EXECUTIVE SUMMARY

For

Modernization and Upgradation of Chennai Fishing Harbour , Kasimedu, Chennai

By

M/s Chennai Port Authority

No 1, Rajaji Salai, Chennai - 600001

EIA Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD

CHENNAI

November -2023

Executive Summary

1. Project Description

The proposed project is the modernization and Upgradation of Chennai Fishing Harbour, Kasimedu, Chennai. At present, the Chennai Fishing Harbour is spread on **31.956 Hectares** of land area and contains **48.56 Hectares** of water spread area within its breakwaters.

As per EIA Notification 2006, the proposed project site falls under 7(e)-Ports, Harbours, Breakwaters and Dredging. The category of the project is B1.

Project Proponent: Chennai Fishing Harbour is managed and operated by the Fishing Harbour Management Committee (FHMC). The Chairman of Chennai Port Trust is the Chairman of the FHMC.

The Committee has representations from the Ministry of Fisheries, Animal Husbandry and Dairying (GoI), the Department of Fisheries (GoTN), the Marine Product Export Development Authority (MPEDA), District Administration, the Central Institute of Coastal Engineering, Police and various fisheries unions.

1.1 Environmental Sensitive Areas

This section details with the environmentally sensitive areas present within the project site and surrounding environs. It included national parks, state forest, essential habitats etc. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in below Table.

<table>
<tr><th>Sr. No</th><th>Areas</th><th colspan="3">Proposed project location boundary</th></tr>
<tr><td rowspan="12">1</td><td rowspan="12">Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value</td><td>Monuments</td><td>Dist (~km)</td><td>Direc</td></tr>
<tr><td>Old Town Wall Tondiarpet</td><td>2.27</td><td>SSW</td></tr>
<tr><td>Tomb of David Yale and Joseph Hymners in the compound of Law College Muthialpet(George Town)</td><td>4.09</td><td>SSW</td></tr>
<tr><td>Ramparts gates bastions Ravelins with vaulted chambers and water cisterns underneath moat and defense walls all round with glacis to the extent of the existing barbed wire fence Fort St. George</td><td>4.54</td><td>SSW</td></tr>
<tr><td>King’s Barracks Block No.XXV Fort St. George</td><td>4.62</td><td>SSW</td></tr>
<tr><td>Old British Infantry Officers Mess (Now housing the Fort Museum) Block No.XXXVI/2 Fort St. George</td><td>4.7</td><td>S</td></tr>
<tr><td>Guard Room Block No.V Fort St. George</td><td>4.89</td><td>SSW</td></tr>
<tr><td>St. Mary’s Church with tablets laid on the ground and enclosed by a compound and a buried wall Fort St. George</td><td>4.92</td><td>S</td></tr>
<tr><td>Clives House built in 1753 Fort St. George</td><td>4.96</td><td>SSW</td></tr>
<tr><td>Nursing Sister’s House (Block 1/3) Fort St. George</td><td>4.97</td><td>S</td></tr>
<tr><td>Big Warehouse south of the Church Library (in Block No.II/7) Fort St. George</td><td>4.98</td><td>S</td></tr>
<tr><td>Garrisons Engineer’s Depot Block No.IV Fort St. George</td><td>5.03</td><td>SSW</td></tr>
</table>

		Last house on the left of 'Snobs Allay' (oldest house in theFort with carved staircase) – Block No.I/1 Fort St. George	5.04	S
		Fort St. George "Arsenal" between Wellesley house and Clive's House with shells and cannons piled together near the Gateway Block IV/1-12 and 14-18	5.05	S
		Chaplain's house including portion which the northern side of the Old WallII/1 Fort St.George	5.06	S
		Wellesley House (Built in 1798) Block No.IV/13 Fort St. George	5.09	SSW
		Victory War Memorial	5.5	S
		Prehistoric settlement site-megalithic period Pulal	11.12	WNW
		Adyar Banyan Tree	12.8	SSW
		Memorial Pillar Anna Salai	12.95	SW

2 — Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests

Description	Dist. (~km)	Dire.
Periyathoppu Lake	6.06	NW
Kadapakkam Lake	8.37	NW
Retteri Lake/Madavaram Eri	8.91	W
Korattur Tank	11.30	W

Description	Dist (~km)	Dire~
Bay of Bengal	Site is within Bay of Bengal	
Buckingham Canal	2.17	WNW
Kodungaiyur Canal	2.35	W
Captain Cotton Canal	2.44	W
Otteri Nala	3.26	SW
Korttalaiyar/Kosisttalaiyar R	4.75	NNW
Cooum/Kuvam R	5.07	SSW
Ennur Creek	10.46	N
Adyar R	11.16	SSW
Pulal/Red Hills Lake	11.55	WNW
Canal near Padiyanallur	14.88	WNW

3 — Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration

Description	Dist (~km)	Dire~
Bay of Bengal	Site is within Bay of Bengal	
Buckingham Canal	2.17	WNW
Kodungaiyur Canal	2.35	W
Captain Cotton Canal	2.44	W
Otteri Nala	3.26	SW
Korttalaiyar/Kosisttalaiyar R	4.75	NNW
Cooum/Kuvam R	5.07	SSW
Ennur Creek	10.46	N
Adyar R	11.16	SSW
Pulal/Red Hills Lake	11.55	WNW
Canal near Padiyanallur	14.88	WNW

4 — Inland, coastal, marine or underground waters

Description	Dist (~km)	Dire~
Bay of Bengal	Site is within Bay of Bengal	
Buckingham Canal	2.17	WNW
Kodungaiyur Canal	2.35	W
Captain Cotton Canal	2.44	W
Otteri Nala	3.26	SW
Korttalaiyar/Kosisttalaiyar R	4.75	NNW
Cooum/Kuvam R	5.07	SSW
Ennur Creek	10.46	N
Adyar R	11.16	SSW
Pulal/Red Hills Lake	11.55	WNW
Canal near Padiyanallur	14.88	WNW

5	State,	Nil

	National boundaries	
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	

Description	Dist. (~km)	Dire.
SH-114(Chennai-Ennore Rd)	0.01	W
Chennai-Srikakulam Highway	3.34	SW

7	Defence installations	

Description	Dist. (~km)	Dire.
INS Adyar	5.23	S

8	Areas occupied by sensitive manmade land uses(hospitals, schools, places of worship, community facilities)	

Schools	Dist (km)	Direc
Muncipal Corporation School Tondiarpet	0.24	N
Northwick Girls Higher Secondary School	0.42	SSW
Chennai Higher Sec School Thiruvottiyur	0.47	WNW
PAN Palanisamy Higher Secondary School	0.74	WSW
Royapuram Chennai High School	0.85	SW
Corporation School CPT Colony	0.91	NW
Government School Sivan Nagar	0.93	WNW
Old Washermanpet Chennai Corporation Higher Secondary School	0.99	WSW
Sri Chaitanya school Royapuram	1.04	SSW
Chennai Port Dock Educational Higher Sec School	1.27	NNW
Government Girls Higher Sec School Sattangadu	1.71	NNW
Chennai Higher Sec School Netaji Nagar	2.17	W
Chennai Corporation School Harinarayanapuram	2.85	WSW
Government Higher Sec School Mahakavi Bharathiyar Nagar Central	3.6	W
Government High School Bakthavatsalam Colony	4.07	WSW
Government High School Kodangiyur	4.36	W
Corporation Primary School Sharma Nagar	4.5	W
Government School Chinna Kodangiyur	5.15	W
Kendriya Vidyalaya Island Grounds Park Town	5.3	SSW
Government Higher Sec School Manali	5.46	NW
Government School MMDA Layout	5.56	N
Government School Eranavur	6.48	N
Madhavaram Government High School	7.36	WNW
Chennai Higher sec school Girija Nagar	8.73	W
Kendriya Vidyalaya Gill Nagar	10.32	SW
Government Higher Sec School Kathivakkam	10.36	N
Popli Raja Government High School	10.57	WNW
Velammal Vidhyashram CBSE Surapet	11.27	W

