

**Formation of New Drinking water Reservoir in Kovalam Sub Basin in between
ECR and OMR Roads for the inhabitants at Thiruporur & Thirukazhukundram
Taluks of Chengalpattu District**

RAPID ENVIRONMENTAL IMPACT ASSESSMENT REPORT

BY

**M/s. WATER RESOURCES DEPARTMENT
CHEPAUK, CHENNAI**

**(Project site falls under CRZ Zone -IB, CRZ II, CRZ III (NDZ) & CRZ IVB, it attracts the provisions of CRZ
Notification, 2011)**

Baseline study Period – (April 2025 to June 2025)

EIA Consultant



M/s. HUBERT ENVIRO CARE SYSTEMS (P) LTD

NABET/ EIA/24-27/ RA-0335

Submitted to

State Coastal Zone Management Authority,

Tamil Nadu

(November 2025)

Declaration by the Project Proponent

I, Mr.G. Karthigeyan, Executive Engineer, Water Resources Department undertakes that owing the contents (information and data) of REIA report preparation have been undertaken for the “Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the Inhabitants at Thiruporur & Thirukazhukundram Taluks of Chengalpattu District “and the information and content provided in the report are factually correct.


For, M/s. Water Resources Department
Executive Engineer, W.R.D.,
Araniyar Basin Division,
Chepauk, Chennai-5.

ACKNOWLEDGEMENT

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For, M/s. Water Resources Department
Executive Engineer, W.R.D.,
Araniyar Basin Division,
Chepauk, Chennai-5.

TABLE OF CONTENT

1	INTRODUCTION	16
1.1	Purpose of the Project and Project Background	16
1.2	Identification of the Project and Project Proponent.....	17
1.3	Need of the Project	17
1.4	Brief Description of nature of the Project.....	18
1.5	Project Cost.....	25
1.6	Scope of the study	25
1.7	Objectives of the Study	27
1.8	Methodology adopted for the Study.....	27
2	PROJECT DESCRIPTION.....	29
2.1	Type of Project	29
2.2	Need for the Project.....	29
2.3	Site location.....	32
2.4	Size or Magnitude of operation	36
2.5	Project Cost.....	36
2.6	Proposed Schedule for Approval and Implementation.....	36
2.7	Connectivity	36
2.8	Project description	37
2.9	Resource requirement.....	46
2.9.1	Land requirement.....	46
2.9.2	Water requirement	46
2.9.3	Power requirement – Construction Phase	47
2.9.4	Man power requirement.....	47
2.9.5	Municipal Solid Waste Management.....	47
2.10	Other Miscellaneous wastes	47
2.11	Hazardous waste generation and management.....	48
3	DESCRIPTION OF ENVIRONMENT.....	50
3.1	Study area and Period.....	50
3.2	Description of the Study Area, components & Methodologies.....	51
3.3	Environmentally/Ecologically Sensitive areas.....	52
3.4	Physical Conditions of PIA district.....	63
3.4.1	PIA District Profile.....	63

3.4.2	Climatic Conditions	64
3.4.3	Natural Resources of Chennai District Forest Resources.....	64
3.5	Establishment of Baseline for valued environmental components	81
3.5.1	Air Environment.....	81
3.5.2	Meteorological Conditions	81
3.5.3	Meteorological Data Collection	81
3.5.4	General Meteorological Scenario based on IMD Data.....	81
3.5.5	Meteorological data during Study Period.....	82
3.5.6	Atmospheric Inversion	83
3.6	Ambient Air Quality	84
3.6.1	Ambient Air Quality Monitoring Stations	84
3.6.2	Ambient Air Quality Monitoring Techniques and Frequency.....	85
3.6.3	Results and Discussions	91
3.7	Noise Environment.....	91
3.7.1	Results and Discussions	96
3.8	Water Environment	97
3.8.1	Surface Water Resources.....	97
3.8.2	Surface Water Quality Assessment.....	97
3.8.3	Groundwater resources	107
3.8.4	Groundwater Quality Assessment	110
3.9	Soil Quality.....	119
3.9.1	Results and Discussions	126
3.10	Biological Environment.....	126
3.10.2	Bird Survey and Data Analysis	126
3.10.3	Other Fauna Study	127
3.11	Socio Economic profile	146
3.11.1	Socio Economic Aspects	146
3.11.2	Social Economic Profile of the study area.....	148
4	ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	164
4.1	Details of Investigated Environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project.....	164
4.2	Construction Phase	164
4.2.1.1	Air Environment.....	164

4.2.1.2 Meteorological Data.....	165
4.2.1.3 AERMET Process	165
4.2.1.4 AERMOD Process	166
4.2.1.5 Emission	166
4.2.1.6 Conclusion.....	172
4.2.1.7 Sources of Impacts.....	182
4.2.1.8 Mitigation Measures	182
4.2.2 Noise Environment.....	182
4.2.2.1 Sources of Impacts.....	182
4.2.2.2 Mitigation Measures	183
4.2.3 Land Environment.....	183
4.2.3.1 Impacts.....	183
4.2.3.2 Mitigation measures	183
4.2.4 Water environment.....	183
4.2.4.1 Impacts.....	183
4.2.4.2 Mitigation measures	183
4.2.4.3 Wastewater management.....	183
4.2.4.4 Waste Generation.....	183
4.2.4.5 Ecology	183
4.2.4.6 Social environment	183
4.3 Operation Phase	184
4.3.1 Air Environment.....	184
4.3.2 Noise Environment.....	184
4.3.3 Water Environment	184
4.3.3.1 Sources of Impacts.....	184
4.3.3.2 Mitigation Measures	184
4.3.4 Soil and sediment.....	184
4.3.4.1 Sources of Impacts.....	184
4.3.5 Mitigation Measures	184
4.4 Traffic study	184
5. ANALYSIS OF ALTERNATIVES	188
5.1 Introduction	188
5.2 Alternate locations	188
6. ENVIRONMENTAL MONITORING PROGRAM.....	192

6.1	Introduction	192
6.2	Objectives	192
6.3	Environmental Monitoring Programme.....	193
6.3.1	Monitoring Programme for Construction Phase.....	193
6.3.2	Monitoring Programme for Operation Phase.....	194
6.4	Institutional Set-up for Monitoring	195
6.5	Legal and Statutory compliance.....	196
6.6	Information Dissemination and Public Relations.....	196
6.7	Greenbelt Development	196
7.	ADDITIONAL STUDIES	199
7.1	IMPACT ASSESSMENT AND HABITAT MITIGATION PLAN OF KAZHUVELI WETLANDS	199
7.2	Risk Assessment.....	217
7.2.1	Purpose of the Report	217
7.2.2	Hazard Identification and Risk Assessment (Hira) Study.....	217
7.2.2.1	Introduction	217
7.2.2.2	Risk Assessment Steps.....	217
7.2.2.3	Hazard Identification.....	218
7.2.2.4	Types of Hazards.....	218
7.2.3	Hazard Identification and Risk Assessment Matrix	218
7.3	Disaster Management Plan	227
7.3.1	ONSITE DISASTER MANAGEMENT PLAN.....	227
7.3.1.2	Objectives of the Disaster Management Plan	227
7.4	Hydrological Modelling and Water Balance Analysis	227
8.	PROJECT BENEFITS.....	232
8.1	Financial Benefits of the Project.....	232
8.2	Social Benefits of the Project.....	232
8.3	Employment potential–skilled; semi-skilled and unskilled	232
8.4	Other tangible benefits	233
9.	ENVIRONMENTAL COST BENEFIT ANALYSIS.....	235
10.	ENVIRONMENTAL MANAGEMENT PLAN	237

10.1	Description of the administrative aspects of ensuring that mitigate measure are implemented and their effectiveness monitored	237
10.2	Objectives of EMP	237
10.3	EMP Roles and Responsibilities	238
10.4	Responsibilities of Environmental Management Cell	238
10.4.1	EMP for construction phase	240
10.4.2	EMP for operation phase	241
10.5	Budgetary Provisions for EMP	244
11.	SUMMARY & CONCLUSION	246
11.1	Summary of the Project	246
11.2	Conclusion	248
12	DISCLOSURE OF CONSULTANT	251
12.1	Brief Profile of Hubert Enviro Care Systems (P) Limited (HECS)	251

LIST OF FIGURE

FIGURE 1.1 LOCATION MAP OF THE STUDY AREA	25
FIGURE 2-1 PROPOSED PROJECT LAYOUT	30
FIGURE 2.2 CRZ DELINEATION MAP 1:4000 SCALE.....	31
FIGURE 2.3 TOPO MAP OF THE STUDY AREA	32
FIGURE 2-4 GOOGLE IMAGE OF 1 KM RADIUS.....	33
FIGURE 2-5 GOOGLE IMAGE OF 5 KM RADIUS.....	34
FIGURE 2-6 GOOGLE IMAGE OF 10 KM RADIUS.....	35
FIGURE 3-1 TOPO MAP OF STUDY AREA	52
FIGURE 3-2 ENVIRONMENTAL SENSITIVE AREAS COVERING WITHIN 15 KM FROM PROJECT BOUNDARY-1	62
FIGURE 3-3 ENVIRONMENTAL SENSITIVE AREAS COVERING WITHIN 15 KM FROM PROJECT BOUNDARY-2	63
FIGURE 3-4 GEOLOGY & MINERAL MAP OF CHENGALPATTU, TAMIL NADU, HIGHLIGHTING THE PROJECT SITE	66
FIGURE 3-5 CONTOUR MAP OF THE STUDY AREA.....	68
FIGURE 3-6 SOIL MAP OF CHENGALPATTU, HIGHLIGHTING THE PROJECT SITE	71
FIGURE 3-7 GEOMORPHOLOGY MAP OF STUDY AREA	73
FIGURE 3-8 LAND USE MAP OF THE STUDY AREA	75
FIGURE 3-9 HYDROGEOLOGY MAP OF PIA DISTRICT	77
FIGURE 3-10 MAP OF THE FLOOD ZONES IN TAMIL NADU, HIGHLIGHTING THE PROJECT SITE	78
FIGURE 3-11 MAP OF THE WIND & CYCLONE ZONES IN TAMIL NADU, HIGHLIGHTING THE PROJECT SITE.....	79
FIGURE 3-12 SEISMICITY MAP OF TAMIL NADU, HIGHLIGHTING THE PROJECT SITE.....	81
FIGURE 3-13 WIND ROSE DURING APRIL 2025 TO JUNE 2025	83
FIGURE 3-14 ATMOSPHERIC INVERSION LEVEL AT THE PROJECT SITE.....	84
FIGURE 3-15 MAP SHOWING THE AMBIENT AIR QUALITY MONITORING LOCATIONS	85
FIGURE 3-16 TRENDS OF MEASURED AMBIENT CONCENTRATIONS IN THE STUDY AREA.....	90
FIGURE 3-17 MAP SHOWING THE NOISE MONITORING LOCATIONS.....	95
FIGURE 3-18 MAP SHOWING THE SURFACE WATER MONITORING LOCATIONS	101
FIGURE 3-19 DEPTH TO WATER LEVEL DURING PRE-MONSOON & POST MONSOON IN KANCHEEPURAM, TAMIL NADU.....	109
FIGURE 3-20 MAP SHOWING THE GROUNDWATER MONITORING LOCATIONS.....	112
FIGURE 3-21 MAP SHOWING THE SOIL MONITORING LOCATION.....	121
FIGURE 4-1 WIND ROSE DIAGRAM OF METEOROLOGICAL DATA CONSIDERED FOR MODELLING.....	165
FIGURE 4-2 PREDICTED 24-HRS GLC'S OF PARTICULATE MATTER PM WITHIN 10 KM RADIUS OF THE STUDY AREA	168
FIGURE 4-3 PREDICTED 24-HRS' GLC'S OF SO2 WITHIN 10 KM RADIUS OF THE STUDY AREA	169

FIGURE 4-4 PREDICTED 24-HRS' GLC'S OF NO_x WITHIN 10 KM RADIUS OF THE STUDY AREA	170
FIGURE 4-5 PREDICTED 1-HRS' GLC'S OF CO WITHIN 10 KM RADIUS OF THE STUDY AREA..	171
FIGURE 4-6 PREDICTED 24-HRS GLC'S OF PARTICULATE MATTER PM WITHIN 10 KM RADIUS OF THE STUDY AREA	173
FIGURE 4-7 PREDICTED 24-HRS' GLC'S OF NO_x WITHIN 10 KM RADIUS OF THE STUDY AREA	174
FIGURE 4-8 PREDICTED 1-HRS' GLC'S OF CO WITHIN 10 KM RADIUS OF THE STUDY AREA	175
FIGURE 4-9 PREDICTED 24-HRS GLC'S OF PARTICULATE MATTER PM WITHIN 10 KM RADIUS OF THE STUDY AREA	178
FIGURE 4-10 PREDICTED 24-HRS' GLC'S OF SO₂ WITHIN 10 KM RADIUS OF THE STUDY AREA	179
FIGURE 4-11 PREDICTED 24-HRS' GLC'S OF NO_x WITHIN 10 KM RADIUS OF THE STUDY AREA	180
FIGURE 4-12 PREDICTED 1-HRS' GLC'S OF CO WITHIN 10 KM RADIUS OF THE STUDY AREA	181

