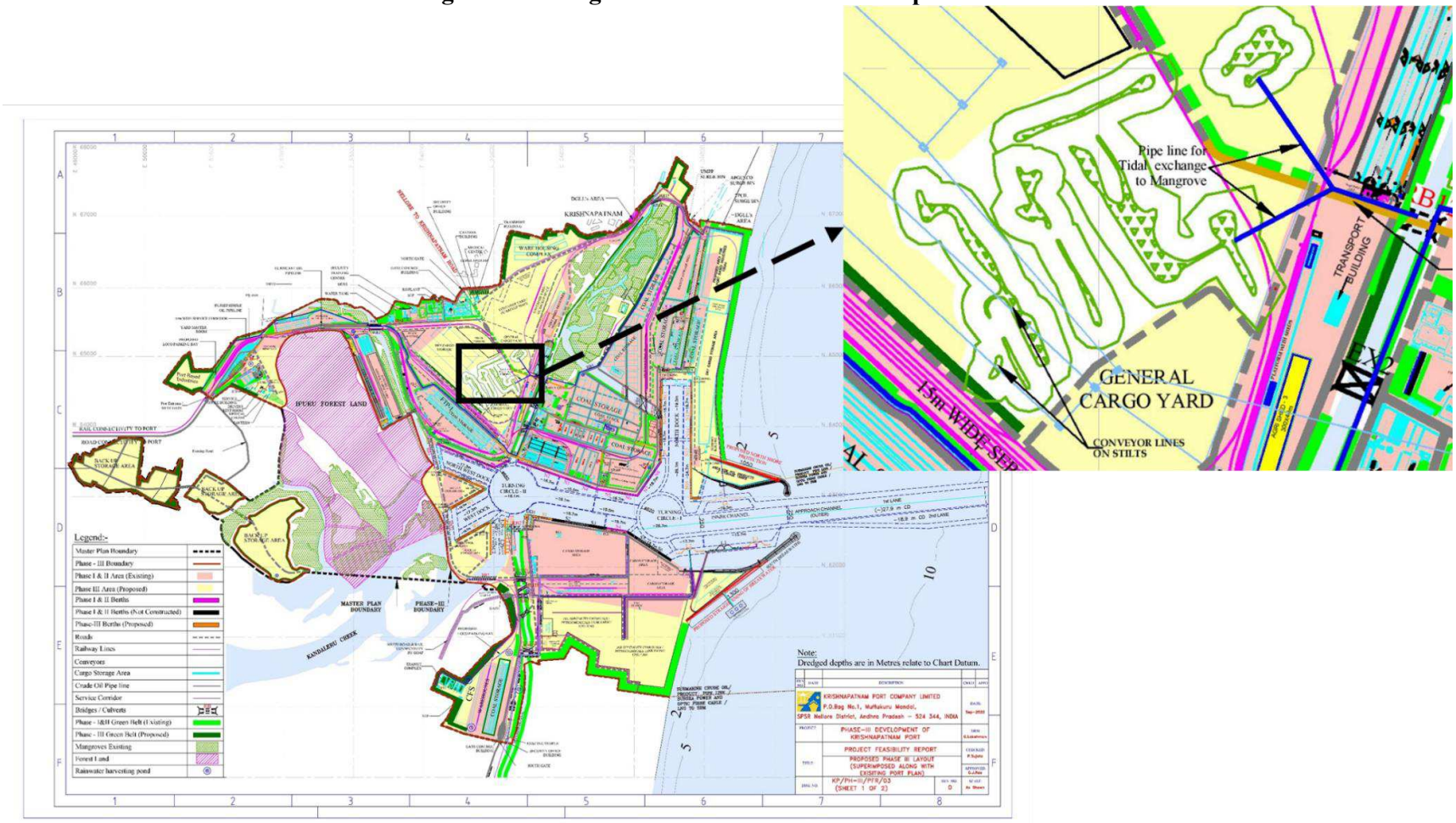


The following management measures are provided to ensure the conservation of the existing mangroves inside the facility and to avoid any indirect impacts that arise during the construction of stilts/trestles for the bridges.

- The detailed mangrove study should be conducted and analysed species-wise based on the IUCN conservation status.

- The mangroves within the Port shall be protected and conserved for their survival and ecological benefits.
- A random survey to assess the health of the mangroves shall be done prior to the construction works and also periodically.
- Regular monitoring should be carried out for their survival rate and rate of growth which include height, stem diameter, establishment of the canopy, nature of foliage and area etc.
- Quality of the sediment composition physico-chemical and nutrients will be monitored at the compensatory afforestation site. The appropriate parameters will be monitored Monthly/ Quarterly/ Half-yearly / Annually to ensure high success rate of afforestation.

Figure 9-2 Mangroves in the Phase-III development area



9.1.7 Traffic Management- Terrestrial

The traffic in the port during the construction phase is expected due to transportation of men and materials for the construction activities. Therefore, the recommendation pertaining to the movement of the vehicles are as follows:

- All construction works shall be carried out during daytime and night time; activities during night time should be minimum which in turn control the movement of vehicles.
- The vehicle movement over cleared/levelled areas shall be restricted.
- Limit the vehicle movements to the construction zone in order to not interfere with the truck movements.
- Vehicle movements shall be avoided in stagnant areas/low lying areas which will increase the compaction of the soil environment.
- The speed limit of the vehicles shall be restricted to 20 kmph within the port limits.

9.1.8 Terrestrial Ecology Management

Clear demarcation of the project area should be done prior to the commencement of construction works. This will ensure that any disturbance to flora and fauna is restricted to the actual project area and avoid spill-over effects to the neighboring areas. In addition, the proponent will re-vegetate some of the disturbed areas through a well-designed Greenbelt development program with maximum native species. The contractor shall only clear the vegetation that needs to be cleared in accordance to the structural plan of the layout. The contractor shall deploy, the following measures to protect flora and fauna within the project site:

- Clearing of the vegetation shall be confined within the demarcated construction boundary;
- Burning fallen trees shall be avoided; where feasible, mulch and reuse for the greenbelt development shall be promoted;
- Do not disturb areas outside the proposed area of development;
- Place site depots, equipment compounds and stock pile areas on previously cleared areas away from trees, bushes and native grasses.
- If cleared areas are not available for stockpiles at site, consider using cleared areas on adjoining land;
- Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil;
- Limit the removal of topsoil to retain the nutrients to support the greenbelt development

- Remove the cleared vegetation from the site to reduce the risk of spreading weeds and diseases;
- Retain or relocate tree hollows, where appropriate leave dead trees where possible, as they serve as habitat for fauna;
- Report any animal kills or injuries to the site manager; and check the site for the animals trapped in site works

9.1.9 Worker Safety and Health Management

Worker safety and their health at the construction site should be considered as high priority function of the construction. Proper work environment should be regulated considering the welfare of the contracted workers at site.

1. Avoid direct exposure to construction dust and diesel engine emissions
2. Use most appropriate respiratory protection program to avoid occupational health exposure to welding and metal gas cutting fumes and emissions from painting activities and grit blasting operations
3. Avoid direct exposure to prolonged outdoor temperatures during the onsite fabrication activities
4. Provide safe drinking water to the workers.

9.1.10 Marine Environmental Management Plan

It is recommended that KPCL shall adopt the requirements provided under the marine component during the construction phase. All main contractors are required to incorporate the minimum environmental management requirements in their work method statements. Prior to commencement of construction activities, contractors must submit the following information to KPCL.

Environmental Marine Management Plan- During Construction Phase

- KPCL shall appoint a supervisor to be present always at construction work near the shore and/or when working with heavy equipment.
- Any work must include precautionary measures against debris falling or being blown into the water. No waste, garbage or other materials shall be dumped in the water.
- Construction site near water need to be kept tidy to prevent tools and debris from falling in to the water and damaging the environment.

- Any construction at or near the water edge- or where debris can be washed down or blown in to water requires silt screens, to be placed in the water before the work starts.
- Screen shall be placed around storage areas, to prevent waste blowing away and sediment run-off in to the sea.
- Screening must be constructed properly. Small quantity of sediment may enter into the water in spite of installation of control measures; hence precautionary measure shall be undertaken.
- Storage areas for sand, soil, and all work areas must be at least 20 m back from the high water mark.
- Washing down of construction equipment is not permitted within 50 m of the high water mark.
- Deployment of sediment screen to minimize the sediment load in marine water as a result of capital dredging.
- KPCL shall appoint a supervisor to verify the sediment screens as well as collection and analysis of water samples.
- Screen shall be deployed at critical point in order to prevent / minimize the spread of sediments associated with dredging operation.
- Sampling sites shall be fixed to provide information on the water quality variation at dredge site.
- Control of surface run-off shall be directed to catch pond to prevent the sediments from the coal stockyard and jetty.
- Trained dredger operators should be put to work to ensure minimal loss of turbid water from the dredger.
- The dredger used for dredging should be a well maintained and inspected, the vessel shall be free from any defects and leakages.
- Increased monitoring for turbidity to incorporate or re-orient silt screens accordingly.
- Select appropriate dredge method / technology for reduced impact of dredging on the surrounding environment.
- Avoid spillage of construction materials or concrete in the marine environment during construction.
- When necessary, monitor water quality including turbidity, as well as mangroves and other sensitive species in the surrounding area.

9.1.11 Marine Ecology Management Plan

According to the study conducted by NIOT, the dredging activities will impact the microbenthos and macrobenthos which would result in the reduction of species diversity by 50% and population density by 60%. In order to minimise the loss, the following management measures shall be implemented:

- Reduce the volume of the dredged material removed.
- Reduce the frequency of dredging.
- Avoid dredging activities that convert intertidal to subtidal habitats.
- The topsoil of 0.5m shall be preserved and utilised in respective locations to minimise the loss of benthic biota.
- Best management practices shall be followed to avoid impacts of ambient light conditions on the ecosystem.

9.1.12 Management Plan for Dredging Activities

The dredging will be carried out during the construction phase as well as the operation phase in the form of capital dredging and maintenance dredging. During the dredging process, the following management control measures have to be taken up in order to avoid the damage to the environment.

The environmentally suitable dredger has to be selected to minimise the release of fine sediments like Cutter Suction Dredgers (CSD) & Trailer Suction Hopper Dredgers (TSHD) and hence the impacts are reduced. The monitoring of water quality has to be carried out before and after the dredging process since the quality of water column might be affected due to turbidity caused by dredging. An official or a representative from the KPCL has to be present to monitor the activity of dredging. The health of the mangroves should be monitored to check the effects of sedimentation caused by dredging activity.

The following measures shall be taken up during the dredging activities:

- Sediment screens/containment bunds shall be provided for the reclamation areas during the dredging to avoid the disturbance and turbidity in the surrounding environment.
- Dredging shall be taken up only when necessary and in the areas that have been designated.
- Time based dredging operations such as daily/weekly/fortnightly/monthly shall be taken up to avoid the effect on critical sensitivity for receptors (noise, light, odour).

- The appropriate dredger as per the site condition shall be chosen to minimise the impacts on the marine environment.
- The dredging activities shall be planned to suit tidal ebb/flood conditions and avoided during tidal extremes.
- The dredging activities shall be confined to fair weather seasons and avoided during monsoon and days of heavy rainfall.
- Wind direction shall be taken into account by scheduling the dredging operations as function of wind direction.
- Dredging shall also be undertaken to remove the contaminated sediments caused due to port construction and operation.
- Dredging shall be taken up in the grid pattern to reduce the damage to the seabed.
- Marine water quality and sediment quality should be checked before, during and after the dredging activities.