Kendriya Vidyalaya Anna Nagar	11.55	WSW
Government school Chavadi St	12.55	W
Government High School Athipattu	13.75	N
Redhills Government Boys Higher Secondary School	14.1	WNW

Colleges	Dist (km)	Direc
Government Arts And Science College R.K.Nagar	0.8	W
Government Polytechnic College R.K.Nagar	0.85	W
Sir Theagaraya College	1.41	SW
Stanley Medical College Hospital	2.15	SW
Bharathi Women's College	2.35	SSW
V. Ramakrishna Polytechnic College	2.52	N
Thiruvottiyur Government Arts And Science College	2.79	N
Dr Ambedkar Government Arts College	3.77	WSW
Madras Law College	3.99	SSW
Government Dental College and Hospital George Town	4.38	SSW
Thiruthangal Nadar Arts College	4.53	WNW
MMC College	5.33	SSW
Tamilnadu Diploma Horticulture College	6.02	WNW
Madhavaram Tamil Nadu Veterinary and Animal Sciences University	6.03	WNW
Government Polytechnic College Purasawalkam	6.19	WSW
Government Medical College Omandurar Government Estate	6.2	SSW
University of Madras	6.21	S
CPCL Polytechnic College	6.39	NW
ST.Anne's Arts & Science College	6.68	W
Government Kilpauk Medical College	7.5	SW
Pachaiyappa's College	8.54	SW
Loyola College	9.37	SW
Stella Maris College	9.5	SSW
Govt. Siddha Medical College	9.74	WSW
Apollo Arts & Science College North Chennai	10.19	NW
Velammal Engineering College	11.46	W
Sri Nallalaghu Nadar Polytechnic College	11.81	WNW
SRM Institute Of Science And Technology Vadapalani	12.14	SW
RB Gothi Jain College For Women	13.01	WNW
Annai Violet Arts and Science College	13.51	W

Hospitals	Dist (km)	Direc
Government Peripheral Hospital Tondiarpet	0.85	W
CSI Rainy Multi Speciality Hospital	0.85	SW
Chennai Corporation Hospital Vanniyar St	1.68	SW
Government R.S.R.M Lying In Hospital	1.74	SW
Urban Primary Health Centre Balakrishna Naidu Colony	2.01	N
Govt Maternity Hospital & AYUSH Medical korukkpet	2.36	WSW

Tiruvottiyur Government Hospital	2.57	N
Urban Primary Health Center Jothi Nagar	5.05	N
Chennai Corporation Hospital Perumalpet	5.81	SW
Tamil Nadu Government Multi Super Speciality Hospital	6.17	SSW
Southern Railway Headquarters new Hospital Perambur	6.52	WSW
Madhavaram Milk Colony Government Hospital	6.67	WNW
Government Kasturba Gandhi Hospital	7.13	S
Government Maternity And Child Hospital Ayanavaram	7.63	WSW
Government Peripheral Hospital Periyar Nagar	7.9	W
Government Royapettah Hospital	8.18	SSW
Government Primary Health Center Manali New Town	8.37	NNW
Government Peripheral Hospital Anna Nagar	8.85	WSW
Urban Primary Health Centre Ennore	9.56	N
Puzhal ESI Hospital	10.71	WNW
Government Hospital Korattur	12.38	W
Primary Health Centre Naravarikuppam	13.57	WNW
Government Primary Health Centre Minjur	14.04	N

Government Buildings	**Dist (km)**	**Direc**
Sub collector office Tondiarpet	0.62	W
Coast Guard District head quarters no.5 Bharati Dock II	2.35	S
Chennai Corporation Office Thiruvottriyur	2.43	N
Chennai District Collector Office	2.89	SSW
Metropolitan Magistrate Court George Town	3.39	SSW
TN Slum Clearance Board Vyasarpadi	3.46	WSW
Vyasarpadi Post Office	3.76	W
Madras High Court	3.82	SSW
Reserve Bank Of India	4.23	SSW
Tamil Nadu Public Service Commission Esplanade	4.41	SSW
Secretariat	4.77	SSW
Chief Magistrate Court Allikulam Complex Kannappar Thidal	5.06	SSW
Greater Chennai Corporation Zonal Office 6 Pattalam	5.16	WSW
Sub Treasury Perambur	5.89	WSW
Indian Coast Guard Regional Headquarters Sathya Nagar	5.91	S
M1 Police Station Madhavaram	6.31	W
TNUSRB Pudupet	6.51	SW
Chief Metropolitan Magistrate Court Egmore	6.58	SW
Ezhilagam	6.63	SSW
Directorate of Horticulture	6.64	SSW
Tamil Nadu Minerals Limited	6.76	SSW
PWD Office	6.82	SSW
Chennai Corporation Office Perambur	7.03	WSW
Greater Chennai Corporation Zone 3 Madhavaram	7.36	WNW
Madhavaram Taluk Office	9.63	WNW

Panagal Maligai	13.84	SW
Saidapet Metropolitan Magistrate Court	14.27	SSW

Religious Places	Dist (km)	Direc
Saint Theresa's Church	0.29	S
Arunachaleswarar Temple Tondiarpet	0.53	W
Shree Sreenivasa Varadharaja Perumal Sannidhi	0.58	W
Seni Amman Temple	1.21	SW
St Roque's Church and Cemetery	1.92	SW
Arutkottam Arulmigu Murugan Temple	2.01	W
St Francis Xaviers Shrine Church	2.81	SSW
Arulmigu Thiyagarajaswamy Temple	2.87	N
Ravishwarar Shiva Temple	3.82	WSW
Sri Chenna Kesava Perumal Temple	4.17	SSW
Kandhakottam Temple	4.51	SSW
CSI St. Mary's Church	4.95	S
Palani Andavar Temple	5.4	WSW
Sri Kandaswamy Temple	5.55	WSW
Kadarkarai Sagaya Madha Chruch	5.94	NNE
Our Lady of Lourdes Church Perambur	6.11	WSW
St. Sebastian Church	6.54	W
Kasi Viswanathar Temple	6.59	WSW
Walajah Big Mosque	6.98	SSW
Shri Kailasanathar Kovil	7.2	WNW
Shri Angala Eswari Muneeswarar Temple	7.34	N
Arulmigu Sri Parthasarathyswamy Temple	7.87	SSW
St.Teresa's Church	9.1	SW
Infant Jesus Shrine Manali New Town	9.16	NNW
Kapaleeswarar temple Mylapore	10.21	SSW
Redhills Jain Temple	10.4	WNW
Velankanni Madha Church Villivakkam	10.57	W
Vadapalani Murugan Temple	11.9	SW
Sri Kurungaleeshwarar Temple	12.07	WSW
Thirumanangeeswarar Thiruvudai Amman Temple	14.21	NNW

9 Areas containing important, high quality or scarce resources, (groundwater resources, surface resources, forestry,

Description	Dist (~km)	Dire~
Bay of Bengal	Site is within Bay of Bengal	
Buckingham Canal	2.17	WNW
Kodungaiyur Canal	2.35	W
Captain Cotton Canal	2.44	W
Otteri Nala	3.26	SW
Korttalaiyar/Kosisttalaiyar R	4.75	NNW
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	agriculture, fisheries, tourism, minerals)	
10	Areas already subjected to pollution or environmental damage (those where existing legal environmental standards are exceeded)	Nil
11	Areas susceptible to natural hazard which could cause the project to present environmental problems, (earthquakes, subsidence, landslides, erosion or extreme or adverse climatic conditions)	The study area falls under Zone-III (Moderate risk) according to the Indian Standard Seismic Zoning Map. Suitable seismic coefficients in horizontal and vertical directions respectively, will to be adopted while designing the structures. The place is also prone for Cyclone and Tsunami.