LIST OF TABLES

TABLE 1-1: SALIENT FEATURES OF THE PROJECT	19
TABLE 2-1 AREA DETAILS	29
TABLE 2-2 CONNECTIVITY OF THE PROJECT SITE	36
TABLE 2-3 MAN POWER REQUIREMENT	47
TABLE 2-4 SOLID WASTE GENERATION AND MANAGEMENT – CONSTRUCTION PHASE.....	47
TABLE 3-1 ENVIRONMENTAL SENSITIVE AREAS WITHIN 15KM FROM PROJECT BOUNDARY	52
TABLE 3-2 GEOMORPHOLOGY PATTERN OF THE STUDY AREA.....	71
TABLE 3-3 LAND USE/LAND COVER STATISTICS FOR STUDY AREA.....	74
TABLE 3-4 CLIMATOLOGICAL SUMMARY-CHENNAI (MINAMBAKKAM) (1991-2020)	81
TABLE 3-5 METEOROLOGY DATA FOR THE STUDY PERIOD (APRIL 2025 TO JUNE 2025).....	83
TABLE 3-6 DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS.....	84
TABLE 3-7 ANALYTICAL METHODS FOR ANALYSIS OF AMBIENT AIR QUALITY PARAMETERS (NAAQ)	86
TABLE 3-8 SUMMARY OF THE AVERAGE BASELINE CONCENTRATIONS OF POLLUTANTS.....	87
TABLE 3-9 AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE	92
TABLE 3-10 DAY AND NIGHT EQUIVALENT NOISE LEVELS	93
TABLE 3-11 TEST METHODS USED FOR THE ANALYSIS OF WATER QUALITY PARAMETERS..	97
TABLE 3-12 DESIGNATED BEST USE WATER QUALITY CRITERIA	99
TABLE 3-13 DETAILS OF SURFACE WATER SAMPLING LOCATIONS.....	100
TABLE 3-14 PHYSICOCHEMICAL PARAMETERS OF SURFACE WATER SAMPLES FROM THE STUDY AREA.....	102
TABLE 3-15 DISTRIBUTION OF SAFE AND SEMI-CRITICAL UNITS OF THIRUPORUR TALUK, CHENGALPATTU DISTRICT (WRD, 2022 – G.O. (MS.) NO. 15)	108
TABLE 3-16 DETAILS OF GROUNDWATER QUALITY MONITORING LOCATIONS	110
TABLE 3-17 PHYSICOCHEMICAL ANALYSIS OF GROUNDWATER SAMPLES FROM STUDY AREA	113
TABLE 3-18 SOIL & SEDIMENT QUALITY MONITORING LOCATIONS	120
TABLE 3-19 PHYSICOCHEMICAL PARAMETER OF SOIL SAMPLES FROM THE STUDY AREA ..	122
TABLE 3-20 SOCIAL INDICATORS	147
TABLE 3-21 EXISTING INDUSTRIES DETAILS.....	148
TABLE 3-22 POPULATION PROFILE WITHIN THE STUDY AREA	149
TABLE 3-23 SUMMARIES OF EMPLOYMENT AND LIVELIHOOD WITHIN THE STUDY AREA...154	
TABLE 3-24 LITERATES POPULATION AND THE PERCENTAGE WITHIN THE STUDY AREA ..158	
TABLE 3-25 SUMMARIES OF SOCIO-ECONOMIC INDICATORS WITHIN THE STUDY AREA.....162	
TABLE 4-1 STACK EMISSIONS FOR PROPOSED PROJECT	167
TABLE 4-2 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF PARTICULATE MATTER PM OBTAINED THROUGH MODELING	168
TABLE 4-3 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF SULFUR DIOXIDE OBTAINED THROUGH MODELING	169
TABLE 4-4 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF OXIDE OF NITROGEN OBTAINED THROUGH MODELING	170

TABLE 4-5 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF CARBON MONOXIDE OBTAINED THROUGH MODELING	171
TABLE 4-6 TOTAL MAXIMUM GLCS FROM THE STACK EMISSIONS	172
TABLE 4-7 TRANSPORTATIONS EMISSIONS FOR PROPOSED PROJECT	172
TABLE 4-8 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF PARTICULATE MATTER PM OBTAINED THROUGH MODELING	173
TABLE 4-9 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF OXIDE OF NITROGEN OBTAINED THROUGH MODELING	174
TABLE 4-10 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF CARBON MONOXIDE OBTAINED THROUGH MODELING	175
TABLE 4-11 TOTAL MAXIMUM GLCS FROM THE TRANSPORTATIONS EMISSIONS	176
TABLE 4-12 STACK & TRANSPORTATIONS EMISSIONS (CUMULATIVE) FOR PROPOSED PROJECT	177
TABLE 4-13 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF PARTICULATE MATTER PM OBTAINED THROUGH MODELING	178
TABLE 4-14 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF SULFUR DIOXIDE OBTAINED THROUGH MODELING	179
TABLE 4-15 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF OXIDE OF NITROGEN OBTAINED THROUGH MODELING	180
TABLE 4-16 ESTIMATED TOP 10 HIGHEST CONCENTRATIONS OF CARBON MONOXIDE OBTAINED THROUGH MODELING	181
TABLE 4-17 TOTAL MAXIMUM GLCS FROM THE STACK EMISSIONS	182
TABLE 4-18 TRAFFIC VOLUME AFTER IMPLEMENTATION OF THE PROJECT	185
TABLE 6-1 ENVIRONMENTAL MONITORING PROGRAM DURING CONSTRUCTION PHASE	194
TABLE 6-2 POST PROJECT ENVIRONMENTAL MONITORING PROGRAM	195
TABLE 10-1 DETAILS OF EMP BUDGET.....	244

<u>LIST OF ACRONYMS</u>	
°C	DEGREE CELSIUS
BLQ	BELOW LIMIT OF QUANTIFICATION
BOD	BIOCHEMICAL OXYGEN DEMAND
COD	CHEMICAL OXYGEN DEMAND
CPCB	CENTRAL POLLUTION CONTROL BOARD
CRZ	COASTAL REGULATION ZONE
CZMP	COASTAL ZONE MANAGEMENT PLAN
DG	DIESEL GENERATOR
DMP	DISASTER MANAGEMENT PLAN
EIA	ENVIRONMENTAL IMPACT ASSESSMENT
EMS	ENVIRONMENTAL MANAGEMENT STUDIES
EMP	ENVIRONMENTAL MANAGEMENT PLAN
ETP	EFFLUENT TREATMENT PLANT
GLC	GROUND LEVEL CONCENTRATION
HTL	HIGH TIDE LINE
IMD	INDIA METEOROLOGICAL DEPARTMENT
IRS	INSTITUTE OF REMOTE SENSING
KLD	KILO LITER PER DAY
KVA	KILOVOLT AMPERE
LPA	LITRE PER ANNUM
LOQ	LIMIT OF QUANTIFICATION
LTL	LOW TIDE LINE
MOEF&CC	MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
MSL	MEAN SEA LEVEL
NAAQ	NATIONAL AMBIENT AIR QUALITY STANDARDS
NABL	NATIONAL ACCREDITATION BOARD FOR TESTING AND CALIBRATION LABORATORIES
NR	NO RELAXATION
RMC	READY MIX CONCRETE
QCI NABET	QUALITY COUNCIL OF INDIA NATIONAL ACCREDITATION BOARD FOR EDUCATION AND TRAINING
RA	RISK ASSESSMENT
TDS	TOTAL DISSOLVED SOLIDS

<u>List of Annexure</u>	
Annexure 1	Soil Investigation report
Annexure 2	Project Layout
Annexure 3	HEC HMS Study Report
Annexure 4	Carrying capacity of canals
Annexure 5	Project cost breakup
Annexure 6	Affidavit for Land
Annexure 7	Detailed project report
Annexure 8	Risk Assesment & DMP
Annexure 9	CRZ Map 1:4000 scale Map
Annexure 10	CRZ Map 7km radius
Annexure 11	CRZ report
Annexure 12	ToR Minutes

CHAPTER 1

INTRODUCTION

1 Introduction

1.1 Purpose of the Project and Project Background

The Government of Tamil Nadu has made several attempts to ensure water security in Chennai and the Chennai Metropolitan Area (CMA). However, the increasing water scarcity poses a significant challenge, particularly in a context where urban expansion has been rapid alongside swift industrialization programs. The significant rise in population density further exacerbates this challenge.

Rapid urban and industrial expansion in Chennai has led to considerable changes in land use, contributing to increased consumption of both surface and groundwater. This has impacted the region in several ways:

1. The expansion of land use has adversely affected the existing drainage systems; and
2. The available quantity of water consistently falls short of the increasing demand, leading to a growing gap between water supply and demand each year.

Furthermore, groundwater is overexploited in most parts of the CMA, resulting in seawater intrusion. Although the total annual rainfall has not decreased, the number of rainy days has reduced, affecting overall water availability.

The water needs of Chennai city and the CMA continue to grow due to demographic pressures and rising inter-sector demand, for domestic, industrial, commercial, infrastructural, and ecological purposes. While the average drinking water supply in Chennai is around 700 to 800 million litres per day (MLD), the current demand exceeds 1100 MLD. This demand is expected to double in the next decade. The water needs of the broader CMA region also remain uncertain and largely unmet.

Although the Government of Tamil Nadu has initiated several water augmentation measures, such as the installation of seawater desalination plants, Chennai's water supply situation remains precarious. Compounding these challenges are the extreme events induced by climate change.

In light of this, more conscious and integrated efforts are necessary. These include conserving surface runoff, recharging groundwater, constructing new reservoirs, and ensuring that conservation and augmentation measures also contribute to flood and drought mitigation.

The formation of coastal reservoirs represents a paradigm shift in water resource development. Instead of storing water in mountainous dams, which capture runoff from limited portions of the catchment, coastal reservoirs allow for the storage of water in Estuaries, capturing excess floodwaters from the entire catchment area. One of the key advantages of coastal reservoirs is that natural environmental flows can be maintained while simultaneously capturing excess floodwaters at the end of the catchment to mitigate flooding and support water resource development.

1.2 Identification of the Project and Project Proponent

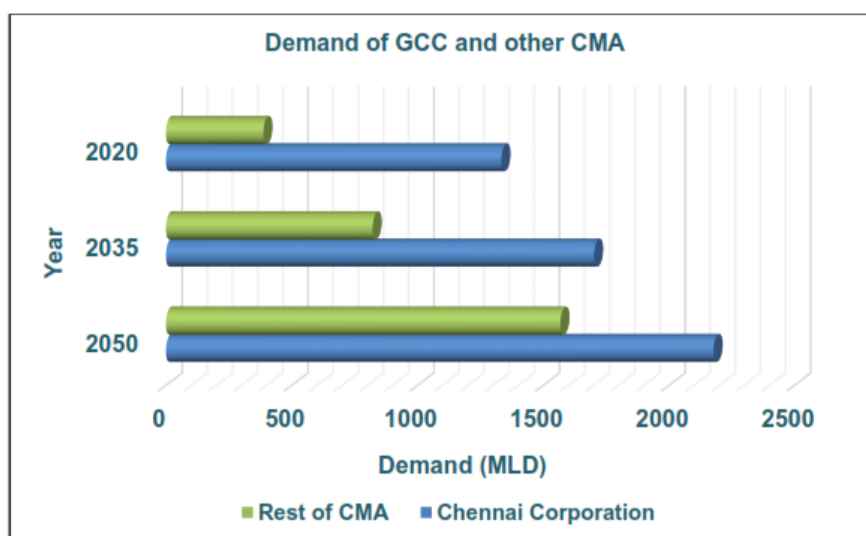
The Department of Water Resources is one of the departments of Government of Tamil Nadu. The department was split from the Public works department in June 2021 and is responsible for the management and conservation of water bodies in the state. The WRD is structured around a river basin framework, divided into four regional offices located in Chennai, Trichy, Madurai, and Coimbatore. Each region is managed by a Chief Engineer who oversees basin management within their jurisdiction.

1.3 Need of the Project

The city faces various challenges related to surface water availability, pollution, over-extraction, infrastructure limitations, and the impact of climate change. The per capita water supply and consumption changes according to the peoples' habits and it is generally more in megacities compared to villages and small towns. The water supply assumed by the CMWSSB in the core city and in CMA area is as follows: The per capita water supply of 150 lpcd is considered for adoption to Chennai Corporation and the rest of the CMA is categorized into Urban and Rural; for the urban Area, 135 lpcd up to intermediate stage (2035) and 150 lpcd for ultimate stage (2050), has been considered. On this basis, the estimated demand in the core city and in the CMA.

Description	2015	2020	2035	2050
	(in MLD)			
GCC	922	1333	1702	2178
Rest of CMA	214	387	821	1568
Total	1136	1720	2523	3746

Source : CMWSSB



1.4 Brief Description of nature of the Project

The new drinking water reservoir formation under Phase I will be in an extent of (1770.5 ha) **4375 acres** vested with WRD & Revenue lands. The site can be accessed from Kelambakkam – Kovalam Link Road on the North, Thiruporur – Nemmeli link Road in the middle and OMR – ECR connecting Bypass Road on the South near Mamallapuram. The Reservoir site is bounded by the ECR Road on the eastern periphery, OMR Road on the western periphery and Muttukadu – Kovalam on the North and Mamallapuram on the South.

The overall catchment area is identified as **41,408 hectares** (ha), of which 29,642 Ha are intercepted by a cascade system of 69 tanks in Thaiyur, Manamathy, and other minor groups. The remaining free catchment area of **11,766 ha** is available to feed the proposed reservoir.

Land use in the catchment is dominated by agricultural fields, fallow lands, and forested areas. The current average bed level of the site is +0.350m, the foreshore level is +1.800m, and the Full Reservoir Level (FRL) is +3.000m. The plan involves excavation of bund and levees of kazhuveli area, top soil of

water spread area and constructing a foreshore bund along with a peripheral catchment drain to prevent localized inundation. With a total storage depth of 3.00 meters and a water spread area of 17.71 square kilometers, the proposed reservoir is expected to achieve a single filling storage capacity of approximately 1.655 TMC with an annual storage of 2.25TMC. The reservoir will indirectly augment groundwater recharge, check seawater intrusion, and directly supplement the Chennai city water supply with up to 170 MLD for nine months each year.