9.1.13 Management Plan for Dredged Spoil Disposal

As per the NIOT study on dredged spoil disposal, the following management plan is proposed:

- Select the most appropriate type and size of haul/transport barges.
- Select most appropriate hydraulic pipeline for the material type.
- Use of vessels with accurate positioning systems to ensure dumping at the selected site.
- The dredged sediment quality should match with the sediment quality at the dumping ground.
- Submerged discharges shall be taken up for hydraulic disposal of dredged material.
- Capping of contaminated sediments with clean materials to prevent underwater spread.
- Confined disposal facilities such as use of liners may be installed to prevent leaching when open water disposal is not possible.
- The dispersion of fine-grained dredged material may be ensured by following a dispersive strategy to minimise the blanketing of larger areas.
- Reduce or eliminate the overflow during hydraulic loading at hoppers or transport barges to reduce the quantity of suspended sediment lost.

9.1.14 Shoreline Management

The existing port is operational for the last 10 years and no noticeable impact was observed on the shoreline changes. For the proposed Phase-III expansion, it has been observed from the NIOT study that the shoreline will not be affected due to the straightening of the breakwaters. Though there is no significant change in the first year of breakwater straightening, as a management plan, stockpiling of 2 million m^3 of sediments shall be done on the north of northern breakwaters, as recommended by NIOT, during the capital dredging of Phase-III expansion as a long term coastal protection measure. The rubble mound shore protection structures 1300m and 1050m long to the windward side of the existing South and North breakwater will further help to protect the shore from any residual accretion due to proposed project.

9.1.15 Waste Management

Construction Waste Management Plan

Any waste comprising building materials, debris and rubble resulting from construction, re-modelling, repair and demolition of any civil structure is termed as Demolition and Construction waste. The waste generated should be disposed as per the Construction and Demolition Waste Management Rules, 2016.

a. The generated construction and demolition waste should be collected, segregated and should be ensured that the waste does not get mixed with other waste (solid waste) and is stored and disposed separately.
b. If the port generates construction and demolition waste more than 20 tons/day or 300 tons/month the waste shall be segregated into four streams as follows
    i. Concrete
    ii. Soil
    iii. Wood and plastics
    iv. Bricks and mortar.

Segregated wastes shall be disposed through authorized vendors for processing construction and demolition waste.

Solid Waste Management

The waste generated in the dredging and construction activities shall be used within the port for reclamation activities and the levelling of low-lying areas on the land environment as well

as for shore protection works. Apart from waste used for reclamation, the remaining shall be disposed in the offshore identified disposal location. The solid wastes shall be disposed as per Solid Waste Management Rules, 2016.

The hazardous waste that arises from volatile chemicals and paints shall be disposed as per the Hazardous Waste Management Rules, 2016.

9.2 Environmental Management Plan- During Operation Phase

9.2.1 Air Quality Management- Terrestrial

The air quality modelling study was conducted and the results inferred that the incremental concentrations during the post-project development were found to be within the limits of NAAQ. The highest contributor of particulate matter was from coal yards and the highest contributor of SO_x and the NO_x were vehicular emissions. The following management plans are given to further reduce the impacts on the air quality:

- KPCL shall install Mechanical Dust Suppression System at Coal Terminal, additional covered belt conveyors, transfer points, discharge point at coal stockyard, telescopic chute for free falling of material from conveyor belt, dust containment for transfer point, loading hopper at terminal to minimize the fugitive dust emissions.
- Dedicated pumps, water tanks, filter, nozzles, sprinklers, compressor shall be installed for DS systems to have efficient water spray pattern at the source point of emission.
- All Nozzles spray shall be maintained at a minimum of 3 kg/cm^2 along with compressed air ensuring effective spray with optimum water quantity. Water Tanks should be properly covered for dust entrainment as well as to avoid choking of water filter.
- Adequate number of heavy-duty atomizers shall be deployed in addition to dust suppression of other transit areas as well as to augment the sprinkling systems at storage yards etc. in case of contingency.
- Inspection of Dust Suppression system shall be carried out every day and maintenance for every week.
- Wind Screen shall be erected all along the coal stock pile area to prevent dispersion of dust from the surface of the stock pile. Fertilizers shall be stored under covered sheds, in order to control the fugitive dust dispersion into surrounding environment.

- Coal stacking shall be done not more than 12 m height.
- Periodic removal of settled dust on the road shall be ensured and this can be achieved by Truck Mounted Higher Capacity Vacuum Cleaner Machine which shall be deployed for removal of settled road dust
- Dedicated truck mounted water sprinkling system shall be installed for regular wetting of roads after removal of settle road dust to prevent fugitive coal dust
- Wheel Washing Platform and settling tanks are installed and shall be maintained properly outside the cargo handling and storage areas.
- All coal cargo truck and rail rakes shall be properly covered while transportation and adherence to the condition stipulated by APPCB.
- Keep transfer equipment (forklift, cranes and trucks) in good working condition
- Upgrade the land-based vehicle fleet with less polluting trucks and vehicles, and using alternative fuels and mixtures
- Encourage reduction in engine idling during on and off-loading activities
- Encourage storage planning to avoid or minimize re-storage and reshuffling of cargo
- Wherever practicable, design the facilities in such a way that travel distance shall be minimized from terminal hopper-loading and un-loading facilities to storage areas
- Regularly sweeping terminal and handling areas, truck / rail storage areas and paved roadway surfaces.
- The dredging equipment will be monitored on a regular basis and maintenance servicing would be done not to emit any pollutants into air environment.
- The dredged materials will be pumped/handled in wet conditions through pipes and so there will not be any dust nuisance either at the dredged site or at the dumping area.
- As per the international best practices, these marine diesel engines are designed to meet the regulations of the International Convention for the Prevention of Pollution from Ships (MARPOL) with NO_X emissions less than 14.4 gram/Kwhr of engine.

- A Standard Operating Procedure (SOP) can be developed to include the same as part of the KPCL environment management plan to verify that all ships anchored at the port are adopting these MARPOL regulations.

9.2.2 Noise Quality Management- Terrestrial

The noise quality modelling study was conducted and the noise levels at the port boundary were found to be well below the standard limits. The preferred method for noise control measures for stationary sources is reduction at source. The noise control management plan has been developed in line with the IFC-WB General EHS Guidelines – Noise.

- Select equipment with lower sound power levels such as Cranes, Stationary DG Sets, Compressors, Pumps etc
- Install suitable mufflers on engine exhausts and compressor components
- Install acoustic enclosures for equipment generating noise such as Mobile Cranes, Material Handling System, DG Sets, Transfer Towers, Coal Loading Area of Truck and Rail Wagon
- Improve the acoustic performance of constructed buildings, apply sound insulation
- Install acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier.
- Barriers should be located as close to the source or to the receptor location to be effective
- Install vibration isolation for mechanical equipment
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas
- Re-locate noise sources to less sensitive areas to take advantage of distance and shielding
- Take advantage of the natural topography as a noise buffer during facility design
- Reduce project traffic routing through community areas wherever possible
- Regulate the truck movement to minimize the noise generation (preferably 20 Kmph speed shall be prescribed)
- Battery powered equipment instead of diesel powered shall be used wherever possible
- Develop a mechanism to record and respond to complaints

9.2.3 Traffic Management- Terrestrial

The traffic impact assessment study conducted for the proposed Phase-III expansion has indicated that the projected additional traffic due to the proposed cargo increase can be

accommodated in the existing exit roads from the port. As per the baseline traffic survey, Muthukur Road faces heavy traffic and can be controlled by either diverting the cargo traffic to the other roads. So, KPCL shall ensure minimal cargo evacuation through the Muthukur Road so as to maintain the carrying capacity in all the roads that connect the traffic. In addition, KPCL has proposed to operate the coal cargo evacuation through the south gate as well to serve the thermal power plants to further reduce the stress on the other roads. General traffic management plan shall be implemented to prevent accidents and maintain efficient traffic movement:

- All the cargo trucks and containers shall maintain a speed limit of 20 km within the port premises.
- Necessary traffic signboards shall be provided in all the roads that connect the port and in NH-5 that connects the port road by Andhra Pradesh State Road Development Corporation with the support of KPCL as per IRC 67-2012 standards.
- Cargo traffic should not interfere public during peak hours of traffic. Also, the cargo trucks and containers shall be operated at night time to reduce the traffic stress.
- Driver Training programs shall be provided to create awareness on road safety.
- Adequate truck parking facilities shall be provided by KPCL for reducing the congestions on internal roads.

9.2.4 Marine and Creek Water Quality Management

During the operation phase, the truck movements will be on the bridges built over the water course and the ship movements will be on the creeks to the berths. The truck movements and ship movements over the water course should be avoided from spillage of cargoes in the water during movement. The cargo should be covered properly while transportation. The ships should be prevented from discharging water into the creek during anchorage. The drains and outfall should be regularly cleaned to avoid anaerobic decomposition in the water environment. The loading and unloading should completely be mechanised to avoid spillage of cargoes. There are 14 rainwater harvesting pits in the existing port area and additional will be provided in the proposed port area to collect the rainwater which in turn will contribute to the groundwater recharge.

The sediment screens shall be installed during maintenance dredging activities. The ships entering and exiting the port should follow the guidelines of MARPOL in terms of discharging

water. The ballast water and the other types of discharges should be treated before discharging into the marine environment. The post project monitoring of water and sediment quality in the marine environment is important as part of the marine environment management.

9.2.5 Marine Ecology Management

The screening must be constructed properly during the maintenance dredging. The dredged materials will be disposed at the identified disposal location in the offshore. The discharge from ships shall not be allowed into the marine environment. The spilled cargo, if any, in the cargo handling areas of the land environment adjacent to the marine waters shall be removed from time to time to ensure prevention of contamination.

9.3 Cargo Transport and Spillage Control

The cargo that is prone to spillage and dust pollution is the bulk cargo. KPCL handles both import and export cargo. The cargo spillage can happen at any point of the following process: i) cargo: ship to shore transfer, ii) temporary storage within the port zone, iii) bulk material conveyance from quayside to storage location, and iv) conveyance from storage area to destination. The spillage control and dust suppression measures for each cargo are as follows:

9.3.1 Coal (Import)

The coal cargo is usually unloaded by mechanical means using Grab unloaders which are extremely versatile. At KPCL, mobile cranes and grabs used are equipped with ECO control system (100 % closed grabs).

The coal is transported from berth by conveyor belts to destination in case of neighbouring thermal power plants and to storage yards in respect of remaining volume. The stackers will be used for stacking coal by mechanical means. Reclaimers will be used to reclaim and transport to wagon loader by conveyor. Coal is transported by roadways (trucks) as well as waterways (ships or barges) for which the transport is done by conveyors and trucks and loading by mechanical means into the ships.

Spillage Control: All conveyors are covered and transfer houses are provided with cladding. All rail wagons and trucks destined beyond port are fully covered. The Spillage at loading station will be very nominal as wagon loading stations are electronically controlled with PLCs. However, spillage if any will be reclaimed and deposited in the stacks.

Dust Suppression Control: Mechanised dust suppression systems are provided for coal storage yards, conveyors, wagon loading station. Heavy duty atomizers for other areas

augmented with mobile sprinkler systems. Dust prevention and suppression measures are already being practiced at Krishnapatnam Port for Phase II development. The same shall be extended for the Phase III expansion as well

9.3.2 General Cargo- Fertiliser (Import)

The fertilisers will be unloaded from ships by mechanical means with Grab unloaders. Transport from berth by covered conveyors to covered warehouses as cargo is hygroscopic. Reclaiming will be done by reclaimers and transported to wagon loader by conveyor and loading into wagons by continuous wagon loader, in case of bulk transport. In respect of bagged transport, conveyor transports bulk fertilizer to mechanized bagging plant and transports bagged fertilizer by wagons and trucks.