1.2 Proposed Facilities

The proposed project is the modernization and upgradation of Chennai Fishing Harbour,Kasimedu,Chennai.

At present, the Chennai Fishing Harbour is spread on **31.956 Hectares** of land area and contains **48.56 Hectares** of water spread area within its breakwaters.

<table>
<tr><th>Sr. No.</th><th>Description</th><th>Details</th></tr>
<tr><td>1</td><td>Location</td><td>Kasimedu, Chennai.</td></tr>
<tr><td>2</td><td>Survey Nos.</td><td>The survey where the proposed project site is located are as follows:
3483, 3482, 3514, 3515, 3522, 3524, 4321 ,4342 ,4343, 3457, 3485, 3464,3527, 3518.
The sub-clause of the above mentioned S.F.Nos are as follows:
3312/2, 3457/1, 3457/2, 3457/3, 3463/3, 3463/4, 3464/1, 3464/2, 3473, 3482/1, 3482/3, 3483/1, 3483/2, 3483/3, 3484/1 pt, 3484/3, 3485 pt, 3514, 3515, 3518, 3522, 3524 pt, 3527/2, 3527/50, 3527/51, 3527/59, 3527/60, 3527/68, 3527/69, 3527/77, 3527/78, 3527/86, 3527/87, 3527/95, 3527/96, 3527/104, 3527/105, 3527/113, 3527/114, 3527/117, 4321, 4342, 4343 pt.</td></tr>
<tr><td>3</td><td>Area Break-up Details</td><td>
<table>
<tr><th>Sr.No</th><th>Proposed Structures</th><th>L x W (m x m)</th><th>Length (m) / Area (sq.m)</th></tr>
<tr><td>1.</td><td>Boat repair spare parts complex</td><td>15 x 15</td><td>225</td></tr>
<tr><td>2.</td><td>Fish handling shed at Trawler Wharf</td><td>100 x 27</td><td>2700</td></tr>
<tr><td>3.</td><td>Cleaning, Packaging and Cold storage complex</td><td>20 x 10</td><td>200</td></tr>
<tr><td>4.</td><td>Administrative Complex& Centralized control Block with Commercial Complex on the Ground Floor, (G+2)</td><td>25 x 15</td><td>375</td></tr>
<tr><td>5.</td><td>Two & Four wheeler parking – 1</td><td>45 x 16</td><td>720</td></tr>
<tr><td>6.</td><td>Two & Four wheeler parking – 2</td><td>44 x 35</td><td>1540</td></tr>
<tr><td>7.</td><td>Sanitary Complex</td><td>10 x 5</td><td>50</td></tr>
<tr><td>8.</td><td>Two-lane peripheral road with storm water drains, cable truff and a pedestrian path including widening and repair of existing road network</td><td>1600 x 7.5</td><td>12000</td></tr>
<tr><td>9.</td><td>Ship lifting facility and Boat Repair Yard</td><td>76x123</td><td>9348</td></tr>
<tr><td>10.</td><td>Vessel Monitoring and control system at Harbour Entrance</td><td>5x5</td><td>25</td></tr>
<tr><td>11.</td><td>Additional Fish Handling Shed at Trawler Wharf</td><td>100 x 27</td><td>2700</td></tr>
<tr><td>12.</td><td>Two Nos. Of shed over Northern wharf, supporting with existing strucuture</td><td>50x20.5</td><td>1025</td></tr>
<tr><td>13.</td><td>Truck Paved parking area facility near proposed two & four wheeler parking no1</td><td>(27x35)+(28x35)</td><td>1925</td></tr>
<tr><td>14.</td><td>Providing Two numbers of solar operated with electrical backup fish drying machine (1 Tonne capacity) including civil structure as Pilot Project</td><td>11x22</td><td>242</td></tr>
<tr><td>15.</td><td>Two wheeler and Car Parking for administrative and commercial complex and two wheeler parking shed in the Eastern side of the Administrative and commercial complex building</td><td>(22x16)+(22x4)</td><td>440</td></tr>
<tr><td>16.</td><td>Net Mending shed at southern side</td><td>30x12</td><td>360</td></tr>
<tr><td>17.</td><td>New open shed with Arabian Tent Roofing for fish cutting stalls near</td><td>2x30x5</td><td>300</td></tr>
</table>
</td></tr>
</table>

			retail shops		
		18.	Proposed rooms for stacking unsold items in the rear side of fish cutting stall	72x5	360
		19.	New open sheds with Arabian Tent roofing for prawn sale point	66x20	1320
		20.	Low Level Reservoir	11.2x7.30	81.76
		21.	Over Head Water Tank	Dia - 6m	28.26
		22.	Effluent Treatment Plant (ETP)	28.2 x11.4	321.48
		23.	Sewage Treatment Plant (STP)	6.6x12.65	83.49
		Built Up area			**36,369.99**
		24.	Dredging		4,54,214
		25.	Controlled Entry and Exit Arrangements, Elevated Compound wall and 2Nos. of Arched Entrances		1600

4	Water Requirement	During construction phase, approx 80 KLD will be required for both domestic and construction purpose. For existing, fresh water requirement of 200 KLD is been already and is sufficient for proposed phase also. The source of water will be met from dedicated pipeline from CMWSSB. Moreover, the RO Plants of capacity 25LPH & 500 LPH are to be proposed as Potable drinking water is a necessity for the users of the fishing harbour. The potable water at the harbour is primarily used in large quantities by the fishing boats (MFBs) before sailing out. On-shore fishermen, labourers, vendors, retailers and buyers also require potable water. For the storage of water, Ground Level Reservoir (GLR) and Over Head Tank (OHT) will be proposed. The water requirement given below is applicable both for Existing and Proposed Operation Phase.

Sr.No.	Description	Water Requirement (KLD)
1.	Domestic	13
2.	Flushing	20
3.	Washing (Floor/Fish)	70
4.	Mechanized Fish Boats (MFB) Requirement	97
Total		**200**

5	Power Requirement	In existing phase, 154.67KW (LT) is equipped and its sourced from TANGEDCO. The existing will be used for proposed phase also. There are no source of DG for power back up.

6	Manpower Requirement	**Sr.No.**	**Phase**	**Components**	**Requirement**
		1	Construction	Proposed	100
		2	Operation	**Existing**	
				Officers	10
				Staff	30
				Police Personnel	As per the requirement

7	Road connectivity	**Description**	**Dist. (~km)**	**Dire.**
		SH-114(Chennai-Ennore Rd)	0.01	W
		Chennai-Srikakulam Highway	3.34	SW

8	Proposed Project Cost	The total investment of the project is INR 89.62 Crore.

1.3 Hazardous waste Generation and Management

Hazardous waste materials are properly disposed as per the Hazardous and Other Wastes (Management and Trans boundary Movement) Amendment Rules, 2016. Hazardous waste collection, storage & disposal to authorized recyclers.

1.4 Solid waste generation and Management:

Sr.No	Waste type	Exisiting phase (kg/day)	Proposed phase (kg/day)	Management measure
1	Organic waste	1.44	1.44	Collected in Municipal Bins and directly disposed through Greater Chennai Corporation dumping yard at Kodungaiyur.
2	Inorganic waste	0.96	0.96	
Total		**2.4**	**2.4**	

1.5 Wastewater Generation

All the domestic sewage facilities will be equipped by proposing STP with SBR technology of capacity 40 KLD and the STP specification is attached as **Annexure 6**. Effluent generation from washing will be treated by proposing ETP of 80 KLD capacity and the ETP specification is attached as **Annexure 7**.