Table 1-1: Salient features of the project

S.No	Features	Description																																																									
1	Name of the project	Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the inhabitants in Thiruporur & Thirukazhukundram Taluks of Chengalpattu District																																																									
2	Name of the Proponent	M/s. Water Resources Department																																																									
3	Project Location	Village: Thiruvидanthai,Kalavakkam,Nemmeli,Thiruporur,Thandalam, KrishnanKaranai,Pattipulam,Paiyanur,Saluvankuppam,Mamallapuram. Taluk : Thiruporur, Thirukalukundram District: Chengalpattu State: Tamil Nadu																																																									
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11	Historical/ Archaeological Place/ Monuments	Monuments Small Monolithic Temples known as Valiankuttai Ratha (unfinished) Mamallapuram Two small monolithic Temples known as the Pidari Amman Ratha (unfinished) Mamallapuram Mukundanayanar Temple (half buried in sand to the north of the village) Two inscribed rocks one having six and the other fifty lines of ancient Tamil inscriptions with remains of other ancient buildings Saluvankuppam Rock cut Siva Temples with three lingas Huge stone figures of a lion elephant and a bull Mamallapuram Triple celled rock-cut shrine with Gopi's churn in front of it Triple celled rock-cut shrine with Gopi's churn in front of it Mamallapuram Kotikal Mantapa Mamallapuram Rock cut sculptures representing a group of elephants monkeys and peacock Mamallapuram Two rock-cut cave Temples at the northeast corner of the Koneri Pallam Tank Mamallapuram Tiger headed rock-cut Temple Saluvankuppam Krishna's Butterball Mamallapuram Rock-cut Ganesa Temple Mamallapuram Droupadi's Bath Mamallapuram Rock-cut Varaha temple containing Varaha and Vamana Incarnations of Vishnu Mamallapuram Arjuna's Penance Mamallapuram Royagopuram (unfinished) Mamallapuram Eight stone images on a masonry Platform known as the "Seven pidaris" Mamallapuram Unfinished Ratha and stone couch Mamallapuram Unfinished Rock cut cave Temple North of Krishna Mantapa Mamallapuram Two Unfinished Excavations Near The Light House Mamallapuram Krishna Madapa Mamallapuram	Distance~km 0.46km 0.56km 0.61km 0.70km 0.71km 0.74km 0.75km 0.75km 0.75km 0.75km 0.76km 0.79km 0.85km 0.85km 0.87km 0.91km 0.91km 0.91km 0.92km 0.93km 0.94km 0.95km	Direction S S E E W SE SE SE SE SSE W SE SE SSE SE SE SSE ESE SSE SE SSE SE

	Unfinished Excavations Near Triple Celled Rock Cut Shrine Mamallapuram	1.10km	SSE
	Unfinished Excavations South Of Draupadi Rath Mamallapuram	0.98km	SSE
	Dolotsava Mandapa Mamallapuram	1.06km	SE
	Iswara Temple Mamallapuram	1.11km	SSE
	Large unfinished rock sculpture similar to Arjuna's Penance near the light-house Mamallapuram	1.14km	SSE
	Dharmaraja's Rock cut throne Mamallapuram	1.17km	SSE
	Mahishasura rock standing in the sea north of Shore Temple Mamallapuram	1.46km	ESE
	Aleva shore Temple Mamallapuram	1.52km	SE
	Two small carved rocks to the south of the shore Temple Mamallapuram	1.58km	SE
	Megalithic cists and cairns Tirupporur	1.70km	W
	Arjuna's Rath Mamallapuram	1.73km	S
	Sahadeva's Rath Mamallapuram	1.73km	S
	Bhima's Rath Mamallapuram	1.74km	S
	Dharmaraja's Rath Mamallapuram	1.76km	S
	Megalithic cists and cairns Kanakapattu	1.86km	W
	Nithya Kalyanaswami Temple Tiruvidanthai	2.89km	NNE
	Urn burials Alathur	3.83km	W
	Megalithic cists and cairns Madayathur	4.50km	W
	Megalithic cists and cairns Sirudavur	5.18km	W
	Megalithic cists and cairns Porundavakkam	5.62km	W
	Megalithic cists and cairns Manamai	5.97km	SSW
	Megalithic cists and cairns Amur	6.77km	W
	Megalithic cists and cairns Atcharavakkam	7.18km	W
	Megalithic cists and cairns Agaram	7.12km	W
	Megalithic cists and cairns Padur	7.16km	N
	Megalithic cists and cairns Vembedu	7.58km	W
	Group of cairns and cists Sembakkam	8.63km	W
	Megalithic cists and cairns Mailai	8.89km	W
	Megalithic cists and cairns Kottamedu	9.05km	W
	Megalithic cists and cairns with stone circles Edakunram	9.33km	W
	Megalithic cists and cairns Pundi	9.46km	W
	Megalithic cists and cairns Nellikuppam	10.87km	W
	Ruined Dutch Fort and cemetery Sadras	11.18km	S
	Megalithic cists and cairns Kalvay	11.23km	WNW
	Megalithic cists and cairns Vengur	11.41km	W

		Megalithic cists and cairns with stone circles Rayalpattu	11.35km	W
		Megalithic cists and cairns Kalvay	11.43km	WNW
		Megalithic cists and cairns Ottivakkam	11.53km	NW
		Megalithic cists and cairns Ottivakkam	11.62km	NW
		Megalithic cists and cairns Agaram	11.89km	W
		Megalithic cists and cairns Sirukunram	11.92km	W
		Megalithic cists and cairns Kumili	12.57km	NW
		Orikkal Mantapam Tirukalikundrum	12.77km	W
		Megalithic cists and cairns with stone circles Ponmar	13.40km	NNW
		Megalithic cists and cairns Unamanjeri	13.58km	NW
		Megalithic cists and cairns Ottiyambakkam	14.17km	NNW
		Megalithic cists and cairns Melkottaiyur	14.38km	NNW
12	Hills & valleys	Nil within 15km radius		
13	Nearest River/ Lakes/Dams	Water bodies	Distance~km	Direction
		Buckingham Canal	Within the site	
		Stream(Tirupporur Inlet)	Within the site	
		Stream(Tandalam Inlet)	Within the site	
		Stream(Manamathy Inlet)	Within the site	
		Bay of Bengal	0.70km	E
		Lake near Kuttavakkam	0.79km	WSW
		Lake near Paiyanur	1.62km	W
		Tandalam Lake	1.88km	W
		Kalavakkam Lake	2.34km	NW
		Manjal Madu	3.21km	N
		Kalangal Maduvu	3.25km	N
		Illalur Lake	3.81km	W
		Sirudavur Lake	4.01km	W
		Kadampadi Lake	4.57km	SW
		Kovalam Creek	4.91km	N
		Taiyur Lake	5.30km	NNW
		Kulipantandalam Lake	5.74km	WSW
		Padur Lake	6.61km	N
		Lake near Kunnattur	6.91km	SSW
		Manampathi Lake	7.75km	W
		Nattamkariyacheri Lake	8.38km	SW
		Kayar Lake	8.67km	WNW
		Puduppakkam Lake	8.96km	NNW
		Kulattur Lake	9.98km	NW
		Kaluvaliar R	11.03km	SW
		Kondangi Lake	12.01km	WNW
		Mambakkam Lake	12.29km	NNW

		Sirukunram Lake	13.24km	W		
		Ottiyambakkam Lake	14.88km	NNW		
14	Defense Installations	Nil within 15 km radius				
15	Project cost	The capital cost is INR 471.00 Crores				
16	Nearby Villages	Villages			Population	
		Saluvankuppam	0.07km	E	1194	
		Nemmeli	0.11km	E	3,822	
		Krishnankaranai	0.26km	E	538	
		Mamallapuram	0.30km	SE	15,172	
		Tandalam	0.33km	W	5,546	
		Paiyanur	0.39km	W	4,532	
		Pattipulam	0.39km	E	2,250	
		Alattur	0.74km	W	2,189	
		Thiruporur	1km	W	13,666	

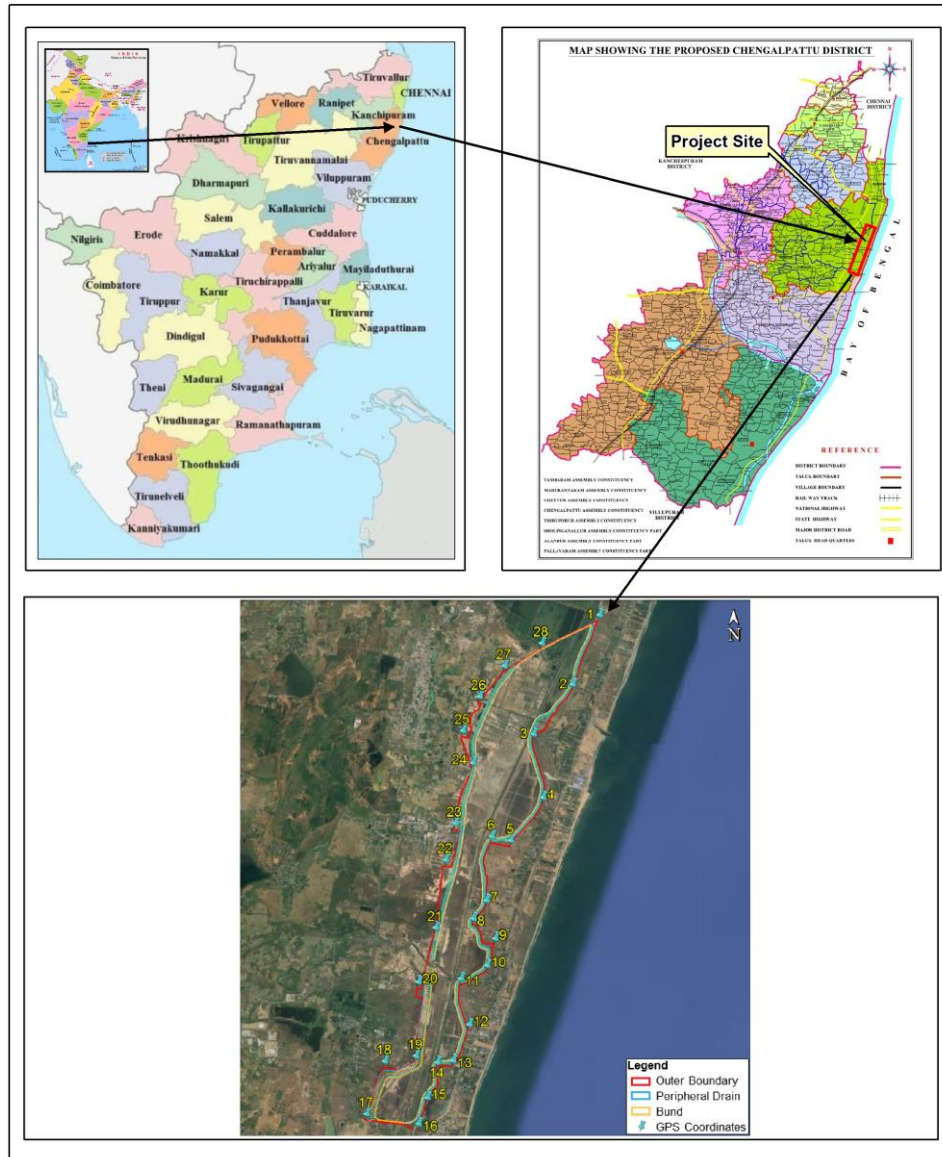


Figure 1.1 Location Map of the study area

1.5 Project Cost

The total investment of the project is **INR 471.00 Crores**.

1.6 Scope of the study

The baseline environmental study was carried out during **April - June 2025**.

Chapter 1: Introduction

Introductory information is presented in this Chapter. The introduction chapter provides background of the project, project proponent and describes the objective of this document. The purpose and organization of the report is also presented in this chapter.

Chapter 2: Project Description

This Chapter includes Project Description and Infrastructure Facilities delineating all the industrial and environmental aspect of the Construction and operation phase activities as well as process details of proposed products.

Chapter 3: Description of the Environment

This Chapter provides baseline environmental status of Environmental Components (Primary data) delineating meteorological details of the project site and surrounding area.

Chapter 4: Anticipated Environmental Impacts & Mitigation Measures

This Chapter presents the analysis of impacts on the environmental and social aspects of the project as a result of establishment of plan and thereby suggesting the mitigation measures.

Chapter 5: Analysis of Alternatives (Technology and Sites)

This chapter includes the justification for the selection of the project site from Environmental point of view as well as from economic point of view so that the technology will be affordable to the member units of the industrial area.

Chapter 6: Environmental Monitoring Program

This chapter will include the technical aspects of monitoring, the effectiveness of mitigation measures which will include the measurement methodologies, frequency, location, data analysis, reporting schedules etc.

Chapter 7: Additional Studies

This chapter will deal with identification of the risks due to proposed project in relation to the general public and the surrounding environment during construction and operation phases of the project and thereby presents Disaster Management Plan, Social impact assessment and R&R action plans.

Chapter 8: Project Benefits

This chapter deals with improvement in physical and social infrastructures, employment potential and other tangible benefits.

Chapter 9: Environmental Cost Benefit Analysis

It is not under our scope

Chapter 10: Environmental Management Plan

This is the key Chapter of the report and presents the mitigation plan, covers the institutional and monitoring requirements to implement environmental mitigation measures and to assess their adequacy during project implementation.

Chapter 11: Summary and Conclusion

This chapter summarizes the information given in Chapters in this REIA/EMP report and the conclusion based on the environmental study, impact identification, mitigation measures and the environmental management plan.

Chapter 12: Disclosure of Consultant Engaged

Disclosure of Consultant Engaged presents the declaration by the EIA consultant organisation as per the NABET requirements

1.7 Objectives of the Study

- To ensure environmental considerations are explicitly addressed and incorporated into the development decision-making process.
- To anticipate and avoid, minimize or offset the adverse significant biophysical, social and other relevant effects of the above project proposal.
- To protect the productivity and capacity of natural systems and the ecological processes which maintain their respective functions.
- To promote development that is sustainable and optimizes resource use as well as management opportunities.
- To fully recognize the scope and requirements of the REIA and comply with the same.

1.8 Methodology adopted for the Study

The Rapid Environmental Impact Assessment (REIA) is an assessment of the possible impact, whether positive or negative, that a proposed project may have on the environment, together consisting of the natural, social and economic aspects, i.e., aiming at “Sustainable Development” due to the project activities.