Spillage Control: All conveyors are covered and transfer houses are provided with cladding. All rail wagons and trucks destined beyond port are fully covered. Spillage outside ware house is not foreseen. Nominal spillage if any at berth will be very less and will be reclaimed and deposited in the warehouse.

Dust Suppression Control: Dust generation is not expected during cargo handling.

9.3.3 Cement & Cement Clinker (Export)

The cement in bulk form from grinding unit to berth will be transported by means of closed conveyor. The loading of ships will be done by mechanical means. Transport of bagged cement by trucks to berth and loading will be by means of ships gear or shore crane. Conveyors and warehouses are fully covered as the cargo is hygroscopic.

Spillage Control: All conveyors are covered and transfer houses are provided with cladding. All rail wagons and trucks destined beyond port are fully covered. Spillage outside ware house is not foreseen.

Dust Suppression Control: Dust generation is not expected during cargo handling.

9.3.4 Food Grains and Sugar (Import and Export)

Unloading/loading from/to ships will be by mechanical means with Grab unloaders. Transport from berth will be by covered conveyors/trucks to covered warehouses as the cargo is hygroscopic. In respect of bagged transport, conveyor transport of bulk fertilizer to mechanized bagging plant and bagged fertilizer transport by wagons and trucks.

Spillage Control: All rail wagons and trucks destined beyond port are fully covered. Spillage outside ware house is not foreseen. Nominal spillage if any at berth will be very less and will be reclaimed and deposited in the warehouse.

Dust Suppression Control: Dust generation is not expected during cargo handling.

9.3.5 Granite and other ores (Export)

Transport of cargo to storage yards will be done by railway wagons and trucks. The transport from storage yards to berths will be by trucks and loading into ships will be by ships gear or shore cranes.

Spillage Control: All rail wagons and trucks are fully covered. Nominal spillage if any will be very less and will be reclaimed and deposited in the warehouse.

Dust Suppression Control: Mechanised dust suppression systems for storage yards, with heavy duty atomizers augmented with mobile sprinkler systems will be provided.

9.3.6 Edible Oil, Crude and Chemicals (Import)

The cargo will be unloaded from ships through ship pumps. It will be then transported to refineries /storage by pipelines.

Spillage Control: Port is already equipped to handle Tier-1 Spills. KPCL has tie up with ICG for higher category spills. For hazardous cargo specific measures as per the EMP shall be followed to avoid/minimize risk and damage.

9.3.7 POL and liquid cargo (Export & Import)

The liquid cargo will be unloaded by means of ships pumps and loaded by means of pumping at source and conveyance by pipeline.

Spillage Control: Port is already equipped to handle Tier-1 Spills. KPCL has tie up with ICG for higher category spills. For hazardous cargo specific measures as per the EMP shall be followed to avoid/minimize risk and damage. For the proposed project which includes liquid berths and SBMs, the oil spill response equipment will be augmented as per requirement.

9.3.8 General Preventive Measures for Spillage

For the road transport of all types of cargoes/containers which are not transported by rail conveyor, pipeline or waterways:

- All trucks with dust generating cargo shall be covered.
- All roads are paved and mechanised dry sweeping is resorted.

Spillage Control: Spillage if any shall be immediately reclaimed and deposited back to respective storage to the extent feasible. Nominal spill, if any, which cannot be reclaimed will be stored and passed on to respective cargo owners or disposed by suitable means as maybe required, as per relevant norms.

Dust Suppression Control: Surface drainages along-side roads and from storage area will be routed through drains to collection pits and guard ponds with facility to recycle for dust suppression. Adequate greenbelt around storage yards and along periphery of port boundary and dust shields shall be augmented.

9.4 Sewerage Management

The port has an existing STP of capacity 300 KLD which is in operation. The Phase-III development will contribute to further increase in sewage levels. Therefore, additional STP amounting to a total of 700 KLD are proposed to be established within the port to treat the sewage generated from the Phase-III development. The treated effluent from STP will be of 560 KLD which will be recycled for the greenbelt development (116 KLD) and dust suppression systems (444 KLD).

9.5 Effluent Management

The effluent in the port facility has to be treated before discharging into the environment. KPCL has proposed an Effluent Treatment Plant (ETP) of 300 KLD capacity to treat the effluent from the port. The treated water will be used for greenbelt development and dust suppression.

9.6 Industrial Waste Management

The port handles only import and export cargo. There is no mine or burden wastes. Also, there is no manufacturing process involved. Therefore, there is no industrial waste generated. The runoff from the coal storage and dry cargo storage shall be collected in guard ponds after routing through sediment collection pits and shall later be used for dust suppression.

9.7 Solid and Hazardous Waste Management

In order to comply with the statutory laws & regulations with respect to waste management, Zero waste under the Zero Waste Initiatives shall be adopted. Presently, the wastes generated in the KPCL is being collected, segregated and finally disposed to recycling vendors and similar practices shall be adopted in future. The solid wastes generated from the port is estimated to be about 1800 kg/day which will be segregated into biodegradable and non-

biodegradable wastes and will be collected in separate bins. Currently, about 90% of the waste generated from the port amounting to around 1620 kg/day is biodegradable and is composted to be used as manure for greenbelt within the port premises. The decentralised composting (organic waste convertor) site shall be located at suitable locations inside the port to process the biodegradable waste to produce manure. The remaining 10% of the waste is non-biodegradable like plastic accounting to about 200 kg/day and shall be disposed through APPCB authorised vendors as prescribed by the Solid Waste Management Rules, 2016.

The hazardous wastes shall be handled as per the Zero Waste Initiative. However, in case of disposal, Hazardous Waste Management (Management and Transboundary Movement) Rules 2016 shall be adopted for hazardous wastes.

9.8 Plastic Waste Management Plan

Plastic is used in ports and harbours for all packing related activities. During this activity a lot of plastic waste will be generated. All plastic waste generated to be handled and disposed as per the Plastic Waste Management Rules, 2016.

a. The Management should take steps to minimize the usage of plastic and segregate the plastic waste at source in accordance with the Solid Waste Management Rules, 2016.
b. Plastic wastes which can be recycled, should be handed over to authorized plastic waste recycler.
c. Various plastic waste collected are to be segregated based on its degree of degradability and to be handed over to the registered waste pickers or waste collection agencies.

Certain types of plastic waste can be segregated and used for road construction to enhance the durability of the roads inside site area. The material quantity for laying roads can be minimized there by cost cutting can be done when fine grinded plastic is used in road laying. This concept of using plastic materials in construction activities is widely followed in all developed as well as in developing countries in this current decade.

9.9 Power Management

The power supply for the Phase-I and Phase-II developments are provided by the 132/33 KV substation built by KPCL in the port limits and APTRANSCO has agreed to supply power of 58 MW. The additional power that would be required for the Phase-III development is 85 MW,

which will be obtained from APTRANSCO's power grid. In addition, standby diesel generators of adequate capacity are provided to cater the needs during power failure. Uninterrupted power supply is ensured for the IT systems.

Opportunities may be explored to install solar panels on the roof of operational and administrative buildings. The empty spaces inside the port premises shall also be used for the installation of solar panels. The energy generated from the solar panels shall be used for the port activities. This will not only help in the cost savings for the port but also help in reducing the carbon footprint of KPCL.

9.10 Green Belt Development

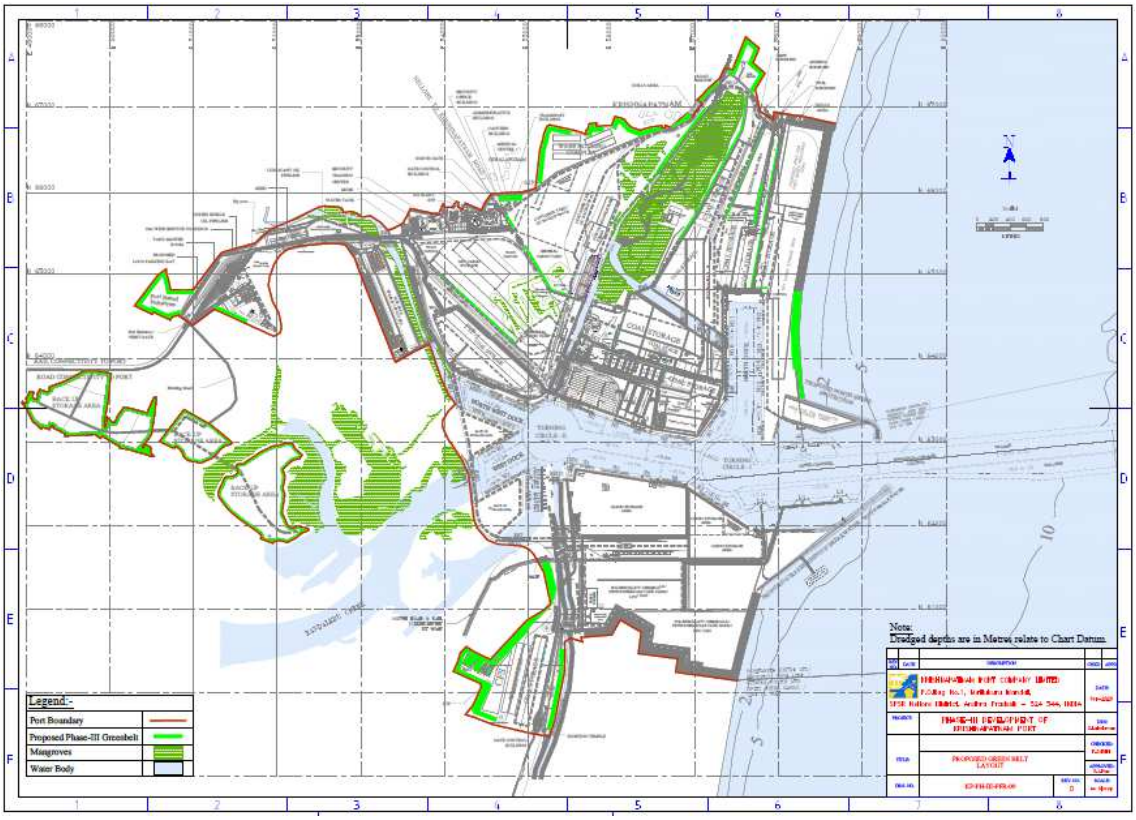
During Phase-I & II developments of the port, 191.5 Ha. of green belt has been developed and being maintained by KPCL. The greenbelt development is also proposed as a part of the Phase-III development. The greenbelt is required to be developed along the western port and also around the storage areas that are proposed in the Phase-III development. The width of the greenbelt proposed to be developed along the boundary is 50 m. The width of greenbelt around the dry bulk storage is 20 m wide. Along with these, avenue plantation has been proposed along the median and alongside the road. The total area proposed for greenbelt development in the proposed Phase-III project is 120 Ha.

According to the greenbelt development guidelines, the number of trees per hectare of greenbelt should be 1500 to 2000. Therefore, the total number of trees that will be planted as part of the proposed development will be 120 Ha. X 2000= 2,40,000 (No.'s). The greenbelt plantation should comprise of three tiers of zonation where tier 1 comprises of herb vegetation, tier 2 comprises of shrub vegetation, and tier 3 comprises of tree vegetation. The suitable pollution tolerant species that can be adopted for developing the greenbelt are provided in the **Table 9-1** and the proposed greenbelt for the Phase-III development is represented in **Figure 9-3**.