1.6 Decommissioning

Restoration and Rehabilitation

- The site is devoid of any forest or trees and hence there will be no change in the land use pattern and no land acquisition or conversion is required.
- Further, the site is devoid of any human habitations hence evacuation of the project-affected persons is not involved in this project.
- As per the NCCR Report, an integrated approach was used for studying the environmental parameters and biodiversity of the Chennai Fishing harbor.
- Satellite, drone images and ground truth survey indicate absence of mangroves in the study area. Mangroves are present 5.5 km and 13.5 km, North and South, respectively of the Chennai Fishing harbor.
- The closest turtle nesting site is located 13 km south, in the Besant Nagar -Neelankarai coastal stretch. Therefore, developmental activities in the Chennai Fishing harbour will have no influence on the turtle nesting sites.
- Based on the observations, we conclude that since mangroves were historically absent in the site and environmental conditions are unfavourable, plantation of mangroves is not recommended.
- Hence, no resettlement and rehabilitation issues are involved in the proposed project.

2. Description of the Environment

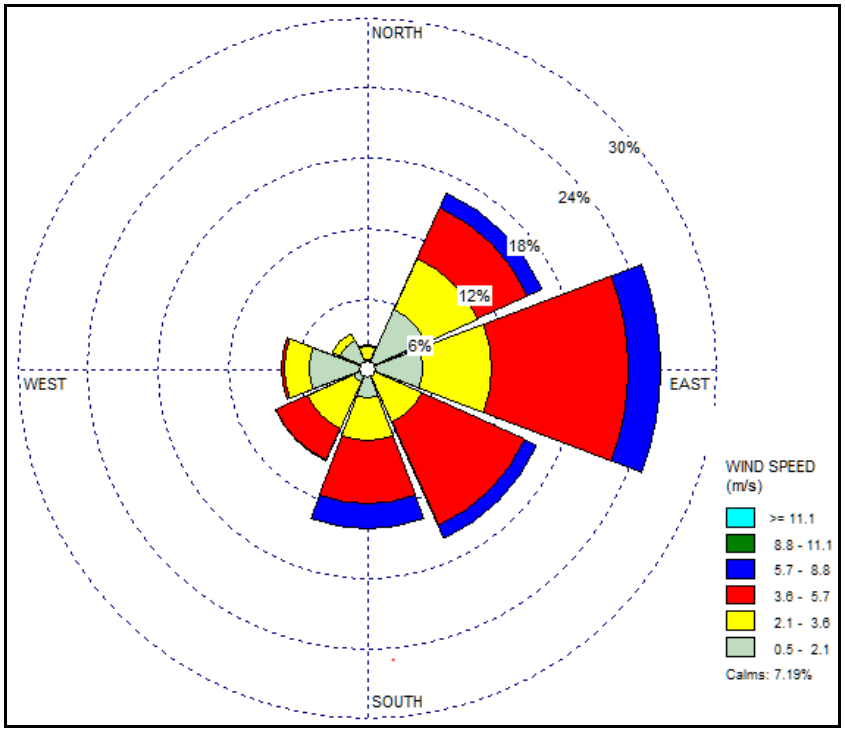
The baseline environmental studies were carried out during **Mid Jan 2023-Mid April 2023.**

2.1 Climatology

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (Km/hr)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.9	20.9	20.0	1.4	83	64	24.6	22.8	4.8	NW	NE
Feb	31.7	21.8	4.7	0.6	80	62	25.6	23.8	5.7	NW	E
Mar	34.0	23.8	3.4	0.2	76	62	25.4	26.7	7.2	S	SE
Apr	35.9	26.2	17.5	1.0	73	66	31.4	30.5	8.7	S	SE
May	38.3	27.7	49.7	1.8	65	62	30.1	31.2	9.2	SW	SE
Jun	37.5	27.4	75.4	4.5	61	58	27.4	28.9	9.1	W	SE
Jul	35.8	26.4	113.1	6.7	67	59	27.5	28.4	8.1	W	SE
Aug	34.9	25.7	141.4	8.8	71	64	28.1	29.4	7.5	W	SE
Sep	34.4	25.4	143.9	7.4	75	68	29.3	29.8	6.4	W	SE
Oct	32.6	24.6	278.3	10.6	81	74	30.1	29.7	4.9	W	E
Nov	30.4	23.2	377.3	11.5	83	75	28.5	27.4	4.6	N	NE
Dec	29.4	21.7	183.7	5.7	83	69	25.7	24.1	5.0	N	NE
Max.	**38.3**	**27.7**	**377.3**	**11.5**	**83**	**75**	**31.4**	**31.2**	**9.2**	Annual predominant wind pattern is **South East**	
Min.	**29.4**	**20.9**	**3.4**	**0.2**	**61**	**58**	**24.6**	**22.8**	**4.6**		
Avg/Total	**33.7**	**24.6**	**1408.4**	**60.2**	**75**	**65**	**28.1**	**27.7**	**6.8**		

As per the above IMD Climatological the observations drawn are the following.

- Daily maximum temperature is 38.3^{o}C and the daily minimum temperature is 20.9^{o}C were recorded in the months of May and January respectively.
- Maximum and minimum relative humidity of 83% and 58% were recorded in the months of January, November, December and June respectively.
- Maximum and minimum rainfall of 377.3mm and 3.4mm was recorded in the months of November and March respectively.
- Maximum and minimum Mean wind speed is 9.2 Km/hr and 4.6 Km/hr was recorded in the months of May and November respectively. According to the above IMD data, Annual predominant wind pattern is from **South East.**



S. No	Parameter	Observation
1.	Temperature	Max Temperature : 38°C Min Temperature : 21°C Avg Temperature : 28.32°C
2.	Average Relative Humidity	74.44%
3.	Average Wind Speed	3.01 m/s
4.	Predominant Wind Direction	East

2.2 Air environment

The ambient air quality in the study area is given below:

Parameters			Locations							
	Conc.	NAAQ Standards	Project Site	Tiruvottiyur	Royapuram	George Town	Veysarpadi	Tondiarpet	Kodangiyur	Chinna Sekkadu
			AAQ1	AAQ2	AAQ3	AAQ4	AAQ5	AAQ6	AAQ7	AAQ8
PM10 Conc. (µg/m³)	Min.	100 (24 Hours)	44.98	35.55	38.04	39.09	40.28	39.73	40.57	39.69
	Max.		64.11	50.66	54.22	55.72	57.41	56.62	57.82	56.56
	Avg.		**53.94**	**42.63**	**45.62**	**46.88**	**48.31**	**47.64**	**48.66**	**47.59**
	98th ‘tile		63.73	50.36	53.90	55.39	57.07	56.29	57.49	56.23
PM2.5 Conc. (µg/m3)	Min.	60 (24 Hours)	26.99	21.33	22.83	23.46	24.17	23.84	24.34	23.81
	Max.		38.46	30.39	32.53	33.43	34.44	33.97	34.69	33.94
	Avg.		**32.37**	**25.58**	**27.38**	**28.13**	**28.99**	**28.59**	**29.20**	**28.56**
	98th ‘tile		38.24	30.22	32.34	33.24	34.24	33.78	34.49	33.74
SO2 Conc. (µg/m3)	Min.	80 (24 Hours)	6.91	6.86	6.88	6.53	6.42	6.40	6.88	6.82
	Max.		9.85	9.77	9.81	9.31	9.15	9.13	9.81	9.72
	Avg.		**8.30**	**8.23**	**8.26**	**7.84**	**7.71**	**7.69**	**8.26**	**8.19**
	98th ‘tile		9.80	9.71	9.75	9.25	9.10	9.07	9.75	9.67
NO2Conc. (µg/m3)	Min.	80 (24 Hours)	13.83	13.70	13.68	12.96	12.76	12.71	13.68	13.57
	Max.		19.71	19.53	19.81	18.47	18.19	18.11	19.50	19.33
	Avg.,		**16.59**	**16.44**	**16.42**	**15.54**	**15.31**	**15.25**	**16.41**	**16.27**

