Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	488/DSTE/PCZMA/NOC/JE-II/2005/245
Compliance ID	737801778
Compliance Number(For Tracking)	EC/M/COMPLIANCE/737801778/2026
Reporting Year	2026
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	29-05-2026
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	PUDUCHERRY
RO/SRO Office Address	Integrated Regional Offices, Chennai

Note:- SMS and E-Mail has been sent to V Geroge Jenner, PUDUCHERRY with Notification to Project Proponent.

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	11-35/2010-IA.III
Compliance ID	1229397278
Compliance Number(For Tracking)	EC/M/COMPLIANCE/1229397278/2026
Reporting Year	2026
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	29-05-2026
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	PUDUCHERRY
RO/SRO Office Address	Integrated Regional Offices, Chennai
Note:- SMS and E-Mail has been sent to V Geroge Jenner, PUDUCHERRY with Notification to Project Proponent.	

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/PY/MIS/26984/2009
Compliance ID	1229394992
Compliance Number(For Tracking)	EC/M/COMPLIANCE/1229394992/2026
Reporting Year	2026
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	29-05-2026
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	PUDUCHERRY
RO/SRO Office Address	Integrated Regional Offices, Chennai
Note:- SMS and E-Mail has been sent to V Geroge Jenner, PUDUCHERRY with Notification to Project Proponent.	

Your (Half Yearly Compliance Report) has been Submitted with following details	
Proposal No	IA/PY/MIS/26984/2009
Compliance ID	1229546138
Compliance Number(For Tracking)	EC/M/COMPLIANCE/1229546138/2026
Reporting Year	2026
Reporting Period	01 Jun(01 Oct - 31 Mar)
Submission Date	29-05-2026
RO/SRO Name	V Geroge Jenner
RO/SRO Email	tr025@ifs.nic.in
State	PUDUCHERRY
RO/SRO Office Address	Integrated Regional Offices, Chennai
Note:- SMS and E-Mail has been sent to V Geroge Jenner, PUDUCHERRY with Notification to Project Proponent.	

SIX MONTHLY CRZ and EC & CRZ COMPLIANCE REPORT FOR THE PERIOD OF OCTOBER TO MARCH 2026

Subject: Development of Karaikal Port by Department of Industrial Development (Port), Government of Puducherry at Karaikal under BOT basis by M/s Marg Construction Limited, Chennai – CRZ-reg

Reference: EC & CRZ Clearance letter of No. 10 2/2006 IA -III dated 6th May 2006

DESCRIPTIVE REPORT ON STATUS OF COMPLIANCE TO THE CONDITIONS OF CRZ CLEARANCE AND ENVIRONMENTAL MANAGEMENT

. **Specific Conditions:**

Sl.No	Conditions stipulated	Compliance Status
(I)	All the conditions stipulated in the No Objection Certificate from Pondicherry Pollution Control Committee vide their letter No.PPCC/NOC/KKL/JE/2006/303, dated 9.2.2006 should be strictly implemented.	Noted and complied.
(II)	The reclamation of the port areas should be carried out with the dredged material, dredged material should not be dumped into the sea. No reclamation should be carried outside the port limits.	This condition has been amended as per CRZ amendment letter dated 15th October 2008. The compliance of the conditions stipulated in above letter is presented in the subsequent pages.
(III)	Quarry material should be transported from the identified quarries at Pudukkottai. The query material will be transported in close trucks in order to prevent spills.	Complied. The construction activities as per the CRZ clearance obtained were completed and port is in operation.
(IV)	The coastal protection works should be carried out after detailed hydrodynamic modelling studies and it should be ensured that no erosion or accretion takes place in other areas due to the shore protection work	All the Coastal protection works were carried out as per the hydrodynamic modeling studies. The construction activities as per the CRZ clearance obtained were completed and port is in operation.
(V)	Reclamation of 500 acres should be carried out only for port development. The height of the reclaimed area will be maintained above the maximum find level.	Complied. Reclamation was carried out only for port development. The height of the reclaimed area is maintained at maximum find level. The construction activities as per the CRZ clearance obtained are completed and port is in operation.
(VI)	No groundwater should be tapped for the project. The water should be sourced from Vettar river after obtaining necessary permission from the concerned agencies	No ground water is tapped for development of the project. The port is taking water from Desalination as well PASIC for domestic purpose.

SIX MONTHLY EC COMPLIANCE REPORT FOR THE PERIOD OF OCTOBER to MARCH 2026

Sl.No	Conditions stipulated	Compliance Status
(VII)	The wave tranquility study and the ship manuring studies carried out should be taken into account while operating the port.	Complied. Construction of the port was completed as per the wave tranquility and ship manuring studies carried out and same will be taken account to operation.
(VIII)	The revetment should be designed after conducting flume studies and the section designed based on this study	Complied. Construction of the port was completed as per the relevant studies and is in operation.
(IX)	The project proponent should ensure that during construction and operation of the port there will be on impact on the livelihood of the fisherman. The fishermen should be provided free access to carry out the fishing activity	Noted and agreed upon
(X)	All necessary precautions while undertaking construction and operation of the port should be taken keeping in view the bathymetric changes caused due to tsunami.	Noted and agreed upon
(XI)	All developments in the port should be carried out in accordance with the Coastal Regulation Zone Notification, 1991 and approved Coastal Zone Management Plan of Pondicherry.	Development of Port activities were carried out as per the Coastal Regulation Zone Notification 1991 and approved Coastal Zone Management plan of Karaikal.
(XII)	The ecological and terrestrial studies should be carried out by recognized scientific institutions and report submitted to this Ministry every six months.	The ecological and terrestrial studies were carried out and submitted to MoEF&CC. Regional Office at Chennai. The studies is being carried out by M/s Chennai Mettex Pvt Ltd approved by MoEF&CC
(XIII)	The project proponent should get the Coastal Regulation Zone map re-examined by Puducherry Coastal Zone Management Authority with regard to the High Tide Line and Low Tide Line demarcation and submit the correct version of the Coastal Regulation Zone map to this Ministry within three months from the date of receipt of this Letter.	The Coastal Regulation Zone map re-examined by Puducherry Coastal Zone Management Authority with regard to the High Tide Line and Low Tide Line demarcation and copy of the same submitted to MoEF&CC. Regional Office at Chennai. PPCC letter is attached as Annexure-1
(XIV)	The project proponent should undertake a comprehensive hydrodynamic modelling study with regard to river diversion and submit the report to the Ministry within 6 months from the date of receipt of this letter. Further, the unit should comply with all the findings/recommendations of the study.	The comprehensive hydrodynamic modelling study had been done regarding river diversion the report has submitted to MoEF&CC. Regional Office at Chennai. **Annexure -2**
(XV)	Construction labour camp should be located outside Coastal Regulation Zone areas and	Construction of the port is completed as per the guidance of MoEF&CC and Now the port is in operation at present.

Sl.No	Conditions stipulated	Compliance Status
	should be provided with adequate cooking and sanitation facilities.	
General Condition		
(I)	Development of the proposed channel should be undertaken maintainability informing in the meeting central/local rules and regulations including Coastal Regulation Zone Notification 1991 and its amendments. All the construction design/drawings relating in the proposed development activities must implemented as per the CRZ notification.	Complied. Construction of the port was completed as per central/local rules & regulations including Coastal Regulation Zone Notification and port is in operation at present.
(II)	A well-equipped laboratory with suitable instruments to monitor the quality of air and water shall be to ensure that the quality of ambient air and water conforms to the prescribed standings. The laboratory will also be equipped with qualified manpower including a marine biologist so that the with marine water quality is regularly monitored in order to ensure that the marine life is not adversely affected as a result of implementation of the said project. The quality of ambient air and water shall be monitored periodically in all the seasons and the results should be properly maintained for inspection of be send to this Ministry (Regional Office at Bangalore) Pollution Control Committee Must had the pollution control agencies concerned. The periodic monitoring reports at least once in 6 months must be send this Ministry (Regional Office at Bangalore) and Pollution Control Committee.	Environmental monitoring work is being carried out by agency M/s Chennai Mettex Private limited, approved by MoEF&CC, including baseline studies such as terrestrial, and marine studies. The copy of the report is being submitted to MoEF&CC, Regional Office at Chennai and Puducherry Pollution Control Committee. The average result of AAQ is for North Vanjore PM 10-42.6, PM2.5-18.8, So2-7.2, No2-7.5 and the average result of Keezha Vanjore is PM 10-.57.6, PM2.5-28.5, So2-11.5, No2-14.5, and for Nagore average result PM 10-.49.6, PM2.5-24.5, So2-10.4, No2-12.6. and STP treated water reports are TSS-24.1mg, TDS -1836, BOD- 14mg, COD-69mg. **Annexure -3**
(III)	Adequate provisions for infrastructure facilities such as water supply, fuel for cooking, sanitation etc. must be provided for the laborers during the construction period to avoid damage to the environment. Colonies for the laborers should not be located in Coastal Regulation Zone area. It should also be ensured that the construction workers do not cut trees including mangroves, for fuel wood purpose.	Complied. Construction of the port was completed, and Now the Port is in operation at present.
(IV)	To prevent discharge of sewage and other liquid wastes into the water bodies, adequate system for collection and treatment of the wastes roust be provided. No sewage and other liquid waste without treatment should be allowed to enter into the water bodies.	Port having the facilities to treat the liquid waste, Sewage treatment plant is being operated to treat 32 KLD sewage. The total quantity of treated water is 3785 kl period of October to March 2026 & it is being used for greenbelt development.

SIX MONTHLY EC COMPLIANCE REPORT FOR THE PERIOD OF OCTOBER to MARCH 2026

Sl.No	Conditions stipulated	Compliance Status
(V)	Appropriate facility should be created for the collection of solid and liquid waste generated by the barges/vessels and their safe treatment and disposal, should be ensured to avoid possible contamination of the water bodies.	Port having the facilities to treat solid & liquid waste, the solid waste is disposed through authorized vendor. **Annexure -4**
(VI)	Necessary navigational aids such as channel markers should be provided to prevent accidents. Internationally recognized safety standards shall be applied in case of barge/vessel movements.	Complied. The approach channel is demarcated with lighting buoys for safe navigation and also framed adequate traffic control guidelines. In accordance with international norms requisite provisions are in place and thereby following Navigation and traffic control guidelines. The Port Channels and approach are marked with buoys for the navigational aids as per the international safety standard to prevent the accident. **Annexure -5**
(VII)	The project authorities should take appropriate community development and welfare measures for villagers in the vicinity of the project, including drinking water facilities. A separate fund should be allotted for this purpose.	Port is supporting through CSR activities to nearby villages in Education, Community Health, Sustainable Livelihood, Community Development, Climate Action, Emergency Relief CSR implementation (Capacity building/ training & other administrative expenses) For the CSR activities, KPPL has spent an amount of Rs 32 lakhs in last 6 months.
(VIII)	The quarrying material required for construction purposes should be obtained only from the approved quarries/borrow areas. Adequate safeguard measures shall be taken to ensure that the overburden and rocks at the quarry site do not find their way into water bodies	Complied. Construction of the port has been completed and is in operation at present.
(IX)	For employing unskilled, semi-skilled and skilled workers for the project, preference should be given to local people.	More than 500 Nos. of local people were employed through direct/indirect Employment.
(X)	The recommendations made in the Environmental Management Plan and Disaster Management Plan, contained in the Environmental Impact Assessment and Risk Analysis Reports of the project shall be effectively implemented.	Complied. All the recommendations in EMP and Risk Analysis Report are being implemented.
(XI)	A separate Environmental Management Cell with suitable qualified staff to carry out various environment should be set up under the charge of a Senior Executive who will report directly to the Chief Executive of the Company.	Complied. EMC has been set-up which meets to discuss the implementation of the Environment Safeguards stipulated.

SIX MONTHLY EC COMPLIANCE REPORT FOR THE PERIOD OF OCTOBER to MARCH 2026

<table>
<tr><th>Sl.No</th><th>Conditions stipulated</th><th>Compliance Status</th></tr>
<tr><td>(XII)</td><td>The project affected people, of any should be properly compensated and rehabilitated</td><td>Complied.</td></tr>
<tr><td>(XIII)</td><td>The fund earmarked for environmental protection measures should be maintained in a separate account and there should be no diversion of these funds for any other purpose A year-wise Expenditure on environment safeguards should be reported to this Ministry.</td><td>
<table>
<tr><th>S.No</th><th>Environmental Expenditure for the financial year2025 to 2026</th><th>Amount (Rs)</th></tr>
<tr><td>1</td><td>Continuous Ambient Air Quality monitoring Station instrumentation upgraded</td><td>2100000</td></tr>
<tr><td>2</td><td>Sewage Treatment Plant operation and maintenance</td><td>60000</td></tr>
<tr><td>3</td><td>Monitoring, ambient Air quality, noise Pollution & Potable water quality</td><td>600000</td></tr>
<tr><td>4</td><td>Garbage waste collection and transportation</td><td>330000</td></tr>
<tr><td>5</td><td>Annual maintenance of all garden & Maintenance of planted avenue trees</td><td>450000</td></tr>
<tr><td>6</td><td>Truck mounted Sweeping machine operation and maintenance</td><td>300000</td></tr>
<tr><td>7</td><td>CAAQMS maintenance charges</td><td>900000</td></tr>
<tr><td>8</td><td>Road wetting</td><td>4200000</td></tr>
<tr><td>9</td><td>DSS, DSDF and Sprinkler operation</td><td>900000</td></tr>
<tr><td>10</td><td>Road and railway cleaning</td><td>2400000</td></tr>
<tr><td>11</td><td>World Environmental day celebration</td><td>50000</td></tr>
<tr><td></td><td>Total</td><td>12290000</td></tr>
</table>
</td></tr>
<tr><td>(XIV)</td><td>Full support should be extended to the officers to the Ministry's Regional Office at Bangalore and the officers of the Central and State pollution Control Board by the project proponent during this inspection for monitoring purpose, by furnishing full details and action plans including the action plans including the action taken report in respect if mitigation measures and other environmental protection activities</td><td>Officers from the Ministry's Regional Office at Bangalore/Chennai and the officers of the Central and State pollution Control Board, KPPL Port is being supported during the inspection and monitoring of the project and furnishing full details like action plans including action taken report in respect of mitigation measures and other environmental protection activities are submitted to the statutory bodies.</td></tr>
<tr><td>(XV)</td><td>In case there is an intention of deviation or alteration in the project including the implementation agency. A fresh reference should be made to this Ministry for modification in the clearance condition or imposed of nee ones for ensuring environmental protection. The project proponents should be responsible for implementing the suggested safeguard measures.</td><td>Noted and agreed upon.</td></tr>
</table>

Sl.No	Conditions stipulated	Compliance Status
(XVI)	This Ministry reserves the right to revoke this clearance, if any of the conditions stipulated are not complied with to the satisfactory of this Ministry	Noted.
(XVII)	This ministry or any other competent authority may stipulate any additional conditions subsequently with to the satisfaction of this Ministry.	Noted.
(XVIII)	The project proponent should advertise at least in two local newspaper widely circulated in the region around the project, one of which shall be vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letter are available with the state Pollution Control Board and may also be seen at website of the Ministry of Environment& Forestry at http;//WWW.envfornic.in. The advertisement should be made within 7 days from the date of issue of the clearance letter and copy of the same should be forwarded to the Regional Office of this Ministry at Bangalore.	CRZ Clearance was advertised in Newspaper in English and vernacular language including placing of copies on web as well notice Board of the State Pollution Control Board and website of the Ministry of Environment & Forestry at http;//WWW.envfornic.in. **Annexure -6**
(XIX)	The project proponents should inform the Regional Office as well as the Ministry the date of financial closure and final approval of the project by the concerned authorities and the date of start of the land development Work.	Complied. On 12th June 2009, Financial Closure was achieved.

Subject: Development of Karaikal Port by Department of Industrial Development (Port), Government of Puducherry at Karaikal under BOT basis by M/s Marg Construction Limited, Chennai – CRZ-reg.

Reference: CRZ Clearance letter of No. 10-2/2006-IA. III dated the 15th October, 2008.

DESCRIPTIVE REPORT ON STATUS OF COMPLIANCE TO THE CONDITIONS OF ENVIRONMENTAL CLEARANCE AND ENVIRONMENTAL MANAGEMENT

Specific Conditions:

Sl.No	Conditions stipulated	Compliance Status
(I)	It shall be ensured that during dredging and disposal the fishermen communities shall not be affected.	Construction work for the port was completed as per the clearance obtained and now port is in operation.
(II)	The dumping site shall be between the site No.1 and 2 above within the port limit. Further the area for the dumping shall be such the height material shall not exceed more than 30cms.	The dumping of soil maintained as per the instruction and not exceeded more than 30cms during the dumping period.
(III)	The dredged material shall be continuously monitored for its dispersion. In case there is evidence of shoreline changes due to the dredging and disposal the project proponent shall immediately undertake detailed scientific studies and take necessary mitigative steps under intimation to this Ministry.	A Shoreline Monitoring study has been conducted by Indomer Coastal Hydraulics Private Limited which was submitted as part HY Compliance Report. October 2023 to 2024 dated 29.04.204. All the recommendations are being complied with. Latest shoreline monitoring report carried out by KPPL marine department on 27th October to 29th October 2025 is also attached as **Annexure -7**

SIX MONTHLY EC & CRZ COMPLIANCE REPORT FOR THE PERIOD OF OCTOBER TO MARCH 2026

Subject: Environmental and CRZ clearance for expansion of Karaikal Port (Phase II) at Puducherry by M/s. Karaikal Port Pvt. Ltd.

Reference: MoEF&CC's EC & CRZ Clearance letter of No. 10-42/2009-IA. III dated the 22nd September 2009. (including extension of validity dated, 03rd February 2015, 14th May 2018 and amendment dated on 5th August 2021).

Specific Conditions:

Sl.No	Conditions stipulated	Compliance Status
(I)	The quality of both the rivers shall be re assessed and report shall be submitted to the Ministry within three months	Complied. River water quality is being analyzed, and report has submitted to PPCC as well MoEF&CC. Sampling of the river joining the sea near the Port i.e., River Pravadanayar on the North and the river Vettar on the South were reassessed and Report submitted to the Ministry. It is attached as **Annexure-1**
(II)	No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in Coastal Regulation Zone area.	Complied. As per the permission & regulation of PCZMA, the constructions work was carried out.
(III)	Washing from Auction Hall/Sewage shall be treated and the treatment facility shall be provided in accordance with the Coastal Regulation Zone Notification. 1991. The disposal of treated water shall conform the regulation of Puducherry Pollution Control Board.	Complied. The provision of the Auction Hall is not required for the Project. In respect of Sewage Treatment Plant (STP), with a capacity of 32 KLD is being operated for treatment of domestic sewage & treated sewage is being used for green belt development. The quality of treated water is within the norms as per the regulation of PPCC/CPCB/MoEF&CC is at **Annexure 2.**
(IV)	Putrefied and discarded parts of fishes shall be removed and disposed of in the approved landfill/used as manure/poultry feed.	Not applicable.

Sl.No	Conditions stipulated	Compliance Status
(V)	Oil Spills if any shall be properly collected and disposed of as per the Rules.	No Oil Spill occurred in Port premises in normal operations. However, the provisions containing the Oil Spill Contingency Plan are in place with the requisite equipment provided. **Annexure-3**
(VI)	The approach channel shall be properly demarcated with lighted buoys for safe navigation and adequate traffic control guidelines shall be framed. The fishermen shall be suitably educated and informed about the traffic guidelines.	The approach channel is demarcated with lighting buoys for safe navigation and also framed adequate traffic control guidelines. In accordance with international norms requisite provisions are in place and thereby following Navigation and traffic control guidelines. Photograph containing lighted buoys for safe navigation Through Department of Fisheries, Govt. of Puducherry awareness and Education are regularly imparted to the fishermen including the said traffic guidelines. Buoys photos are attached as **Annexure-4**
(VII)	The project proponent shall set up separate environmental management cell for effective implementation of the stipulated environmental safeguards under the supervision of a Senior Executive.	Karaikal Port Private Limited is an ISO 14001 certified Port and certificate of the same is attached as **Annexure 5**. A Separate Environment Management Cell is in place in KPPL for implementation of the Environment Safeguards stipulated. The EMC is attached as **Annexure 6.**
(VIII)	The project proponent shall take 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.	KPPL port has maintained in house Nursery of indigenous variety, and a variety of plantations are maintained in the nursery with adequate personnel including specialized draught resistance and fruit yielding Palm species. Requisite funds are being allocated to maintain the greenery on basis of annual as a part of Environment Management Plan. The Overall 3.8 lakhs saplings are planted in around the Port premises, last six months port has planted 1567 saplings.
(IX)	The funds earmarked for environment management plan	The funds earmarked for Environment Management Plan will be used for only

<table>
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<tr><td></td><td>shall be included in the budget and this shall not be diverted for any other purposes.</td><td>Environment purposes. The funds are being used for the following purposes. Mechanized Coal handling facility, CAAQM, Monitoring, recurring expenses of nursery and maintenance of plantation, O&M of Dust Suppression System, Truck Tyre Wash System, STP, ETP, Environment Infrastructure. KPPL has spent an amount of Rs.122.9lakhs for the environmental management during the last six months.

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Sl.No	Conditions stipulated	Compliance Status
(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.	The workers involved for Construction were inhabited nearby areas of the Project site. During construction phase, potable water supply and sanitation were arranged. However, for the skilled construction workers accommodation was arranged and maintain sanitation.
(II)	Appropriate measures must be taken while undertaking digging activities to avoid any likely degradation of water quality.	Complied. The advanced technological practices were used to do digging the areas.
(III)	Borrow sites for each quarry sites 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. (b) No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations. (c) Excavation work shall be done in close consultation with the Conservation and watershed Development Agencies working in the area, and	Construction activities as per Phase II of the project was completed and port is in operation. No excavation or dumping is carried out on private party land and in the Project area there is no wetland and forest. No excavation is required to implement the Project. This condition is not applicable.

Sl.No	Conditions stipulated	Compliance Status
	(d) Construction spoils including bituminous material and other hazardous materials must not be allowed to contaminate water courses and the damp sites for such materials must be secured so that they shall not leach into the ground water.	During the construction activities there are no such hazardous materials generated.
(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 in this regard.	Construction completed, M/s MARG Constructions Limited was assigned the Construction activity of this Project. The construction material obtained from approved authorized quarries outside the Project area only. The certificate to this effect is attached as **Annexure -7.**
(V)	Adequate precautions shall be taken during transportation of the construction material so that it does not affect the environment adversely.	Necessary precautionary measures were taken during transportation.
(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 measures and other environmental protection activities.	KPPL is being extending support to Statutory bodies from the Ministry/Regional Office/ PPCC during the inspection. Furnishing the details pertaining to KPPL is submitted in time to the Committee.

Sl.No	Conditions stipulated	Compliance Status
(VII)	Ministry of Environment & Forests or any other competent authority may stipulate any additional conditions or modify the existing ones, if necessary in the interest of environment and the same shall be complied with.	Agree to comply.
(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.	Noted and agreed upon.
(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 & Forests.	Noted and agreed upon.
(X)	The project proponents shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of land development work.	On 12th June 2009, Financial Closure was achieved.
(XI)	Puducherry Pollution Control Board shall display a copy of the clearance letter at the Regional Office, District Industries Center and Collector's Office/Tehsildar's office for 30 days.	Complied by Puducherry Pollution Control Committee
(XII)	These stipulations would be enforced among others under the provisions of water (Prevention & Control of Pollution) Act 1974, the Air (Prevention and Control of Pollution) Act 1981, the	complied.

Sl.No	Conditions stipulated	Compliance Status
	Environment (Protection) Act, 1986, the Public Liability (Insurance) Act 1991 and EIA Notification 1994, including the amendments and rules made thereafter.	
(XIII)	All other statutory clearances such as the approvals for storage of diesel from Chief Controller of Explosives. Fire Department, Civil Aviation Department, Forest Conservation Act, 1980 and wildlife (Protection) Act, 1972 etc. Shall be obtained as applicable by project proponents from the respective competent authorities.	Requisite Clearances obtained from the Competent Authorities concerned by KPPL. The same are attached as **Annexure 8**.
XIV	The project proponent shall advertise in at two local Newspapers widely circulated in the region, one of which shall be in the vernacular language informing, that the project has been accorded Environmental Clearance and copies of Clearance letters are available with the Puducherry Pollution Control Board and may also be seen on the website of the Ministry of Environment & Forests at http://www.enfor.nic.in. The advertisement should be made within 10 days from the date of the receipt of the Clearances letter and a copy of the same should be forwarded to the Regional Office of this Ministry.	Complied. It is attached as **Annexure-9**
XVI	Environmental Clearance is subject to final order of the Hon'ble	Noted

Sl.No	Conditions stipulated	Compliance Status
	Supreme Court of India in the matter of Goa Foundations Vs. Union of India in Writ Petition (Civil) No.460 of 2004 as may be applicable to this project.	
XVII	Any appeal against the Environment Clearance shall be with the National Environment Appellate Authority, if preferred, within a period of 30 days as prescribed under Section 11 off the National Environment Appellate Act, 1997.	Noted
XVIII	A copy of Clearance letter shall be sent by the proponent to concerned Panchayat,Zilla Parisad/Municipal Corporation. Urban Local body and the Local NGO, if any, from whom suggestions/representations, if any, were received while processing the proposal. The clearance letter shall also be put on the website of the company by the proponent.	Copy of the Clearance letter sent by KPPL to the said concerned Agencies. The clearance letter also shared on the website (www.karaikalport.com) of the company.
XIX	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 level namely SPM, RSPM, SO_2, NOx (Ambient levels as well as stack emissions) or critical sectoral	Complied. Environmental monitoring work is being carried out by agency M/s Chennai Mettex Private limited, approved by MoEF&CC, including baseline studies such as terrestrial, and marine studies. The copy of the report is being submitted to MoEF&CC, Regional Office at Chennai and Puducherry Pollution Control Committee. The average result of AAQ is for North Vanjore PM 10-42.6, PM2.5-18.8, So2-7.2, No2-7.5 and the average result of Keezha

Sl.No	Conditions stipulated	Compliance Status
	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.	Vanjore is PM 10-.57.6, PM2.5-28.5, So2-11.5, No2-14.5, and for Nagore average result PM 10-.49.6, PM2.5-24.5, So2-10.4, No2-12.6. and STP treated water reports are TSS-24.1mg, TDS - 1836, BOD- 14mg, COD-69mg.
XX	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated EC conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the SPCB	Six-month Compliance report is being submitted to the Regional Office of the MoEF&CC at Chennai, CPCB Zonal Office at Chennai / Bangalore & PPCC at Puducherry.
XXI	The environmental Statement for each financial year ending 31st March in Form-V as is mandated to be submitted by the project proponent to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986 as amended subsequently shall also be put on the website of the company along with the status of compliance of EC conditions and shall also be sent to the respective Regional Offices of MoEF by e-mail.	The environmental Statement for each Financial Year ending 31st March in Form-V submitted regularly to PPCC, Puducherry & RO/MOEF&CC at Chennai Latest Statement ending 31st March 2025. It is attached as Annexure.10
Present Status of Project: Project construction has been completed.		

Subject: Amendment of Construction of Berth No.4 instead of Berth No.7 at Karaikal Port (Phase-II) at Puducherry by M/s Karaikal Port Private Limited - Reg
Reference: MoEF&CC Letter No. 10-42/2009-IA-III dated 20.05.2011

4. Specific Conditions:

Sl.No	Conditions stipulated	Compliance Status
(I)	The shoreline map prepared by Institute for ocean management, Chennai with regard to the stretch at Karaikal port has be examined and it is observed that on the southern side of the port, the area is shown as medium accretion while, on the northern side the area is shown as medium erosion. This is because the net littoral drift is towards the northern side and due to the breakwater at the southern port there seems to be accretion at the southern breakwater and medium erosion on the northern side. This reveals that the existing measures for beach nourishment maintenance of shoreline are insufficient. Those have to be rectified by adopting suitable measures viz. sand bypass system from south breakwater to the northern side of the north breakwater. The port shall submit the details of action taken to the ministry within 2 months.	**Complied.** The shoreline is being monitored regularly. The shoreline report depicts that there is no significant differences in the coast. The shoreline monitoring conducted in April 2025 is attached as **Annexure 11**
(II)	The port shall adopt suitable measures viz. sand bypass system from south breakwater to the northern side of the north breakwater. The port shall submit the details of action taken to the ministry within 2 Months.	**Complied.** As mentioned above, the shoreline report depicts that there are no significant differences in the coast. Hence this specific condition is not applicable at present. However regular shoreline monitoring will

Sl.No	Conditions stipulated	Compliance Status
		be conducted to check for the requirement.
(III)	There shall be regular monitoring on the shoreline changes and report be submitted to the Ministry at Regional Office, Bangalore with six monthly monitoring report.	**Complied.** Shoreline monitoring reports are being submitted to the Ministry at the Regional office. Copy of compliance report is also attached as **Annexure 11.**
(IV)	"Consent for Establishment" shall be obtained from Puducherry Pollution Control Committee under Air and Water Act and a copy shall be submitted to the Ministry before start of any construction work at the site.	**Complied.** A No Objection Certificate from the Pollution Angle was issued by the Puducherry Pollution Control Committee. All the conditions imposed in the said NOC are being strictly Complied. A copy of the NOC is attached as **Annexure 12.**
(V)	Construction shall be carried out strictly as per the provisions of CRZ Notification, 1991. No construction work other than those permitted in Coastal Regulation Zone Notification shall be carried out in coastal regulation zone area.	**Complied.** Construction was carried out strictly as per the provisions of CRZ Notification.
(VI)	There shall be no disposal of solid and liquid wastes in to the coastal areas.	**Complied.** There is no disposal of solid and liquid wastes into the coastal areas. A necessary waste management plan is in place for the Karaikal Port. The ships visiting the Port are adhering to the applicable regulations such as MARPOL.

Sl.No	Conditions stipulated	Compliance Status
(VII)	Dust control measures shall be installed wherever required in the coal handling areas.	**Complied.** Port has Mechanized Coal Handling System which includes Ship Unloaders, Conveyors, Stacker cum Reclaimers, Wagon Loading & Truck Loading Systems etc are in place and operational. This infrastructure helps in achieving efficient operations and in maintaining clean environment. Highly efficient water sprinkling/ spraying system for dust suppression have been installed to address the coal dust emission. Corrugated sheets of various heights of wind breaking wall have been put along the Coal Stock yards, boundary & Railway sidings. State of the art Tyre wash system is in place where the effluent after treatment is reused in the same unit. Dedicated Tankers are engaged for wetting the coal yards, Roads etc., Port has three tier Green Belt in all the boundaries. Photographs of the Environmentally Friendly initiatives have been attached as **Annexure 13.**
(VIII)	The leachate from the coal yard shall be properly collected and passed	**Complied.**

Sl.No	Conditions stipulated	Compliance Status
	through settling tanks before reuse / recycling.	KPPL has installed a treatment plant to address the leachate from the coal yard. Photographs of the treatment plants are attached as **Annexure 14.**
IX.	All other conditions shall remain unchanged.	Noted for Compliance.

Subject: Expansion of Karaikal Port (Phase-II) at Puducherry by M/s Karaikal Port Pvt. Ltd. – Further consideration for Amendment in Environmental and CRZ Clearance – Amendment to Environmental and CRZ Clearance. Dated 5th August 2021.

DESCRIPTIVE REPORT ON STATUS OF COMPLIANCE TO THE CONDITIONS OF ENVIRONMENTAL CLEARANCE AND ENVIRONMENTAL MANAGEMENT

Specific Conditions:

Sl.No	Conditions stipulated	Compliance Status
(I)	The cargo which are permitted by the Ministry vide its letter No. 10-2/2006 dated 06th May 2006 and letter No. 10-42/2009-IAIII dated 22nd September 2009 and the cargo which are permitted by Puducherry Pollution Control Committee vide its letter No. PPCC/CON/AIR/TRP/KKL/JE/2019/800 dated 7th November, 2019 is only permissible. No other cargo other than permissible cargos as mentioned in the above letters and as per the revised nomenclature is permitted.	Noted
(II)	All other conditions mentioned in the letter No. 10-2/2006 dated 06th May 2006, letter No. 10-42/2009-IAIII dated 22nd September 2009 and letter No. PPCC/CON/AIR/TRP/KKL/JE/2019/800 dated 7th November. 2019 shall remain unchanged.	Noted

Annexure 3

Karaikal Port Private Limited 3rd Party Marine Water - Break Water Area Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'21.52"**	**N 10°50'20.76"**	**N 10°50'19.81"**	**N 10°50'20.81"**	**N 10°50'20.44"**	**N 10°50'19.83"**
Longitude:			**E 79°51'23.86"**	**E 79°51'22.93"**	**E 79°51'16.19"**	**E 79°51'21.92"**	**E 79°51'21.30"**	**E 79°51'20.57"**
Salinity	%	By Argentometric Titration	3.54	3.79	3.86	3.82	4.02	3.84
pH @ 25˚C	-	IS:3025 Part 11-2022 (electromagnetic method)	7.66	7.34	7.42	7.14	7.05	7.58
Temperature	˚C	IS:3025 Part 9-2023	28	26	27	25	24	27
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013	44980	41710	45600	43320	41140	45200
Turbidity	NTU	IS:3025 Part 10-2023	3.42	8.9	1.96	2.9	2.9	5.4
Total Suspended Solids	mg/l	IS:3025 Part 17-2022	12	19	22	15	14	17
Total Dissolved Solids	mg/l	IS:3025 Part 16-2023	41359	35920	36142	36348	37094	36860
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.4	6.2	6.1	5.7	5.3	6.8
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-2023	5.7	5	6	8	4	3.6
COD	mg/l	IS:3025 Part 58-2023	21	20	22	28	19	22
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	20783	20618	20948	20784	21860	20670
Sulphate as SO_4	mg/l	IS:3025 Part 24/Sec-1 - 2022	2183	1862	1842	2262	2036	2190
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12694	14026	14148	14220	14510	12920
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (EDTA titrimetric method)	1397	1242	1288	1460	1420	1289
Magnesium as Mg	mg/l	IS:3025 Part 46-2023	1784	1710	1684	1842	1872	1704
Potassium as K	mg/l	IS:3025 Part 45 -1993(Flame photometric method)	953	914	936	976	994	891
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (1,10 phenanthroline method)	0.36	0.52	0.58	0.44	0.57	0.51
Zinc as Zn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34 : 1988	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	APHA 24th Edn. 2023 - 4500 NO3 - B	5.94	6.17	6.12	6.94	7.62	BDL
Free Ammonia NH_3	mg/l	IS:3025 Part 34 - 1988 (Nesslerization Method)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Macro - Kjedahl Method)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	3025 Part 31/ Sec 1 - 2022 (Stannous Chloride metho	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Heterpoly blue method)	0.79	0.54	0.58	0.62	0.59	0.64
Total Coliform	MPN/100ml	APHA 24th Edition 9221 B	280	340	240	350	240	430
Faecal Coliforms	MPN/100ml	APHA 24th Edition 9221 E	170	110	70	63	63	84

PHYTOPLANKTON								
Total Cell Count	Nollit		33,700	33,100	31,900	31,200	32,300	32,900
Total Geneus	Nos		10	10	10	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratiumsp	Triceratiumsp
			Triceratiumsp	Triceratiumsp	Triceratiumsp	Triceratiumsp	Bacillariasp	Bacillariasp
			Bacillariasp	Bacillariasp	Bacillariasp	Bacillariasp	Protoperidinim Sp	Protoperidinim Sp
			Protoperidinim Sp	Protoperidinim Sp	Protoperidinim Sp	Protoperidinim Sp	Ditylum sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus Sp	Coscinodiscus Sp
			Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus Sp	Planktoniella Sol	Planktoniella Sol
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Skeletonema costatum	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		24,900	24,200	23,100	22,900	23,700	24,600
Total Geneus	Nos		7	6	6	6	7	7
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Isias Sp	Isias Sp	Isias Sp	Nannocalanus	Nannocalanus
			Isias Sp	Dioithiona	Dioithiona	Dioithiona	Isias Sp	Isias Sp
			Dioithiona	Oithiona sp	Oithona sp	Oithona sp	Centropages	Centropages
			Oithiona sp				Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		30,500	30,700	30,200	29,100	29,300	30,800
Faunal Groups	Nos		6	5	5	5	5	6
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Arthropoda Crustacea
			Animalia Rotifera	Protozoa Foraminifera	Protozoa Foraminifera	Protozoa Foraminifera	Protozoa Foraminifera	Animalia - Rotifera
			Protozoa Foraminifera	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Protozoa Foraminifera
			Chordata Fish Egg	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Chordata Fish Egg
			Protozoa Polyhymenophora					Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Break Water Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	21.01.2026	11.02.2026	10.03.2026
Latitude:			**N 10°50'21.52"**	**N 10°50'20.76"**	**N 10°50'19.81"**	N 10°50'20.81"	N 10°50'20.44"	N 10°50'19.83"
Longitude:			**E 79°51'23.86"**	**E 79°51'22.93"**	**E 79°51'16.19"**	E 79°51'21.92"	E 79°51'21.30"	E 79°51'20.57"
pH @ 25°C (1:10 ratio)	-	IS:2720 Part 26-1987 (Reaff:2016)	7.56	7.59	7.21	7.38	7.56	7.46
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	3.09	2.14	2.58	2.19	3.29	2.15
Zinc as Zn	mg/Kg		56.3	61.7	79.8	57.9	77.3	58.1
Manganese as Mn	mg/Kg		326	477	348	391	654	362.77
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.6	28.9	18.62	24.3	26.9	45.58
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 23rd Edn. 2017 – 4500 NO_2-B	0.63	0.68	0.87	0.55	0.38	0.36
Nitrate as NO_3	mg/Kg	APHA23rd Edn. 2017 – 4500 NO_3-B	696	683	625	623	751	746
Free Ammonia as NH_3	mg/Kg	APHA 23rd Edn. 2017 – 4500 NH_3-B,C	3.82	3.76	4.16	2.71	3.22	3.64
Total Nitrogen	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	979	957	836	893	948	968
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	358	451	484	468	441	297.86
Total Phosphate as P	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	361	463	489	486	447	304.64
Silica as SiO_2	%	IS: 1917 Part-3 – 1992 (Reaff: 2005)	60.1	62.34	51.4	59.37	63.54	65.46
OIL & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9203	10327	8692	11087	11734	9109
Nickel as Ni	mg/Kg		25.62	42.8	35.2	37.8	39.5	21
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae, Bolivintidae, Hauerinidae, Gastropoda & Bivalvia, Nematodes & Crustaceans			170	160	150	150	160	160
MEIOBENTHOS								
Nematods, Foraminifera sp, Gastropod Larvae, Bivalves Larvae & Fish eggs			740	720	690	670	710	720
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Karaikal Port Private Limited 3rd Party Effluent Treatment Plant Outlet Water Analysis Results 2025 - 2026										
Sl.No.	**Test Parameters**	**Unit**	**Protocol**	**CPCB Max. Permissible Limits for (Marine Coastal Areas)**	**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
1	pH @ 25°C	-	IS 3025 Part 11 - 2022 (electrometric method)	5.5 to 9.0	7.53	7.13	7.53	7.76	8.13	7.61
2	Total Dissolved Solids	mg/l	IS 3025 Part 17 - 2022	100 mg/l	2053	5490	1824	4880	2318	2946
3	Total Suspended Solids	mg/l	IS 3025 Part 16 -2023	--	14	12	94	14	16	76
4	Oil & Grease	mg/l	IS 3025 Part 32 -1988 (Argentometric Method)	--	6	3	14	4	6	8
5	COD	mg/l	IS 3025 Part 24/Sec 1 - 2022 (Turbidity method)	--	32	24	226	32	39	69
6	BOD @ 27°C for 3 days	mg/l	IS:3025 Part 39:2021	20 mg/l	9	6.0	77	8	12.0	11
7	Total Kjeldahl Nitrogen	mg/l	IS 3025 Part 44 - 2023	100 mg/l	5.8	10	144.9	9	6.3	6.4
8	Sulphate as SO_4	mg/l	IS 3025 Part 58-2023	250 mg/l	132	469	287.9	412	158	242
9	Ammonical Nitrogen	mg/l	IS 3025 Part 34 -1988 (Macro-Kjeldahl Method)	--	4.9	6.8	140	6.9	5.6	5.6
10	Chloride as Cl	mg/l	IS 3025 Part 34 -1988 (Titrimetric Method)	--	624	2794	874.2	1898	682	742
11	Faecal Coliforms	MPN/100ml	APHA 24thEdn. 2023 : 9221 'E'	--	70	120	350	<1.8	110	94
Note : BDL - Below Detection Limit, DL - Detection Limit,MPN - Most Probable Number . NS - Not Specified.										

Karaikal Port Private Limited 3rd Party Harbour Basin Marine Water Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'13.74"**	**N 10°50'13.23"**	**N 10°50'14.03"**	**N 10°50'06.63"**	**N 10°49'54.89"**	**N 10°49'45.59"**
Longitude:			**E 79°50'55.06"**	**E 79°50'54.68"**	**E 79°50'55.24"**	**E 79°50'56.07"**	**E 79°51'01.56"**	**E 79°51'34.85"**
Salinity	%	By Argentometric Titration	3.56	3.93	3.89	3.77	3.96	3.85
pH @ 25˚C	-	IS:3025 Part 11-2022 (electromagnetic method)	7.91	7.25	7.34	7.17	7.19	4.49
Temperature	˚C	IS:3025 Part 9-2023	28	26	27	25	24	28
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013	44860	42690	45200	42910	40380	45300
Turbidity	NTU	IS:3025 Part 10-2023	3.62	6.2	2.2	1.7	2.2	5.7
Total Suspended Solids	mg/l	IS:3025 Part 17-2022	14	14	16	10	12	21
Total Dissolved Solids	mg/l	IS:3025 Part 16-2023	41440	37010	36948	36084	36388	36920
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.3	6.4	6.3	6.6	6.1	7
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-2023	6.1	6	5	5	4	4
COD	mg/l	IS:3025 Part 58-2023	22	24	20	22	16	23
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	21643	21360	21148	20492	21544	20710
Sulphate as SO_4	mg/l	IS:3025 Part 24/Sec-1 - 2022	2134	1994	1884	2134	1932	2216
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12574	14492	14864	14968	14070	12860
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (EDTA titrimetric method)	1428	1380	1412	1426	1342	1292
Magnesium as Mg	mg/l	IS:3025 Part 46-2023	1732	1834	1898	1810	1796	1724
Potassium as K	mg/l	IS:3025 Part 45 -1993(Flame photometric method)	873	969	958	949	922	886
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (1,10 phenanthroline method)	0.35	0.48	0.52	0.35	0.55	0.55
Zinc as Zn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34 : 1988	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	APHA 24th Edn. 2023 - 4500 NO3 - B	6.23	6.2	6.32	6.42	7.36	5.67
Free Ammonia NH_3	mg/l	IS:3025 Part 34 - 1988 (Nesslerization Method)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Macro - Kjedahl Method)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	3025 Part 31/ Sec 1 - 2022 (Stannous Chloride meth	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Heterpoly blue method)	0.69	0.59	0.54	0.57	0.52	0.61
Total Coliform	MPN/100ml	APHA 24th Edition 9221 B	350	210	350	430	350	280
Faecal Coliforms	MPN/100ml	APHA 24th Edition 9221 E	<1.8	110	110	280	84	70

PHYTOPLANKTON								
Total Cell Count	Nollit		31,200	32,300	30,400	30,700	31,800	30,700
Total Geneus	Nos		9	9	9	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratium sp
			Triceratium sp	Triceratium sp	Triceratium sp	Triceratium sp	Triceratium sp	Bacillaria sp
			Bacillaria sp	Bacillaria sp	Bacillaria sp	Bacillaria sp	Bacillaria sp	Protoperidinim sp
			Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus sp
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Coscinodiscus sp	Coscinodiscus sp	Planktoniella Sol
						Planktoniella Sol	Planktoniella Sol	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		21,700	22,900	22,500	21,800	23,100	22,900
Total Geneus	Nos		6	6	6	5	6	6
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Nannocalanus	Nannocalanus	Isias sp	Isias sp	Isias sp
			Dioithiona	Dioithiona	Dioithiona	Oithona sp	Centropages	Centropages
			Oithiona sp	Oithiona sp	Oithona sp		Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		29,400	29,400	29,600	28,700	29,100	30,600
Faunal Groups	Nos		5	5	5	5	5	5
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Animalia - Rotifera
			Animalia Rotifera	Animalia Rotifera	Animalia - Rotifera	Animalia - Rotifera	Protozoa - Foraminifera	Protozoa - Foraminifera
			Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg
			Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Harbour Basin Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°49'13.74"**	**N 10°50'13.23"**	**N 10°50'14.03"**	**N 10°50'06.63"**	**N 10°49'54.89"**	**N 10°49'45.59"**
Longitude:			**E 79°50'55.06"**	**E 79°50'54.68"**	**E 79°50'55.24"**	**E 79°50'56.07"**	**E 79°51'01.56"**	**E 79°51'34.85"**
pH @ 25˚C (1:10 ratio)	-	20 Part 26-1987 (electromagnetic me	7.5	7.52	7.28	7.58	7.49	7.38
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	3.14	2.09	2.5	2.31	3.31	2.28
Zinc as Zn	mg/Kg		56.24	70.32	68.4	51.8	81.3	58.7
Manganese as Mn	mg/Kg		339	443	362	367	637	464.68
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.6	33.1	17.5	25.1	56.8	46.11
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B	0.58	0.65	0.74	0.57	0.36	0.32
Nitrate as NO_3	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B	700	653	668	603	729	736
Free Ammonia as NH_3	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B,C	3.94	3.76	3.96	2.83	3.37	3.48
Total Nitrogen	mg/Kg	IS : 10158 - 1982	890	938	876	901	964	968
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982	357	441	476	459	419	298.26
Total Phosphate as P	mg/Kg	IS : 10158 - 1982	361	453	473	476	426	306.87
Silica as SiO_2	%	IS: 1917 Part-3 – 1992	58.68	60.87	54.2	60.37	62.81	64.86
Oil & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9192	10234	8670	11023	11834	9287
Nickel as Ni	mg/Kg		25.81	32.6	42.6	37.3	40.27	21.27
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	1.69
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae,Bolivintidae,Hauerinidae,Gastropoda & Bivalvia, Nematodes & Crustaceans			130	150	140	130	150	160
MEIOBENTHOS								
Nematodes,Foraminifera sp, Gastropoda Larvae, Bivalvia Larvae & Fish eggs.			720	710	680	650	680	690
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Sampling Locations: 1. North Vanjoor 2. Keezha Vanjoor . 3. Nagore Village.

Month		Oct-25		
Date of Sampling		14.10.2025 to 15.10.2025		
S.No	**Time**	**1.Leq dB(A)**	**2.Leq dB(A)**	**3.Leq dB(A)**
1	**07.00 AM**	44.9	47.6	45.3
2	8	45.6	49.3	46.8
3	9	46.8	50.1	48.2
4	10	48.2	51.8	49.1
5	11	47.3	51.3	47.6
6	**12.00 PM**	47.1	50.9	47.2
7	1	46.8	50.4	48.6
8	2	46.5	51.6	48.3
9	3	46.2	52.9	47.9
10	4	46.7	51.3	47.2
11	5	47.2	53.4	47.8
12	6	48.3	52.7	48.3
13	7	47.5	50.9	49.5
14	8	46.1	49.3	50.2
15	9	45.9	47.2	48.3
16	10	45.1	45.6	47.1
17	11	44.6	45.1	46.2
18	**12.00 AM**	44.2	44.8	44.5
19	1	43.8	43.9	42.9
20	2	43.5	43.1	42.5
21	3	42.9	43.5	42.1
22	4	43.1	44.2	43.4
23	5	44.5	45.6	45.2
24	6	45.2	46.7	46.7

Karaikal Port Private Limited 3rd Party Port Entrance Channel Marine Water Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**10.03.2026**	**10.03.2027**
Latitude:			**N 10°50'21.53"**	**N 10°50'22.45"**	**N 10°50'21.86"**	**N 10°50'20.81"**	**N 10°50'56.38"**	**N 10°50'56.38"**
Longitude:			**E 79°51'23.88"**	**E 79°51'24.61"**	**E 79°51'23.95"**	**E 79°51'30.27"**	**E 79°52'03.57"**	**E 79°52'03.57"**
Salinity	%	By Argentometric Titration	3.57	3.88	4	3.71	3.82	3.82
pH @ 25˚C	-	IS:3025 Part 11-1983 (Reaff:2017)	7.51	7.21	7.26	7.2	7.61	7.61
Temperature	˚C	IS:3025 Part 9-1984 (Reaff:2017)	28	26	27	25	27	27
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013 (Reaff:2019)	45600	42180	44890	42640	45400	45400
Turbidity	NTU	IS:3025 Part 10-1984 (Reaff:2017)	3.47	16.8	1.8	1.3	5.8	5.8
Total Suspended Solids	mg/l	IS:3025 Part 17-1984 (Reaff:2017)	11	28	26	6	19	19
Total Dissolved Solids	mg/l	IS:3025 Part 16-1984(Reaff:2017)	41380	36640	38896	35662	36940	36940
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.2	6.3	6.5	6.1	6.5	6.5
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-1993 (Reaff:2019)	6	7	7	6	5	5
COD	mg/l	IS:3025 Part 58-2006 (Reaff:2017)	19	27	24	24	26	26
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	20868	21140	21740	20180	20546	20546
Sulphate as SO_4	mg/l	IS:3025 Part 24-1986 (Reaff:2019)	2187	1940	1898	2044	2240	2240
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12976	14240	14898	13814	12940	12940
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (Reaff:2019)	1403	1310	1390	1380	1294	1294
Magnesium as Mg	mg/l	IS:3025 Part 46-1994 (Reaff:2019)	1798	1776	1828	1774	1698	1698
Potassium as K	mg/l	IS:3025 Part 45 -1993(Reaff:2019)	894	934	958	921	906	906
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (Reaff:2019)	0.31	0.59	0.68	0.31	0.49	1.49
Zinc as Zn	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 2:2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 48 -1994(Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	6.14	6.29	6.46	6.2	5.9	6.9
Free Ammonia NH_3	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Reaff:2019)	0.81	0.65	0.68	0.54	0.73	0.73
Total Coliform	MPN/100ml	APHA 23rd Edn 2017:9221 B	540	520	350	540	350	350
Faecal Coliforms	MPN/100ml	APHA 23rd Edn 2017:9221 E	110	130	94	94	46	46

PHYTOPLANKTON								
Total Cell Count	Nollit		34,100	33,400	32,100	31,600	32,900	33,300
Total Geneus	Nos		10	10	10	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceroa	Ceratium Macroceroa	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratium sp	Triceratium sp
			Triceratium Sp	Triceratium Sp	Triceratium sp	Triceratium sp	Bacillaria sp	Bacillaria sp
			Bacillaria Sp	Bacillaria Sp	Bacillaria sp	Bacillaria sp	Protoperidinim sp	Protoperidinim sp
			Protoperinim Sp	Protoperinim Sp	Protoperidinim sp	Protoperidinim sp	Ditylum sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus sp	Coscinodiscus sp
			Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus sp	Coscinodiscus sp	Planktoniella Sol	Planktoniella Sol
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Skeletonema Costatum	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		25,600	24,300	23,800	23,200	23,700	54,100
Total Geneus	Nos		7	6	6	6	7	7
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Isias Sp	Isias sp	Isias sp	Nannocalanus	Nannocalanus
			Isias Sp	Dioithona	Dioithiona	Dioithiona	Isias sp	Isias sp
			Dioithona	Oithona Sp	Oithona sp	Oithona sp	Centropages	Centropages
			Oithona Sp				Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		32,700	31,200	30,400	28,900	29,300	31,300
Faunal Groups	Nos		6	5	5	5	5	6
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Arthropoda Crustacea
			Animalia Rotifera	Protozoa Foraminifera	Protozoa - Foraminifera	Protozoa - Foraminifera	Protozoa - Foraminifera	Animalia - Rotifera
			Protozoa Foraminifera	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Protozoa - Foraminifera
			Chordata Fish Egg	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Chordata Fish Egg
			Protozoa Polyhymenophora					Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Port Entrance Channel Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'21.53"**	**N 10°50'22.45"**	**N 10°50'21.86"**	**N 10°50'20.81"**	**N 10°50'21.17"**	**N 10°50'56.38"**
Longitude:			**E 79°51'23.88"**	**E 79°51'24.61"**	**E 79°51'23.95"**	**E 79°51'30.27"**	**E 79°51'32.96"**	**E 79°52'03.57"**
pH @ 25˚C (1:10 ratio)	-	720 Part 26-1987 (electrometric meth	7.62	7.52	7.35	7.34	7.29	7.32
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	2.14	2.11	2.48	2.32	3.14	3.98
Zinc as Zn	mg/Kg		56.1	62.1	77.69	58.6	89.34	69.09
Manganese as Mn	mg/Kg		325	439	321	394	627	366.43
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.5	27.3	20.6	22.8	37.64	46.5
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 23rd Edn. 2017 – 4500 NO_2-B	0.68	0.62	0.79	0.79	0.38	0.41
Nitrate as NO_3	mg/Kg	APHA23rd Edn. 2017 – 4500 NO_3-B	702.8	713	654	654	754	758
Free Ammonia as NH_3	mg/Kg	APHA 23rd Edn. 2017 – 4500 NH_3-B,C	3.78	3.84	4.02	4.02	3.47	3.52
Total Nitrogen	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	956	921	860	860	977	986
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	356	428	470	470	429	200.17
Total Phosphate as P	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	360	436	474	474	435	207.04
Silica as SiO_2	%	IS: 1917 Part-3 – 1992 (Reaff: 2005)	59.47	61.34	52.69	52.69	65.87	66.14
OIL & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9200	10597	8654	11254	11987	9145
Nickel as Ni	mg/Kg		22.53	43	38	37.6	43.6	21.51
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	2.04
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae, Bolivintidae, Hauerinidae, Gastropoda & Bivalvia, Nematodes & Crustaceans			170	160	150	150	160	170
MEIOBENTHOS								
Nematodes, Foraminifera sp, Gastropoda Larvae, Bivalvia Larvae & Fish eggs.			750	730	700	690	720	740
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Karaikal Port Private Limited 3rd Party Sewage Treatment Plant Outlet Water Results 2025 - 2026										
Sl.No	**Test Parameters**	**Unit**	**Protocol**	**CPCB Limits (On Land for Irrigation)**	**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
1	pH @ 25°C	-	IS 3025 Part 11 - 2022 (electrometric method)	5.5 – 9.0	7.42	7.29	7.53	7.53	7.62	7.28
2	Total Suspended Solids	mg/l	IS 3025 Part 17 - 2022	200 mg/l	21	26	28	26	23	21
3	Total Dissolved Solids	mg/l	IS 3025 Part 16 -2023	NS	2167	1746	1748	1628	2137	1591
4	Chloride as Cl	mg/l	IS 3025 Part 32 -1988 (Argentometric Method)	NS	502	694	514.8	337	544	598
5	Sulphate as SO_4	mg/l	IS 3025 Part 24/Sec 1 - 2022 (Turbidity method)	NS	122	147	168.2	104	96.0	176
6	Oil & Grease	mg/l	IS:3025 Part 39:2021	10 mg/l	5	5	6	7	8.0	6
7	BOD @ 27°C for 3 days	mg/l	IS 3025 Part 44 - 2023	100 mg/l	12	15	18	14	14.0	14
8	COD	mg/l	IS 3025 Part 58-2023	NS	94	62	94	69	14	82
9	Total Kjeldahl Nitrogen	mg/l	IS 3025 Part 34 -1988 (Macro-Kjeldahl Method)	NS	6.9	16.4	8	18	100	10.4
10	Ammonical Nitrogen	mg/l	IS 3025 Part 34 -1988 (Titrimetric Method)	NS	6.2	14.2	6	15.6	6.8	9.2
11	Faecal Coliforms	MPN/100ml	APHA 24thEdn . 2023 : 9221 'E'	NS	140	350	94	94	220	280
Note : BDL - Below Detection Limit, DL - Detection Limit, NS - Not Specified, MPN - Most Probable Number.										

Karaikal Port Private Limited 3rd Party Surface Water (Vettar River Water) Analysis Results Nov 2025			
Characteristics Test	**Unit**	**Protocol**	**Results**
Date of Sampling			**20.11.2025**
pH @ 25˚C	-	IS:3025 Part 11-2022 (Electrometric method)	7.56
Oil & Grease	mg/l	IS 3025 Part 39 : 2021	4
Total Kjedahl Nitrogen as N	mg/l	IS 3025 Part 34 - 1988 (Macro- Kjedahl Method)	9
BOD @ 27°C for 3 days	mg/l	IS 3025 Part 44 - 2023	BDL
Chemical Oxygen Demand	mg/l	IS 3025 Part 58 - 2023	10
Total Phosphate	mg/l	IS 3025 Part 31/ Sec 1 - 2022 (Stannous chloride method)	0.41
Dissolved Oxygen	mg/l	IS 3025 Part 38: 1989 - (Azide Modification)	6.1
Hexavalent Chromium as Cr6+	mg/l	IS 3025 Part 52 -2003 (diphenyl carbazide method)	BDL
Total Suspended Solids	mg/l	IS 3025 Part 17 - 2022	22
Electrical Conductivity @ 25°C	µmhos/cm	IS 3025 Part 14 - 2013	858
Boron as B	mg/l	IS 3025 Part 65: 2022	0.09
Vanadium as V	mg/l	IS 3025 Part 2 - 2019	BDL
Total Alkalinity as CaCo*3*	mg/l	IS 3025 Part 23 - 2023	117
Potassium as K	mg/l	IS 3025 Part 45 - 1993 (Flame photometry method)	4.02
Cobalt as Co	mg/l	IS 3025 Part 65: 2022	BDL
Total Hardness as CaCO*3*	mg/l	IS 3025 Part 21 - 2009 (EDTA titrimetric method)	7
Ammoniacal Nitrogen as N	mg/l	IS 3025 Part 34 - 1988 (Titrimetric method)	210
Total Dissolved Solids	mg/l	IS 3025 Part 16 - 2023	526
Fluoride as F	mg/l	APHA 24th Edition 2023 - 4500 - F - D	0.52
Sodium as Na	mg/l	IS 3025 Part 45 - 1993 (Flame photometry method)	82
Iron as Fe	mg/l	IS 3025 Part 53 - 2003 (1, 10 phenanthroline method)	0.42
Lead as Pb	mg/l	IS 3025 Part 65: 2022	BDL
Copper as Cu	mg/l	IS 3025 Part 65: 2022	BDL
Zinc as Zn	mg/l	IS 3025 Part 65 : 2022	BDL
Selenium as Se	mg/l	IS 3025 Part 65 : 2022	BDL
Mercury as Hg	mg/l	IS 3025 Part 65: 2022	BDL
Cadmium as Cd	mg/l	IS 3025 Part 65: 2022	BDL
Arsenic as As	mg/l	IS 3025 Part 65 : 2022	BDL
Nickel as Ni	mg/l	IS 3025 Part 65: 2022	BDL
Chromium as Cr	mg/l	IS 3025 Part 65: 2022	BDL
Manganese as Mn	mg/l	IS 3025 Part 65: 2022	BDL
Chloride as Cl	mg/l	IS 3025 Part 32 - 1988 (Argentometric Method)	190
Sulphate as SO4	mg/l	IS 3025 Part 24/Sec 1 - 2022	20
Nitrate Nitrogen as NO3 - N	mg/l	APHA 23rd Edition 2017 - 4500 -NO3 B	5.4
Total Coliform	MPN/100ml	APHA 24th Edn.2023 - 9221 B	540
Faecal Coliforms	MPN/100ml	APHA 24th Edn.2023 - 9221 E	94
Salmonella	NA	APHA 24th Edn.2023 - 9274 B	Absent/100 ml
Vibrio cholerae	NA	APHA 24th Edn.2023 - 9278 B	Present/100 ml
Enterobacteriaceae	cfu/ml	ISO 21528 Part 2 - 2017	260
Note: BDL - Below Detection Limit, APHA - American Public Health Association, cfu - colony forming unit			

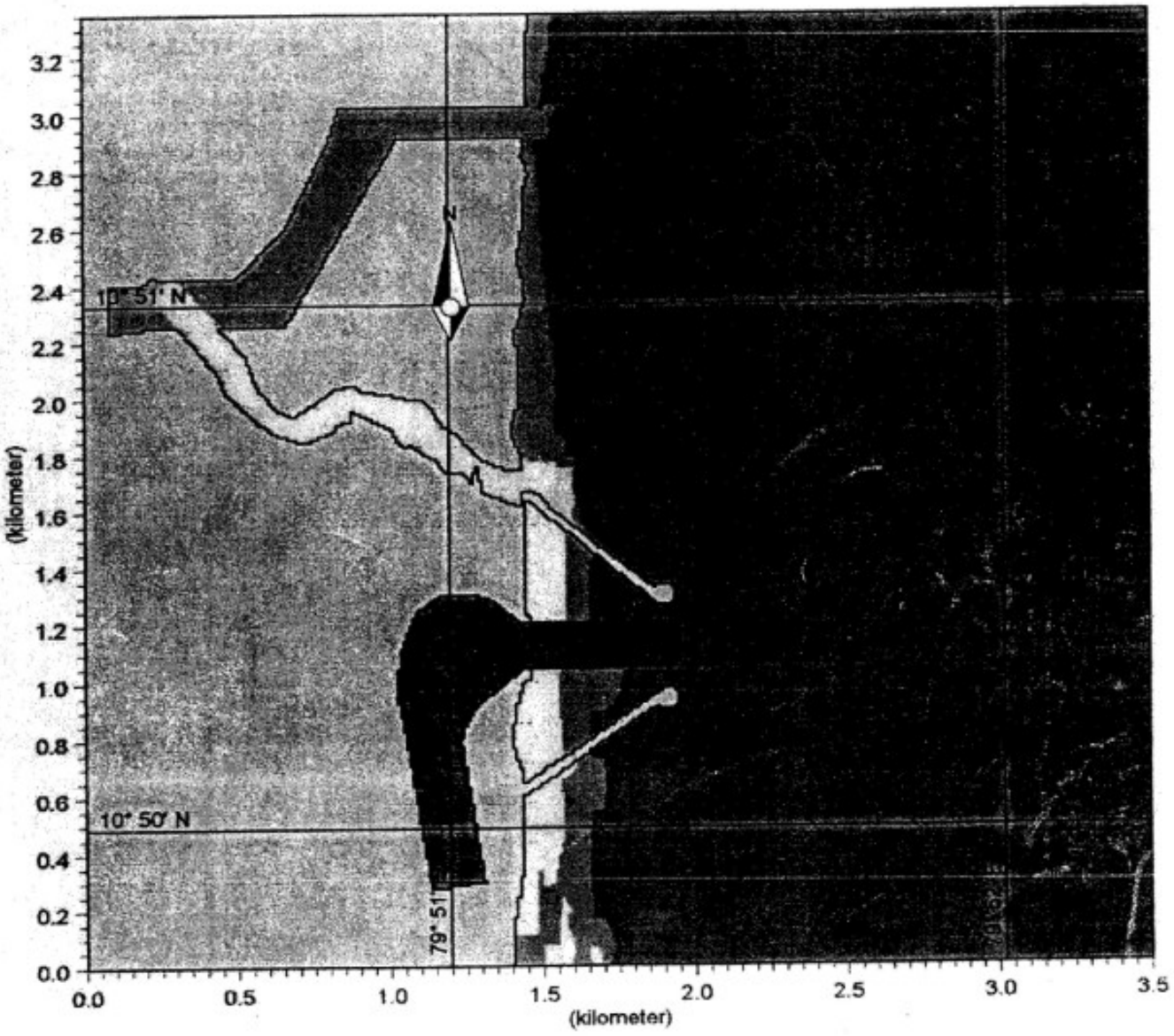
KARAIKAL PORT AAQ MONITORING REPORT

Sl.No	Location	Parameter & Unit	CPCB Standard	Oct-25		Nov-25		Dec-25		Jan-26		Feb-26		March		Annual Average
				14.10.2025 10.15 AM to 15.10.2025 10.15 AM	15.10.2025 10.45 AM to 16.10.2025 10.45 AM	19.11.2025 9.30 AM to 20.11.2025 9.30 AM	20.11.2025 10.15 AM to 21.11.2025 10.15 AM	18.12.2025 9.45 AM to 19.12.2025 9.45 AM	19.12.2025 10.30 AM to 20.12.2025 10.30 AM	21.01.2026 9.15 AM to 22.01.2026 9.15 AM	22.01.2026 10.00 AM to 23.01.2026 10.00 AM	11.02.2026 9.45 AM to 12.02.2026 9.45 AM	12.02.2026 10.15 AM to 13.02.2026 10.15 AM	09.03.2026 9.00 AM to 10.03.2026 9.00 AM	10.03.2026 9.30 AM to 11.03.2026 9.30 AM	
1	North Vanjore Lat: N 10° 51′08.8012″ Long: E 79° 50′49.0668″	PM10 µg/m³	100 µg/m³	49.2	48.4	42.7	46.7	40.7	43.4	38.4	40.4	39.7	43.2	41.2	36.8	**42.6**
2		PM2.5 µg/m³	60 µg/m³	23.4	22.8	18.4	20.9	17.5	19.8	16.2	17.5	16.8	18.3	17.6	16.4	**18.8**
3		SO2 µg/m³	80 µg/m³	7.8	6.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**7.2**
4		NO2 µg/m³	80 µg/m³	9.1	8.7	7.9	8.2	6.5	7.5	6.6	6.9	6.9	7.8	7.1	7.2	**7.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 10.45 AM to 15.10.2025 10.45 AM**	**15.10.2025 11.15 AM to 16.10.2025 11.15 AM**	**19.11.2025 10.15 AM to 20.11.2025 10.15 AM**	**20.11.2025 11.00 AM to 21.11.2025 11.00 AM**	**18.12.2025 10.30 AM to 19.12.2025 10.30 AM**	**19.12.2025 11.15 AM to 20.12.2025 11.15 AM**	**21.01.2026 10.00 AM to 22.01.2026 10.00 AM**	**22.01.2026 10.45 AM to 23.01.2026 10.45 AM**	**11.02.2026 10.30 AM to 12.02.2026 10.30 AM**	**12.02.2026 11.00 AM to 13.02.2026 11.00 AM**	**09.03.2026 9.30 AM to 10.03.2026 9.30 AM**	**10.03.2026 10.00 AM to 11.03.2026 10.00 AM**	
1	Keezha Vanjore Lat: N 10° 50′06.2628″ Long: E 79° 50′23.1006″	PM10 µg/m³	100 µg/m³	59.9	59.2	52.8	56.2	55.8	57.1	58.2	63.4	60.8	56.3	58.7	52.7	**57.6**
2		PM2.5 µg/m³	60 µg/m³	28.7	28.1	23.6	26.4	25.9	28.5	28.6	30.6	33.7	30.5	31.5	27.5	**28.5**
3		SO2 µg/m³	80 µg/m³	12.5	12.1	10.9	12.6	8.9	10.1	11.3	12.4	12.2	11.8	12.9	12.2	**11.5**
4		NO2 µg/m³	80 µg/m³	15.9	15.3	14.7	15.8	12.1	13.9	13.9	14.7	14.7	14.1	14.5	13.9	**14.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 11.15 AM to 15.10.2025 11.15 AM**	**15.10.2025 12.00 PM to 16.10.2025 12.00 PM**	**19.11.2025 11.00 AM to 20.11.2025 11.00 AM**	**20.11.2025 12.15 PM to 21.11.2025 12.15 PM**	**18.12.2025 11.00 AM to 19.12.2025 11.00 AM**	**19.12.2025 12.30 PM to 20.12.2025 12.30 PM**	**21.01.2026 10.30 AM to 22.01.2026 10.30 AM**	**22.01.2026 11.30 AM to 23.01.2026 11.30 AM**	**11.02.2026 11.00 AM to 12.02.2026 11.00 AM**	**12.02.2026 11.45 AM to 13.02.2026 11.45 AM**	**09.03.2026 10.00 AM to 10.03.2026 10.00 AM**	**10.03.2026 11.00 AM to 11.03.2026 11.00 AM**	
1	Nagore Ice Factory (Near CPCL Office) Lat: N 10°49′20.9676″ Long: E 79° 50′23.3772″	PM10 µg/m³	100 µg/m³	56	54.8	50.2	53.2	57.2	58.1	61.6	64.5	56.4	58.4	55.2	51.3	**56.4**
2		PM2.5 µg/m³	60 µg/m³	28.1	27.5	22.9	24.5	27.5	29.4	30.7	32.9	31.5	32.9	29.7	26.8	**28.7**
3		SO2 µg/m³	80 µg/m³	10.3	9.8	11.4	12.1	12.1	13.2	12.7	13.1	12.1	12.5	11.6	11.2	**11.8**
4		NO2 µg/m³	80 µg/m³	13.5	12.4	14.5	16.2	14.9	15.8	15.3	15.9	14.2	14.9	13.8	13.4	**14.6**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 11.45 AM to 15.10.2025 11.45 AM**	**15.10.2025 12.45 PM to 16.10.2025 12.45 PM**	**19.11.2025 11.30 AM to 20.11.2025 11.30 AM**	**20.11.2025 12.45 PM to 21.11.2025 12.45 PM**	**18.12.2025 11.45 AM to 19.12.2025 11.45 AM**	**19.12.2025 01.00 PM to 20.12.2025 01.00 PM**	**21.01.2026 11.15 AM to 22.01.2026 11.15 AM**	**22.01.2026 12.30 PM to 23.01.2026 12.30 PM**	**11.02.2026 11.30 AM to 12.02.2026 11.30 AM**	**12.02.2026 12.45 PM to 13.02.2026 12.45 PM**	**09.03.2026 10.30 AM to 10.03.2026 10.30 AM**	**10.03.2026 12.45 PM to 11.03.2026 12.45 PM**	
1	Nagore Pandagasalai Street Lat: N 10° 49′23.7072″ Long: E 79° 50′39.1596″	PM10 µg/m³	100 µg/m³	41.9	40.4	42.9	45.1	52.5	53.8	56.4	60.6	50.5	52.4	45.9	44.7	**48.9**
2		PM2.5 µg/m³	60 µg/m³	19.6	19.1	18.6	20.4	24.1	25.3	28.2	30.4	26.9	28.5	23.4	21.6	**23.8**
3		SO2 µg/m³	80 µg/m³	9.2	8.3	9.7	10.2	10.3	11.5	11.4	12.1	10.9	11.3	10.2	9.8	**10.4**
4		NO2 µg/m³	80 µg/m³	11.3	10.6	10.2	13.5	12.4	13.1	13.9	14.6	12.8	13.5	12.5	11.9	**12.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 12.15 PM to 15.10.2025 12.15 PM**	**15.10.2025 01.15 PM to 16.10.2025 01.15 PM**	**19.11.2025 12.00 PM to 20.11.2025 12.00 PM**	**20.11.2025 1.15 PM to 21.11.2025 1.15 PM**	**18.12.2025 12.00 PM to 19.12.2025 12.00 PM**	**19.12.2025 01.00 PM to 20.12.2025 01.00 PM**	**21.01.2026 12.00 PM to 22.01.2026 12.00 PM**	**22.01.2026 01.00 PM to 23.01.2026 01.00 PM**	**11.02.2026 12.15 PM to 12.02.2026 12.15 PM**	**12.02.2026 1.15 PM to 13.02.2026 1.15 PM**	**09.03.2026 11.15 AM to 10.03.2026 11.15 AM**	**10.03.2026 1.30 PM to 11.03.2026 1.30 PM**	
1	Nagore Pattinumcherry Lat: N 10° 49′20.5860″ Long: E 79° 50′46.5684″	PM10 µg/m³	100 µg/m³	36.7	36.1	36.4	37.8	44.2	46.3	52.8	53.9	49.6	48.5	41.8	38.4	**43.5**
2		PM2.5 µg/m³	60 µg/m³	18.5	18.3	16.7	17.2	19.7	20.6	25.7	26.2	24.7	25.3	20.5	18.3	**21.0**
3		SO2 µg/m³	80 µg/m³	6.9	BDL	7.2	7.8	8.5	9.2	10.6	11.3	9.5	9.8	8.8	7.9	**8.9**
4		NO2 µg/m³	80 µg/m³	9.2	8.1	9.5	10.3	10.2	10.9	12.3	12.9	10.9	11.6	10.7	10.1	**10.6**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**

As per MoEF EC Point 3 xiv

KARAIKAL PORT PRIVATE LIMITED
CHENNAI

HYDRODYNAMIC MODELLING FOR RIVER DIVERSION AT PROPOSED KARAIKAL PORT SITE



MATHEMATICAL MODEL STUDY REPORT
NOVEMBER, 2006

RAMBØLL

L&T-RAMBØLL CONSULTING ENGINEERS LIMITED
339/340, Anna Salai, Nandanam, Chennai - 600 035.