Table 9-1 Proposed Greenbelt Development for Pollution Control

S.No	Flora Type	Species Proposed
1.	Small Bushes	*Tecoma stans, Bougainvillea spectabilis, Vernona angustifolia etc.*
2.	Scrubs	*Citrus limon, Calotrophis procera, etc.*
3.	Trees	*Azadirachtaindica, Mangifera indica, Ficus benghalensis, Pongamia pinnata etc.*

Figure 9-3 Proposed Greenbelt Development



9.11 Oil Spill Contingency Plan

Oil spill poses threat to the marine environment. The effects of the oil spill depend on various factors such as the type and quantity of oil spilled and how it interacts with the marine environment. Also, the ambient weather conditions will also influence the oil behaviour and dispersion. Oil spill affects the biological and ecological characteristics of the seawater. The ecological impacts also depend on the sensitivity of the organisms towards the oil spill. The oil spill will have severe short term effects. The marine oil spill will adversely affect harbours, fisheries, beaches, wildlife, tourism, human health and industrial plants. The major sources of oil spill are marine tankers, oil installations, SBM etc.

The Oil Spill Modelling study was carried out to find out the damages that will be caused due to the oil spill at the three SBM proposed for the Phase-III development. Based on the study, it was observed that the oil spill can be contained within 6 hrs using the existing Tier-1 Oil Spill Contingency Plan of KPCL facility.

Being an existing port facility, KPCL has already developed a robust Oil Spill Contingency Plan (OSCP) and periodic Mock Drill is being conducted. Based on the proposed developments, the existing OSCP will be updated and implemented as per the necessary guidelines. The existing OSCP is enclosed as **Annexure-11.**

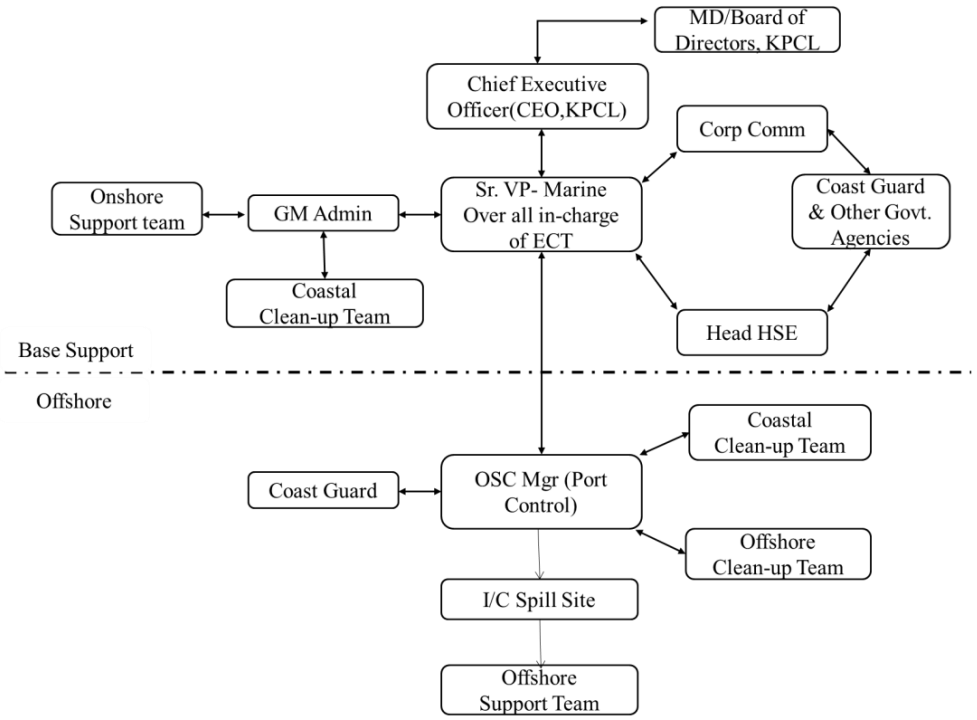
As per the OSCP, KPCL has the capability to provide Tier-I response in case of oil spill by mobilisation of oil spill response equipment and emergency response team personnel. The list of oil spill response equipment available at KPCL are as follows:

Table 9-2 Equipment for Oil Spill Response at KPCL

S. No	Equipment	Quantity
1	Brush Skimmer / Multi Skimmer – 20 TPH	1 No.
2	OSD and assorted absorbents stacked inside	100 Ltrs
3	Shore sealing boom	50 m
4	Towable floating tank – 10 Tonnes	1 No
5	Container, which in turn would be placed and suitably secured on	1 No
6	Approx 20 x 10 meters Pontoon/ craft, having a draught of less than 1.5 meters.	1 No
7	Containment Boom	300 mtrs

The incident organisation chart for the facility is given in **Figure 9-4**.

Figure 9-4 Incident Organisation Chart



The following management measures are provided for oil spill contingency at SBM:

- The work boats in the shape of U or J shall be used to collect the oil spill at SBM.
- The response team on Pontoons will have to inflate the booms
- The boom should be anchored based on the weather condition.
- Depending on the quantity of oil spill, 300-350 m ling booms shall be utilised.
- Skimmers shall be deployed to commence the recovery actions.
- The collected spill shall be sent to the authorised vendors as hazardous wastes.
- Coast guard support may be taken, if required.

9.12 Socio-Economic Management Plan

As per the Ministry's Office Memorandum F. No. 22-65/2017-IA.III dated 30th September, 2020, based on the commitments made during the public hearing, shall include all the activities required to be taken to fulfill these commitments in the Environment Management Plan along with cost estimates of these activities, in addition to the activities proposed as per recommendations of EIA Studies.

9.12.1 Proposed Initiatives for Environmental Management at surrounding villages

Need based Environmental initiatives are proposed based on the socioeconomic indicators, field observations and based on the felt needs of the people during the primary survey, impacts identified, etc. The need based programs are proposed for the approximately 14 villages adjacent to the project site like Water supply, Solid waste management, Development of Biodiversity, new initiative, skill development and innovations in agriculture, etc., In addition to the existing CSR activities, additional support needs to be given for the proposed plan.

9.13 Budget for EMP

The EMP costs are proposed to protect the environment from the impacts of the proposed developmental activities. The impacts that arise due to the construction and operation phases are assessed and the overall cost for implementation of good environmental management programs are as follows:

Table 9-3 Budget for EMP

S.No.	Activities	Cost (Rs.in Crores)	Annual Recurring Cost (Rs.in Crores)
1	Dust Suppression System/Sprinkling System and Atomizers	12.5	4.3
2	Wind Barrier – Structural	4	0.05
3	Storm Water Drainage and Catch Basin	4	0.5
4	Dust Containment for Material Handling System	2.5	0.4
5	Air Pollution Control System (bag-filters)	3.8	1
6	Green Belt Development	8	0.8
7	Noise Control Measures	2	0.04
8	Hazardous Waste Storage Facility	7	0.1
9	Training of Manpower	1	0.05
10	Environmental Lab Set-up	2	0.1
11	Wheel washing facility at Coal Storage Area Entrance	3.2	0.3
12	Truck Mounted Vacuum Cleaning System	2	0.1
13	Sewage Treatment Plant of capacity 700 KLD	12	0.08
14	Effluent Treatment Plant of 300 KLD capacity	8	0.06
15	Environmental Monitoring Budget	8	0.12
16	Initiatives proposed under Environment Management at surround villages	9	0.9
Total		**89**	**8.9**

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Ports and Logistics

Quality, Environment, Health & Safety and Energy Policy

- APSEZ is committed to Quality, Energy, Occupational Health & Safety and Environment in port business. We consider IMS responsibilities are integral part of our business. To meet this commitment, APSEZ will abide by the following principles:

- Satisfy our customers by maintaining a standard of service that consistently meets the agreed requirements
- Focus on occupational health & safety of employees, pollution prevention, preservation & protection of environment at all times and in all circumstances
- Identify and analyze the HSE risks arising from our activities to reduce them to the lowest possible levels
- Eliminate or reduce the potential and severity of injuries, occupational diseases and impact on environment & community arising out of our operations
- Fulfill applicable legislations, regulations and other requirements on IMS and take additional measures considered necessary
- Committed to ensure the availability of information and necessary resources to achieve objectives and energy targets
- Shall Strive to achieve the IMS goals and performance objectives, using effective Integrated Management System; and reviewed to improve performance
- Through consultation and participation of workers and their representatives
- Develop, conduct and promote education and training to improve IMS performance
- Continually improve IMS management system by monitoring, evaluating and reviewing through the definition of operational standards, assessments and audits
- Communicate our policies and standards to employees, suppliers, business partners and where necessary work with them to raise their standards
- Support design activities that consider energy performance improvement
- Reduce consumption of energy
- Use of renewable energy
- Procure energy efficient equipment's, products and services
- Design for energy performance improvement
- Provide necessary information and resources to achieve objectives and targets to all employees comply with applicable legal requirements and other requirements to which organization subscribes relates related to its energy use consumption and efficiency
- Policy will be communicate at all level to enhanced Energy performance and involve our employees and partners for continual improvement in efficiency usage of all variable effecting energy consumption. Commitment to continual improvement in energy performance.

Capt. Unmesh Abhyankar
Joint President, APSEZ

Date: 02/03/2020
Rev: 03

Final Report on

Comprehensive Ecological & Model studies for proposed expansion of Krishnapatnam Port (Phase III)

for

Krishnapatanam Port Company Limited (KPCL)

Prepared by

National Institute of Ocean Technology
(Ministry of Earth Sciences, Government of India)

NIOT Campus
Chennai – 600 100
December 2019

Expansion of Krishnapatnam Port (Phase III) – Comprehensive Study Report

Extraction of NIOT Report

Shoreline Studies

6.0 STUDY ON SHORELINE CHANGES

6.1 Background

Krishnapatnam Port proposes to carry out straightening of breakwaters as part of Phase-III expansion. The present alignment of the breakwaters and the proposed straightening of the breakwaters are shown in Figure1.2. The shoreline change studies consists of two components, the first is a shoreline change analysis carried out using satellite imageries and the second part comprises of assessment of the impact of straightening of the breakwaters using numerical methods.

6.2 Shoreline change analysis

Shoreline change analysis was carried out using Digital Shoreline Analysis System(DSAS) tool of ESRI ArcGIS. DSAS is an extension that enhances the normal functionality of ESRI ArcGIS software, and enables users to calculate shoreline rate-of-change statistics from a time series of multiple shoreline positions. The extension was designed to aid in historic shoreline change analysis. DSAS is also useful for datasets that use polylines as a representation of a feature's position at a specific point in time, such as the forward limit of a glacier, river channel boundaries, land use and land cover maps.

DSAS works by generating orthogonal transects at a user-defined separation and then calculates rates-of-change and associated statistics that are reported in an attribute table. The DSAS tool requires user data to meet specific field requirements. The DSAS approach calculates shoreline rates of change based on the measured differences between the shoreline positions associated with specific time periods shown in Fig 6.1.