Reconnaissance survey and field observations were carried out by the HECS officials and concerned persons. The field observations are used to study the existing status of the environment, to predict the positive and negative impacts of the proposed Upgradation on the environment, and identification of mitigation measures (if any) and suggest EMP for the same.

CHAPTER 2

PROJECT DESCRIPTION

2 Project Description

2.1 Type of Project

The formation of coastal reservoirs represents a paradigm shift in water resource development. Instead of storing water in mountainous dams, which capture runoff from limited portions of the catchment, coastal reservoirs allow for the storage of water in estuaries, capturing excess floodwaters from the entire catchment area.

2.2 Need for the Project

The Proposed Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the Inhabitants at Thiruporur & Thirukazhukundram Taluks of Chengalpattu District. The new reservoir formation under Phase I will be in an extent of 4375 acres vested with WRD & Revenue lands. The site can be accessed from Kelambakkam – Kovalam Link Road on the North, Thiruporur – Nemmeli link Road in the middle and OMR – ECR connecting Bypass Road on the South near Mamallapuram. The Reservoir site is bounded by the ECR Road on the eastern periphery, OMR Road on the western periphery and Muttukadu – Kovalam on the North and Mamallapuram on the South details have been given in Error! Reference source not found..

Table 2-1 Area details

Taluk Name	Village Name	Survey Number	Sub Division	Area in Acres	Land owning Department
Thiruporur	Thiruvidanthai	171	-	244.86	Revenue Department
		325		109.57	
	Kalavakkam	243	-	80.9	
		242/1		82.06	
	Nemmeli	210	49A1	953.26	
	Thiruporur	180		410.59	
	Thandalam	370	-	101.98	
	Krishnan Karanai	68	1	326.08	
	Pattipulam	250	1A1	837.07	
	Paiyanur	271	-	548.5	
		272	-	14.97	
		296	1	38.87	
		120	1	15.12	
	Saluvankuppam	154	1	439.31	
Thirukalu	Mamallapuram	141	1	171.85	

kundram					
Total				4375.00	

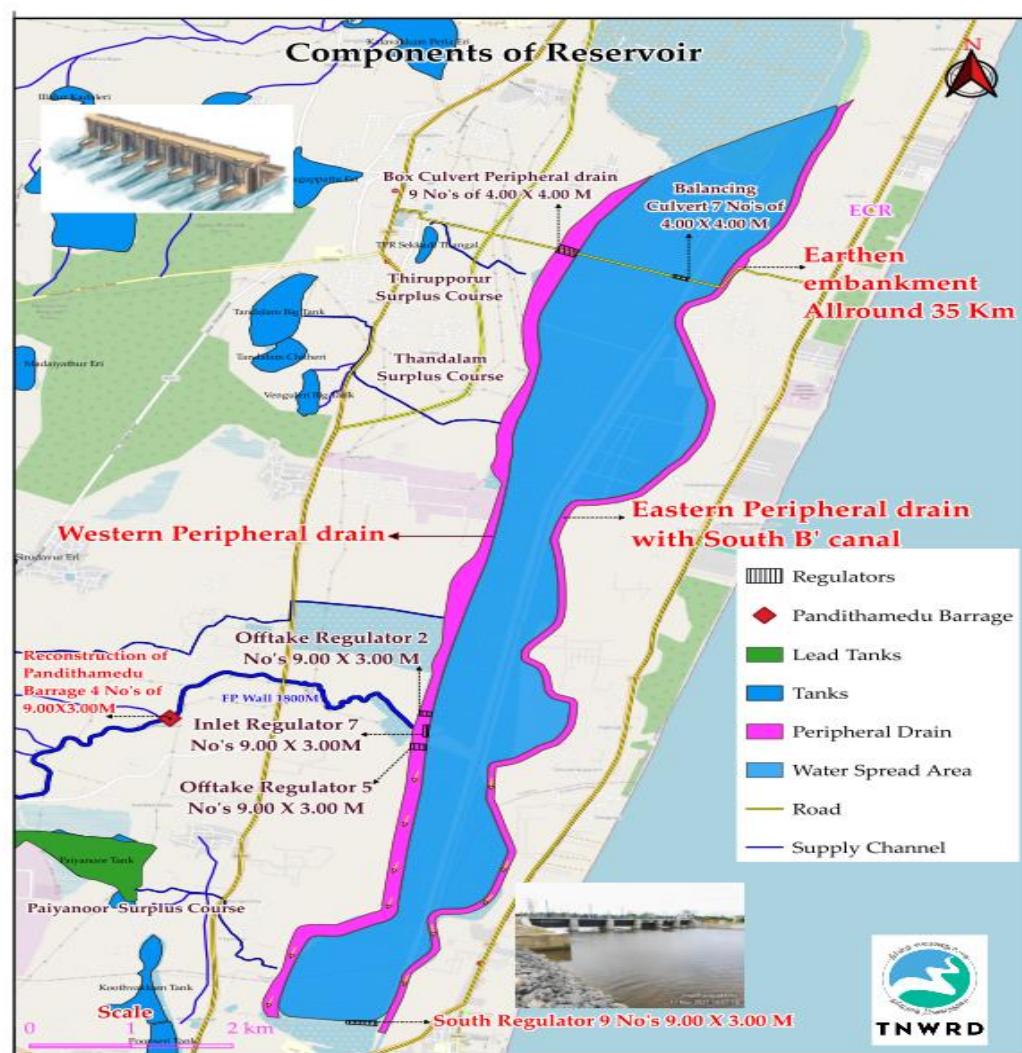


Figure 2-1 Proposed Project Layout

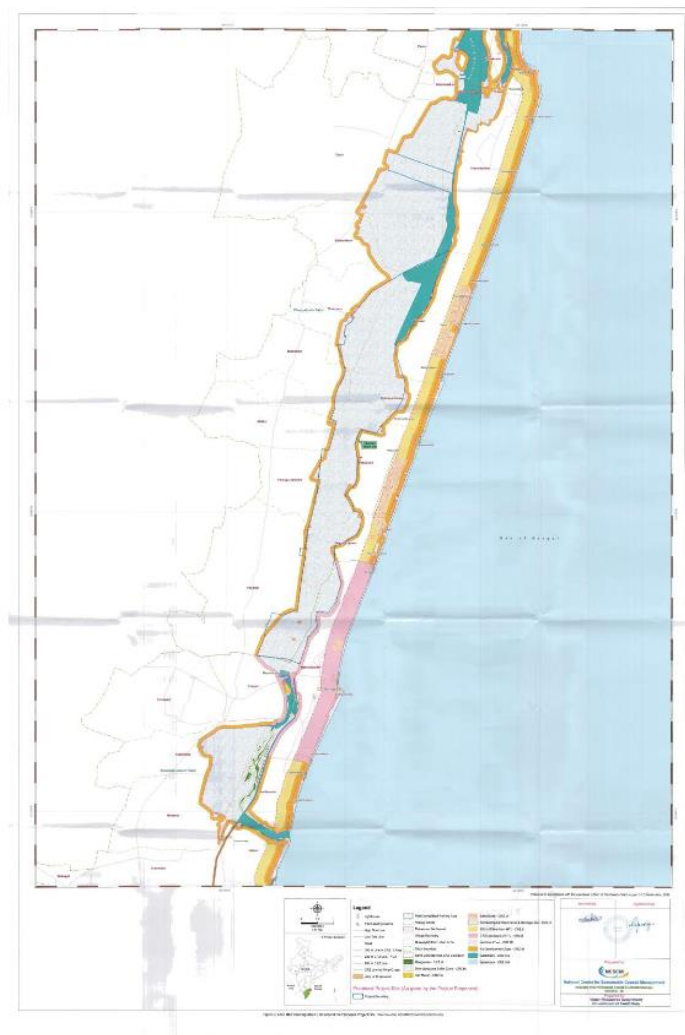


Figure 2.2 CRZ Delineation Map 1:4000 Scale

2.3 Site location

Google satellite imageries covering 1, 5 10 km around the project area are appended in **Figure 2-4 Google Image of 1 km radius** respectively. Environmental Sensitivity map is given in Error! Reference source not found.7. Topo map of the study area is provided in **Figure 2.3**

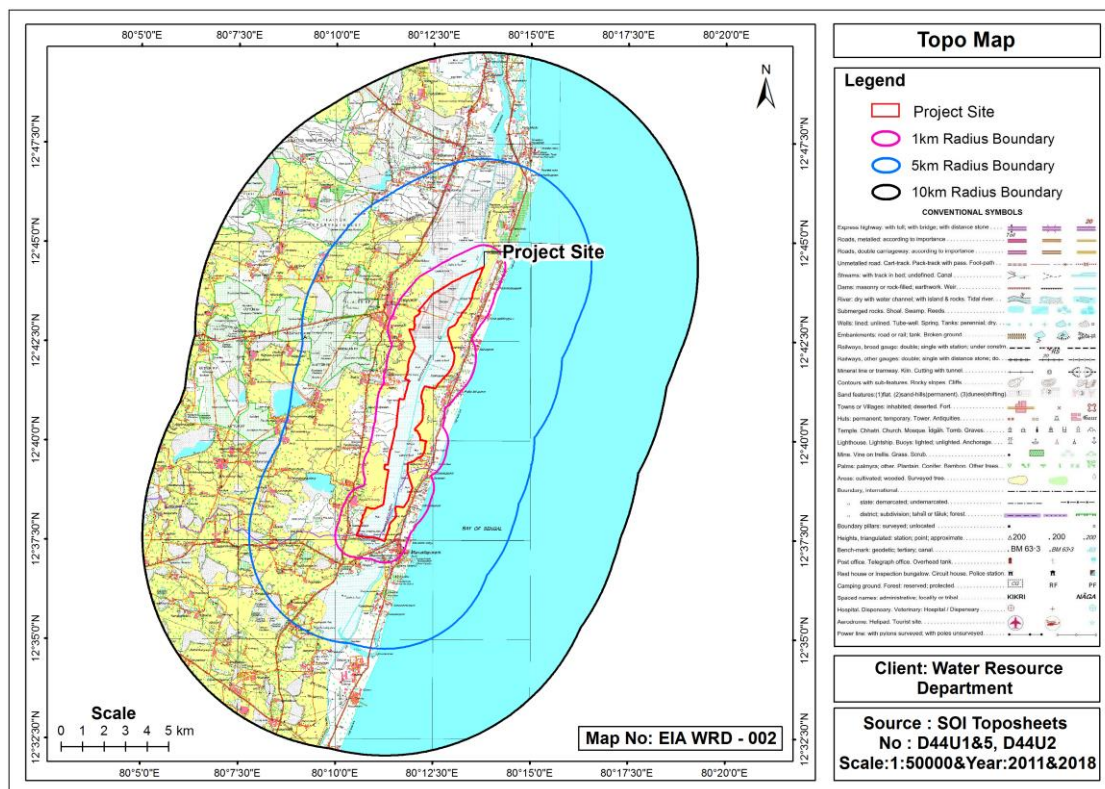


Figure 2.3 Topo map of the study area

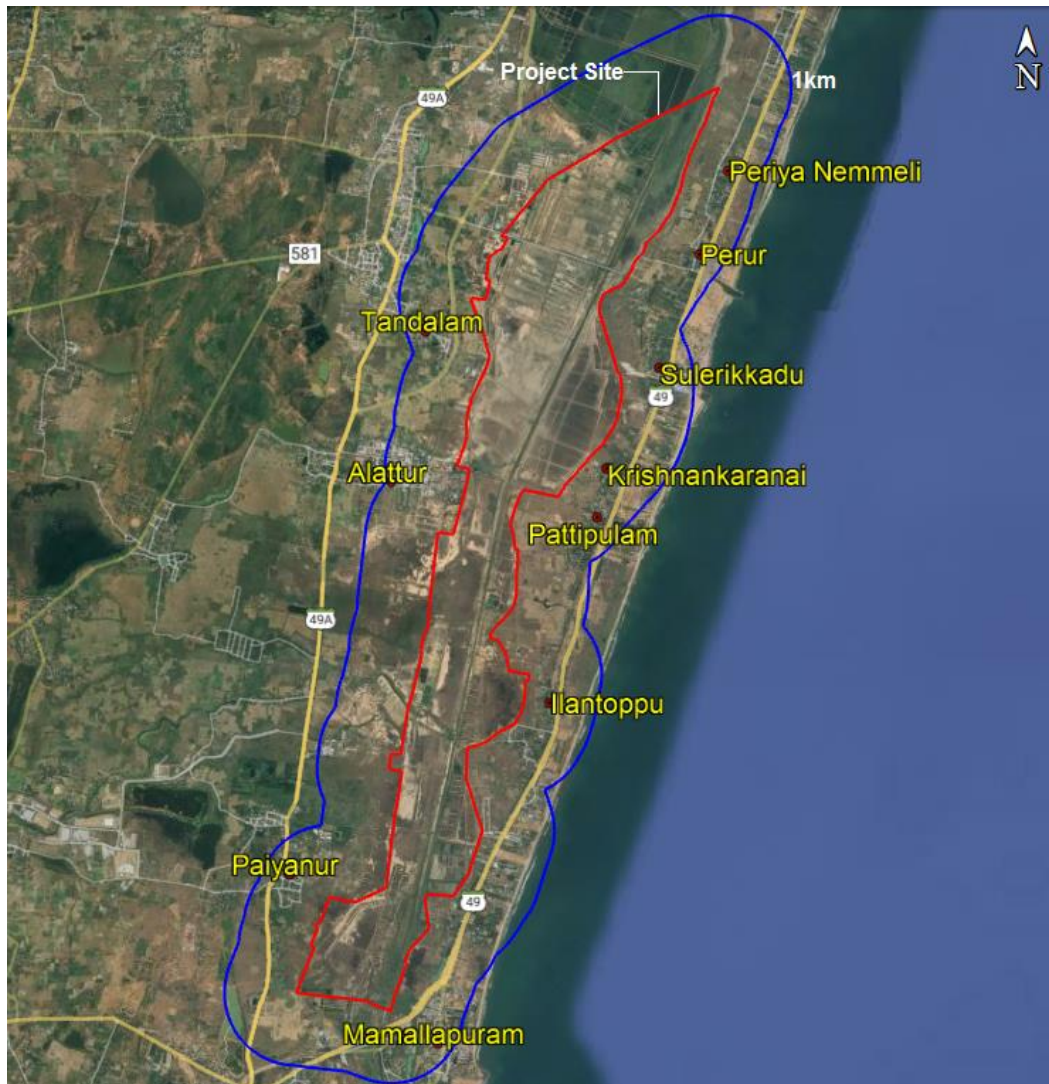


Figure 2-4 Google Image of 1 km radius



Figure 2-5 Google Image of 5 km radius



Figure 2-6 Google Image of 10 km radius

2.4 Size or Magnitude of operation

Proposed project land area is **4375acres** at Survey No.171, 325, 243, 242/1, 210/49A1, 180, 370, 68/1, 250/1A1, 271, 272, 296/1, 120/1, 154/1, 141/1 Thiruvudanthai,Kalavakkam, Nemmeli,Thiruporur,Thandalam, KrishnanKaranai, Pattipulam, Paiyanur, Saluvankuppam ,Mamallapuram Villages, Thiruporur&Thirukalukundram Taluks,Tamilnadu.