RAMBØLL	**L&T-RAMBØLL CONSULTING ENGINEERS LIMITED**

Client: **Karaikal Port Private Limited**
Chennai

Project: River Diversion at Proposed Karaikal Port Site	**Project No.:** C1061502
Title: Hydrodynamic Model Study	**Document No.:** RP001 / **Rev.:** 0

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Notes:

1.

Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
0	21-09-06		JKP		VCN		SMA	

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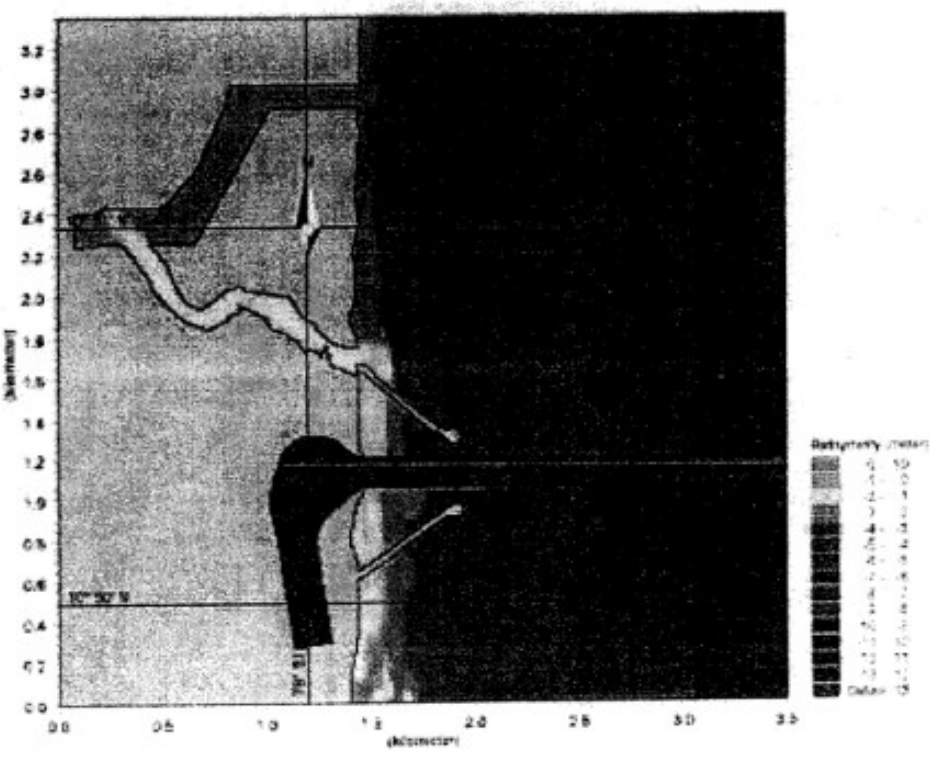
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2.2 Proposed River Diversion

The River Pervadnar is a drainage carrier and it's natural flow is controlled by upstream rainfall. It is a Tributary river of Cauvery and comes from the main branch called Puduvitti. Further it is branched as Puddar ,Vettar finally ends as Pervadnar. It is obvious that a river at the initial stage have narrow width with high velocity. At the middle stage it maintains medium flow and wider. Before the final stage it branches and the velocity becomes slow widening the Riverbed. The River confluences in the East coast of Tamil nadu shows a general trend of shifting towards North.

As per Irrigation deptt. of Tamilnadu records, the river remains dry during Summer and during Monsoon seasons has an M.F.L Discharge of 1820 Cusecs. The width of the River at the upstream is 50m , at the down stream it is 80m and at the mouth widened to 110m. The river has touched the danger level during November 2005.

In the proposed Masterplan of the Karaikal port the river mouth and the end section of the river falls on the project site. Hence Karaikal Port Ltd. proposed to divert the river through suitable hydrodynamic model study. The existing and prposed river diversion is shown below,



2.3 Scope of the study

The detailed scope of this study includes the following tasks,

- Site Visit and collection of River related data from various sources
- Analysis of wind, wave, tide data
- Preparation of digital bathymetry with the river profiles
- To carry out hydrodynamic flow modelling due to Wave action
- Assessment of wave induced flow at proposed diverted River mouth
- To carry out hydrodynamic flow modelling due to Tide action
- Assessment of Tidal penetration in to the existing and diverted river.
- Tidal Prism of the existing and diverted River.
- Presentation of model study results and discussion

3 Hydrodynamic Modelling

3.1 General

Hydrodynamic modelling is carried out using Hydrodynamic flow model of Mike-21 Suites of Program. The model can the flow in response to wave & tide forcing. The basic transport equation of the model drives the 2D free surface flow ignoring stratification. In order to assess the change in hydrodynamic characteristics of the River two types of dynamics are studied. The wave induced Long –shore current is simulated for all the possible wave approach angles to the Karaikal coast. The tide induced Cross-shore current is simulated for Spring & Neap phases of tide. The Flow dynamics for existing River and diverted River are established.

3.2 Input data

3.2.1 Bathymetry

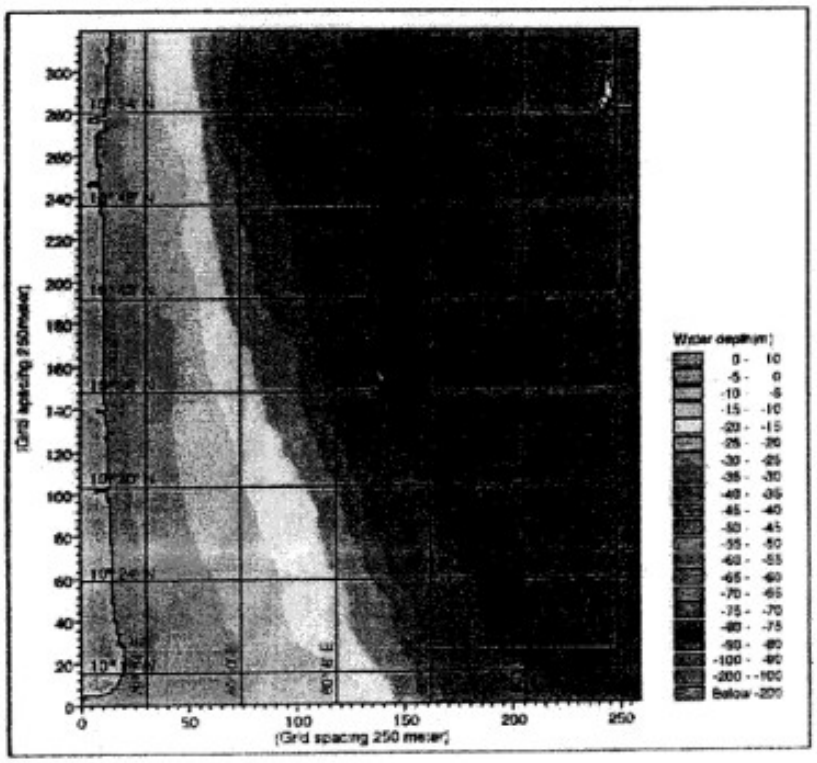


Figure FD- 2 Bathymetry

The Bathymetry of the study area is prepared extending from land to beyond 200m contour in a grid spacing of 250 mx250 m by digitising the bathymetric information (seabed contours and depths) published in the hydrographic charts No.357 & 3007 with scale 1:35,000, 1:300,000 respectively. Spot depths from the hydrographic chart, survey data by M/s Geostar and the location of the 5, 10, 15, 20, 30, 50 & 100, 200m contours have been used to generate the digital area using a suitable interpolation technique. This General bathymetry is presented in Figure FD- 2. The depth contours shows a very gentle slope from offshore to

coast. It can be seen that the distance of the 5m contour from the shoreline is 400m and that of the 10-m contour is 2.2 km.

3.2.2 Wave data

The normal offshore significant wave height varies between 0.5 to 1.8m for over 90% of the waves around the year. Wave heights are generally higher during the months June, July and August more than 10% of the waves being greater than 1.8m. The predominant directions approaching to the Karaikal Coast are from SSE, SE, ESE, E, ENE, NE and NNE. The annual wave Rose based on 10 years BMO wave model data is presented in Figure FD-3The various arms of the rose shows the percentage of occurrence in a year.

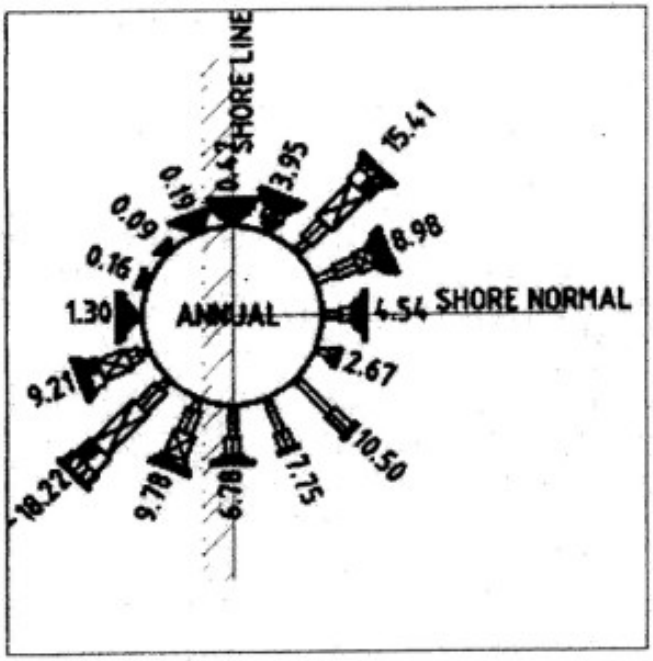


Figure FD- 3 Annual wave rose

3.2.3 Tide data

A self recording tide gauge was deployed at Nagapattinam from 26th February to 25th March 2004. The measured tidal elevations are presented in Figure FD- 4From the plot it can be observed that the range during spring tide is 0.8m and during neap tide is 0.4m.

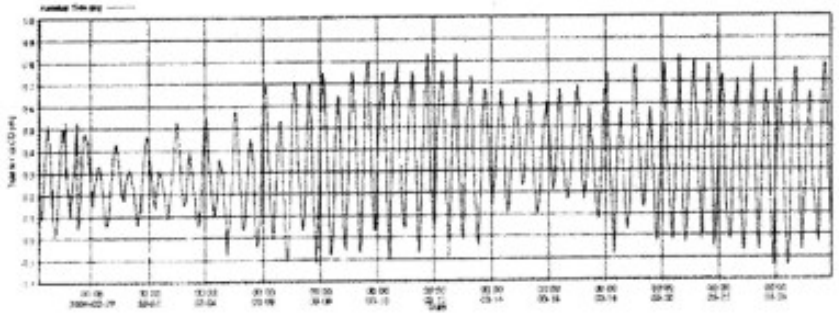


Figure FD- 4 Observed Tide

3.2.4 Current Data

A self-recording current meter was deployed in 10m-water depth, close to the proposed Karaikal Port Site. The measured current speeds and direction at 20minutes interval for the period 1st to 15th March 2004 are presented in Figure FD- 5. From the plot it can be observed that the current speed is 0.6m/s with an average value of about 0.3m/s. Current directions show that the measured currents flow towards North up to the earlier part of the observation period, after which it reverses southward in the later part. This shows that the observation period covers the reversal of the current direction along the coast, which usually takes place in the transition month between the two monsoons. A comparison of the current directions with tidal elevations reveals there is no direct correlation with the semi-diurnal tide indicating that the direction is mainly controlled by the wind driven current.

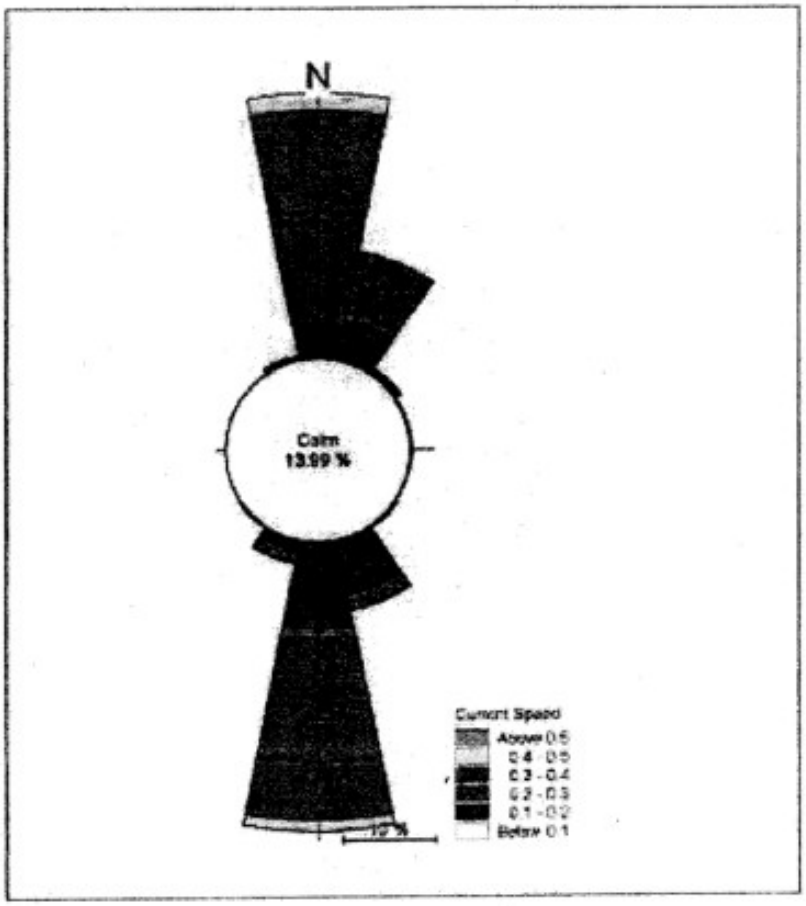


Figure FD- 5 Observed Current rose

3.3 Wave Hydrodynamics

Deep water waves as approaches to shallow water their characteristics change due to depth restriction. Finally at the surf zone it breaks and dissipate it's energy. Depending on the angle it approaches to the coastline it forms a current known as longshore current. Which is a very important physical factor for littoral transport. The hydrodynamic of wave induced is simulated by hydrodynamic model of Mike-21. The wave radiation stress obtained for the coastal regime by modelling the shallow water waves are used as background data in the Longshore current simulation.

The longshore current is generally parallel to coastline and it varies in strength approximately proportional to the square root of the wave height and with Sin $2\alpha_b$, where α_b is the wave incidence angle at breaking. As the position of the breaking line constantly shifts due to the irregularity of natural wave fields and since the distance to the breaker line varies with wave height, the distribution of the long shore current in the coastal profile vary accordingly. The underlying mechanism of the generation of these currents are gradients in momentum flux (radiation stress) due to the decay of obliquely incident waves and the longshore component of the wind. As the longshore current is secondary effect of wave, in this study the deep-water wave data as shown in the wave rose is transformed to nearshore for obtaining radiation stress. The near shore spectral wind-wave model gives radiation stress output as Sxx,Syy, Sxy for three components of stress. The same is plugged into the hydrodynamic flow model for simulating longshore current.

The wave-induced flow in the model area is simulated by specification of the so-called "Wave Radiation Stresses". By averaging the equations of motion over depth and time (the wave period) wave radiation stress terms are included in the momentum equations.

The terms are:

$$x-momentum$$

$$\frac{\partial S_{XX}}{\partial X}+\frac{\partial S_{XY}}{\partial Y}$$

$$y-momentum$$

$$\frac{\partial S_{YY}}{\partial Y}+\frac{\partial S_{XY}}{\partial X}$$

Where SXX , SXY and SYY are the three components of radiation stress.

MIKE 21 NSW can provide resulting maps of radiation stresses Sxx, Sxy and Syy which are defined by,

$$S_{xx}=\rho\frac{g}{2}\left(F_u+F_p\right)$$

$$S_{xy}=\rho\frac{g}{2}F_{uv}$$

$$S_{yy}=\rho\frac{g}{2}\left(F_v+F_p\right)$$

In the output file, the radiation stresses are divided by r. Here Fu, Fuv, Fv and Fp are defined by,

$$F_u = \int_0^{2\pi} \cos^2(\theta)(1+G)E(\theta)d\theta$$

$$F_{uv} = \int_0^{2\pi} \sin(\theta)\cos(\theta)(1+G)E(\theta)d\theta$$

$$F_v = \int_0^{2\pi} \sin^2(\theta)(1+G)E(\theta)d\theta$$

$$F_p = \int_0^{2\pi} GE(\theta)d\theta$$

Where G is given by

$$G = \frac{2kd}{\sinh(2kd)}$$

The input data for this study are bathymetry and wave induced radiation stress simulated by Nearshore wave models. Altogether Seven simulations are carried out pertaining to seven predominant wave approach directions.

3.4 Tidal Hydrodynamics

The estuarine flow pattern in higher resolution Standard hydrodynamic modelling is carried out with velocity based Samgorinsky formulation. The results of the simulations during peak spring and neap conditions each for duration of 24 hrs were allowed to flow into the fine grid.The appropriate governing equations for studying water environment in coastal and estuarine areas are the two-dimensional shallow water equations. These are obtained by vertically integrating the three- dimensional Navier Stokes equations of motion making the following simplified assumptions,

1. The Flow is incompressible
2. The flow is well mixed
3. Vertical acceleration is negligible
4. Bed stress can be modelled

Simulation of hydrodynamic is based on these non-linear vertically integrated 2-D equations of conservation of mass and momentum.

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t}$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x}\left(\frac{p^2}{h}\right) + \frac{\partial}{\partial y}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial x}$$

$$+ \frac{gp\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial x}(h\tau_{xx}) + \frac{\partial}{\partial y}(h\tau_{xy})\right] - \Omega q$$

$$- fVV_x + \frac{h}{\rho_w}\frac{\partial}{\partial x}(p_a) = 0$$

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y}\left(\frac{q^2}{h}\right) + \frac{\partial}{\partial x}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial y}$$

$$+ \frac{gq\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial y}(h\tau_{yy}) + \frac{\partial}{\partial x}(h\tau_{xy})\right] + \Omega p$$

$$- fVV_y + \frac{h}{\rho_w}\frac{\partial}{\partial y}(p_a) = 0$$

These equations are numerically solved by Alternate Direction Implicit (ADI) finite difference technique leading to formation of tri-diagonal matrices, which can be solved efficiently. This entails covering the estuary with a mesh or grid discretising elevations and velocities in space and time to fit on this grid.

The following symbols are used in the equations:

$h(x,y,t)$	-	water depth ($= \zeta - d$, m)
$d(x,y,t)$	-	time varying water depth (m)
$\zeta(x,y,t)$	-	surface elevation (m)
$p,q\ (x,y,t)$	-	flux densities in x- and y-directions ($m^3/s/m$) = (uh,vh); (u,v) = depth averaged velocities in x- and y-directions
$C(x,y)$	-	Chezy resistance ($m^{½}/s$)
g	-	acceleration due to gravity (m/s^2)
$f(V)$	-	wind friction factor
$V,V_x,V_y(x,y,t)$	-	wind speed and components in x- and y-direction (m/s)
$\Omega(x,y)$	-	Coriolis parameter, latitude dependent (s^{-1})
$p_a(x,y,t)$	-	atmospheric pressure ($kg/m/s^2$)
ρ_w	-	density of water (kg/m^3)
x,y	-	space coordinates (m)
t	-	time (s)
$\tau_{xx}, \tau_{xy}, \tau_{yy}$	-	components of effective shear stress

4 Simulated Results

4.1 Long-Shore Flow due to Waves

4.1.1 General

Wave induced Hydrodynamics flow is assessed for the coastal stretch of Karaikal. At the surfzone of proposed project location the current generated by wave incident with respect to the coastline and energy flux by breaking waves are simulated using Nearshore spectral wind-wave model. The incident wave directions to the coast and their associated percentage of occurrence are analysed. Almost 53 % of the offshore wave climate reaches the coast from seven predominant directions (NNE, NE, ENE, E, ESE, SE and SSE) and their 20% exceedence wave parameters presented below, which is used as the run matrix for coastal current simulation.

Wave Direction	Wave Height	Wave Period
NNE	1.6	6
NE	1.65	7
ENE	1.35	5
E	1.2	5
ESE	1.1	5
SE	1.1	7
SSE	1	6.5

4.1.2 Results

A set of results are shown in Figure FD- 6 to Figure FD- 12 corresponding to seven wave incident directions NNE, NE, ENE, E, ESE, SE and SSE respectively. The simulated current speed presented as colour contours and the direction as vector arrows are showing the general flow pattern of the coast. The current speeds ranging from 0-0.8m/s do prevail at the coast. The longshore current is parallel to the coast and directed North-South depending on the wave incident angle. It is observed that the wave induced flow from SE quadrant is slightly higher influence in the Diverted River Mouth then the flow due to NE quadrant waves. However, the penetration is limited to few tens of meters and has no significance, estuarine dynamics point of view.

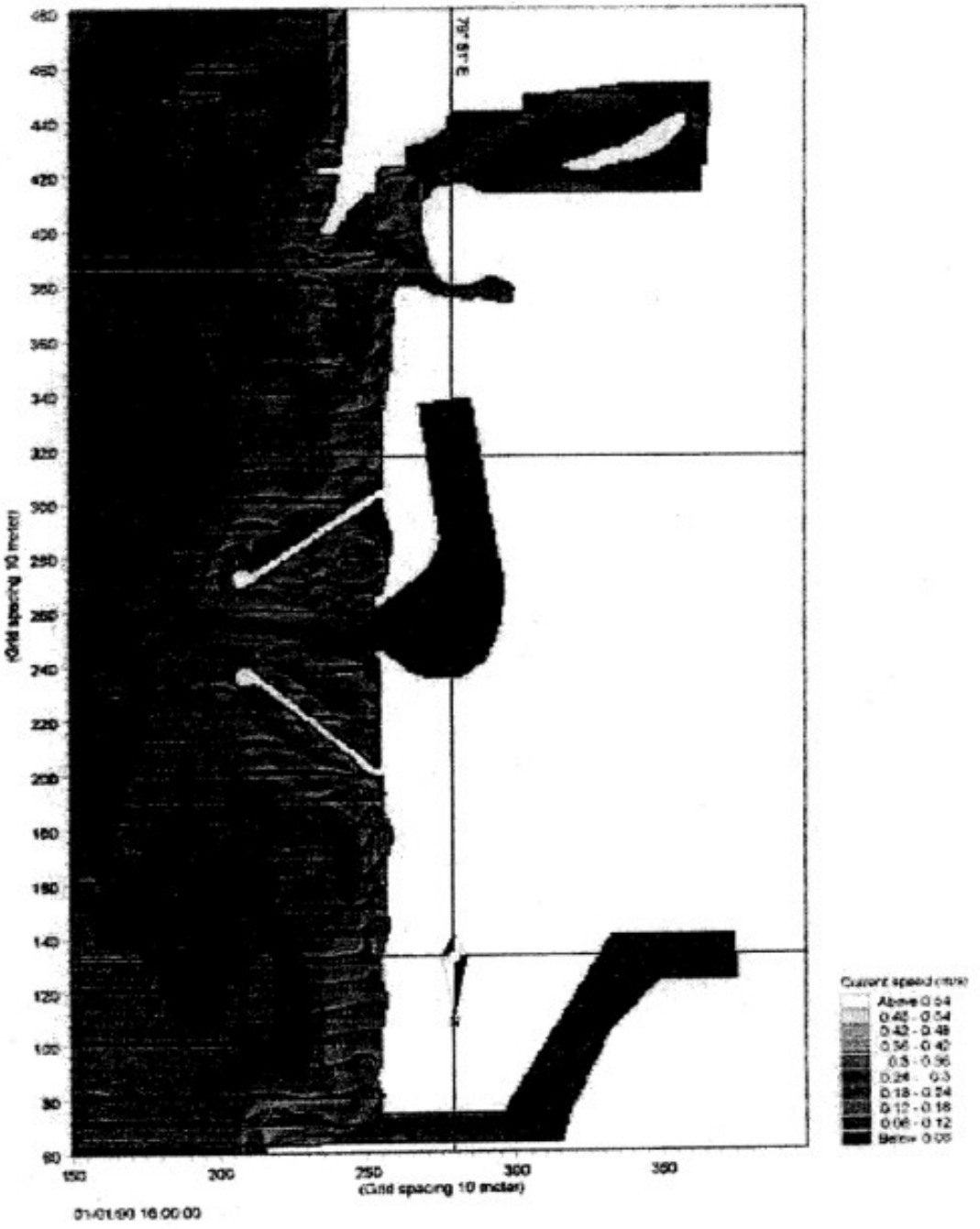


Figure FD- 6 Long shore current due to NNE Waves

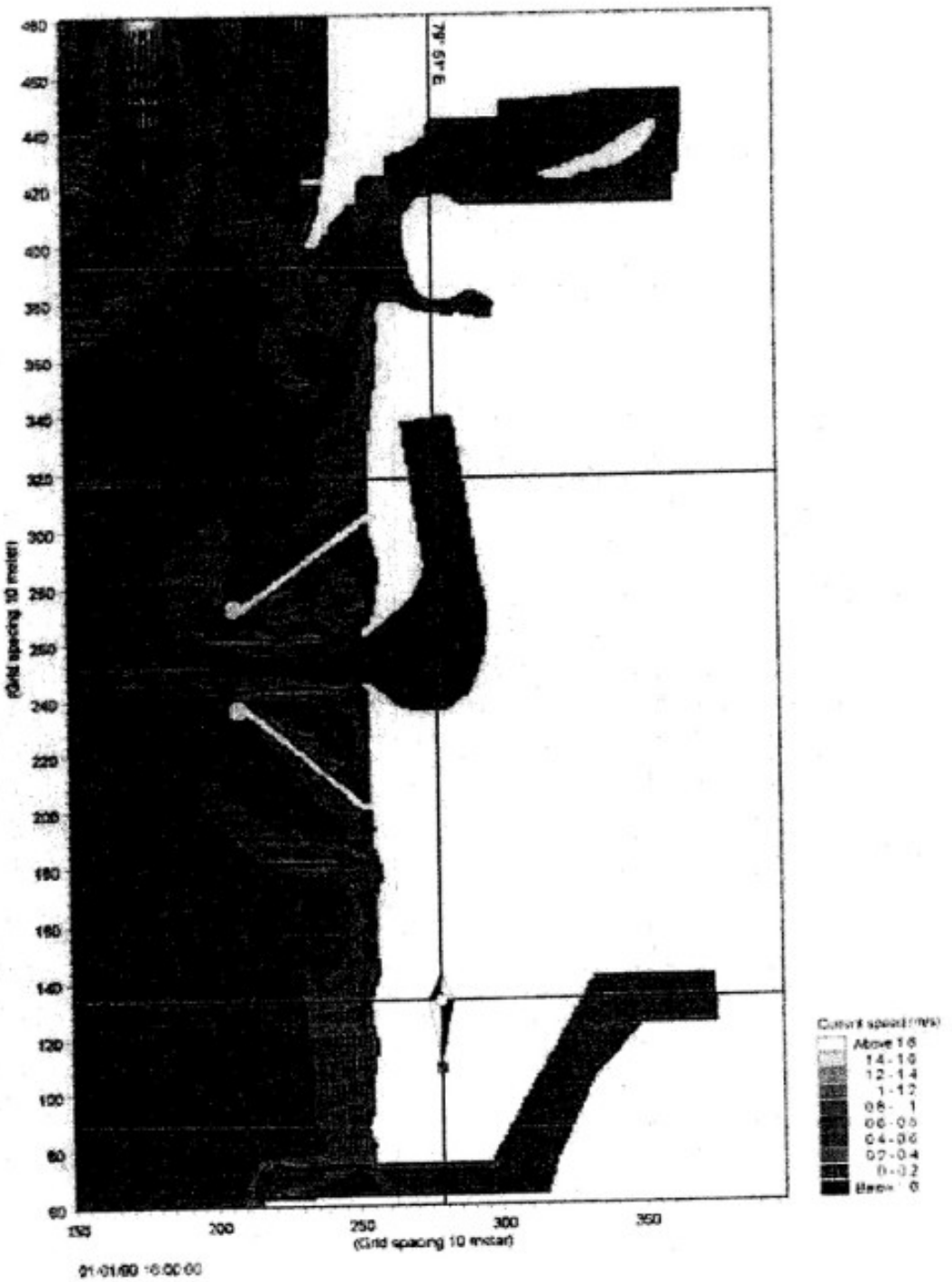


Figure FD- 7 Long shore current due to NE Waves

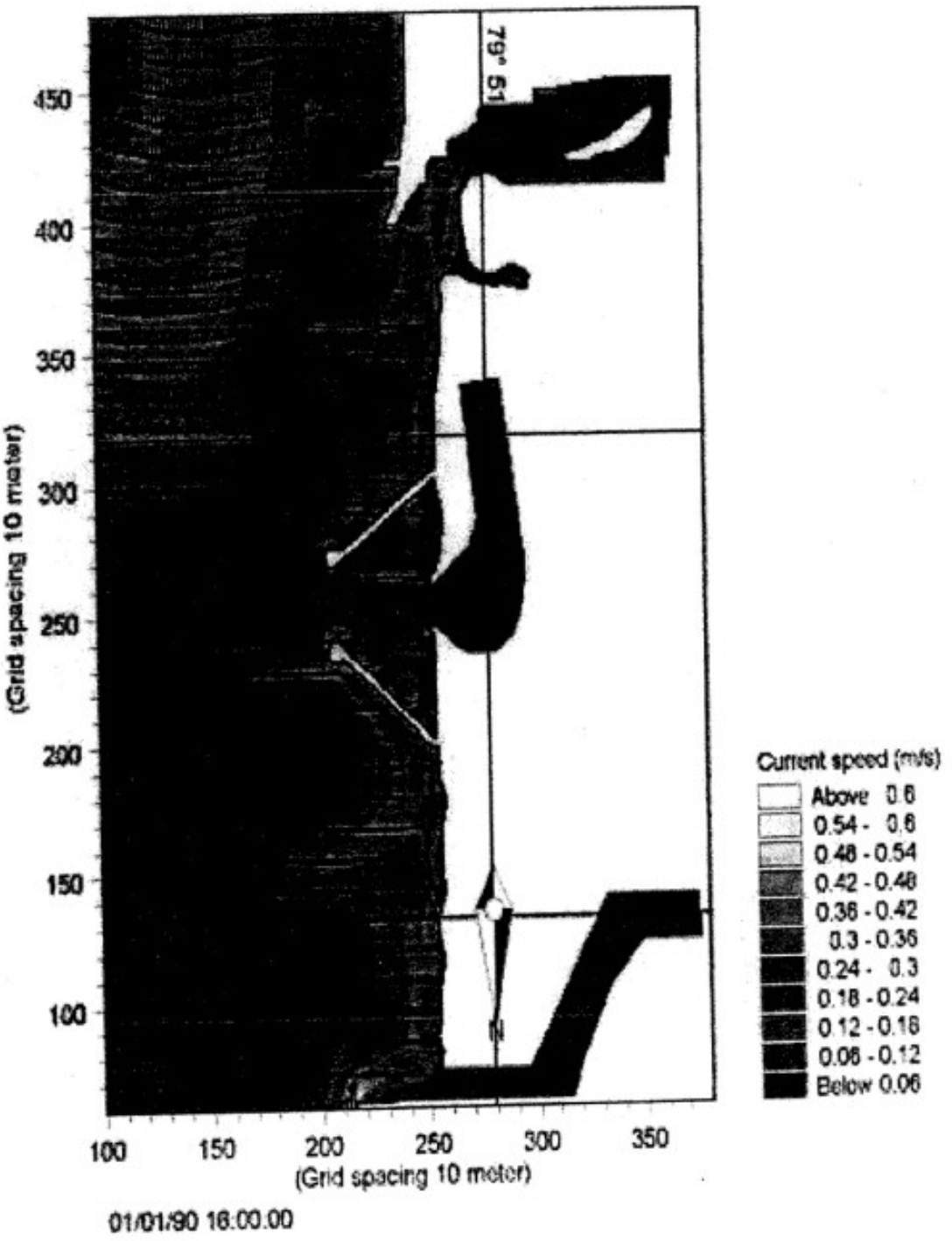


Figure FD- 8 Long shore current due to ENE Waves

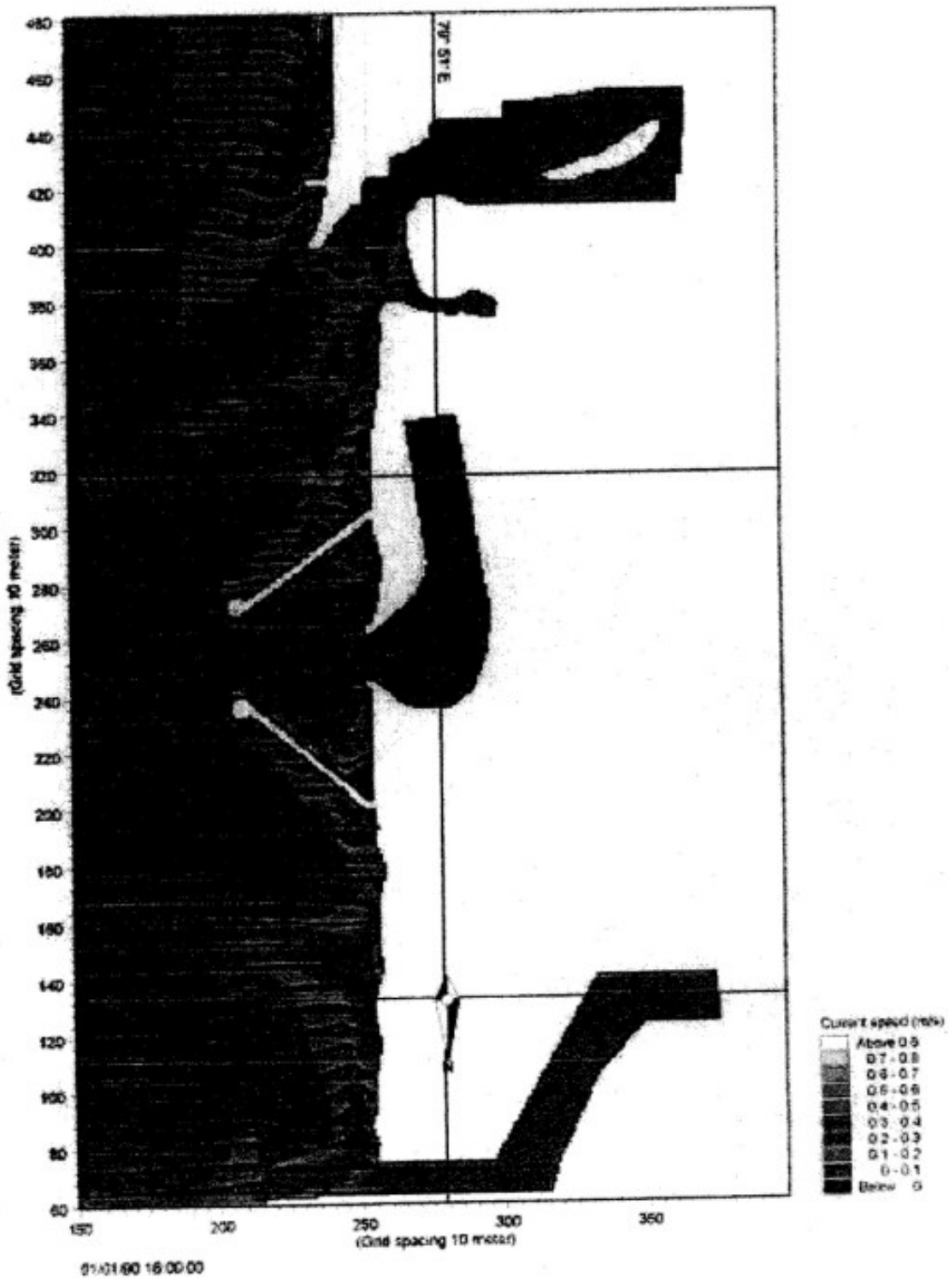


Figure FD- 9 Long shore current due to E Waves

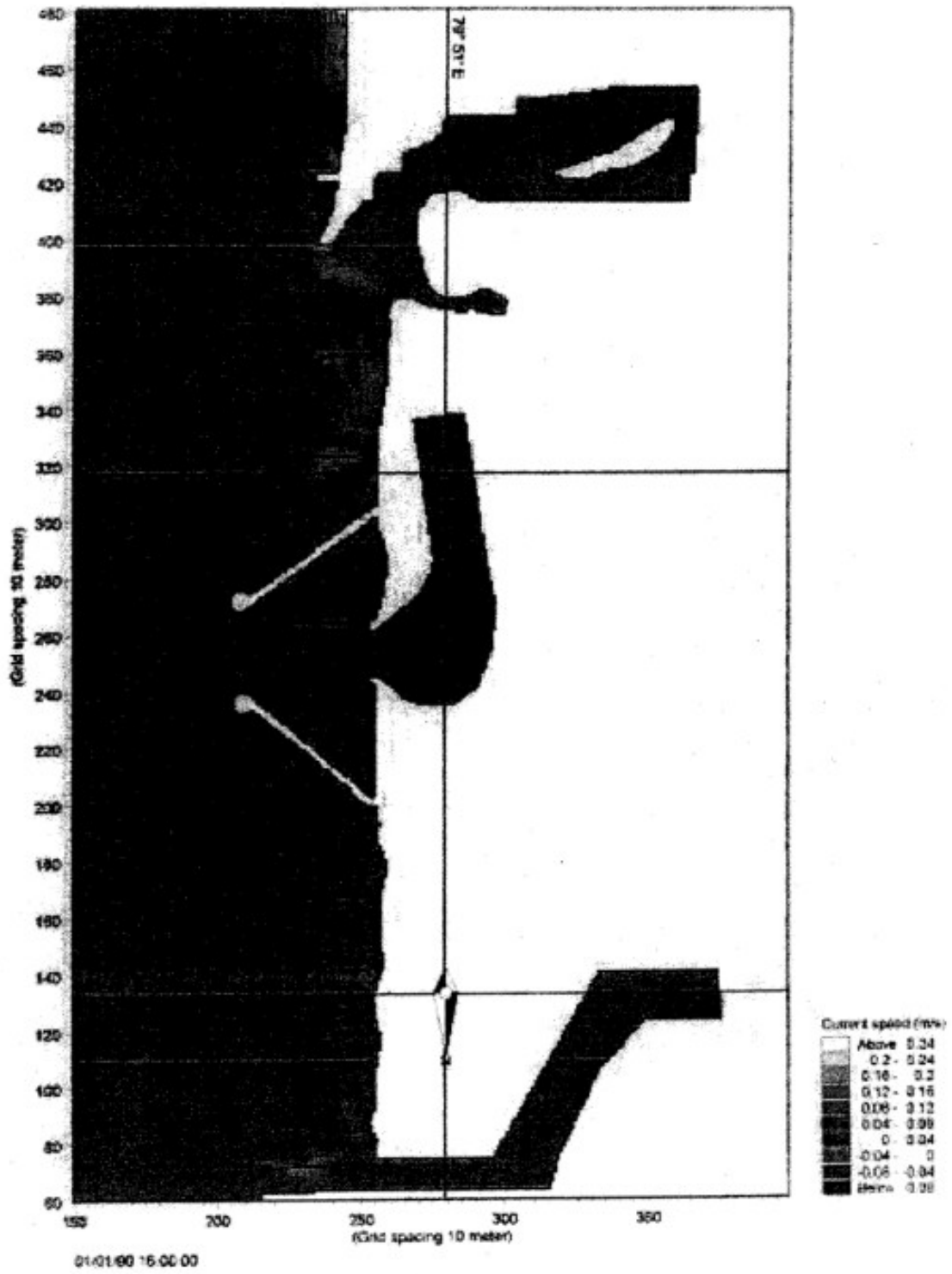


Figure FD- 10 Long shore current due to ESE Waves

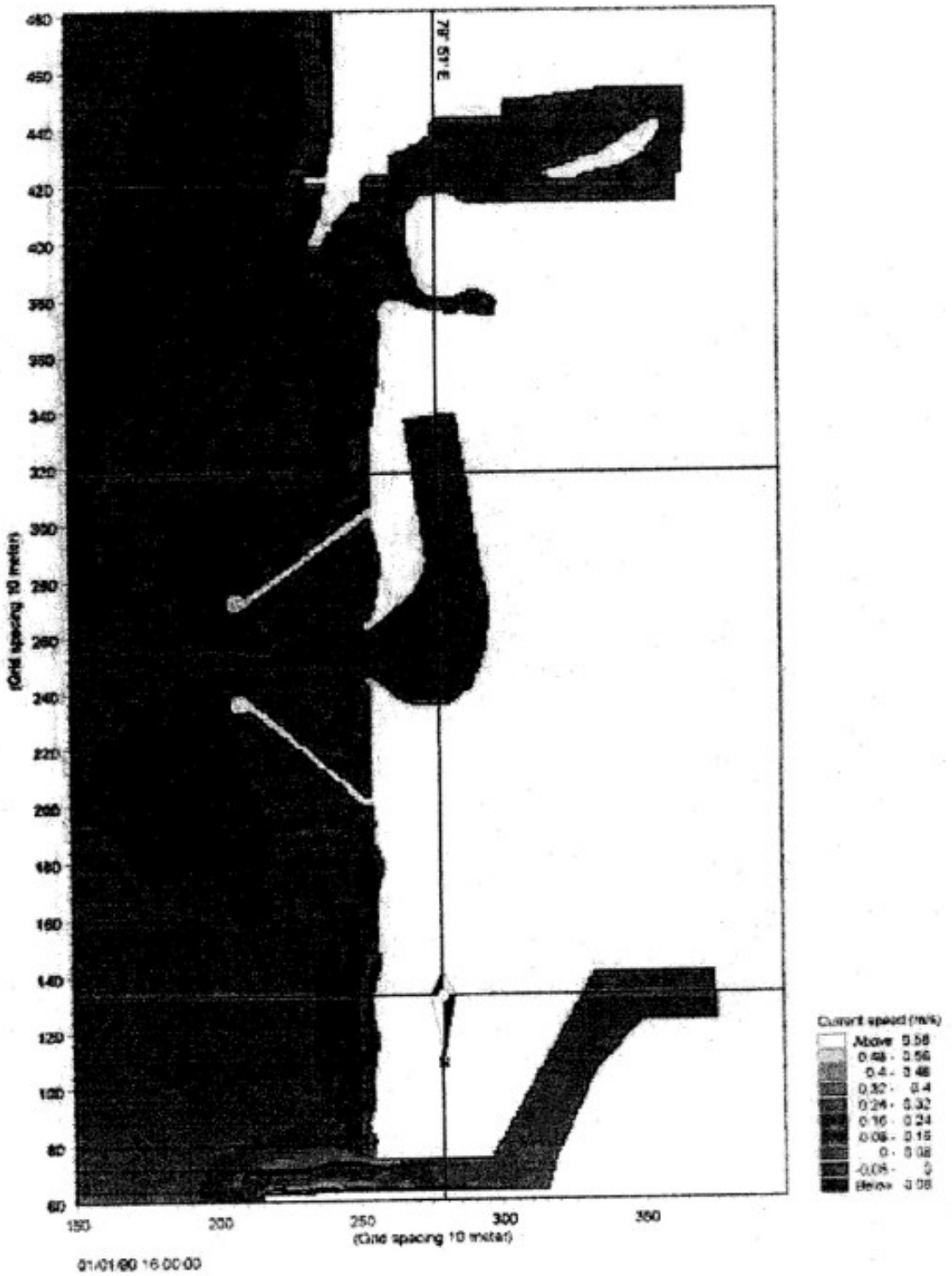


Figure FD- 11 Long shore current due to SE Waves

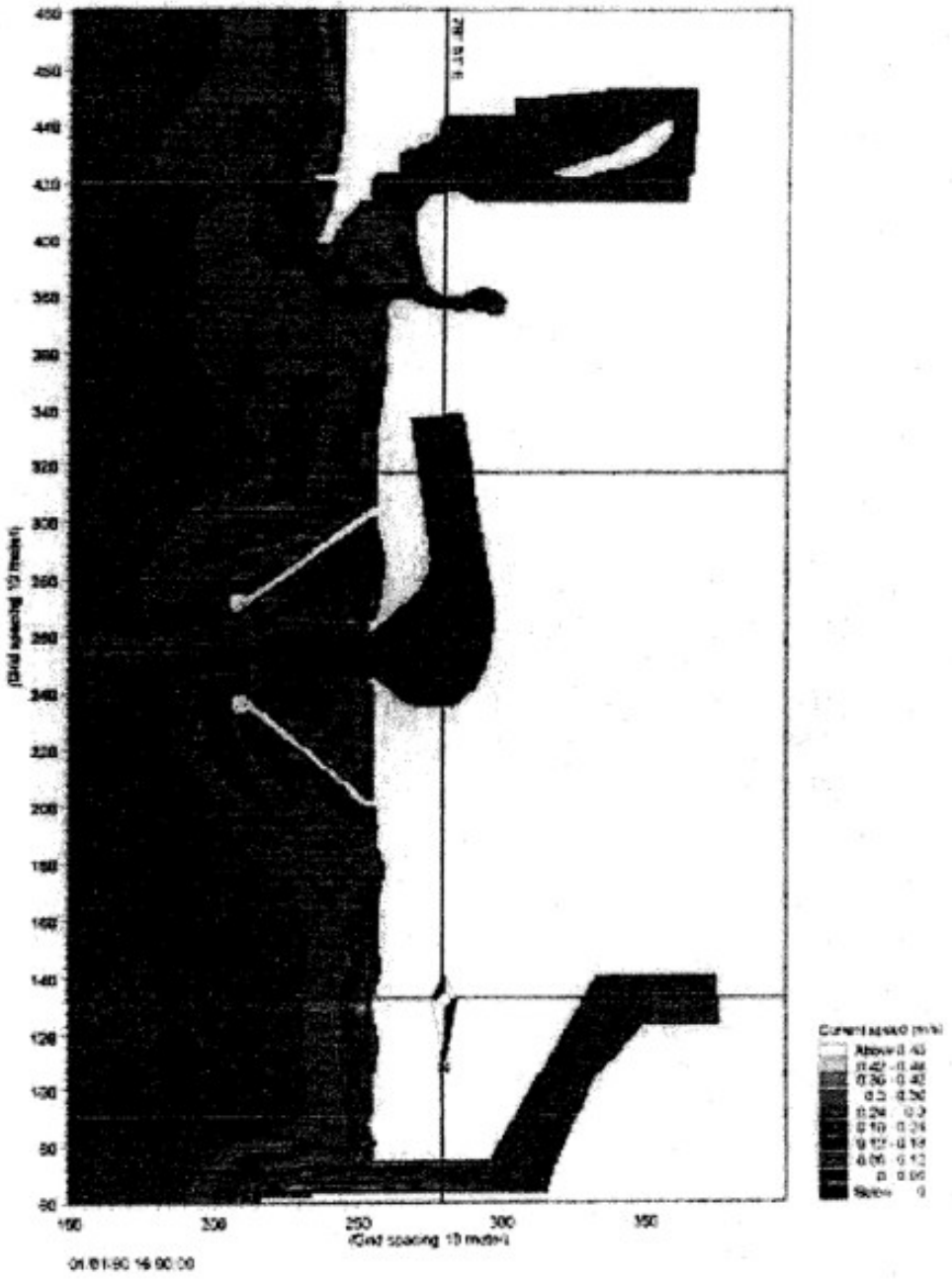


Figure FD- 12 Long shore current due to SSE Waves

4.2 Cross-Shore Flow due to Tide

4.2.1 General

The simulations were carried out for selected 1 day during spring and 1 day during neap from the tidal observations. The evolution of current is catered in the model time step as 15 minute interval. The pattern of current speed and direction at the vicinity of the existing estuary and proposed diversion with port layout for various tidal phases were simulated. The simulations were carried out for duration of 24hrs in each case including warm up (stabilise) for the initial 6hrs.

4.2.2 Tidal influence

The penetration of tide in to the Existing and proposed River is shown in the figure below. The contours indicate the water surface elevation due to Open Ocean tide propagating towards the estuary. During spring tide the maximum water surface elevation (0.8m) into the river then the Neap (0.4m). The limit of Tidal influence in the existing River is upto 1.5km during peak Spring and 1.0km during peak neap tide (flooding). The limit of Tidal influence in the Proposed Diverted River is upto 1.0Km during spring and 0.7Km during neap tide (flooding).It can be seen that generally the direction of flow is East-West direction reversing with inflow (flood) and outflow (ebb) phases of the tide.

4.2.3 Flow Pattern

Current vectors representing the flow pattern during governing flood situations of spring & Neap tides in the model area are presented in Figures. From the figures, it can be seen that the flow pattern in the river mouth is less and further inside it dies down. The small pockets of tidal flats at the confluence are under flooding & drying in regular interval.

4.2.4 Current Speed and direction

It is observed that the tide induced current at the existing River mouth is lower then that of the diverted River. The Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide. As this is not a significant flux ,the influence of tide driven circulation on the river is not appreciable.

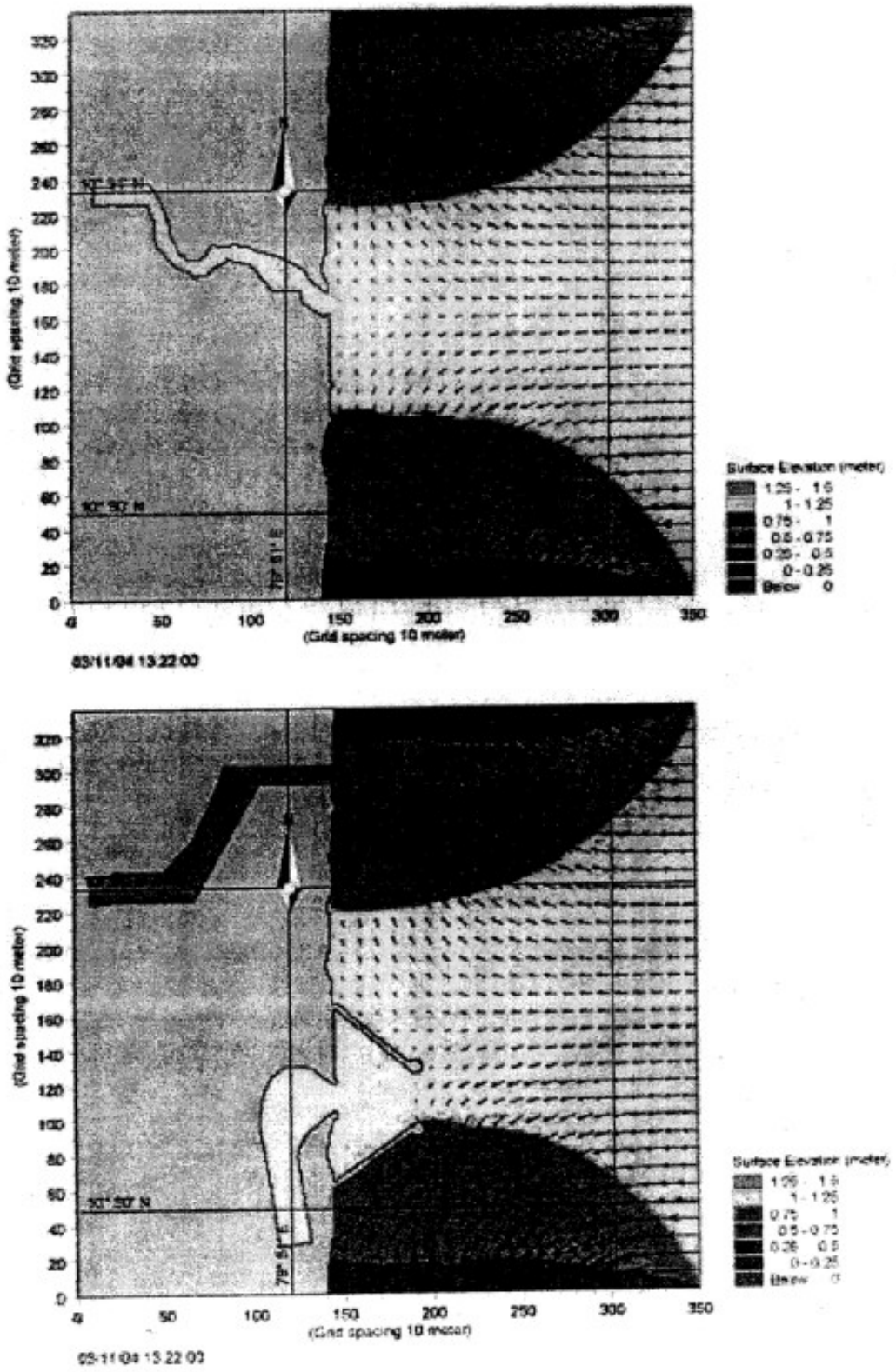


Figure FD- 13 Inflow during Spring Tide (Existing and Diverted River)

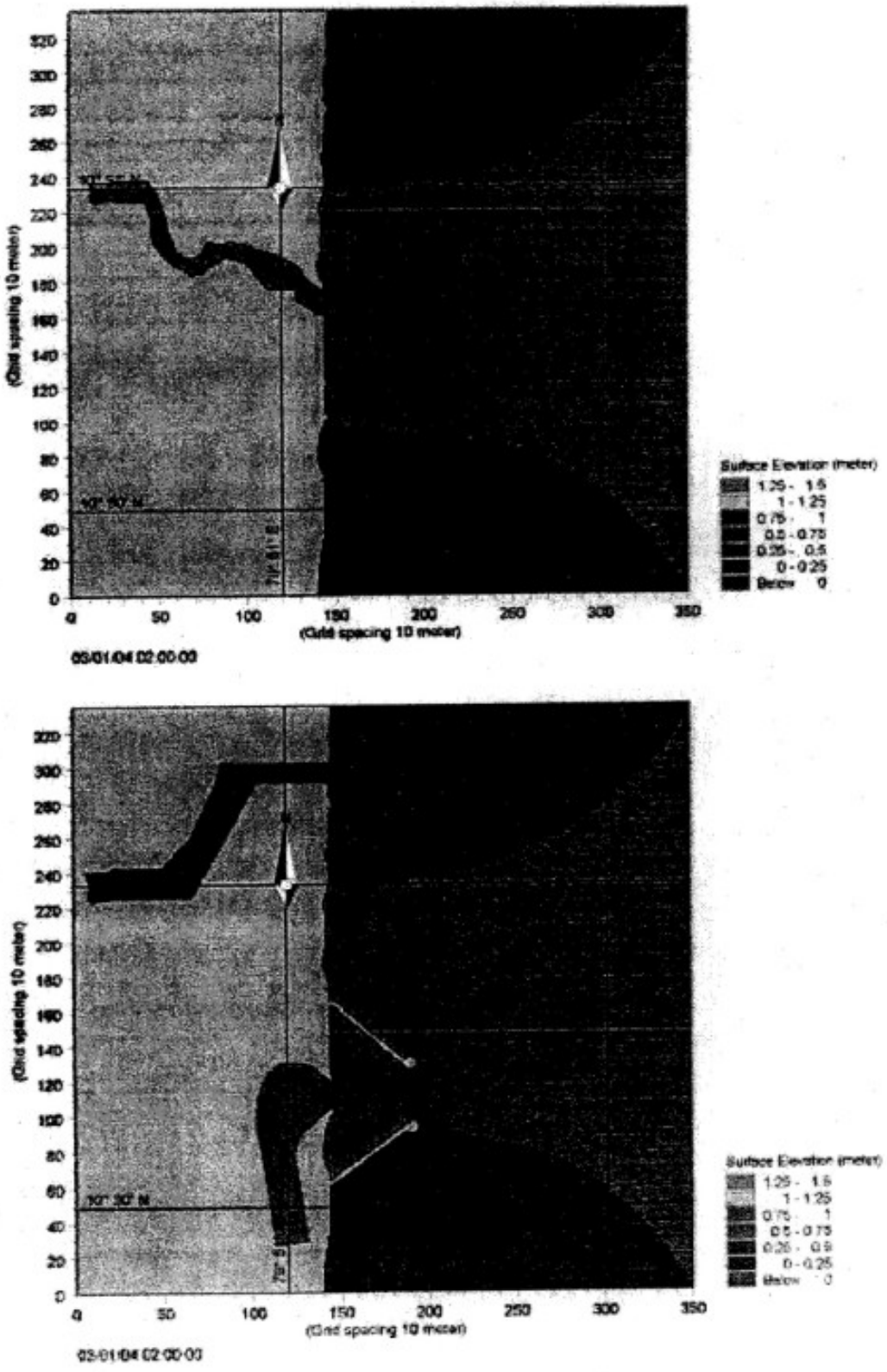


Figure FD- 14 Inflow during Neap Tide (Existing and Diverted River)

5 Tidal Prism

The tidal prism approach (Neill, 1973) can be used for estuaries, with the basic assumption is that the entire estuary fills and empties simultaneously with daily tide.

The maximum discharge Qmax = Π X Volume of water in Tidal Prism / Tidal Period

Maximum discharge during a tidal cycle for Tidal Prism of the Existing Estuary during Spring Tide are 19.0 m3/s and during Neap tide 7.0 m3/s.