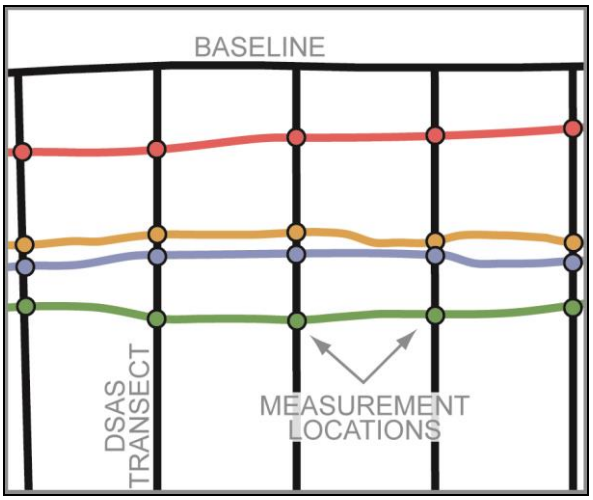

Fig 6.1 Sample DSAS input

The long-term shoreline change assessment for Krishnapatnam coast was studied over a period of 11 years from 2006-2017. Shoreline changes were evaluated by comparing six historical shorelines extracted from different satellite imageries. The details regarding satellite, the date of imageries and resolution are listed in Table 6.1

Table 6.1.Satellite imagery details

Sl.no	Satellite / Sensor	Resolution/Pixel size (m)	Date	Source
1	CARTOSAT 1 PAN	2.5	04/18/2006	NRSC
2	CARTOSAT 1 PAN	2.5	05/17/2011	NRSC
3	RS 2 – LISS-IV	5.8	04/30/2013	NRSC
4	CARTOSAT 1 PAN	2.5	09/10/2014	NRSC
5	CARTOSAT 1 PAN	2.5	09/23/2015	NRSC
6	RS 2 – LISS-IV	5.8	02/20/2017	NRSC

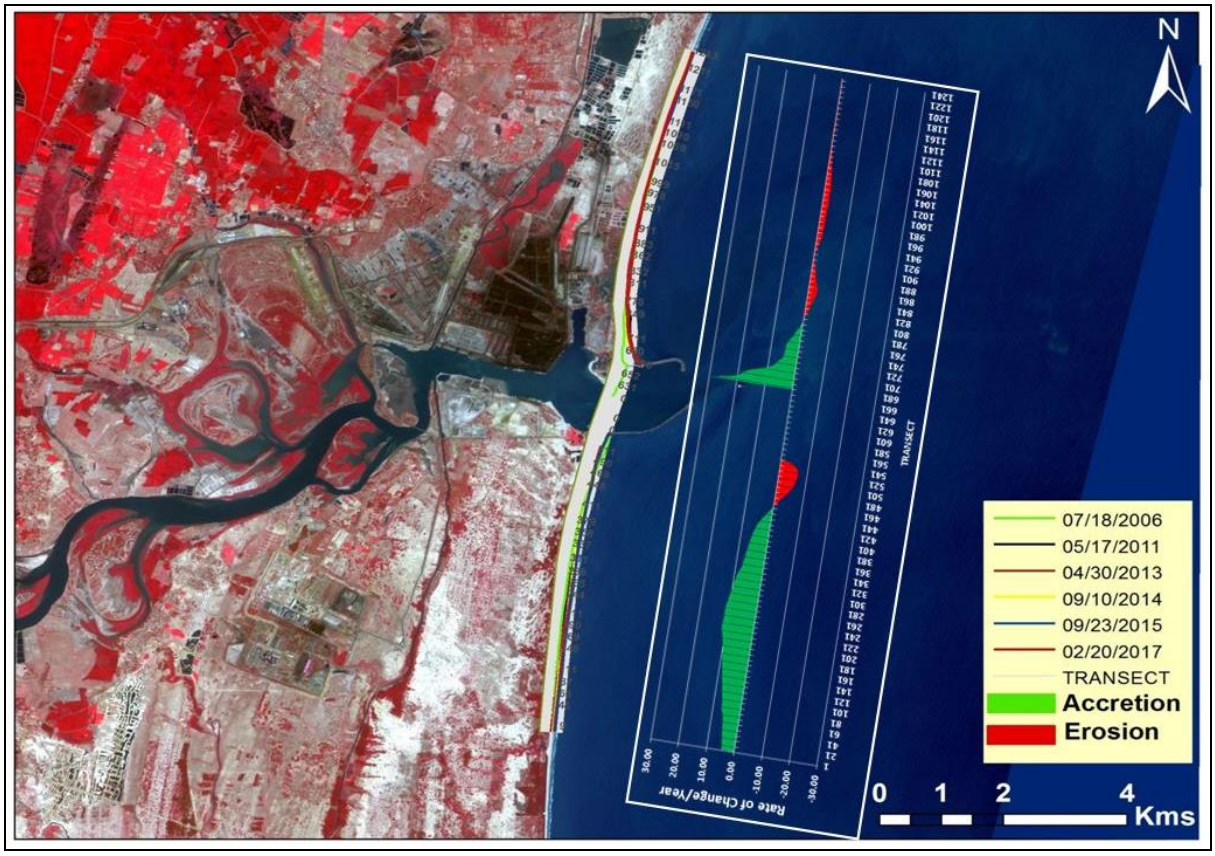

Fig 6.2 DSAS output for Krishnapatnam coast

The present study adopted Linear Regression Rate (LRR) to calculate the shoreline change rate using DSAS. Shoreline changes were evaluated along 11.18 km stretch of shoreline and both erosion and accretion trends were observed. It was observed that 58% of the shoreline is accreting and the rest is eroding. The net rate averaged over 11.18km was 3.126 m/year (accretion). The average accretion rate which observed along 6.46km of the coast was 7.644m/year. The average erosion rate which observed along 4.72km of the coast was 1.82 m/year. The results obtained from DSAS have been shown in Fig 6.2. The best resolution of satellite images used in the study was 2.5m.

Indian National Centre for Ocean Information Services (INCOIS)-Hyderabad had carried out a study titled "The short term changes in the landforms around Krishnapatnam port area in Nellore district of Andhra Pradesh". The study was carried out from June 2008 to May 2010 using LiSS-III satellite images of resolution 23m. The report states *"The shoreline changes during this period depicted very small changes whcih are not very clear from the overlay. However the shorelione change rate calculated during May 2008- May 2009 depicted dominantly accretion except three stretches two on Northern parts of the breakwater and one in the South of the breakwater. Whereas the shoreline change extracted during June 2009-May 2010 reveals maximum stretches in the accretion to no change category. However, three coastal stretches recorded erosion one in the North of the breakwater and two in the southern parts of the study area. The shoreline change rate for the entire study period June 2007- May 2010 was also estimated reveals the entire area is under accretion to no change except one patch in the south of the breakwater is under erosion."* Copy of the report has been enclosed.

6.3 Assessment of the Impact of straightening of the breakwaters

Assessment of impact of straightening of the breakwaters was carried out using LITPACK by DHI. LITPACK is a stand alone deterministic numerical modelling system that integrates numerical models for coastal sediment transport and coastline development in a single package. The LITDRIFT module of LITPACK was used to determine the sediment transport rates and the LITLINE module of LITPACK was used to assess the impact of structures on the shoreline of Krishnapatnam.

The LITDRIFT module simulates the cross-shore distribution of wave height, set-up and longshore current for an arbitrary coastal profile. It provides detailed description of the cross-shore distribution of longshore sediment transport for an arbitrary bathymetry for both regular and irregular sea states.

The LITLINE module simulates the coastal response to gradients in the longshore sediment transport capacity resulting from natural features and a variety of coastal structures. The coastline evolution is calculated by solving a continuity equation for sediment in the littoral zone. The influence of structures, sources and sinks may also be included.

LITLINE module is based on the One-Line model concept for shoreline evolution. The following are some basic assumptions:

1. The shoreline is continuous and quasi- uniform.
2. The cross-shore profile shape remains constant.
3. There is an infinite supply of sand.

6.3.1 Model inputs

Model setup

LITPACK model was setup for sediment transport and shoreline evolution. Model was setup for an extent of 15km along the shore and a cross shore profile of 10km in the seaward direction. Model setup is shown in Fig 6.3, the red line indicates the model shoreline, the blue line indicates the position of the cross shore profile and the black line indicates the baseline.

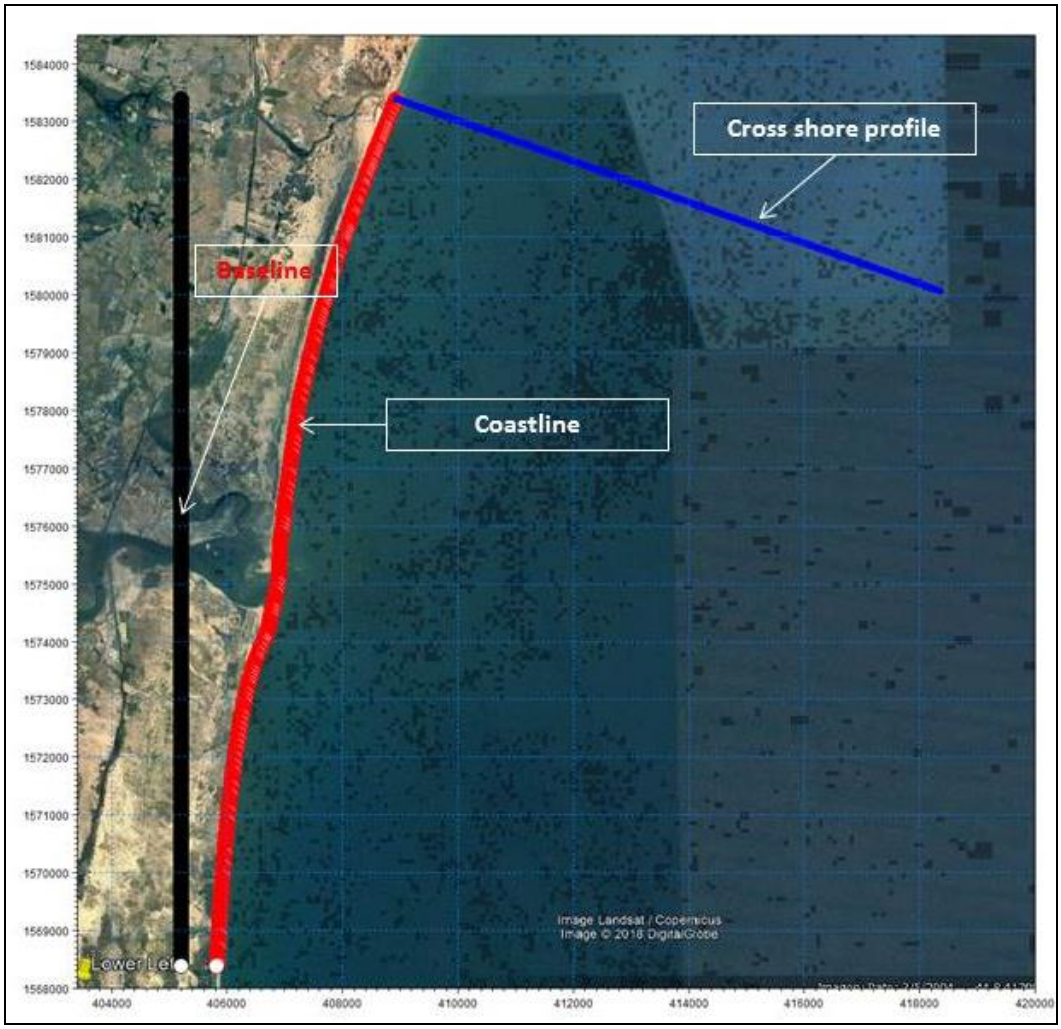

Fig 6.3. LITPACK model setup

Bathymetry and Topography

Bathymetry and Topography were obtained from NHO charts. The bathymetry of the area obtained from NHO charts is shown in Fig 6.4. The topography has been obtained from topography sheets published by Survey of India. The profile best representing the study area was selected and used as model input. The bathymetry profile used for model input is shown in Fig 6.5.