Area of the proposed project activities falling under CRZ zone as per approved CZMP (CRZ Notification, 2011)

Proposed Project Activities	Area in (acres)					Total in acres
	CRZ IB	CRZ II	CRZ III (NDZ)	CRZ IVB	Non-CRZ	
Bund	153.96	-	8.52	18.03	0.04	180.55
Peripheral Drain	391.23	-	35.69	29.98	17.52	474.42
Project Boundary	3864.54	3.36	148.00	320.89	38.21	4375

Length of the proposed project activities falling under CRZ categories as per approved CZMP (CRZ Notification, 2011)

Proposed Project Activities	Length (in m)		
	CRZ IB	CRZ III (NDZ)	CRZ IVB
CS Line	28864.77	2764.41	2196.12
Weir	91.04	-	-

2.5 Project Cost

The total capital investment on the proposed project is **INR 471.00 Crore**.

2.6 Proposed Schedule for Approval and Implementation

The time schedule for the completion of construction is 2 years from the Approval of Competent Authority.

Proposed Project CRZ clearance will be obtained by December 2025

2.7 Connectivity

The project site is situated in the prime location of the Chennai area. It is well connected by roadways, Airways and water ways.

Table 2-2 Connectivity of the project site

Sr.No.	Features	Description
1	Nearest Port	Chennai Port , ~37km, N

2	Nearest Airport	Chennai International Airport , ~27.44km, NNW				
3	Highway	SH-49 (Chennai-Thoothukudi)(ECR Road)		0.19km	E	
		NH-332A(Mahabalipuram-Pondicherry)		1.48km	SSW	
4	Nearest Railway station	Guduvancheri,~20.81km,NW				

2.8 Project description

The reservoir is enclosed by an earthen bund extending for **about 30.436 kilometers**. In addition, eastern and western peripheral drains are proposed to manage surplus runoff following full reservoir storage and to accommodate local catchment flows, thereby preventing foreshore inundation.

The key hydraulic structures such as inlet regulators, outlet regulators, and offtake regulators are planned; each designed to handle a maximum discharge of 12,000 cusecs from sub-catchments of the Manamathy group of tanks (Manamathy Maduvu) and other free catchment areas contributing to the reservoir. Necessary provisions for improvements to the Manamathy Surplus Course, Flood Protection Walls and Reconstruction of Pandithamedu barrage and flood banks are provided for protection of the inlets and upstream of the inlet arrangements.

Designed Components of Reservoirs and Appurtenance Works:

This Phase-I project proposal of “Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the inhabitants in Thiruporur & Thirukazhukundram Taluks of Chengalpattu District”, comprises the following major components:

Component I: Formation of new drinking water Reservoir and its appurtenances (Eastern & Southern Side)

- i) Formation of Earthen embankment in Eastern (14896 m) and Southern side (310 m) for Reservoir.
- ii) Laying Stone revetment for embankment in Eastern and Southern side at Inner slope for protection.
- iii) Construction of South Regulator near Kokilamedu mouth
- iv) Formation of Eastern peripheral drain (15105 m) with overburden berm
- v) Providing Turfing at Rear slope of embankment

Component II: Formation of new drinking water Reservoir and its appurtenances (Eastern & Southern Side).

- i) Formation of Earthen embankment in Northern (1960 m) and Western side (13270 m) for Reservoir

- ii) Laying Stone revetment for embankment in Northern and Western side at Inner slope for protection
- iii) Construction of Inlet Regulator at confluence of Manamathy surplus course into Reservoir
- iv) Construction of Offtake regulator in western peripheral drain at North side of Inlet regulator
- v) Construction of Offtake regulator in western peripheral drain at South side of Inlet regulator.
- vi) Formation of Western peripheral drain (12700 m) with overburden berm
- vii) Providing Turfing at Rear slope of embankment.

Component III: Improvements to Manamathy Inlet

- i) Formation of Earthen embankment in manamthy Surplus course up to inlet point for a length of 2050 m.
- ii) Laying Stone revetment in manamathy Surplus course for embankment at Inner slope for protection.
- iii) Construction of Balancing Culverts at Thiruporur Nemmeli Road with vents.
- iv) Providing Turfing at Rear slope of embankment
- v) Deepening of Reservoir water spread portion (removing the top soil on an average of 0.6m)
- vi) Reconstruction of Pandithamedu barrage with flood banks for a length of 1650
- vii) Construction of flood protection wall (on both sides 1650 m) of Manamathy surplus course from Pandithamedu barrage to OMR road and Regrading
- viii) Construction of Inlet drains connected with Manamathy Surplus course.

2.8.1.1 Structural Components of the Proposed Reservoir

The development of the proposed reservoir under Phase I involves a comprehensive arrangement of civil and hydraulic structures designed to facilitate water storage, conveyance of surplus, and flood management. These components are planned to optimize water resource utilization, ensure structural integrity, and maintain environmental balance. The key structural elements include earthen bunds for impoundment, peripheral drains for surplus runoff management, and inlet, outlet, and offtake regulators to control inflow and outflow across multiple sub-catchments. The detailed technical description of each component is given below,

Formation of Earthen Embankment:

Embankment Formation:

The earthen embankment is to be constructed using a homogeneous soil layer up to a height of 4.80 meters from the proposed reservoir bed level (+0.00m).

Top Width:

The top width of the embankment is proposed to be 5.00 meters.

Site Preparation:

Prior to embankment construction, the topsoil will be uniformly stripped to a depth of 0.50 meters to ensure proper bonding with the fill material.

Cut-Off Trench:

A cut-off trench, formed with impervious IPZ layer, will be provided at the base of the embankment to a depth of 3.00 meters, acting as a barrier to reduce seepage through the foundation.

Reservoir Side Protection:

The upstream (reservoir-facing) slope of the embankment will be protected by revetment over graded filter layers to safeguard against erosion due to water action.

Rear Slope Treatment:

The downstream slope (non-water side) will be treated with G2 grass turfing to prevent erosion from rainwater runoff and surface flow.

Seepage Control:

A horizontal drainage layer is proposed along the bund to collect and safely discharge seepage water following the phreatic line, ensuring the long-term stability of the embankment.

Peripheral Drain System and Adjacent Structures**Peripheral Drains:**

- **Location:** Positioned on the eastern and western sides of the reservoir.
- **Bed Level:** Set at (-) 0.30 meters to facilitate effective gravity drainage.

Overburden Bund (Drain Bund):

- **Position:** Located adjacent to the reservoir bund, forming one boundary of the peripheral drain.
- **Top Level:** Proposed at (+) 2.75 meters, providing sufficient freeboard above the Full Supply Level (FSL) of the drain.
- **Purpose:** Acts as a protective bund for the peripheral drain to prevent overtopping and contain runoff during high inflow events.

Spoil Bank:

- **Location:** On the opposite side of the overburden bund, effectively enclosing the drain.
- **Top Level:** Proposed at (+) 2.00 meters.

- **Function:** Formed using excavated material from the drain; helps in containing flow and maintaining separation from surrounding land.

Full Supply Level (FSL) of Peripheral Drain:

- **Level:** (+) 1.20 meters
- **Purpose:** Designed to channel surplus runoff post-reservoir filling and manage local catchment runoff, effectively preventing foreshore inundation and waterlogging in nearby areas.

Southern Regulator:

The South end regulator is proposed at the tail end of the reservoir near kokilamedu with nine numbers of vent of size 9.00m x 1.75m, to enable the routing of floodwaters through the reservoir during high inflow periods, for a maximum design discharge of 12,000 cusecs (339.79 cumecs).

The body wall, U/s apron, stilling basin will be constructed using M20 grade concrete with 60% of 40 mm and 40% 20mm graded aggregate. The wearing coat of 25cm thick for body wall, U/s apron, D/s apron, stilling basin is proposed using M25 grade RCC with 12mm dia rod @ 25cm c/c.

The U/s cut-off wall will be constructed with RCC M30 grade concrete reinforced with 16mm dia @ 20cm c/c as main reinforcement and distributors with 12mm dia @ 15cm c/c on both faces using open excavation method. The D/s cut off will be executed as diaphragm wall using RCC M30 concrete with 25 mm dia main reinforcement @ 15cm c/c and 16mm dia distributors @ 15cm c/c on both faces

The abutments, wing walls and return walls will be constructed with M20 grade concrete using 60% of 40 mm and 40% 20mm graded aggregate and will include surface reinforcement @ 5 Kg/Sq.m.

The South end regulator is designed with following salient features,

1. Discharge : 339.79 cumecs (12,000 cusecs).
2. Length of body wall : 91.00m
3. FMWL : +3.000m
4. RWL : +2.400m
5. Upstream bed level : +0.000m
6. Downstream bed level : +0.000m
7. Height of body wall : 1.250m
8. Sill of shutter : +1.250m
9. No. of shutter : 09

10. Size of shutters : 9.00m x 1.75m
11. Thickness of pier : 1.50m
12. Total Floor length :19.00m
13. Length of stilling basin : 8.10m
14. Depth of u/s cut off wall : (-) 4.000m
15. Depth of D/s cut off wall : (-) 7.000m
16. CC Blocks : 1.50 x 1.50 x 0.90 m – 3 rows.
17. Length of launching apron : 6.00m

Inlet Regulator from Manamathy surplus:

The Inlet regulator to the reservoir from the manamathy surplus is proposed at the western side near payanur village, which is the primary source of water for the reservoir, allowing surplus flows from the tanks in the sub catchment of manamathy group of tanks in kovalam sub basin. The inlet regulator is designed with seven numbers of vents of size 9.00m x 3.00m to accommodate a maximum design discharge of 12,000 cusecs (339.79 cumecs).

The body wall, U/s apron, stilling basin will be constructed using M20 grade concrete with 60% of 40 mm and 40% 20mm graded aggregate. A 25 cm thick wearing coat will be provided over the body wall, U/s and D/s apron, and stilling basin using RCC M25 concrete reinforced with 12mm dia rod @ 25cm c/c.

The U/s cut-off wall will be constructed with RCC M30 grade concrete reinforced with 16mm dia @ 20cm c/c as main reinforcement and distributors with 12mm dia @ 15cm c/c on both faces using open excavation method for designed depth of 3.5m from bed level. The D/s cut off will be executed as diaphragm wall using RCC M30 concrete with 25 mm dia main reinforcement @ 15cm c/c and 16mm dia distributors @ 15cm c/c on both faces constructed to a designed depth of 5.00m from the bed level of regulator.

The abutments, wing walls and return walls will be constructed with M20 grade concrete using 60% of 40 mm and 40% 20mm graded aggregate and will include surface reinforcement @ 5 Kg/Sq.m.

The Inlet regulator is designed with following salient features,

1. Discharge : 339.79 cumecs (12,000 cusecs).
2. Length of body wall: 72.00m
3. FMWL : +3.160m
4. RWL : +3.000m :
5. Upstream bed level: +0.300m

6. Downstream bed level: +0.000m
7. Sill of shutter : +0.600m
8. No. of shutter: 07
9. Size of shutters: 9.00m x 3.00m
10. Thickness of pier: 1.50m
11. Total Floor length: 14.00m
12. Length of stilling basin: 5.60m
13. Depth of u/s cut off wall: (-) 3.200m
14. Depth of D/s cut off wall: (-) 4.700m
15. CC Blocks : 1.50 x 1.50 x 0.90 m – 3 rows.
16. Length of launching apron: 6.00m

South offtake Regulator in western peripheral drain:

The South offtake regulator is proposed at the western peripheral drain nearby to the reservoir inlet regulator in paiyanur village. This regulator is designed with five numbers of vents of size 9.00m x 3.00m, to handle a maximum design discharge of 12,000 cusecs (339.79 cumecs). It serves the purpose of routing of excess flood water from the Manamathy surplus into the western peripheral drain to kokilamedu drain.

The body wall, U/s apron, stilling basin will be constructed using M20 grade concrete with 60% of 40 mm and 40% 20mm graded aggregate. A 25 cm thick wearing coat will be provided over the body wall, U/s and D/s apron, and stilling basin using RCC M25 concrete reinforced with 12mm dia rod @ 25cm c/c.

The U/s cut-off wall will be constructed with RCC M30 grade concrete reinforced with 16mm dia @ 20cm c/c as main reinforcement and distributors with 12mm dia @ 15cm c/c on both faces using open excavation method for designed depth of 3.5m from bed level. The D/s cut off will be executed as diaphragm wall using RCC M30 concrete with 25 mm dia main reinforcement @ 15cm c/c and 16mm dia distributors @ 15cm c/c on both faces constructed to a designed depth of 5.00m from the bed level of regulator.

The abutments, wing walls and return walls will be constructed with M20 grade concrete using 60% of 40 mm and 40% 20mm graded aggregate and will include surface reinforcement @ 5 Kg/Sq.m.