Maximum discharge during a tidal cycle for Tidal Prism of the Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.

6 Conclusion

- The Wave induced Long-shore flow (North-South) is in the range of 0.2 to 0.8 m/s for the Karaikal coast
- The Tidal Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide.
- The Wave induced current of magnitude 0.2 m/s enters the mouth of the river have an influence few tens of meters
- The Tidal penetration in the existing River is in the range of 1.0 to 1.5km during Spring and 0.7 to 1.0km during neap tide flooding.
- The Tidal penetration in the Proposed Diverted River is in the range of 0.75 to 1.0Km during spring and 0.5 to 0.7Km during neap tide flooding.
- The tidal prism estimation for Existing Estuary during Spring Tide is 19.0 m3/s and during Neap tide is 7.0 m3/s.
- The tidal prism estimation for Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.
- The River is very small and studies show negligible change in hydrodynamic characteristics due to diversion.

Certificate of Approval

Issued by Indian Register Quality Systems

IRCLASS SYSTEMS AND SOLUTIONS PRIVATE LIMITED

Certificate No.
IRQS/250301275

To certify that the Environmental Management Systems of

Karaikal Port Private Limited

ADDRESS
Keelavanjore village, Thirumalai Rayan
Pattinam, Karaikal ,Pondicherry -609 606,
India

has been assessed and found conforming to the requirement of **ISO 14001: 2015**

INITIAL CERTIFICATION DATE	CURRENT DATE OF GRANTING	EXPIRY DATE
JULY 13, 2022	AUGUST 19, 2025	JULY 12, 2028

CERTIFICATION SCOPE

Providing port facilities for Receipt, Storage and Handling of Bulk, Break Bulk and liquid Cargo

Indian Register Quality Systems

NABCB EM 005

IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

AUTHORISED CERTIFICATION BODY SIGNATURE

Shashi Nath Mishra
Chief Operating Officer (COO)

This approval is subject to continued satisfactory maintenance of the Environmental Management Systems of the organization to the above requirements which will be monitored by IRQS during annual Surveillance audits. Validity of the Certificate is subject to successful completion of annual surveillance audits. The use of the Accreditation Mark indicates accreditation with respect to activities covered by the certificate with NABCB accreditation no. EM 005

Condition Overleaf.

Indian Register Quality Systems (A Division of IRCLASS Systems and Solutions Private Limited)
Head Office: 52A, Adi Shankaracharya Marg, Opp. Powai Lake, Powai, Mumbai - 400 072, India. Website: www.irqs.co.in, www.irclass.org

karaikal port

ISO 9001
ISO 14001
ISO 45001
ISO 50001

KPPL/MAR/CG/2023-11

22nd Feb 2023

To
The Commanding Officer
Indian Coast Guard Station,
Karaikal.

Sub: - Approval of Oil Spill Contingency Plan – Karaikal Port.

Sir,

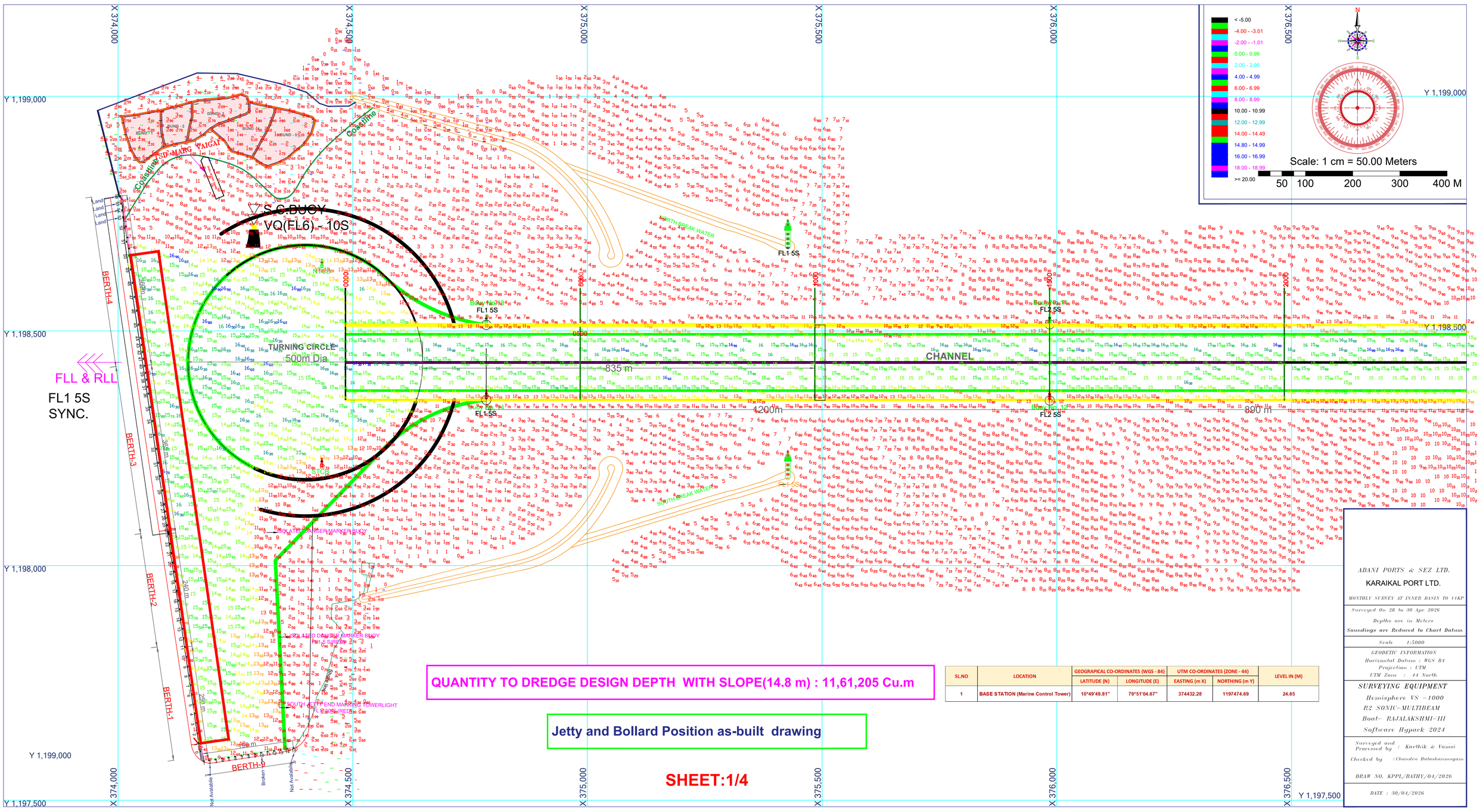
In continuation with our letter no: KPPL/MAR/CG/2023-08, dtd, 10th Feb 2022, we hereby, submit our updated Oil Spill Contingency Plan (Soft Copy) for your vetting and approval.

Thanking You,

Yours Sincerely,
For Karaikal Port Pvt Ltd,

Authorized Signatory,
Port Operations Center.

KARAIKAL PORT PRIVATE LIMITED
CIN: U45203PY2006PTC001945
Registered Office
Kheezhavanjoor Village, T.R. Pattinam, PB No. 33, Karaikal - 609 606. Tel. : +91 4365 256600 (5 Lines) Fax : +91 4365 256603



QUANTITY TO DREDGE DESIGN DEPTH WITH SLOPE(14.8 m) : 11,61,205 Cu.m

SLNO	LOCATION	GEOGRAPICAL CO-ORDINATES (WGS - 84)		UTM CO-ORDINATES (ZONE - 44)		LEVEL IN (M)
		LATITUDE (N)	LONGITUDE (E)	EASTING (m X)	NORTHING (m Y)	
1	BASE STATION (Marine Control Tower)	10°49'49.81"	79°51'04.67"	374432.28	1197474.69	24.65

Jetty and Bollard Position as-built drawing

SHEET:1/4

ADANI PORTS & SEZ LTD.

KARAIKAL PORT LTD.

MONTHLY SURVEY AT INNER BASIN TO 11KP

Surveyed On 28 to 30 Apr 2026

Depths are in Meters

Soundings are Reduced to Chart Datum

Scale 1:5000

GEODETIC INFORMATION
Horizontal Datum : WGS 84
Projection : UTM
UTM Zone : 44 North

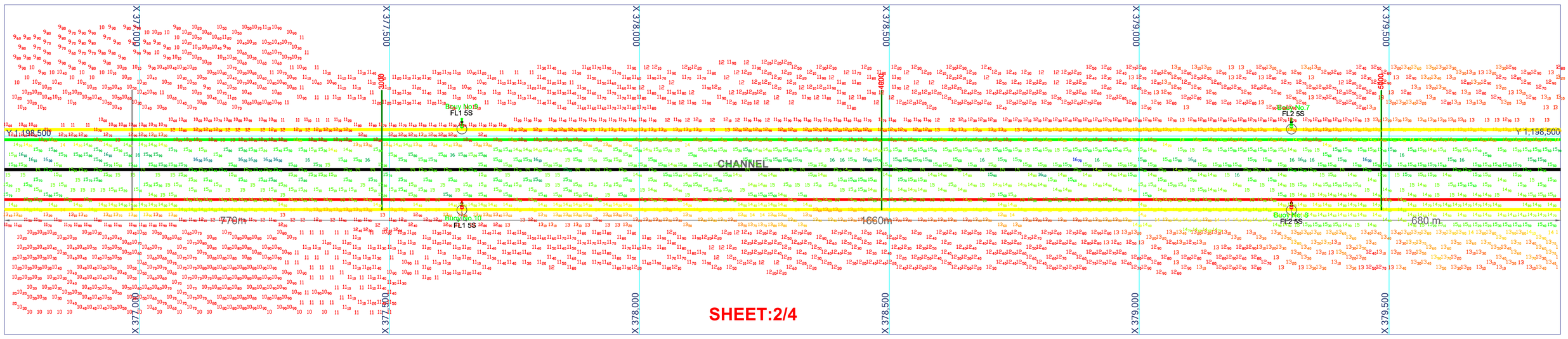
SURVEYING EQUIPMENT
Hemisphere VS -1000
R2 SONIC-MULTIBEAM
Boat- RAJALAKSHMI-III
Software Hypack 2024

Surveyed and Processed by : Karthik & Vanni

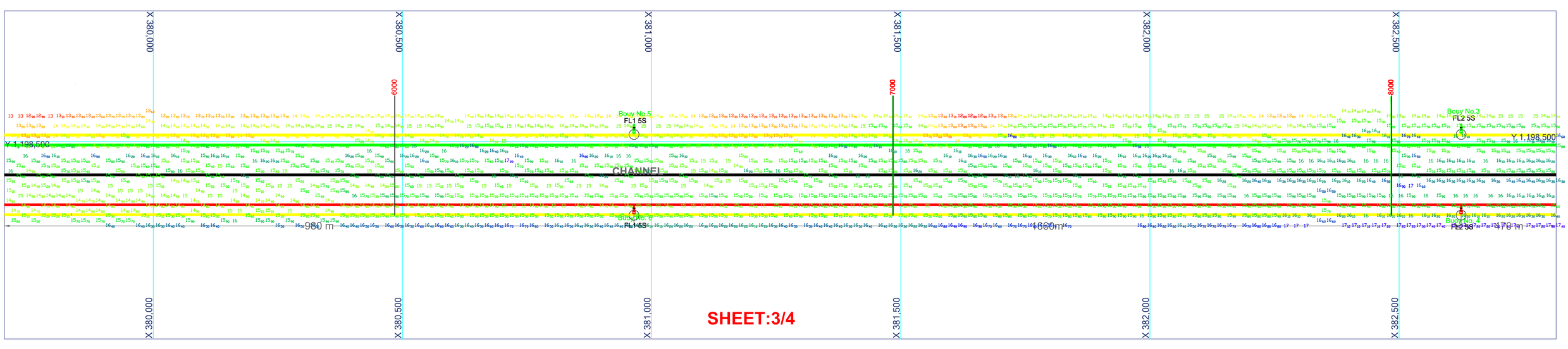
Checked by : Chandra Balasharmugam

DRAW NO. KPPL/BATHY/04/2026

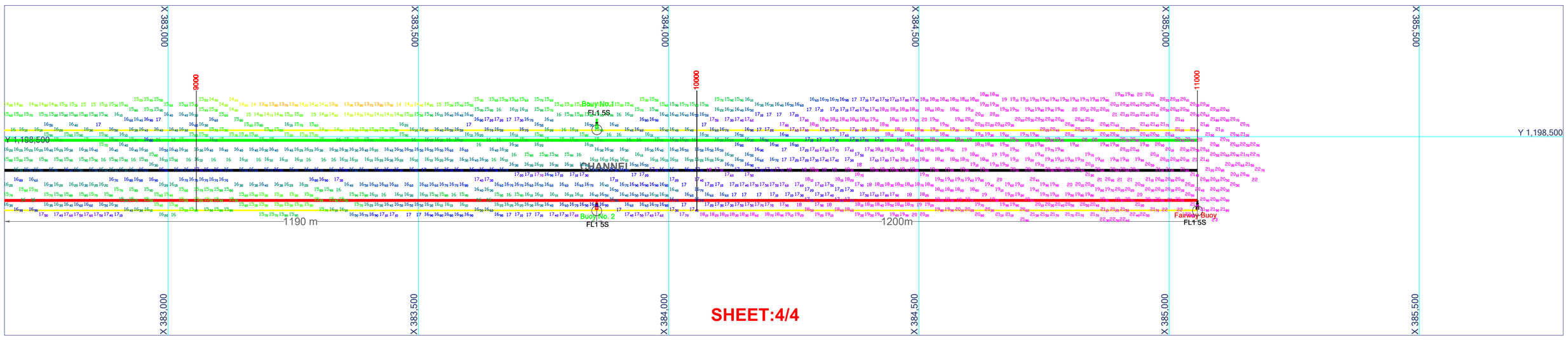
DATE : 30/04/2026



SHEET:2/4



SHEET:3/4



SHEET:4/4

MARG

To,

Dr U. Sridharan,
Additional Director
Ministry of Environment and Forests
Regional Office (Southern Zone)
Bangalore- 560 034

Sir,

Sub: Environmental and CRZ clearance for the expansion of Karaikal Port (Phase II)
Ref: No 10-42/2009-IA.III, dated 22.9.2009

The Ministry of Environment and Forest has accorded Environmental and CRZ clearance for the expansion of Karaikal Port (Phase II) letter dated 22nd September 2009 (No 10-42/2009-IA.) As per the general conditions stipulated in the EC letter, an advertisement was made in two local news papers informing the public regarding Clearance and the copies are enclosed as directed by the ministry to forward the same to the regional office, Bangalore.

We are also enclosing a report on the Environmental Monitoring Program covering the period from March 2009 to August 2009 for your kind consideration and the same has been already submitted to Pondicherry Pollution Control Committee.

Sincerely,

14/10/09

Manjunath Bhat
Manager-Environment

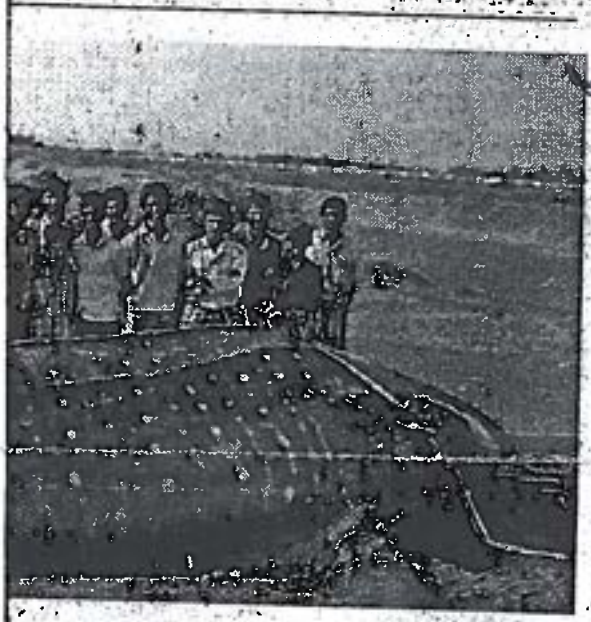
Encl:

1. Copies of the Advertisement in the News Paper
2. Report on Environmental Monitoring Program

Sent thro' courier

KARAIKAL PORT PRIVATE LIMITED
Corp. Off : 'Marg Axis' 4/318, Rajiv Gandhi Road, Kottivakkam, Chennai - 600 041. tel : +91-44 - 2454 2311 (9 lines). fax : +91-44 -2454 2316

...in only select hills across the globe. ... will affect ground water levels ...



KARAIKAL PORT PRIVATE LIMITED

392 & 393, Rajiv Gandhi Salai, Kottivakkam,
Chennai - 600 041.

Wishes to inform that its Phase II expansion project for its Karaikal Port has been accorded environmental and CRZ clearance by the Ministry of Environment and Forests, Government of India and copies of clearance letters are available with the Puducherry Pollution Control Board and also on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in.

Date : 13.10.2009 **EXECUTIVE DIRECTOR**

Change of Name

...D. Narendran ... of Thiru D. Dhasarathan, ...rn on ... February 1990 (native ...strict : Tiruchirappalli), residing at ...d No. 2, New No. 4, Bharathidasan ...reet, Ponmalaipatti, Tiruchirappalli ...0 004, shall henceforth be known as ...EE NARENTHRAN. A.D.

D. NARENDRAN.

...uchirappalli, 4th August 2009.

Change of Name

I, V. Sadasivam, son of Thiru K. Velsamy born on 10th May 1968 (native district : Karur), residing at No. 3-277, P. Sellandipalayam, Pallapalayam Post, Karur - 639 002, shall henceforth be known as V. SADASSIVAM.

V. SADASIVAM.

Pallapalayam, 10th August 2009.

SOUTHERN RAILWAY

ANNOUNCEMENT

As announced by Honourable Minister of ...ilways on 03/07/09 in the Budget Speech for ...09-10, the existing system of coupon books for ...credited press correspondents is being replaced ... **photo identity card based system.** Photo ...ntification card will be issued by Railways to ...credited press correspondents instead of coupon ...oks. ... photo identification card will be issued ... production of the certification by the Press ...ormation Bureau and other competent state and ...al authorities as per laid down Railway Board ...idelines. This new system of concession based ... Photo Identity card along with increased ...ncession (50%) on Rajdhani and Shatabdi trains ...ffective from **15/10/09.**

For further details and enquiry, the following ...y be contacted :

Senior Commercial Manager,
Passenger Reservation System,
Southern Railway, Chennai.
Phone No.044-25351621

SERVING CUSTOMERS WITH A SMILE

FORM No.5
(See Rule 23)
Form of Advertisement of Petition

IN THE HIGH COURT OF JUDICATURE AT MADRAS
(Original Jurisdiction)

COMPANY PETITION NO.225 OF 2009
CONNECTED WITH COMPANY APPLICATION NO.686 OF 2009

In the matter of Companies Act, 1956
AND
In the matter of Scheme of Amalgamation under Section 391 to 394 of the Companies Act
BETWEEN
In the matter of Scheme of Amalgamation of Salzer Cables Limited with Salzer Electronics Limited

Salzer Electronics Limited
a Company incorporated under the Companies Act, 1956 and having its Registered office at Samichettipalayam, Jothipuram (Via), Coimbatore 641 047
Represented by its Director
S. Baskara Subramanian

... PETITIONER / TRANSFEREE COMPANY

FORM OF ADVERTISEMENT OF PETITION

A petition under Section 391 to 394 of the Companies Act, 1956 for amalgamation / merger of Salzer Cables Limited with Salzer Electronics Limited as presented by petitioner on the 29th day of July 2009 and the said petition is fixed for hearing before the Company Judge on 26.10.2009. Any person desirous of supporting or opposing the said petition should send to the petitioner's advocate, notice of his intention, signed by him or his advocate, with his name and address, so as to reach the petitioner's advocate not later than two days before the date fixed for the hearing of the petition. Where he seeks to oppose the petition, the grounds of opposition or a copy of the affidavit shall be furnished with such notice. A copy of the petition will be furnished by the undersigned to any person requiring the same on payment of the prescribed charges for the same.

Dated 16.9.2009.

K.J.Rebello
S. Elambharathi
A. Senthilnathan
Sunitha. K
(Advocate for petitioner)

Address : No.364, Kurupam Court
Lloyds Road, Gopalapuram,
Chennai - 600 086.

FORM No.5
(See Rule 23)
Form of Advertisement of Petition

IN THE HIGH COURT OF JUDICATURE AT MADRAS
(Original Jurisdiction)

COMPANY PETITION NO.224 OF 2009
CONNECTED WITH COMPANY APPLICATION NO.685 OF 2009

In the matter of Companies Act, 1956
AND
In the matter of Scheme of Amalgamation under Section 391 to 394 of the Companies Act
BETWEEN
In the matter of Scheme of Amalgamation of Salzer Cables Limited with Salzer Electronics Limited

Salzer Cables Limited
a Company incorporated under the Companies Act, 1956 and having its Registered office at No.663, Coimbatore Main Road, Bettathapuram, Kamarajar - 641 104.
Represented by its Director
D. Rajeshkumar

PETITIONER / TRANSFEROR COMPANY

FORM OF ADVERTISEMENT OF PETITION

A petition under Section 391 to 394 of the Companies Act, 1956 for amalgamation / merger of Salzer Cables Limited with Salzer Electronics Limited as presented by petitioner on the 29th day of July 2009 and the said petition is fixed for hearing before the Company Judge on 26.10.2009. Any person desirous of supporting or opposing the said petition should send to the petitioner's advocate, notice of his intention, signed by him or his advocate, with his name and address, so as to reach the petitioner's advocate not later than two days before the date fixed for the hearing of the petition. Where he seeks to oppose the petition, the grounds of opposition or a copy of the affidavit shall be furnished with such notice. A copy of the petition will be furnished by the undersigned to any person requiring the same on payment of the prescribed charges for the same.

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K.J.Rebello
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A. Senthilnathan
Sunitha. K
(Advocate for petitioner)

Address : No.364, Kurupam Court
Lloyds Road, Gopalapuram,
Chennai - 600 086.



நீடாமங்கலம் ரெயில்வே கேட் பகுதியில் சாலையோரம் கழிவுநீர் சாக்கடையில் கவிழ்ந்து கிடக்கும் உரம் ஏற்றிய லாரி.

நீடாமங்கலம் அருகே

உரம் ஏற்றிய லாரி கழிவுநீர் கால்வாயில் கவிழ்ந்தது

நீடாமங்கலம், அக்.14–

நீடாமங்கலத்தில் உரம் ஏற்றிய லாரி கழிவுநீர் கால்வாயில் கவிழ்ந்தது.

உரம் ஏற்றிய லாரி

திருவாரூர் மாவட்டம் நீடாமங்கலம் நகரில் நெடுஞ்சாலை ரெயில்வே கேட்டை ஒட்டி கழிவு நீர் கால்வாய் செல்கிறது. இந்த நிலையில் நேற்று முன்தினம் சென்னையில் இருந்து நீடாமங்கலத்துக்கு ரெயில் மூலம் 1306 டன் ஐ.பி.எல். டி.ஏ.பி. உரம் கொண்டு வரப்பட்டு லாரிகள் மூலம் தொடக்கவேளாண்மை கூட்டுறவு வங்கிகளுக்கு அனுப்பி வைக்கப்பட்டது.

இதன்படி நேற்று மதியம் 15 டன் டி.ஏ.பி. உரம் ஏற்றிய ஒரு லாரி திருராமேஸ்வரம் நோக்கி ரெயில் நிலையத்தில் இருந்து புறப்பட்டது. அப்போது எதிரே வந்த வாகனத்திற்கு வழிவிட லாரியை சாலையின் ஓரம் ஒதுக்கிய போது லாரி கழிவுநீர் கால்வாயில் சாலையை அரித்துக்கொண்டு சரிந்தது. இதனால் லாரியில் இருந்த உரமூட்டைகள் மீதே சரிந்தன.

தலைமறைவு

சம்பவ இடத்தில் இருந்து லாரி டிரைவர் தலைமறைவாகி விட்டார். இது குறித்த தகவல் அறிந்த நீடாமங்கலம் போலீஸ் இன்ஸ்பெக்டர் சமரசம் மற்றும் போலீசார் சம்பவ இடத்திற்கு விரைந்து சென்று விசாரணை மேற்கொண்டனர். லாரியின் டிரைவர் தலைமறைவானதால் அவர் யார்? எந்த ஊரைச் சேர்ந்தவர்? என தெரியவில்லை.

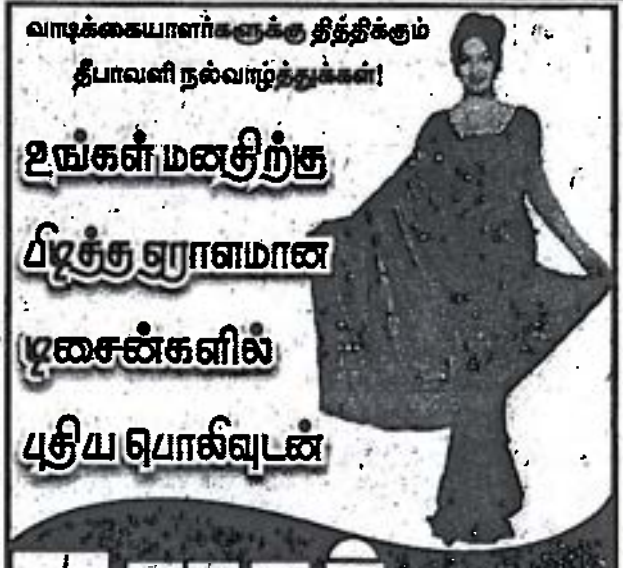
மன்னார்குடி அருகே

ஆம்புலன்ஸ் மோதி விவசாயி பலி

கோட்டூர், அக்.14–

மன்னார்குடி அருகே உள்ள நெடுவாக்கோட்டை வடக்கு தெருவை சேர்ந்தவர் கந்தசாமி (வயது 60). விவசாயி. நேற்று இரவு 8 மணி அளவில் சைக்கிளில் வீட்டுக்கு சென்று கொண்டிருந்தார். அப்போது மன்னார்குடியில் இருந்து தஞ்சைக்கு சென்ற ஆம்புலன்ஸ் வேன் ஒன்று சைக்கிள் மீது மோதியது. இதில் படுகாயம் அடைந்த கந்தசாமி ஆஸ்பத்திரிக்கு கொண்டு செல்லும் வழியில் பரிதாபமாக செத்தார். இது குறித்து மன்னார்குடி போலீசார் வழக்குப்பதிவு செய்து ஆம்புலன்ஸ் டிரைவர் காமராஜை கைது செய்தனர். மேலும் விசாரணை நடந்து வருகிறது.

பெறமுடியும் என்பதை கருத்தில் கொண்டு இந்த முடிவை ஆளும் காங்கிரஸ் கட்சி எடுத்துள்ளது.





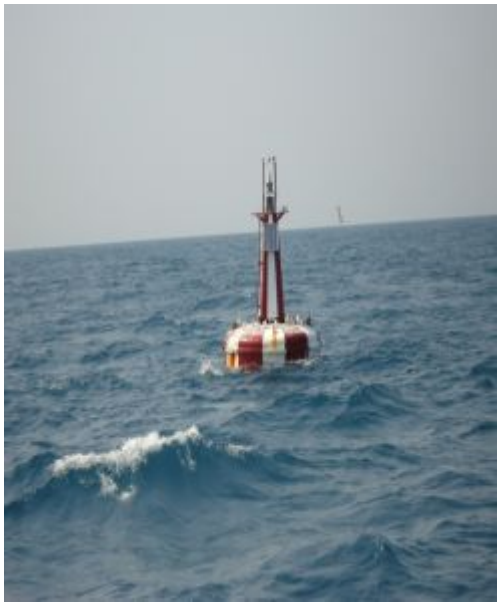
காரைக்கால் போர்ட் பிரைவேட் லிமிடெட்

392 & 393, ராஜீவ்காந்தி சாலை, கொட்டுவாக்கம், சென்னை-600 041.

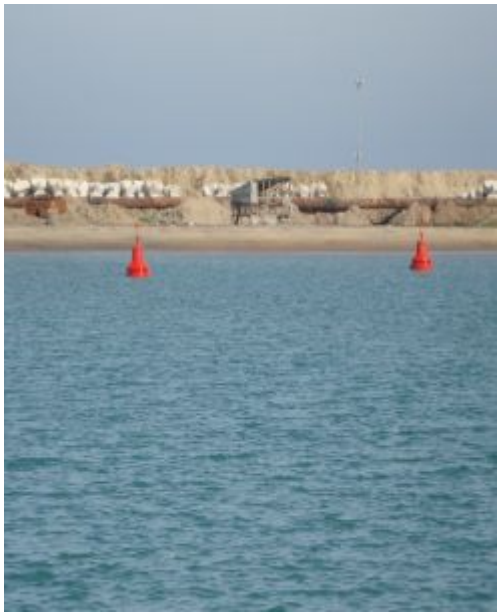
இதன் மூலம் காரைக்கால் துறைமுகத்தின் இரண்டாம் கட்ட விரிவாகத் திட்டத்திற்கு சுற்றுச்சூழல் மற்றும் கடற்கரை ஒழுங்குமுறை மண்டலத்தின் (CRZ) கீழ், இந்திய அரசின் சுற்றுச்சூழல் மற்றும் வனத்துறை அமைச்சகத்தால் அனுமதி வழங்கப்பட்டுள்ளது என்று தெரிவித்துக் கொள்ளப்படுகிறது. மேற்படி அனுமதி கடிதத்தின் நகல்கள் புதுச்சேரி மாசுக்கட்டுப்பாட்டு வாரியத்திலும் மற்றும் சுற்றுச்சூழல் வனத்துறை அமைச்சகத்தின் இணையதளமான http://envfor.nic.in லும் உள்ளது.

தேதி: 13.10.2009 செயலாக்க இயக்குநர்

BUOYS









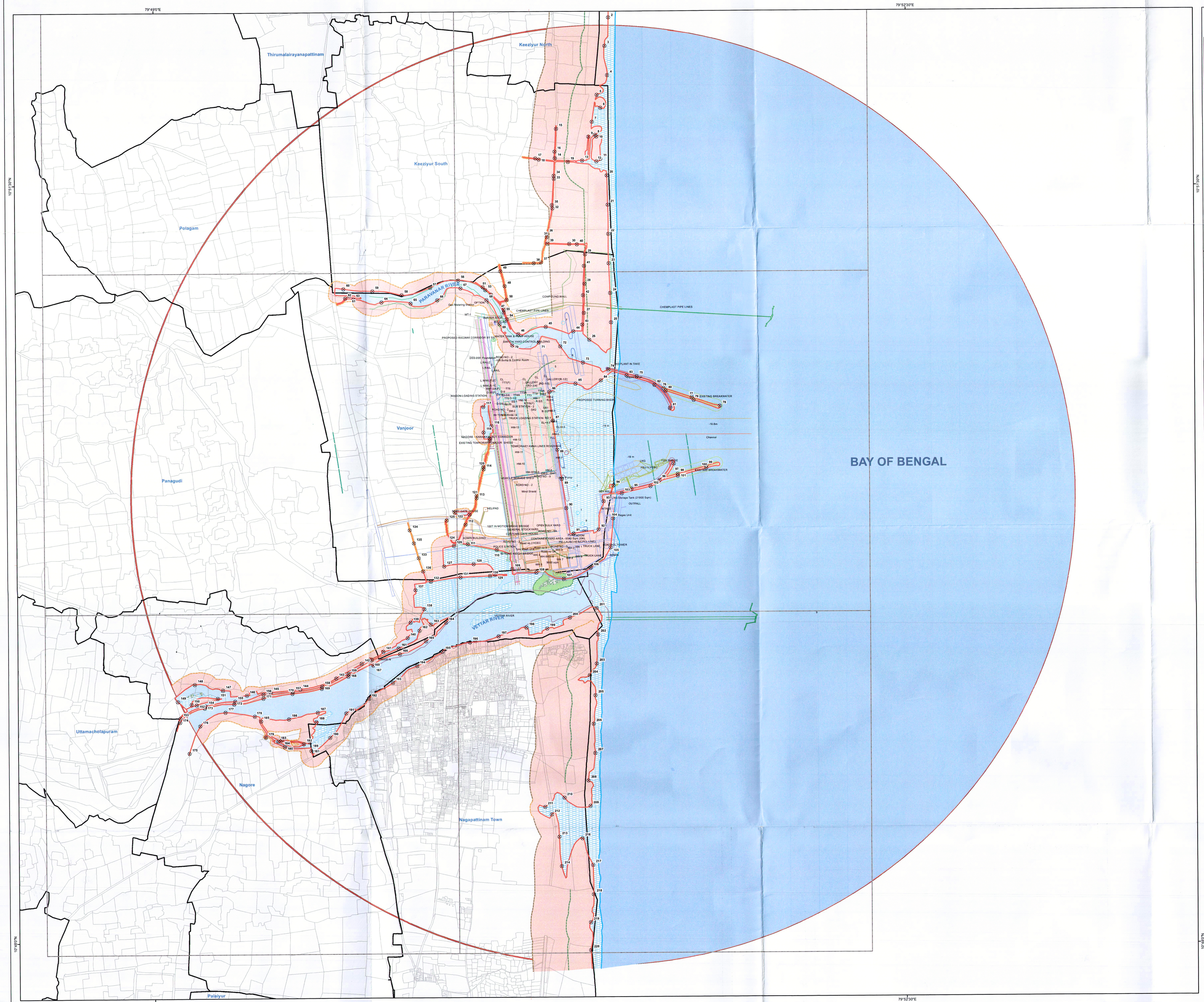
Annexure - 16

Washing Floor at ETP 1

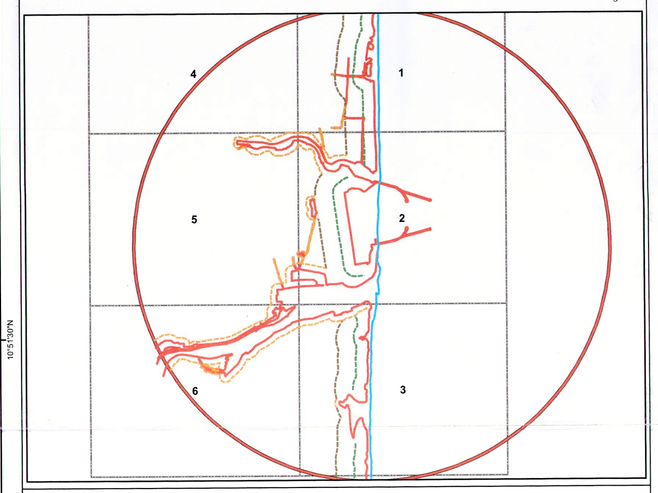




DEMARCATION OF HIGH TIDE LINE, LOW TIDE LINE AND COASTAL REGULATION ZONE FOR THE PROPOSED PROJECT SITE AT KARAIKAL PORT, KARAIKAL DISTRICT, UNION TERRITORY OF PUDUCHERRY



KEY MAP



Legend

Source: GPS SURVEY

- HTL REFERENCE POINT
- HIGH TIDE LINE
- LOW TIDE LINE
- 100m / WIDTH OF CREEK FROM HTL
- 200m FROM HTL
- 500m FROM HTL

Source: CRZ NOTIFICATION 2011

- MANGROVES (CRZ 1A)
- 50m FROM MANGROVES (CRZ 1A)
- CRZ IB
- CRZ III
- CRZ IVA
- CRZ IVB

Source: CLIENT

- SURVEY BOUNDARY
- VILLAGE BOUNDARY
- 4KM BUFFER FROM SITE

SCALE: 1:11,000

0 245 490 980 1,470 1,960 Meters

Prepared by

INSTITUTE OF REMOTE SENSING
ANNA UNIVERSITY
CHENNAI - 600 025

For

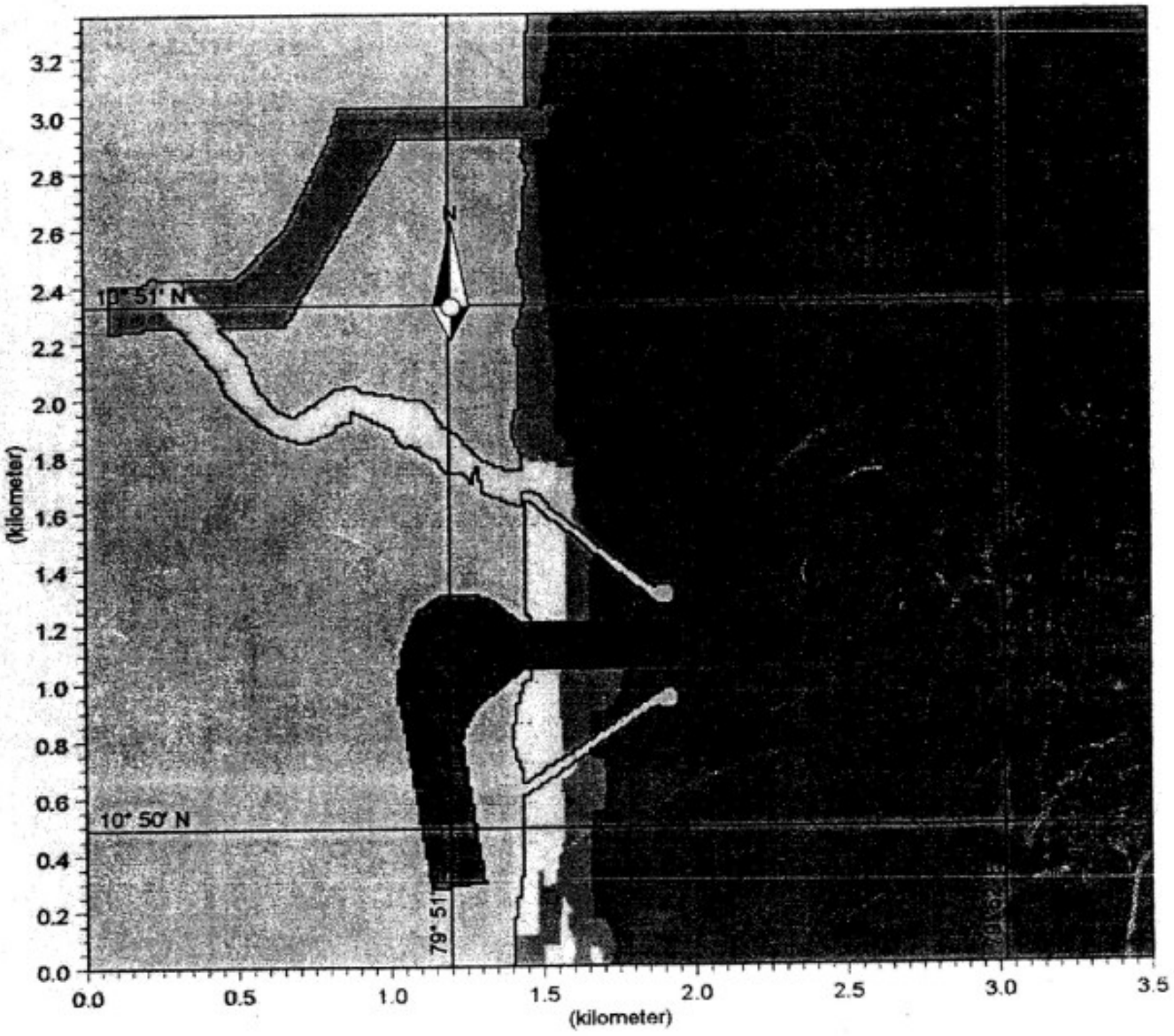
KARAIKAL PORT,
KARAIKAL DISTRICT,
UNION TERRITORY OF PUDUCHERRY

PREPARED BY	
VERIFIED BY	
APPROVED BY	Prof. S.S. Ramakrishnan, B.E(Hons), M.Tech, Ph.D., Director, Institute of Remote Sensing, Anna University, Chennai-600 025.

As per MoEF EC Point 3 xiv

KARAIKAL PORT PRIVATE LIMITED
CHENNAI

HYDRODYNAMIC MODELLING FOR RIVER DIVERSION AT PROPOSED KARAIKAL PORT SITE



MATHEMATICAL MODEL STUDY REPORT
NOVEMBER, 2006

RAMBØLL

L&T-RAMBØLL CONSULTING ENGINEERS LIMITED
339/340, Anna Salai, Nandanam, Chennai - 600 035.

RAMBØLL	**L&T-RAMBØLL CONSULTING ENGINEERS LIMITED**

Client: **Karaikal Port Private Limited**
Chennai

Project: River Diversion at Proposed Karaikal Port Site	**Project No.:** C1061502
Title: Hydrodynamic Model Study	**Document No.:** RP001 / **Rev.:** 0

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Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
0	21-09-06		JKP		VCN		SMA	

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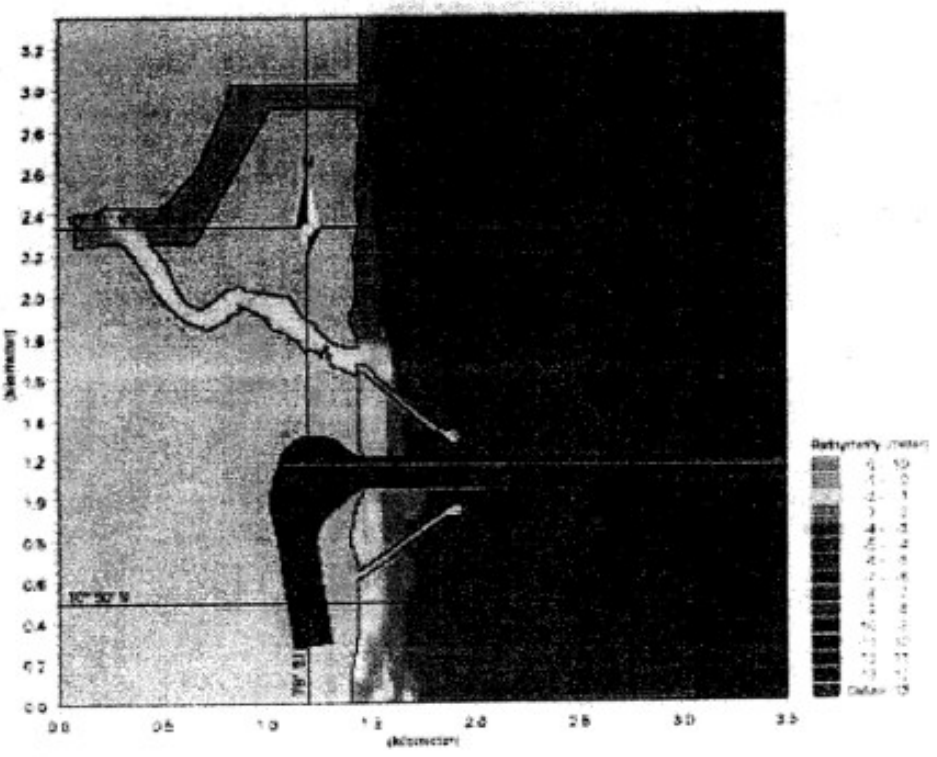
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2.2 Proposed River Diversion

The River Pervadnar is a drainage carrier and it's natural flow is controlled by upstream rainfall. It is a Tributary river of Cauvery and comes from the main branch called Puduvitti. Further it is branched as Puddar ,Vettar finally ends as Pervadnar. It is obvious that a river at the initial stage have narrow width with high velocity. At the middle stage it maintains medium flow and wider. Before the final stage it branches and the velocity becomes slow widening the Riverbed. The River confluences in the East coast of Tamil nadu shows a general trend of shifting towards North.

As per Irrigation deptt. of Tamilnadu records, the river remains dry during Summer and during Monsoon seasons has an M.F.L Discharge of 1820 Cusecs. The width of the River at the upstream is 50m , at the down stream it is 80m and at the mouth widened to 110m. The river has touched the danger level during November 2005.

In the proposed Masterplan of the Karaikal port the river mouth and the end section of the river falls on the project site. Hence Karaikal Port Ltd. proposed to divert the river through suitable hydrodynamic model study. The existing and prposed river diversion is shown below,



2.3 Scope of the study

The detailed scope of this study includes the following tasks,

- Site Visit and collection of River related data from various sources
- Analysis of wind, wave, tide data
- Preparation of digital bathymetry with the river profiles
- To carry out hydrodynamic flow modelling due to Wave action
- Assessment of wave induced flow at proposed diverted River mouth
- To carry out hydrodynamic flow modelling due to Tide action
- Assessment of Tidal penetration in to the existing and diverted river.
- Tidal Prism of the existing and diverted River.
- Presentation of model study results and discussion

3 Hydrodynamic Modelling

3.1 General

Hydrodynamic modelling is carried out using Hydrodynamic flow model of Mike-21 Suites of Program. The model can the flow in response to wave & tide forcing. The basic transport equation of the model drives the 2D free surface flow ignoring stratification. In order to assess the change in hydrodynamic characteristics of the River two types of dynamics are studied. The wave induced Long –shore current is simulated for all the possible wave approach angles to the Karaikal coast. The tide induced Cross-shore current is simulated for Spring & Neap phases of tide. The Flow dynamics for existing River and diverted River are established.

3.2 Input data

3.2.1 Bathymetry

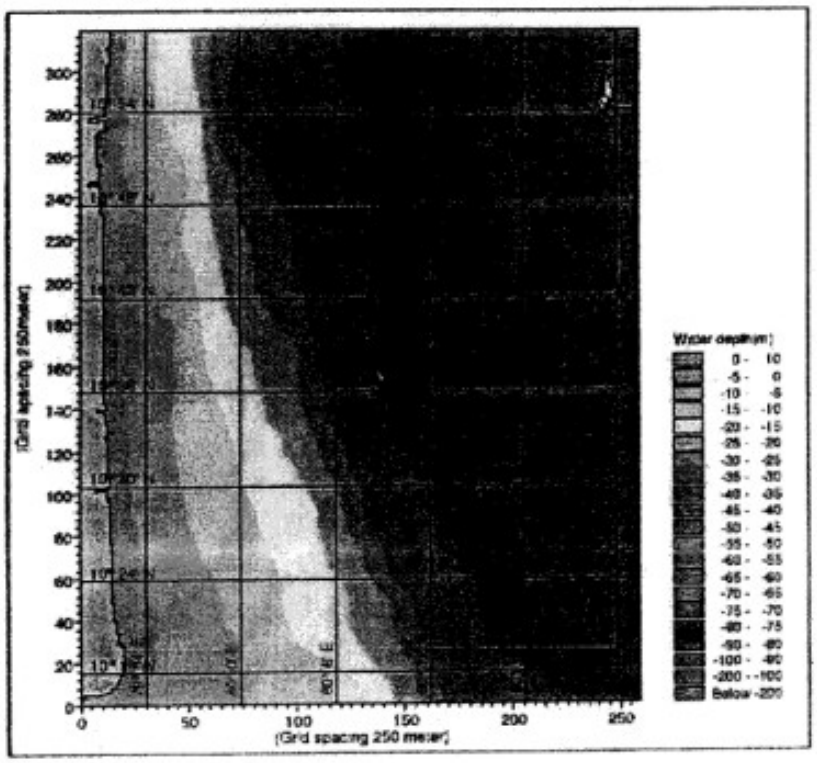


Figure FD- 2 Bathymetry

The Bathymetry of the study area is prepared extending from land to beyond 200m contour in a grid spacing of 250 mx250 m by digitising the bathymetric information (seabed contours and depths) published in the hydrographic charts No.357 & 3007 with scale 1:35,000, 1:300,000 respectively. Spot depths from the hydrographic chart, survey data by M/s Geostar and the location of the 5, 10, 15, 20, 30, 50 & 100, 200m contours have been used to generate the digital area using a suitable interpolation technique. This General bathymetry is presented in Figure FD- 2. The depth contours shows a very gentle slope from offshore to

coast. It can be seen that the distance of the 5m contour from the shoreline is 400m and that of the 10-m contour is 2.2 km.

3.2.2 Wave data

The normal offshore significant wave height varies between 0.5 to 1.8m for over 90% of the waves around the year. Wave heights are generally higher during the months June, July and August more than 10% of the waves being greater than 1.8m. The predominant directions approaching to the Karaikal Coast are from SSE, SE, ESE, E, ENE, NE and NNE. The annual wave Rose based on 10 years BMO wave model data is presented in Figure FD-3The various arms of the rose shows the percentage of occurrence in a year.

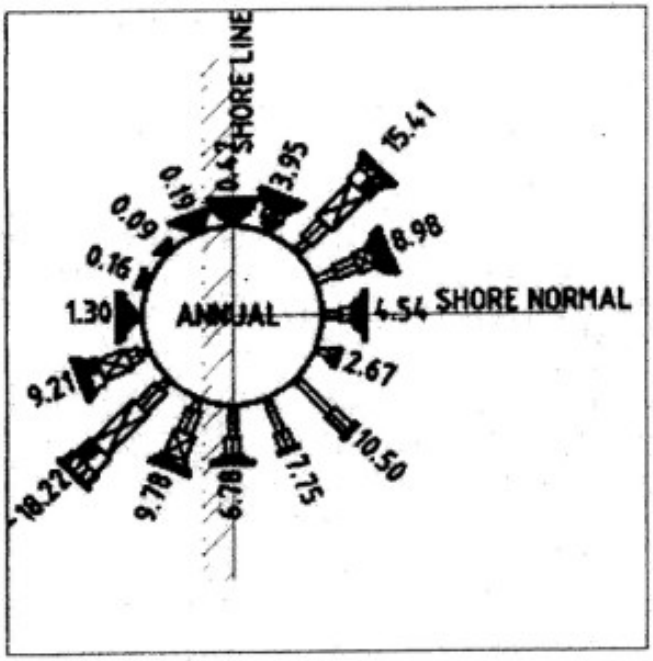


Figure FD- 3 Annual wave rose

3.2.3 Tide data

A self recording tide gauge was deployed at Nagapattinam from 26th February to 25th March 2004. The measured tidal elevations are presented in Figure FD- 4From the plot it can be observed that the range during spring tide is 0.8m and during neap tide is 0.4m.

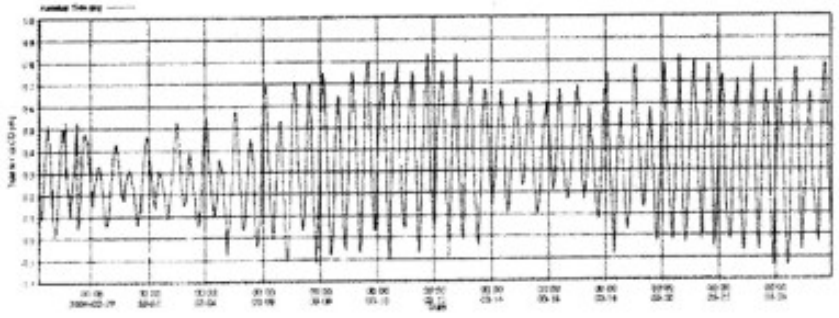


Figure FD- 4 Observed Tide

3.2.4 Current Data

A self-recording current meter was deployed in 10m-water depth, close to the proposed Karaikal Port Site. The measured current speeds and direction at 20minutes interval for the period 1st to 15th March 2004 are presented in Figure FD- 5. From the plot it can be observed that the current speed is 0.6m/s with an average value of about 0.3m/s. Current directions show that the measured currents flow towards North up to the earlier part of the observation period, after which it reverses southward in the later part. This shows that the observation period covers the reversal of the current direction along the coast, which usually takes place in the transition month between the two monsoons. A comparison of the current directions with tidal elevations reveals there is no direct correlation with the semi-diurnal tide indicating that the direction is mainly controlled by the wind driven current.

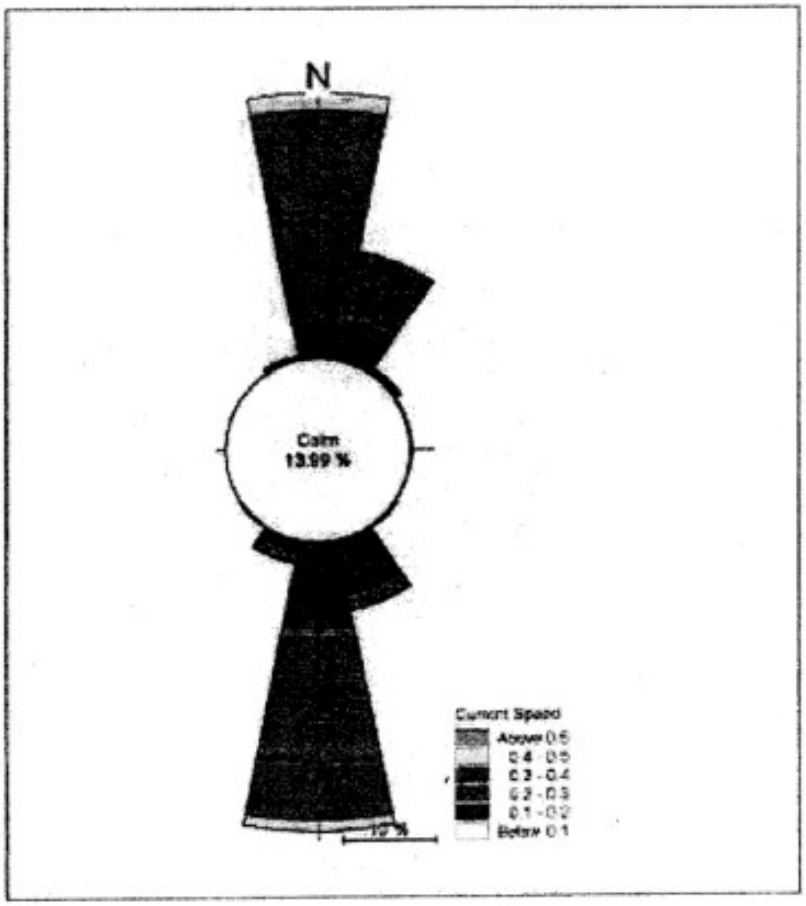


Figure FD- 5 Observed Current rose

3.3 Wave Hydrodynamics

Deep water waves as approaches to shallow water their characteristics change due to depth restriction. Finally at the surf zone it breaks and dissipate it's energy. Depending on the angle it approaches to the coastline it forms a current known as longshore current. Which is a very important physical factor for littoral transport. The hydrodynamic of wave induced is simulated by hydrodynamic model of Mike-21. The wave radiation stress obtained for the coastal regime by modelling the shallow water waves are used as background data in the Longshore current simulation.

The longshore current is generally parallel to coastline and it varies in strength approximately proportional to the square root of the wave height and with Sin $2\alpha_b$, where α_b is the wave incidence angle at breaking. As the position of the breaking line constantly shifts due to the irregularity of natural wave fields and since the distance to the breaker line varies with wave height, the distribution of the long shore current in the coastal profile vary accordingly. The underlying mechanism of the generation of these currents are gradients in momentum flux (radiation stress) due to the decay of obliquely incident waves and the longshore component of the wind. As the longshore current is secondary effect of wave, in this study the deep-water wave data as shown in the wave rose is transformed to nearshore for obtaining radiation stress. The near shore spectral wind-wave model gives radiation stress output as Sxx,Syy, Sxy for three components of stress. The same is plugged into the hydrodynamic flow model for simulating longshore current.

The wave-induced flow in the model area is simulated by specification of the so-called "Wave Radiation Stresses". By averaging the equations of motion over depth and time (the wave period) wave radiation stress terms are included in the momentum equations.

The terms are:

$$x-momentum$$

$$\frac{\partial S_{XX}}{\partial X}+\frac{\partial S_{XY}}{\partial Y}$$

$$y-momentum$$

$$\frac{\partial S_{YY}}{\partial Y}+\frac{\partial S_{XY}}{\partial X}$$

Where SXX , SXY and SYY are the three components of radiation stress.

MIKE 21 NSW can provide resulting maps of radiation stresses Sxx, Sxy and Syy which are defined by,

$$S_{xx}=\rho\frac{g}{2}\left(F_u+F_p\right)$$

$$S_{xy}=\rho\frac{g}{2}F_{uv}$$

$$S_{yy}=\rho\frac{g}{2}\left(F_v+F_p\right)$$

In the output file, the radiation stresses are divided by r. Here Fu, Fuv, Fv and Fp are defined by,

$$F_u = \int_0^{2\pi} \cos^2(\theta)(1+G)E(\theta)d\theta$$

$$F_{uv} = \int_0^{2\pi} \sin(\theta)\cos(\theta)(1+G)E(\theta)d\theta$$

$$F_v = \int_0^{2\pi} \sin^2(\theta)(1+G)E(\theta)d\theta$$

$$F_p = \int_0^{2\pi} GE(\theta)d\theta$$

Where G is given by

$$G = \frac{2kd}{\sinh(2kd)}$$

The input data for this study are bathymetry and wave induced radiation stress simulated by Nearshore wave models. Altogether Seven simulations are carried out pertaining to seven predominant wave approach directions.

3.4 Tidal Hydrodynamics

The estuarine flow pattern in higher resolution Standard hydrodynamic modelling is carried out with velocity based Samgorinsky formulation. The results of the simulations during peak spring and neap conditions each for duration of 24 hrs were allowed to flow into the fine grid.The appropriate governing equations for studying water environment in coastal and estuarine areas are the two-dimensional shallow water equations. These are obtained by vertically integrating the three- dimensional Navier Stokes equations of motion making the following simplified assumptions,

1. The Flow is incompressible
2. The flow is well mixed
3. Vertical acceleration is negligible
4. Bed stress can be modelled

Simulation of hydrodynamic is based on these non-linear vertically integrated 2-D equations of conservation of mass and momentum.

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t}$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x}\left(\frac{p^2}{h}\right) + \frac{\partial}{\partial y}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial x}$$

$$+ \frac{gp\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial x}(h\tau_{xx}) + \frac{\partial}{\partial y}(h\tau_{xy})\right] - \Omega q$$

$$- fVV_x + \frac{h}{\rho_w}\frac{\partial}{\partial x}(p_a) = 0$$

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y}\left(\frac{q^2}{h}\right) + \frac{\partial}{\partial x}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial y}$$

$$+ \frac{gq\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial y}(h\tau_{yy}) + \frac{\partial}{\partial x}(h\tau_{xy})\right] + \Omega p$$

$$- fVV_y + \frac{h}{\rho_w}\frac{\partial}{\partial y}(p_a) = 0$$

These equations are numerically solved by Alternate Direction Implicit (ADI) finite difference technique leading to formation of tri-diagonal matrices, which can be solved efficiently. This entails covering the estuary with a mesh or grid discretising elevations and velocities in space and time to fit on this grid.

The following symbols are used in the equations:

$h(x,y,t)$	-	water depth ($= \zeta - d$, m)
$d(x,y,t)$	-	time varying water depth (m)
$\zeta(x,y,t)$	-	surface elevation (m)
$p,q\ (x,y,t)$	-	flux densities in x- and y-directions ($m^3/s/m$) = (uh,vh); (u,v) = depth averaged velocities in x- and y-directions
$C(x,y)$	-	Chezy resistance ($m^{½}/s$)
g	-	acceleration due to gravity (m/s^2)
$f(V)$	-	wind friction factor
$V,V_x,V_y(x,y,t)$	-	wind speed and components in x- and y-direction (m/s)
$\Omega(x,y)$	-	Coriolis parameter, latitude dependent (s^{-1})
$p_a(x,y,t)$	-	atmospheric pressure ($kg/m/s^2$)
ρ_w	-	density of water (kg/m^3)
x,y	-	space coordinates (m)
t	-	time (s)
$\tau_{xx}, \tau_{xy}, \tau_{yy}$	-	components of effective shear stress

4 Simulated Results

4.1 Long-Shore Flow due to Waves

4.1.1 General

Wave induced Hydrodynamics flow is assessed for the coastal stretch of Karaikal. At the surfzone of proposed project location the current generated by wave incident with respect to the coastline and energy flux by breaking waves are simulated using Nearshore spectral wind-wave model. The incident wave directions to the coast and their associated percentage of occurrence are analysed. Almost 53 % of the offshore wave climate reaches the coast from seven predominant directions (NNE, NE, ENE, E, ESE, SE and SSE) and their 20% exceedence wave parameters presented below, which is used as the run matrix for coastal current simulation.

Wave Direction	Wave Height	Wave Period
NNE	1.6	6
NE	1.65	7
ENE	1.35	5
E	1.2	5
ESE	1.1	5
SE	1.1	7
SSE	1	6.5

4.1.2 Results

A set of results are shown in Figure FD- 6 to Figure FD- 12 corresponding to seven wave incident directions NNE, NE, ENE, E, ESE, SE and SSE respectively. The simulated current speed presented as colour contours and the direction as vector arrows are showing the general flow pattern of the coast. The current speeds ranging from 0-0.8m/s do prevail at the coast. The longshore current is parallel to the coast and directed North-South depending on the wave incident angle. It is observed that the wave induced flow from SE quadrant is slightly higher influence in the Diverted River Mouth then the flow due to NE quadrant waves. However, the penetration is limited to few tens of meters and has no significance, estuarine dynamics point of view.