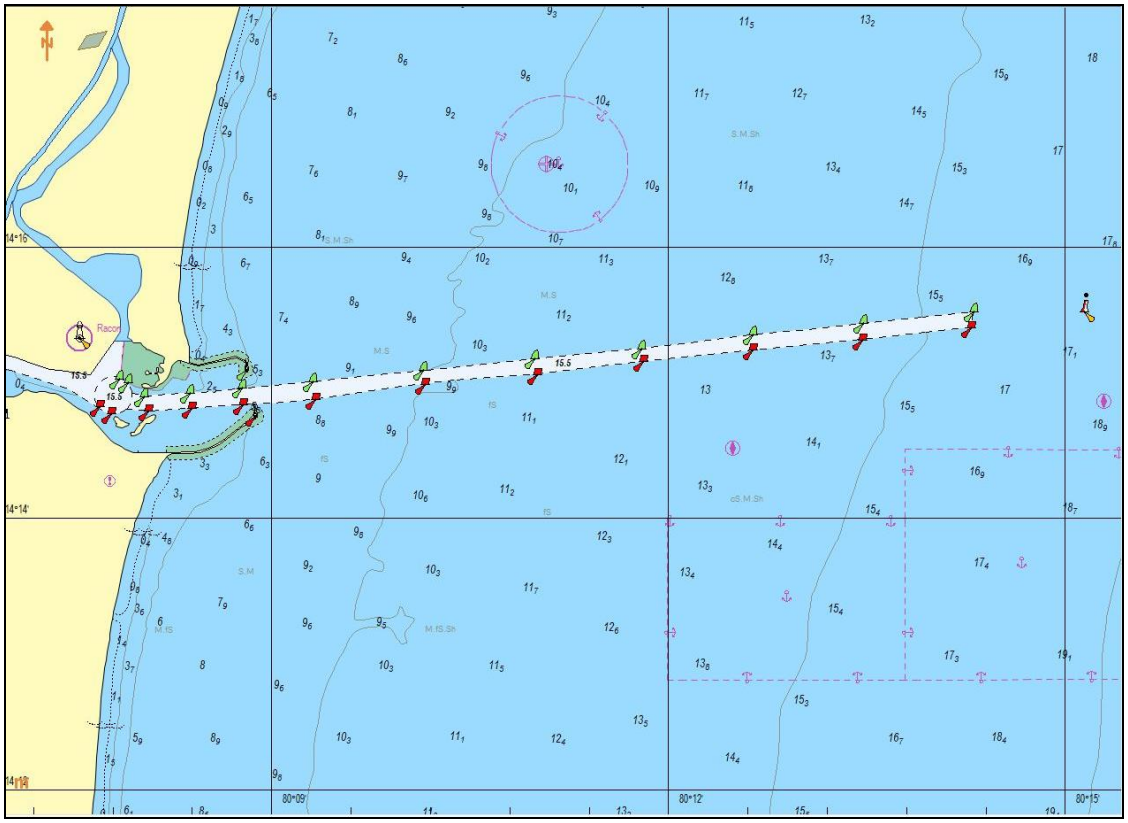

Fig 6.4. Bathymetry from NHO charts

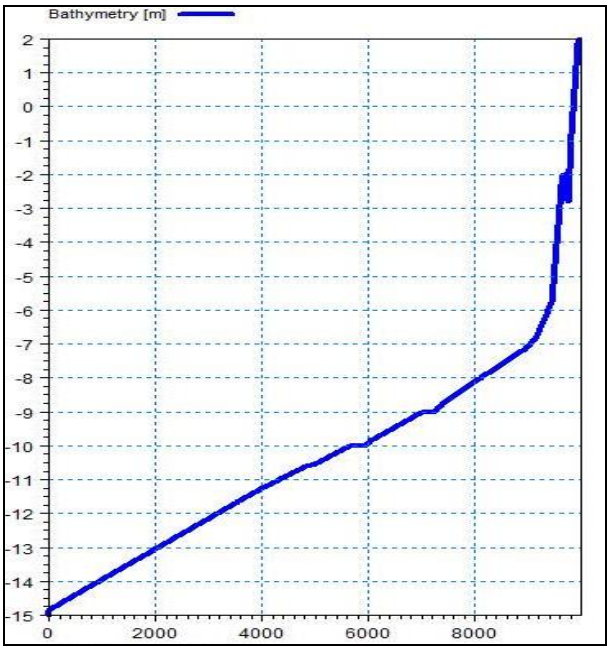

Fig 6.5. Bathymetry profile

Sedimentology

Grab samples were collected along the shore for data on sediments in the area. Sieve analysis was carried for grain size parameters. The D_{50} obtained from grain size analysis was

0.17mm and was used as model input. The fall velocity was determined using Rubey's equation.

Wave data

Wave data from NIOT wave model was used as inputs for the model. Schematized wave was used as input for various model scenarios. The annual wave rose plot off Krishnapatnam is shown in Fig5.13

Shoreline data

Information on shoreline obtained from Google imageries was used at various stages for setting up and validation of shoreline evolution model. Shoreline of Google image dated May 17, 2011 was used for model setup and shoreline of Google image dated April 30, 2013 was used for model validation.

6.3.2 Model calibration and validation

LITDRIFT

The annual sediment transport rates were calculated using the LITDRIFT module. Wave characteristics of one year period were used as inputs. Roughness of 0.01 was used for model calibration. LITDRIFT model was calibrated using sediment transport rates of Ennore coast. The net sediment transport rate along Krishnapatnam coast was estimated at $0.146x10^6m^3$/year and coast $0.14x10^6m^3$/year was observed along Ennore coast by Ranga Rao etal. The model is calibrated using sediment transport rates provided in literature.

LITLINE

The model was setup using shoreline of May 17,2011 and validated using the shoreline of April 30, 2013 . Inputs for shoreline and cross-shore profiles were provided for a grid spacing of 10m. Schematized wave inputs were provided for the corresponding period. The breakwaters along the coast were idealized as groins and a beach was assumed to be present in between the groins. A close match for shoreline change was obtained from the model and shoreline of April 30, 2013 which is shown in Fig 6.6.

6.3.3 Results

LITDRIFT

The gross sediment transport rate for Krishnapatnam is $0.27x10^6m^3$/year and the net sediment transport rate is $0.146x10^6m^3$/year towards North. The monthly sediment transport rates for Krishnapatnam coast have been provided in Table 6.2. Negative symbol indicates the transport towards North.

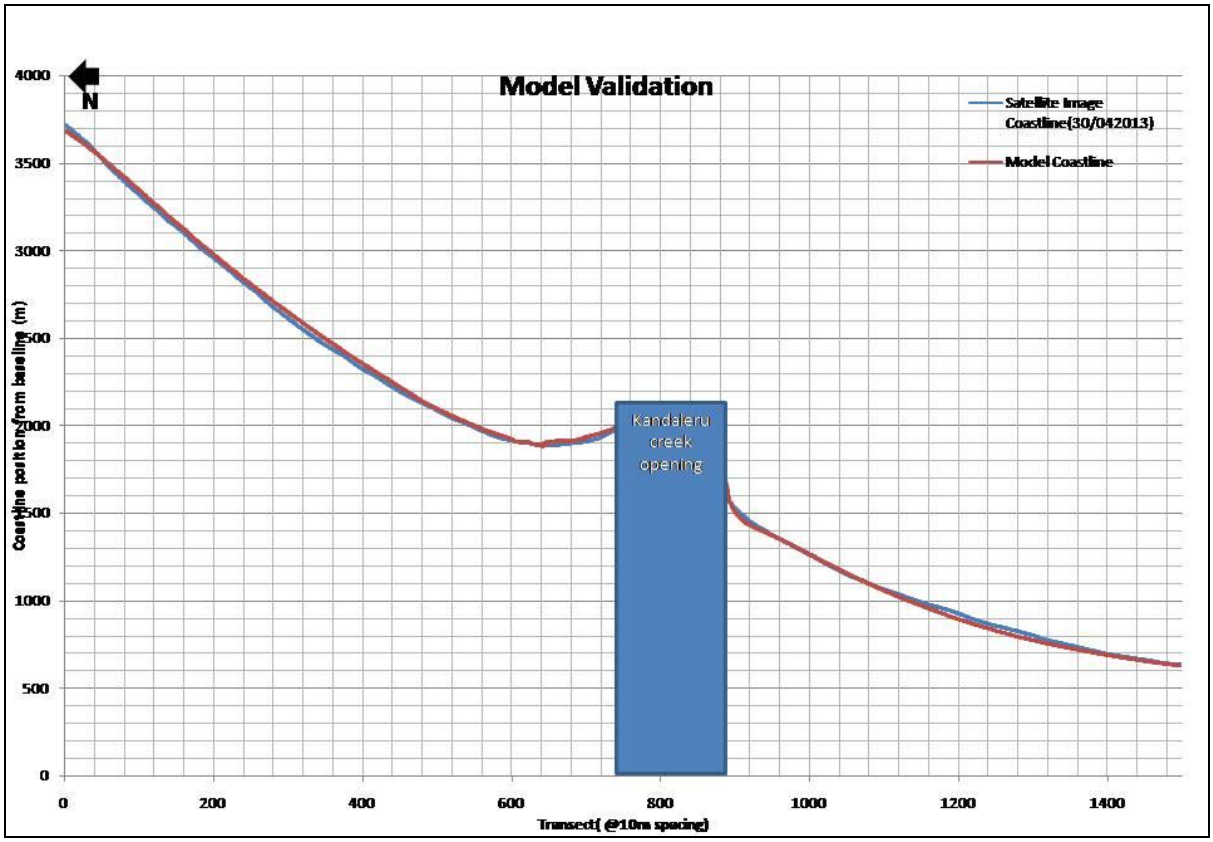

Fig 6.6.Model validation

Table 6.2. Monthly sediment transport rates

Month	Net sediment transport (in m^3)	Gross sediment transport (in m^3)
January	-6896.04	8304.14
February	-5067.52	6100.62
March	-20274.28	20274.28
April	-30878.56	30878.56
May	-32438.65	32438.65
June	-23765.22	23765.22
July	-22056.88	22056.88
August	-34023.79	34023.79
September	-14082.66	14312.54
October	-5400.09	24034.07
November	18830.72	21723.36
December	29672.31	32538.00
Total (Approximately)	-146380	270450

LITLINE

Production runs were carried out for straightening of the breakwaters. Three scenarios were modelled for shoreline evolution. The first scenario is shoreline evolution with straightened

breakwaters over a period of one year. The second scenario is shoreline evolution with straightened breakwaters over a period of five years and the third scenario is shoreline evolution over a period of ten years.

In the first scenario no significant changes in shoreline are observed over a period of one year due to straightening of the breakwaters. The model result are shown in Fig 6.8. The maximum integrated drift computed from the model is 0.288×10^6 m ^{3} towards North.

The second scenario shows shoreline evolution over a period of 5 years, maximum erosion of 30m for a stretch of 2800m to the North of the straightened breakwaters which is shown in Fig 6.9. The maximum integrated drift computed from the model is 1.15×10^6 m ^{3} towards North.

The third scenario shows shoreline evolution over a period of 10 years, maximum erosion of 60m for a stretch of 3000m to the North of the straightened breakwaters which is shown in Fig 6.10. The maximum integrated drift computed from the model is 2.24×10^6 m ^{3} towards North.

In order to mitigate erosion to the North of the breakwaters a fourth scenario was modelled for shoreline evolution as a shoreline management option. A stockpile of 2×10^6m ^{3} of sediments was placed on the the Northern side of the north breakwater on the beach for a stretch extending 4000mx150mx3.5m and shoreline evolution over a period of 1,5 and 10 years were modelled. The results have been shown in Fig 6.11, Fig 6.12 and Fig 6.13 for the respective periods, the stockpile location is shown in Fig 6.7. From the model study for shoreline evolution with nourishment to the north of breakwaters the shoreline is observed to be stable (shown in Fig 6.13).