	98th 'tile		19.59	19.42	19.55	18.36	18.08	18.01	19.39	19.22
Pb (µg/m3)	**Avg.**	**1 (24 hour)**	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)	BLQ (LOQ 0.05)
CO (mg/m3)	**Avg.**	**4 (1hour)**	0.54	0.43	0.46	0.47	0.48	0.48	0.49	0.48
Ozone(O3), µg/m3	**Avg.**	**180 (1hour)**	10.4	10.60	10.30	10.80	10.20	10.11	10.23	10.40
Benzene, µg/m3	**Avg.**	**5**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ (LOQ 1)
Benzo (a) pyrene, ng/m3	**Avg.**	**1 (Annual)**	BLQ (LOQ 1)	BLQ (LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ (LOQ 1)	BLQ(LOQ 1)
As (ng/ m3)	**Avg.**	**6(Annual)**	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)	BLQ (LOQ 2)
Ni (ng/m3)	**Avg.**	**20(Annual)**	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)	BLQ (LOQ 10)
NH3 (µg/m3)	**Avg.**	**400 (24hours)**	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)	BLQ(LOQ5)

Note: *BLQ (Below Limit of Quantification); LOQ (Limit of Quantification)*

2.3 Noise Environment

S. No	Location	Location Code	Distance (~km) from Project boundary	Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1.	Project Site	N1	Within the Site		50.5	43.4	75	70	Industrial
2.	Tiruvottiyur	N2	3.16	N	52.3	44.7	55	45	Residential
3.	Royapuram	N3	0.37	S	51.7	43.3	55	45	Residential
4.	George Town	N4	3.16	SSW	52.3	42.8	55	45	Residential
5.	Veysarpadi	N5	3.96	WSW	54.8	44.3	55	45	Residential
6.	Tondiarpet	N6	0.44	W	53.2	42.2	55	45	Residential
7.	Kodangiyur	N7	4.16	W	54.6	41.5	55	45	Residential
8.	Chinna Sekkadu	N8	4.88	NW	53.6	40.2	55	45	Residential

2.4 Soil Environment

S.No	Parameters	Units	Project Site	Tiruvottiyur	Royapuram	George Town	Veysarpadi	Tondiarpet	Kodangiyur	Chinna Sekkadu
			S1	S2	S3	S4	S5	S6	S7	S8
1.	Soil Texture	-	Sandy Clay	Clay loam	Sandy Clay	Clay loam	Sandy Clay	Clay loam	Sandy Clay loam	Clay loam
2.	Sand	%	45.2	35.4	46.2	33.1	46.5	32.7	45.6	33.4
3.	Silt	%	19.4	26.6	17.4	29.9	18.3	30.8	20.2	31.2
4.	Clay	%	35.4	38.0	36.4	37.0	35.2	36.5	34.2	35.4
5.	pH	-	7.52	7.32	7.54	7.10	7.12	7.12	7.43	6.12
6.	Electrical conductivity	µS/cm	175	157	143	168	136	129	186	182
7.	Nitrogen as N	mg/kg	120.2	115.3	110.6	115.8	120.7	95.4	98.6	105.2
8.	Phosphorus	mg/kg	5.83	5.16	4.93	5.16	5.38	4.26	4.39	4.71
9.	Potassium	mg/kg	75.25	69.82	66.79	69.82	72.86	57.68	59.50	63.75
10.	Boron	mg/kg	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)	BLQ(LOQ0.1)
11.	Cadmium	mg/k	BLQ(L	BLQ(L	BLQ(L	BLQ(L	BLQ(L	BLQ(L	BLQ(L	BLQ(L

		g	OQ 0.1)	OQ 0.1)	OQ 0.1)	OQ 0.1)	OQ 0.1)	OQ 0.1)	OQ 0.1)	OQ 0.1)
12.	**Chromium**	**mg/kg**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
13.	**Porosity**	**-**	0.42	0.75	0.42	0.73	0.42	0.74	0.42	0.71
14.	**Water holding Capacity**	**%**	15.80	17.80	15.80	17.60	16.20	17.70	19.80	18.00

Note: *BLQ – Below Limit of Quantification; LOQ – Limit Of Quantification*

2.5 Surface water quality

Parameter	Unit	Surface water standards (IS 2296 Class-A)	Marine sample near project site	Adyar River d/s	Adyar River u/s	Buckingham Canal d/s	Cooum River u/s	Buckingham Canal u/s	Otteri Nala	Cooum River d/s
			SW1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8
pH (at 25°C)	--	**6.5-8.5**	8.17	6.78	7.23	6.69	7.42	7.47	7.58	6.90
Electrical Conductivity	µS/cm	-	52008	14797	4305	40314	39369	33087	2817	43350
Total Dissolved Solids	mg/l	**500**	30233	8729	2336	23670	23135	19635	1576	26450
Total Suspended Solids	mg/l	-	19	48	41	38	46	29	25	52
Total Alkalinity as $CaCO_3$	mg/l	-	436.9	327.4	278.9	367.5	334.5	307.8	231.9	389.5
Total Hardness as $CaCO_3$	mg/l	**300**	5503.8	1563.8	574.7	4306.0	4209.3	3569.7	297.0	4813.0
Sodium as Na	mg/l	-	8924	2535	618	6982	6825	5788	481	7804
Potassium as K	mg/l	-	398	113	27	311	304	258	21	348
Calcium as Ca	mg/l	-	1249.4	355.0	130.5	977.5	955.5	810.3	67.4	1092.6
Magnesium as Mg	mg/l	-	578.4	164.3	60.4	452.5	442.4	375.2	31.2	505.8
Chloride as Cl	mg/l	**250**	13280.0	3773.3	920.0	10390.0	10156.7	8613.3	574.1	11613.3
Sulphate as SO_4	mg/l	**400**	5511.2	1565.9	381.8	4311.9	4215.0	3574.5	238.2	4819.5
Nitrate as NO_3	mg/l	**20**	2.8	5.1	4.0	3.8	6.0	3.7	3.4	4.4
Fluorides as F	mg/l	**1.5**	0.87	0.52	0.45	0.63	0.71	0.64	0.41	0.69
Cyanide	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
Arsenic	mg/l	**0.05**	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)	BLQ (LOQ 0.005)
Boron as B	mg/l	-	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
Cadmium as Cd	mg/l	**0.01**	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)	BLQ(LOQ 0.001)
Chromium, Total	mg/l	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
Copper as Cu	mg/l	**1.5**	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ	BLQ(LOQ 0.01)	BLQ(LOQ	BLQ(LOQ 0.01)	BLQ(LOQ	BLQ(LOQ

			0.01)	0.01)	0.01)		0.01)		0.01)	0.01)
Lead as Pb	mg/l	**0.1**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
Manganese as Mn	mg/l	**0.5**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
Mercury	mg/l	**0.001**	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
Nickel as Ni	mg/l	**-**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
Selenium as Se	mg/l	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
Dissolved Oxygen	mg/l	**6**	6.5	5.7	5.9	5.5	5.2	5.9	5.7	5.1
Chemical Oxygen Demand as O_2	mg/l	**-**	16.0	68.0	50.0	80.0	98.0	62.0	54.0	112.0
BOD, 3 days @ 27°C as O_2	mg/l	**2**	2.0	12.0	8.0	12.0	16.0	10.0	8.0	17.0