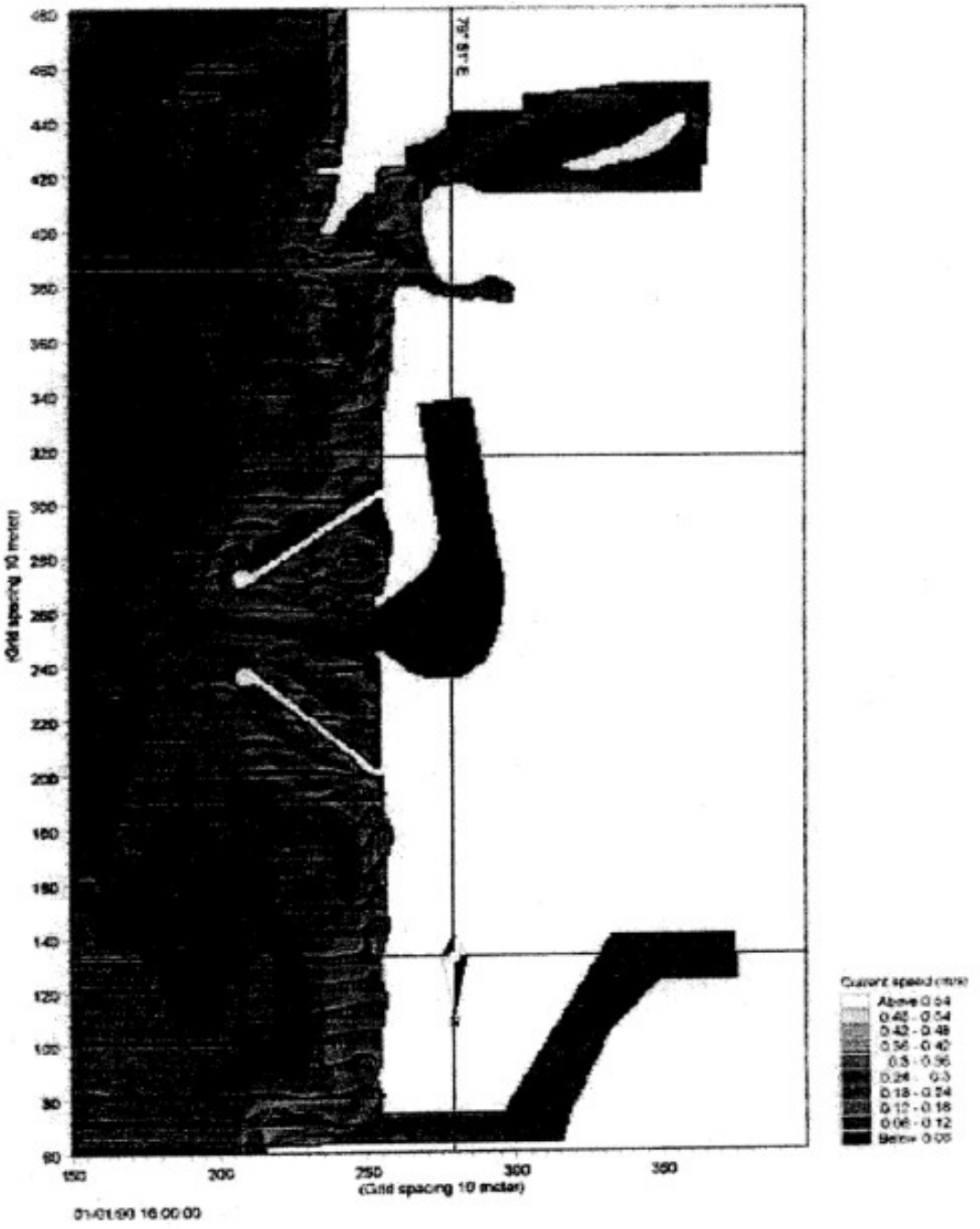


Figure FD- 6 Long shore current due to NNE Waves

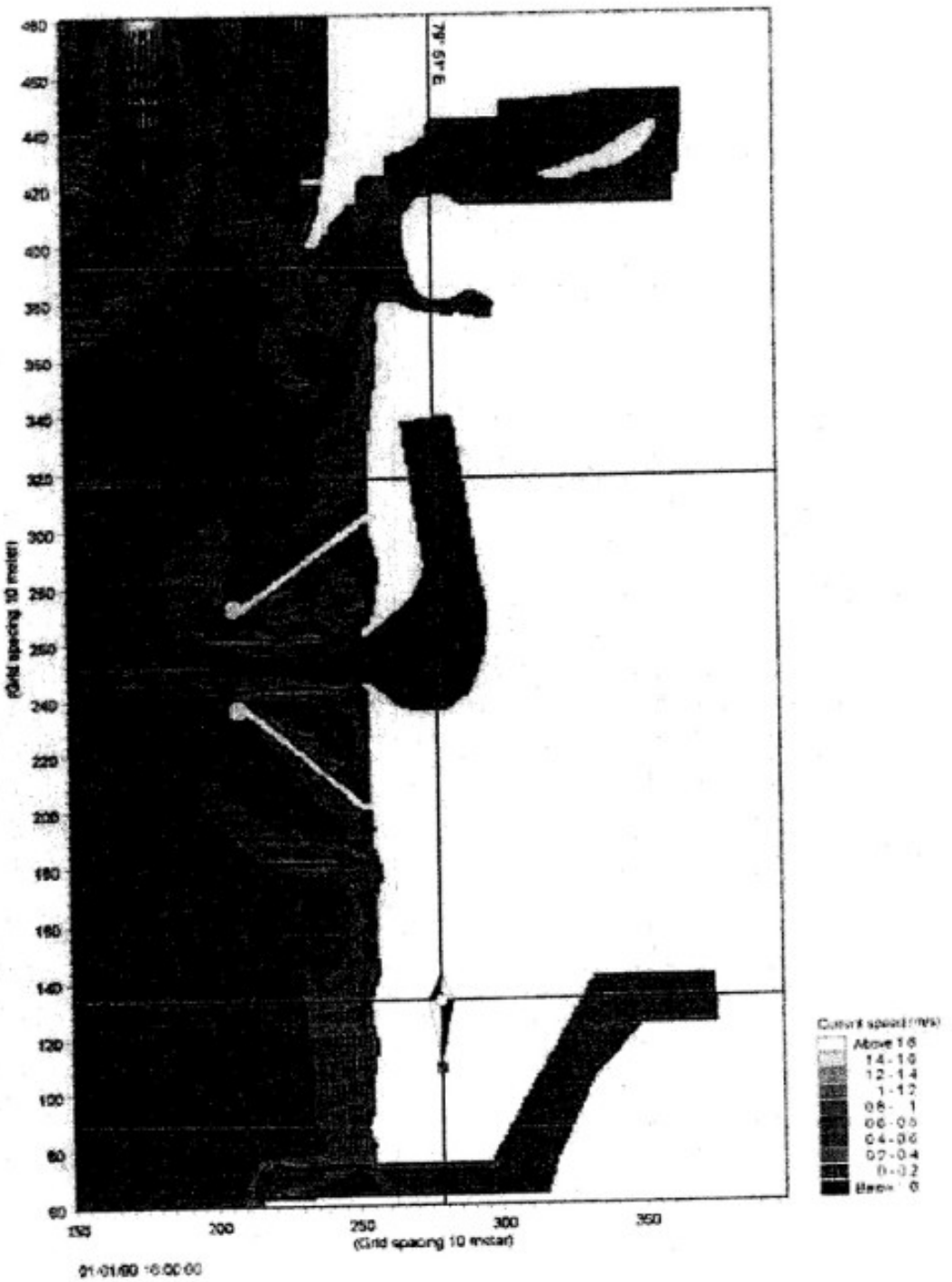


Figure FD- 7 Long shore current due to NE Waves

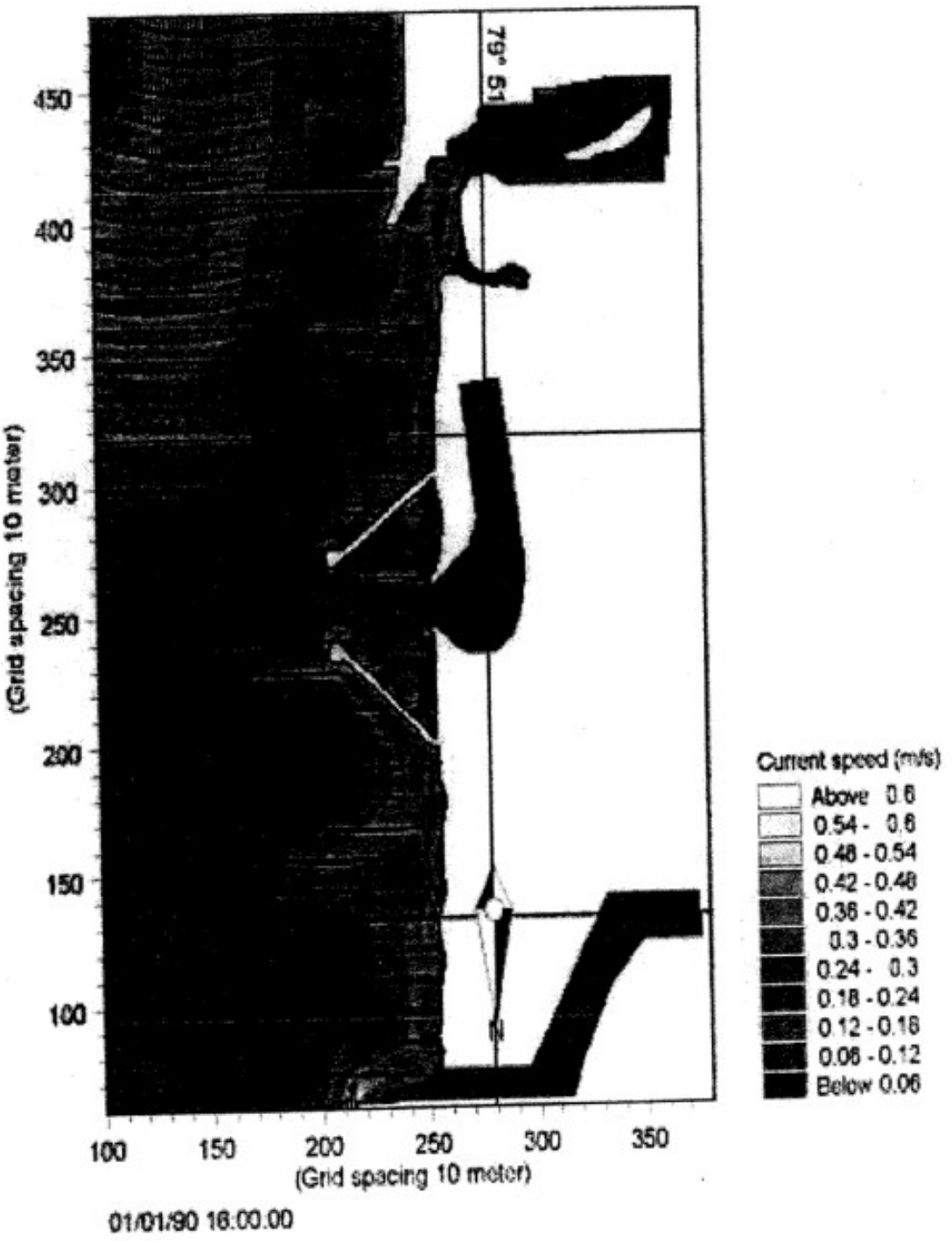


Figure FD- 8 Long shore current due to ENE Waves

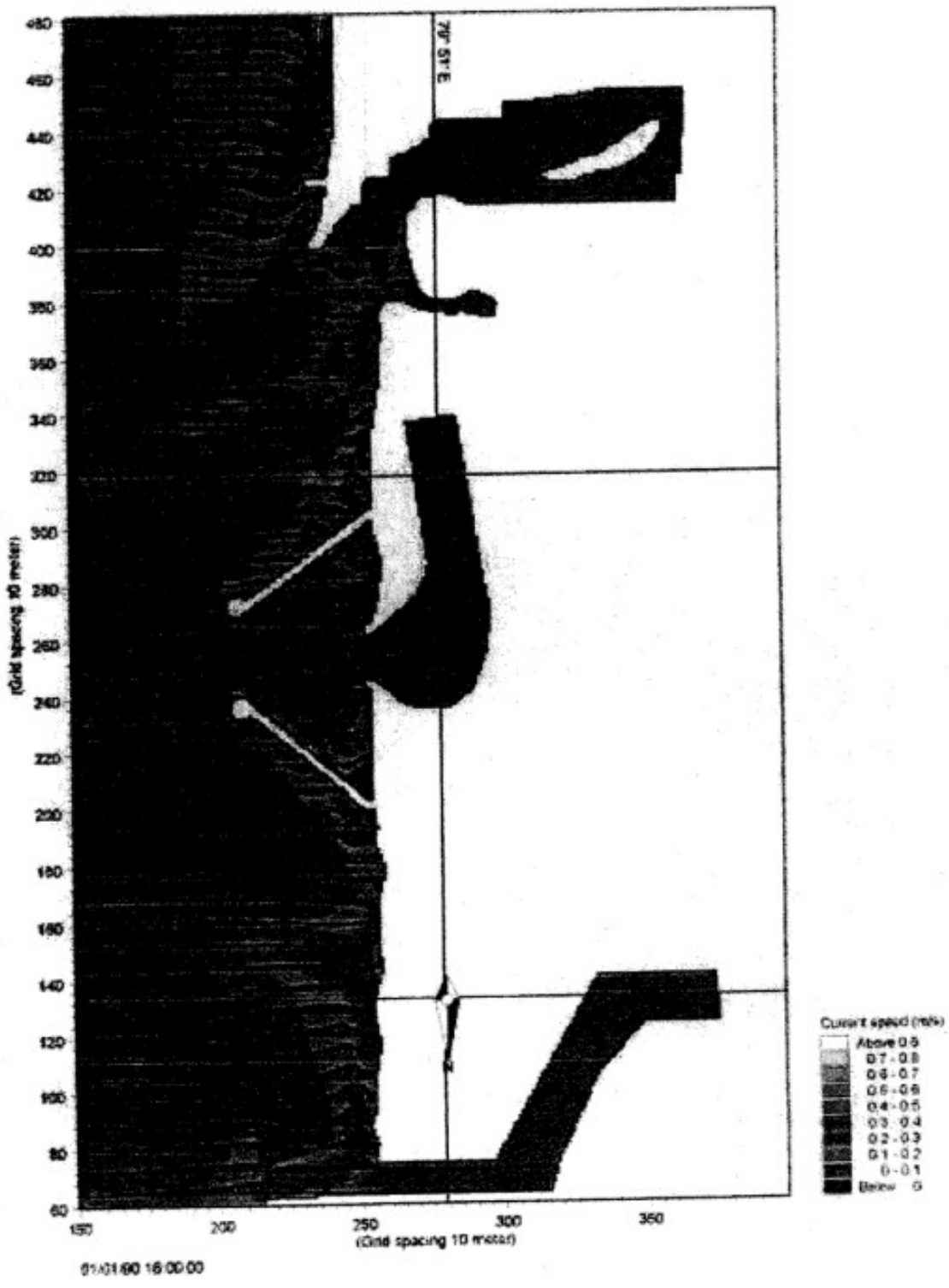


Figure FD- 9 Long shore current due to E Waves

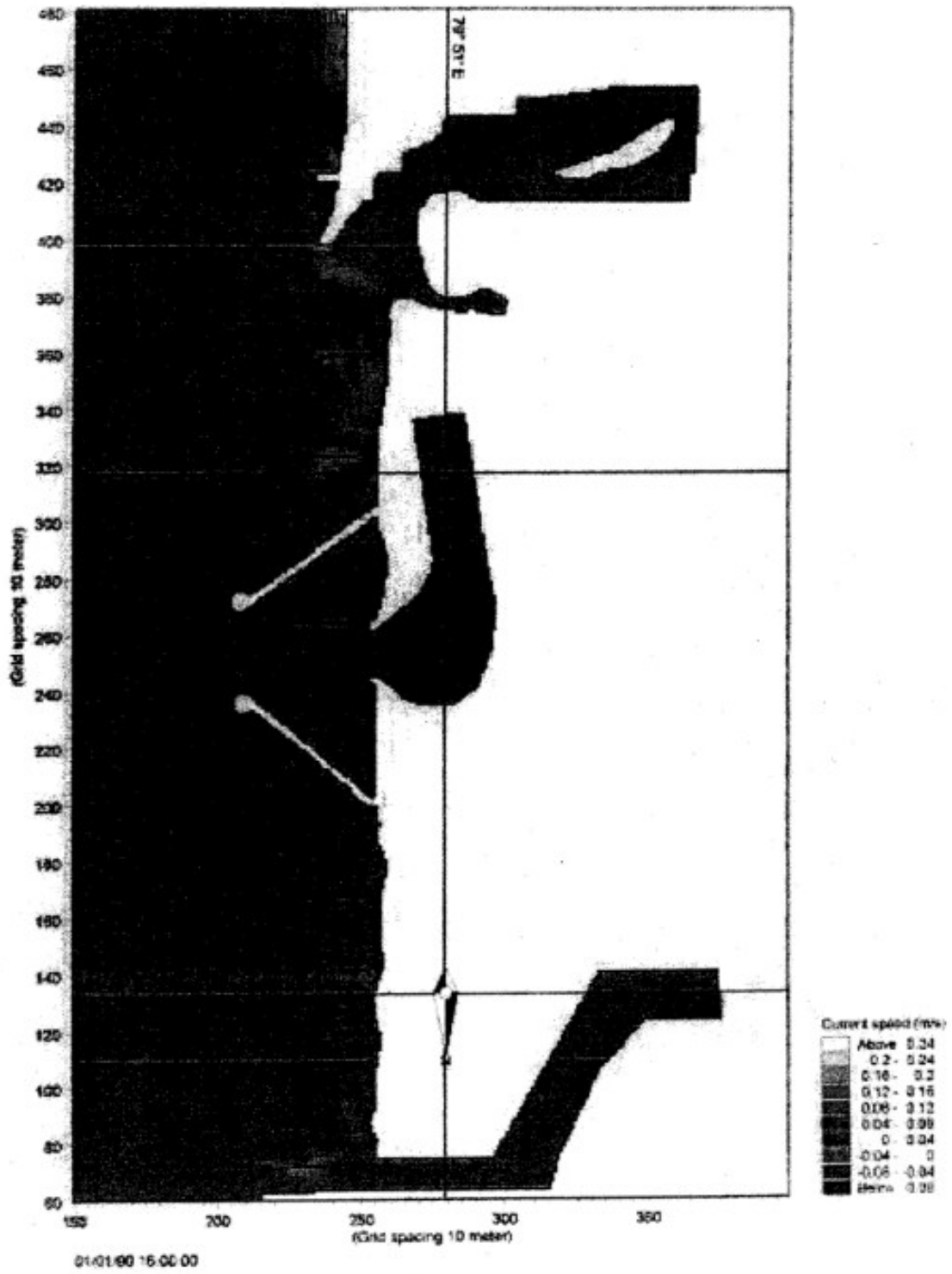


Figure FD- 10 Long shore current due to ESE Waves

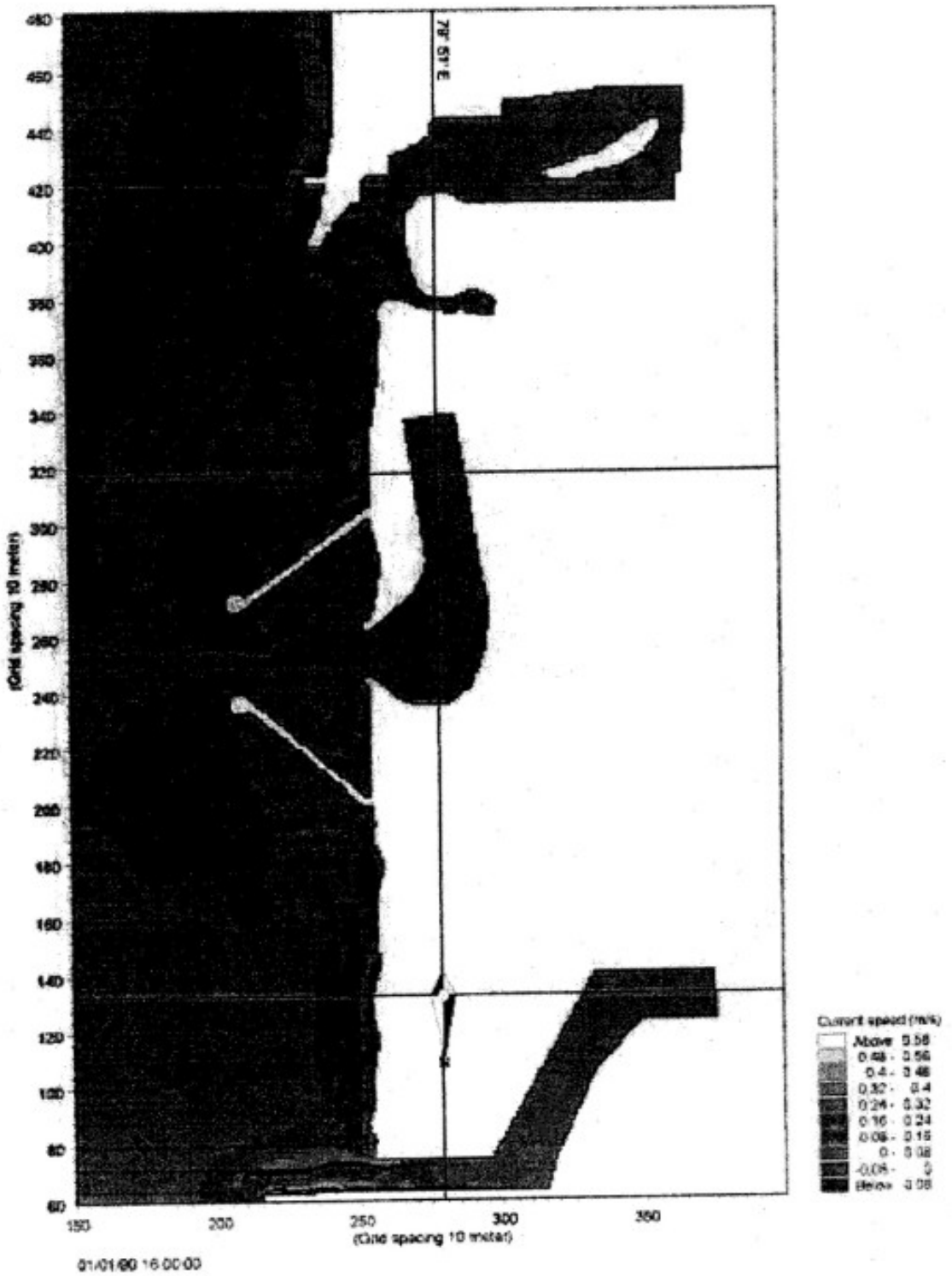


Figure FD- 11 Long shore current due to SE Waves

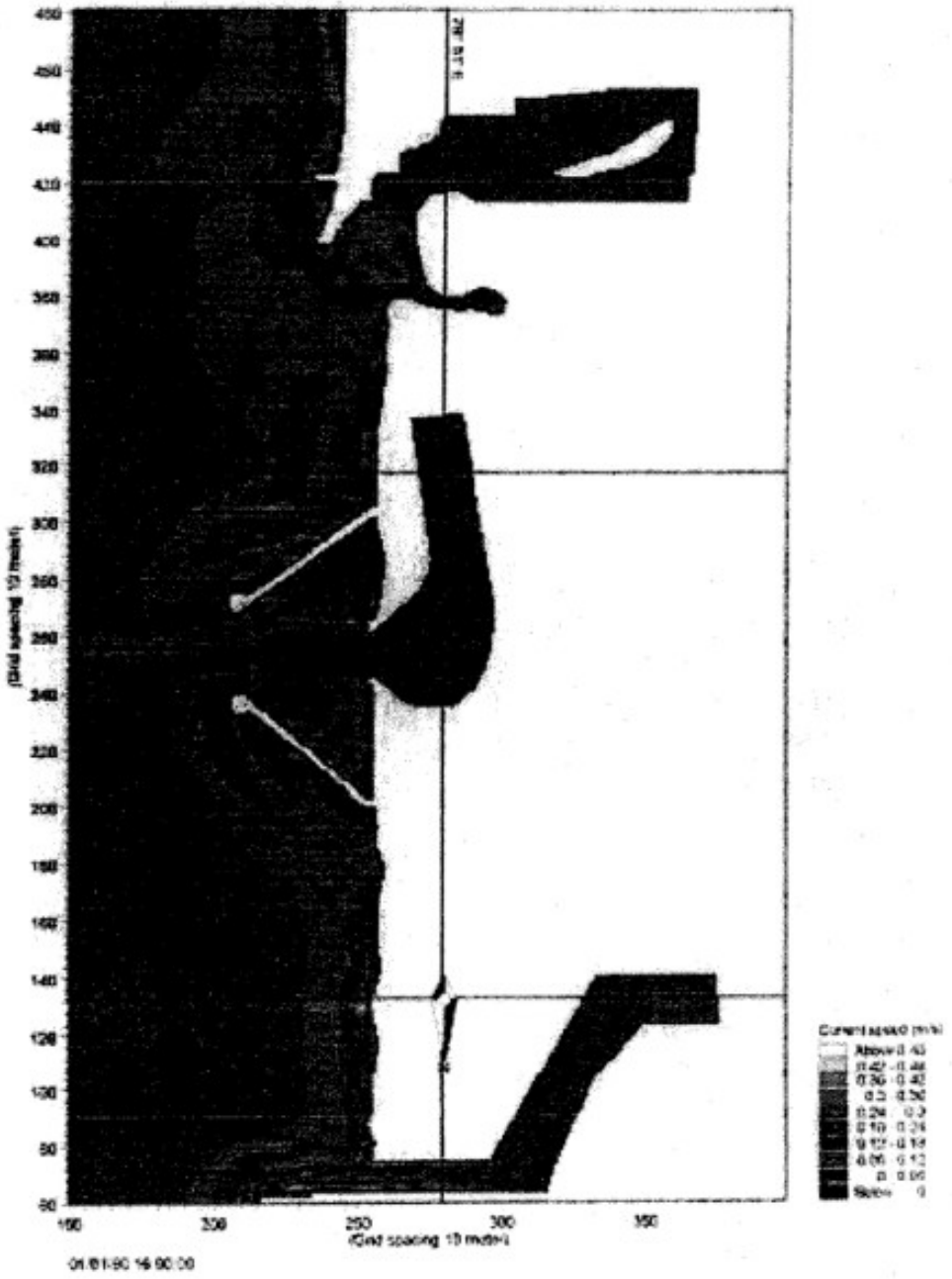


Figure FD- 12 Long shore current due to SSE Waves

4.2 Cross-Shore Flow due to Tide

4.2.1 General

The simulations were carried out for selected 1 day during spring and 1 day during neap from the tidal observations. The evolution of current is catered in the model time step as 15 minute interval. The pattern of current speed and direction at the vicinity of the existing estuary and proposed diversion with port layout for various tidal phases were simulated. The simulations were carried out for duration of 24hrs in each case including warm up (stabilise) for the initial 6hrs.

4.2.2 Tidal influence

The penetration of tide in to the Existing and proposed River is shown in the figure below. The contours indicate the water surface elevation due to Open Ocean tide propagating towards the estuary. During spring tide the maximum water surface elevation (0.8m) into the river then the Neap (0.4m). The limit of Tidal influence in the existing River is upto 1.5km during peak Spring and 1.0km during peak neap tide (flooding). The limit of Tidal influence in the Proposed Diverted River is upto 1.0Km during spring and 0.7Km during neap tide (flooding).It can be seen that generally the direction of flow is East-West direction reversing with inflow (flood) and outflow (ebb) phases of the tide.

4.2.3 Flow Pattern

Current vectors representing the flow pattern during governing flood situations of spring & Neap tides in the model area are presented in Figures. From the figures, it can be seen that the flow pattern in the river mouth is less and further inside it dies down. The small pockets of tidal flats at the confluence are under flooding & drying in regular interval.

4.2.4 Current Speed and direction

It is observed that the tide induced current at the existing River mouth is lower then that of the diverted River. The Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide. As this is not a significant flux ,the influence of tide driven circulation on the river is not appreciable.

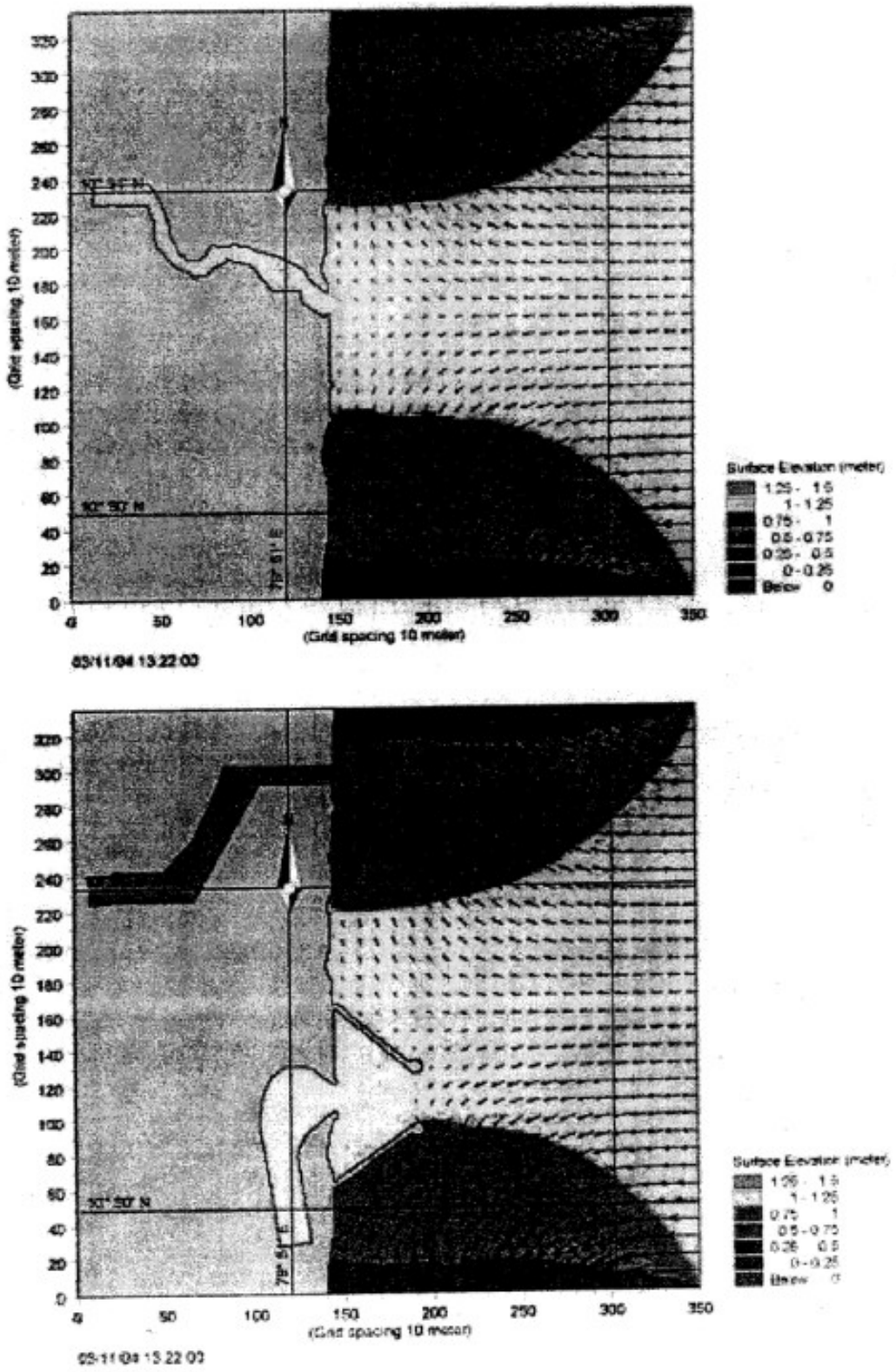


Figure FD- 13 Inflow during Spring Tide (Existing and Diverted River)

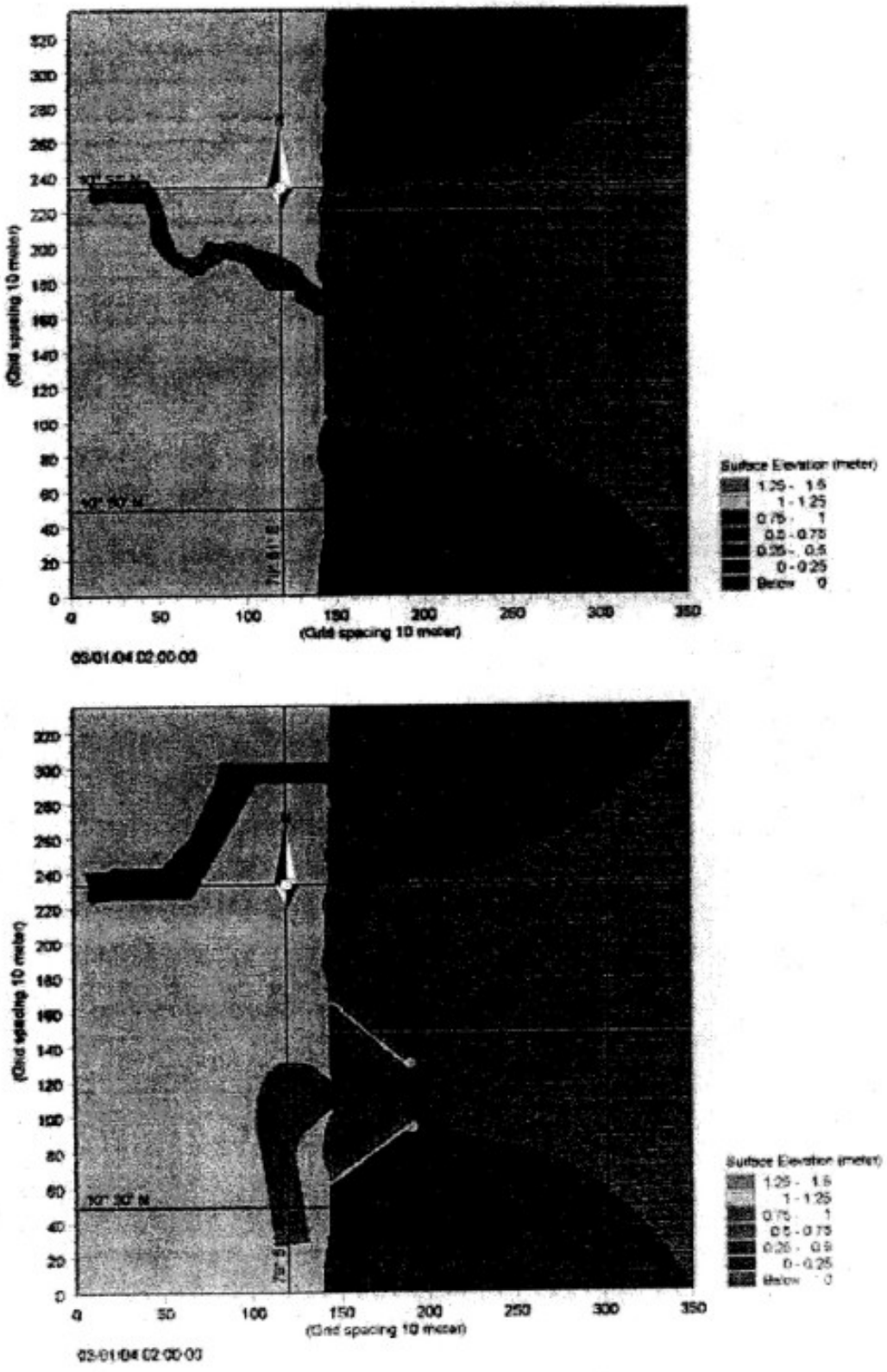


Figure FD- 14 Inflow during Neap Tide (Existing and Diverted River)

5 Tidal Prism

The tidal prism approach (Neill, 1973) can be used for estuaries, with the basic assumption is that the entire estuary fills and empties simultaneously with daily tide.

The maximum discharge Qmax = Π X Volume of water in Tidal Prism / Tidal Period

Maximum discharge during a tidal cycle for Tidal Prism of the Existing Estuary during Spring Tide are 19.0 m3/s and during Neap tide 7.0 m3/s.

Maximum discharge during a tidal cycle for Tidal Prism of the Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.

6 Conclusion

- The Wave induced Long-shore flow (North-South) is in the range of 0.2 to 0.8 m/s for the Karaikal coast
- The Tidal Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide.
- The Wave induced current of magnitude 0.2 m/s enters the mouth of the river have an influence few tens of meters
- The Tidal penetration in the existing River is in the range of 1.0 to 1.5km during Spring and 0.7 to 1.0km during neap tide flooding.
- The Tidal penetration in the Proposed Diverted River is in the range of 0.75 to 1.0Km during spring and 0.5 to 0.7Km during neap tide flooding.
- The tidal prism estimation for Existing Estuary during Spring Tide is 19.0 m3/s and during Neap tide is 7.0 m3/s.
- The tidal prism estimation for Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.
- The River is very small and studies show negligible change in hydrodynamic characteristics due to diversion.

Annexure 3

Karaikal Port Private Limited 3rd Party Marine Water - Break Water Area Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'21.52"**	**N 10°50'20.76"**	**N 10°50'19.81"**	**N 10°50'20.81"**	**N 10°50'20.44"**	**N 10°50'19.83"**
Longitude:			**E 79°51'23.86"**	**E 79°51'22.93"**	**E 79°51'16.19"**	**E 79°51'21.92"**	**E 79°51'21.30"**	**E 79°51'20.57"**
Salinity	%	By Argentometric Titration	3.54	3.79	3.86	3.82	4.02	3.84
pH @ 25˚C	-	IS:3025 Part 11-2022 (electromagnetic method)	7.66	7.34	7.42	7.14	7.05	7.58
Temperature	˚C	IS:3025 Part 9-2023	28	26	27	25	24	27
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013	44980	41710	45600	43320	41140	45200
Turbidity	NTU	IS:3025 Part 10-2023	3.42	8.9	1.96	2.9	2.9	5.4
Total Suspended Solids	mg/l	IS:3025 Part 17-2022	12	19	22	15	14	17
Total Dissolved Solids	mg/l	IS:3025 Part 16-2023	41359	35920	36142	36348	37094	36860
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.4	6.2	6.1	5.7	5.3	6.8
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-2023	5.7	5	6	8	4	3.6
COD	mg/l	IS:3025 Part 58-2023	21	20	22	28	19	22
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	20783	20618	20948	20784	21860	20670
Sulphate as SO_4	mg/l	IS:3025 Part 24/Sec-1 - 2022	2183	1862	1842	2262	2036	2190
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12694	14026	14148	14220	14510	12920
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (EDTA titrimetric method)	1397	1242	1288	1460	1420	1289
Magnesium as Mg	mg/l	IS:3025 Part 46-2023	1784	1710	1684	1842	1872	1704
Potassium as K	mg/l	IS:3025 Part 45 -1993(Flame photometric method)	953	914	936	976	994	891
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (1,10 phenanthroline method)	0.36	0.52	0.58	0.44	0.57	0.51
Zinc as Zn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34 : 1988	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	APHA 24th Edn. 2023 - 4500 NO3 - B	5.94	6.17	6.12	6.94	7.62	BDL
Free Ammonia NH_3	mg/l	IS:3025 Part 34 - 1988 (Nesslerization Method)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Macro - Kjedahl Method)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	3025 Part 31/ Sec 1 - 2022 (Stannous Chloride metho	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Heterpoly blue method)	0.79	0.54	0.58	0.62	0.59	0.64
Total Coliform	MPN/100ml	APHA 24th Edition 9221 B	280	340	240	350	240	430
Faecal Coliforms	MPN/100ml	APHA 24th Edition 9221 E	170	110	70	63	63	84

PHYTOPLANKTON								
Total Cell Count	Nollit		33,700	33,100	31,900	31,200	32,300	32,900
Total Geneus	Nos		10	10	10	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratiumsp	Triceratiumsp
			Triceratiumsp	Triceratiumsp	Triceratiumsp	Triceratiumsp	Bacillariasp	Bacillariasp
			Bacillariasp	Bacillariasp	Bacillariasp	Bacillariasp	Protoperidinim Sp	Protoperidinim Sp
			Protoperidinim Sp	Protoperidinim Sp	Protoperidinim Sp	Protoperidinim Sp	Ditylum sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus Sp	Coscinodiscus Sp
			Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus Sp	Planktoniella Sol	Planktoniella Sol
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Skeletonema costatum	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		24,900	24,200	23,100	22,900	23,700	24,600
Total Geneus	Nos		7	6	6	6	7	7
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Isias Sp	Isias Sp	Isias Sp	Nannocalanus	Nannocalanus
			Isias Sp	Dioithiona	Dioithiona	Dioithiona	Isias Sp	Isias Sp
			Dioithiona	Oithiona sp	Oithona sp	Oithona sp	Centropages	Centropages
			Oithiona sp				Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		30,500	30,700	30,200	29,100	29,300	30,800
Faunal Groups	Nos		6	5	5	5	5	6
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Arthropoda Crustacea
			Animalia Rotifera	Protozoa Foraminifera	Protozoa Foraminifera	Protozoa Foraminifera	Protozoa Foraminifera	Animalia - Rotifera
			Protozoa Foraminifera	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Protozoa Foraminifera
			Chordata Fish Egg	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Chordata Fish Egg
			Protozoa Polyhymenophora					Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Break Water Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	21.01.2026	11.02.2026	10.03.2026
Latitude:			**N 10°50'21.52"**	**N 10°50'20.76"**	**N 10°50'19.81"**	N 10°50'20.81"	N 10°50'20.44"	N 10°50'19.83"
Longitude:			**E 79°51'23.86"**	**E 79°51'22.93"**	**E 79°51'16.19"**	E 79°51'21.92"	E 79°51'21.30"	E 79°51'20.57"
pH @ 25°C (1:10 ratio)	-	IS:2720 Part 26-1987 (Reaff:2016)	7.56	7.59	7.21	7.38	7.56	7.46
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	3.09	2.14	2.58	2.19	3.29	2.15
Zinc as Zn	mg/Kg		56.3	61.7	79.8	57.9	77.3	58.1
Manganese as Mn	mg/Kg		326	477	348	391	654	362.77
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.6	28.9	18.62	24.3	26.9	45.58
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 23rd Edn. 2017 – 4500 NO_2-B	0.63	0.68	0.87	0.55	0.38	0.36
Nitrate as NO_3	mg/Kg	APHA23rd Edn. 2017 – 4500 NO_3-B	696	683	625	623	751	746
Free Ammonia as NH_3	mg/Kg	APHA 23rd Edn. 2017 – 4500 NH_3-B,C	3.82	3.76	4.16	2.71	3.22	3.64
Total Nitrogen	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	979	957	836	893	948	968
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	358	451	484	468	441	297.86
Total Phosphate as P	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	361	463	489	486	447	304.64
Silica as SiO_2	%	IS: 1917 Part-3 – 1992 (Reaff: 2005)	60.1	62.34	51.4	59.37	63.54	65.46
OIL & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9203	10327	8692	11087	11734	9109
Nickel as Ni	mg/Kg		25.62	42.8	35.2	37.8	39.5	21
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae, Bolivintidae, Hauerinidae, Gastropoda & Bivalvia, Nematodes & Crustaceans			170	160	150	150	160	160
MEIOBENTHOS								
Nematods, Foraminifera sp, Gastropod Larvae, Bivalves Larvae & Fish eggs			740	720	690	670	710	720
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Karaikal Port Private Limited 3rd Party Effluent Treatment Plant Outlet Water Analysis Results 2025 - 2026										
Sl.No.	**Test Parameters**	**Unit**	**Protocol**	**CPCB Max. Permissible Limits for (Marine Coastal Areas)**	**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
1	pH @ 25°C	-	IS 3025 Part 11 - 2022 (electrometric method)	5.5 to 9.0	7.53	7.13	7.53	7.76	8.13	7.61
2	Total Dissolved Solids	mg/l	IS 3025 Part 17 - 2022	100 mg/l	2053	5490	1824	4880	2318	2946
3	Total Suspended Solids	mg/l	IS 3025 Part 16 -2023	--	14	12	94	14	16	76
4	Oil & Grease	mg/l	IS 3025 Part 32 -1988 (Argentometric Method)	--	6	3	14	4	6	8
5	COD	mg/l	IS 3025 Part 24/Sec 1 - 2022 (Turbidity method)	--	32	24	226	32	39	69
6	BOD @ 27°C for 3 days	mg/l	IS:3025 Part 39:2021	20 mg/l	9	6.0	77	8	12.0	11
7	Total Kjeldahl Nitrogen	mg/l	IS 3025 Part 44 - 2023	100 mg/l	5.8	10	144.9	9	6.3	6.4
8	Sulphate as SO_4	mg/l	IS 3025 Part 58-2023	250 mg/l	132	469	287.9	412	158	242
9	Ammonical Nitrogen	mg/l	IS 3025 Part 34 -1988 (Macro-Kjeldahl Method)	--	4.9	6.8	140	6.9	5.6	5.6
10	Chloride as Cl	mg/l	IS 3025 Part 34 -1988 (Titrimetric Method)	--	624	2794	874.2	1898	682	742
11	Faecal Coliforms	MPN/100ml	APHA 24thEdn. 2023 : 9221 'E'	--	70	120	350	<1.8	110	94
Note : BDL - Below Detection Limit, DL - Detection Limit,MPN - Most Probable Number . NS - Not Specified.										

Karaikal Port Private Limited 3rd Party Harbour Basin Marine Water Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'13.74"**	**N 10°50'13.23"**	**N 10°50'14.03"**	**N 10°50'06.63"**	**N 10°49'54.89"**	**N 10°49'45.59"**
Longitude:			**E 79°50'55.06"**	**E 79°50'54.68"**	**E 79°50'55.24"**	**E 79°50'56.07"**	**E 79°51'01.56"**	**E 79°51'34.85"**
Salinity	%	By Argentometric Titration	3.56	3.93	3.89	3.77	3.96	3.85
pH @ 25˚C	-	IS:3025 Part 11-2022 (electromagnetic method)	7.91	7.25	7.34	7.17	7.19	4.49
Temperature	˚C	IS:3025 Part 9-2023	28	26	27	25	24	28
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013	44860	42690	45200	42910	40380	45300
Turbidity	NTU	IS:3025 Part 10-2023	3.62	6.2	2.2	1.7	2.2	5.7
Total Suspended Solids	mg/l	IS:3025 Part 17-2022	14	14	16	10	12	21
Total Dissolved Solids	mg/l	IS:3025 Part 16-2023	41440	37010	36948	36084	36388	36920
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.3	6.4	6.3	6.6	6.1	7
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-2023	6.1	6	5	5	4	4
COD	mg/l	IS:3025 Part 58-2023	22	24	20	22	16	23
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	21643	21360	21148	20492	21544	20710
Sulphate as SO_4	mg/l	IS:3025 Part 24/Sec-1 - 2022	2134	1994	1884	2134	1932	2216
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12574	14492	14864	14968	14070	12860
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (EDTA titrimetric method)	1428	1380	1412	1426	1342	1292
Magnesium as Mg	mg/l	IS:3025 Part 46-2023	1732	1834	1898	1810	1796	1724
Potassium as K	mg/l	IS:3025 Part 45 -1993(Flame photometric method)	873	969	958	949	922	886
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (1,10 phenanthroline method)	0.35	0.48	0.52	0.35	0.55	0.55
Zinc as Zn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 65 : 2022	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34 : 1988	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	APHA 24th Edn. 2023 - 4500 NO3 - B	6.23	6.2	6.32	6.42	7.36	5.67
Free Ammonia NH_3	mg/l	IS:3025 Part 34 - 1988 (Nesslerization Method)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Macro - Kjedahl Method)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	3025 Part 31/ Sec 1 - 2022 (Stannous Chloride meth	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Heterpoly blue method)	0.69	0.59	0.54	0.57	0.52	0.61
Total Coliform	MPN/100ml	APHA 24th Edition 9221 B	350	210	350	430	350	280
Faecal Coliforms	MPN/100ml	APHA 24th Edition 9221 E	<1.8	110	110	280	84	70

PHYTOPLANKTON								
Total Cell Count	Nollit		31,200	32,300	30,400	30,700	31,800	30,700
Total Geneus	Nos		9	9	9	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratium sp
			Triceratium sp	Triceratium sp	Triceratium sp	Triceratium sp	Triceratium sp	Bacillaria sp
			Bacillaria sp	Bacillaria sp	Bacillaria sp	Bacillaria sp	Bacillaria sp	Protoperidinim sp
			Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Protoperidinim sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus sp
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Coscinodiscus sp	Coscinodiscus sp	Planktoniella Sol
						Planktoniella Sol	Planktoniella Sol	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		21,700	22,900	22,500	21,800	23,100	22,900
Total Geneus	Nos		6	6	6	5	6	6
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Nannocalanus	Nannocalanus	Isias sp	Isias sp	Isias sp
			Dioithiona	Dioithiona	Dioithiona	Oithona sp	Centropages	Centropages
			Oithiona sp	Oithiona sp	Oithona sp		Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		29,400	29,400	29,600	28,700	29,100	30,600
Faunal Groups	Nos		5	5	5	5	5	5
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Animalia - Rotifera
			Animalia Rotifera	Animalia Rotifera	Animalia - Rotifera	Animalia - Rotifera	Protozoa - Foraminifera	Protozoa - Foraminifera
			Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg
			Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Harbour Basin Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°49'13.74"**	**N 10°50'13.23"**	**N 10°50'14.03"**	**N 10°50'06.63"**	**N 10°49'54.89"**	**N 10°49'45.59"**
Longitude:			**E 79°50'55.06"**	**E 79°50'54.68"**	**E 79°50'55.24"**	**E 79°50'56.07"**	**E 79°51'01.56"**	**E 79°51'34.85"**
pH @ 25˚C (1:10 ratio)	-	20 Part 26-1987 (electromagnetic me	7.5	7.52	7.28	7.58	7.49	7.38
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	3.14	2.09	2.5	2.31	3.31	2.28
Zinc as Zn	mg/Kg		56.24	70.32	68.4	51.8	81.3	58.7
Manganese as Mn	mg/Kg		339	443	362	367	637	464.68
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.6	33.1	17.5	25.1	56.8	46.11
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B	0.58	0.65	0.74	0.57	0.36	0.32
Nitrate as NO_3	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B	700	653	668	603	729	736
Free Ammonia as NH_3	mg/Kg	APHA 24th Edn. 2023 – 4500 NO2-B,C	3.94	3.76	3.96	2.83	3.37	3.48
Total Nitrogen	mg/Kg	IS : 10158 - 1982	890	938	876	901	964	968
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982	357	441	476	459	419	298.26
Total Phosphate as P	mg/Kg	IS : 10158 - 1982	361	453	473	476	426	306.87
Silica as SiO_2	%	IS: 1917 Part-3 – 1992	58.68	60.87	54.2	60.37	62.81	64.86
Oil & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9192	10234	8670	11023	11834	9287
Nickel as Ni	mg/Kg		25.81	32.6	42.6	37.3	40.27	21.27
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	1.69
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae,Bolivintidae,Hauerinidae,Gastropoda & Bivalvia, Nematodes & Crustaceans			130	150	140	130	150	160
MEIOBENTHOS								
Nematodes,Foraminifera sp, Gastropoda Larvae, Bivalvia Larvae & Fish eggs.			720	710	680	650	680	690
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Sampling Locations: 1. North Vanjoor 2. Keezha Vanjoor . 3. Nagore Village.

Month		Oct-25		
Date of Sampling		14.10.2025 to 15.10.2025		
S.No	**Time**	**1.Leq dB(A)**	**2.Leq dB(A)**	**3.Leq dB(A)**
1	**07.00 AM**	44.9	47.6	45.3
2	8	45.6	49.3	46.8
3	9	46.8	50.1	48.2
4	10	48.2	51.8	49.1
5	11	47.3	51.3	47.6
6	**12.00 PM**	47.1	50.9	47.2
7	1	46.8	50.4	48.6
8	2	46.5	51.6	48.3
9	3	46.2	52.9	47.9
10	4	46.7	51.3	47.2
11	5	47.2	53.4	47.8
12	6	48.3	52.7	48.3
13	7	47.5	50.9	49.5
14	8	46.1	49.3	50.2
15	9	45.9	47.2	48.3
16	10	45.1	45.6	47.1
17	11	44.6	45.1	46.2
18	**12.00 AM**	44.2	44.8	44.5
19	1	43.8	43.9	42.9
20	2	43.5	43.1	42.5
21	3	42.9	43.5	42.1
22	4	43.1	44.2	43.4
23	5	44.5	45.6	45.2
24	6	45.2	46.7	46.7

Karaikal Port Private Limited 3rd Party Port Entrance Channel Marine Water Results 2025-2026								
Characteristics Test	**Unit**	**Protocol**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Date of Sampling			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**10.03.2026**	**10.03.2027**
Latitude:			**N 10°50'21.53"**	**N 10°50'22.45"**	**N 10°50'21.86"**	**N 10°50'20.81"**	**N 10°50'56.38"**	**N 10°50'56.38"**
Longitude:			**E 79°51'23.88"**	**E 79°51'24.61"**	**E 79°51'23.95"**	**E 79°51'30.27"**	**E 79°52'03.57"**	**E 79°52'03.57"**
Salinity	%	By Argentometric Titration	3.57	3.88	4	3.71	3.82	3.82
pH @ 25˚C	-	IS:3025 Part 11-1983 (Reaff:2017)	7.51	7.21	7.26	7.2	7.61	7.61
Temperature	˚C	IS:3025 Part 9-1984 (Reaff:2017)	28	26	27	25	27	27
Electrical Conductivity	µmhos/cm	IS:3025 Part 14- 2013 (Reaff:2019)	45600	42180	44890	42640	45400	45400
Turbidity	NTU	IS:3025 Part 10-1984 (Reaff:2017)	3.47	16.8	1.8	1.3	5.8	5.8
Total Suspended Solids	mg/l	IS:3025 Part 17-1984 (Reaff:2017)	11	28	26	6	19	19
Total Dissolved Solids	mg/l	IS:3025 Part 16-1984(Reaff:2017)	41380	36640	38896	35662	36940	36940
Dissolved Oxygen	mg/l	IS:3025 Part 38-1989 (Reaff:2019)	6.2	6.3	6.5	6.1	6.5	6.5
BOD @ 27˚C for 3 days	mg/l	IS:3025 Part 44-1993 (Reaff:2019)	6	7	7	6	5	5
COD	mg/l	IS:3025 Part 58-2006 (Reaff:2017)	19	27	24	24	26	26
Chloride as Cl	mg/l	IS:3025 Part 32-1988 (Reaff:2019)	20868	21140	21740	20180	20546	20546
Sulphate as SO_4	mg/l	IS:3025 Part 24-1986 (Reaff:2019)	2187	1940	1898	2044	2240	2240
Sodium as Na	mg/l	IS:3025 Part 45 - 1993 (Reaff:2019)	12976	14240	14898	13814	12940	12940
Calcium as Ca	mg/l	IS:3025 Part 40-1991 (Reaff:2019)	1403	1310	1390	1380	1294	1294
Magnesium as Mg	mg/l	IS:3025 Part 46-1994 (Reaff:2019)	1798	1776	1828	1774	1698	1698
Potassium as K	mg/l	IS:3025 Part 45 -1993(Reaff:2019)	894	934	958	921	906	906
Oil & Grease	mg/l	IS:3025 Part 39-2021	BDL	BDL	BDL	BDL	BDL	BDL
Iron as Fe	mg/l	IS:3025 Part 53:2003 (Reaff:2019)	0.31	0.59	0.68	0.31	0.49	1.49
Zinc as Zn	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Manganese as Mn	mg/l	IS:3025 Part 2:2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Cadmium as Cd	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/l	IS:3025 Part 2-2004 (Reaff:2014)	BDL	BDL	BDL	BDL	BDL	BDL
Mercury Hg	mg/l	IS:3025 Part 48 -1994(Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Nitrate as NO_3	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	6.14	6.29	6.46	6.2	5.9	6.9
Free Ammonia NH_3	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Kjeldahl Nitrogen	mg/l	IS:3025 Part 34-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Inorganic Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Total Phosphate	mg/l	IS:3025 Part 31-1988 (Reaff:2019)	BDL	BDL	BDL	BDL	BDL	BDL
Silica as SiO_2	mg/l	IS:3025 Part 35-1988(Reaff:2019)	0.81	0.65	0.68	0.54	0.73	0.73
Total Coliform	MPN/100ml	APHA 23rd Edn 2017:9221 B	540	520	350	540	350	350
Faecal Coliforms	MPN/100ml	APHA 23rd Edn 2017:9221 E	110	130	94	94	46	46

PHYTOPLANKTON								
Total Cell Count	Nollit		34,100	33,400	32,100	31,600	32,900	33,300
Total Geneus	Nos		10	10	10	10	10	10
Geneus			Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis	Dianophysis
			Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus	Leptocylindrus
			Ceratium Macroceroa	Ceratium Macroceroa	Ceratium Macroceros	Ceratium Macroceros	Bellerochea Sp	Bellerochea Sp
			Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Bellerochea Sp	Triceratium sp	Triceratium sp
			Triceratium Sp	Triceratium Sp	Triceratium sp	Triceratium sp	Bacillaria sp	Bacillaria sp
			Bacillaria Sp	Bacillaria Sp	Bacillaria sp	Bacillaria sp	Protoperidinim sp	Protoperidinim sp
			Protoperinim Sp	Protoperinim Sp	Protoperidinim sp	Protoperidinim sp	Ditylum sp	Ditylum sp
			Ditylum sp	Ditylum sp	Ditylum sp	Ditylum sp	Coscinodiscus sp	Coscinodiscus sp
			Coscinodiscus Sp	Coscinodiscus Sp	Coscinodiscus sp	Coscinodiscus sp	Planktoniella Sol	Planktoniella Sol
			Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Planktoniella Sol	Skeletonema Costatum	Skeletonema costatum
ZOOPLANKTON								
Total Cell Count	Nollit		25,600	24,300	23,800	23,200	23,700	54,100
Total Geneus	Nos		7	6	6	6	7	7
Geneus			Brachionus	Brachionus	Brachionus	Brachionus	Brachionus	Brachionus
			Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus	Paracalanus
			Favella	Favella	Favella	Favella	Favella	Favella
			Nannocalanus	Isias Sp	Isias sp	Isias sp	Nannocalanus	Nannocalanus
			Isias Sp	Dioithona	Dioithiona	Dioithiona	Isias sp	Isias sp
			Dioithona	Oithona Sp	Oithona sp	Oithona sp	Centropages	Centropages
			Oithona Sp				Oithona sp	Oithona sp
ZOOPLANKTON								
Population	No.m^3		32,700	31,200	30,400	28,900	29,300	31,300
Faunal Groups	Nos		6	5	5	5	5	6
Major Groups			Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda	Arthropoda Copepoda
			Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Arthropoda Crustacea	Animalia - Rotifera	Arthropoda Crustacea
			Animalia Rotifera	Protozoa Foraminifera	Protozoa - Foraminifera	Protozoa - Foraminifera	Protozoa - Foraminifera	Animalia - Rotifera
			Protozoa Foraminifera	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Chordata Fish Egg	Protozoa - Foraminifera
			Chordata Fish Egg	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Protozoa Polyhymenophora	Chordata Fish Egg
			Protozoa Polyhymenophora					Protozoa Polyhymenophora

Karaikal Port Private Limited 3rd Party Port Entrance Channel Sediment Results 2025-2026								
Parameters	**Unit**	**Procedure**	**Oct-25**	**Nov-25**	**Dec-25**	**Jan-26**	**Feb-26**	**Mar-26**
Sample on			**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
Latitude:			**N 10°50'21.53"**	**N 10°50'22.45"**	**N 10°50'21.86"**	**N 10°50'20.81"**	**N 10°50'21.17"**	**N 10°50'56.38"**
Longitude:			**E 79°51'23.88"**	**E 79°51'24.61"**	**E 79°51'23.95"**	**E 79°51'30.27"**	**E 79°51'32.96"**	**E 79°52'03.57"**
pH @ 25˚C (1:10 ratio)	-	720 Part 26-1987 (electrometric meth	7.62	7.52	7.35	7.34	7.29	7.32
Iron as Fe	%	USEPA 3050 B -1996 & USEPA 6010C - 2000	2.14	2.11	2.48	2.32	3.14	3.98
Zinc as Zn	mg/Kg		56.1	62.1	77.69	58.6	89.34	69.09
Manganese as Mn	mg/Kg		325	439	321	394	627	366.43
Cadmium as Cd	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Chromium as Cr	mg/Kg		22.5	27.3	20.6	22.8	37.64	46.5
Mercury Hg	mg/Kg		BDL	BDL	BDL	BDL	BDL	BDL
Nitrite as NO_2	mg/Kg	APHA 23rd Edn. 2017 – 4500 NO_2-B	0.68	0.62	0.79	0.79	0.38	0.41
Nitrate as NO_3	mg/Kg	APHA23rd Edn. 2017 – 4500 NO_3-B	702.8	713	654	654	754	758
Free Ammonia as NH_3	mg/Kg	APHA 23rd Edn. 2017 – 4500 NH_3-B,C	3.78	3.84	4.02	4.02	3.47	3.52
Total Nitrogen	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	956	921	860	860	977	986
Inorganic Phosphate	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	356	428	470	470	429	200.17
Total Phosphate as P	mg/Kg	IS : 10158 - 1982 (Reaff:2014)	360	436	474	474	435	207.04
Silica as SiO_2	%	IS: 1917 Part-3 – 1992 (Reaff: 2005)	59.47	61.34	52.69	52.69	65.87	66.14
OIL & Grease	mg/Kg	USEPA 9071 B - 1998	BDL	BDL	BDL	BDL	BDL	BDL
Magnesium as Mg	mg/Kg	USEPA 3050 B -1996 & USEPA 6010C - 2000	9200	10597	8654	11254	11987	9145
Nickel as Ni	mg/Kg		22.53	43	38	37.6	43.6	21.51
Lead as Pb	mg/Kg		BDL	BDL	BDL	BDL	BDL	2.04
FAUNAL GROUP								
MACROBENTHOS								
Rotaliidae, Bolivintidae, Hauerinidae, Gastropoda & Bivalvia, Nematodes & Crustaceans			170	160	150	150	160	170
MEIOBENTHOS								
Nematodes, Foraminifera sp, Gastropoda Larvae, Bivalvia Larvae & Fish eggs.			750	730	700	690	720	740
Note: BDL: Below Detection Limit **DL**: Detection Limit								

Karaikal Port Private Limited 3rd Party Sewage Treatment Plant Outlet Water Results 2025 - 2026										
Sl.No	**Test Parameters**	**Unit**	**Protocol**	**CPCB Limits (On Land for Irrigation)**	**15.10.2025**	**20.11.2025**	**18.12.2025**	**21.01.2026**	**11.02.2026**	**10.03.2026**
1	pH @ 25°C	-	IS 3025 Part 11 - 2022 (electrometric method)	5.5 – 9.0	7.42	7.29	7.53	7.53	7.62	7.28
2	Total Suspended Solids	mg/l	IS 3025 Part 17 - 2022	200 mg/l	21	26	28	26	23	21
3	Total Dissolved Solids	mg/l	IS 3025 Part 16 -2023	NS	2167	1746	1748	1628	2137	1591
4	Chloride as Cl	mg/l	IS 3025 Part 32 -1988 (Argentometric Method)	NS	502	694	514.8	337	544	598
5	Sulphate as SO_4	mg/l	IS 3025 Part 24/Sec 1 - 2022 (Turbidity method)	NS	122	147	168.2	104	96.0	176
6	Oil & Grease	mg/l	IS:3025 Part 39:2021	10 mg/l	5	5	6	7	8.0	6
7	BOD @ 27°C for 3 days	mg/l	IS 3025 Part 44 - 2023	100 mg/l	12	15	18	14	14.0	14
8	COD	mg/l	IS 3025 Part 58-2023	NS	94	62	94	69	14	82
9	Total Kjeldahl Nitrogen	mg/l	IS 3025 Part 34 -1988 (Macro-Kjeldahl Method)	NS	6.9	16.4	8	18	100	10.4
10	Ammonical Nitrogen	mg/l	IS 3025 Part 34 -1988 (Titrimetric Method)	NS	6.2	14.2	6	15.6	6.8	9.2
11	Faecal Coliforms	MPN/100ml	APHA 24thEdn . 2023 : 9221 'E'	NS	140	350	94	94	220	280
Note : BDL - Below Detection Limit, DL - Detection Limit, NS - Not Specified, MPN - Most Probable Number.										