6.4 Summary

The following is the summary of the shoreline change study:

- Shoreline change analysis carried out along 11.18 km stretch of shoreline and it was observed that 58% of the shoreline shows accretion and the rest erosion. The net rate averaged over 11.18km was 3.126 m/year (accretion). The average accretion rate observed along 6.46km of the coast was 7.644m/year. The average erosion rate observed along 4.72km of the coast was merely 1.82 m/year.
- The net sediment transport estimated using LITDRIFT is 0.146x106m3/year towards North and the gross sediment transport rate is 0.27x106m3/year
- No significant changes in shoreline were observed due to straightening of breakwaters over a period of one year, However, erosion to an extent of 30m is observed for a stretch of 2800m over a period of 5 years due to straightening of breakwaters and a stretch of 3000m undergoes erosion for an extent of 60m over a period of 10 years.
- As a shoreline management option, stockpiling of 2×10^6m3 of sediments to the North of the breakwaters as a suitable option for mitigating erosion was modelled and the shoreline was found to be stable over a period of 10 years.

Fig 6.7 stockpiling location

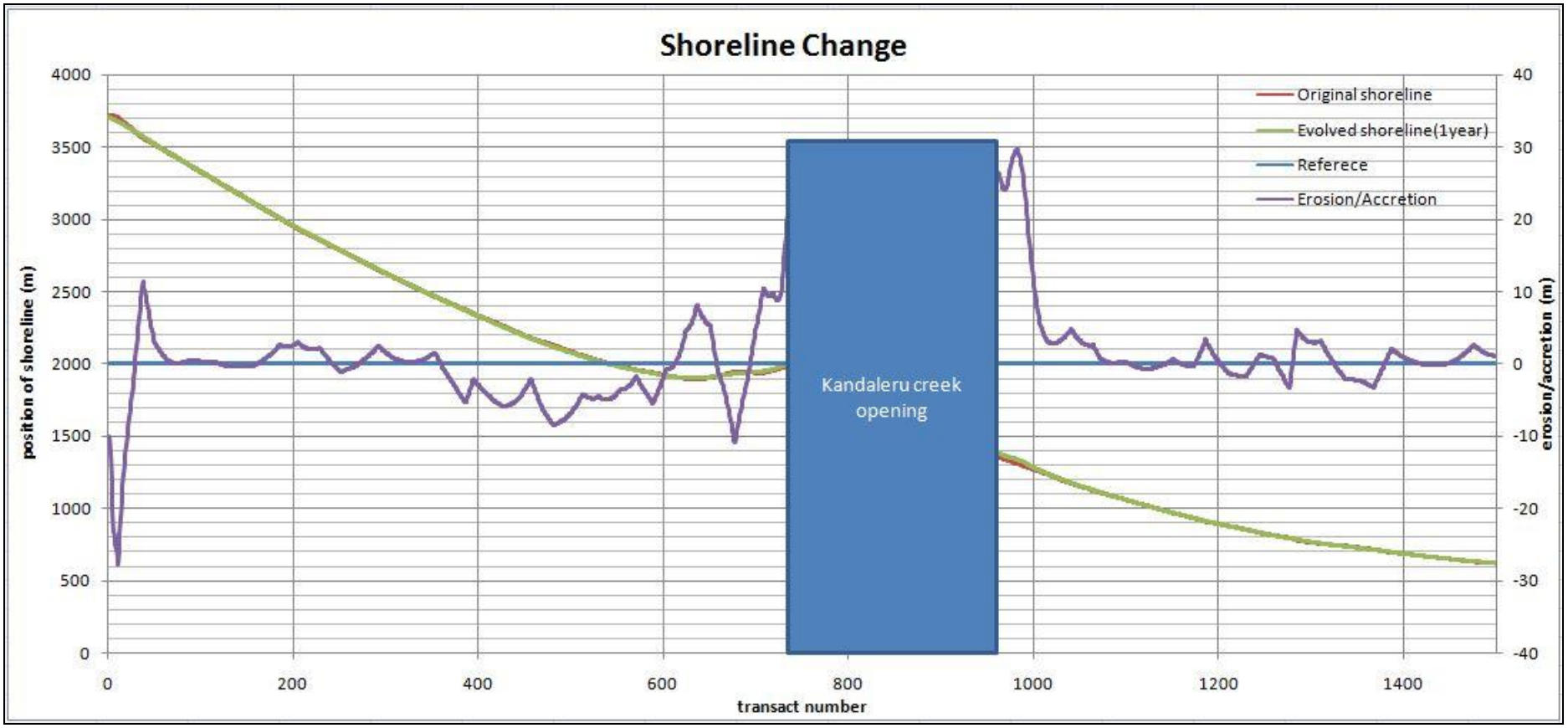

Fig 6.8.Shoreline evolution over a period of one year with straightening of the breakwaters

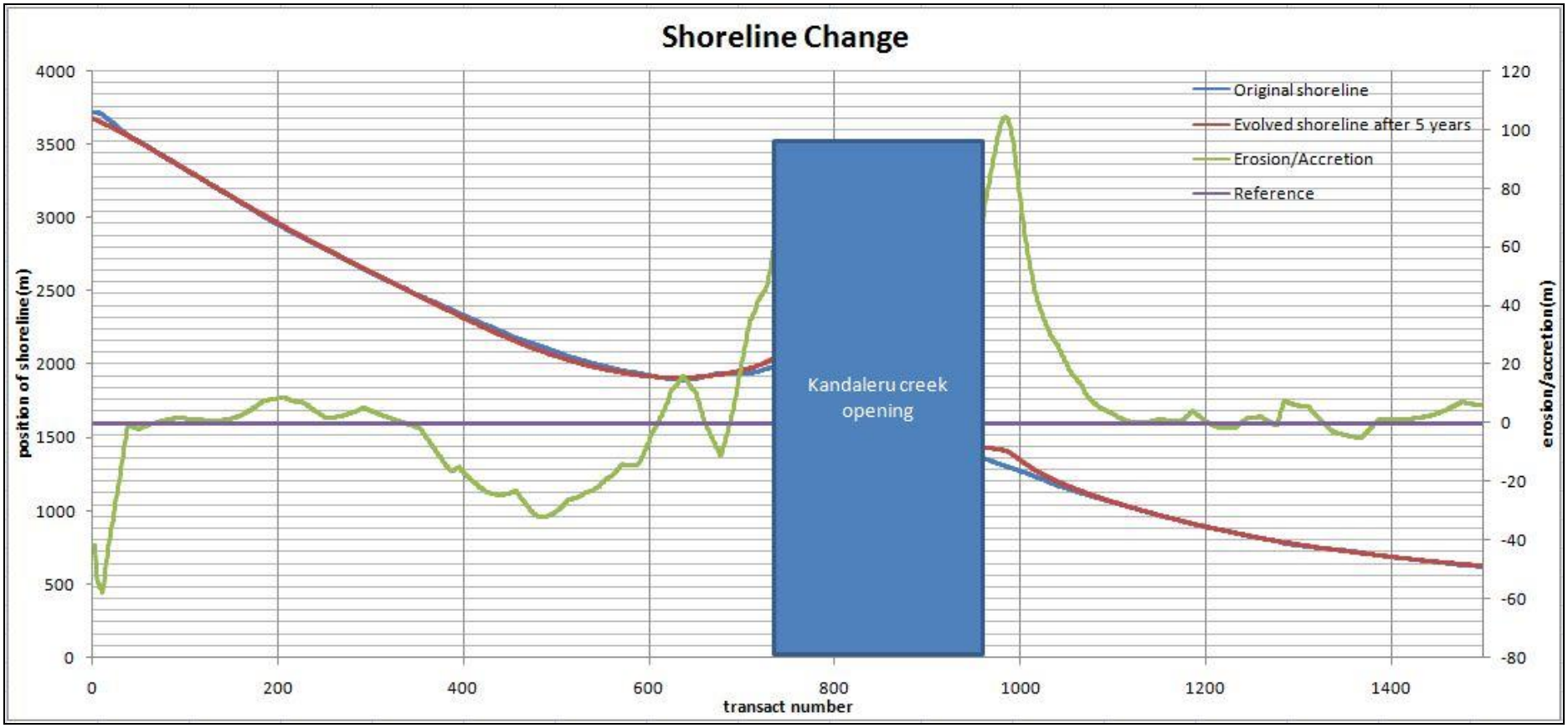

Fig 6.9.Shoreline evolution over a period of five years with straightening of the breakwaters

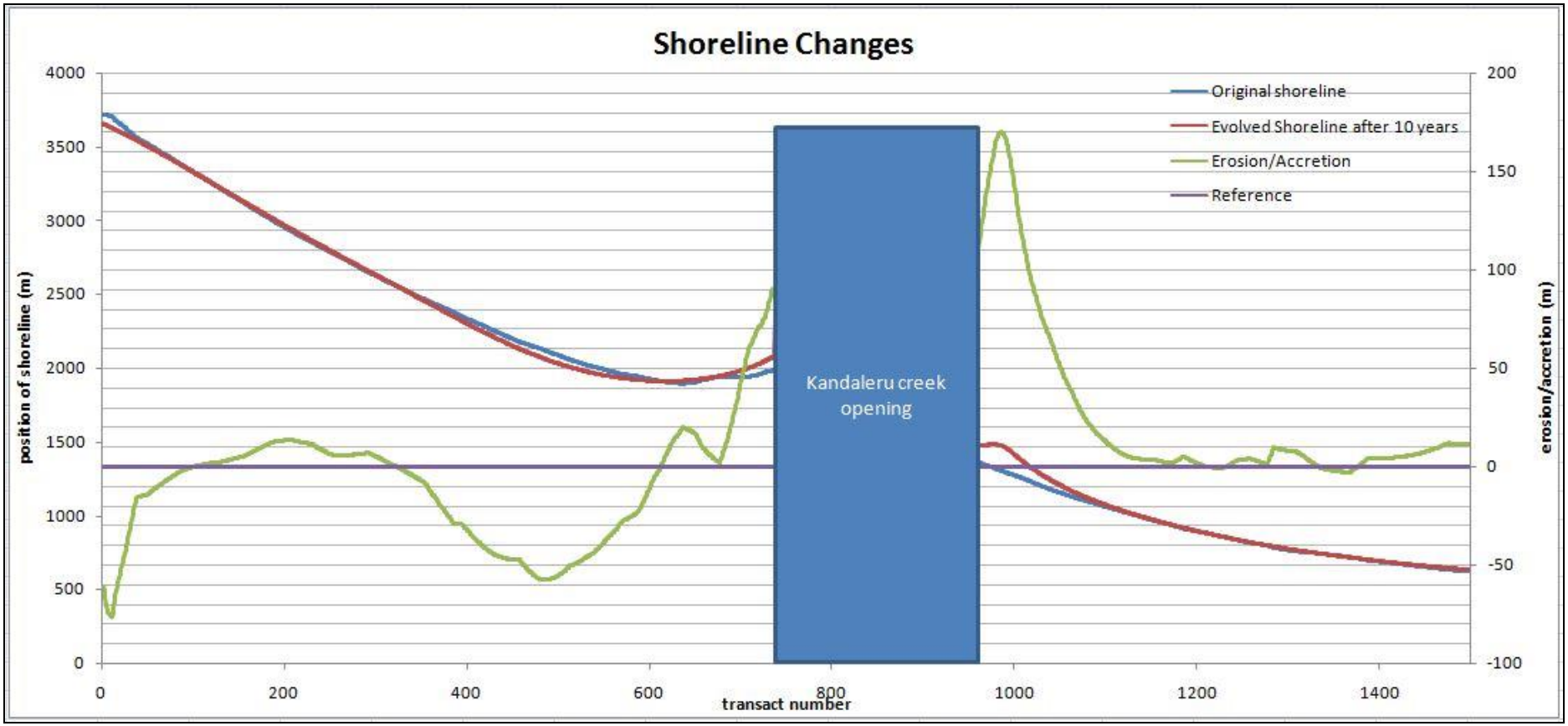

Fig 6.10.Shoreline evolution over a period of ten years with straightening of the breakwaters