Note: **BLQ – Below Limit of Quantification; LOQ – Limit of Quantification**

2.6 Ground water quality

Sl. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Near Project Site	Tiruvottiyur	Royapuram	George Town	Veysarpadi	Tondiarpet	Kodangiyur	Chinna Sekkadu
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
1.	Colour	**Hazen**	**15**	**5**	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
2.	Turbidity	**NTU**	**5**	**1**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
3.	pH	**--**	**NR**	**6.5-8.5**	7.98	7.6	7.37	7.96	7.8	7.75	7.41	7.83
4.	Conductivity	**µS/cm**	**-**	**-**	2098	1887	1675	1732	1427	1526	1843	1478
5.	Total Dissolve Solids	**mg/l**	**2000**	**500**	1166	1040	911	934	802	835	1018	812
6.	Total Suspended Solids		**-**	**-**	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)	BLQ(LOQ 1)
7.	Alkalinity as $CaCO_3$	**mg/l**	**600**	**200**	301	269	234	241	198	215	261	209
8.	Total Hardness as $CaCO_3$	**mg/l**	**600**	**200**	478	427	372	390	315	348	415	338
9.	Sodium as Na	**mg/l**	**-**	**-**	221	197	172	177	178	157	191	153
10.	Potassium as K	**mg/l**	**-**	**-**	15	14	12	10	7	8	13	7

Sl. No	Parameters	Unit	Drinking water Standard (IS 10500: 2012) Permissible Limit	Drinking water Standard (IS 10500: 2012) Acceptable Limit	Near Project Site	Tiruvottiyur	Royapuram	George Town	Veysarpadi	Tondiarpet	Kodangiyur	Chinna Sekkadu
					GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8
11.	Calcium as Ca	**mg/l**	**200**	**75**	108.6	96.9	84.5	88.5	71.5	79.0	94.1	76.7
12.	Magnesium as Mg	**mg/l**	**100**	**30**	50.3	44.9	39.1	41.0	33.1	36.6	43.6	35.5
13.	Chloride as Cl	**mg/l**	**1000**	**250**	395.0	352.5	307.5	316.0	260.0	282.0	342.5	274.0
14.	Sulphate SO_4	**mg/l**	**400**	**200**	163.9	146.3	127.6	131.1	107.9	117.0	142.1	113.7
15.	Nitrate as NO_3	**mg/l**	**NR**	**45**	4.3	6.5	7.8	4.8	5.5	6.2	7.1	5.4
16.	Fluorides as F		**1.5**	**1**	0.48	0.46	0.44	0.43	0.41	0.40	0.45	0.42
17.	Cyanide	**mg/l**	**NR**	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
18.	Arsenic as As	**mg/l**	**0.05**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
19.	Boron as B	**mg/l**	**1.0**	**0.5**	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)	BQL(LOQ 0.1)
20.	Cadmium as Cd	**mg/l**	**NR**	**0.003**	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)	BQL(LOQ 0.001)
21.	Chromium as Cr	**mg/l**	**NR**	**0.05**	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)	BQL(LOQ 0.01)
22.	Copper as Cu	**mg/l**	**1.5**	**0.05**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
23.	Lead as Pb	**mg/l**	**NR**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
24.	Manganese as Mn	**mg/l**	**0.3**	**0.1**	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)	BLQ(LOQ 0.05)
25.	Mercury	**mg/l**	**NR**	**0.001**	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)	BLQ(LOQ 0.0005)
26.	Nickel as Ni	**mg/l**	**NR**	**0.02**	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)	BLQ(LOQ 0.01)
27.	Selenium as Se	**mg/l**	**NR**	**0.01**	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)	BLQ(LOQ 0.005)
28.	Zinc as Zn	**mg/l**	**15**	**5**	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)

(Note: BLQ – Below Limit of Quantification; LOQ – Limit of Quantification; NR – No Relaxation)

3. Anticipated Environmental Impacts and mitigation measures

3.1 Air environment

Construction Phase:

Activities like site clearance; site levelling movements of workers and material, construction of road, transportation activities will generate dust, gaseous pollutants and particulate matter and affect the air quality. The other impacts include -

- Site Preparation-fencing, boundary and clearing of site will cause disturbance to the surroundings.
- Release of suspended particles (sediments) from dredging activities
- Excavation, backfilling and levelling.
- Hauling and dumping of earth materials and construction spoils.
- Foundation works can cause dust generation which will decrease the air quality and it can impact the labours working.
- Fabrication, erection of steel structures.
- Construction of internal roads drains and water supply.
- Cleaning and landscaping.
- Emission from Construction Equipments

Operation Phase:

The major activity at the harbour during operational phase is:

- Fishing markets
- Catchment of fishes
- Vehicular movements for the fish exports.

- No chemical process or any manufacturing activity involved; hence there will not be any process emission.
- No gases will be emitted even during the operation phase, as the major activity during this phase will be fish handling.
- The impact of the air pollution due these will be very negligible as the proposed project is in the coastal area.

Mitigation measures

Construction sites shall be enclosed with impermeable sheets or garden nets to prevent dust carry off. Water sprinkling shall be done at vulnerable areas.

- Pollution under control certificate shall be insisted for motor vehicles and relevant machinery.

- Earth and bulk filling materials shall be covered during transportation.
- Persons working close to sources of high emission shall be provided with protective gear such as mask and caps

3.2 Noise environment
Construction Phase

Noise during construction phase will involve movement and operation of machinery and equipment as well as handling, loading, unloading of materials. Operation of mixer machines, cranes, winch machine, dumpers, pile drivers, metal works etc., as well as movement of trucks will generate noise.

Operation Phase

During operational phase, the major source of noise:

1. Motor boat movements
2. Market prone area
3. From boat repair complex (to be proposed)
4. Ship Lifting Facitlity

However, this increase in noise level will be lower compared to the construction phase.

Mitigation measures

Air horns shall be prohibited in the project area. Sounding of horns(of other types) shall be allowed only in emergency.

- Sound level monitoring shall be done as specified by TNPCB norms.
- Persons working close to equipments generating high level of noise (85 dB (A)) shall be provided with personal protective equipment such as ear plugs.

Appropriate measures for minimizing noise from use of mechanical devices will be taken by the implementing agencies /contractors by adopting damping, absorption, dissipation and deflection methods and provision of acoustic enclosures, mufflers, noise sources isolators.

3.3 Soil environment
Construction Phase:

Generation of solid wastes is inevitable during both construction and operation phases. Solid generated during construction period will constitute debris, construction wastes, discarded metal items of construction utilities, spares and equipments, tyre, dry cell / batteries, etc. in addition, domestic wastes will be generated from the temporary labour camps at project site.

The likely impacts from such wastes will be on the soil and aquatic phase if it escapes into the water body.The impacts during construction phase will be temporary in nature and confined to the construction period only.

Operation Phase:

During the operation phase solid waste will constitute fish offal, discarded fish boxes, utility and plastic items, ropes, nets, dry cell / batteries, etc. in addition to domestic waste to be generated from the eatery, dormitory, etc., within the harbour complex.

The likely impacts from such wastes will be on soil, sanitation and water quality. Impacts during this phase will be continual, for which proper management plan will be implemented required for mitigation of such impacts.

Mitigation measures

- As STP of 40 KLD and ETP of 80 KLD is to be proposed all the wastes will be directed to the same. Therefore, no discharge of any waste will be released in the land.
- The Greenbelt will be proposed at the project site taking into consideration the availability of area as the efficacy of green belt in pollution control mainly depends on width of green belt, distance from pollution sources, and site of the habitat from working place and tree height & density.
- The green belt development will be carried out in the consultation with a local forest department wherever feasible, which will help in minimizing adverse impact on the flora found in the area.