The South offtake regulator is designed with following salient features,

1. Discharge : 339.79 cumecs (12,000 cusecs).
2. Length of body wall : 51.00m
3. FMWL : +3.160m

4. RWL : +3.000m :
5. Upstream bed level : +0.300m
6. Downstream bed level : +0.300m
7. Sill of shutter : +0.300m
8. No. of shutter : 05
9. Size of shutters : 9.00m x 3.00m
10. Thickness of pier : 1.50m
11. Total Floor length : 16.00m
12. Length of stilling basin : 7.60m
13. Depth of u/s cut off wall : (-) 3.200m
14. Depth of D/s cut off wall : (-) 4.700m
15. CC Blocks : 1.50 x 1.50 x 0.90 m – 3 rows.
16. Length of launching apron : 6.00m

North offtake Regulator in Western peripheral drain:

The North offtake regulator is proposed at the western peripheral drain nearby to the reservoir inlet regulator in paianur village. This regulator is designed with two numbers of vents of size 9.00m x 3.00m for a maximum design discharge of 4,800 cusecs (135.92 cumecs) for the purpose of routing the flood water from the Manamathy surplus to the Muttukadu drain on the north through the western peripheral drain.

The body wall, U/s apron, stilling basin will be constructed using M20 grade concrete with 60% of 40 mm and 40% 20mm graded aggregate. A 25 cm thick wearing coat will be provided over the body wall, U/s and D/s apron, and stilling basin using RCC M25 concrete reinforced with 12mm dia rod @ 25cm c/c.

The U/s cut-off wall will be constructed with RCC M30 grade concrete reinforced with 16mm dia @ 20cm c/c as main reinforcement and distributors with 12mm dia @ 15cm c/c on both faces using open excavation method for designed depth of 3.5m from bed level. The D/s cut off will be executed as diaphragm wall using RCC M30 concrete with 25 mm dia main reinforcement @ 15cm c/c and 16mm dia distributors @ 15cm c/c on both faces constructed to a designed depth of 5.00m from the bed level of regulator.

The abutments, wing walls and return walls will be constructed with M20 grade concrete using 60% of 40 mm and 40% 20mm graded aggregate and will include surface reinforcement @ 5 Kg/Sq.m.

The North offtake regulator is designed with following salient features,

1. Discharge : 135.92 cumecs (4,800 cusecs).

2. Length of body wall : 19.50m
3. FMWL : +3.160m
4. RWL : +3.000m :
5. Upstream bed level : +0.300m
6. Downstream bed level : +0.300m
7. Sill of shutter : +0.300m
8. No. of shutter : 02
9. Size of shutters : 9.00m x 3.00m
10. Thickness of pier : 1.50m
11. Total Floor length : 16.00m
12. Length of stilling basin : 7.60m
13. Depth of u/s cut off wall : (-) 3.200m
14. Depth of D/s cut off wall : (-) 4.700m
15. CC Blocks : 1.50 x 1.50 x 0.90 m – 3 rows.
16. Length of launching apron : 6.00m

Carrying capacity of the canal:

1. All-Round Earthen Bund Impounding the Reservoir

Top Bund Level (TBL) : (+) 4.800m

Full Reservoir Level (FRL) : (+) 3.000m

Bed Level : (+) 0.000m

Proposed Bund length

Eastern side - 14986 m

Western side - 13270 m

Southern side - 350 m

Northern side - 2000 m

The top width of bund as 5.00m and Stone revetment arrangements on the water side slope and Turfing on the rear side slope.

2. Eastern Peripheral Drains

Length of Western Peripheral Drain - 13400m (with overburden berm on reservoir side and spoil bank on other side)

Length of Eastern peripheral drain - 15105m (with overburden berm on reservoir side and spoil bank on other side)

Eastern Peripheral Drain Discharge : 3,000 cusecs

Eastern Peripheral Drain FSL : (+) 1.200m

Proposed Bed level : (-) 0.300m

Overburden bund top level : (+) 2.750m

Overburden bund top width : 10.00m

Spoil Bank Top Level proposed

Eastern Peripheral Drain : (+) 1.500m

Cross-section of the drain

Eastern Peripheral Drain bed width – 35.00m

Proposed Side slopes of drain : 2:1

3. Western Peripheral Drains

Length of Western Peripheral Drain - 13400m (with overburden berm on reservoir side and spoil bank on other side)

Western Peripheral Drain Discharge : 12,000 cusecs cusecs from manamanthi inlet towards South

Western Peripheral Drain Discharge : 4000cusecs cusecs from North to manamanthi inlet point

Sl.No	Details	manamanthi inlet towards South	North to manamanthi inlet point
1.	Proposed discharge	12000 cusecs	4800 Cusecs
2.	Proposed bed width	125m	60m
3.	Proposed FSL	1.80m	1.80m
4.	Side slopes	2.5:1	2.5:1
5.	Overburden berm top level	(+) 2.750m	(+) 2.750m
6.	spoil berm top level	(+) 2.000m	(+) 2.000m

4. South End Outlet Regulator (Kokilamedu)

- Maximum Flood Discharge : 12,000 cusecs (339.80 cumecs)
 - Maximum Water Level : (+) 3.000m (Reservoir)
 - Rear Water Level : (+) 2.400m (including High tide level)
- U/s Bed Level : (+) 0.000m
- D/s Bed Level : (+) 0.000m
- Sill Level of shutter : (+) 1.250m (High tide level)
- Top of Bund level : (+) 4.800m

Number of vent of size 9.00m x 1.75m for the site requirements

5. Inlet Regulator at confluence of Manamathy surplus course into Reservoir

- Maximum Flood Discharge : 12,000 cusecs (339.80 cumecs)
 - Front Maximum Water Level : (+) 3.300m

- Rear Water Level : (+) 3.000m
- U/s Bed Level : (+) 0.300m
- D/s Bed Level : (+) 0.300m
- Proposed Sill Level : (+) 0.600m
- Top of Bund level : (+) 4.800m
- Manamathy surplus bed fall : 1 : 2000

Number of vent of size 9.00m x 3.00m for the site requirements

6. Off-take Regulator in western peripheral drain at North side of Inlet regulator

- Maximum Flood Discharge : 4,800 cusecs (135.92 cumecs)
 - Front Maximum Water Level : (+) 3.300m
 - Rear Water Level : (+) 3.000m
- U/s Bed Level : (+) 0.300m
- D/s Bed Level : (+) 0.300m
- Proposed Sill Level Sill Level : (+) 0.300m
- Top of Bund level : (+) 4.800m
- Manamathy surplus bed fall : 1 : 2000

Number of vent of size 9.00m x 3.00m for the site requirements

7. Off-take Regulator in western peripheral drain at South side of Inlet regulator

- Maximum Flood Discharge : 12,000 cusecs (339.80 cumecs)
 - Front Maximum Water Level : (+) 3.300m
 - Rear Water Level : (+) 3.000m
- U/s Bed Level : (+) 0.300m
- D/s Bed Level : (+) 0.300m
- Sill Level : (+) 0.300m
- Top of Bund level : (+) 4.800m
- Manamathy surplus bed fall : 1 : 2000

Number of vent size of 9.00m x 3.00m for the site requirements

2.9 Resource requirement

2.9.1 Land requirement

2.9.2 Water requirement

For construction Phase: Total water Requirement is **34.35 KLD**

For construction activities- 20 KLD

Domestic: 14.35 KLD including Flushing.

Source: Nearby WRD tank.

Operation phase: Nil

2.9.3 Power requirement – Construction Phase

Description	Quantity	Source
Power requirement	110kVA	TANGEDCO
DG set	2x 58.50kVA	--

2.9.4 Man power requirement

Table 2-3 Man Power Requirement

Description	Manpower Nos.
Construction Phase	410
Operation Phase	7

2.9.5 Municipal Solid Waste Management

The generation of municipal Solid waste and its management is given in **Table 2-4**.

Table 2-4 Solid Waste Generation and Management – Construction Phase

Sr.No	Waste type	Construction Phase (kg/day)	Method of Disposal
1	Organic waste	110.7	Will be disposed through municipal bins
2	Inorganic Waste	73.8	Will be disposed through authorised recycler
Total		184.5	

Note: Manpower Nos. – 410 Nos for construction phase

Operation Phase:

Nil since the proposed project involve only storage of drinking water.

2.10 Other Miscellaneous wastes

Construction waste will be generated and it will be disposed through authorized recycler.

Sewage

In construction Phase temporary sanitary facilities for workers will be installed, Sewage from the domestic will be disposed through septic tanks and dispersion trenches.

Operation Phase:

The reservoir's primary function is water storage and runoff management, with no provision for treating effluents or sewage.

Effluent

The proposed reservoir is declared and maintained as a "Zero Effluent Discharge Zone." No treated or untreated effluents, industrial discharges, sewage, or storm water with pollutants shall be permitted to enter the reservoir

2.11 Hazardous waste generation and management

Hazardous waste materials are disposed properly as per the Hazardous and Other Wastes (Management and Transboundary Movement) Amendment Rules, 2016.

CHAPTER 3

BASELINE ENVIRONMENT

3 DESCRIPTION OF ENVIRONMENT

The environment of region is characterized by diverse natural and anthropogenic features, including landforms, water resources, vegetation and human settlements. It exhibits a mix of ecological habitats, ranging from agricultural lands to natural ecosystems, supporting a variety of flora and fauna. Climatic conditions, soil characteristics and water availability play a significant role in shaping the environmental dynamics of the area. Understanding these baseline environmental conditions is crucial for assessing potential project impacts and planning sustainable development measures. This chapter depicts the establishment of baseline for various environmental components, as identified in and around the proposed project **“Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the Inhabitants atThiruporur & Thirukazhukundram Taluks of Chengalpattu District”**. The baseline data monitored during three (3) months i.e., from **April 2025 to June 2025** are used as primary data whereas the secondary data was collected from the published data from government and semi-government organizations. The primary baseline data has been generated by M/s. Hubert Enviro Care Systems (P) ltd, Chennai, NABL accredited MoEF&CC approved environmental testing laboratory for the following terrestrial environmental components.

3.1 Study area and Period

About 10 km radius from the periphery of the proposed project site has been designated as the Project Impact/Influence Area (PIA) for assessing the baseline environmental conditions and potential impacts associated with the project. The core study area is the project area and its immediate surroundings to the tune of 1km radius from the boundary. The PIA covers parts of **Kovalam Sub Basin between ECR and OMR Road in Thiruporur &Thirukalukundram Taluks of Chengalpattu district, Tamil Nadu**. This PIA was subjected to monitor for 3 month duration starting from the month of **April 2025 to June 2025**. The data collected during the monitoring period are considered as primary baseline data. The key points of the PIA are given below:

PIA Area	:	10 km radius from the periphery of the proposed project site
Project Area	:	Kovalam Sub Basin between ECR and OMR Road
Taluk	:	Thiruporur &Thirukalukundram Taluk
District	:	Chengalpattu district

State : Tamil Nadu
Monitoring Duration : April 2025 to June 2025

3.2 Description of the Study Area, components & Methodologies

As outlined in Chapter 1, M/s. Water Resources Department proposes “Kovalam Sub Basin between ECR and OMR Road in Thiruporur & Thirukalukundram Taluks of Chengalpattu district, Tamil Nadu, covering an area of 4375 Acres (1770.5 ha). The topographic map of the study area is provided in **Figure 3.1**. The present study involves a comprehensive analysis of land use, topography, geology, water resources, biodiversity and demographic patterns. Methodologies adopted for the assessment include field surveys, remote sensing, GIS mapping and data collection from secondary sources such as government reports (CGWB, DCHB etc) and published data from portals. These methods ensure a systematic and detailed evaluation of the project area, laying the groundwork for identifying environmental sensitivities and proposing appropriate mitigation measures. An overview of the study area, with reference to its physical characteristics, is presented in the following sections to provide a clear understanding before detailing the prevailing environmental conditions.

Meteorology	:	Refer Section 3.5
Ambient Air Quality	:	Refer Section 3.6
Ambient Noise Levels	:	Refer Section 3.7
Water Quality: Surface Water & Groundwater Quality	:	Refer Section 3.8
Soil Quality	:	Refer Section 3.9
Biological Environment	:	Refer Section 3.10
Socio Economic Status	:	Refer Section 3.11

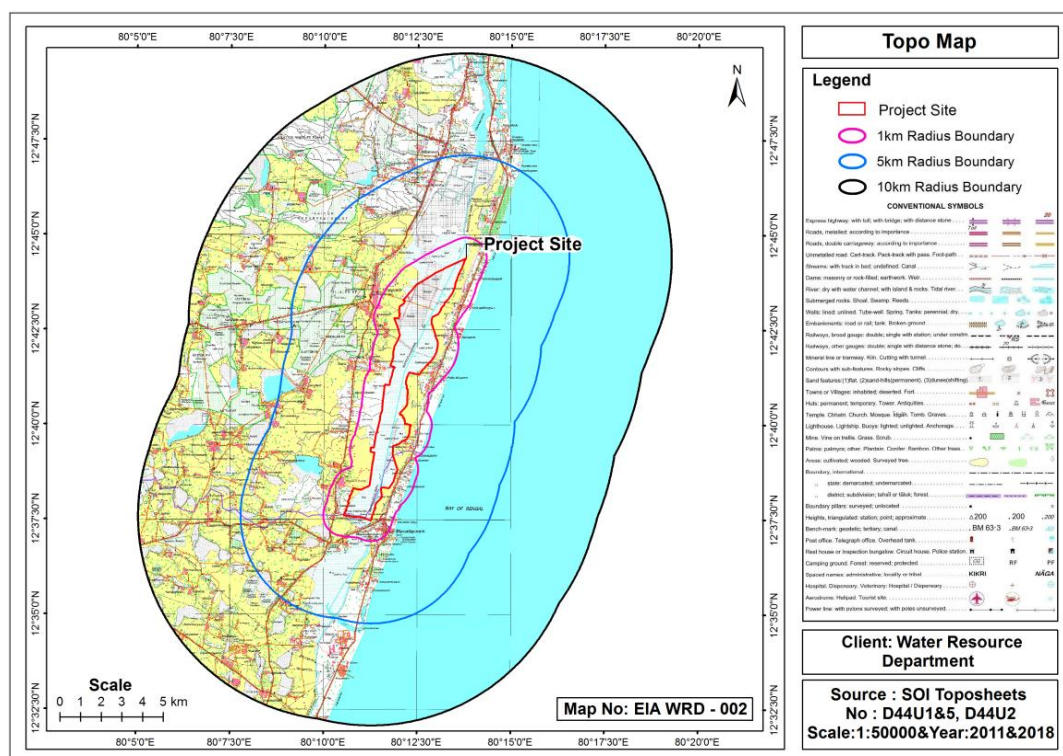


Figure 3-1Topo Map of Study area

3.3 Environmentally/Ecologically Sensitive areas

The National Environment Policy (2006) defined the Eco-Sensitive Areas “as areas/zones with identified environmental resources having incomparable values which require special attention for their conservation” because of its landscape, wildlife, biodiversity, historical and natural values. 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 **Figure 3-2** and **Figure 3-3**. Due to the complexity of the environmental features, which are difficult to represent clearly on a single map, the sensitive areas are shown in two separate maps (**Figure 3.2** and **Figure 3.3**).