Karaikal Port Private Limited 3rd Party Surface Water (Vettar River Water) Analysis Results Nov 2025			
Characteristics Test	**Unit**	**Protocol**	**Results**
Date of Sampling			**20.11.2025**
pH @ 25˚C	-	IS:3025 Part 11-2022 (Electrometric method)	7.56
Oil & Grease	mg/l	IS 3025 Part 39 : 2021	4
Total Kjedahl Nitrogen as N	mg/l	IS 3025 Part 34 - 1988 (Macro- Kjedahl Method)	9
BOD @ 27°C for 3 days	mg/l	IS 3025 Part 44 - 2023	BDL
Chemical Oxygen Demand	mg/l	IS 3025 Part 58 - 2023	10
Total Phosphate	mg/l	IS 3025 Part 31/ Sec 1 - 2022 (Stannous chloride method)	0.41
Dissolved Oxygen	mg/l	IS 3025 Part 38: 1989 - (Azide Modification)	6.1
Hexavalent Chromium as Cr6+	mg/l	IS 3025 Part 52 -2003 (diphenyl carbazide method)	BDL
Total Suspended Solids	mg/l	IS 3025 Part 17 - 2022	22
Electrical Conductivity @ 25°C	µmhos/cm	IS 3025 Part 14 - 2013	858
Boron as B	mg/l	IS 3025 Part 65: 2022	0.09
Vanadium as V	mg/l	IS 3025 Part 2 - 2019	BDL
Total Alkalinity as CaCo*3*	mg/l	IS 3025 Part 23 - 2023	117
Potassium as K	mg/l	IS 3025 Part 45 - 1993 (Flame photometry method)	4.02
Cobalt as Co	mg/l	IS 3025 Part 65: 2022	BDL
Total Hardness as CaCO*3*	mg/l	IS 3025 Part 21 - 2009 (EDTA titrimetric method)	7
Ammoniacal Nitrogen as N	mg/l	IS 3025 Part 34 - 1988 (Titrimetric method)	210
Total Dissolved Solids	mg/l	IS 3025 Part 16 - 2023	526
Fluoride as F	mg/l	APHA 24th Edition 2023 - 4500 - F - D	0.52
Sodium as Na	mg/l	IS 3025 Part 45 - 1993 (Flame photometry method)	82
Iron as Fe	mg/l	IS 3025 Part 53 - 2003 (1, 10 phenanthroline method)	0.42
Lead as Pb	mg/l	IS 3025 Part 65: 2022	BDL
Copper as Cu	mg/l	IS 3025 Part 65: 2022	BDL
Zinc as Zn	mg/l	IS 3025 Part 65 : 2022	BDL
Selenium as Se	mg/l	IS 3025 Part 65 : 2022	BDL
Mercury as Hg	mg/l	IS 3025 Part 65: 2022	BDL
Cadmium as Cd	mg/l	IS 3025 Part 65: 2022	BDL
Arsenic as As	mg/l	IS 3025 Part 65 : 2022	BDL
Nickel as Ni	mg/l	IS 3025 Part 65: 2022	BDL
Chromium as Cr	mg/l	IS 3025 Part 65: 2022	BDL
Manganese as Mn	mg/l	IS 3025 Part 65: 2022	BDL
Chloride as Cl	mg/l	IS 3025 Part 32 - 1988 (Argentometric Method)	190
Sulphate as SO4	mg/l	IS 3025 Part 24/Sec 1 - 2022	20
Nitrate Nitrogen as NO3 - N	mg/l	APHA 23rd Edition 2017 - 4500 -NO3 B	5.4
Total Coliform	MPN/100ml	APHA 24th Edn.2023 - 9221 B	540
Faecal Coliforms	MPN/100ml	APHA 24th Edn.2023 - 9221 E	94
Salmonella	NA	APHA 24th Edn.2023 - 9274 B	Absent/100 ml
Vibrio cholerae	NA	APHA 24th Edn.2023 - 9278 B	Present/100 ml
Enterobacteriaceae	cfu/ml	ISO 21528 Part 2 - 2017	260
Note: BDL - Below Detection Limit, APHA - American Public Health Association, cfu - colony forming unit			

KARAIKAL PORT AAQ MONITORING REPORT

Sl.No	Location	Parameter & Unit	CPCB Standard	Oct-25		Nov-25		Dec-25		Jan-26		Feb-26		March		Annual Average
				14.10.2025 10.15 AM to 15.10.2025 10.15 AM	15.10.2025 10.45 AM to 16.10.2025 10.45 AM	19.11.2025 9.30 AM to 20.11.2025 9.30 AM	20.11.2025 10.15 AM to 21.11.2025 10.15 AM	18.12.2025 9.45 AM to 19.12.2025 9.45 AM	19.12.2025 10.30 AM to 20.12.2025 10.30 AM	21.01.2026 9.15 AM to 22.01.2026 9.15 AM	22.01.2026 10.00 AM to 23.01.2026 10.00 AM	11.02.2026 9.45 AM to 12.02.2026 9.45 AM	12.02.2026 10.15 AM to 13.02.2026 10.15 AM	09.03.2026 9.00 AM to 10.03.2026 9.00 AM	10.03.2026 9.30 AM to 11.03.2026 9.30 AM	
1	North Vanjore Lat: N 10° 51′08.8012″ Long: E 79° 50′49.0668″	PM10 µg/m³	100 µg/m³	49.2	48.4	42.7	46.7	40.7	43.4	38.4	40.4	39.7	43.2	41.2	36.8	**42.6**
2		PM2.5 µg/m³	60 µg/m³	23.4	22.8	18.4	20.9	17.5	19.8	16.2	17.5	16.8	18.3	17.6	16.4	**18.8**
3		SO2 µg/m³	80 µg/m³	7.8	6.5	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**7.2**
4		NO2 µg/m³	80 µg/m³	9.1	8.7	7.9	8.2	6.5	7.5	6.6	6.9	6.9	7.8	7.1	7.2	**7.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 10.45 AM to 15.10.2025 10.45 AM**	**15.10.2025 11.15 AM to 16.10.2025 11.15 AM**	**19.11.2025 10.15 AM to 20.11.2025 10.15 AM**	**20.11.2025 11.00 AM to 21.11.2025 11.00 AM**	**18.12.2025 10.30 AM to 19.12.2025 10.30 AM**	**19.12.2025 11.15 AM to 20.12.2025 11.15 AM**	**21.01.2026 10.00 AM to 22.01.2026 10.00 AM**	**22.01.2026 10.45 AM to 23.01.2026 10.45 AM**	**11.02.2026 10.30 AM to 12.02.2026 10.30 AM**	**12.02.2026 11.00 AM to 13.02.2026 11.00 AM**	**09.03.2026 9.30 AM to 10.03.2026 9.30 AM**	**10.03.2026 10.00 AM to 11.03.2026 10.00 AM**	
1	Keezha Vanjore Lat: N 10° 50′06.2628″ Long: E 79° 50′23.1006″	PM10 µg/m³	100 µg/m³	59.9	59.2	52.8	56.2	55.8	57.1	58.2	63.4	60.8	56.3	58.7	52.7	**57.6**
2		PM2.5 µg/m³	60 µg/m³	28.7	28.1	23.6	26.4	25.9	28.5	28.6	30.6	33.7	30.5	31.5	27.5	**28.5**
3		SO2 µg/m³	80 µg/m³	12.5	12.1	10.9	12.6	8.9	10.1	11.3	12.4	12.2	11.8	12.9	12.2	**11.5**
4		NO2 µg/m³	80 µg/m³	15.9	15.3	14.7	15.8	12.1	13.9	13.9	14.7	14.7	14.1	14.5	13.9	**14.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 11.15 AM to 15.10.2025 11.15 AM**	**15.10.2025 12.00 PM to 16.10.2025 12.00 PM**	**19.11.2025 11.00 AM to 20.11.2025 11.00 AM**	**20.11.2025 12.15 PM to 21.11.2025 12.15 PM**	**18.12.2025 11.00 AM to 19.12.2025 11.00 AM**	**19.12.2025 12.30 PM to 20.12.2025 12.30 PM**	**21.01.2026 10.30 AM to 22.01.2026 10.30 AM**	**22.01.2026 11.30 AM to 23.01.2026 11.30 AM**	**11.02.2026 11.00 AM to 12.02.2026 11.00 AM**	**12.02.2026 11.45 AM to 13.02.2026 11.45 AM**	**09.03.2026 10.00 AM to 10.03.2026 10.00 AM**	**10.03.2026 11.00 AM to 11.03.2026 11.00 AM**	
1	Nagore Ice Factory (Near CPCL Office) Lat: N 10°49′20.9676″ Long: E 79° 50′23.3772″	PM10 µg/m³	100 µg/m³	56	54.8	50.2	53.2	57.2	58.1	61.6	64.5	56.4	58.4	55.2	51.3	**56.4**
2		PM2.5 µg/m³	60 µg/m³	28.1	27.5	22.9	24.5	27.5	29.4	30.7	32.9	31.5	32.9	29.7	26.8	**28.7**
3		SO2 µg/m³	80 µg/m³	10.3	9.8	11.4	12.1	12.1	13.2	12.7	13.1	12.1	12.5	11.6	11.2	**11.8**
4		NO2 µg/m³	80 µg/m³	13.5	12.4	14.5	16.2	14.9	15.8	15.3	15.9	14.2	14.9	13.8	13.4	**14.6**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 11.45 AM to 15.10.2025 11.45 AM**	**15.10.2025 12.45 PM to 16.10.2025 12.45 PM**	**19.11.2025 11.30 AM to 20.11.2025 11.30 AM**	**20.11.2025 12.45 PM to 21.11.2025 12.45 PM**	**18.12.2025 11.45 AM to 19.12.2025 11.45 AM**	**19.12.2025 01.00 PM to 20.12.2025 01.00 PM**	**21.01.2026 11.15 AM to 22.01.2026 11.15 AM**	**22.01.2026 12.30 PM to 23.01.2026 12.30 PM**	**11.02.2026 11.30 AM to 12.02.2026 11.30 AM**	**12.02.2026 12.45 PM to 13.02.2026 12.45 PM**	**09.03.2026 10.30 AM to 10.03.2026 10.30 AM**	**10.03.2026 12.45 PM to 11.03.2026 12.45 PM**	
1	Nagore Pandagasalai Street Lat: N 10° 49′23.7072″ Long: E 79° 50′39.1596″	PM10 µg/m³	100 µg/m³	41.9	40.4	42.9	45.1	52.5	53.8	56.4	60.6	50.5	52.4	45.9	44.7	**48.9**
2		PM2.5 µg/m³	60 µg/m³	19.6	19.1	18.6	20.4	24.1	25.3	28.2	30.4	26.9	28.5	23.4	21.6	**23.8**
3		SO2 µg/m³	80 µg/m³	9.2	8.3	9.7	10.2	10.3	11.5	11.4	12.1	10.9	11.3	10.2	9.8	**10.4**
4		NO2 µg/m³	80 µg/m³	11.3	10.6	10.2	13.5	12.4	13.1	13.9	14.6	12.8	13.5	12.5	11.9	**12.5**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**
Sl.No	**Location**	**Parameter & Unit**	**CPCB Standard**	**14.10.2025 12.15 PM to 15.10.2025 12.15 PM**	**15.10.2025 01.15 PM to 16.10.2025 01.15 PM**	**19.11.2025 12.00 PM to 20.11.2025 12.00 PM**	**20.11.2025 1.15 PM to 21.11.2025 1.15 PM**	**18.12.2025 12.00 PM to 19.12.2025 12.00 PM**	**19.12.2025 01.00 PM to 20.12.2025 01.00 PM**	**21.01.2026 12.00 PM to 22.01.2026 12.00 PM**	**22.01.2026 01.00 PM to 23.01.2026 01.00 PM**	**11.02.2026 12.15 PM to 12.02.2026 12.15 PM**	**12.02.2026 1.15 PM to 13.02.2026 1.15 PM**	**09.03.2026 11.15 AM to 10.03.2026 11.15 AM**	**10.03.2026 1.30 PM to 11.03.2026 1.30 PM**	
1	Nagore Pattinumcherry Lat: N 10° 49′20.5860″ Long: E 79° 50′46.5684″	PM10 µg/m³	100 µg/m³	36.7	36.1	36.4	37.8	44.2	46.3	52.8	53.9	49.6	48.5	41.8	38.4	**43.5**
2		PM2.5 µg/m³	60 µg/m³	18.5	18.3	16.7	17.2	19.7	20.6	25.7	26.2	24.7	25.3	20.5	18.3	**21.0**
3		SO2 µg/m³	80 µg/m³	6.9	BDL	7.2	7.8	8.5	9.2	10.6	11.3	9.5	9.8	8.8	7.9	**8.9**
4		NO2 µg/m³	80 µg/m³	9.2	8.1	9.5	10.3	10.2	10.9	12.3	12.9	10.9	11.6	10.7	10.1	**10.6**
5		CO mg/m³	4 mg/m³	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**#DIV/0!**

SRI KATHAYEE AMMAN SERVICES

No: 3, North Street, Keelavanjore, T.R.Pattinam,
Karaikal-609606 Cell: 91 9843255626

Proprietor K. R.Rajendran

Pan: ATCPR9969E

Date: 10.02.2025

Certificate of Waste Management Services

To Whom It May Concern

This certificate is issued on behalf of M/s KATHAYEE AMMAN SERVICE, a waste management entity company, providing comprehensive waste management services to Karaikal Port Pvt. Ltd. (KPPL).

We offer waste management services that cover the entire scope of domestic solid waste generated by the Port project. This includes the collection, transportation, processing, and disposal of various types of municipal solid waste such as plastic, paper, tin, glass, cardboard, food waste, etc.

We use advanced technologies such as windrow composting, vermi-composting, etc. to ensure effective waste management solutions. We have dedicated maintain 3 vehicles for waste collection and transportation including specialized containers and trucks for various waste streams.

Our company actively participates in a range of waste management projects, contributing to the development and implementation of effective waste management strategies, and; especially we are also tied up with having valid license used by the Commissioner, Thirumalairayan Pattinam Commune Panchayat, Karaikal , Puducherry. for residue disposal.

Our processes prioritize waste reduction, recycling, and responsible disposal methods to minimize the environmental impact. Our team of waste management professionals has extensive experience in managing waste for diverse projects, including port facilities and industrial zones.

We continually invest in employee training and development to ensure the highest standards of service quality and safety. We, M/s KATHAYEE AMMAN SERVICE, hereby certify that our waste management services are capable of handling municipal solid waste generated from the Karaikal Port project at its present capacities and also for the future requirements of Port development. We are fully prepared to support and manage all waste-related aspects to facilitate the project's success.

For M/s KATHATEE AMMAN SERVICES.

For SRI KATHAYEE AMMAN SERVICES

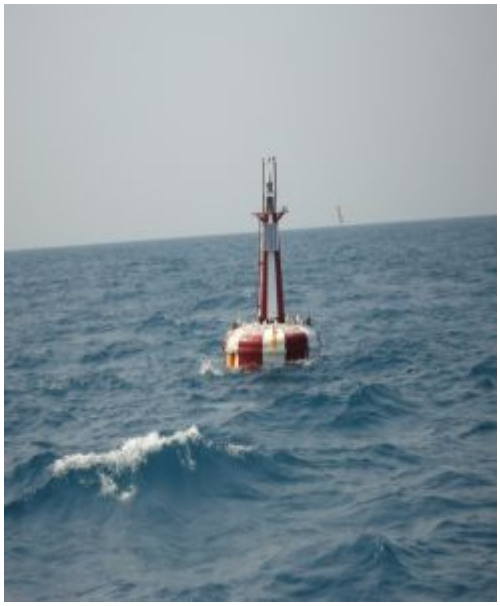
Proprietor

K.R Rajendran

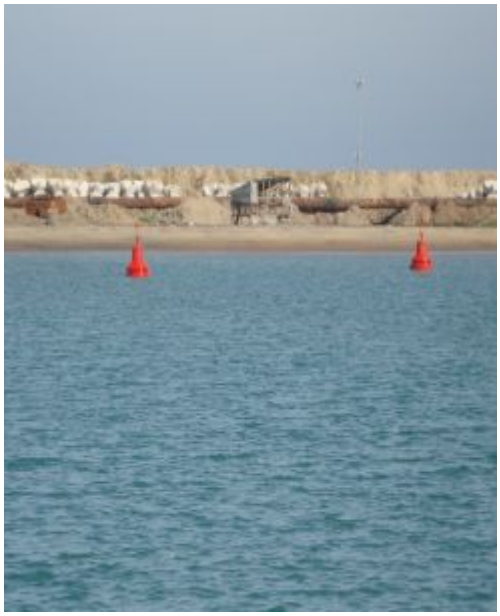
K.R.

(K.R. RAJENDRAN)
Proprietor

BUOYS









MARG

To,

Dr U. Sridharan,
Additional Director
Ministry of Environment and Forests
Regional Office (Southern Zone)
Bangalore- 560 034

Sir,

Sub: Environmental and CRZ clearance for the expansion of Karaikal Port (Phase II)
Ref: No 10-42/2009-IA.III, dated 22.9.2009

The Ministry of Environment and Forest has accorded Environmental and CRZ clearance for the expansion of Karaikal Port (Phase II) letter dated 22nd September 2009 (No 10-42/2009-IA.) As per the general conditions stipulated in the EC letter, an advertisement was made in two local news papers informing the public regarding Clearance and the copies are enclosed as directed by the ministry to forward the same to the regional office, Bangalore.

We are also enclosing a report on the Environmental Monitoring Program covering the period from March 2009 to August 2009 for your kind consideration and the same has been already submitted to Pondicherry Pollution Control Committee.

Sincerely,

14/10/09

Manjunath Bhat
Manager-Environment

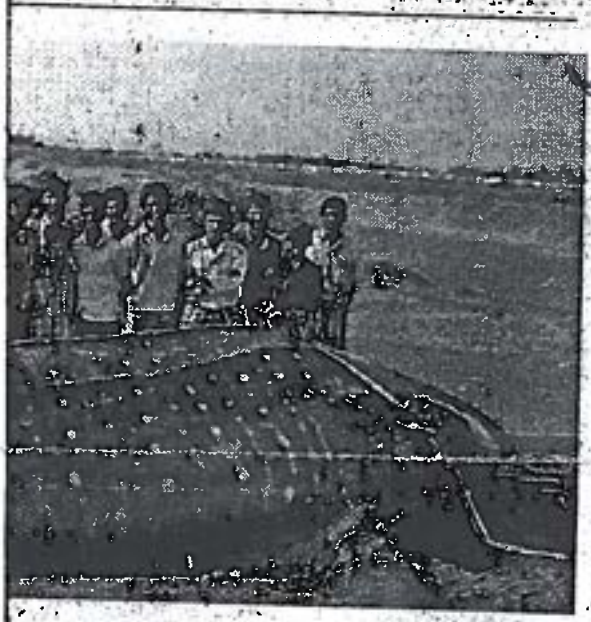
Encl:

1. Copies of the Advertisement in the News Paper
2. Report on Environmental Monitoring Program

Sent thro' courier

KARAIKAL PORT PRIVATE LIMITED
Corp. Off : 'Marg Axis' 4/318, Rajiv Gandhi Road, Kottivakkam, Chennai - 600 041. tel : +91-44 - 2454 2311 (9 lines). fax : +91-44 -2454 2316

...in only select hills across the globe. ... will affect ground water levels ...



KARAIKAL PORT PRIVATE LIMITED

392 & 393, Rajiv Gandhi Salai, Kottivakkam,
Chennai - 600 041.

Wishes to inform that its Phase II expansion project for its Karaikal Port has been accorded environmental and CRZ clearance by the Ministry of Environment and Forests, Government of India and copies of clearance letters are available with the Puducherry Pollution Control Board and also on the website of the Ministry of Environment and Forests at http://www.envfor.nic.in.

Date : 13.10.2009 **EXECUTIVE DIRECTOR**

Change of Name

...D. Narendran ... of Thiru D. Dhasarathan, ...rn on ... February 1990 (native ...strict : Tiruchirappalli), residing at ...d No. 2, New No. 4, Bharathidasan ...reet, Ponmalaipatti, Tiruchirappalli ...0 004, shall henceforth be known as ...EE NARENTHRAN. A.D.

D. NARENDRAN.

...uchirappalli, 4th August 2009.

Change of Name

I, V. Sadasivam, son of Thiru K. Velsamy born on 10th May 1968 (native district : Karur), residing at No. 3-277, P. Sellandipalayam, Pallapalayam Post, Karur - 639 002, shall henceforth be known as V. SADASSIVAM.

V. SADASIVAM.

Pallapalayam, 10th August 2009.

SOUTHERN RAILWAY

ANNOUNCEMENT

As announced by Honourable Minister of ...ilways on 03/07/09 in the Budget Speech for ...09-10, the existing system of coupon books for ...credited press correspondents is being replaced ... **photo identity card based system.** Photo ...ntification card will be issued by Railways to ...credited press correspondents instead of coupon ...oks. ... photo identification card will be issued ... production of the certification by the Press ...ormation Bureau and other competent state and ...al authorities as per laid down Railway Board ...idelines. This new system of concession based ... Photo Identity card along with increased ...ncession (50%) on Rajdhani and Shatabdi trains ...ffective from **15/10/09.**

For further details and enquiry, the following ...y be contacted :

Senior Commercial Manager,
Passenger Reservation System,
Southern Railway, Chennai.
Phone No.044-25351621

SERVING CUSTOMERS WITH A SMILE

FORM No.5
(See Rule 23)
Form of Advertisement of Petition

IN THE HIGH COURT OF JUDICATURE AT MADRAS
(Original Jurisdiction)

COMPANY PETITION NO.225 OF 2009
CONNECTED WITH COMPANY APPLICATION NO.686 OF 2009

In the matter of Companies Act, 1956
AND
In the matter of Scheme of Amalgamation under Section 391 to 394 of the Companies Act
BETWEEN
In the matter of Scheme of Amalgamation of Salzer Cables Limited with Salzer Electronics Limited

Salzer Electronics Limited
a Company incorporated under the Companies Act, 1956 and having its Registered office at Samichettipalayam, Jothipuram (Via), Coimbatore 641 047
Represented by its Director
S. Baskara Subramanian

... PETITIONER / TRANSFEREE COMPANY

FORM OF ADVERTISEMENT OF PETITION

A petition under Section 391 to 394 of the Companies Act, 1956 for amalgamation / merger of Salzer Cables Limited with Salzer Electronics Limited as presented by petitioner on the 29th day of July 2009 and the said petition is fixed for hearing before the Company Judge on 26.10.2009. Any person desirous of supporting or opposing the said petition should send to the petitioner's advocate, notice of his intention, signed by him or his advocate, with his name and address, so as to reach the petitioner's advocate not later than two days before the date fixed for the hearing of the petition. Where he seeks to oppose the petition, the grounds of opposition or a copy of the affidavit shall be furnished with such notice. A copy of the petition will be furnished by the undersigned to any person requiring the same on payment of the prescribed charges for the same.

Dated 16.9.2009.

K.J.Rebello
S. Elambharathi
A. Senthilnathan
Sunitha. K
(Advocate for petitioner)

Address : No.364, Kurupam Court
Lloyds Road, Gopalapuram,
Chennai - 600 086.

FORM No.5
(See Rule 23)
Form of Advertisement of Petition

IN THE HIGH COURT OF JUDICATURE AT MADRAS
(Original Jurisdiction)

COMPANY PETITION NO.224 OF 2009
CONNECTED WITH COMPANY APPLICATION NO.685 OF 2009

In the matter of Companies Act, 1956
AND
In the matter of Scheme of Amalgamation under Section 391 to 394 of the Companies Act
BETWEEN
In the matter of Scheme of Amalgamation of Salzer Cables Limited with Salzer Electronics Limited

Salzer Cables Limited
a Company incorporated under the Companies Act, 1956 and having its Registered office at No.663, Coimbatore Main Road, Bettathapuram, Kamarajar - 641 104.
Represented by its Director
D. Rajeshkumar

PETITIONER / TRANSFEROR COMPANY

FORM OF ADVERTISEMENT OF PETITION

A petition under Section 391 to 394 of the Companies Act, 1956 for amalgamation / merger of Salzer Cables Limited with Salzer Electronics Limited as presented by petitioner on the 29th day of July 2009 and the said petition is fixed for hearing before the Company Judge on 26.10.2009. Any person desirous of supporting or opposing the said petition should send to the petitioner's advocate, notice of his intention, signed by him or his advocate, with his name and address, so as to reach the petitioner's advocate not later than two days before the date fixed for the hearing of the petition. Where he seeks to oppose the petition, the grounds of opposition or a copy of the affidavit shall be furnished with such notice. A copy of the petition will be furnished by the undersigned to any person requiring the same on payment of the prescribed charges for the same.

Dated 16.9.2009.

K.J.Rebello
S. Elambharathi
A. Senthilnathan
Sunitha. K
(Advocate for petitioner)

Address : No.364, Kurupam Court
Lloyds Road, Gopalapuram,
Chennai - 600 086.



நீடாமங்கலம் ரெயில்வே கேட் பகுதியில் சாலையோரம் கழிவுநீர் சாக்கடையில் கவிழ்ந்து கிடக்கும் உரம் ஏற்றிய லாரி.

நீடாமங்கலம் அருகே

உரம் ஏற்றிய லாரி கழிவுநீர் கால்வாயில் கவிழ்ந்தது

நீடாமங்கலம், அக்.14–

நீடாமங்கலத்தில் உரம் ஏற்றிய லாரி கழிவுநீர் கால்வாயில் கவிழ்ந்தது.

உரம் ஏற்றிய லாரி

திருவாரூர் மாவட்டம் நீடாமங்கலம் நகரில் நெடுஞ்சாலை ரெயில்வே கேட்டை ஒட்டி கழிவு நீர் கால்வாய் செல்கிறது. இந்த நிலையில் நேற்று முன்தினம் சென்னையில் இருந்து நீடாமங்கலத்துக்கு ரெயில் மூலம் 1306 டன் ஐ.பி.எல். டி.ஏ.பி. உரம் கொண்டு வரப்பட்டு லாரிகள் மூலம் தொடக்கவேளாண்மை கூட்டுறவு வங்கிகளுக்கு அனுப்பி வைக்கப்பட்டது.

இதன்படி நேற்று மதியம் 15 டன் டி.ஏ.பி. உரம் ஏற்றிய ஒரு லாரி திருராமேஸ்வரம் நோக்கி ரெயில் நிலையத்தில் இருந்து புறப்பட்டது. அப்போது எதிரே வந்த வாகனத்திற்கு வழிவிட லாரியை சாலையின் ஓரம் ஒதுக்கிய போது லாரி கழிவுநீர் கால்வாயில் சாலையை அரித்துக்கொண்டு சரிந்தது. இதனால் லாரியில் இருந்த உரமூட்டைகள் மீதே சரிந்தன.

தலைமறைவு

சம்பவ இடத்தில் இருந்து லாரி டிரைவர் தலைமறைவாகி விட்டார். இது குறித்த தகவல் அறிந்த நீடாமங்கலம் போலீஸ் இன்ஸ்பெக்டர் சமரசம் மற்றும் போலீசார் சம்பவ இடத்திற்கு விரைந்து சென்று விசாரணை மேற்கொண்டனர். லாரியின் டிரைவர் தலைமறைவானதால் அவர் யார்? எந்த ஊரைச் சேர்ந்தவர்? என தெரியவில்லை.

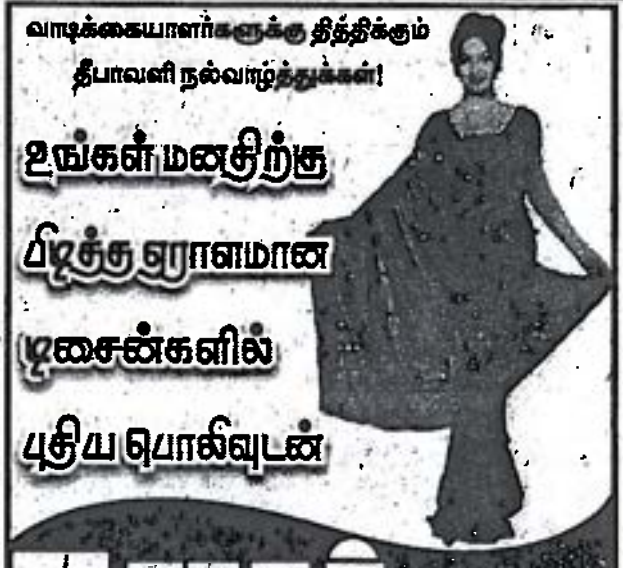
மன்னார்குடி அருகே

ஆம்புலன்ஸ் மோதி விவசாயி பலி

கோட்டூர், அக்.14–

மன்னார்குடி அருகே உள்ள நெடுவாக்கோட்டை வடக்கு தெருவை சேர்ந்தவர் கந்தசாமி (வயது 60). விவசாயி. நேற்று இரவு 8 மணி அளவில் சைக்கிளில் வீட்டுக்கு சென்று கொண்டிருந்தார். அப்போது மன்னார்குடியில் இருந்து தஞ்சைக்கு சென்ற ஆம்புலன்ஸ் வேன் ஒன்று சைக்கிள் மீது மோதியது. இதில் படுகாயம் அடைந்த கந்தசாமி ஆஸ்பத்திரிக்கு கொண்டு செல்லும் வழியில் பரிதாபமாக செத்தார். இது குறித்து மன்னார்குடி போலீசார் வழக்குப்பதிவு செய்து ஆம்புலன்ஸ் டிரைவர் காமராஜை கைது செய்தனர். மேலும் விசாரணை நடந்து வருகிறது.

பெறமுடியும் என்பதை கருத்தில் கொண்டு இந்த முடிவை ஆளும் காங்கிரஸ் கட்சி எடுத்துள்ளது.



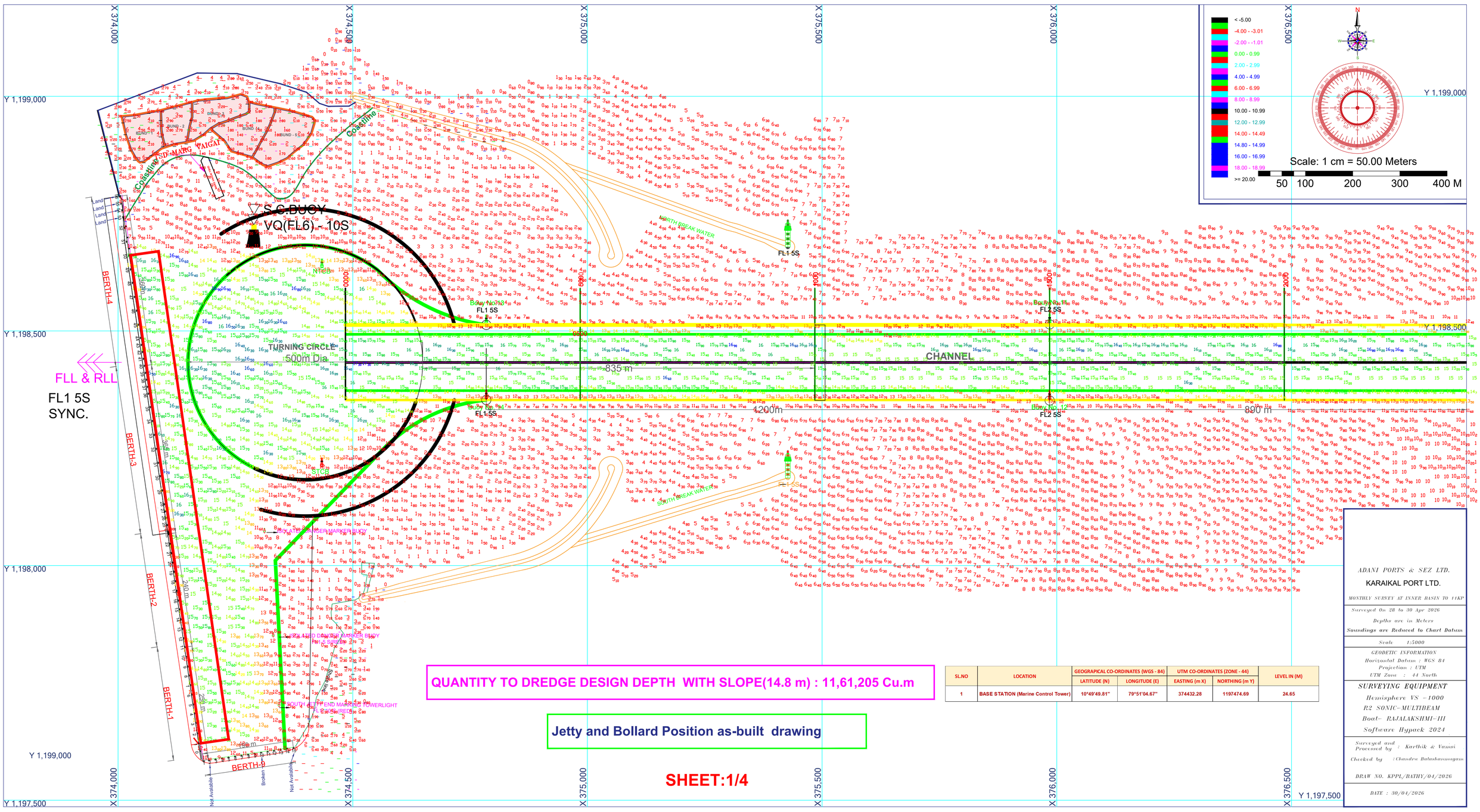


காரைக்கால் போர்ட் பிரைவேட் லிமிடெட்

392 & 393, ராஜீவ்காந்தி சாலை, கொட்டுவாக்கம், சென்னை-600 041.

இதன் மூலம் காரைக்கால் துறைமுகத்தின் இரண்டாம் கட்ட விரிவாகத் திட்டத்திற்கு சுற்றுச்சூழல் மற்றும் கடற்கரை ஒழுங்குமுறை மண்டலத்தின் (CRZ) கீழ், இந்திய அரசின் சுற்றுச்சூழல் மற்றும் வனத்துறை அமைச்சகத்தால் அனுமதி வழங்கப்பட்டுள்ளது என்று தெரிவித்துக் கொள்ளப்படுகிறது. மேற்படி அனுமதி கடிதத்தின் நகல்கள் புதுச்சேரி மாசுக்கட்டுப்பாட்டு வாரியத்திலும் மற்றும் சுற்றுச்சூழல் வனத்துறை அமைச்சகத்தின் இணையதளமான http://envfor.nic.in லும் உள்ளது.

தேதி: 13.10.2009 செயலாக்க இயக்குநர்



QUANTITY TO DREDGE DESIGN DEPTH WITH SLOPE(14.8 m) : 11,61,205 Cu.m

SLNO	LOCATION	GEOGRAPICAL CO-ORDINATES (WGS - 84)		UTM CO-ORDINATES (ZONE - 44)		LEVEL IN (M)
		LATITUDE (N)	LONGITUDE (E)	EASTING (m X)	NORTHING (m Y)	
1	BASE STATION (Marine Control Tower)	10°49'49.81"	79°51'04.67"	374432.28	1197474.69	24.65

Jetty and Bollard Position as-built drawing

SHEET:1/4

ADANI PORTS & SEZ LTD.

KARAIKAL PORT LTD.

MONTHLY SURVEY AT INNER BASIN TO 11KP

Surveyed On 28 to 30 Apr 2026

Depths are in Meters

Soundings are Reduced to Chart Datum

Scale 1:5000

GEODETIC INFORMATION
Horizontal Datum : WGS 84
Projection : UTM
UTM Zone : 44 North

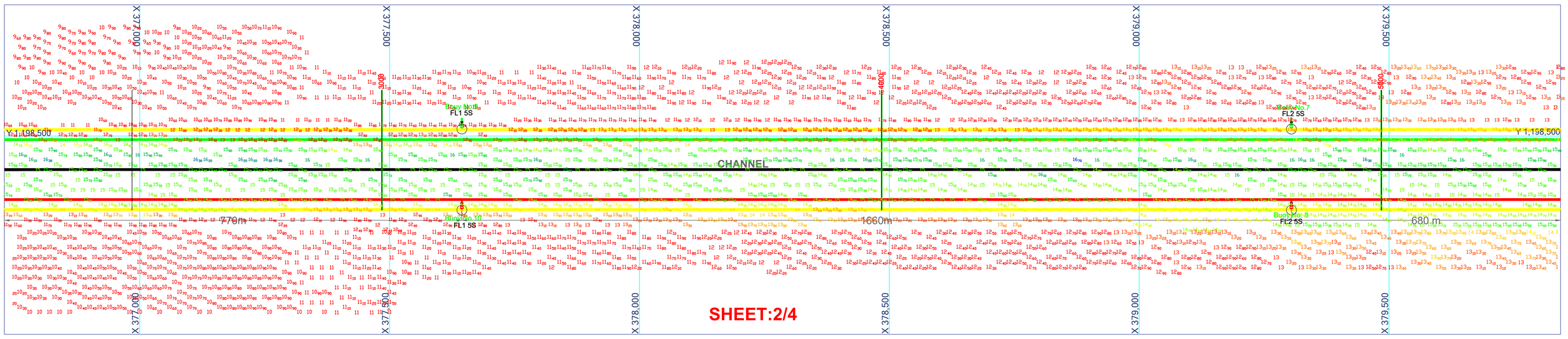
SURVEYING EQUIPMENT
Hemisphere VS -1000
R2 SONIC-MULTIBEAM
Boat- RAJALAKSHMI-III
Software Hypack 2024

Surveyed and Processed by : Karthik & Vanni

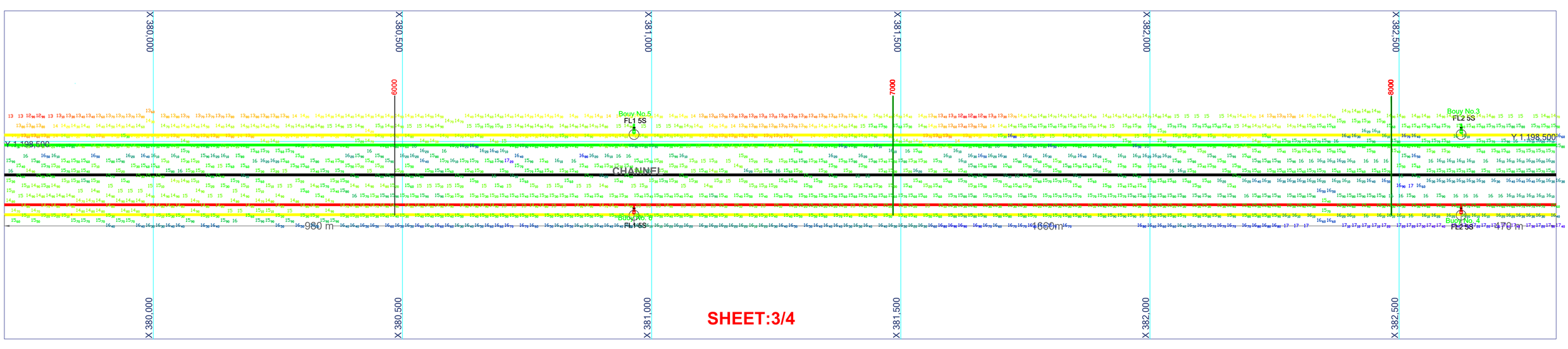
Checked by : Chandra Balasharmugam

DRAW NO. KPPL/BATHY/04/2026

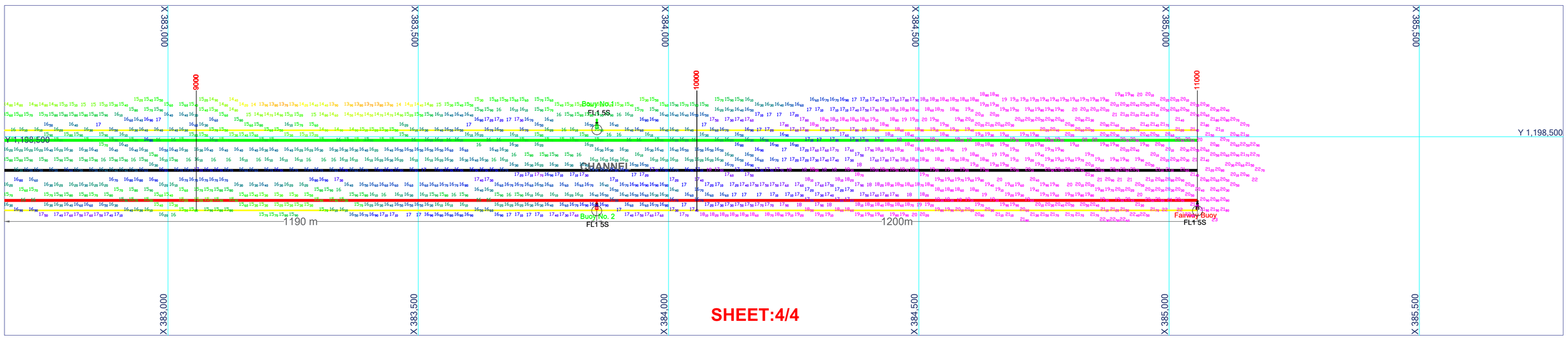
DATE : 30/04/2026



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SHEET:3/4

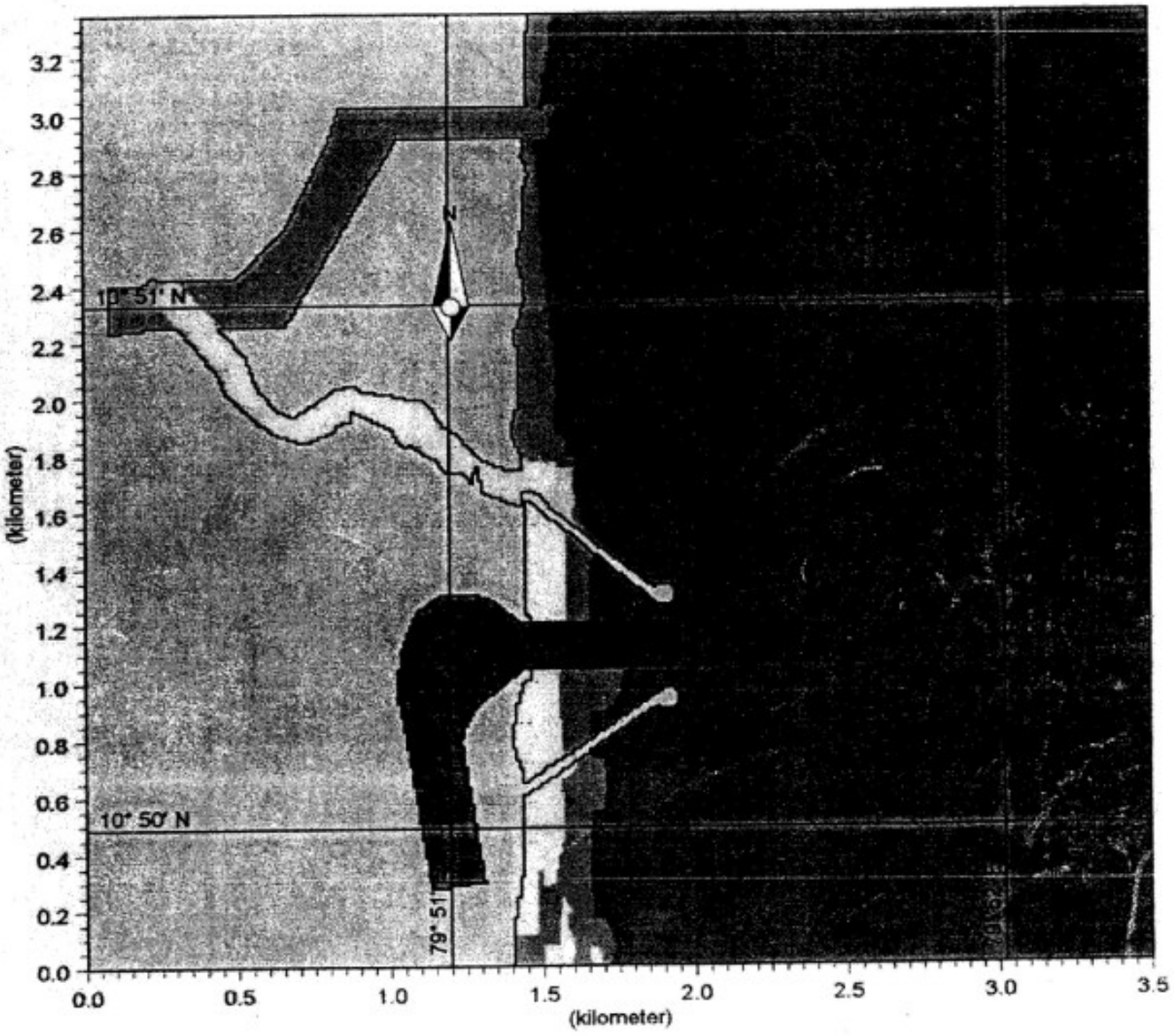


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As per MoEF EC Point 3 xiv

KARAIKAL PORT PRIVATE LIMITED
CHENNAI

HYDRODYNAMIC MODELLING FOR RIVER DIVERSION AT PROPOSED KARAIKAL PORT SITE



MATHEMATICAL MODEL STUDY REPORT
NOVEMBER, 2006

RAMBØLL

L&T-RAMBØLL CONSULTING ENGINEERS LIMITED
339/340, Anna Salai, Nandanam, Chennai - 600 035.

RAMBØLL	**L&T-RAMBØLL CONSULTING ENGINEERS LIMITED**

Client: **Karaikal Port Private Limited**
Chennai

Project: River Diversion at Proposed Karaikal Port Site	**Project No.:** C1061502
Title: Hydrodynamic Model Study	**Document No.:** RP001 / **Rev.:** 0

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File path: I:\ports\2006\river diversion study (c1061502)\outputs\reports\001-jkp-model study report.doc

Notes:

1.

Revision Details:

Rev.	Date	Details	Prepared Init.	Prepared Sign.	Checked Init.	Checked Sign.	Approved Init.	Approved Sign.
0	21-09-06		JKP		VCN		SMA	

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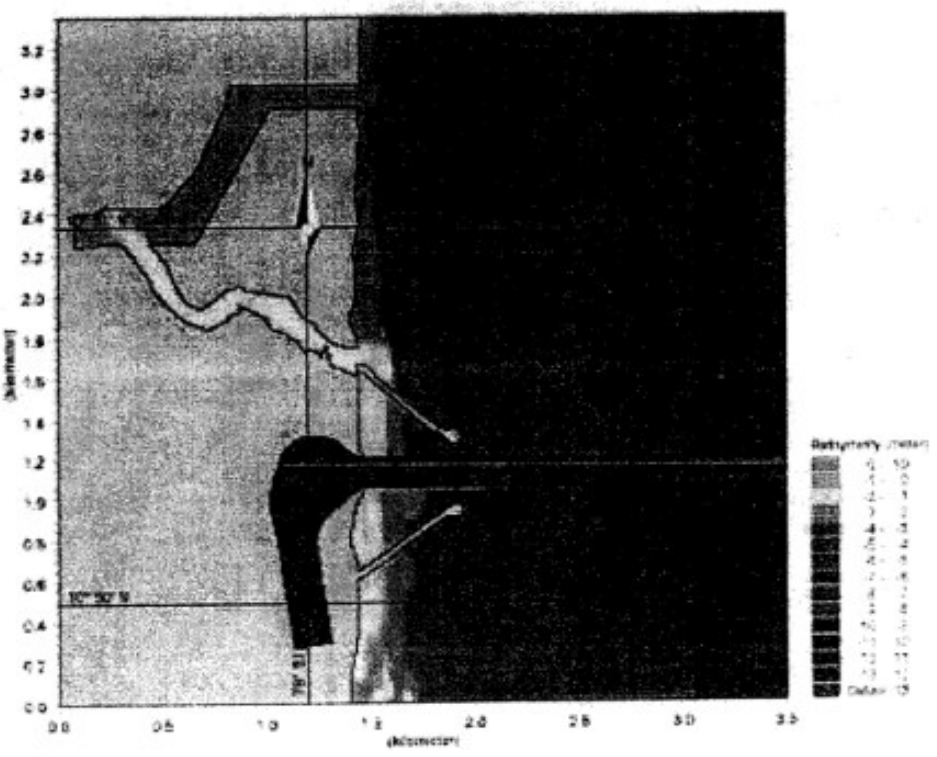
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2.2 Proposed River Diversion

The River Pervadnar is a drainage carrier and it's natural flow is controlled by upstream rainfall. It is a Tributary river of Cauvery and comes from the main branch called Puduvitti. Further it is branched as Puddar ,Vettar finally ends as Pervadnar. It is obvious that a river at the initial stage have narrow width with high velocity. At the middle stage it maintains medium flow and wider. Before the final stage it branches and the velocity becomes slow widening the Riverbed. The River confluences in the East coast of Tamil nadu shows a general trend of shifting towards North.

As per Irrigation deptt. of Tamilnadu records, the river remains dry during Summer and during Monsoon seasons has an M.F.L Discharge of 1820 Cusecs. The width of the River at the upstream is 50m , at the down stream it is 80m and at the mouth widened to 110m. The river has touched the danger level during November 2005.

In the proposed Masterplan of the Karaikal port the river mouth and the end section of the river falls on the project site. Hence Karaikal Port Ltd. proposed to divert the river through suitable hydrodynamic model study. The existing and prposed river diversion is shown below,



2.3 Scope of the study

The detailed scope of this study includes the following tasks,

- Site Visit and collection of River related data from various sources
- Analysis of wind, wave, tide data
- Preparation of digital bathymetry with the river profiles
- To carry out hydrodynamic flow modelling due to Wave action
- Assessment of wave induced flow at proposed diverted River mouth
- To carry out hydrodynamic flow modelling due to Tide action
- Assessment of Tidal penetration in to the existing and diverted river.
- Tidal Prism of the existing and diverted River.
- Presentation of model study results and discussion

3 Hydrodynamic Modelling

3.1 General

Hydrodynamic modelling is carried out using Hydrodynamic flow model of Mike-21 Suites of Program. The model can the flow in response to wave & tide forcing. The basic transport equation of the model drives the 2D free surface flow ignoring stratification. In order to assess the change in hydrodynamic characteristics of the River two types of dynamics are studied. The wave induced Long –shore current is simulated for all the possible wave approach angles to the Karaikal coast. The tide induced Cross-shore current is simulated for Spring & Neap phases of tide. The Flow dynamics for existing River and diverted River are established.

3.2 Input data

3.2.1 Bathymetry

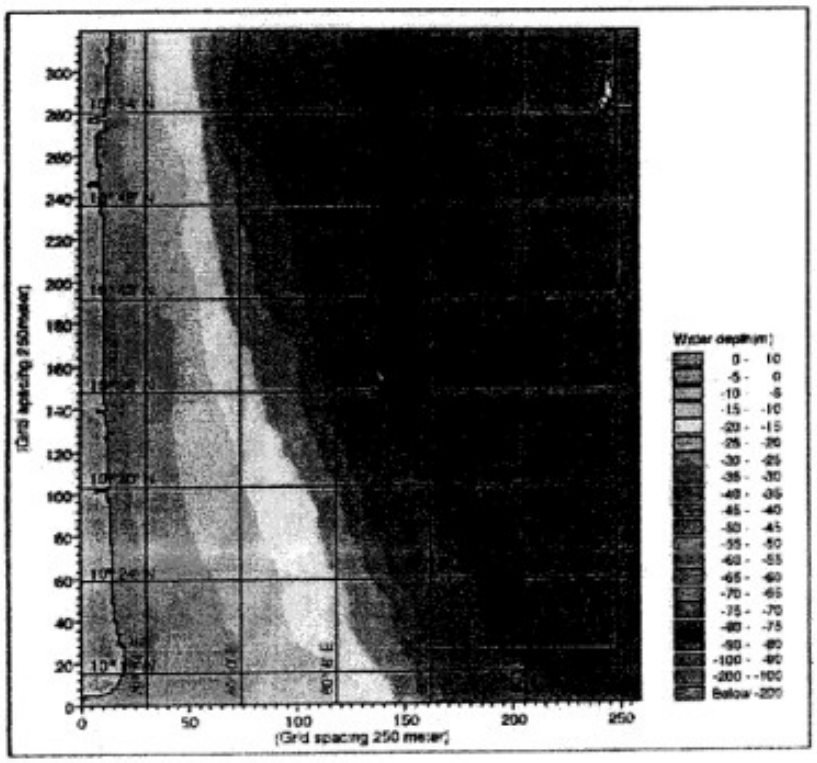


Figure FD- 2 Bathymetry

The Bathymetry of the study area is prepared extending from land to beyond 200m contour in a grid spacing of 250 mx250 m by digitising the bathymetric information (seabed contours and depths) published in the hydrographic charts No.357 & 3007 with scale 1:35,000, 1:300,000 respectively. Spot depths from the hydrographic chart, survey data by M/s Geostar and the location of the 5, 10, 15, 20, 30, 50 & 100, 200m contours have been used to generate the digital area using a suitable interpolation technique. This General bathymetry is presented in Figure FD- 2. The depth contours shows a very gentle slope from offshore to

coast. It can be seen that the distance of the 5m contour from the shoreline is 400m and that of the 10-m contour is 2.2 km.

3.2.2 Wave data

The normal offshore significant wave height varies between 0.5 to 1.8m for over 90% of the waves around the year. Wave heights are generally higher during the months June, July and August more than 10% of the waves being greater than 1.8m. The predominant directions approaching to the Karaikal Coast are from SSE, SE, ESE, E, ENE, NE and NNE. The annual wave Rose based on 10 years BMO wave model data is presented in Figure FD-3The various arms of the rose shows the percentage of occurrence in a year.

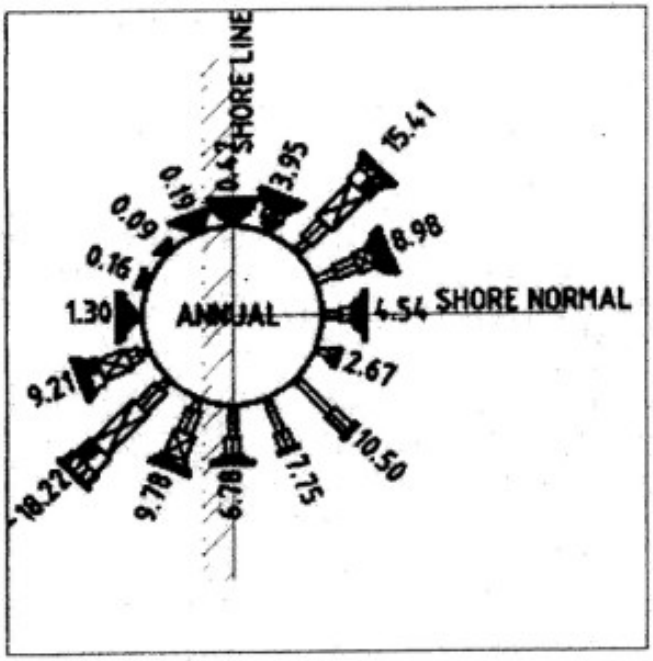


Figure FD- 3 Annual wave rose

3.2.3 Tide data

A self recording tide gauge was deployed at Nagapattinam from 26th February to 25th March 2004. The measured tidal elevations are presented in Figure FD- 4From the plot it can be observed that the range during spring tide is 0.8m and during neap tide is 0.4m.

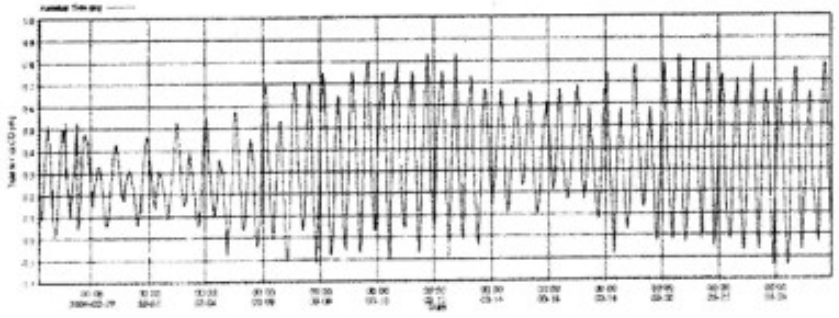


Figure FD- 4 Observed Tide

3.2.4 Current Data

A self-recording current meter was deployed in 10m-water depth, close to the proposed Karaikal Port Site. The measured current speeds and direction at 20minutes interval for the period 1st to 15th March 2004 are presented in Figure FD- 5. From the plot it can be observed that the current speed is 0.6m/s with an average value of about 0.3m/s. Current directions show that the measured currents flow towards North up to the earlier part of the observation period, after which it reverses southward in the later part. This shows that the observation period covers the reversal of the current direction along the coast, which usually takes place in the transition month between the two monsoons. A comparison of the current directions with tidal elevations reveals there is no direct correlation with the semi-diurnal tide indicating that the direction is mainly controlled by the wind driven current.

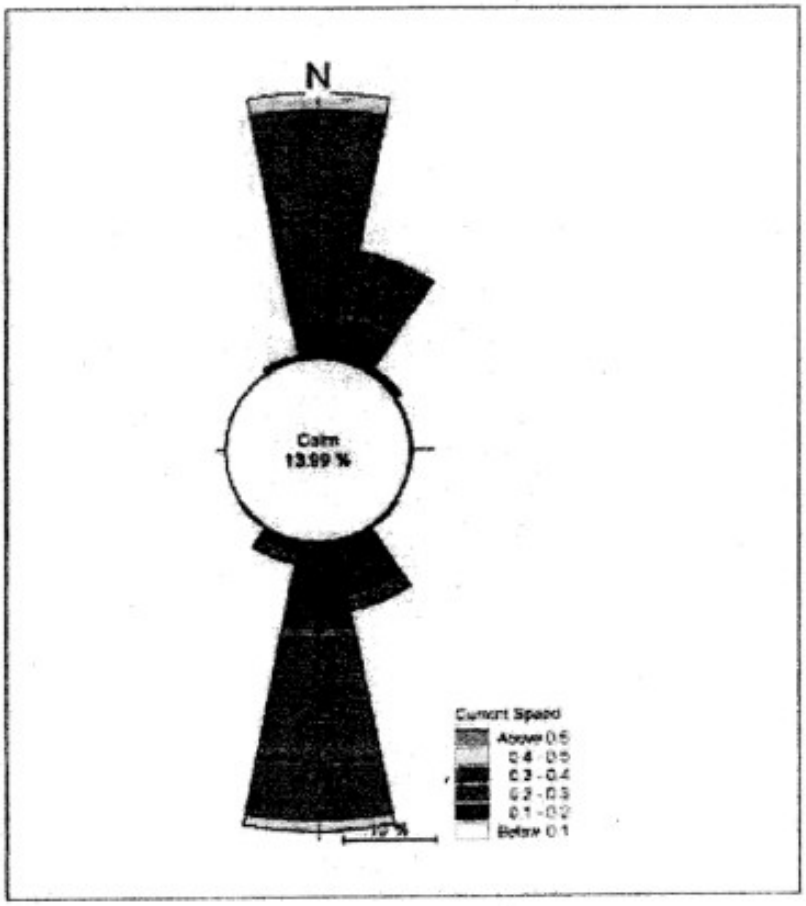


Figure FD- 5 Observed Current rose

3.3 Wave Hydrodynamics

Deep water waves as approaches to shallow water their characteristics change due to depth restriction. Finally at the surf zone it breaks and dissipate it's energy. Depending on the angle it approaches to the coastline it forms a current known as longshore current. Which is a very important physical factor for littoral transport. The hydrodynamic of wave induced is simulated by hydrodynamic model of Mike-21. The wave radiation stress obtained for the coastal regime by modelling the shallow water waves are used as background data in the Longshore current simulation.

The longshore current is generally parallel to coastline and it varies in strength approximately proportional to the square root of the wave height and with Sin $2\alpha_b$, where α_b is the wave incidence angle at breaking. As the position of the breaking line constantly shifts due to the irregularity of natural wave fields and since the distance to the breaker line varies with wave height, the distribution of the long shore current in the coastal profile vary accordingly. The underlying mechanism of the generation of these currents are gradients in momentum flux (radiation stress) due to the decay of obliquely incident waves and the longshore component of the wind. As the longshore current is secondary effect of wave, in this study the deep-water wave data as shown in the wave rose is transformed to nearshore for obtaining radiation stress. The near shore spectral wind-wave model gives radiation stress output as Sxx,Syy, Sxy for three components of stress. The same is plugged into the hydrodynamic flow model for simulating longshore current.

The wave-induced flow in the model area is simulated by specification of the so-called "Wave Radiation Stresses". By averaging the equations of motion over depth and time (the wave period) wave radiation stress terms are included in the momentum equations.

The terms are:

$$x-momentum$$

$$\frac{\partial S_{XX}}{\partial X}+\frac{\partial S_{XY}}{\partial Y}$$

$$y-momentum$$

$$\frac{\partial S_{YY}}{\partial Y}+\frac{\partial S_{XY}}{\partial X}$$

Where SXX , SXY and SYY are the three components of radiation stress.

MIKE 21 NSW can provide resulting maps of radiation stresses Sxx, Sxy and Syy which are defined by,

$$S_{xx}=\rho\frac{g}{2}\left(F_u+F_p\right)$$

$$S_{xy}=\rho\frac{g}{2}F_{uv}$$

$$S_{yy}=\rho\frac{g}{2}\left(F_v+F_p\right)$$

In the output file, the radiation stresses are divided by r. Here Fu, Fuv, Fv and Fp are defined by,

$$F_u = \int_0^{2\pi} \cos^2(\theta)(1+G)E(\theta)d\theta$$

$$F_{uv} = \int_0^{2\pi} \sin(\theta)\cos(\theta)(1+G)E(\theta)d\theta$$

$$F_v = \int_0^{2\pi} \sin^2(\theta)(1+G)E(\theta)d\theta$$

$$F_p = \int_0^{2\pi} GE(\theta)d\theta$$

Where G is given by

$$G = \frac{2kd}{\sinh(2kd)}$$

The input data for this study are bathymetry and wave induced radiation stress simulated by Nearshore wave models. Altogether Seven simulations are carried out pertaining to seven predominant wave approach directions.

3.4 Tidal Hydrodynamics

The estuarine flow pattern in higher resolution Standard hydrodynamic modelling is carried out with velocity based Samgorinsky formulation. The results of the simulations during peak spring and neap conditions each for duration of 24 hrs were allowed to flow into the fine grid.The appropriate governing equations for studying water environment in coastal and estuarine areas are the two-dimensional shallow water equations. These are obtained by vertically integrating the three- dimensional Navier Stokes equations of motion making the following simplified assumptions,

1. The Flow is incompressible
2. The flow is well mixed
3. Vertical acceleration is negligible
4. Bed stress can be modelled

Simulation of hydrodynamic is based on these non-linear vertically integrated 2-D equations of conservation of mass and momentum.

$$\frac{\partial \zeta}{\partial t} + \frac{\partial p}{\partial x} + \frac{\partial q}{\partial y} = \frac{\partial d}{\partial t}$$

$$\frac{\partial p}{\partial t} + \frac{\partial}{\partial x}\left(\frac{p^2}{h}\right) + \frac{\partial}{\partial y}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial x}$$

$$+ \frac{gp\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial x}(h\tau_{xx}) + \frac{\partial}{\partial y}(h\tau_{xy})\right] - \Omega q$$

$$- fVV_x + \frac{h}{\rho_w}\frac{\partial}{\partial x}(p_a) = 0$$

$$\frac{\partial q}{\partial t} + \frac{\partial}{\partial y}\left(\frac{q^2}{h}\right) + \frac{\partial}{\partial x}\left(\frac{pq}{h}\right) + gh\frac{\partial \zeta}{\partial y}$$

$$+ \frac{gq\sqrt{p^2+q^2}}{C^2 \cdot h^2} - \frac{1}{\rho_w}\left[\frac{\partial}{\partial y}(h\tau_{yy}) + \frac{\partial}{\partial x}(h\tau_{xy})\right] + \Omega p$$

$$- fVV_y + \frac{h}{\rho_w}\frac{\partial}{\partial y}(p_a) = 0$$

These equations are numerically solved by Alternate Direction Implicit (ADI) finite difference technique leading to formation of tri-diagonal matrices, which can be solved efficiently. This entails covering the estuary with a mesh or grid discretising elevations and velocities in space and time to fit on this grid.

The following symbols are used in the equations:

$h(x,y,t)$	-	water depth ($= \zeta - d$, m)
$d(x,y,t)$	-	time varying water depth (m)
$\zeta(x,y,t)$	-	surface elevation (m)
$p,q\ (x,y,t)$	-	flux densities in x- and y-directions ($m^3/s/m$) = (uh,vh); (u,v) = depth averaged velocities in x- and y-directions
$C(x,y)$	-	Chezy resistance ($m^{½}/s$)
g	-	acceleration due to gravity (m/s^2)
$f(V)$	-	wind friction factor
$V,V_x,V_y(x,y,t)$	-	wind speed and components in x- and y-direction (m/s)
$\Omega(x,y)$	-	Coriolis parameter, latitude dependent (s^{-1})
$p_a(x,y,t)$	-	atmospheric pressure ($kg/m/s^2$)
ρ_w	-	density of water (kg/m^3)
x,y	-	space coordinates (m)
t	-	time (s)
$\tau_{xx}, \tau_{xy}, \tau_{yy}$	-	components of effective shear stress

4 Simulated Results

4.1 Long-Shore Flow due to Waves

4.1.1 General

Wave induced Hydrodynamics flow is assessed for the coastal stretch of Karaikal. At the surfzone of proposed project location the current generated by wave incident with respect to the coastline and energy flux by breaking waves are simulated using Nearshore spectral wind-wave model. The incident wave directions to the coast and their associated percentage of occurrence are analysed. Almost 53 % of the offshore wave climate reaches the coast from seven predominant directions (NNE, NE, ENE, E, ESE, SE and SSE) and their 20% exceedence wave parameters presented below, which is used as the run matrix for coastal current simulation.

Wave Direction	Wave Height	Wave Period
NNE	1.6	6
NE	1.65	7
ENE	1.35	5
E	1.2	5
ESE	1.1	5
SE	1.1	7
SSE	1	6.5

4.1.2 Results

A set of results are shown in Figure FD- 6 to Figure FD- 12 corresponding to seven wave incident directions NNE, NE, ENE, E, ESE, SE and SSE respectively. The simulated current speed presented as colour contours and the direction as vector arrows are showing the general flow pattern of the coast. The current speeds ranging from 0-0.8m/s do prevail at the coast. The longshore current is parallel to the coast and directed North-South depending on the wave incident angle. It is observed that the wave induced flow from SE quadrant is slightly higher influence in the Diverted River Mouth then the flow due to NE quadrant waves. However, the penetration is limited to few tens of meters and has no significance, estuarine dynamics point of view.