3.4 Water environment
Construction Phase:

Activities related to construction of training walls, dredging of entrance channel, land reclamation and revetment, quays, RC sloping hard, Beach landing slope, etc. will involve miscellaneous civil work, movement of construction materials, etc. which will have potential impacts.

Dredging and other construction activities will increase turbidity level in the water column. This will be short term and restricted to the construction period only.

The change in the drainage system due to construction of the training and dredging at the channel entrance with respect to tide, current and circulation will be temporary in nature and better flushing of the existing channel will offset any negative impact caused over period of time.

Operation Phase:

There will be no major impacts foreseen in the operation phase. Some of the biodegradable and non-biodegradable waste may discharge directly into the water.

Wastewater generated from the auction halls and post-cleaning process will be directed to proposed ETP and will be reused.

Mitigation measures

The water will be well stored in the Over Head Tank (OHT) and Low Level Reservoir (LLR). Drinking water arrangements by 5Nos. of RO with 25LPH capacity along with the 2Nos. of 500LPH capacity and 2Nos. of 1000L Storage Tanks. There will be no discharge of waste in direct to the water bodies as it will be emerged with the available existing 5 toilets.

3.5 Biological environment

- Sewage generated at different locations will be treated in septic tank – soak pit systems.
- Regular monitoring of the water parameters as recommended are to be made for review and further control measures, if found necessary on the basis of the monitoring reports. Monitoring reports are to be submitted to the statutory authorities at the periodicity specified by them.
- Oil spills from fishing vessels shall be contained and removed/dispersed with appropriate facilities.
- Wash-off from oil handling areas will be directed or conveyed into the effluent treatment plant consisting of bar screen, oil trap and settling unit. Sediment deposition at the training wall shall be cleared at least once in two years.
- Wash-water from auction hall will be sent to the effluent treatment plant consisting of bar screen, oil trap and settling unit.
- Washed water from the fish auction area will be connected to Effluent Treatment Plant consisting of bar screen, oil trap and settling tank prior to discharge into the sea.
- Surface water, ground water, marine water and discharge effluent quality shall be analysed regularly as detailed in the EMP.

4. Environmental Monitoring Program

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during operational phase. With the knowledge of baseline conditions, the monitoring program can serve as an indicator for any deterioration in environmental conditions due to operational phase and suitable mitigatory steps could be taken in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring. The following routine monitoring program will be implemented under the post project monitoring.

Environmental Monitoring Program during construction phase

Sr. No	Area of Monitoring	Number of Sampling Stations	Frequently of Sampling	Parameters to be Analyzed
1.	Ambient Air Quality	4 Stations	Twice a week:24 hourly period	PM10, PM2.5, SO_x, NO_x CO and TVOC

2.	Noise	4 (two within premises and two outside premises)	Weekly	Ambient Equivalent continuous Sound Pressure Levels (L_{eq}) at day and Night time.
3.	Surface water and Ground water	4 Stations (one within the premises and two outside premises)	Weekly	pH, Conductivity, TSS, TDS, BOD,COD, DO, Heavy metals (Ar, Pb, Ch, Ni etc), Chloride, Sulphate, Total Coliform
4.	Vehicular Emissions	2 Stations Inside and Outside premises	Weekly	Air emission and noise, PUC
5.	Soil	4 Stations (one within the premises and two outside premises)	Weekly	pH, Physicochemical properties like N,P,K,B,Cu,Heavy metals
6.	Terrestrial and Marine Ecology	Within 10 km radius	Weekly	Symptoms of injuries and total count of Phytoplankton, Flora, Fisheries productivity,benthic fauna .

5. Additional Studies

5.1 Risk Assessment

The Quantitative Risk Assessment study has been performed as dictated by the IS15656:2006 "HAZARD IDENTIFICATION AND RISK ANALYSIS - CODE OF PRACTICE" to give crucial insights on the hazards involved in mainly in the dredging process in the proposed project of Modernization and Upgradation of the Chennai Fishing Harbour, Kasimedu.

EVALUATE OR ACCESS THE RISK

Once the risk and affected persons have been identified, next step is to access the risk to protect the people from harm. There must be a defined risk rating to access the identified risk.

RISK RATING

One of the most simplistic forms of risk assessment is to rate the remaining risk as high, medium or low, depending on how likely the activity is to cause harm and how serious that harm might be. This is called ''Risk rating''.

LEVEL OF RISK

Low risk: It is most unlikely that harm would arise under the controlled conditions listed, and even if exposure occurred, the injury would be relatively slight.

Moderate risk: These types of risks are ones that could cause issues, but that there is still a lower chance that they will cause your work to fail. It is more likely that harm might actually occur and the outcome could be more serious. Minor injury is a typical example for this kind of risk.

High and extreme risk: These are the risks that take the highest priority. They can cause your work to fail, and you need to plan for these risks ahead of time. If injury is likely to arise and that injury might be serious like broken bones, trip to the hospital, loss of consciousness, or even a fatality.

Numerical scores are given to the different elements (e.g. consequence, exposure, likelihood) of risks and these scores are added or multiplied to get a rating for the risk.

ELEMENTS OF RISK

Probability: Risk probability, or likelihood, is the possibility of a risk event occurring. The likelihood can be expressed in both a qualitative and quantitative manner. The likelihood
is the probability of loss when a sub-standard act occurs or sub-standard condition exists.
The likelihood should be based on the worst case scenario, ranging from a remote
possibility to the inevitable. Factors affecting the likelihood include:

- Number of times the situation occurs
- Location of the hazard
- Duration of the exposure
- Environmental conditions
- Competence of the people involved

CONSEQUENCES

Consequences are the expected severity. The severity is expressed in terms of the effect on the person, whether injury or ill health, and ranging from minor injury to death. The risks are clearly higher if an accident is likely to result in serious injury or death.

RISK ANALYSIS

Once the hazard has been identified, it is necessary to assess what risk they pose to employees in the workplace. In this way we can establish a measure of the risk and determine what priority they should have for corrective actions. The risk assessment step is that part of the process that assesses the probability and consequences of hazard that have been identified. Once we have estimated the probability and consequences for each hazard then we can allocate it a priority for corrective action.

5.2 Seasonal Disaster Mapping

Features	Description
Earthquake	➢ The District is located in Zone II of seismic vulnerability as captured in the Vulnerability Atlas. ➢ While earthquakes cannot be predicted, a detailed mapping of seismic fault systems and seismic source regions, quantification of probability of experiencing various strengths of ground motion at a site in terms of return

	period for an intensity will be carried out and appropriate regulations put in place to decrease the vulnerability of built environment.
Tsunami	➢ So far as Tiruvallur District is concerned there are 3 costal talukas and as per Analysis of Mean Sea level of Tiruvallur there are 77 villages of 3 costal taluks in which Thiruvottiyur taluk are less than 1 km far from sea and on less than 10 meter of height from ocean level. ➢ Tsunami which struck the coast line of Tiruvallur District in the year 2004 took away the lives of 29 persons also caused extensive damage to property which made the livelihood of the coastal community a questionable one.
Cyclone	➢ The largest low-pressure systems are cold-core polar cyclones and extra tropical cyclones which lie on the synoptic scale. Coastal Taluks viz., Thiruvottiyur, Ponneri and Gummidipoondi with coast line of 27.9 Kms are particularly prone. ➢ Cyclones originate out at sea and become hazardous when they come ashore. They also drive the sea level up to cause coastal flooding. ➢ At a community level, the TNSDMA has provided Multi-Purpose Evacuation Shelters at 5 locations. ➢ Further, Public Buildings, Choultries, Community Halls and buildings owned by various private educational institutions have also be identified for use as cyclone shelters, for evacuation and temporary occupation.
Oil Spillage	➢ On 28th January - 2017 two ships namely MV BW Maple and MV MT Dawn Kancheepuram collided off the coast of Ernavur Village, Tiruvottiyur Taluk resulting into Bunker Oil Spill into the sea. ➢ The Tiruvallur distirct administration was actively involved in the oil spill removal process. Coast guard is the designated agency to tackle oil spill.
Fire	Fire may be caused due to earthquakes, explosions, electrical malfunctioning and various other causes. Tiruvallur District has been listed in 'very high risk' category in view of the population density, residential built-up area and Industrial areas in the district.