Note: This split is purely for representation purposes and does not indicate any classification or division of the study area.

Table 3-1 Environmental Sensitive Areas within 15km from Project Boundary

S.No	Areas	Distance & Direction from project boundary			
		S. No	Environment	Distance (km)	Direction
1	Water bodies & Mangroves		Others		

es & Biological Park & Reserve Forest	1.	The Madras Crocodile Bank Trust and Centre for Herpetology	1km	ENE
	Mangroves			
	1.	Mangroves near Mamallapuram	0.93km	S
	2.	Mangroves near Venpurusham	1.96km	S
	3.	Mangroves near Kokkilimedu	4.87km	S
	4.	Mangroves near Sadras	12.46km	S
	Reserve Forest			
	1.	Alattur RF	1.42km	W
	2.	Illalur RF	1.79km	W
	3.	Tandalam RF	2.19km	W
	4.	Tandalam RF	2.19km	W
	5.	Madayattur RF	2.62km	W
	6.	Taiyur RF	4.37km	NW
	7.	Kattur RF	5.29 km	W
	8.	Kulattur RF	6.52km	NW
	9.	Kayar RF	8.32km	WNW
	10.	Mambakkam RF	8.87km	NNW
	11.	Sonallur RF	9.04km	NNW
	12.	Oragadam RF	10.28km	W
	13.	Kalvay RF	11.27km	WNW
	14.	Sirukunram RF	11.71km	W
	15.	Anjur RF	12.64km	W
	16.	Kumili RF	12.79km	NW
	17.	Tirukkalukkunram RF	13.39km	W
	18.	Nemmeli RF	13.75km	W
	19.	Navalur RF	14.87km	WSW
	Water bodies			
	1.	Buckingham Canal	Within the site	
	2.	Stream(Tirupporur Inlet)	Within the site	
	3.	Stream(Tandalam Inlet)	Within the site	
	4.	Stream(Manamathy Inlet)	Within the site	
	5.	Bay of Bengal	0.70km	E

2	Manmade	6.	Lake near Kuttavakkam	0.79km	WSW
		7.	Lake near Paiyanur	1.62km	W
		8.	Tandalam Lake	1.88km	W
		9.	Kalavakkam Lake	2.34km	NW
		10.	Manjal Madu	3.21km	N
		11.	Kalangal Maduvu	3.25km	N
		12.	Illalur Lake	3.81km	W
		13.	Sirudavur Lake	4.01km	W
		14.	Kadampadi Lake	4.57km	SW
		15.	Kovalam Creek	4.91km	N
		16.	Taiyur Lake	5.30km	NNW
		17.	Kulipantandalam Lake	5.74km	WSW
		18.	Padur Lake	6.61km	N
		19.	Lake near Kunnattur	6.91km	SSW
		20.	Manampathi Lake	7.75km	W
		21.	Nattamkariyacheri Lake	8.38km	SW
		22.	Kayar Lake	8.67km	WNW
		23.	Puduppakkam Lake	8.96km	NNW
		24.	Kulattur Lake	9.98km	NW
		25.	Kaluvaliar R	11.03km	SW
		26.	Kondangi Lake	12.01km	WNW
		27.	Mambakkam Lake	12.29km	NNW
		28.	Sirukunram Lake	13.24km	W
		29.	Ottiyambakkam Lake	14.88km	NNW
2	Manmade	S. No	School / Colleges	Distance (km)	Direction
		1.	Pattipulam Government Adi Dravidar Welfare High School	0.48km	E
		2.	Nemmeli Government Higher Secondary School	0.53km	E
		3.	Payanoor Government High School	0.84km	W
		4.	Jagannath College of Nursing	Adjacent to site	W
		5.	Government Arts and Science Colllege Nemmeli	0.45km	E
		6.	Dhanalakshmi Srinivasan College of Engineering and Technology	0.27km	S

S. No	Hospitals	Distance (km)	Direction
1.	Payanoor Government Health Sub Centre	0.85km	W
2.	Mahabalipuram Government Hospital	0.84km	S
3.	Tiruporur Government General Hospital	1.64km	E
S. No	Government Buildings	Distance (km)	Direction
1.	Thandalam VAO Office	0.80km	W
2.	Thiruporur Tashildar Office	1.41km	W
3.	Kalavakkam Fire Station	1.98km	W
S. No	Religious Places	Distance (km)	Direction
1.	Shri Padavettamman Temple	Adjacent to site	W
2.	Shri Munisuvratswami Jain Navgraha Temple	0.12km	E
3.	Sri Mageshwarar Temple	0.35km	W
4.	Karukathamman Temple	0.38km	S
5.	Arulmigu Shri Selliamman Temple	0.39km	E
6.	Shri Sengazhaniemman Temple	0.49km	E
7.	Arulmigu Sri Urumaathamman Temple	0.71km	E
8.	Arulmigu Sri Sthala Sayana Perumal Temple	0.94km	SE
9.	Nemmeli Dargah	1.02km	E
10.	Arulmigu Kanthasamy Temple Thiruporur	1.38km	W
11.	Mahabalipuram Shore Temple	1.39km	SE
12.	Sahaya Madha Church	1.49km	NE
13.	Kailasanathar Temple	1.77km	W
14.	Sri Angalamman Temple	1.89km	NNW
15.	Nithya Kalyana Perumal Temple	2.89km	NNE
16.	Sri Chenganmaaleeswarar Shiva Temple	3.96km	NNW
17.	Boominathar Temple	4.54km	NNE
18.	Divine Mercy Church	5.14km	N
19.	Hazrath Thameem Ansari Sahabiye Rasool	5.68km	NNE

		Dargah sheriff		
20.		Veera Anjaneyar Temple Sannidhi	8.71km	NNW
21.		Arulmigu Sri Periyandavar Temple	9.80km	W
22.		Sri Thiruvareswarar Temple	11.81km	S
23.		Jagannath Shrine	12.31km	N
24.		Arulmigu Sri Vedhagiriswarar Temple	12.77km	W
S. No		Industries	Distance (km)	Direction
1.		Orchid Pharma Ltd	Adjacent to site	W
2.		S.V CHEM Intermediates Pvt.Ltd	Adjacent to site	W
3.		Ghcl Limited	Adjacent to site	W
4.		Tamman Titoe Pharma Pvt.Ltd	0.11km	W
5.		Punit Meditek Private Limited	0.29km	W
6.		Mk Aromatics Limited	0.34km	W
7.		Turbo Energy Private Limited	0.44km	W
8.		Limra Chemicals & Pharmaceuticals Pvt. Ltd	0.38km	W
9.		Anjan Drug Private Limited Alathur	0.49km	W
10.		Kokal Interior Contracts Pvt.Ltd	0.51km	E
11.		Advanced Biotech Products (P) Ltd	0.54km	W
12.		Strides Pharma (Vivimed)	0.57km	W
13.		Nemmeli Seawater Desalination Plant	0.60km	E
14.		PAR Active Technologies PVT. LTD	0.64km	W
15.		G R Industries	0.67km	W
16.		Amrutanjan Health Care Ltd	0.68km	W
17.		Clarion Foods	0.69km	W
18.		Pure Organic Industries	0.73km	W
19.		Rama Krishna Packaging Private Ltd	0.80km	W
20.		Alchymars ICM SM Private Limited	0.81km	W

	21.	Stellar optics private limited	0.89km	W
	22.	Unilink Pharma Pvt.Ltd	0.84km	W
	23.	Global pharma	1.02km	W
	24.	Apex Plant II	1.06km	W
	25.	Refex Industries	1.07km	W
	26.	Apex Pharmaceutical	1.10km	W
	27.	Stedman Pharmaceuticals Pvt Ltd Factory	1.20km	W
	28.	Eurokem Laboratories Pvt. Ltd	1.29km	W
	29.	Goodwin Refractory Services India Pvt Ltd	1.63km	NNW
	30.	Carbonair industries Madras Pvt.Ltd	1.84km	NNW
	31.	Rambal Limited	2.47km	W
	32.	Godrej Consumer Products Ltd	2.57km	W
	33.	Daiceal Safety Systems India Pvt Ltd	2.62km	W
	34.	Yamaha India Pvt	3.23km	W
	35.	Takasago International India Pvt Ltd	3.45km	W
	36.	Multipurpose recruitment and training Chennai Pvt Ltd	3.53km	NNW
	37.	Swaminathan Enterprise private limited	3.62km	W
	38.	Ajinomoto India Pvt Limited	3.85km	W
	39.	Hitachi Astemo Chennai Pvt	3.89km	W
	40.	Maruchan Ajinomoto India Private Limited	4.00km	W
	41.	Tunga Aerospace Industries Private Limited	4.44km	W
	42.	Levim Lifetech	4.51km	W
	43.	Anabond Limited	4.73km	W
	44.	Vikaarte foods Pvt Ltd	4.76km	NNW
	45.	Bhavini Atomic Power Plant	5.74km	S
	46.	Fourrts India Laboratories Pvt.Ltd	5.81km	NNW
	47.	Preethi Kitchen Appliances	6.93km	NNW
	48.	Polyhose India Pvt Ltd	6.96km	NNW

		49.	Multivista Global Pvt.Ltd. Print Manufacturing	7.15km	NNW
		50.	Valeth High Tech Composites Pvt Ltd	8.81km	N
		51.	Casting yard ITD	8.85km	N
		52.	Inventz Lifesciences Private Limited	9.26km	N
		53.	Maya Appliances Pvt Ltd	11.08km	W
		54.	Alina Pvt Ltd	11.55km	W
3	State, National boundaries	S. No	State boundaries	Distance (km)	Direction
		1.	Nil	-	-
		S. No	National boundaries	Distance (km)	Direction
		1.	Nil	-	-
4	Nearest Highway & Railway Station	S. No	Highway	Distance (km)	Direction
		1.	NH-332A(Mahabalipuram-Pondicherry)	1.48km	SSW
		2.	SH-49 (Chennai-Thoothukudi)(ECR Road)	0.19km	E
			Railway Station	Distance (km)	Direction
		1.	Guduvancheri Railway station	20.81km	NW
5	Nearest Airport & port	S. No	Airport	Distance (km)	Direction
		1.	Chennai Int Airport	27.44km	NNW
			Port	Distance (km)	Direction
		1.	Chennai Port	37km	N
6	Monuments & Heritages	S. No	Monuments	Distance (km)	Direction
		1.	Small Monolithic Temples known as Valiankuttai Ratha (unfinished) Mamallapuram	0.46km	S
		2.	Two small monolithic Temples known as the Pidari Amman Ratha (unfinished) Mamallapuram	0.56km	S
		3.	Mukundanayanar Temple (half buried in sand to the north of the village)	0.61km	E
		4.	Two inscribed rocks one having six and the other fifty lines of ancient Tamil inscriptions with remains of other ancient buildings Saluvankuppam	0.70km	E
		5.	Rock cut Siva Temples with three lingas	0.71km	W

6.	Huge stone figures of a lion elephant and a bull Mamallapuram	0.74km	SE
7.	Triple celled rock-cut shrine with Gopi's churn in front of it Triple celled rock-cut shrine with Gopi's churn in front of it Mamallapuram	0.75km	SE
8.	Kotikal Mantapa Mamallapuram	0.75km	SE
9.	Rock cut sculptures representing a group of elephants monkeys and peacock Mamallapuram	0.75km	SE
10.	Two rock-cut cave Temples at the northeast corner of the Koneri Pallam Tank Mamallapuram	0.75km	SSE
11.	Tiger headed rock-cut Temple Saluvankuppam	0.76km	W
12.	Krishna's Butterball Mamallapuram	0.79km	SE
13.	Rock-cut Ganesa Temple Mamallapuram	0.85km	SE
14.	Droupadi's Bath Mamallapuram	0.85km	SSE
15.	Rock-cut Varaha temple containing Varaha and Vamana Incarnations of Vishnu Mamallapuram	0.87km	SE
16.	Arjuna's Penance Mamallapuram	0.91km	SE
17.	Royagopuram (unfinished) Mamallapuram	0.91km	SSE
18.	Eight stone images on a masonry Platform known as the "Seven pidaris" Mamallapuram	0.91km	ESE
19.	Unfinished Ratha and stone couch Mamallapuram	0.92km	SSE
20.	Unfinished Rock cut cave Temple North of Krishna Mantapa Mamallapuram	0.93km	SE
21.	Two Unfinished Excavations Near The Light House Mamallapuram	0.94km	SSE
22.	Krishna Madapa Mamallapuram	0.95km	SE
23.	Unfinished Excavations Near Triple Celled Rock Cut Shrine Mamallapuram	1.10km	SSE
24.	Unfinished Excavations South Of Draupadi Rath Mamallapuram	0.98km	SSE
25.	Dolotsava Mandapa Mamallapuram	1.06km	SE
26.	Iswara Temple Mamallapuram	1.11km	SSE