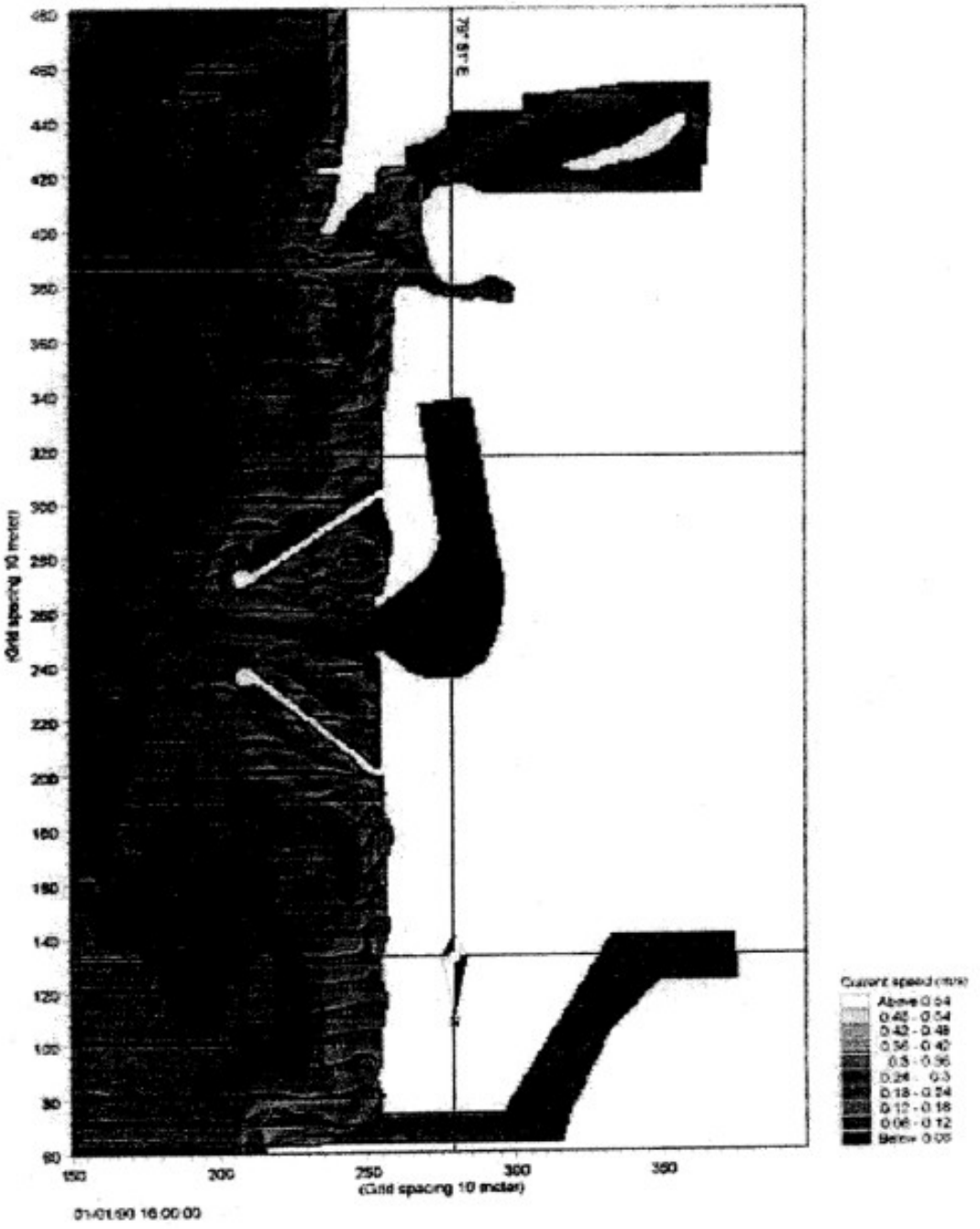


Figure FD- 6 Long shore current due to NNE Waves

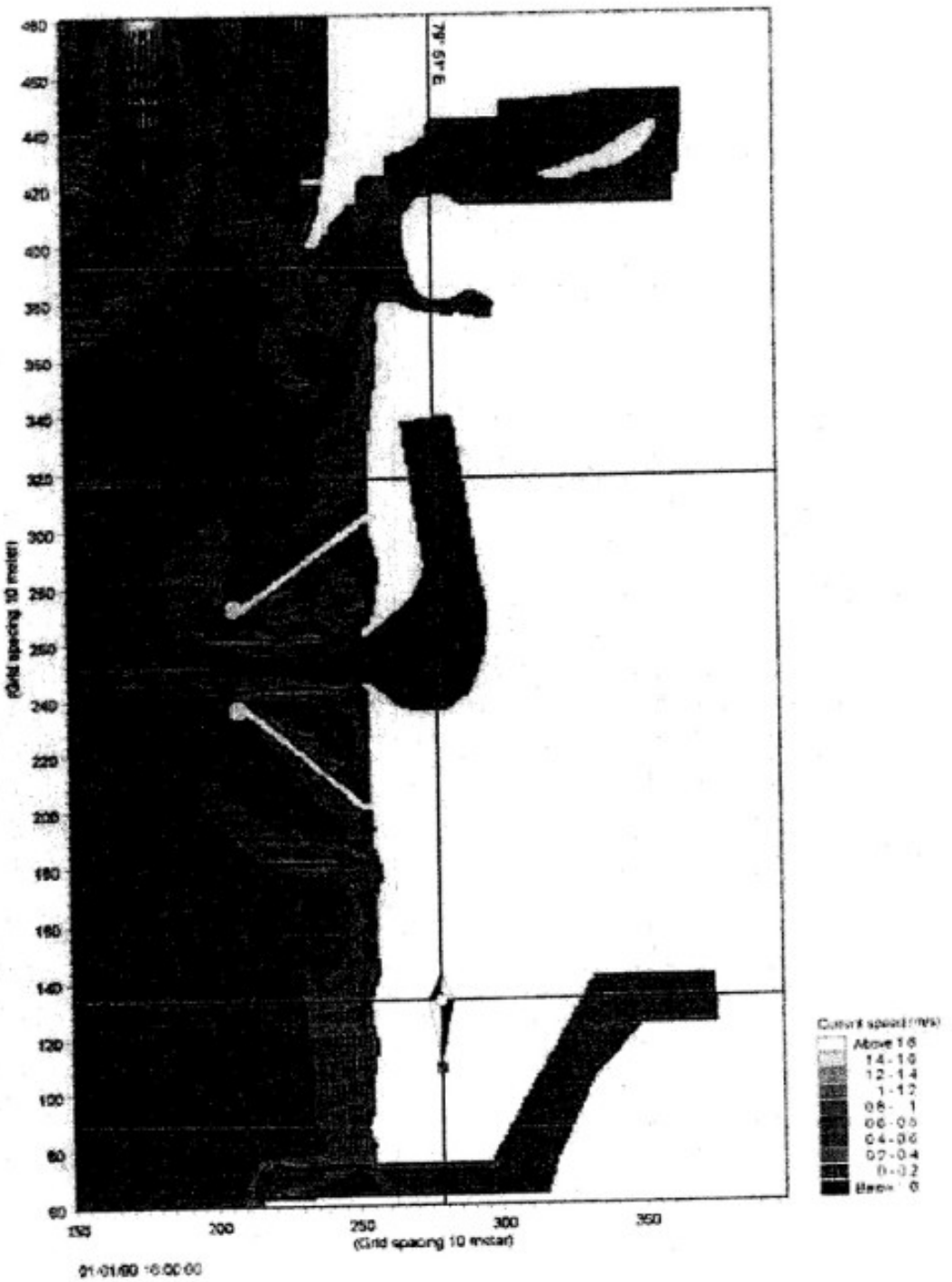


Figure FD- 7 Long shore current due to NE Waves

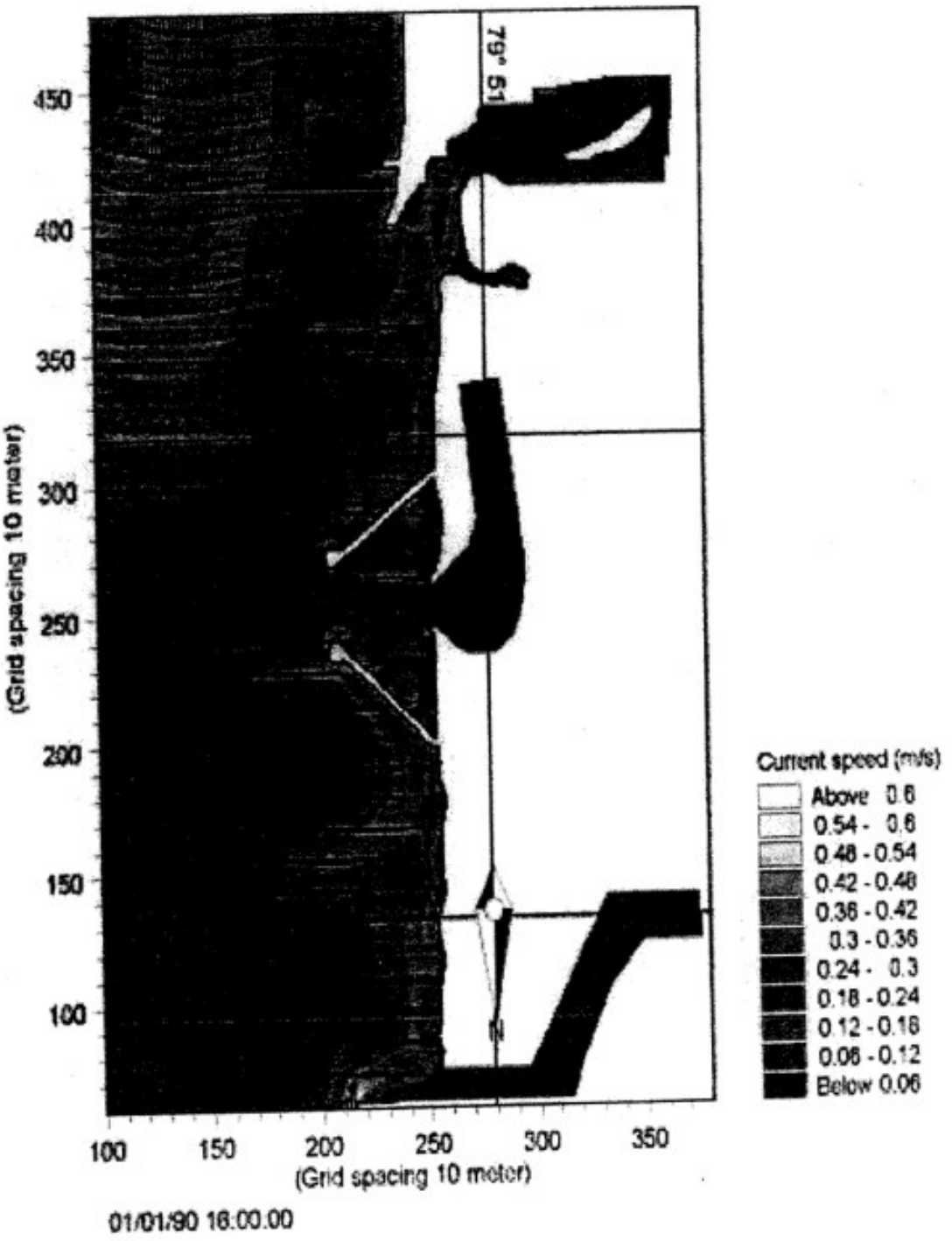


Figure FD- 8 Long shore current due to ENE Waves

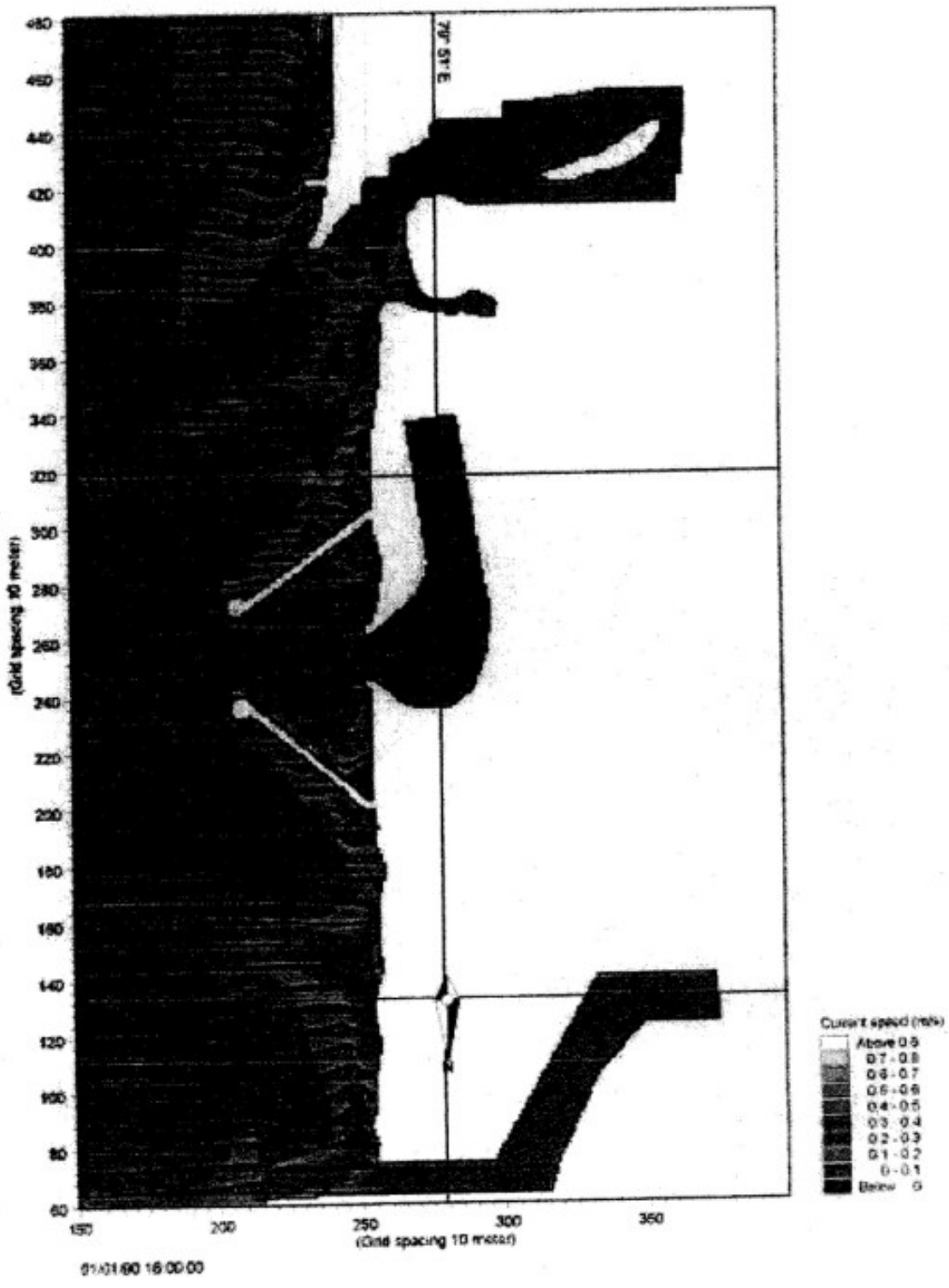


Figure FD- 9 Long shore current due to E Waves

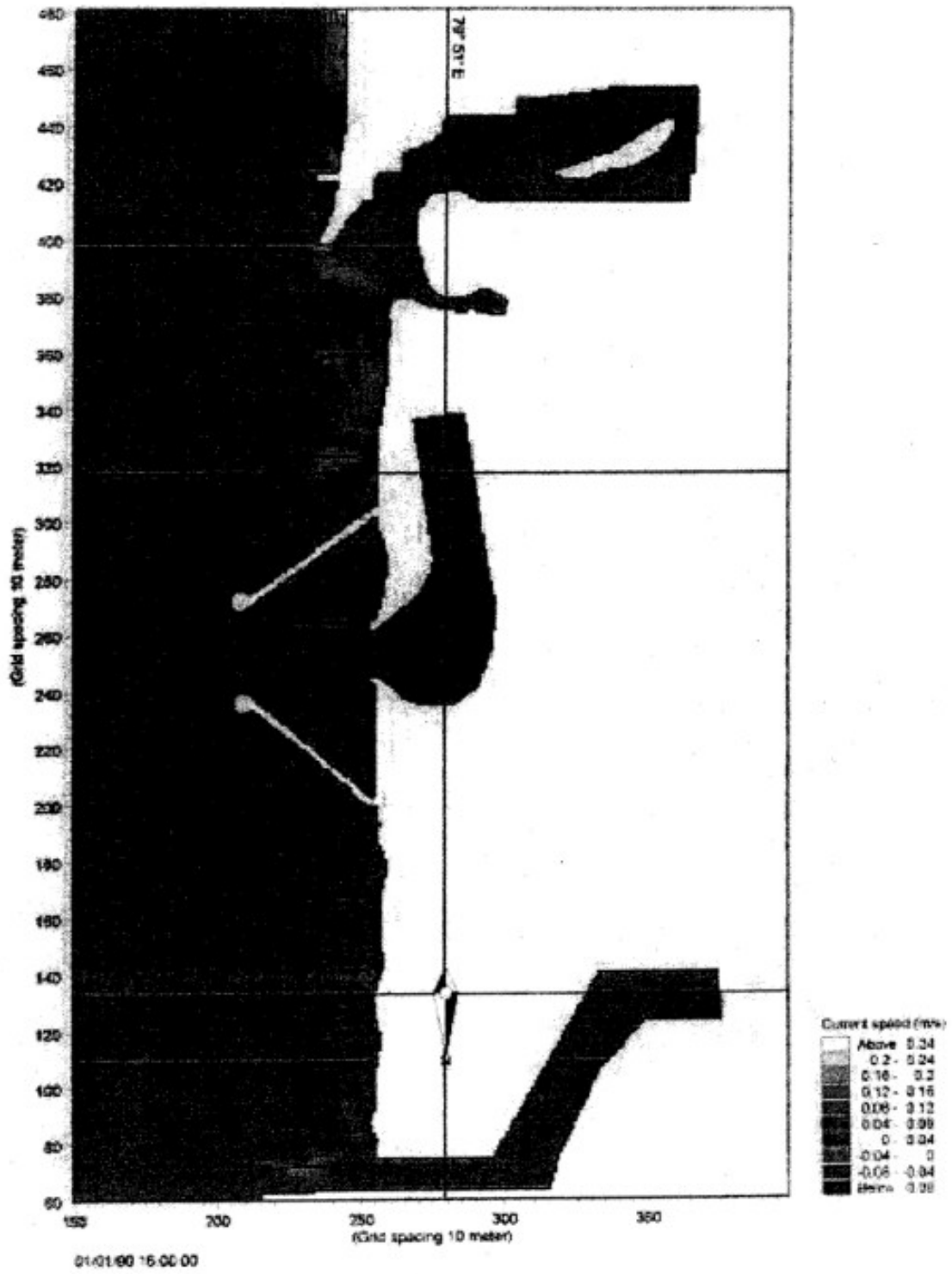


Figure FD- 10 Long shore current due to ESE Waves

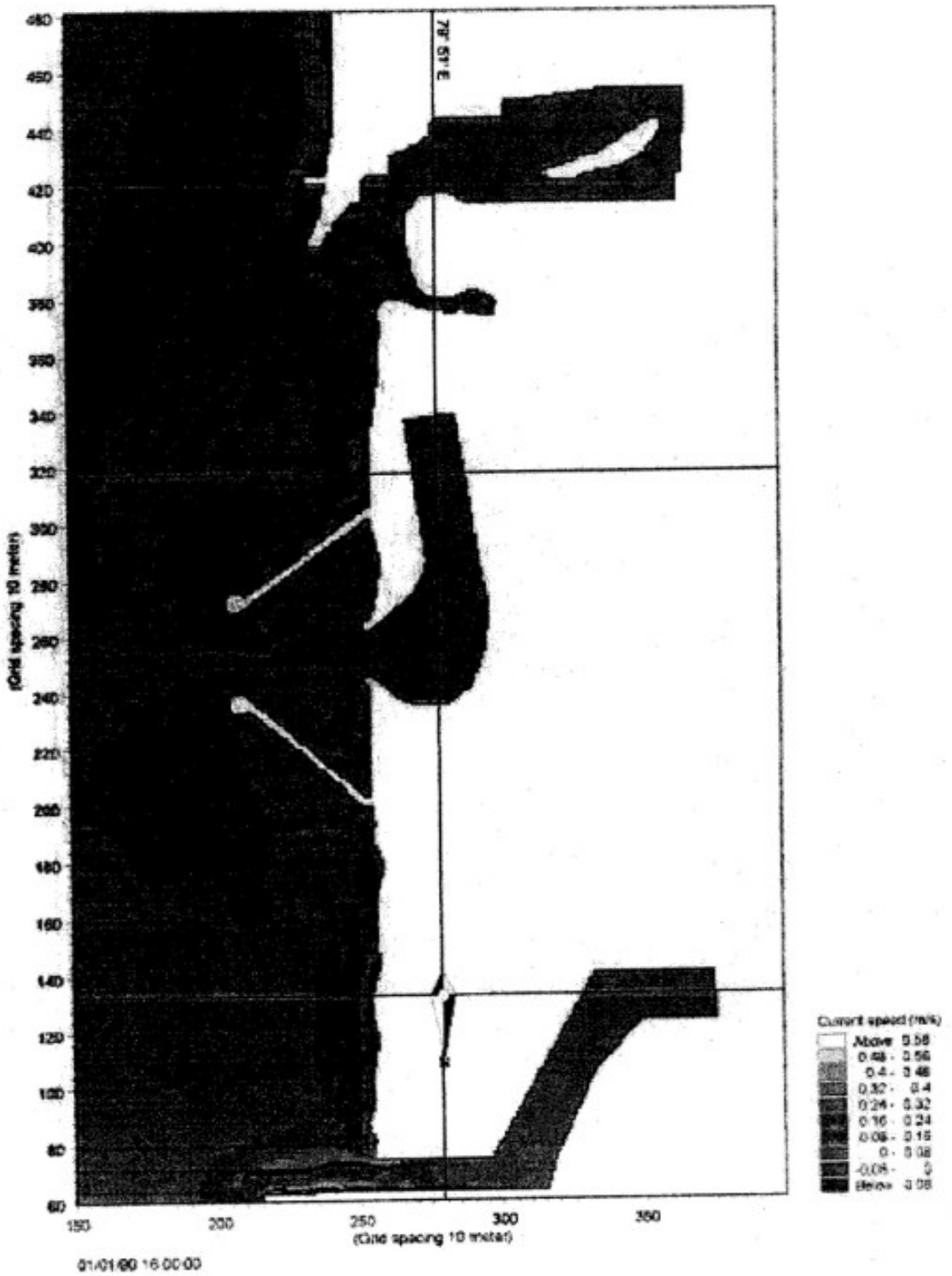


Figure FD- 11 Long shore current due to SE Waves

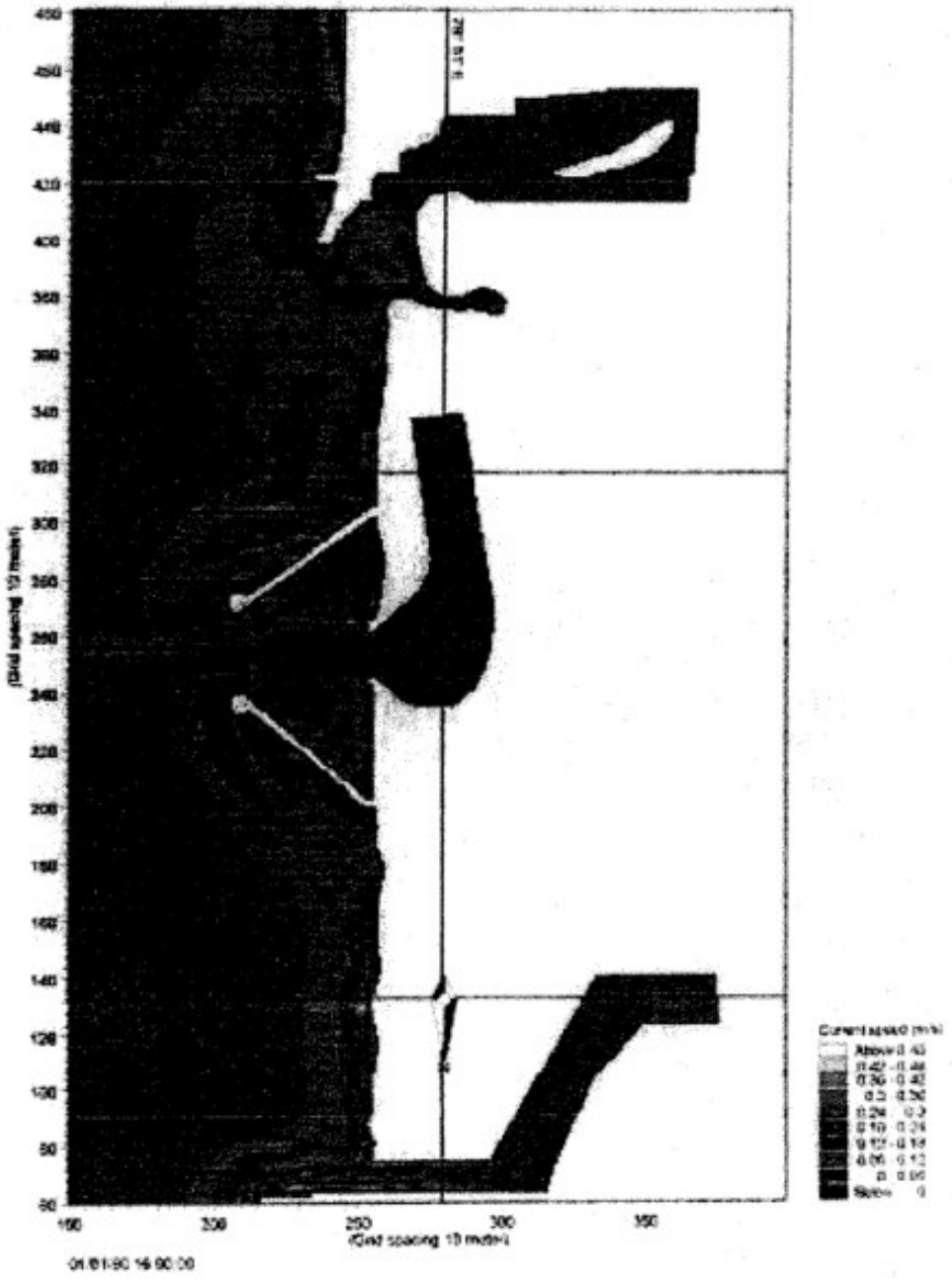


Figure FD- 12 Long shore current due to SSE Waves

4.2 Cross-Shore Flow due to Tide

4.2.1 General

The simulations were carried out for selected 1 day during spring and 1 day during neap from the tidal observations. The evolution of current is catered in the model time step as 15 minute interval. The pattern of current speed and direction at the vicinity of the existing estuary and proposed diversion with port layout for various tidal phases were simulated. The simulations were carried out for duration of 24hrs in each case including warm up (stabilise) for the initial 6hrs.

4.2.2 Tidal influence

The penetration of tide in to the Existing and proposed River is shown in the figure below. The contours indicate the water surface elevation due to Open Ocean tide propagating towards the estuary. During spring tide the maximum water surface elevation (0.8m) into the river then the Neap (0.4m). The limit of Tidal influence in the existing River is upto 1.5km during peak Spring and 1.0km during peak neap tide (flooding). The limit of Tidal influence in the Proposed Diverted River is upto 1.0Km during spring and 0.7Km during neap tide (flooding).It can be seen that generally the direction of flow is East-West direction reversing with inflow (flood) and outflow (ebb) phases of the tide.

4.2.3 Flow Pattern

Current vectors representing the flow pattern during governing flood situations of spring & Neap tides in the model area are presented in Figures. From the figures, it can be seen that the flow pattern in the river mouth is less and further inside it dies down. The small pockets of tidal flats at the confluence are under flooding & drying in regular interval.

4.2.4 Current Speed and direction

It is observed that the tide induced current at the existing River mouth is lower then that of the diverted River. The Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide. As this is not a significant flux ,the influence of tide driven circulation on the river is not appreciable.

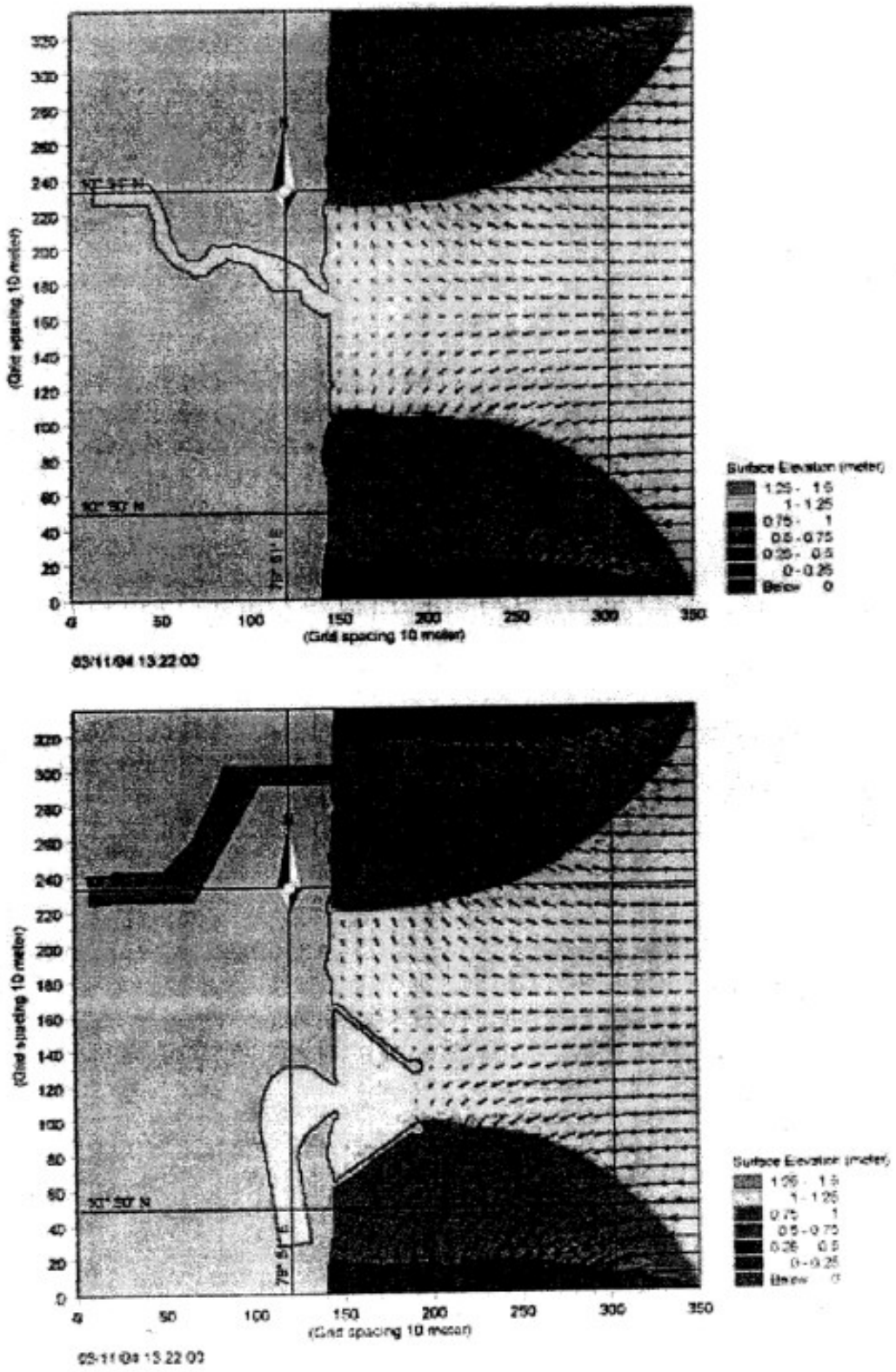


Figure FD- 13 Inflow during Spring Tide (Existing and Diverted River)

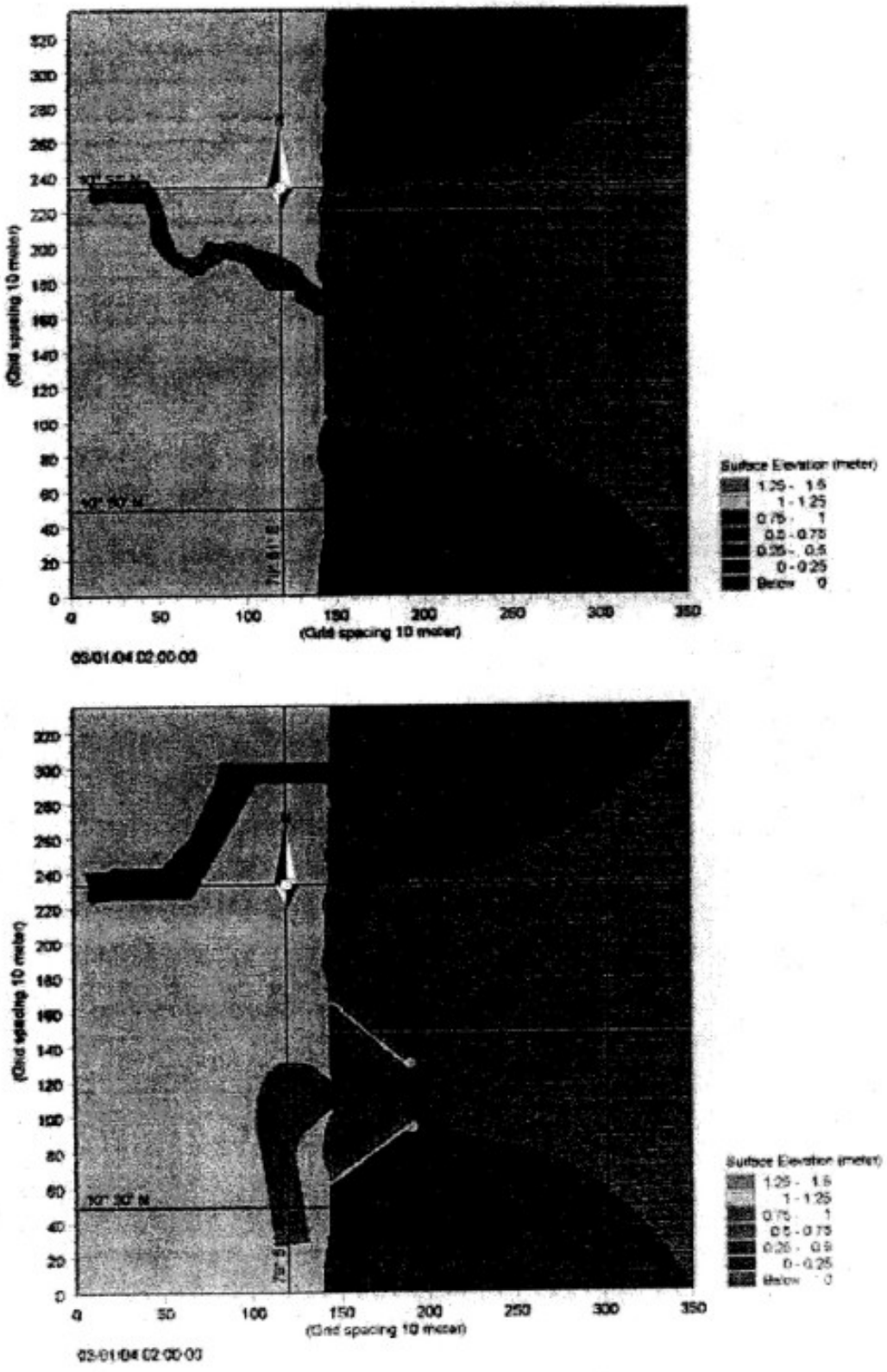


Figure FD- 14 Inflow during Neap Tide (Existing and Diverted River)

5 Tidal Prism

The tidal prism approach (Neill, 1973) can be used for estuaries, with the basic assumption is that the entire estuary fills and empties simultaneously with daily tide.

The maximum discharge Qmax = Π X Volume of water in Tidal Prism / Tidal Period

Maximum discharge during a tidal cycle for Tidal Prism of the Existing Estuary during Spring Tide are 19.0 m3/s and during Neap tide 7.0 m3/s.

Maximum discharge during a tidal cycle for Tidal Prism of the Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.

6 Conclusion

- The Wave induced Long-shore flow (North-South) is in the range of 0.2 to 0.8 m/s for the Karaikal coast
- The Tidal Cross-shore flow (East-West) at the mouth of the Estuary is in the range of 0.25 to 0.42 m/s during Spring and 0.20 to 0.30 m/s during neap tide.
- The Wave induced current of magnitude 0.2 m/s enters the mouth of the river have an influence few tens of meters
- The Tidal penetration in the existing River is in the range of 1.0 to 1.5km during Spring and 0.7 to 1.0km during neap tide flooding.
- The Tidal penetration in the Proposed Diverted River is in the range of 0.75 to 1.0Km during spring and 0.5 to 0.7Km during neap tide flooding.
- The tidal prism estimation for Existing Estuary during Spring Tide is 19.0 m3/s and during Neap tide is 7.0 m3/s.
- The tidal prism estimation for Diverted Estuary during Spring Tide are 28.0 m3/s and during Neap tide 9.0 m3/s.
- The River is very small and studies show negligible change in hydrodynamic characteristics due to diversion.

Certificate of Approval

Issued by Indian Register Quality Systems

IRCLASS SYSTEMS AND SOLUTIONS PRIVATE LIMITED

Certificate No.
IRQS/250101274

To certify that the Quality Management Systems of

Karaikal Port Private Limited

ADDRESS
Keelavanjore village, Thirumalai Rayan
Pattinam, Karaikal ,Pondicherry -609 606,
India

has been assessed and found conforming to the requirement of **ISO 9001 : 2015**

INITIAL CERTIFICATION DATE	CURRENT DATE OF GRANTING	EXPIRY DATE
JULY 13, 2022	AUGUST 19, 2025	JULY 12, 2028

CERTIFICATION SCOPE

Providing port facilities for Receipt, Storage and Handling of Bulk, Break Bulk and liquid Cargo

Indian Register Quality Systems

NABCB QM 006

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AUTHORISED CERTIFICATION BODY SIGNATURE

Shashi Nath Mishra
Chief Operating Officer (COO)

This approval is subject to continued satisfactory maintenance of the Quality Management Systems of the organization to the above requirements which will be monitored by IRQS during annual Surveillance audits. Validity of the Certificate is subject to successful completion of annual surveillance audits. The use of the Accreditation Mark indicates accreditation with respect to activities covered by the certificate with NABCB accreditation no. QM 006.

Condition Overleaf.

Indian Register Quality Systems (A Division of IRCLASS Systems and Solutions Private Limited)
Head Office: 52A, Adi Shankaracharya Marg, Opp. Powai Lake, Powai, Mumbai - 400 072, India. Website: www.irqs.co.in, www.irclass.org

Certificate of Approval

Issued by Indian Register Quality Systems

IRCLASS SYSTEMS AND SOLUTIONS PRIVATE LIMITED

Certificate No.
IRQS/250401276

To certify that the Occupational Health and Safety Management Systems of

Karaikal Port Private Limited

ADDRESS
Keelavanjore village, Thirumalai Rayan
Pattinam, Karaikal ,Pondicherry -609 606,
India

has been assessed and found conforming to the requirement of **ISO 45001: 2018**

INITIAL CERTIFICATION DATE	CURRENT DATE OF GRANTING	EXPIRY DATE
JULY 13. 2022	AUGUST 19, 2025	JULY 12, 2028

CERTIFICATION SCOPE

Providing port facilities for Receipt, Storage and Handling of Bulk, Break Bulk and liquid Cargo

Indian Register Quality Systems

NABCB OH 007

MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

AUTHORISED CERTIFICATION BODY SIGNATURE

Shashi Nath Mishra
Chief Operating Officer (COO)

This approval is subject to continued satisfactory maintenance of the Occupational Health and Safety Management Systems of the organization to the above requirements which will be monitored by IRQS during annual Surveillance audits. Validity of the Certificate is subject to successful completion of annual surveillance audits. The use of the Accreditation Mark indicates accreditation with respect to activities covered by the certificate with NABCB accreditation no. OH 007.

Condition Overleaf.

Indian Register Quality Systems (A Division of IRCLASS Systems and Solutions Private Limited)
Head Office: 52A, Adi Shankaracharya Marg, Opp. Powai Lake, Powai, Mumbai - 400 072, India. Website: www.irqs.co.in, www.irclass.org

16/03 2020 11:35AM FAX 04368224900 ICGS.KARIKAL 0001

Telefax: 04368-226500
Email : cgs-kkl@indiancoastguard.nic.in
Reply should be addressed to
The Commanding Officer

BHARATIYA TATRAKSHAK AVASTHAN KARAIKAL
ICGS Karaikal
No.64, Bharathi Nagar,
Karaikal – 609 604

731/7

16 Mar 2020

The Manager
(Marine Operations)
Karaikal Port Pvt Ltd
Kheezhavanjoor Village
TR Pattinam, PB No.33
Karaikal-609606

OIL SPILL CONTINGENCY PLAN – KARAIKAL PORT PVT LTD

1. Refer to CGRHQ(E) letter 7604 dated 02 Mar 17 and this station letter 704/6 dated 17 Apr 17.

2. The revised Oil Spill Contingency Plan (OSCP) of Karaikal Port Pvt Ltd had been approved by competent Coast Guard authority w.e.f 02 Mar 17 for a period of five years.

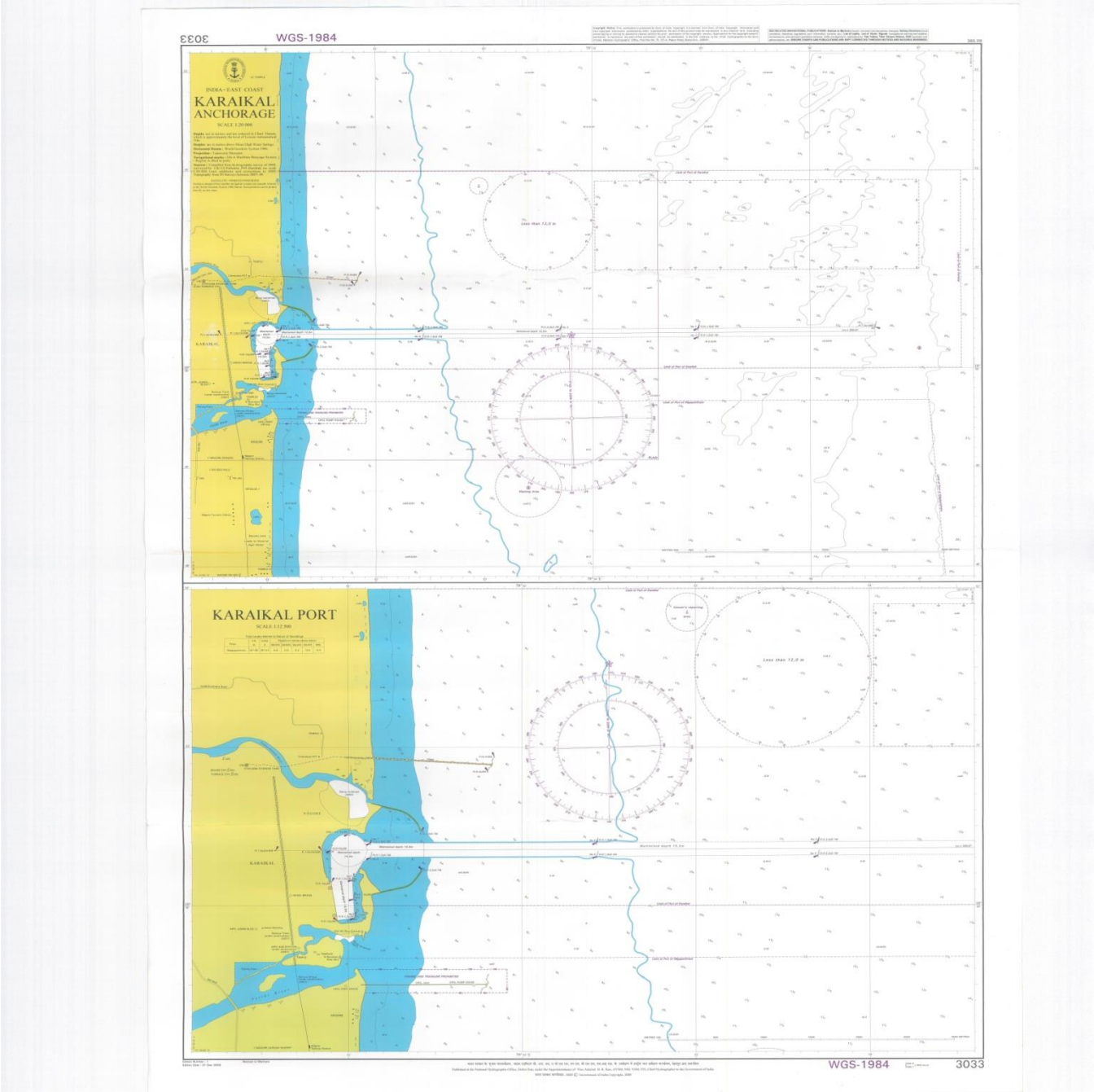
Thanking you,

Yours faithfully,

(Praveen Kumar)
Asst Commandant
Station Ops Officer
for Commanding Officer

Encl. As above

OIL SPILL CONTINGENCY PLAN



Karaikal Port Private Limited

Keezhavanjore, T.R. Patinam, Karaikal Pondicherry-609 606
Tel: 04368 224773

Amendment History				
S. No.	**Section Revised**	**Date of Revision**	**Pages Revised**	**Brief Descripton of Revision**
1	Amendment-01	20-May-2010	13,57,66,80,82,91, 92	Sections:6.2,17.3,21.2,3, Appendix – 4,6,14,15 (Crude Oil / Petro Products handling /ECT/Sensitive Mapping)
2	Amendment-02	01-May-2012	3,4,81	Appendix -4,5,6 (information Flow Chart, Incident Organisation Chart, Communication list)
3	Amendment-03	3-March-2015	7 (19-25)	Section 8.1 to 8.9, Crude handling, unloading arm, Fire Fighting Facilities, Weather watch, Pollution Control, hose connection / disconnection, Sludge Removal Facilities added
4	Amendment-03	3-March-2015	Two (55-57)	Section 15.2, 15.3, Oil Spill Modeling and how to track spilled oil added
5	Amendment-03	3-March-2015	One (98)	Appendix 6, Communication Details updated
6	Amendment-04	01-April-2016	98	Appendix 6, Communication Details updated
7	Amendment-05	17-Feb-2020	13,28,99,102,111, 115 & 116	Sec 6.2, Sec 8.9, App 3, App 6, App 14, App 17 & App 18
8	Amendment-06	09-Feb-2023	13,14,15,16,81,91,92, 94,95,103 & 106	Sec 6.2, 6.4, App 5, App 6, App 7, App 14 & App 17

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1. INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The management of Karaikal Port has decided to come up as a model port in private sector in east coast of India. In the process, all the plans and reports are desired to be in place and Oil Spill Contingency Plan (OSCP) also finds it's place among "MUST" documents. The purpose to have this document is to educate and train own staff and crew members about various oil spill scenarios and how to deal with the situation when any incident / accident occurs. Document also speaks about the consequences of oil spill on Environment, Flora and fauna, Marine life, Socio economic life etc. in terms of Permanent or Quasi permanent damages. Taking efforts and precautions in preventing oil spill is part of the goals set by port management.

1.2 AUTHORITY AND JURISDICTION

Karaikal Port Ltd. is a subsidiary of MARG group of companies and is governed by Board of Directors. Functioning of the port will be from Karaikal, which is a part of Union Territory, Pondicherry, It is situated about 170 Km. south of Pondicherry and is well connected by road and rail (after gauge conversation).The Port officer Pondicherry is the supervisory authority from the union government side. The port has been allotted sea front area along with required land to operate, co-ordinates of which are shown in the chart No. 3033 placed at ***Appendix-1.***

1.3 DEFINITIONS AND ACRONYMS

Contingency Plan - A plan of action prepared in anticipation of an oil spill. A contingency plan usually consists of guidelines developed for a specific industrial facility or an entire region to increase the effectiveness, efficiency, and speed of cleanup operations in the event of an oil spill, and simultaneously protect areas of biological, social, and economic importance.

Emergency Operations Center (EOC)- A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency.

High Water / Low Water: The tides in the sea changes every six hours and in turn produces high water and low water phenomena. The water level rises accordingly along the coast, and the highest high water is the point after which the tides changes and low water starts.

Incident Action Plan - Contains objectives reflecting the overall incident strategy, specific tactical action and supporting information for the next operational period. The plan maybe written or oral. When written, the plan may have a number of forms as attachments e.g. traffic plan, safety plan, communication plan and map etc.

Manual Removal - Removal of oil and contaminated debris by hand tools such as rakes, scrapers, hoses, shovels and buckets.

Natural Biodegradation – The reduction in concentration of chemical(s) of concern though naturally occurring microbial activity.

Oil Pollution Incident - An occurrence or series of occurrences having the same origin, which results or may result in a discharge of oil and which poses or may pose a threat to the marine environment, or to the coastline related interests of one or more states, and which requires emergency action or other immediate response.

Sensitivity Maps - Maps used by the Emergency Response Team which designate areas of biological, social, and economic importance in a given region. These maps often rank sensitive areas so that in the event of an extensive spill, these areas can be protected or cleaned up first. Sensitivity maps usually contain other information useful to the response team such as the location of shoreline access areas, landing strips, roads, communities, and the characteristics of shoreline area. Maps of this type form an integral part of local or regional contingency plans.

Shoreline Cleanup – The act of physical removal of oily waste from the coast line after the spill has hit shoreline / coastline is known as shore clean up. Mostly it is a manual cleanup of debris mixed with oil for sending it to the disposal site.

1) Tier 1 : These response systems are arrangements established at individual ports and oil handling facilities, and are designed to deal effectively with small operational spills (Less than 700 tons). *Port has got Tier-1 OSR Equipment as per the appendix 3.*

2) Tier 2 : These arrangements provide for the pooling of government or privately owned resources at the local level or from a wider geographical area to respond to an incident which may exceed, either in size, complexity or due to its remote location, the Tier 1 capability of an individual facility.

3) Tier 3 : These arrangements provide for a combined national or international response to a major oil spill that cannot be dealt with effectively under the Tier 2 arrangements. To avoid duplication of expensive resources that may only be required infrequently, cooperative arrangements have been established between group of oil companies for responding to such events.

ACRONYMS:

AMSA	Australian Maritime Safety Authority
ECR	Emergency Control Room
ECT	Emergency Control Team
EIA	Environment Impact Assessment
EMSA	European Maritime Safety Agency
ERG	Emergency Response Group
ERT	Emergency Response Team
PPCB	Pondicherry Pollution Control Board
HSE	Health Safety & Environment
IC	Incident Controller
IMO	International Maritime Organization
IPIECA	International Petroleum Industry Environmental Conservation Association
MoEF	Ministry of Environment & Forest
NIO	National Institute of Oceanography
NOS DCP	National Oil Spill Disaster Contingency Plan

OISD	Oil Industry Safety Directorate
OPRC	Convention of Oil Pollution Preparedness, Response and Co Operation, '90
OSC	On Scene Commander
OSCP	Oil Spill Contingency Plan
OSD	Oil Spill Dispersant
OSRA	Oil Spill Risk Analysis
OSR	Oil Spill Response
PMS	Preventive Maintenance Schedule
ICGS	Indian Coast Guard Station / Ship
ICGAS	Indian Coast Guard Air Station
DGCG	Director General Coast Guard
COMCG	Commander Coast Guard
CGHQ	Coast Guard Head Quarters
CGRHQ (E)	Coast Guard Regional Head Quarters (East)
CGPRT (E)	Coast Guard Pollution Response Team (East)
COS	Chief Of Staff
CGDHQ	Commander Coast Guard District Head Quarter
CO	Commanding Officer

1.4 GEOGRAPHIOC BOUNDRIES (LOCAL AREAS)

The geographical boundaries of this port as per Indian Ports Act are from:

Lat. 10^0 50' 00" N to Lat. 10^0 52' 00" N

Long. 079^0 51'09" E to Long. 079^0 57" 23" E

It is located about 9 kms. south, from Karaikal town, south east of Vanjiurkuppam in the Vanjore village, TR Pattinam commune, Karaikal taluk, Union Territory of Pondicherry between Karaikal and Nagore. The chart applicable is 3033. The total land allotted to develop the port area is about 600 acres. In fact the southern boundary of the port touches the northern banks of river Vettar and the port limits of Nagapattinam port starts from the mouth of the River Vettar. About ½ mile, north of north break water lies Chemplast jetty, of Sanmar Group, which is well within

Karaikal port limits. Almost along the southern banks of river Vettar; CPCL oil Jetty is situated. But this fall under Port limits of Nagapattinam Port.

2. RESPONSE SYSTEM AND POLICIES

This plan is to be interfaced with other plans of the port, and can be effectively complied with the same manpower / team delegated for the Emergency Response works. For example, Disaster Management Plan (DMP) including Fire Fighting Teams or Rescue and Assistance teams, of the port can be interfaced with suitable permissible modifications. However it must be borne in mind that this contingency plan has to be implemented both, on land as well as water. Water crafts i.e. tugs, boats and other methods of working on water will be utilized in the plan. Hence people acquainted with the characteristics' of the sea would be more suitable for such Emergency Response Teams.

The company's policy towards OSR activities will be to:

- Respond immediately to any spill incident with the objective of protecting marine & human life and to minimize environmental impacts;
- Work and consult with appropriate government bodies and the local community to address any issues relating to oils spills in a timely manner;
- Provide adequate training and information to enable employee and contractors to adopt environmentally responsible work practices, and to be aware of their responsibilities in the prevention and cleanup of oil spill.
- Develop emergency plans and procedures so that incidents (accidental spills) can be responded to in a timely manner;
- Develop and maintain management system to identify, control and monitor risks and to comply with Statutory Regulations and industry guidelines.
- Assess the situation and take timely and appropriate action where third party interests are involved, such as products or chartered vessels, drill rigs supply vessels, sea based industries or population, nearby ports etc.

Ascertain that each identified employee is responsible for the implementation of this policy in association with his specific duties. This includes contractors and their employees as well.

3. ORGANISATION

3.1 PLANNING ORGANISATION

In planning organization, it has been decided to involve senior management level personnel. This would provide an easy access to decision making process and have an effective command and control structure. This team is designated as Emergency Control Team (ECT) and it's leader as Emergency Control Room Team Leader (ECRT Leader) would be functioning from a control room termed as Emergency Control Room (ECR) The team will be consisting of senior personnel from various departments, who would formulate the strategy for oil spill combat and direct the Emergency Response Team (ERT) to carry out the task. The supervisors would be termed as Team Leaders and would be responsible for all actions of their respective teams.

3.2 RESPONSE ORGANISATION

The response organization is one of the major part of any Emergency Response Group. Here the response organization has been planned to be structured in two groups, Ashore and Afloat and these groups are further sub divided in to two groups each; so as to have one team readily available to relieve the team on site. The teams proposed have been planned to be designated as Emergency Response Team (ERT) and the leader of this team as ERT Leader and the person detailed to supervise and monitor the Oil Spill on site and advise the control room is designated as On Scene Commander (OSC).

Response Organisation also includes

a. **Salvage Monitoring and Control Unit**
b. **Marine Response Centre**
c. **Shoreline Response Centre**
d. **Emergency Control Centre**

Basic Requirements of ECR (Emergency Control Room):-

a. **Copy of OSCP**
b. **Layout of roads, fuel, waterline, drainage, electricity etc.**
c. **Name address and telephone No. of all concerned groups involved in the response.**
d. **Dedicated and reliable communication equipments both on and off the site.**
e. **Plan board, logbooks, etc for log keeping.**
f. **Emergency lights in the event of power failure**
g. **E-mail, fax and photography facility**

While the response action is under way, efforts will also be made to fully investigate the cause of spill and stop the same, to avoid further damage.

4. PLAN REVIEW

4.1 REVISION / UPDATE REQUIREMENTS

Once the OSR exercises are planned and carried out as per this (OSCP) plan, there are chances that it may require certain revisions / changes arising out of ground realities and the experiences gained. The updating and revisions may be required to be incorporated due to induction of new equipment's, change in deployment pattern of the equipment's, or experiences gained during exercises etc. However the fresh Reassessment of this plan is recommended to be done after every Three Years or increase of traffic by 100% or increase in volume of commodity handled by 100%, whichever is earlier.

4.2 EXERCISE AND DRILLS

Regular exercises and drills form part of this plan and a schedule is to be drawn in consultation with Administration and Marine department. Drill forms the integral part of the OSR team, which is to be exercised at frequent interval so as to make every team member perfect and understand what role he has to play. Exercises may be planned in consultation with ECRT leader. This may be table top or in actual, with or without deployment of equipment's.

5. TRANING, EXERCISES AND DRILLS

5.1 TRAINING

A periodical training program is to be drawn by the Marine department, involving all the concerned departments. A training matrix involving all concerned level of personnel is placed as ***Appendix-2***. This training program basically is a knowledge oriented capsule course for the ones who have joined the department for the first time and a refresher course for the veterans. It provides the knowledge and information about the oil spill causes, prevention, response equipment's; their capabilities and limitations, type and deployment of different types of equipment at different situations and locations etc. It is important to note that Oil Spill Response (OSR) work requires skill and experience in this field. Reason being that "Sea does not spare anybody" and only experienced persons familiar with the sea behavior/ conditions would be able to survive at sea, because all the OSR works are to be carried out afloat at sea or ashore on the sea beaches as the case may be.

Administrative department will ensure that every person, who has a role or responsibility in emergency response management, under takes training as detailed in the oil spill training matrix. The Administrative department is to ensure that training for both offshore and onshore personnel are organized in coordination with HOD Marine, as per the training schedule.

HOD Marine is to ensure that OSR Team personal who are required to operate oil spill equipment, undergo training for effective deployment of equipment's and devices. He is also to ensure that all the masters / skippers and their crew members of the ships, barges and tugs operating for this port; are fully trained for effective deployment of OSR equipment and devices, earmarked for their ship / vessel. The IMO divides the training in three levels, as follows:

Level 1

To provide all field personnel and Supervisor, responsible for undertaking on site cleanup operations, an overview of the techniques available for recovering spilled oil and clearing polluted shorelines.

Level 2

Supervisor / On-Scene Commander /Incident Controller. To provide senior personnel with the skills necessary to co-operate and supervise response operations, in a timely, organized and effective manner.

Level 3

Administrators and Senior Managers, to provide senior personnel with an awareness of the role and responsibilities required in the management of spills of national significance.

These courses are required to meet, both statutory and Karaikal Port management's requirements for oil spill response preparedness and safe operations. Records demonstrating that personnel have satisfactorily completed the designated training course shall be maintained.

Details of personnel trained in IMO level-1 and level-2 is as per ANNEXURE 14.

5.2 EXERCISES AND DRILLS

Exercises and Drills are an integral part of any team work, even if the incidents / accidents are expected not to take place due to various safety / precautionary measures are in place. Marine Department is to plan periodical exercises in

conjunction with other departmental programs. The regular testing of the OSCP will ensure that skills and awareness of ERT are maintained in a state of operational readiness. In order to have optimal utilization of equipment and to minimize wear and tear in each exercise, half yearly exercises are proposed for testing OSCP and ERT. Testing and exercises also provide management an opportunity to access equipment, measure performance and obtain feedback from participants, update and correct the OSCP and provide inputs to the company's commitment on oil spill prevention and response.

Exercise and drills involve any or a combination of the following:

a) Oil Spill Contingency Plan orientation
b) Table top scenarios for the Incident management team (OSC & ERT Leader)
c) Table top scenarios for the ECT (Emergency Control Team)
d) Notification and callout procedures.
e) Equipment and personnel mobilization and deployment.
f) Joint exercises with other organizations.
g) Full scale incident management exercises.

Each exercise shall be debriefed to identify weaknesses in the OSCP and equipment, and to undertake appropriate remedial action wherever required. The Administrative department / **HOD** will ensure that amendments reflecting these actions are incorporated into this plan.

Karaikal Port carries out three drills in a year related to oil spill and same is witnessed by the representatives of the neighboring terminals and Indian Coast Guard Station Karaikal.

6. AREA ASSESSMENTS

6.1 AREA OF RESPONSIBILITY

The area of responsibility is within the port limits of the Karaikal Port, and the area demarcated as the anchorage area for the vessels calling on to this port or carrying out the lighter age operations from there, as shown in chart No.3033. It is important

to note that in the 1st Phase, the length of the channel is 10900 meters (10.9 km) and the channel is 160 meters wide with 15.5 meters of depth maintained. The anchorage area is planned at 5.4 miles from the jetty. However in 2nd Phase, the width of the channel is planned to be increased to 250 meters and maintained depth of the channel will be 16.5 meters and the vessels of 14.5 meters of draught are likely to call on then. Any spill incident arising during this passage will also fall in the responsibility jurisdiction of this port. Also if the spill occurs in these areas and goes out of the port limits, response activity to that will also be our responsibility.

6.2 PLANNING COMMITTEE ORGANISATION

The planning committee organization will be formally called as Emergency Control Team (ECT), consisting of senior managers from various departments; for providing expert advices and also on the spot clearance for any requirements arising out of the situation.

The following personnel are designated as:

COO	: Emergency Control Team Leader (ECT Leader) and Incident Controller (IC)
HOD (Marine)	: On Scene Commander (OSC)
HOS (Marine)	: Alt. On Scene Commander (Alt.OSC)

The composition of Emergency Control Team (ECT) which will be functioning from Emergency Control Room (ECR) is as follows:

1	COO	ECT Leader and Incident Controller (IC)
2	*Head Marine*	*On Scene Commander (OSC)*
3	Head Cargo.	Member
4	*T/Mgr - Supertug Karaikal*	Member
5	Manager F & S	Member
6	Head Security	Member
7	Head Mech.	Member

The composition of Emergency Response Team (ERT) is as follows:

AFLOAT- OSR TEAM	**"A"**	**AFLOAT - OSR TEAM**	**"B"**
1. *HOD Marine (Team/Ldr)*	1	HOS-*Marine (Team/L)*	1
2. *Master Tug Mermaid-III*	1	*Master Tug Dolphin-1*	1
3. OSR team members	6	OSR team members	6
4. Tug crew (seaman)	4	Tug crew (seaman)	4
5. Work/country boat crew	4	Work/country boat crew	4

ASHORE - OSR TEAM	**"A"**	**ASHORE - OSR TEAM**	**"B"**
1. Asst *Manager Marine-Asst.T/L 1*		*Asst.Mgr Marine (Asst.T/L)*	1
2. OSR team members	3	OSR team members	2
3. Security services men	5	Security services men	5
4. Casual labourers	25	Casual labourers	25

*****OSR Team members are distributed to the teams as per appendix 14.***

6.3 AREA SPILL HISTORY

There has been no history of grounding of any vessel as this port is under construction. There are two jetties either side of the port. CPCL jetty on the southern side is exclusively used for crude transfer. However, no previous spill record exists for that also.

6.4 THREAT ANALYSIS AND PROTECTION

The threat of oil spill occurring in the area of study in this port, are likely to be from the following reasons:

(i) Grounding	* Master / Pilot error
	* Engine/ Steering failure
	* Adverse weather conditions
	* Action to avoid collision
(ii) Collision	* Ship to Ship
	* Barge to Barge / Ship
	* Ship to shore / structure / Barge
(iii) Bunkering	* Rupture / leak from hoses
	* Over flow of tanks

(iv) Accidents ashore	* Toppling / capsizing of tanker lorry
(v) Disposal of bilges over side	* Bilge pumping operations

Karaikal Port is capable to contain oil spill of TIER-2.

6.5 PROBABLE QUANTITY OF OIL LIKELY TO BE SPILLED IN VARIOUS CIRCUMSTANCES:-

1. Grounding	**:**	**1000 KL**
2. Collision	**:**	**1000 KL**
3. Bunkering	**:**	**500 Ltrs**
4. Accident Ashore	**:**	**200 Ltrs**
5. Disposal of Bilges	**:**	**500 Ltrs**
6. Tanker Operation	**:**	**100 KL**
7. Accident at Neighboring Terminals	**:**	**100 KL**

Threat Protection of Karaikal Port						
S.No	**Hazard**	**Risk**	**Probable Quantity in worst case scenario**	**Possible Cause**	**Likelihood of Risk**	**Type of Control**
1	Grounding	Oil Spill	1000 KL	Steering Failure, Incorrect assessment taken of vessel draft and squat during under keel clearance calculation. Vessel Transiting in channel too fast (increased squat) Incorrect chart datum assessed. (hydrographic survey outdated)	3	1. Shipping movements are executed by the well trained pilots only. 2. Minimum depth is always maintained in the channel and basin areas. 3. Shipping movements are carried out only in the fair weather conditions. 4. Substandard vessel are not accepted by the port. 5. Pilot checks the vessel condition and engine response prior undertaking shipping moves. 6. Port has three navigation aids for assessing Pilot. 6 sets of the buoys, day/night transit light and Harbor Pilot System which is useful in poor visibility also.
2	Collision	Oil Spill	1000 KL	Misjudgment, Vessel equipment failure / malfunction (navigational, steering, propulsion, auxiliary, tugs),Human Error (Pilot, Tug Master, VTS), Environmental Conditions (poor visibility, strong current, high swell)	2	1. Only oneway channel, so minimum risk of collision between vessels.
4	Bunkering	Oil Spill	500 Ltrs	Hose leakage/damage	3	Bunkering operations carried out in the presence of jetty supervisor only after checking all the points of per-bunker transfer checklist

5	Accident Ashore	Oil Spill	200 Ltrs	Collison, lorry toppled	2	1. Vehicles are not allowed to have more than 20 KM/H speed. 2. License details are checked at entry gate. 3. Drivers of the vehicles are checked for intoxication by a breath analyiser
6	Disposal of Bilges	Oil Spill	500 Ltrs	Bilge discharge by a vessel	2	1. Regular Monitoring of sea front by port crafts.
7	Tanker Operation	Oil Spill	100 KL	Hose Rupture, Manifold leakage	2	1.Tanker operations are carried out under the supervision of trained person. 2. Hoses are regularly tested for leakages 3. Continuous watch keeping at manifold

6.6 THE DRIFT MOVEMENT IN DIFFERENT TIMES OF THE YEAR INSIDE AND OUTSIDE THE HARBOUR HAS BEEN GIVEN AS BELOW:

The movement of the oil slick inside harbor is likely to be minimal at all the times as it is a well sheltered place. Movement, if any, will be only due to tidal variation. However movement of the slick, out of harbor areas would vary from place to place, due to climatic (monsoon) conditions. Few conditions in four quarters are discussed below:

6.6.1 NORMAL WEATHER CONDITIONS (JAN - MAR) – OUTSIDE HARBOUR

Wind – Mild in SW/SWW direction

Tidal induced current – 0.5 kts

Any oil spill taking place during this period is likely to move towards SW / SWW direction along the wind and tide direction at a very slow rate. As the time passes by the speed of the wind will further come down to practically NIL in March and hence only tide effect will be dominant. Therefore the Slick will take about 3 to 4 hrs. time to reach shore in the direction, as stated above, if the spill occurs near the 5 meters contour line and will take 8-9 hours if it is near 10 meters contour line.