H: Human, A: Animals, I: Infrastructure

6. Project Benefits

6.1 Financial Benefits of the Project

- It plays a vital role in India's National Economy, contributing to the country's GDP, exports, food and nutritional security.
- The proposed activity will be a boost to the hub of the economic activity. As, the Chennai fishing harbour is one of the major harbour in our country and ninth among notified fish landing points.

6.2 Social Benefits of the Project

- Improvising the welfare of the fishermen community.

- This project will improve the livelihood of the fisher community
- This project will cater for the improvement of GDP.
- With the improvement of sanitation facilities, the health hazard including the water borne diseases are expected to be contained.
- Generation of direct and indirect employment during construction and operation phases.

7. Environmental Management Plan

Land environment

- The surface roads, which are proposed to be utilized during construction, shall be black topped to avoid fugitive dust.
- No new quarry is proposed to be specifically opened and the construction material is to be extracted from existing operating quarries, located outside the study area.
- Hence, project proponents are not required to implement management measures related to quarry slope stabilization.

Solid Waste Disposal

- Many of the waste items can be recycled and reused. This involves collecting and sorting the discarded materials suitable for recycling, paper, plastic, glass and aluminium cans, etc.
- Wet organic matter can be converted into compost. lt is advisable to have separate containers to facilitate the segregation of wastes into bio-degradable and non biodegradable components.
- Floating garbage is best collected by small boats using a scoop net or two vessels working together using a floating net boom at the designated dumping areas of the local administration. Plastic drums of 100-litre'capacity with airtight lids shall be bought and used to collect offal from fish markets or moored boats.
- Other organic fish wastes generated near the quay and auction hall area will be collected in air tight containers and sent to the organic waste composter, bio- mechanical composter of the local body.

Water Environment

- The major source of water pollution in the construction and operation phases is the sewage generated by the workers and employees. As a part of control of water pollution adequate numbers of community toilets connected to one septic tank will be constructed.

- The main source of wastewater generated during operation phase, will be the effluent generated from the fish washing, auction hall cleaning etc.
- The sewage will be generated from administrative block, toilet blocks etc. and it will be treated in septic tank.
- For treatment of sewage, an Effluent Treatment Plant and sewage treatment plant has been proposed within the fishery harbour.

Air Environment

The following measures are recommended to control air pollution:

- Contractor will be responsible for maintaining properly functioning of construction equipment to minimize exhaust.
- Construction equipment and vehicles will be turned off when not used for extended periods of time.
- Unnecessary idling of construction vehicles to be prohibited.
- Effective traffic management to be implemented.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

Control of Pollution due to Increased Vehicles

- The vehicles emitting pollutants above the standards should not be allowed to ply either in the project construction or in the operation phases.
- Vehicles and construction equipment shall be fitted with internal devices i.e. catalytic converters to reduce CO and HC emissions.
- Water sprinkling shall be done at least thrice a day at the construction sites, haul roads and other access roads.
- Measures such as covering the trucks while transporting the construction material shall be initiated to control fugitive dust as also to control the re-suspension of particulate matters from the excavated materials.
- Staff involved in construction shall be provided with suitable Personnel Protective Equipment (PPE) such as dust masks, ear plugs, gum boots, gloves, etc.
- Idling of delivery trucks or other equipment shall be avoided during loading and unloading of construction material.

Noise Environment

- It is proposed to develop a greenbelt along the road stretches. The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards.
- The construction equipment will be required to use available noise suppression devices and properly maintained mufflers.

- Ear protective devices should be used by the construction workers where they are exposed to steady noise levels above 85 dB.
- Noise from the DG set shall be controlled by providing an acoustic enclosure.
- To prevent the adverse effects of noise the exposure period of affected persons be limited as specified by Occupational Safety and Health Administration (OSHA).

Prevention of Soil Contamination

- Vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground.
- Oil interceptors will be provided within the construction camps.
- All spills and collected petroleum products will be disposed off in accordance with CPCB norms.

Traffic Management

- The following measures are recommended as a part of Traffic Management Plan.
- Local villagers will be informed about the construction schedule.
- Traffic management with diversion through alternate routes will be implemented by providing adequate sign boards.
- Upon project completion, quick clearance of debris, etc. will facilitate access by customers to local business and residents to their households.
- Placement of traffic staff to facilitate easy of movement.

Odour Management

- A number of systems and indigenous low-cost methods are applied to reduce the impact of typical odour from fishing harbour areas.
- These technologies includes Odour neutralising agents, windbreak walls, Air scrubber, Bio filter, Short, Active oxygen, Ozone treatment, etc.

First-aid posts

- It is proposed to maintain one first-aid post manned by a qualified doctor and support staff during construction phase.
- The first-aid post will have all emergency medicines and appliances required for meeting emergencies arising during construction as well as a stand-by ambulance.
- The activities of this centre will include coordinating local vector control programmes / campaigns

Social Upliftment of the Fishermen Community

- The social upliftment of the local habitations and villages will include village roads, community halls, bus shelters, footpaths, distribution of free medicine, etc.

Dredging Management Plan

- It is proposed to carry out maintenance dredging activity within the fishing harbour to facilitate effective and optional utilization of harbour. The depth of the dredging is varying from 1- 2m in accordance with the site conditions.
- The area of dredging is 4,54,214 sq.m. Quantity of dredging material is 5,60,000 Cum.
- The dredged materials are proposed to be transported through self propelled dump barge (bottom open drop barge) .
- The impact on coastal environment during construction phase would be mainly from the activities in the inter-tidal phase due to construction of fishing harbour.

Sr.No.	Potential Direct Impacts	Potential Indirect Impacts
1.	Increased sediment Loading and deterioration in water quality	Impacts to fisher revenue stream for a shorter period of time
2.	Destruction/Entanglement of fishing gears	Decreased in the supply of catchment of fishes to the market
3.	Obstruction to travel routes	Reduced water quality

Hence, as a part of the management strategy various activities shall be well coordinated and optimized to avoid time and cost, which are given below:

- As part of conservation strategy, dredging will not be carried out during the fish breeding season.
- Dredging and construction activities to be scheduled and planned to minimize the impacts on fishermen and marine ecology providing necessary mechanisms to trap the spillage of fuel / engine oil and lubricants from the construction site to minimize impacts on benthos.
- Temporary colonies of the construction workers would be established sufficiently away from the High Tide Level (HTL) with adequate sanitation facilities and waste treatment measures. Construction debris shall be disposed safely in the designated areas.
- Proper covered storage area shall be used for dumping, transporting and disposal of the dredged material from the project site to designated dumping site outside the CRZ limits.
- Vehicles transporting reclamation materials must have their loads covered using tarpaulin or canvas sheet when utilizing the public road to prevent spillage of materials that can become a source of dust pollution.
- Minimise or even prevent dewatering or overflow from dredger.
- Good practice when loading and transporting unsuitable dredged material.
- Regular maintenance of ships and barges so as to prevent accidental leaks and spillage.
- Deflectors should be installed on the draghead and to ensure marine mammal and turtle observers are on board during dredge operations.

- As part of this exercise, the dredger will be equipped with spill response kits and dredging will be carried out in confined manner to reduce the impacts on marine environment.

All the standards preparatory will be taken to reduce the impact on marine water quality. Eventhough, the impacts will be for a shorter period only.