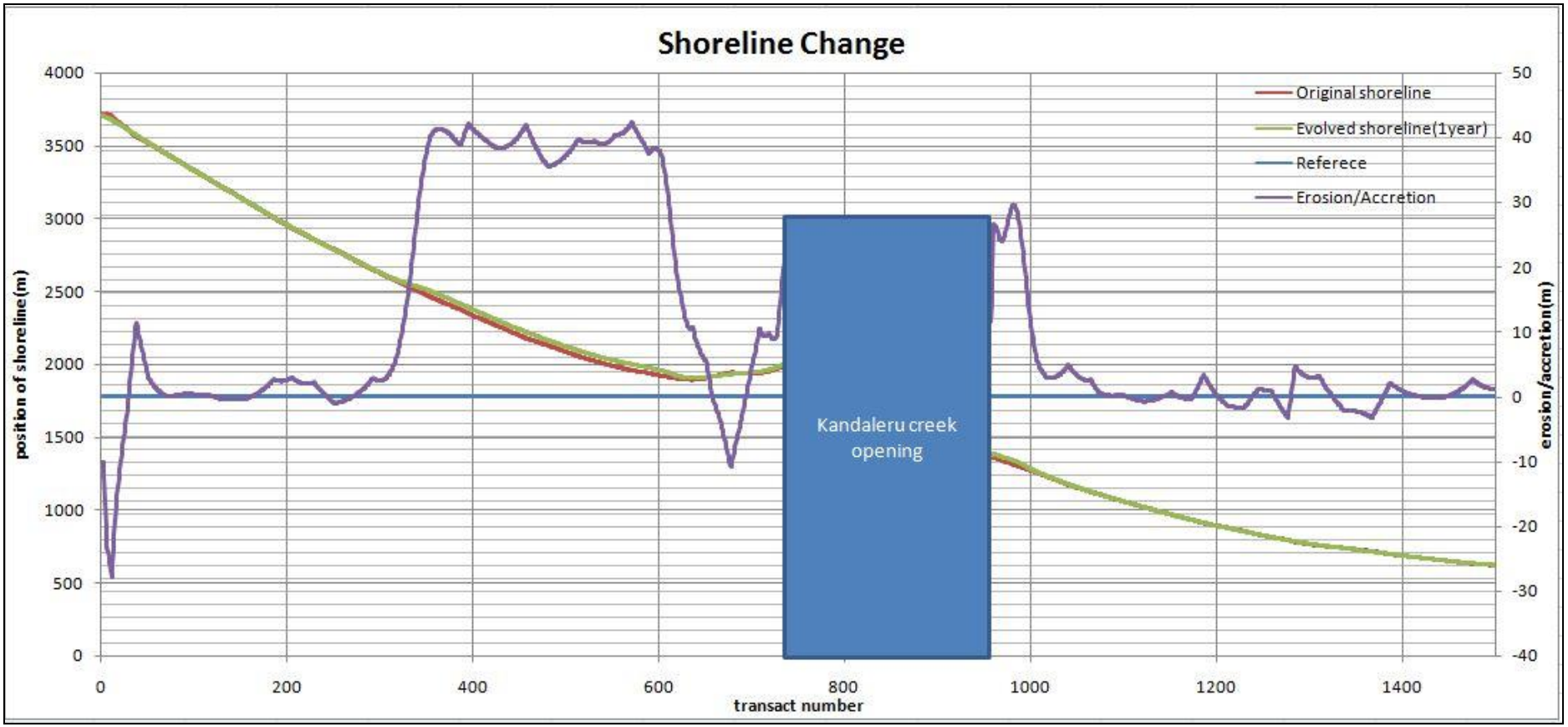

Fig 6.11.Shoreline evolution over a period of one year with stockpiling of sand to the north and straightening of the breakwaters

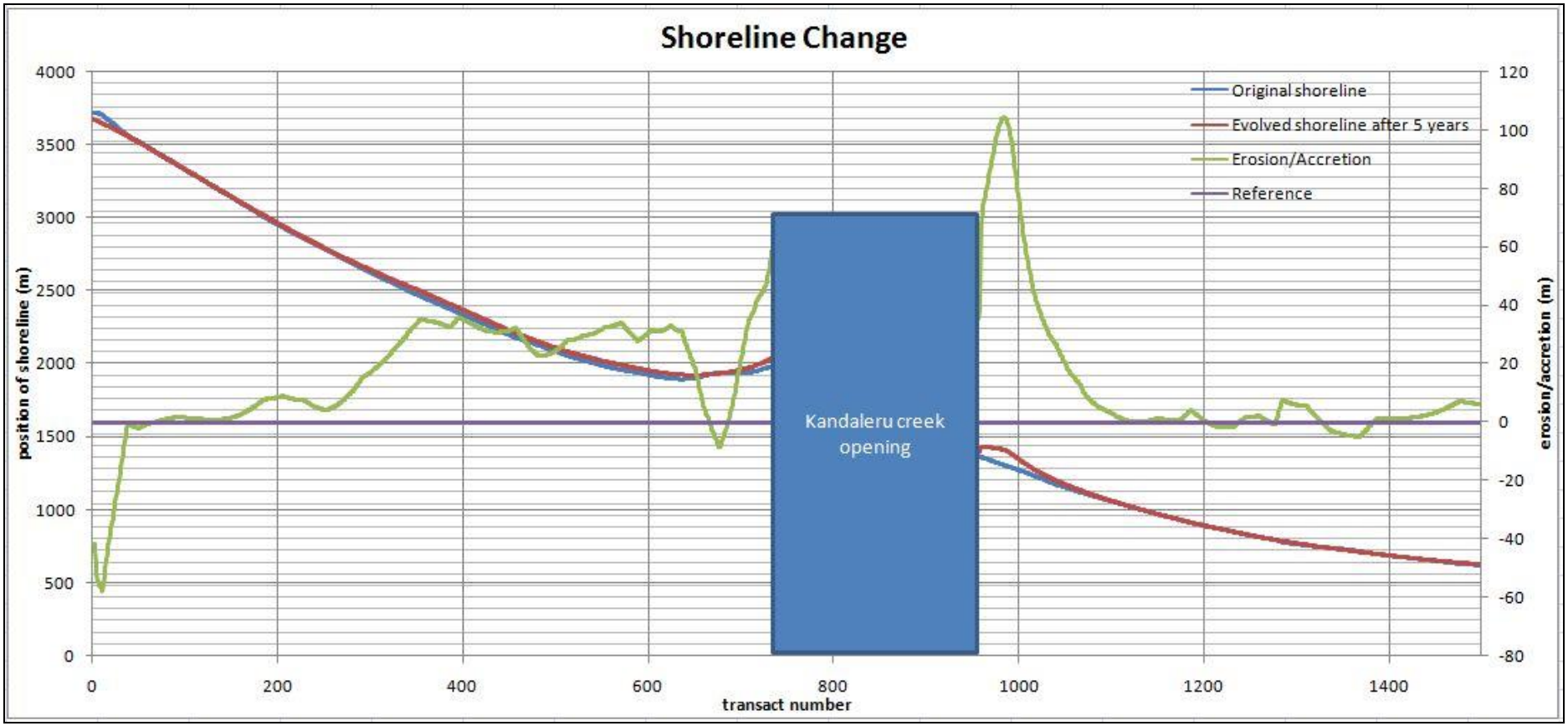

Fig 6.12.Shoreline evolution over a period of five years with stockpiling of sand to the north and straightening of the breakwaters

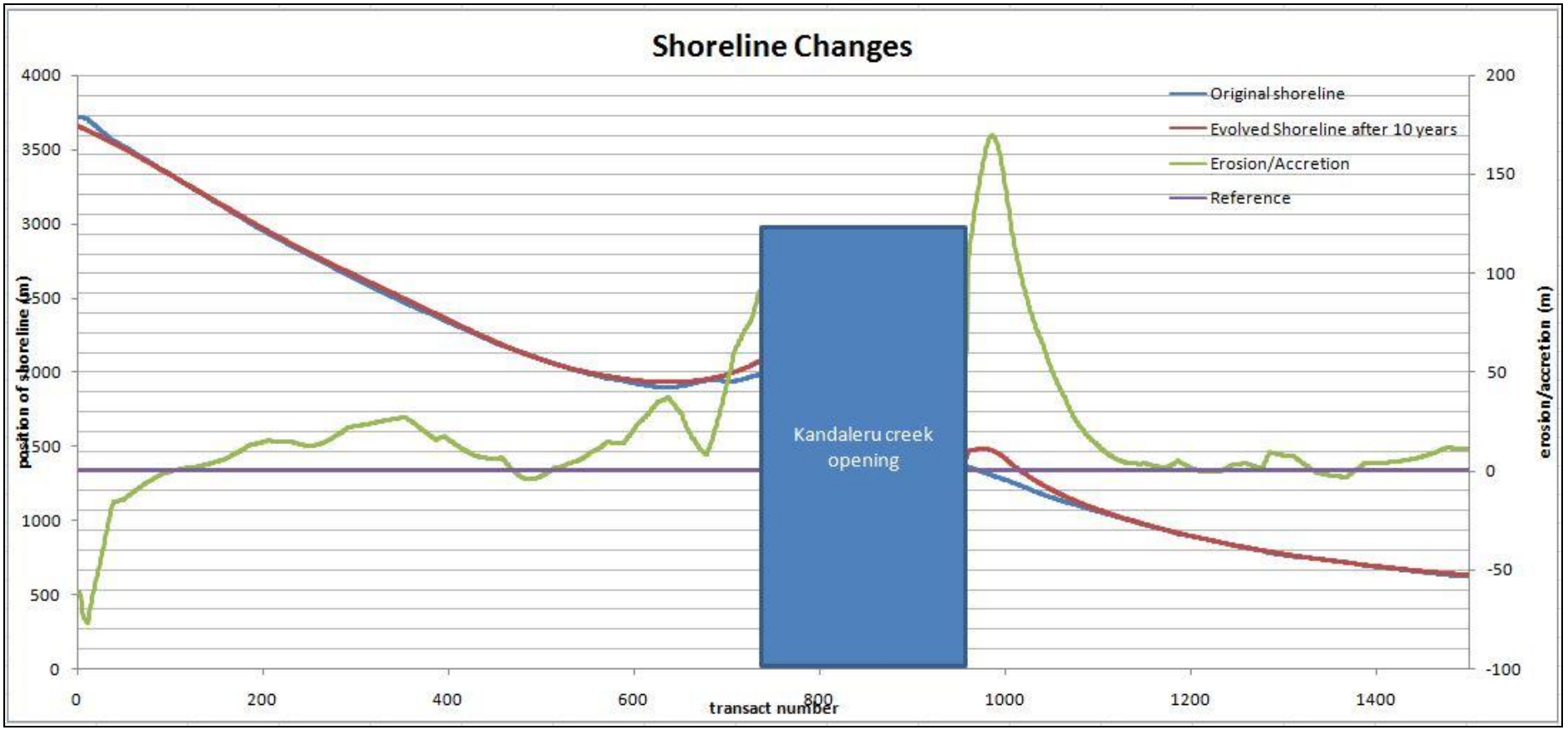

Fig 6.13.Shoreline evolution over a period of ten years with stockpiling of sand to the north and straightening of the breakwaters