6.6.2 NORMAL WEATHER CONDITIONS (APR - JUNE) – OUTSIDE HARBOUR

Wind – Variable wind in different directions in different times of the day, mostly NE/NNE

Current – 0.25 to 0.5 kts

The oil spill is likely to move in a NE/NNE direction away from the shore (due to initiation of onset of SW monsoon process). The wind continues to be variable at times but settles towards NE direction in the month of Jun. The wind speed also increases as the SW monsoons approach. If the slick has taken place close to 5 meter contour line, then the slick is likely to move almost parallel to the shore line along the line of current, north wards and may hit the coast due to variable wind conditions, and no time frame can be given for this. But in case the slick is beyond 8 meters or close to 10 meters contour line, then in that case, it is likely to move away from the coast.

6.6.3 SOUTH WEST MONSOON CONDITIONS (JUL - SEP) – OUTSIDE HARBOUR

Wind – MODERATE to STRONG in N/NE direction
Tidal induced current – 0.5 to 1.5 kts
During this period the SW monsoon is in full swing, although it may not rain much as in the other coastal parts of the country (Tamil Nadu receives most of its rain in NE Monsoons) but other conditions i.e., Wind, Current etc remain the same. Therefore behavior of the oil spill drift will be same as discussed in para 6.5.2, however the rate of movement would be faster due to the prevailing current of 0.5 to 1.5 kts.

6.6.4 NORTH EAST MONSOON CONDITIONS (OCT - DEC) – OUTSIDE HAROUR

Wind – MODERATE to STRONG in SW/SWW direction

Tidal induced current – 0.5 kts

The North East monsoon conditions are quiet vigorous over Tamil Nadu. Any oil spill taking place around 5 meter line will hit the coast line in an SW direction from the spill in around 30 to 60 minutes of time and spill around 10 meters line, may take maximum about 1.5 to 2 hours of time to hit the coast due to strong North Easterly wind, high waves and current conditions. In case of occurrence of rain at that time, the tracking of the oil spill may become difficult. The general direction of the spill hitting the coast line is predicted to be in SW direction from the point of oil spill.

7. HEALTH AND SAFETY POLICY

7.1 PUBLIC HEALTH AND SAFETY

In the event of oil spill taking place, certain issues are bound to come up in a very big way. They may pose threat to public health and safety to a section of population residing close to the shore, beaches or dependent on the river water. The oil slick may create hazardous situation of fire in to the oil soaked debris collected inside the harbour or ashore near the habitations. This may create a political storm on the issue and unwanted situations may crop up for safe operations of the establishment and the management. Even State administrative authorities may also make issue about it.

7.2 WORKER HEALTH AND SAFTY

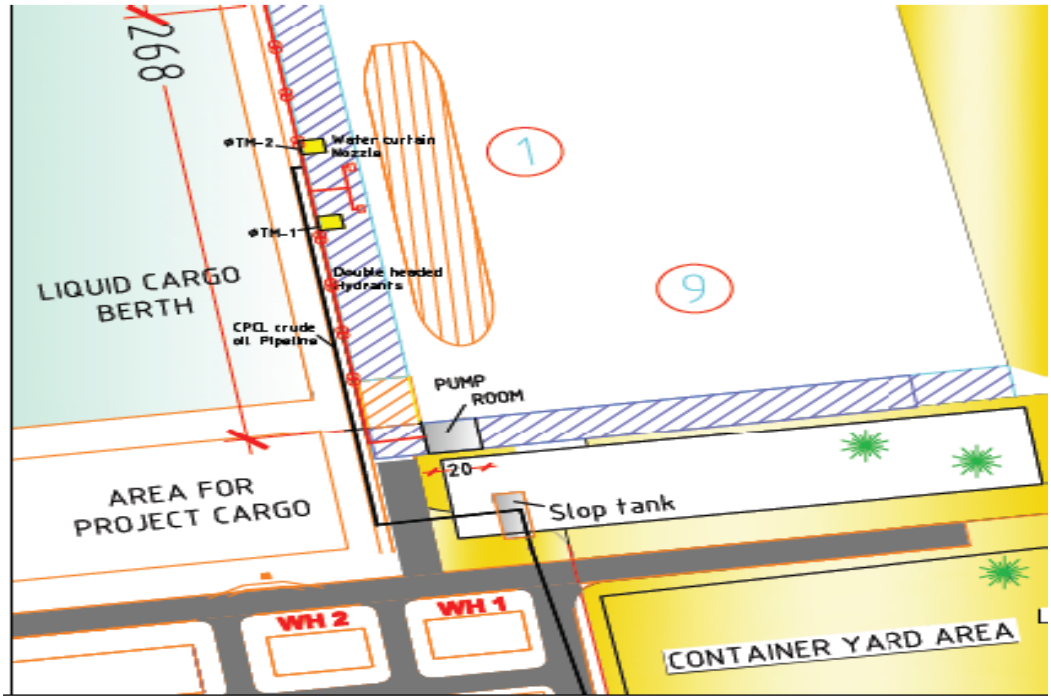
The oil spill if alongside jetty / inside the harbour, would come up as high as possible to the piers / soil / rocks ashore during high water but while receding tide oil would smear them and not go back with the tide. Thus would create foul smell when it comes in contact with atmosphere. This air is likely to get sucked in through the air intake points of the A/C or ventilation system of the ship, which in turn may create

an unhealthy atmosphere for habitation. Once such incident takes place, it takes very long time to come back to normal situation.

8. CRUDE OIL HANDLING AT KARAIKAL PORT

8.1 FACILITIES AT KARAIKAL PORT FOR HANDLING CRUDE OIL

Berth no.1 is used for handling Crude oil & Petroleum products. This berth is conjoined with berth no.2 with an overall length of about 460 mtrs. The berth face is well protected by fenders & adequate numbers of mooring bollards are provided for safe berthing of the vessel. The berth is provided with full Fire Fighting system as per OISD 156 standards. Remote controlled foam monitors, fire curtains etc. form part of the firefighting system. Presently Port is handling around 4.0 Lac MT of CRUDE OIL PER ANNUM. General Arrangement of berth no.1 as below.



8.2 UNLOADING ARM

The berth is designed to operate with Trailer Mounted Marine Unloading Arm of 12" dia. There is a drain slop tank of 6 Cum capacity to drain the Chiksan on completion of cargo operations. Marine Unloading Arm connection to nominated vessel manifold will be carried out by port staff under assistance from ship staff where necessary.


ORIENTA
TUG
02 12 2012

8.3 Photos of Unloading Arm



8.4 FIRE FIGHTING FACILITIES

Fire fighting system as per OISD-156 standards has been installed to handle crude oil and other petroleum products up to 100000 Metric tons.

Following are the main components of this system

1. Main Fire pumps
2. Jockey pump
3. Foam pump
4. Foam tank – Qty Readily available with Port is 26 KL. In case of any requirement can be procured from M/S Integrated Fire Production Pvt Ltd, Kolkata. Phone- +913324541061-ext 11
5. Foam Tower Monitor
6. Base Foam Monitor
7. Double headed Hydrants
8. Jumbo curtain Nozzles
9. Fire Entry Suits
10. Fire Proximity suits
11. Breathing apparatus
12. DCP -75KG Trolley mounted
13. Foam Type Extinguishers (9 Ltrs)
14. DCP Type Extinguishers (10 kg)
15. CO2 Type Extinguishers (9.0kg)

In addition, a mobile combination Fire tender (Water- 5000 Ltrs+ Foam 500 Ltrs) is also available. Our harbour tugs are also fitted with necessary Fire Fighting arrangement as per international standards.

8.5 WEATHER WATCH

A strict watch should be kept by the tanker's crew/ duty officers on the prevailing weather and approaching tropical squall conditions and any deterioration shall be brought to the notice of Master. Sudden squalls are likely during summer times (between Apr / Sep) with wind forces of upto 40 knots. Lines shall be tended, if required.

In deteriorating weather condition, the decision to cease loading and unberth lies with the tanker master with advice given by the Pilot/Port control. During Exigencies like Approaching Cyclone, Tsunami or other similar causes, the port may decide to send the vessel out to sea to ensure safety of both vessel & port property.

Generally cargo operations should cease and vessel should be ready with engines to unberth under following weather conditions:

- **Persistent Wind speeds in excess of 15 m/s or 30 Knots**
- **Squally weather with associated thunder & Lightning.**
- **Tsunami / Earth quake warning in port.**

Only Double hull tankers with Segregated Ballast system are permitted into Karaikal Port.

Tankers should ensure that their cargo operating system is in a fit & efficient condition. All pumps, emergency trips, IG system etc. must be tried out prior arrival. All cargo tanks should be in inert condition prior arrival. Pilot / Terminal representative will check the tanks for inert condition prior commencing cargo operation. Tankers should have a Discharge plan ready at hand to discuss with receiver representative / terminal representatives to indicate the sequence of cargo discharge, tanks & lines to be used, rate of discharge, ballasting sequence, stripping procedure etc.

8.6 POLLUTION CONTROL

Tankers calling Karaikal Port must strictly abide by the requirements of MARPOL. Should any violation be noticed, the Tanker will be unberthed and detained till remedial action is taken and liabilities established. All spillages, accidental or otherwise, must be reported by tanker Master to the port control.

Oil Spill containing equipment held by Karaikal Port are stored in a container, kept on Berth No.9 Eastern end.

8.7 OIL SPILLAGE

- In case of any oil spill, the **Marine Control Tower** is to be informed and all oil transfer operations stopped immediately.
- All craft in the vicinity of the spill are to be informed.
- The cause of the spill must be identified and remedied.
- Spill must be contained and cleaned up.Coast Guard Station in Karaikal Oil transfer will only be resumed when safe conditions are restored again




NO SMOKING

8.8 HOSE / UNLOADING ARM DISCONNECTION

Following standard is followed:

- It is ensured that valves are closed & hose / unloading arm is drained properly.
- Connecting bolts are eased and load taken on hose support crane. Once bolts are totally off, hose is lifted clear while keeping the drain line open to ensure that the entire hose content is drained into the sump.
- Once draining completed, drain valve is closed on shore. Hose end is then fitted with the blind flange & hose lowered onto the jetty. At no instance shall the hose be dropped onto the jetty.

8.9 FACILITIES FOR SLUDGE DISPOSAL

Port has registered seven parties authorized by the Pollution Control Board for collecting and disposing the sludge / waste Oil. Master of the vessel routes his request to the Agent, which in turn arranges Sludge Removal Party. All the registered parties are issued passbooks by the state pollution control board, it contains the maximum quantity of the sludge the party is authorized to remove in a year. All the sludge removal entries are updated in the passbook.

Following parties are registered with KPPL for Sludge Removal:-

Southern Petrocem	**+919442547953**
PMB & Co.	**+919600083925**

9. SCENARIO DEVELOPMENT

OIL SPILL RISKS

Identification of activities and risks: The Karaikal Port in Karaikal district is undertaking a massive change in terms of status of this remote area. From a remote and a sleepy village it is being transformed in to a modern all weather Deep Sea Water Port. The of volume of traffic in the port is going to increase from eight ships a month in first phase to about 18 to 20 ships per month in 2nd phase. Type of ships

calling on to this port will be Dry Bulk vessels for coal, Break Bulk carriers, Liquid Bulk carriers, and Container vessels The movement of shipping traffic, with different types of cargo being handled at different berths has shifted the Oil Spill Risk scenario from Nil at outer harbour to quiet possible at, both, outside the harbour as well as inside the harbor. Therefore the type of risks identified in the Oil Spill Risk Analysis (OSRA) would be due to Bunkering and collision / grounding and other various reasons as mentioned.

Types of oil likely to be spilled: Since ships calling on to this port would be mostly using either HSD or Furnace oil as fuel and Port is handling Crude and Edible Oil. The likelihood of oil spill taking place is of HSD, Furnace Oil, Crude and Edible Oil only. Chances of any other type of oil getting spilled due to any other reasons are considered very remote, as they may not be in use in significant quantity or not handled at all.

Probable fate of spilled oil: It is estimated that, in case of oil spill, the same would be contained and collected effectively by deploying of Booms and Skimmer of a capacity of 20 to 30 TPH. Subsequently recovered oil would be collected in the pontoon tank on which the OSR equipment container would have been mounted. This arrangement would be advantageous in many ways, as it would serve, both, as Mobile Floating Storage Platform for OSR equipment's as well as Mobile Floating Working Platform for the personnel of Emergency Response Team, and also as boat pontoon (when not in use) for the small boats and crafts operating inside the harbor. A list of Offshore OSR Equipment available with Karaikal Port is placed at ***Appendix-3.***

The oil spilled, out of the harbor area moving towards the coast to the shallow water has to be contained and collected by deployment of suitable configuration of containment booms and skimmer. As the likelihood of slick moving towards the coast, North of north break water in SW monsoon and South of south break water in NE monsoon are more as compared to any other period of the year. The slick will hit the coast at a faster speed in the NE monsoon. The oil spill response time may

be less and also working conditions may not be very easy due to ongoing monsoon. Therefore Shore Cleanup option has to be exercised. However in the case of spill occurring inside the harbour; the endeavor should be the 'Containment of the Spill' first in whatever position it is, so as to stop the oil slick from spreading and damaging other berths.

Development of Oil Spill Scenarios: As it has already been predicted that the likelihood of oil spill taking place may be due to while Bunkering or Grounding / Collision. The spill is likely to move along the current /wind direction depending upon the tide conditions at that time. In this context some oil spill scenarios can be examined

9.1 SOUTH WEST MONSOON CONDITIONS – OUT OF HARBOUR

9.1.1 DAY TIME – SLACK WATER LEADING TO HIGH WATER

In this situation the oil slick can be seen as lying stationary for some time and thereafter as the tide starts increasing, the slick is likely to move towards NNE / NE. In case the winds are stronger the slick may move in NNE direction almost parallel to the coast. Here the tide current and range is not much, hence the slick will move in the direction of wind or tide whichever is stronger at that time.

9.1.2 THREE AND HALF HOURS AFTER HIGH WATER STARTING

At this time the currents would pick up slightly and the oil slick is likely to move as explained above but at slightly higher speed. However it may not go to significant distance due to time factor. Once the ebbing starts the oil slick is likely to move along the wind towards N / NE. The oil can be easily trapped into booms which would have been anticipated well before and suitably placed well before hand and subsequently spilled oil collected by skimmer.

9.1.3 AT MAXIMUM HIGH WATER – SLACK WATER CONDITIONS

In this scenario the oil slick would remain more or less stationary till it is Slack water. But the slick may move in the direction of wind if it is strong. Once the ebb tide starts or the water starts receding, the slick is likely to move towards the shores if the slick is close to 5 meter line, but if it is 10 - 20 meters line it is likely to move almost parallel to the coast line. Chances of slick moving towards the sea will be if the slick is beyond 20 meter line as the currents would have tendency to pull the slick towards deeper end, subsequently taking it towards open sea.

9.1.4 NIGHT TIME

It would be very difficult task to locate the spill at sea after sunset, and further more to track it .The problem will be compounded more if it is raining. However the behavior of the spill will remain same as in the day time.

9.2 SOUTH WEST MONSOON – INSIDE THE HARBOUR

9.2.1 DAY TIME – SLACK WATER LEADING TO HIGH WATER

It should be borne in mind that the ecologically sensitive mangrove areas are practically starting very next to the entrance of the river Vettar. Therefore our endeavor should be to contain the spill inside the harbour itself.

Now keeping the above situations in the background, the spill scenario has to be tackled. In the first case, if the spill occurs at the berth no 1 or parallel to it, it would gradually start moving towards W, SW Since the monsoon is SW monsoon and the tide has just started rising, the oil slick should also start moving with the speed & in the direction of the tide. But due to the height of tide the spill is likely to remain in the confined space of the berth. This phenomena may give some more time to play around in Spill response activities.

9.2.2 DAY TIME - THREE AND HALF HOURS AFTER HIGH WATER STARTING

The survey and the observation indicate that the tidal current would be of about .5 to 1kt at the most during flooding. Therefore, if a spill occurs at berth no 1 or parallel to it, is likely to remain there only but move closer to the jetty. So total time required for initiation and starting of spill response activities can be planned accordingly. It should be well understood that this time would be the peak current speed of the tide.

9.2.3 DAY TIME – SLACK WATER LEADING TO LOW WATER

Now let us examine a case of spill occurring at berth no 5 (edible oil berth) or berth next to it. Here the spill is likely to remain there or move a bit towards southern side of the berth and thereafter likely to get trapped in the pocket of western end of north breakwater. Due to formation of water pocket in this area and wind direction taking it inside the sheltered area, this oil spill slick may not go out of the harbour, and lay there for quiet some time. Because by the time ebb tide current picks up, the spilled oil would have been at the place as discussed above.

9.2.4 NIGHT TIME

The night time behavior of the oil slick will remain the same as day time. Only detection and time to time appreciation would become very difficult. It would become further more difficult in case of rain and strong wind conditions.

9.3 IN NORTH EAST MONSOON CONDITIONS – OUT OF HARBOUR

9.3.1 DAY TIME SCENARIO

In this period of monsoon the weather conditions are quiet vigorous and shipping operations do get disrupted at times. Wind speeds would also be quite strong and uncomfortable as compared to South West monsoon period. Wind direction would be mainly from NE direction as well as sea conditions also. Any spill occurring in this time would be heading towards the SW direction and subsequently hit the coast, between South break water and entrance point of Vettar river or it may go well

beyond the CPCL jetty also, depending position and situation of the spill. Ecologically this area is sensitive, being a rich fishing ground all around and mangroves at the southern banks of Vettar river. Due to NE monsoon season and winter season, the weather conditions may be hazy or foggy in the day time also, thereby reducing the visibility conditions. Sea conditions may be fairly rough and non-conducive for spill response activities at sea. Being main monsoon season rains are frequent and heavy at times. Hence leaving options of shore cleaning only. It has been observed that waves of about two meters height were entering harbor mouth, during month of December due to formation of a low pressure area nearby. This phenomena generates a back push / push from quarter / Stern, which besides increasing the speed creates difficulty in steerage of the ship. Therefore in case of any machinery break down, the situation would be uncontrollable, hence leading to grounding of the vessel. Due to the above conditions the spill occurring may be of a higher magnitude and may be termed as worst case scenario spill.

9.3.2 NIGHT TIME SCENARIO

Night time scenario would be no different than the day one except that the visibility would go down further and visual appreciation of the distance and oil spill would be badly hampered.

9.4 NORTH EAST MONSOON CONDITIONS – INSIDE THE HARBOUR

9.4.1 DAT TIME SCENARIO – SLACK WATER LEADING TO HIGH WATER

The NE monsoon is quiet vigorous, but it is anticipated that effect of the sea swell will not be felt in side the harbor basin. However the effect of the wind will remain the same. Any occurrence of spill from berth no 1 to 5 or 8 in this situation, would be affected by the strong winds initially and once the high tide starts; the oil spill would start moving gradually towards the jetty in a vector direction formed by the tide and wind direction. Thus the spill is likely to move towards southern / south west side of

the harbour. It may take about 10-15 minutes to reach the area, as the area would be slightly sheltered by berths and ships for the wind effect to take place effectively.

9.4.2 DAY TIME –THREE AND HALF HOURS AFTER HIGH WATER

Around this time the spill occurring at berth no 8 (Edible oil berth), is likely to gain momentum, as the tide current would be at its peak, and wind direction also would be in the same direction. The spill is likely to move in line of the jetty W /SW wards, as it would be in the shelter of the ships / jetty and wind effect will be less. But once it comes in contact of wind, the spill will move towards the berth No. 1 and finally get collected between berth No. 1 and OSV berth in the direction of the vector formed due to combination of wind and tide. This spill scenario would necessitate a good oil spill response action, as the spill is likely to get trapped in this area being a sheltered place.

9.4.3 DAY TIME – SLACK WATER LEADING TO LOW WATER

At the time of slack water the scenario of oil spill next to / at the berth no.1 (coal berth); the oil spilled is likely to move in an easterly direction till it is clear from lee of the jetty; Thereafter it is likely to move in an north easterly direction and get pushed and trapped, due to the increasing tide current in the angular pocket created by construction of southern break water. It will be worth mentioning here that, due to the ongoing monsoon; heavy rains occurring in the area, the spill might get broken into small patches.

9.4.4 NIGHT TIME SCENARIO

During active monsoon periods in the night time**.** The working conditions become quiet difficult due to various factors i.e. low / bad visibility on account of rain, mist, haze fog etc. strong winds, thunder storms, chilly weather and cyclonic weather conditions etc. These all conditions may occur together or singularly both in day or night time. Therefore during night time, appreciation of the situation would be quiet

difficult. However behavior of the oil spill would be the same as the tide and wind effect will be as day time only.

9.5 NORMAL WEATHER CONDITIONS

During normal weather conditions the wind speed will come down considerably as well as ebb tide current also. However the movement of the oil spill will depend on the tide mainly, as the winds may be very mild or variable at times. The movement of the oil spill may be slow and response action can be initiated at a faster and effective rate, both inside as well as outside the harbour.

10. APPLICABLE DOMESTIC AND INTERNATIONAL AGREEMENTS

The problem of oil pollution of the sea has been long been recognized by the World Community and with the growth in the quantum of oil transported by sea, the need for concerted action internationally has been appreciated. Culminating to an International Conference held at London in 1954 and the International Convention for the Prevention of Pollution of Sea by Oil, 1954, was adopted. Subsequently, an International Conference for the prevention of pollution of the sea was held in 1973 and a further International Convention was drawn up. This Convention also covers pollution other than by oil. This Convention further amended by 1978 Protocol and in its present form is known as MARPOL 73/78 and is in force since then.

10.1 INTERNATIONAL CONVENTIONS

The efforts of International Conventions and National Legislation are directed towards to achieve following objectives:

i) To provide for the complete elimination of the willful and Intentional pollution of the sea by oil.

ii) To provide for minimization of the willful, intentional and accidental pollution of the sea by oil and other substances from offshore facilities.

iii) To provide for the complete elimination of the willful and intentional pollution of the sea by activities such as Tank Washing and Bilge discharge involving noxious and hazardous cargoes other than oil.

iv) To deal with minimization of spillage of oil or other noxious substances as a result of accidents.

v) To deal with dumping or other means of disposal of shore generated waste and sewage in the seas by the ships and barges.

vi) To deal with the safe carriage of dangerous goods / cargo.

vii) To deal with the treatment of ships generating sewage or waste.

viii) To deal with air pollution from ships.

In order to meet the challenges arising out of Oil Pollution Damage, there have also been the following three International Conventions:

i) International Convention relating to Intervention on the high seas in Cases of Oil Pollution Damage, 1969.

ii) International Convention on Civil Liability for Oil Pollution,1969 and

iii) International Convention on the Establishment of an International Fund for the Oil Pollution Damage, 1971.

The shipping industry, due its international nature necessitates that much of its regulations be conducted through International agreement. These agreements provide the basis for much of the domestic legislation. Important International Conventions which requite to be considered are as follows:

10.1.1 INTERNATIONAL CONVENTION ON OIL POLLUTION PREPAREDNESS RESPONSE AND COOPERATION (OPRC-90)

OPRC-90 emphasizes on the obligation of the signatories for the maintenance of credible oil spill response system. The convention amongst other things make provisions for:

i) Oil pollution emergency plans for ships, oil platforms and ports
ii) Oil pollution response procedures
iii) Establishment of regional and national systems for preparedness and response
iv) Facilitation of international cooperation and mutual assistance
v) Exchange of information
vi) Promotion of research and development and
vii) Technical cooperation and training.

10.1.2 INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS 1973 AND 1978 PROTOCOL (MARPOL)

The MARPOL convention is the most comprehensive international initiative aimed at reducing pollution from shipping operations. The convention details standards for the discharge of six pollutants:

i) Oil
ii) Bulk noxious liquid
iii) Harmful substances in packed form
iv) Sewage
v) Garbage and
vi) Air

MARPOL also sets out construction requirements for vessels to reduce the risk of pollution occurring and manage waste onboard.

10.1.3 UNITED NATIONS CONVENTION ON LAW OF THE SEA 1982 (UNCLOS)

UNCLOS amongst other matter imposes obligations on coastal states to protect and preserve marine environment for example, under article 192, “States have the obligation to protect and preserve the marine environment”.

UNCLOS also defines the powers and terms under which a coastal state can impose protective measures. These powers accordingly form maritime zone within which

the activity takes place i.e. Territorial sea 12 nm and Exclusive Economic Zone (EEZ) is 200 nm.

10.1.4 INTERNATIONAL CONVENTION FOR SAFETY OF LIFE AT SEA (SOLAS)

SOLAS prescribes standard to ensure adequate safety provisions for ships and their crews. It specifies requirements for construction and equipments and navigation practices.

10.1.5 CONVENTION OF THE INTERNATIONAL REGULATIONS FOR PREVENTION OF COLLISION AT SEA 1972 (COLREGS);

The COLREG is often referred as “Rules of the Road” and prescribes requirement for the navigation and safe conduct of all the vessels and requirement of avoidance of collision.

10.2 NATIONAL LAWS

10.2.1 RULES – ORDERS; PART XI OF THE MS ACT, 1958

It provides effect to the International Convention for the prevention of pollution of the sea by oil, 1954, as amended in 1962.

10.2.2 DG SHIPPING INITIATIVES

The problem of pollution of the sea by oil is of particular concern to India since a large quantity of oil is being transported by sea from the Middle East, past Indian coast to the eastern countries. The above, combined with our own oil imports, pose a continuous threat of oil pollution to our marine environment.

Therefore the problem has to be handled in two stages:

Part I Prevention of such oil pollution and

Part II Mitigation, Containment /control, Combat of oil spill and removal, even it is accidental or otherwise.

As far as Part I is concerned, it is handled as per International Conventions i.e. MARPOL, MS Act 1958 and MS Rules 1974 (Prevention of pollution of the Sea by oil). These Rules are applicable to all tankers of 150 tons or above and all other ships of 400 tons or more. The rules specify the limits of prohibited zones, the equipment's to be carried onboard the ships and general precautions to be taken for prevention of leakage and accidental discharges as well as precautions to be taken during, loading, transferring and unloading by oil tankers. These rules also specify all the vessels to maintain Oil Record Book to indicate any operations carried out on board with respect to oil.

As regards Part II, a Contingency Plan of action is prepared so that in the event of any oil spillage, accidental or otherwise, the same can be dealt effectively. The plan envisages overall co-ordination by the Director General Coast Guard (DGCG), as Central Coordinating Authority with the local coordination / control being exercised by authorities in the major ports. As far as Local Action Groups are concerned, they are to have the infrastructure ready to meet the emergent situation expeditiously effectively and successfully. *Local Action Group of Karaikal Port is per Appendix 17.*

As already mentioned above, the authorities in the major ports viz. Kandla, Mumbai, JNPT, Goa, Manglore, Cochin, Tuticorin, Chennai, Vishakapatnam, Paradip and Kolkata, will constitute and co-ordinate the Local Action Group. The local action group depending upon the quantum of oil pollution that they may have to deal with, shall equip their organization with pollution response equipment's viz. Dispersants, Dispersants spraying equipment's, Skimmers, Booms, Crafts, and other materials as required for the oil spill combat. All major ports have been duly notified to possess oil reception facilities as well required by the Convention. The International Convention on Civil Liability for oil pollution 1969, came into force on June 1975. This Convention has been ratified by the Government of India. As envisaged in the convention, Ship owners, Ship masters etc. are required to take note that insurance

of other financial security to the extent as prescribed in the MS Rule 1985 for the Compensation against oil spill from tankers. India is a signatory to both CLC 92 and Fund 92.

11.0 NET ENVIRONMENTAL BENEFIT ANALYSIS

Net environmental Benefit Analysis (NEBA) is an approach used to compare how different ecological, social, economical and aesthetic aspects are affected by different oil spill prevention, planning and response action. NEBA compares the effect of different scenarios on the resources and values that could be affected if a spill occurred. NEBA is also used to identify where more information is needed to determine what impact may occur, and to identify potential conflicts that may arise in the protection of different resources

11.1 NEBA (NET ENVIRONMENT BENEFIT ANALYSIS) FOR EFFECTIVE OIL SPILL PREPAREDNESS AND RESPONSE

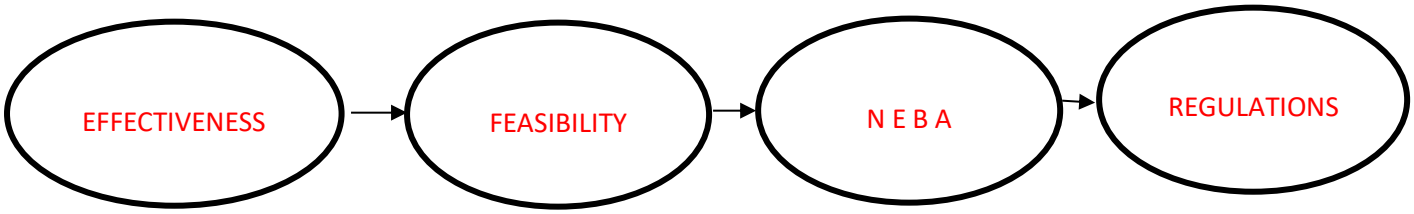
The best scenario is not to have Oil Spill. Karaikal Port endeavors to take all necessary precautions to avoid any incident of Oil Spill. However, in the unfortunate event of Oil Spill Management of Karaikal Port will co-ordinate with the Government, nearby industries and local communities before and after a spill and facilitate a least possible impact to the environment and community resources.

PROCESS

1. ASSESS: Identify and Priorities environmental and community assets.
2. PLAN : Develop plan for possible scenario
3. FRAME DECISIONS: Design decision frameworks based on Environment condition and social factors.
4. Decide : Select most appropriate and effective response approach based upon priorities and tradeoffs
5. DEPLOY: Implement response using appropriate tools and techniques and monitor results.
6. ADAPT: Adapt response approach based upon changing conditions and additional information gathered.

7. RESTORE: Work with Govt and Communities to restore the environment and community assets to pre-spill states.
8. LEARN: Gather and incorporate lessons learned into future policies, plan and good practice guides.

In Oil Spill response, KPPL uses a four step process to consider four primary factors



11.2 ROLE OF NEBA BEFORE A SPILL

1. EVALUATE DATA : Identify and prioritize environmental and community assets based upon environmental sensitivities and social values. Example
   a. Proximity to local population
   b. Presence of sensitive species
   c. Proximity to sensitivity shoreline
   d. Impact on regional industries
   e. Impact on regional infrastructure
   f. Geographical consideration
   g. Wave condition
   h. Weather
   i. Oil Type, viscosity and thickness
   j. Oil Depth, movement and volume

2. PREDICT OUTCOME : Review and compare previous spill cases, including restoration consideration, to understand potential impact. Example:
   a. Previous Spill Histories
   b. Environmental Impacts

3. BALANCE TRADEOFFS: Weigh environmental and social impacts to determine most effective oil spill response tools and balance tradeoffs.
   a. Benefits and drawback of using OSD
   b. Benefits and drawback of In-situ burning
   c. Benefits and drawback of manual recovery
   d. Benefits and drawback of natural recovery
   e. Benefits and drawback of physical recovery

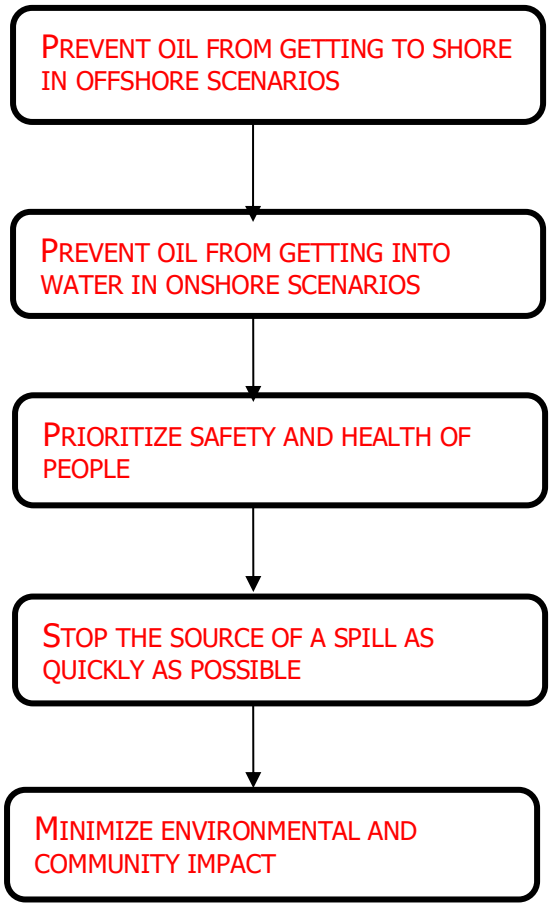
4. SELECT OPTION : Establish plans and put pre-approvals in place to support environmental and social values.
   a. If spill is near shore (Spawning Season)– Mechanical Recovery, In-situ burning, Natural Removal

b. If spill is near shore (Wind blowing spill towards populated area) : Use of dispersant after obtaining approval from Coast Guards, Mechanical Recovery, Natural removal.
c. Subsea Spill : Use of dispersant after obtaining approval from Coast Guards, Mechanical Recovery, In-situ burning, Natural removal.
d. On Shore or near shore release (Near Marsh or Sand Beach): Physical Removal, In-situ burning, Natural Removal.

11.3 ROLE OF NEBA DURING A SPILL

1. EVALUATE DATA : Assess specific oil spill conditions to determine most effective tools to minimize environmental and social impacts.
2. PREDICT OUTCOME : Confirm effectiveness and feasibility of response options to achieve optimal results.
3. BALANCE TRADEOFF: Re-evaluate environmental and social impacts to determine most effective oil spill response tools and balance tradeoffs
4. SELECT OPTION : Inform rapid decision making and implementation of oil spill response tools based on evaluations

GUIDING PRINCIPLES THAT ALLOW THE RESPOSNE COMMUNITY TO ACHIEVE A RAPID, WELL – MANAGED, AND UNIFIED RESPOSNE EFFORT:



11.4 ROLE OF NEBA AFTER OIL SPILL

1. EVALUATE DATA : Gather lessons learned and best practices to understand environmental and social impacts resulting from oil spill response and use data to inform restoration decisions
2. PREDICT OUTCOME : Inform restoration activities and spill cases for future oil spill response exercises, drills, and scenario planning
3. BALANCE TRADEOFF: Re-evaluate environmental and social impacts to determine most effective oil spill response tools and balance tradeoffs for future oil spill incidents

4. SELECT OPTION : Inform rapid decision-making protocols and pre-selection of most effective tools in future oil spill incidents

A WELL MANAGED RESPOSNE MUST INCLUDE:

1. Safety at the forefront of response decision
2. Availability of the appropriate response equipment's and tools
3. Government and Industries working together in response
4. Use of NEBA and consideration of tradeoffs in response decision
5. Informed trained teams that understand policies and procedures
6. Effective timely communication between government, industries, and communities

11.5 Net Environmental Benefit Analysis - Scenarios

Net Environmental Benefit Analysis				
S.No	**Possible Scenarios**	**Possible Response Tools**	**Benefits**	**Drawbacks**
1	Oil Spill After Vessel Grounding	1) Use of Dispersants 2) In-situ Burning 3) Mechanical Recovery 4) Natural Removal	1) Removes surface Oil that could harm wildlife. Prevents Oil spreading to shore and enhances natural bio-degradation of oil. 2) Removes large amount of oil rapidly and reduces vapors on water surface 3) Removes oil with minimal environmental impact 4) Does not involve intrusive removal / cleanup techniques that further damage the environment, allowing for the natural bio-degradation of oil.	1) Dispersed oil has the potential to affect water column-dwelling wildlife and vegetation. 2) Burning presents a risk of fire spreading and localized reduction in air quality; burn residues can be difficult to remove. 3) Mechanical recovery is extraordinarily slow and labor-intensive, with typically no more than 10-20 percent oil. 4) In natural removal, oil is not removed, and winds and current can change, sending the oil spill towards the sensitive areas.
2	Collision	1) Use of Dispersants 2) In-situ Burning 3) Mechanical Recovery 4) Natural Removal	1) Removes surface Oil that could harm wildlife. Prevents Oil spreading to shore and enhances natural bio-degradation of oil. 2) Removes large amount of oil rapidly and reduces vapors on water surface 3) Removes oil with minimal environmental impact 4) Does not involve intrusive removal / cleanup techniques that further damage the	1) Dispersed oil has the potential to affect water column-dwelling wildlife and vegetation. 2) Burning presents a risk of fire spreading and localized reduction in air quality; burn residues can be difficult to remove. 3) Mechanical recovery is extraordinarily slow and labor-intensive, with typically no more than 10-20 percent oil. 4) In natural removal, oil is not removed, and winds and current can change,

			environment, allowing for the natural bio-degradation of oil.	sending the oil spill towards the sensitive areas.
4	Bunkering	Mechanical Recovery	Removes oil with minimal environmental impact	Mechanical recovery is extraordinarily slow and labor-intensive, with typically no more than 10-20 percent oil.
5	Accident Ashore	Mechanical Recovery	Removes oil with minimal environmental impact	Mechanical recovery is extraordinarily slow and labor-intensive, with typically no more than 10-20 percent oil.
6	Disposal of Bilges	1) Mechanical Recovery 2) Natural Removal	3) Removes oil with minimal environmental impact 4) Does not involve intrusive removal / cleanup techniques that further damage the environment, allowing for the natural bio-degradation of oil.	1) Mechanical recovery is extraordinarily slow and labor-intensive, with typically no more than 10-20 percent oil. 2) In natural removal, oil is not removed, and winds and current can change, sending the oil spill towards the sensitive areas.
7	Tanker Operation	Mechanical Recovery	Removes oil with minimal environmental impact	Mechanical recovery is extraordinarily slow and labour-intensive, with typically no more than 10-20 percent oil.

SECTION -2

OPERATIONS

SECTION – 2 CONTENTS

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12.0 INTRODUCTION

MARG Limited is developing the Karaikal Port in this district of the Pondicherry state, and the port has been registered under the name “Karaikal Port Private Limited”. The development of the port is in advance stages and the operations are likely to start within a short period. In the first phase, the port plans to handle Coal carriers and Break bulk vessels and thereafter in the second phase they would cover container and liquid bulk vessels for edible oil.

In this section the emphasis is laid on Operational Matters, as the administrative matters have already been discussed in section 1. The port management has visualized and decided to be ready to deal effectively with all the eventualities which may arise in the course of time during port operations and Oil Spill Response Readiness is one of them. Apart from providing bunker facilities to its harbour crafts the port may provide bunker facilities to the visiting ships if they so desire with sufficient prior notice, thereby handling oil, may be in small or sizable quantity. It is also important to note that this area receives good amount of rainfall during NE monsoon period and cyclones passing through or from nearby areas are quiet common. In other words the monsoon is quiet effective and vigorous in this stretch of Nagapattinam, Karaikal, Cuddalore and Chidambaram districts. The nearest port where ships of more than two meters drought can enter, is Chennai in North and Tuticorin in South, circumventing Sri Lanka. Involving huge distances to travel and waiting time at the anchorage. In this backdrop the Karaikal Port assumes a significant importance being in private sector as all other minor / major ports are in Public sector. (other ports are having single captive jetties for their own requirement only).

13 JURISDICTIONAL BOUNDRIES

The jurisdictional boundaries of this port as shown in the chart No. 3033 are area bounded between:

Lat. 10^0 50' 00" N to Lat 10^0 52' 00" N and
Lon. 079^0 51' 09" E to Lon 079^0 57' 23" E

Karaikal Port falls under the control of Port Officer Pondicherry, a Union Territory governed state.

14. NOTIFICATIONS

14.1 INTERNATIONAL NOTIFICATIONS

These notifications are statutory requirements, relevant agreements

14.1.1 MARPOL 73/78

India has ratified the International Convention for the Prevention of Pollution from Ships, 1973 and the Protocol of 1978 relating to the convention, which is generally known as MARPOL 73/78.
The term "Ships' includes fixed or floating off shore installation or structure engaged in gas or oil exploration, exploration or production activities or unloading or loading oil.

Annex 1 of MARPOL 73/78 comprises of regulation for the prevention of pollution by oil. Briefly, these requirements are:

- Installation of oil filtering equipment to ensure that any oily mixture discharges into the sea after passing through the system has an oil content not exceeding 15-ppm.

- Maintenance of an oil record book as specified in appendix-ii of annexure 1 of MARPOL 73/78
- Prohibition of discharged of oil or oily discharges with oil content exceeding 15 ppm (without dilution)
- An approved “shipboard oil pollution emergency plan” to be carried on board.

14.1.2 INTERNATIONAL CONVENTION ON OIL POLLUTION PREPAREDNESS, RESPONSE AND COOPERATION (OPRC), 1990

International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) was adopted in London on 30 November 1990 and entered into force on May 13, 1995.

The OPRC Convention provides an international framework for cooperation in combating and responding to major incidents or threats of oil pollution. The Convention strives:

- to prevent marine pollution by oil, in accordance with the precautionary principle;
- to advance the adoption of adequate response measures in the event that oil pollution does occur;
- to provide for mutual assistance and cooperation between States for these aims.

The Parties to the OPRC Convention are required to establish measures for dealing with pollution incidents, either nationally or at a regional and global level, in cooperation with other countries. The convention calls for the establishment of stockpiles of oil spill combating equipment, for the conduct of oil spill combating exercise, and for the development of detailed plans for dealing with pollution incidents. Parties must require that ships, offshore units, and seaports under their jurisdiction have oil pollution emergency plans. Such plans are required for:

- oil tankers of 150 gross tons & above, and other ships of 400 gross tons & above;

- any fixed or floating offshore installation or structure engaged in gas or oil exploration, exploitation, production activities, or loading or unloading oil (the operators of offshore units could have arrangements similar to oil pollution emergency plans, however, these must be coordinated with national systems for responding promptly and effectively to oil pollution incidents).
- any seaport and oil handling facility that presents a risk of an oil pollution incident.

Parties to the convention are required to provide assistance to others in the event of a pollution emergency and a special Annex to the Convention provides for the reimbursement of any such assistance provided.

14.1.3 MERCHANT SHIPPING ACT, 1958

Require oil operators to clean up any oil spill from off shore petroleum operations whether at sea or ashore.

Part XI-A refer to the prevention and containment of pollution of the sea by oil and applies to tankers of 150 tonnes gross or more, other ships of 500 tonnes gross and more and offshore installation. The provision for prevention of pollution refers to prohibition as to discharge of oil or oily mixture, equipment to prevent oil pollution, oil record book inspection, EEZ control and information regarding contravention.

14.2 REQUIRED NOTIFICATIONS

These are as follows:

14.2.1 COAST GUARD ACT, 1978

The Coast Guard is the national coordinating authority for marine oil spill response, and under the Act:

a) All spills are required to be reported to the Coast Guard.

b) Monitoring the movement of spill as long as situation is under control

c) *If Oil Spill is beyond the control of KPPL and KPPL seeks assistance of Coast Guards, response action of coast guards will be at a cost to the port.*

14.2.2 ENVIRONMENT PROTECTION ACT, 1986

Ministry of Environmental and Forest (MoEF) while granting environmental clearance to ports and oil/gas projects requires oil operators to establish oil spill control capabilities. Under section 6 and 25 of environment Protection Act, 1986 the Government of India has stipulated discharge standards for several industrial activities, operations and process, including the drilling and gas extraction industry, where standards for liquid effluent for offshore and onshore facilities (requiring marine disposal) have been fixed.

14.2.3 COASTAL REGULATION ZONES NOTIFICATION ACT, 1991

MOEF has declared the coastal stretches of seas, bays, backwaters etc that are influenced by tidal action (in the landward side) up to 500 meters from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL as Coastal Regulation Zone (CRZ)

CRZ is classified into four categories i.e. CRZ-I, CRZ-II, CRZ-III, CRZ-IV

CRZ-I: includes areas that are ecologically sensitive and important e.g. mangroves and spawning ground for fish and marine life. In CRZ-I area, transfer and storage of crude oil from terminal to ship and vice versa required permission of the Central Government. The operator has to ensure proper safeguard against exigencies arising due to any spill.

CRZ-II: the area that has already been developed up to or close to the shoreline. For this purpose, “developed is” is referred to as that area within the municipal limits or in other legally designated urban area which is already substantially built up and

which has been provided with drainage approach roads and other infrastructure facilities. Such as water supply and sewage mains.

CRZ-III: areas that are relatively undisturbed and those which do not belong to either category I or II. These will include coastal zone in the rural area (developed and underdeveloped) and also areas within Municipal limits or other legally designated urban areas, which are not substantially built.

CRZ-IV: Coastal stretches in the Andaman and Nicobar, Lakshadweep and small islands except those designated as CRZ-I, CRZ-I, OR CRZ-III.

14.3 LOCAL NOTIFICATIONS

These are**:**

14.3.1 ENVIRONMENT IMPACT ASSESSMENT NOTIFICATION, 1994

Under the provision of EIA notification, 1994, all major development project including exploration for oil and gas and their production, transportation and storage, ports / harbors and all tourism projects in the CRZ are required to obtain environmental clearances from Ministry of Environment & Forests.

15. COMMAND POST

The command post is the place from where all the OSR activities will be controlled. This command post has been designated as **Emergency Control Room (ECR)**. From this room the **Emergency Control Team (ECT)** will be functioning and directing all the OSR activities. This team will be headed by **Incident Controller (IC)** or **Emergency Control Team Leader (ECT Leader)**. On receipt of spill information the information is passed in the lines as shown in a flow chart that has been placed

at ***Appendix-4.*** An incident organisation chart is placed at ***Appendix-5*** regarding decision making on OSR activities.

15.1 POLICY AND PROCEDURE FOR ESTABLISHING EMERGENCY CONTROL ROOM AND FACILITIES

The Marine Control Tower is the designated **Emergency Control Room (ECR)** wherein **Emergency Control Team (ECT)** will be functioning. Alternatively some other office may be temporarily converted into ECR in the same building.

The Emergency Control Room (ECR) is the place designated for the Emergency Control Team (ECT) to assemble and operate from. In fact this room would be accommodating number of senior officers who are empowered to take immediate decisions then and there only. The whole OSR Operations would be Reviewed and Directed from this room, hence the importance of this room and it's facilities can be well understood.

15.1.1 FACILITIES AT EMERGENCY CONTROL ROOM (ECR)

The various facilities and administrative requirements of an Emergency Control Room (ECR) are available in MCT, these are as follows:-

(a) A conference table & chairs to accommodate at least 8 to 10 senior officers- *Available in MCT*.

(b) A white board with suitable writing facilities – *Available in MCT*

(c) A Computer with Printer and Power Point Presentation system – *Available in MCT*

(d) A telephone with STD / ISD and Fax facilities – *Available in MCT*

(e) VHF communication facilities with ships and other vessels- *Available in MCT*

(f) VHF Walkie Talkie communication facilities with OSR Team leader- *Available in MCT*

(g) Internal and External telephone directories- *Available in MCT*

(h) List of important personnel and their Cell phone numbers. - *Available in MCT*

(i) Copies of Disaster Management Plan (DMP). - *Available in MCT*

(j) Copy of Health Safety and Environment (HSE) Policy of the port. - *Available in MCT*

(k) NOSDCP issued by the Coast Guard - *Available in MCT*

(l) Copies of the STATUTORY REGULATIONS. – *Available in MCT*

i) MARPOL 73 /78
ii) International Convention on Oil Spill Preparedness, Co-operation and Response (OPRC) 1990.
iii) Merchant Shipping Act 1958
iv) Section 32 of the WATER (Prevention and Control of Pollution) Act 1974.
v) Environmental protection Act 1986.
vi) Coast Guard Act.
vii) Pondicherry Port Authority Act.
viii) Rule 5 of the Environment (Protection) Rules 1986

(m) Oil Spill Risk Analysis (OSRA) Report - *Available in MCT*
(m) Oil Spill Contingency Plan (OSCP) report. - *Available in MCT*
(n) Chart of the area - *Available in MCT*
(o) Chart of the adjoining areas - *Available in MCT*
(p) Parallel Ruler, Divider, Pencil, Eraiser, Sharpener etc. - *Available in MCT*
(q) Log book, Noting sheets and general stationary items. - *Available in MCT*
(s) One person to be detailed as Log book writer.
(t) Road map of the area which has been declared as likely to be affected by oil spill, showing its distances from ECR and the condition of the road.
(u) Nearest point / place of availability Fresh water and Electricity (two & three phase) supply to the place of destination / deployment of equipment's.
(v) Location of any boat jetty in the area with navigational data and its distance from each location of OSR equipment deployment site, both from landward as well as seaward side.
(w) Location and distance of nearest harbour from where bigger vessels can operate in case any requirement arises.
(x) Facilities available in that port i.e. loading / unloading cranes and their capability, Bunkering facility and type of fuel available, ship / equipment repair facilities etc.
(y) List and location of Government and Private Hospitals having specialist facilities relating to oil burns and other oil related casualties.
(z) Distance of nearest airport to facilitate air lifting of casualties as well as operation of fixed winged aircrafts for aerial spray of dispersants or any other requirements.

15.1.2 COMMUNICATION EQUIPMENTS

Communication plays a very vital role in the efficient functioning of ECR, OSR Team, OSR Team Leader ECRT members etc. There is no scope for any failure or being non-communicable. The facilities which are considered must are:

i) Telephone with STD facility

ii) Fax

iii) Inter com

iv) VHF Set

v) Internal telephone directory

vi) List of important telephone numbers of Dist. Administration, Hospitals, Fire stations Airports etc.

With these facilities Emergency Control Team (ECT) would be able to communicate efficiently within and outside the port area, Emergency Response Team Leaders, On Scene Commander, Ships in harbor etc. A list of all important telephone numbers including mobile phones are placed at **Appendix-6.**

15.1.3 REPORTS, MANNUAL, MAPS, CHARTS AND INCIDENT LOGS

All reports, manuals about equipment's, their operation and maintenance, maps showing approach roads to various important vulnerable points, Environmentally and Economically sensitive areas with distance table and motorable condition etc. Navigational Charts with Tide table, parallel ruler, divider, pencil and eraser for plotting of the position of the oil slick and navigable areas etc. should be placed in the ECR.

Incident Logs are must for logging of all the events taking place. This will help in preparing a comprehensive Incident Report on day to day basis as well as on completion of operation. In fact a person should be nominated separately for this purpose.

15.1.4 RESPONSIBILITIES OF ON SCENE COMMANDER (OSC)

The **Head** (Marine) is designated as **On Scene Commander (OSC)** for Oil Spill Response Operations / Exercises. He will be working / supervising at the Oil Spill Scene, and is considered the best person to assess the situation on the spot and therefore would be responsible for:

(a) Safe and Effective deployment / recovery of OSR equipment's.

(b) Effective deployment of trained team of Oil Spill Response personnel and their turnaround in duties. *In case of oil spill incident the personnel will work in two shifts of 12 hours. The IMO Level-1 manpower will be divided in two groups who will work of 12 hours and relieve each other. Additionally the support staff like security and Fire and Safety will be utilized under the supervision of IMO trained personnel.*

(C) Requisitioning of additional manpower from HOD- HRD, from Security Guards or Casual Labourers for works as required for land based operations or water borne operations.

(d) Effective and Safe deployment of trained manpower.

(e) Ensuring that Oil Spill Combat is carried out round the clock till it is complete.

(f) Prepare the duty roster of OSR personnel and ensure that every one has understood his part of duty to be performed.

(g) Ensure that each duty watch / team on duty is suitably turned around as per demand of the situation.

(h) He should be always in communication with his team / teams as well as with Emergency Control Room (ECR) and by means of VHF / Mobile phone or messenger if required.

(i) Ensure that each Team leader is equipped with suitable communication equipment. Assess the oil spill scenario and declare it as Minor / Major Oil Spill or Tier I / Tier II or Tier III.

(j) Assess the requirement of consumable items like, Sorbent sheets, Sorbent Booms etc. and alert Commercial department for further procurement action indicating approximate time when the items are required at site.

(k) Ensure that all the actions carried out are suitably logged in a proper format, (This would assist in analyzing the efficiency of both men and machine as well as determine scope for further improvement in OSR activities).

(l) On Scene Commander (OSC) will be reporting directly to **COO**, designated as Emergency Control Room Team Leader (ECRT Leader) of all the events and also routing all his requirements of men and material including water crafts, vehicles, cranes etc. to him only.

(m) The OSC would be responsible for safe recovery / return, accounting of all items provided to his OSR team.

(n) The OSC must ensure that his OSR team members are in possession of essential Safety/Working gears i.e. Life Jackets, Raincoats, Torches, Lifelines, Lifebuoy, etc. List of safety / working gears is placed at ***Appendix-7.***

(o) On completion of each OSR Operation / Exercise the OSC must prepare a written report and submit it within 24 hours to COO for Debriefing / discussions at the level of management or as decided. The report should project the realistic picture of the operations carried out, highlighting all the achievements and failures. The lessons learnt must also be honestly projected so as to improve upon by including them into training curriculum and also apprise individuals of their mistakes / short comings.

(p) The status report on the serviceability of the equipment is also to be submitted along with the report on the operations.

(q) The OSC will be responsible for taking necessary preventive measure against Oil Fire arising out of any situation / action.

(r) He is to understand that safety is not only important to his men and equipment, but is equally important from navigational point of view to the boat / vessel from which they are operating.

(s) Prior to the deployment of the OSR equipment and his team, the OSC must discuss the strategy of deployment with the skipper / master of the vessel, so as to avoid last minute operational / navigational hitches.

(t) He is to ask for regular weather forecast and carryout necessary adjustments in his deployment patterns of men and machinery accordingly.

(u) A check off list is to be made (in advance) for the equipments to be carried, both Afloat and Ashore separately.

(v) A check off list for Do's & Don'ts is also to be made and kept ready well in advance and all the members of the team are to be made to refresh themselves of the contents before departing for the site.

(w) If feasible, OSC should provide a rough drawing / sketch of the area and the position of OSR equipment placed, date wise, indicating north, wind direction and speed, tide condition and other weather parameters etc. to the ECR.

(x) Periodical turning around of machineries / adequate rest (as per manual) is also to be the integral part of the OSC's duties.

(y) Collection of Oil / Water samples every 4-6 hours (as directed) is to be done by the OSR team leader under the directives of OSC.

(z) While operating Ashore OSC is to keep tide conditions always in mind and keep the stores and vehicles always away from high water line to avoid damages from sea water / getting bogged down in loose sand.

(aa) Sufficient lighting arrangement at the work site while working Ashore / Afloat is to be ensured by the OSC.

(ab) First Aid kit is to be available with the teams at their work site.

(ac) The OSC in consultation with ECR Team Leader would decide which boom configuration is to be adopted for containment of oil spill.

15.2 STAFFING

15.2.1 EMERGENCY CONTROL ROOM IN-CHARGE

As already discussed in 3.1 of section 1, the staffing of ECR would be required from various departments, The designated person in-charge of ***Emergency Control Room (ECR) is on Duty Radio Officer*****,** he is to carry out:

(i) Maintain the serviceability of the equipment's provided for use in ECR

(ii) Maintain the VHF communication between ships and ECR.

(iii) Log all the communication and events of the ECR

(iv) Collect all the weather data from ships / IMD

(v) Plot and track the position of the oil slick on the chart

(vi) Prepare daily log of events and hand over to ECR Team leader at 0801 daily.

(vii) Assist ECR Team members in carrying out table top exercises / actual operations

(viii) Maintain liaison with other departments for the requirements of ECR.

The HOD Marine and Head Administration will be providing necessary skilled and unskilled personnel for the OSR Team, both from marine and non-marine field.

15.2.2 EMERGENCY CONTROL ROOM TEAM (ECRT) LEADER

The HOD Marine is designated as Emergency Control Room Team Leader (ECRT leader). He will be over all responsible for organizing and conducting OSR activities, both Afloat as well as Ashore.

15.3 OBTAINING ADDITIONAL EQUIPMENTS, SUPPLIES AND MANPOWEER

For obtaining additional equipment the local nearby ports and offshore / onshore installations are to be contacted and once suitability of their equipment to our port is established, a memorandum of understanding is to be signed between both. Such type of understanding is also required between other ports also, as this avoids duplication of equipment as well as reduces the extra expenditure on individual ports. However due care is to be taken in assessing the suitability of the equipment in one's jurisdiction as well as compatibility to our pollution response equipment. So that in case the level is raised to a higher Tier, all the equipment's can be used together without much of technical hiccups.

Requirement of extra manpower to meet the requirement of running these equipment's has to be thought off well in advance. The best possible solution to get the trained man power on these equipment's is to send our own men for on job training when the other ports are conducting pollution response exercise. After attending three or four such exercises we'll be benefited by getting a group / team trained on other's equipment without having purchased those expensive equipment's. This trained manpower may come very handy to us at the time of ACTUAL requirement. Also with this we can provide a trained manpower / team to

the same organization who has trained these people on their pollution response equipment's either free of cost or for a price or as decided by the management.

The agreement is also to include details on consumable pollution response items like, sorbents pads, sorbent booms, dispersants etc.

In case of oil spill a general alert can be sounded to these friendly members requesting to keep the required items as stand by.

16. DATA COLLECTION

16.1 RECEIPT OF INITIAL REPORT

The moment oil spill is reported / intimated to the various departments, the emergency call out procedures be adopted and the action by:

i) Marine department is to provide all the relevant data for that day to ECR i.e. Tide conditions at that time, tide timings, Current, Wind direction / speed, Weather forecast, Vessel movements, Vessel position in harbour, Water crafts available for pollution response activities. Any other important data /information / charts available may also be provided.

ii) Administrative department is to provide information regarding availability of type and number of vehicles available for transportation of men and equipments. Also number of Security personnel and Casual labourers are available at that time is to be informed.

iii) F&S department is to indicate readiness about FIRE CONTINGENCY including OIL FIRE and also number of spare Life Jackets available.

iv) Security dept. is to enhance the security level so as to prevent unauthorized entry to the spill area, site.

16.2 Oil Spill Modelling

A number of models have been developed to simulate weathering processes and forecast the fate of oil once spilled.

The models follow a number of different approaches. They can range from a simple vector calculation, to sophisticated computer models of the movement and distribution of the oil in three dimensions along with predictions of the change in properties as the oil weathers.

To model the movement of oil, the most important input parameters include the type and quantity of oil spilled, along with the rate of release. Key environmental input data include wind strength and direction, ocean currents, tides and air and sea temperatures. Accuracy and availability of this data can often be an issue.

Models are widely used for contingency planning where they can be particularly helpful for decision makers. By modelling a series of the most likely oil spill scenarios, decisions concerning suitable response measures and strategic locations for stockpiling equipment and materials can be made. The locations shown to be the most vulnerable can be identified, the logistics of responding to these locations studied and response equipment placed accordingly.

Spill response training is another activity that makes use of oil spill models to allow trainees to react to simulated spill scenarios with varying circumstances.

Effective use of models during an actual emergency response can be more challenging. This is because it requires numerous input parameters, for which data may not be readily available at short notice. Usually the oil release occurs immediately after an incident. Information such as the oil type or the quantities involved may not be known. As the incident develops, more accurate data will improve the output of the model.

Although models cannot precisely predict the changes oil undergoes, they can indicate whether oil is likely to dissipate naturally or whether it is likely to reach the

shoreline. This information can be used by spill responders to decide on the scope of initial aerial surveillance flights and/or the most effective spill response techniques to employ within the optimum timeframe.

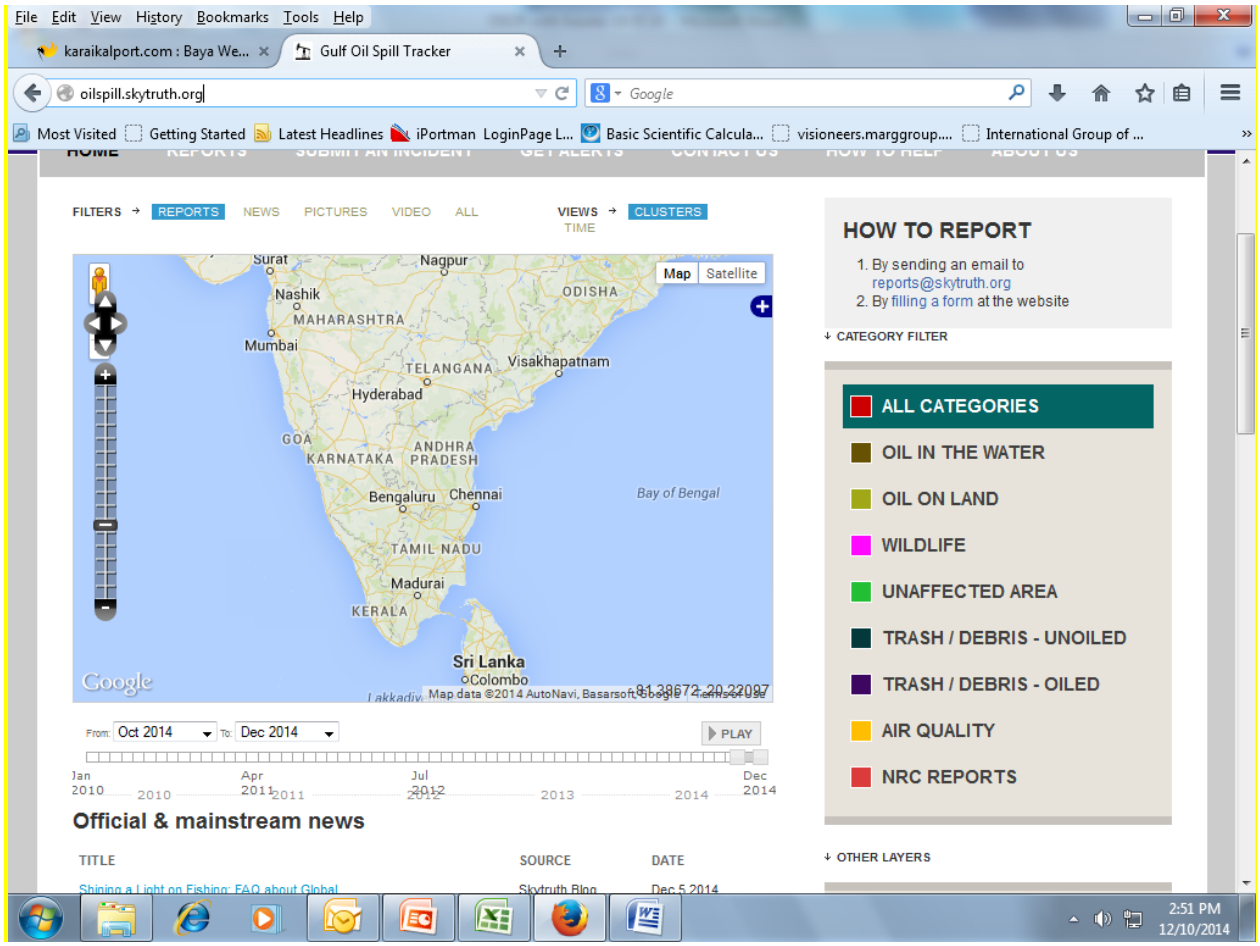
It is important to keep in mind that models have their limitations and are no substitute for real observations (eg aerial surveillance, shoreline survey).

16.3 TRACKING SPILL MOVEMENT

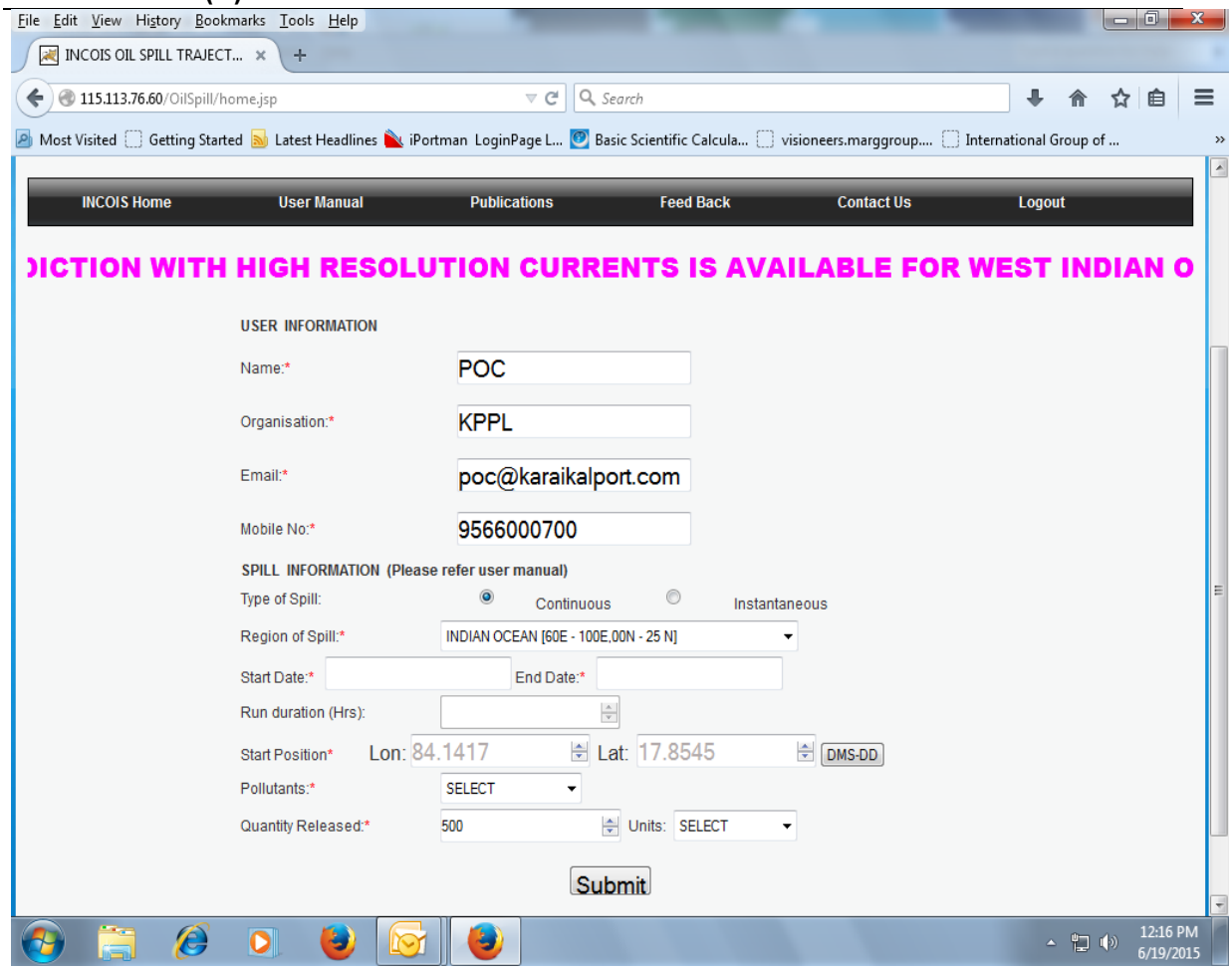
ECT would calculate and estimate the position of the slick in 24 / 48 & 72 hours by continuous plotting of the position of the oil slick on the chart and keep informing Emergency Response Team of the current as well as predicted position of the oil slick on water.

Tracking of the oil spill is done by the software GNOME. We need to fill in estimate quantity of spilled oil, Type of Oil, Wind speed & direction, Current speed and direction. This software shows the predicted movement of slick and estimated time of dispersing.

Additionally website http://oilspill.skytruth.org/ can also be used for tracking oil spill. Data is required to be filled in the incident log with weather and current details.



Karaikal Port is also registered with INCOIS for their advisory on Oil Spill. INCOISE provides real time data on the movement of Oil by taking into consideration current, wind direction and speed.



As time passes by, in addition to the surface drift due to wind and sea currents, as oil spill undergoes a variety of complex physical, chemical and biological processes, which gives rise to change in properties of the oil spilled. The important mass transport or weathering processes are:

i) **Spreading**
ii) **Dispersion**
iii) **Evaporation**
iv) **Emulsification**
v) **Dissolution**
vi) **Oxidation**
vii) **Sinking**
viii) **Biodegradation**

(i) Spreading - Spreading of oil is one of the least predictable aspects of spill behavior except that it will generally be rapid. The rate of spreading depends on a large number of inter related factors, that include thickness of oil slick characteristics of the oil, Wax content, Viscosity, Presence of natural surface active compounds, Pour Point and Boiling Point range, Sea state and weather.

Volume of spill / Rate of spill – Large, instantaneous spill will spread out faster. Spreading would be rapid and dominant initially; there after it gradually decreases and finally stops. It may take 01 to 10 days. The spread oil breaks up and form "Windrows" parallel to the wind direction.

(ii) Dispersion – All oil will mix into the water column as a result of wave action .It is generally limited to the surface and the first few meters below. In very rough seas dispersion can remove a significant proportion of oil or oily emulsion from the sea surface

(iii) Evaporation - Volatile fractions of oil will evaporate for (low specific gravity) low viscosity oil. Evaporation is the most significant factor in the loss of hydrocarbons from an oil slick, and may range from 75% loss for light fuel oils down to less than 10% for heavy oils. The higher the wind speed and ambient temperature, greater the rate of evaporation. A high wax content in oils tends to suppress the evaporation loss due to a consequent inhibition of the amount of spreading that occurs. Wax tends to raise the Pour Point of the oil and so high wax oils tend to be viscous, semisolid or even solid at normal sea temperature.

(iv) Emulsification – Some oils will form water-in-oil emulsions if enough mixing energy is applied. Generally these oils have high specific gravity, high asphaltene content and moderate Pour Point. The emulsion formed may consist of up to 80% water by volume. Therefore the volume of some slicks may eventually exceed that of the oil spilled, despite the loss of light oil components through evaporation. In calm waters little or no emulsification occur. The emulsion forms within a Few Hours with low viscosity oils, whereas it may take several days with viscous oils. It is often referred to as "Chocolate Mousse" because of its colour and consistency.

Oil emulsions have elevated viscosities relative to the oils themselves and this has implications for oil spill management and onshore behavior of the oil slick. Asphaltenes, together with moderate wax content, tend to facilitate the formation of stable emulsion. The “Chocolate Mousse” may sink if it becomes denser than the sea water. Under wave action the emulsion remains relatively fluid but tends to get stiff when resting still on a beach or on still water.

(v) Dissolution - Many of the light components in oils are relatively soluble and can be dissolved in sea water as a result of wave action. The nature and amount of this “Water Soluble Fraction” (WSF) varies according to oil type. ‘Heavy Oils’ tend to loose little by dissolution due to the low amount of light hydrocarbons.

(vi) Oxidation - Oxidation occurs when oil is exposed to air. Rapidly spreading (low viscosity) oils are most amenable to oxidation. Ultraviolet rays facilitate oxidation and the term ‘Photo-oxidation’ is often used to describe the process.

(vii) Sinking - Very few oils will weather to such an extent that their specific gravity will exceed that of sea water. If this does occur, the oil may sink to the sea bottom, or into the water column.

(viii) Biodegradation - Biodegradation refers to the breakdown of hydrocarbons by bacteria, which use the hydrocarbons as food source. The rate of this degradation depends on a number of factors including:

The availability of nutrients suitable for bacterial metabolism (primary Nitrate / ammonia and phosphate) Ambient temperature, Oxygen concentration, Chemical characteristics of the oil, Physical character of the oil etc.
The process of the biodegradation of the spilled oil is enhanced in the Tropics preferably due to elevated temperatures. The main physical properties that decides the fate of oil spilled at sea are specific gravity, distillation characteristics, Viscosity and pour point. Specific gravity of oil is its density in relation to pure water. The

specific gravity of crude oil and petroleum products is usually expressed in terms of API gravity.

16.4 SHORELINE IMPACT REPORTS / ASSESSMENTS

I) Here the shoreline is almost in a straight line in both, north and south as well. The shore line is having sandy beaches right up to Karaikal Town beach, which is frequented by the visitors. On full moon day of the Tamil month Masi, the "Masimadam" festival is celebrated on the sea shore of Karaikal. The Karaikal Ammavar temple festival which also holds the annual "Mangani" festival, a well attended 'Mela'. Any oil pollution in this area or disturbance on account of oil spill, would create unrest among the local population. This may create law and order problem in due course of time.

II) In the south, after CPCL jetty, the sandy beach starts again, and pollution of these areas is going to disturb the local population as well. However pollution of river Vettar and the mangroves on the southern bank of it, is going to stir the hornets nest. As mangroves come under the jurisdiction of either Revenue department or Forest department. The fish culture, fishing, fish landing and boat traffic is also likely to get affected. Resulting in unrest in local population due to loss of revenue and employment. It is pertinent to mention here that all these areas fall under Nagapattinam district of Tamil Nadu state. Any tiff or matter arising out of these affairs would become a issue between State Govt. and Central Govt., as the Karaikal falls under Pondicherry, which is an Union Territory. Although local customs and socio- cultural habits of Pondicherry (Karaikal) and Tamil Nadu are same to a large extant, however political alignments may have a major role to play in solving the crisis.

III) There is no tourist beaches in the vicinity of Port the only public beach is almost 12 Km from Port which will not be affected as per drifting modeling attached. However in case of any spill reaching to the beach, adequate shore cleaning equipment as per APPENDIX-7 is *available with Karaikal Port*.

17. OPERATIONAL ADMINISTRATION

17.1 SPILL FUNDING PROCEDURE

The funding procedures have been discussed in the Legislations in force as to who will be bearing the burden of spill and cost of cleanup as well as cost to the damages caused to the human beings and the environment. Some ports are levying cess on the ships involved in the oil transfer activities. However in case no oil tanker traffic is in the port then in that case the port administration has to take care of the fund mobilization, themselves.

Karaikal port is accepting only those vessels which are covered by the P&I clubs for the oil pollution liability. This check is done prior giving acceptance to the receivers for bringing the vessel to Karaikal. In case of any eventuality related to oil spill caused by vessels, port shall deploy resources available with itself and neighboring terminals and Coast Guard.

17.2 DOCUMENTATION AND COST RECOVERY PROCESS

As far as documentation is concerned, the ECR will be forwarding to Finance dept. all the data / report generated on account of OSR efforts on deployment of manpower, expenditure on vehicles, amount of consumables used and other expenses in the form of a report. Finance department is to initiate the process of the cost recovery process from the Shipping companies / Authorised agents of the vessel concerned.

17.3 DAMAGE ASSESSMENT PROCEDURES

Here the Socio-economic study chapter of the Environment Impact Assessment (EIA) report will come handy to assess the damage caused to the local industries, workers, economic loss to the social fabric, local government by way of direct and indirect taxes etc, The study carried out in the base year would provide the economic value of each category of the things on which study has been carried out, and as per price index or Standard Schedule of Rates (SSR) of that time, the losses can be easily calculated.

A careful survey of the affected areas would also reveal the type of damage is:

1) Temporary
2) Semi-permanent
3) Permanent

1) Temporary damages caused to the Environment and social fabric can occur due to the mitigation efforts taken by the port authorities, and it can be reversed to its previous status with some social and financial efforts or on its own. Although no fixed time frame can be given for the process to take place, but on a broader scale it may take anything from six weeks to six months time. It should be understood that monitoring of the progress of the efforts put in, is a time consuming and costly affair specially, when it is damage to the underwater flora and fauna.

2) Semi-Permanent damages caused are of long lasting nature. The damages can be cured / reversed by various efforts but are very time consuming and a burden on the exchequer. Although the damages can be reversed but it would be difficult to give any time frame and also it may not come back to desired state. For instance, due to the damages caused to fish breading habitat in that area, the process may start after some time but to some different location, thus depletion of fish catch in a particular area and emergence in another.

3) Permanent Damages are those damages which cannot be reversed at all. If, by some chance any regeneration takes place, it may be entirely different than the previous ones. In case of permanent damages there is total destruction to the environment, flora and fauna, marine life and total destruction to aquatic life cycle in that particular area.

17.4 REQUIRED REPORTS

On sighting any oil spill, the person is to inform Duty Officer in Port who, in turn, will inform the HOD (Marine). Coast Guard authorities are to be informed by written

communication immediately in format placed at Appendix-10. Other relevant Government authorities are also to be informed simultaneously.

The formats of the required reports i.e. Daily incident log, Personal log form, Oil spill report form and POLREP etc. are placed at ***Appendices-8,9, 10 & 11.***

18. LOGISTICS

18.1 PERMITS REQUIRED

When the decision to raise the Tier level of oil spill is being taken, a review of our own spill response capability is also to be done simultaneously. Once it is felt that additional resources are required, the concerned agencies are to be alerted immediately and mobilization action for those equipments / items should be initiated without loosing any time.

It should be borne in mind that mobilization of resources from out stations is a time consuming and cumbersome exercise, therefore it should be calculated well before hand (during mock drills) the anticipated arrival time of the Pollution Response Equipments on account of:

a) Transportation time by rail / road / sea / air.
b) Time taken by Custom / Government formalities.
c) Time taken in loading / unloading.
d) Availability of specialized loading / unloading machineries and accessories.

18.2 PERSONNEL AND PERSONNEL SUPPORT

It is also very important to keep in mind as who is going to operate that pollution response equipment's which are being mobilized from their sources (ports or establishments) with whom we have got some tie ups / agreement. In case the equipment's are coming with one set of man power, then from where their relief would come? And in case only equipment's are provided then, do we possess required trained manpower? All such matters are to be deliberated upon in detail by

the On Scene Commander and Emergency Control Room Team together during Exercise Planning Stage itself. Otherwise it would be very difficult to mobilize desired manpower at the eleventh hour.

Requesting for Coast Guard help will certainly be forth coming, but with a huge capitation fee. They would be self-sufficient in all respects.

18.3 TRANS BOUNDARY MOVEMENT OF EQUIPMENT AND PERSONNEL

Care is to be exercised in planning the movement of men and equipment from one State / Region / Zone to another, because some difficulties may crop up at the last moment that too when materials have been moved, men may not work or men and equipment's have been moved and positioned but equipment's won't work.
Reasons may be quiet genuine; for example,

a) **Contract Agreement -** There may be contract agreement between the worker / crew / with his employer to work on that particular organizations premises / vessel only.

b) **Climatic Conditions -** The worker / crew may not be aware about the cold / hot / rough weather conditions prevailing in that particular area, thus preventing him to perform his task effectively. At times he may not be able to perform at all due to harsh weather conditions.

c) **Language Barriers -** At times the OSR crew may not find themselves comfortable with the new atmosphere where they cannot communicate in their own language, hence hindrance in smooth operations.

d) **Delay on Check posts -** At times the delay in positioning of the equipment's may be caused due non clearance of the OSR equipment's by the Check Post authorities while passing through the Land Locked State, due non awareness about the nature of equipment and the urgency to reach the destination.

18.4 INFORMATION RESOURCE HARDWARE

The various companies engaged in procurement and supplies of the OSR equipment's are quite a few in number. However before taking any decision on procurement of equipment and spares, it must be ensured that after sales services, compatibility with the existing equipment's, lead time in supply of spares and consumables, training to personnel etc. have been taken in consideration because many companies are interested in selling bigger and costly equipment's only. Supply of spares, training, repairs etc. although promised are not responded to even after repeated correspondence. In this regard it is advised that, local market survey be carried out and sources be identified well before hand. Experts and Advisors will be able to guide better in this respect. The details of Advisor and Consultants are placed at ***Appendix-12.***

19. SPECIALIST ITEMS

19.1 SPECIALISED RESPONSE TEAMS

In the present context of this port, since this port is not handling crude oil products in bulk directly or indirectly, neither is engaged in Exploration and Production of crude oil; Specialized Response Teams from outside country i.e. EARL Singapore etc. are not recommended. The OSR team recommended for this port has been constituted keeping the threat scenario of this port.

19.2 MEDIA AND PUBLIC RELATIONS SPECIALISTS

All the information as press release to print and TV media are to be released by the Public Relations Officer (PRO) or by the person designated, only. The press release format is to be signed by Emergency Control Room Team Leader (ECRT leader) as cleared and then forwarded to **Chief Executive Officer (CEO)** for information and final release. The format for the press release is placed at ***Appendix-13.***

19.3 SPECIALISED SALVAGED TEAMS

The port plans to handle Coal carriers and General Cargo vessels initially in the first phase and Container vessels & Liquid bulk vessels for edibles in the second phase. So far no plans to handle large crude oil in future, therefore no recommendations are considered in this plan.

20. RESOURCE DIRECTORY

The various contact details are attached at ***Appendix-6.***

21. COMMUNICATIONS

21.1 COMMUNICATION PLAN

The port possess a good network of communication equipment's to meet its requirements. Normal VHF set is available to establish ship to ship and ship to shore communication. In addition to this, every vessel and water craft has been provided with VHF and mobile phone to establish communications as desired. Navtex is also being made available with the Marine Control Tower and in case of any required information or the required messages, authorities have to request IMD authorities for the information required.

22. SENSITIVE AREAS

22.1 IDENTIFICATION

The sensitive areas identified in the jurisdiction of this port are:

(a) Mangroves on the Southern side of the Vettar river
(b) Vettar river mouth itself. And

(c) Areas, around the anchorage coordinates to a radius of about 23 miles, as the area is rich fishing grounds for the fisher folks of Karaikal and Nagapattinam districts.

The areas as discussed above need to be protected, as a large population of the coastal areas of both the districts depend on fishing and associated trade with it. Destruction to their livelihood by any means would result in mass unrest, raising political eyebrows and taking unpredictable turn of events. As far as Vettar river mouth area and its southern banks are concerned, the southern bank is dotted with vegetation of mangroves and CPCL jetty at the eastern end. Fishing boat traffic has also been seen, and fish ponds have also been noticed along the river bank. Therefore it is likely to attract the attention of Forest dept. authorities and State Revenue authorities as well. Although the CPCL oil jetty and Vettar river fall outside the port jurisdiction of Karaikal Port, but as spilled oil is likely to cross over to Nagapattinam Port limits, due to its close proximity to our port limits, Karaikal Port authorities have decided to initiate all possible effective measures to combat oil spill immediately and prevent any ecological disaster to take place closer to these areas also. The Sensitive area map is placed at ***Appendix-15.***

22.2 PRIORITISING

Prioritizing the sensitive areas as per their importance is necessary, because it has to be understood well that oil spill would certainly cause damage. But what is the quantum of damage / loss, is to be assessed well before. The recommended priority areas to be defended are sequentially as follows:

(a) Vettar river mouth and the mangroves on its southern banks.

(b) Anchorage area.

On assessing the spill movement, the impact area, can be predicted and accordingly the protection or containment techniques be adopted. Quick initiation of OSR action during NE monsoon conditions is necessary, as the spill occurring in the anchorage area, in the channel or at the mouth of harbour, is likely to hit the Vettar river shores

/ mouth. Thus frequent exercises in this area would determine the reaction time at various times of the monsoon period.

23. MECHANICAL RESPONSE STRATEGIES

In mechanical response strategies, the discussion would revolve around; how to deploy the OSR equipment's in different locations to derive best advantages in different monsoon conditions.

23.1 OUT OF HARBOUR

23.1.1 NORTH EAST OF NORTH BREAK WATER (ANCHORAGE AREA)

As soon as the spill trajectory is available and resources at risk to be protected are clear, the water craft designated shall be required to position the Boat Pontoon (Pollution Response Pontoon) with pollution response equipment's already positioned in 20 feet container on it. Once all the ERT members (team) and OSC are onboard, the boat proceeds towards the destination with pollution response pontoon in tow.

- Before the boat proceeds with the pontoon, the OSC is to brief all the ERT members as well as ERT leader about the plan and methodology to be adopted. All the equipment's, include Safety equipment's, and all other items are to checked up as per the check off list. Report to this effect is to be made by team leader to OSC.
- The Air Filled Boom reel is to be made ready for operation by connecting it to power pack and tested for its free movement.
- The anchors and their markers (floats) are also to be laid on the pontoon deck and made ready for immediate connecting up.

All the work of checking of equipment's, power pack, anchors for boom anchoring connecting up of towing bridal / connector ropes and passing (heaving lines) lines etc. have to be finished during the passage / transit time only.

On arrival to the

(A) Oil Spill (floating) Site

On reaching the spill site the Pollution Response Pontoon is brought Leeward side of the oil spill and quickly anchored (if sounding / depth permits). Immediately the outer end of the Air Filled Boom's towing bridal is passed to the work boat by heaving lines duly connected with the connector rope and anchor.

The work boat is instructed to encircle the oil slick, keeping well clear of the oil slick and make a shape of "U" or "J" whichever is better feasible at that time. The boat is to try and contain all the oil slicks in one attempt. In this process the Response Team on the Pontoon should continue to pay out the inflated boom until the oil slick is encircled or desired configuration is achieved.

On getting instructions from OSC the boat with pontoon may anchor herself or assist to anchor the boom, depending upon the weather condition or as required. The length of boom required to be deployed may vary from 300-350 meters or more depending upon the quantum of oil spill that has taken place. Once the containment has been achieved successfully, the outer end of the boom which is with the work boat, may be anchored with sufficient amount of rope and float as marker buoy attached to it; if the weather or /and depth permits. Thereafter the skimmer may be deployed and recovery action started.

(B) Oil Spill Likely to hit Vettar River

In this situation Diversionary Boom or Deflection boom technique is to be used. Booms are to be laid from the landwards north of CPCL jetty, in a NE direction approximately bearing 045 in position "B": "B". If the spill is in line of "Z" :"Z". With the help of work boat at one end of the boom and the other end by the pontoon boat. The pontoon may be anchored at an convenient place so as to be helpful in booming.

The section of about 250-300 meters length of boom may be used for each point. The Shore Sealing Boom is to be made ready from the land wards side by connecting up inboard end with towing bridal and securing it with some strong point

on the land or securing it with anchor on beach/ land. Once the landward end is firmly secured, the shore sealing boom is filled half with air and sea water in respective chambers. About 25 to 30 meters of boom is laid out to the boat with the help of heaving line duly connected with towing Bridal. Once booms, are paid out to the desired length the shore sealing boom and Air Filled Boom which is onboard the pontoon or the boats are connected together. Now the boom is laid in the direction as indicated above in position “B” “B”. Once the boom is fully laid in the position its anchored to keep it in the desired direction and place. Similarly the second length of the Air Filled boom is laid in position “C” “C” and its both the ends are to be carefully anchored, so as to maintain its position and direction. These are also to be anchored every 35-50 meters, so as to take the strain of the wind, current and tide and keep the boom in a straight line. At every anchoring point, a marker buoy / float is also to be attached. This will act as an indicator of the anchor point as well as help OSR team crew in easy retrieval of anchors; and also to boat operators to exercise caution when operating nearby.

The North Eastern end of the boom laid in position ‘B’ “B” should be behind of the South Western end of the boom placed in position “C” “C”. This point of the boom should be over lapping to boom laid in front of boom “B” “B”, It is important to mention here is that, the very purpose of deployment of these booms is to divert / deflect the oil slick away from the Vettar river mouth. Therefore care is to be exercised while anchoring of the booms that they remain in straight line maintaining the required direction and overlapping position as well.

Positioning of booms in this position would be required only in North East monsoon conditions. No threat is foreseen in South West monsoon conditions.

(C) Oil Spill hitting the coast at beach- Shore line cleanup

In case of shore line cleanup required at beach, approach to the likely affected areas are connected with road and could be reached within one hour time. This operation is likely to be manpower intensive.

To remove the oil soaked soil, the earth removing equipment's are to be used. The soil is to be removed carefully by the Shovels and Scrapers provided among shore cleaning gears. All the oily soil may be collected at one place on Tarpaulin or as convenient. Heavily oil soaked soil be collected separately on a separate tarpaulin and oil allowed to trickle down and subsequently collected at a convenient point, thereafter disposed off as per directions in force by State Pollution Control Board.

The oily soil be washed with sea water by spraying water by sprinkler, and oil collected with the help of booms & skimmer if heavily contaminated; otherwise dumped (sand) in the pits dug, for bioremediation.

In no circumstances the oil soaked sand or oil soaked debris are to be left unattended. It may cause damage to the reputation of the port authorities.

Booms Positioning for shoreline sensitive areas as per above mentioned points i.e. A, B & C are placed at ***Appendix-16.***

23.2 INSIDE THE HARBOUR

23.2.1 BETWEEN BERTH NOS. 2 & 4

In case of oil spill occurring in between Berth no 2 & 4, the spill is likely to move, West and South West of berth no. 4. The chances of oil spill impacting the Western berths is during high water, and eastern berths in low water. The strong wind effect will also affect the spill movement. Therefore laying of booms has to be done, on as required basis, to isolate the spill and recovery thereafter.

The moment oil spill alert is sounded, the OSR team is to muster on pontoon deck and start getting ready the response equipment's. The Light oil Air inflatable Boom is to be connected with the towing bridal, and the rope connected to it is to be passed to the boat; which in turn would start encircling the oil spill and start containment process. Thereafter on directions from OSC it is to be taken to a convenient berth / place for deployment of skimmer and commencement of recovery process. All the actions are to be very quick, as reaction time will be very less. Because, in case of

NE monsoon; the weather conditions may not be very favorable for OSR team. However during SW monsoon conditions weather conditions inside the harbor are likely to be comparatively better as compared to Out Side Harbor conditions.

23.2.2 BETWEEN BERTH NOS. 7 TO 9

In this position, (northern side) the spill may have the tendency to revolve there if it is very close to the berth 8 & 9, because of being in the sheltered area in both the monsoons.

23.2.3 EQUIPMENT HELD WITH PORT

Port has following OSR equipment already in place onboard Tug boat **Prabhat Shobha**

1. Oil spill dispersant system (Capacity:2000 ltrs) + OSD drums,
2. Absorbent pads,

A list of Offshore OSR Equipment available with Karaikal Port is placed at ***Appendix-3.***

24. NON MECHANICAL RESPONSE STRATEGIES

The non-mechanical response strategies basically includes application of chemicals and neutralizing the toxicity of the spilled oil. In this process, various types of Oil Spill Dispersants (OSDs) are used / sprayed on the spill manually, by ships, boats, helicopters and aircrafts. However before using any dispersant, prior approval of Coast Guard authorities is mandatory. According to Marine scientists, use of OSDs, increases the level of toxic soluble in the water if used in shallow waters; and very harmful to aquatic life.

Since usage of OSD in depths, less than 20 mtrs is prohibited, the port can use bio-product developed by NMRL for oil spill in areas of less depth and even during beach cleanup.

25. SITE HEALTH AND SAFETY PLAN

The company has to keep the health of the site in a healthy condition, in other words, the environmental condition of the site affected; has to be improved under a time bound project program till it is restored to its original condition. Health and Safety programs for the local population are also to be drawn and implemented as per the company's policy. Regular health checkups are to continue for the affected population to maintain company's reputation.

26. TRANSPORT STORAGE AND DISPOSAL OF WASTE

Safety During Operation

- Wear the appropriate Personal Protective Equipment (PPE)
- Identify risks and mitigate them where possible
- Communicate any risks and controls in place through a pre-operation safety brief.

Waste oil recovered from the site is to be collected and stored in suitable containers (Plastic or metallic drums) which are suitable for storage and transportation. If the recovered oil is suitable for recycling, the same to be used accordingly But in case it is not useable at all and requires to be disposed off, then in that case the State pollution Control boards guidelines are to be followed.

There are two parties registered with the Karaikal Port, who are authorized by the state pollution control board to collect the waste oil. If the oil is not suitable for recycling it can be disposed off by delivering the same to facility like M/S Century Refineries Pvt Ltd. CENTURY REFINERIES (Incineration Plant) deals with incineration of hazardous waste and disposal of used coolants in environmentally

secured manner. Since 2003 both disposal of used coolant and incineration services are extended to all the industries generating incinerable waste. The facility can incinerate 400 Kgs per hour this includes solid and liquid waste. The incinerated ash is sent to TSDF facility for final disposal.

27. FUNDING AND COST DOCUMENTATION

Funding of the OSR efforts during the exercises and drills has to be looked after by the Karaikal Port authorities. In actual spill scenarios also initial funding and all OSR activities are to be looked after by the Port Authorities, but at a later stage once the activities are over, the cost recovery action may be initiated by the Accounts Section. This action of monitoring the expenditure can be effectively carried out right from the initiation of Callout Procedure itself and the concerned polluting companies can be billed on day today basis or as desired by the port authorities.

28. PUBLIC AND MEDIA RELATIONS

As already mentioned earlier, only CEO (Port) or person authorized, is to issue / release information to public and press. A format is also provided at *Appendix-13.* Consequent upon releases cleared by Vice COO, local and government officials are to be briefed by the PRO or any other person authorized to do so.

All interactions with the media personnel are to be through the CEO (Port) or Person authorized as follows:

- Calls from Media Personnel, Special Interest Group and Partners will be referred to Chief Operating Officer.
- Calls from Oil, Shipping Companies or Service Companies will only be put through to the ECR if they have a direct bearing on the emergency.
- Calls from Relatives and Friends of Personnel involved in the incident will be answered to advise all callers of the most recent press statement. Relatives and friends enquiring about Ship, Port Staff or Consultants will be put through

to the PRO. Relatives and friend enquiring about contractor staff will be referred to their respective contract employer. Contractor's contact details are available in directory of emergency contacts.

- Call from curious member of the public will be informed by PRO that periodic press statements are being released.

29. DEMOBILISATION AND TERMINATION OF OPERATIONS

Once the Pollution Response Operations are over, the time to relax has not yet come. All the equipment's and machineries are to be accounted and checked for their serviceability and then stored in their respective places. Consumables are to be accounted for. All equipment's and machineries are to be thoroughly washed with Fresh Water as per the OEM's guidelines. Necessary maintenance needs to be carried out and ensured that the equipment is ready for next deployment. Any deficiency / defects are to be immediately reported upon. This process is to form the part of all the exercise also.

29.1 PREPARING FORMAL DETAILED REPORT

After the operations are completed the OSC is to prepare a detailed report covering all the aspects of the oil spill cleanup, which must include success and failures as well, lessons learnt, recommendations about equipment's, man power, plans etc. The report is to be forwarded to ECR Team Leader, who in turn after discussion with his team members would forward the report with his comments and recommendations to COO (Port) for further review and appropriate action.

29.2 REVIEWING PLANS AND PROCEDURES FROM LESSONS LEARNT

The ECT should carryout deliberations on the report received from OSC and give its recommendations to COO (Port) for putting it to Management for necessary action. Necessary amendments may be carried out in the plan when felt necessary, and a

record to the effect be maintained. It is recommended that this plan be reviewed after 3 years or increase in traffic of 100% whichever is earlier. An all-out effort be made to ensure that every person connected with the OSR duties “Reads this document, and signs in the Master Copy held with his HOD as having read and understood.”

SECTION – 3

DATA DIRECTORY / APPENDICES

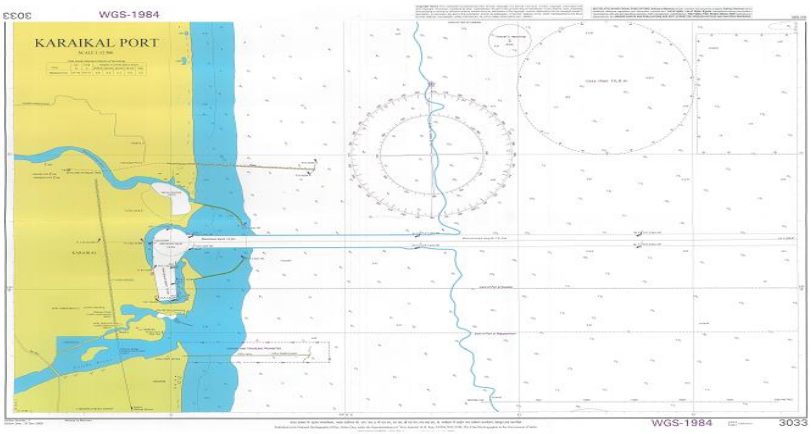
LIST OF APPENDICES

APPENDIX-01	GEOGRAPHICAL LIMITS OF PLAN
APPENDIX-02	TRAINING-SAFETY SCHEDULES AND DRILL EXERCISES PROGRAMME FOR LEVEL I, II & III
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APPENDIX-1

Ref page no.03

GEOGRAPHICAL LIMITS OF PLAN





APPENDIX-2

Ref page no.10

TRAINING-SAFETY SCHEDULES AND DRILL / EXERCISES PROGRAMME FOR LEVEL I, II & III

HOD - Admin will co-ordinate training of all the personnel involved in oil spill response activities at various levels so as to ensure all personnel are trained appropriate to their role. He will also be responsible for ensuring personnel entrusted with Maintenance and Operation of OSR equipment undergo appropriate and timely training as well as participate in refresher courses, drills and exercises.

He will also be responsible towards the crew for training on operation of the pollution response equipment fitted onboard the tugs operating under Manager Marine's control. In that he is to ensure that Masters of the tugs comply to the directives issued in this regard from time to time.

TRAINING AND COMPETENCY

PURPOSE

To identify in the form of a matrix, the mandatory oil spill response training that Karaikal Port personnel shall under take to support the port's Oil Spill Contingency Plan.

General Manager-Marine in consultation with HOD-Admin shall determine the Oil Spill Training needs and priorities on an annual basis.

ATTENDANCE

Port employees and relevant contractor's men shall attend oil spill training courses. The training shall meet International Maritime Organization (IMO), model as the minimum criteria for oil spill response training.

Level I

To provide field personnel and supervisor, responsible for undertaking on site cleanup operations, an over view of the techniques available for recovering spilled oil and cleaning polluted shores.

Level II

Supervisor / On-scene Commander (OSC)

To provide senior personnel with the skills necessary to co-operate and supervise oil spill response operations, in a timely, organized and effective manner.

Level III

Administrators and Senior Managers

To provide senior personnel with an awareness of the role and responsibilities required in the management of spills of national significance. Training courses are required to meet both, Statutory and Karaikal Port's Policy requirements for Oil Spill Response requirements and safe operations.

RECORDS

Records specifying that personnel have satisfactorily completed the designated training course, shall be maintained.

TRAINING MATRIX:

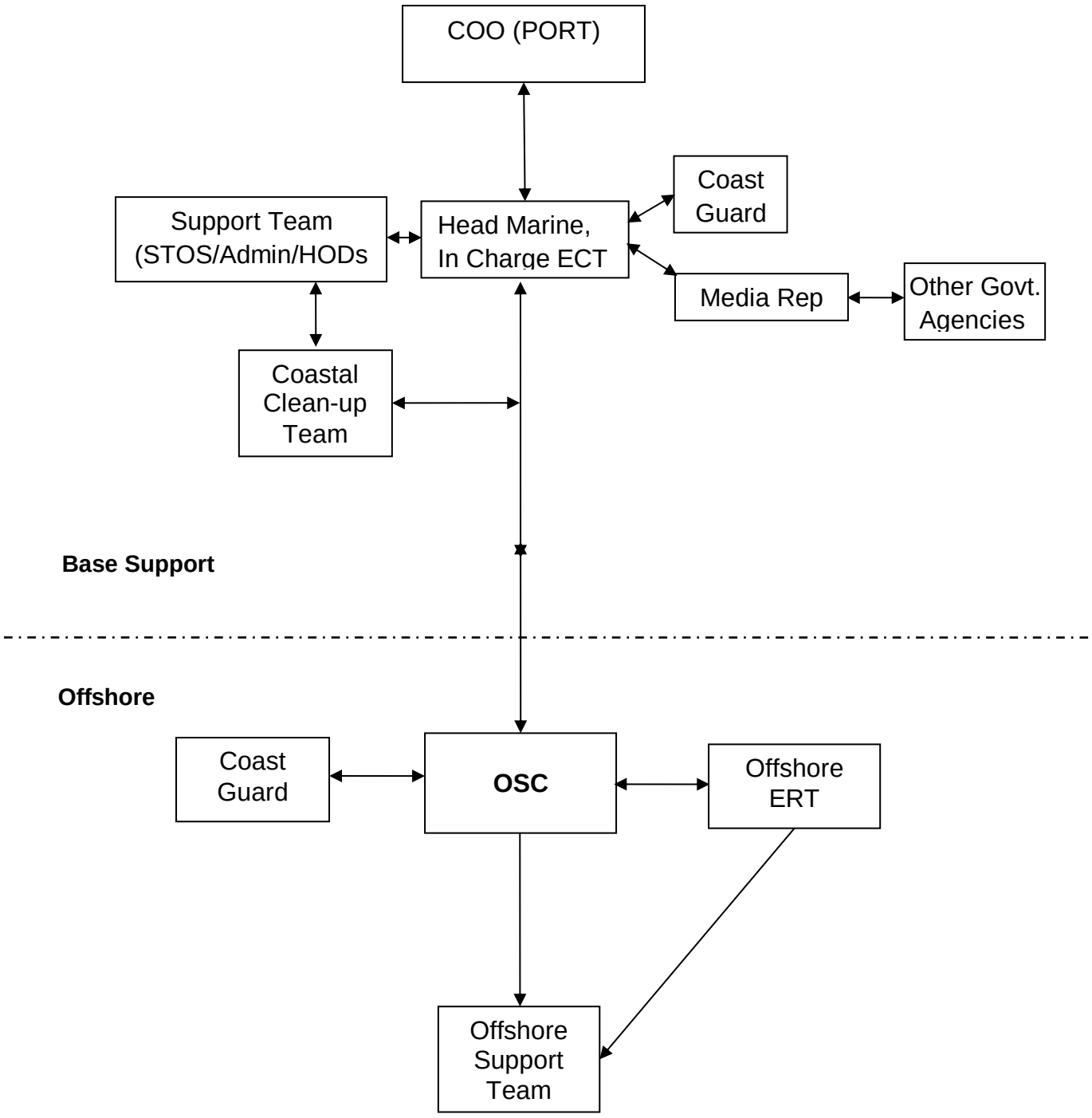
OIL SPILL TRAINING	**IMO OSR Level 1**	**IMO OSR Level 2**	**IMO OSR Level 3**
Course Description	First Responders	Supervisors/On Scene Commander	Administrators & Senior Managers
Port Management			*
Emergency Control Team members		*	*
Onshore OSR Team	*		
Offshore OSR Team	*		
Tug -Vessel Marine Crew	*		
Other Supervisor		*	
Retraining Frequency	3 years	3 years	3 years

Note: Annual refresher course of 8 hours duration for Level I & II, and for Level III. 4 hours duration will be given to personnel as appropriate to their training needs.

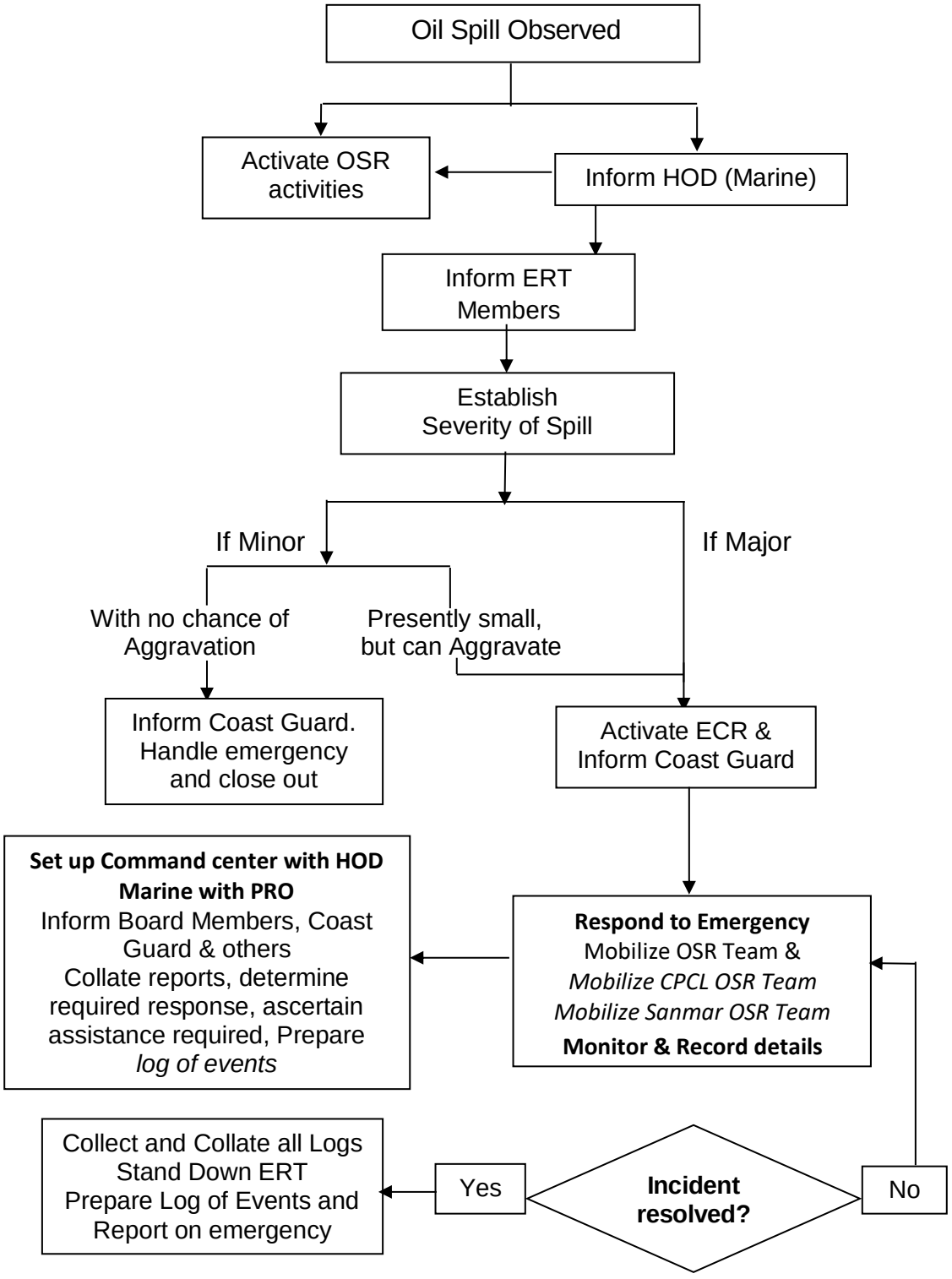
OSR EQUIPMENT – AVAILABLE WITH KARAIKAL PORT

Sl. No.	Description	Quantity
1.	PVC inflatable Boom Make – Desmi Toil Boom AFPU-900-250m.	250 M
2.	PVC Rigid Boom, Make - Desmi	500 M
3.	Canadyne fence boom	100 M
4.	Air Boom PVC – ELASTEC USA	600 M
5.	Air Boom PVC – Canadyne	475 M
6.	River Boom – Canadyne	800 M
7.	Air Blower	02 Nos
8.	Weir Skimmer 2 - 30 TPH	01 No
9.	Multi Skimmer	02 Nos
10.	Disc Skimmer	01 No
11.	Drum Skimmer	03 Nos
4.	Sorbent Boom	400 M
5.	Sorbent Pads	2000 Nos
6.	OSD – Rochem	600 Ltrs (Dt of Exp: 2023).
10.	Power Pack with accessories	02
11.	Anchors & accessories for booms	as per set
12.	Reusable Adsorbents	For up to 1000 ltr absorption
13.	Floating Storage Tank 10 MT	01 No
14.	Oil Recovery Pump	06 Nos
15.	Towable Bladder ELASTEC USA	02 Nos
16.	OSD Sprayer ELASTEC USA	02 Sets

INFORMATION FLOW CHART



INCIDENT ORGANISATION CHART



Appendix-6:

Ref pages no.57 & 76

COMMUNICATION LIST

Organisation	Name	Title	Office	Mobile
Control Centre				
Marine Control Tower	Emergency Control Room	ECR	04365–256610/12	9566000700
Karaikal Port Pvt Ltd.	Harinder Singh	COO (Port) & Incident Commander		9566153039
	Capt. Dharam Prakash	OSC		9100113421
	Suresh Singh Bogal	Alt. OSC		9500048355
	Ravi N	Alt. OSC		7358394110
STOS	Duty Pilot	Pilot		7977949892
Authority	District Collector Office		04368 222444/025	
	PPCC		04368 231540	
	Supt. Police		04368 228007	
	Police Control Room		04368 222437	
	Meteorology Dept.		04368 222531	
	Fisheries Dept.		04368 222616	
	Municipal Office		04368 222427	
Fire Station	Station Fire Officer Karaikal		04368 230101/ 112	
Chemplast Sanmar-Karaikal	Chemplast Sanmar-Control Tower		04368 292846	
Medical	Port Medical Center		04365 256605	
	Primary Health Centre-TR Pattinam		04368 222413 222634	
Coast Guard				
CO-CG Station	Karaikal		04368 226500	
CGRHQ (E)	Chennai (CSO Ops) EPABX		044 23460403 23460450	
CG-DHQ	Puducherry		0413-2257954	
CG-DHQ	Puducherry		0413-2257950	
CG PRT (E)	Chennai		044 23460465	
CG COMDIS-5,	Chennai EPABX		044 23460451 23460460	
Port Dept.	Puducherry		0413 2337114 2338092	
Collector Office	Karaikal		04368 222444	
Collector Office	Nagapattinam		04365 253080	
Indian Navy	Karaikal		04365 242534	
Coastal Police Station	Karaikal		04368 224750	
GH	Karaikal		04368 222593	

APPENDIX-7

Ref pages no.59 & 70

SAFETY / SHORELINE CLEANUP EQUIPMENTS AVAILABLE WITH KARAIKAL PORT

Sl. No.	Description	Quantity
1.	PCV hand gloves – small 14”	20
2.	PCV hand gloves – small 16”	20
3.	PCV hand gloves – small 18”	20
4.	Mops with handle	20
5.	Hand shovel with wooden handle	20
6.	Wheel Barrow	10
7.	Rake with handle	10
8.	Tarpaulin-standard size 30’ X 27’	4
9.	Gunny bags	50
10.	HDPE bags	50
11.	Safety Helmets	14
12.	Liquid Soap (in canes)	50 Ltrs
13.	Water Flask 20 Liters	02
14.	Saw Dust packed in gunny bags	100 Kgs
15.	Disposable Coveralls – Small	10
16.	Disposable Coveralls – Medium	20
17.	Disposable Coveralls – Large	20
18.	Disposable Coveralls – Extra Large	20
19.	Gum boot – Small	15
20.	Gum boot – Medium	15
21.	Gum boot – Large	15
22.	Plastic Buckets – 10 liters	15
23.	Plastic Buckets – 20 liters	15
24.	Plastic Mug – 1 liter	15
25.	Cotton Rag – in bags	100 Kg.
26.	Trolley	03
27.	Detergent Powder	25 Kg
28.	Work / Lift vests	06
29.	Disposable cups / glasses	200
30.	Plastic Chairs	6
31.	Folding Tables	2
32.	First Aid Kit	01 Set

DAILY INCIDENT LOG

DAILY INCIDENT LOG –TEAM LEADER –OIL SPILL RESPONSE GROUP

Name…… …… Rank……..

Notification received. ONSHORE / OFFSHORE / INSIDE HARBOUR

Time ……..… Date ……..

Day…… Shift……...

LOCATION OF THE INCIDENT

Name of the VESSEL / PLACE……Area ……..……

Latitude ……... Longitude ……..……

Distance from Western end of Berth ……NM Sounding……..……..….

Incident occurred Incident Severity (tick one)

Time ……. Date …….. Minor / Major/ Tier I/ Tier II/ Tier III

Brief details of incident and action taken.

……..

……..

……..

……..

……..

……

WEATHER DATA

Wind Speed ….……..…….	Wind Direction ……..…….	Sea State ……..…..…..…
Current Speed.……..……..	Current Direction.…….....	Visibility ……..…..…..…
Sea Temperature ……..……...	Air Temperature ……. ……..	Fog / Mist ……..…….....
Rain/ Precipitation ….……..….	Humidity …….	Cloud Cover.……..…..……..

OPERATION DATA

Type of Boom / Booms deployed…… …. Total Length……. In Depth ……..

Power Pack Running hrs …..……. Skimmer Running hrs ……..…

Oil Recovered from water …..…… Liters / Tons Oil transferred ashore ……Liters / Tons

Oil /Sludge cleared from shore …..…Kg. Sorbents pads used …….. Nos.

O.S.D. used ……...Liters Saw Dust used…… Kg.

LOGISTICS AND MANPOWER

Number and type of vessel/boats available for assistance ……

Number and type of vehicles available for assistance ……

Manpower utilized ---

Fireman…… Security Services men …..…….. Casual Labourers……. Others …….

FORM COMPLETED BY

Name ……

Rank / Designation ……..……

Signature……..…

Time…… Date……..…

On completion, this form is to be handed over to On Scene Commander (OSC), who in turn after his comments would hand over this form to Emergency Control room (ECR) Team Leader. In absence of any OSC it may be handed over to ECR Team Leader directly.

APPENDIX-9

Ref page no.53

PERSONAL LOG FORM

(To be filled by In-charge ECR for the team members of the ECR and handed over to ECR Team Leader on completion of OSR operation / Exercise)

Form Completed By :

Name …….

Designation …….

Signed ……. Date …….../……../…….

TIME (24 hour clock)	**COMMUNICATION** (To / From)	**ACTION / MESSAGE**

Particular of Person /organization
Reporting Incident Title :…….. Organisation :……..…… Telephone / Mobile / Telex/ Fax number : ……..……. Date / Time :……. Spill location :……..……. Type and quantity of oil spill :……..…….. Cause of oil spill :……. Response to spillage, if any :……. Any other information :……..…

OIL SPILL REPORT FORM **APPENDIX-11**

Ref page no.53

POLLUTION REPORT (POLREP) FORMAT

Address	From …….	To …….
Date	Time	Time Group
Identification		
Serial Number		

Part 1	1.	Date and Time
(POLWARN)	2.	Position (in Lat. / Long.)
	3.	Incident
	4.	Outflow of Oil
Acknowledge		
	40.	Date and time
	41.	Position
	42.	Characteristics of pollution
	43.	Source and cause of pollution
	44.	Wind direction and speed
	45.	Current or tide
	46.	Sea state and pollution
	47.	Drift of pollution
Part II	48.	Forecast
(POLINF)	49.	Identify of observer and ship on scene
	50.	Action taken / initiated
	51.	Photographs or samples
	52.	Names of other agencies informed
	53-59.	Spare
	60	Acknowledge
Acknowledge		
	80.	Date and time
	81.	Request for assistance
	82.	Coast
	83.	Pre-arrangements for the delivery
	84.	Assistance to where and how
	85.	Other agencies requested
Part III	86.	Change of command
(POLFAC)	87.	Exchange of information
	88.	Names and number of
	89.	Description of equipment
	90.	ETA and arrival information
	91.	Place of embarkation
	92.	Place of disembarkation
	93-98.	Spare
	99.	Acknowledge

ADVISORS AND CONSULTANTS LIST

ADVISOR:

INTERNAL

All the members of the Board of Directors are requested to be as Advisors.

EXTERNAL

Indian Coast Guard – Chennai, Karaikal

Indian Navy – Chennai, Nagapattinam

CONSULTANTS :

1. M/S Clean Sea Enterprises
   D-440, II nd Floor, Vashi Plaza
   Sector-17, Vashi
   Navi Mumbai - 400 703, INDIA

2. NIO – GOA
3. NEERI

APPENDIX-13

Ref pages nos.75 & 89

PRESS RELEASE FORMAT

INITIAL PRESS STATEMENT FORM-POLLUTION INCIDENT
Public Statement Number 1. *An oil spill* occurred at …….. hours today at Karaikal Port, Karaikal - Pondicherry within the port limits. The location of the incident is Berth No …… / ……..NM…….from …….. of the port. The incident / accident occurred whilst the vessel M.V…… was BUNKERING / BERTHING / UN-BERTHING / LEAVING HARBOUR / ENTERING HATBOUR / at ANCHORAGE. The situation is UNDER CONTROL / NOT YET UNDER CONTROL / OUT OF CONTROL. The vessel involved in the INCIDENT / ACCIDENT is in a STABLE / UNSTABLE condition. The Emergency Response Team IS BEING / HAS ALREADY BEEN mobilized to deal with the situation. So far……LITERS / TONS of…..oil has been recovered. Weather conditions are described in the area as being VERY POOR /POOR /FAIR /FINE. Sea conditions in the area are said to be SMOOTH / MODRATE / ROUGH / VERY ROUGH / HIGH. Further statements will be issued in light of any further developments. The media, departments may contact PRO Karaikal Port, Karaikal - Pondicherry any additional information. Signature …… Name of Chief Operating Officer …… Date ……Time …… Place: ……..……..
NOTE: When typed this form must be signed by the HOD Marine / EMERGENCY CONTROL TEAM LEADER (ECR Team Leader) and forwarded to Chief Operating Officer. Under no circumstances the press statement be released to the media without the approval of the concerned authority.

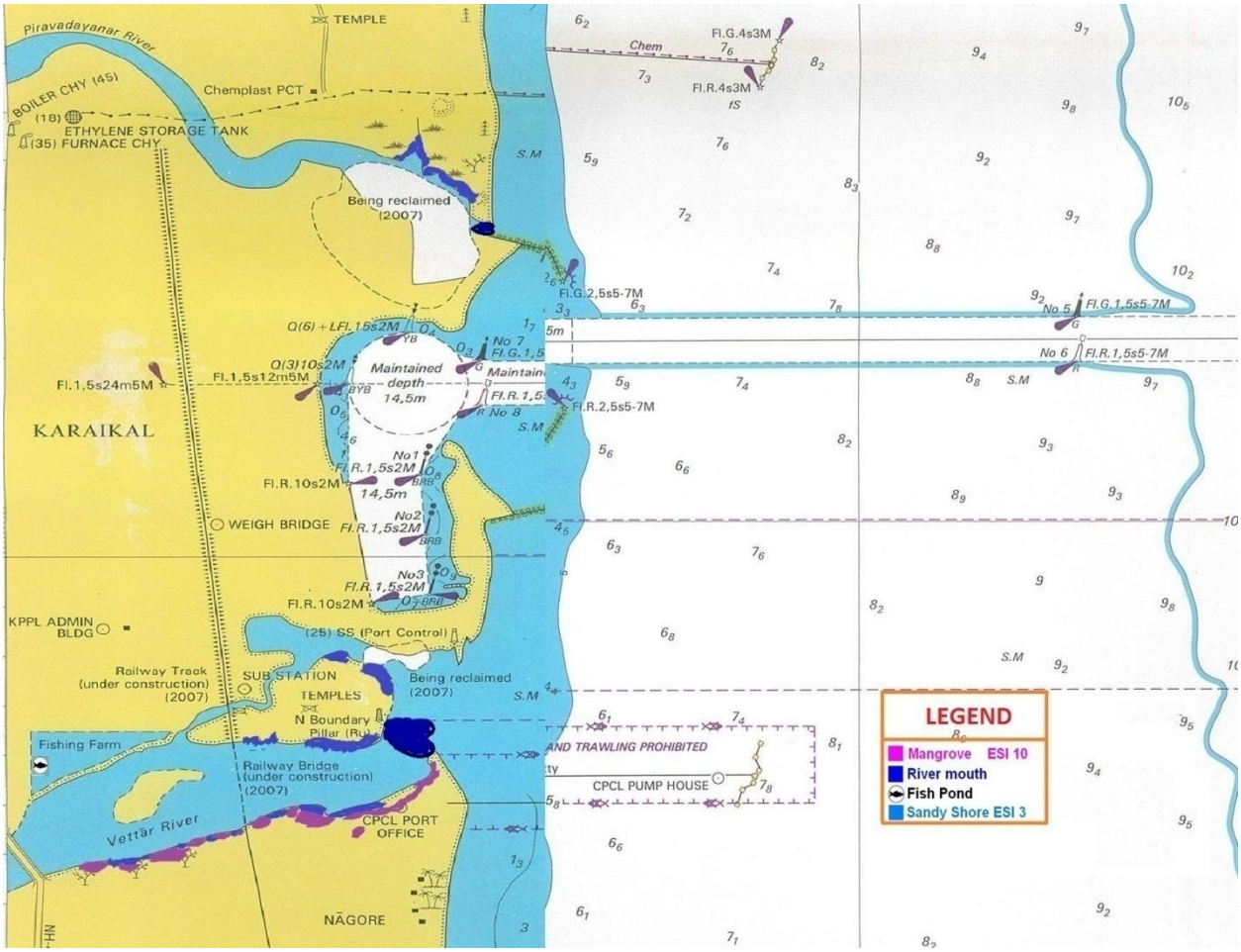
APPENDIX-14

Ref Page No.14

LIST OF PERSONNEL TRAINED IN IMO LEVEL-1 AND 2

IMO Level 1 & 2 Training Completed Employees List							
S.No.	**Emp No**	**Employee Name**	**IMO Level**	**Desg.**	**Dept.**	**TEAM**	**Contact No.**
1	KPPL0337	Capt Dharam Prakash	Level-2	HOD - Marine	Marine	OSC	9100113421
2	KPPL0035	Suresh Singh Bogal	Level-2	AGM	Marine	A/Afloat	9500048355
3	KPPL0114	Muralidhar B	Level-2	AGM	Tank Farm	B/Afloat	8754589514
4	KPPL0154	Jay Singh	Level-2	Dy. Manager	Tank Farm	A/Ashore	9677128729
5	KPPL0143	Ramachandran M	Level-1	AGM	Survey	B /Afloat	9500117204
6	KPPL0026	Narayanaswamy L	Level-1	AGM	Mechanical	A /Afloat	9677055217
7	1548593	Sivakumar GB	Level-1	Dy. Manager	Marine	B /Ashore	9677052432
8	1548594	Karmakar P.K	Level-1	Asst. Manager	Marine	A /Afloat	7550031112
9	1549737	Ravi N	Level- 1	Asst. Manager	Marine	B / Ashore	7358394110
10	KPPL0031	Karthikeyan.P	Level-1	Dy. Manager	Fire & Safety	A /Afloat	9500013722
11	KPPL0099	Rajendiran K	Level-1	Asst. Manager	EHS	B /Afloat	8754417465
12	1548558	Silambarasu.C	Level-1	Radio Officer	Marine	B /Afloat	8754484038
13	1548429	Anandaraj M	Level-1	Sr. Supervisor	Marine	B /Afloat	9840617764
14		Perumal R	Level-1	Jr. Supervisor	Fire & Safety	B /Afloat	9840998310
15		Detchanamurthy P	Level-1	Leading Fireman	Fire & Safety	B /Afloat	Nil
16	1558508	Jeevanathan S	Level-1	Supervisor	Marine	B /Ashore	8754495385
17	1550072	Jegan R	Level-1	Executive	Cargo	B /Ashore	8754502718

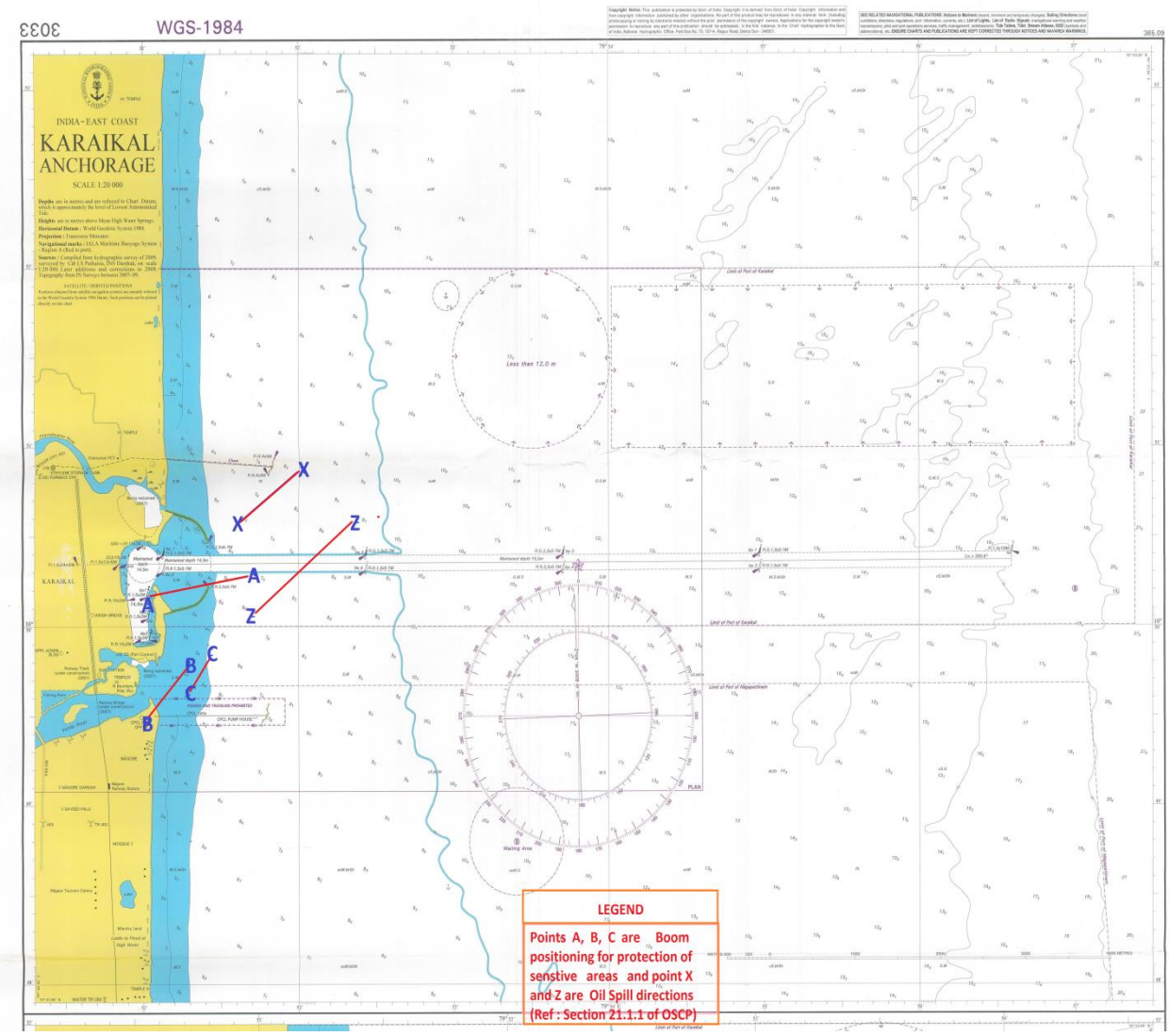
SENSITIVE AREA MAP



APPENDIX-16

Ref Page No.83

MECHANICAL RESPONSE TO SENSTIVE AREAS



LOCAL ACTION GROUP OF KARAIKAL PORT PVT LTD

Designation	Organization	Contact No.	
COO	Karaikal Port	9566153039	
Commanding Officer	Coast Guard Station, Karaikal	04368-226500	
Asst. Commandant	Coast Guard Station, Karaikal	04368-226500	
Representative	Pollution Control Board, Karaikal	04368-231540	
Director	Fishries, Karaikal	9842529184	
District Collector	Collectorate Office, Karaikal	04368-222444	**In case of spill likely to hit shoreline**
Representative	M/S CPCL, Nagore	9443278004	
Representative	M/S Chemplast Sanmar, Karaikal	9894740287	
DGM Environment	Karaikal Port	8754417461	
Head IR (PRO)	Karaikal Port	7893725789	
Head-Marine	Karaikal Port	9100113421	
AGM – Marine	Karaikal Port	8925812749	
Asst. Manager - Marine	Karaikal Port	7358394110	

SRI KATHAYEE AMMAN SERVICES

No: 3, North Street, Keelavanjore, T.R.Pattinam,
Karaikal-609606 Cell: 91 9843255626

Proprietor K. R.Rajendran

Pan: ATCPR9969E

Date: 10.02.2025

Certificate of Waste Management Services

To Whom It May Concern

This certificate is issued on behalf of M/s KATHAYEE AMMAN SERVICE, a waste management entity company, providing comprehensive waste management services to Karaikal Port Pvt. Ltd. (KPPL).

We offer waste management services that cover the entire scope of domestic solid waste generated by the Port project. This includes the collection, transportation, processing, and disposal of various types of municipal solid waste such as plastic, paper, tin, glass, cardboard, food waste, etc.

We use advanced technologies such as windrow composting, vermi-composting, etc. to ensure effective waste management solutions. We have dedicated maintain 3 vehicles for waste collection and transportation including specialized containers and trucks for various waste streams.

Our company actively participates in a range of waste management projects, contributing to the development and implementation of effective waste management strategies, and; especially we are also tied up with having valid license used by the Commissioner, Thirumalairayan Pattinam Commune Panchayat, Karaikal , Puducherry. for residue disposal.

Our processes prioritize waste reduction, recycling, and responsible disposal methods to minimize the environmental impact. Our team of waste management professionals has extensive experience in managing waste for diverse projects, including port facilities and industrial zones.

We continually invest in employee training and development to ensure the highest standards of service quality and safety. We, M/s KATHAYEE AMMAN SERVICE, hereby certify that our waste management services are capable of handling municipal solid waste generated from the Karaikal Port project at its present capacities and also for the future requirements of Port development. We are fully prepared to support and manage all waste-related aspects to facilitate the project's success.

For M/s KATHATEE AMMAN SERVICES.

For SRI KATHAYEE AMMAN SERVICES

Proprietor

K.R Rajendran

K.R.

(K.R. RAJENDRAN)
Proprietor

SRI KATHAYEE AMMAN SERVICES

No: 3, North Street, Keelavanjore, T.R.Pattinam,
Karaikal-609606 Cell: 91 9843255626

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For M/s KATHATEE AMMAN SERVICES.

For SRI KATHAYEE AMMAN SERVICES

Proprietor

K.R Rajendran

K.R.

(K.R. RAJENDRAN)
Proprietor