	27.	Large unfinished rock sculpture similar to Arjuna's Penance near the light-house Mamallapuram	1.14km	SSE
	28.	Dharmaraja's Rock cut throne Mamallapuram	1.17km	SSE
	29.	Mahishasura rock standing in the sea north of Shore Temple Mamallapuram	1.46km	ESE
	30.	Aleva shore Temple Mamallapuram	1.52km	SE
	31.	Two small carved rocks to the south of the shore Temple Mamallapuram	1.58km	SE
	32.	Megalithic cists and cairns Tirupporur	1.70km	W
	33.	Arjuna's Rath Mamallapuram	1.73km	S
	34.	Sahadeva's Rath Mamallapuram	1.73km	S
	35.	Bhima's Rath Mamallapuram	1.74km	S
	36.	Dharmaraja's Rath Mamallapuram	1.76km	S
	37.	Megalithic cists and cairns Kanakapattu	1.86km	W
	38.	Nithya Kalyanaswami Temple Tiruvidanthai	2.89km	NNE
	39.	Urn burials Alathur	3.83km	W
	40.	Megalithic cists and cairns Madayathur	4.50km	W
	41.	Megalithic cists and cairns Sirudavur	5.18km	W
	42.	Megalithic cists and cairns Porundavakkam	5.62km	W
	43.	Megalithic cists and cairns Manamai	5.97km	SSW
	44.	Megalithic cists and cairns Amur	6.77km	W
	45.	Megalithic cists and cairns Atcharavakkam	7.18km	W
	46.	Megalithic cists and cairns Agaram	7.12km	W
	47.	Megalithic cists and cairns Padur	7.16km	N
	48.	Megalithic cists and cairns Vembedu	7.58km	W
	49.	Group of cairns and cists Sembakkam	8.63km	W

		50.	Megalithic cists and cairns Mailai	8.89km	W
		51.	Megalithic cists and cairns Kottamedu	9.05km	W
		52.	Megalithic cists and cairns with stone circles Edakunram	9.33km	W
		53.	Megalithic cists and cairns Pundi	9.46km	W
		54.	Megalithic cists and cairns Nellikuppam	10.87km	W
		55.	Ruined Dutch Fort and cemetery Sadras	11.18km	S
		56.	Megalithic cists and cairns Kalvay	11.23km	WNW
		57.	Megalithic cists and cairns Vengur	11.41km	W
		58.	Megalithic cists and cairns with stone circles Rayalpattu	11.35km	W
		59.	Megalithic cists and cairns Kalvay	11.43km	WNW
		60.	Megalithic cists and cairns Ottivakkam	11.53km	NW
		61.	Megalithic cists and cairns Ottivakkam	11.62km	NW
		62.	Megalithic cists and cairns Agaram	11.89km	W
		63.	Megalithic cists and cairns Sirukunram	11.92km	W
		64.	Megalithic cists and cairns Kumili	12.57km	NW
		65.	Orikkal Mantapam Tirukalikundrum	12.77km	W
		66.	Megalithic cists and cairns with stone circles Ponmar	13.40km	NNW
		67.	Megalithic cists and cairns Unamanjeri	13.58km	NW
		68.	Megalithic cists and cairns Ottiyambakkam	14.17km	NNW
		69.	Megalithic cists and cairns Melkottaiyur	14.38km	NNW
		Heritages		Distance (km)	Direction
		1.	Nil	-	-
7	Defense	S. No	Defense Installations	Distance (km)	Direction

Installations	1.	Nil	-	-
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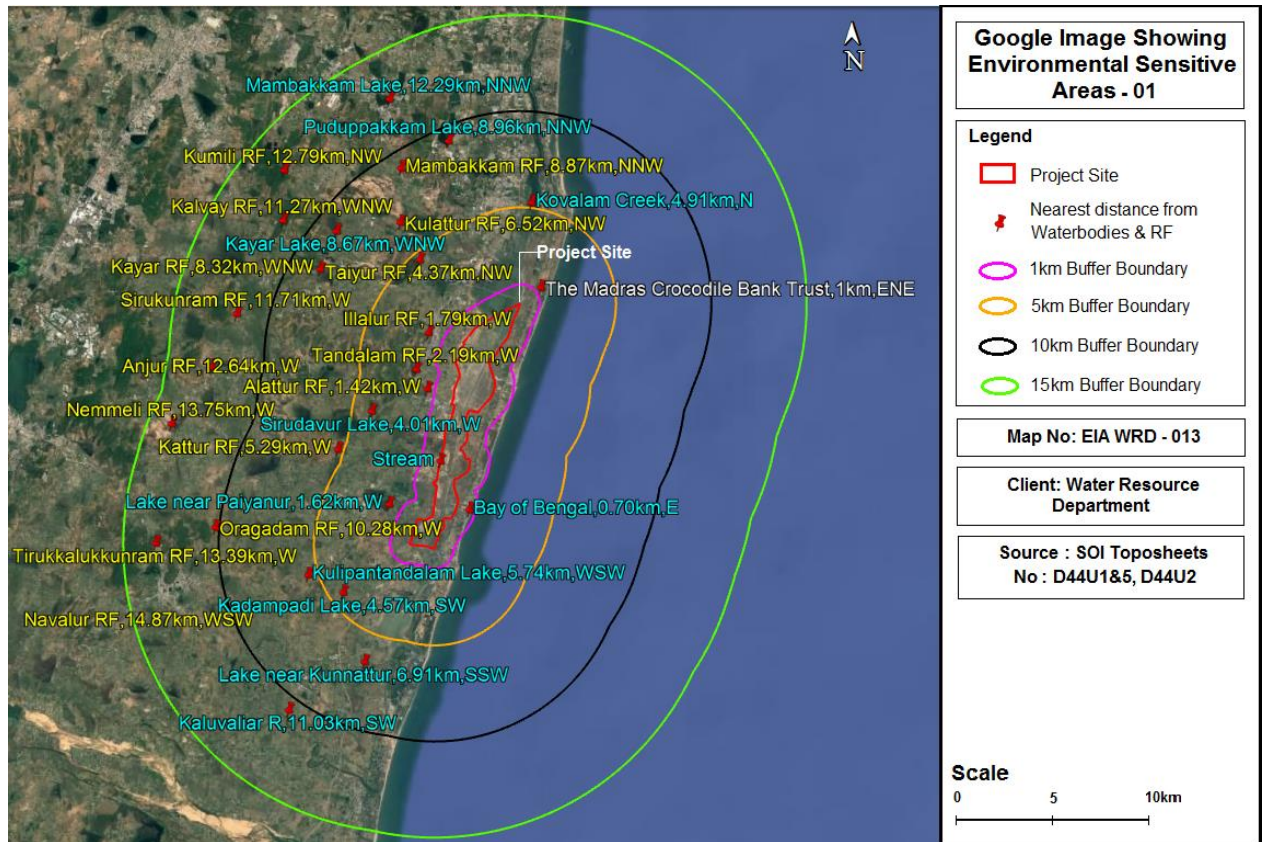


Figure 3-2 Environmental sensitive areas covering within 15 km from project boundary-1

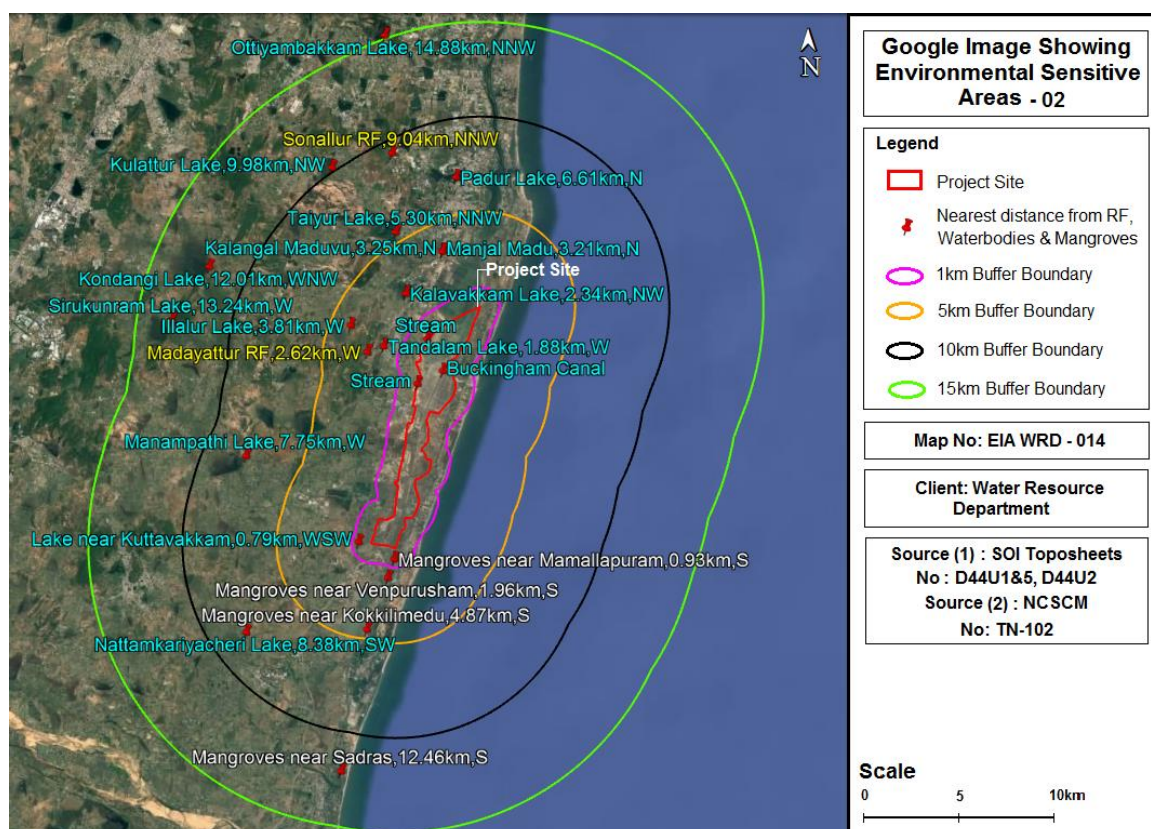


Figure 3-3 Environmental sensitive areas covering within 15 km from project boundary-2

3.4 Physical Conditions of PIA district

In this section, the physical conditions of PIA district are discussed in general and wherever possible references to the conditions prevailing in the study area in particular are also provided. The physical conditions are discussed as under:

- District profile
- Drainage, Land Use, Geology, Physiographic
- Natural Resources
- Climatic conditions, Seismic Zone characteristics and Natural Hazard

3.4.1 PIA District Profile

The project influence area (PIA) falls within the Chengalpattu District, which was bifurcated from the Kancheepuram District on 29.11.2019. As the latest district report for Chengalpattu is not yet available, the existing report for Kancheepuram District prior to the bifurcation has been utilized for this report. PIA covered in this report falls within the Chengalpattu District, which was formerly part of the Kancheepuram District.

Kancheepuram district lies between 11°00' and 12°00' latitudes and between 77°28' and 78°50' longitudes. It has an area of 4483 sq.kms. Kancheepuram district stands 15th place in terms of

the largest area. Kancheepuram district is bordering Bay of Bengal in the east, Tiruvannamalai district in the west, Thiruvallur district in the north, Chennai district in the north-east, Vellore district in the northwest and Viluppuram district in the south.

Source: <https://censusindia.gov.in/nada/index.php/catalog/45355>

Ref: Census of India 2011 - Tamil Nadu - Series 34 - Part XII A - District Census Handbook, Kancheepuram, ([DH 2011 3303 PART A DCHB KANCHEEPURAM.pdf](#))

3.4.2 Climatic Conditions

The climate is normal during winter but very hot in summer in the Kancheepuram district. Maximum temperature has been recorded in May and minimum temperature has been recorded in January. In 2009-10, maximum temperature of the district was 37.3°C and the minimum temperature was 20.8°C. The pre-monsoon rainfall is almost uniform throughout the district. The coastal regions get more in rather than the interior regions. This district is mainly depending on the seasonal rain, the distress conditions prevail in the event of the failure of rain. Northeast and southwest monsoon contribute rainfall of 54% and 36% respectively to the total annual rainfall.

Source: <https://censusindia.gov.in/nada/index.php/catalog/45355>

Ref: Census of India 2011 - Tamil Nadu - Series 34 - Part XII A - District Census Handbook, Kancheepuram, ([DH 2011 3303 PART A DCHB KANCHEEPURAM.pdf](#))

3.4.3 Natural Resources of Chennai District Forest Resources

3.4.3.1 Flora & Fauna

Due to rapid industrialisation, increasing conversion of waste land and agricultural land for residential purposes, the forests cover in the Kancheepuram district is affected. The total area under forest in this district is 27226.60 hectares. This works out to 7.2% of the total geographical area of the district. The forest area is scattered throughout the district. Trees of poor height of deciduous type and fuel trees and low scrub jungle are generally found in the reserve forest of the district.

Source: <https://censusindia.gov.in/nada/index.php/catalog/45355>

3.4.3.2 Forest Resources

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Source: <https://censusindia.gov.in/nada/index.php/catalog/45355>

Kancheepuram, ([DH 2011 3303 PART A DCHB KANCHEEPURAM.pdf](#))

3.4.3.3 Agricultural Resources

In Kancheepuram district, agriculture is the main occupation of the people with 47% of the population engaged in it. Paddy is the major crop cultivated in the district. Groundnuts, Sugarcane, Gingelly, Cereals and Millets and Pulses are the other crops in Kancheepuram district. Major horticultural crops cultivated in the district are mango, banana, sapota, guava, watermelon, brinjal, ladies finger, chilly, curry leaves, jasmine, tube roses and cysanthamam. There are five State Horticultural Farms in the district at Athur, Vichanthangal, Melottivakkam, Melkadirpur and Pichivakkam. An area of 3096 hectares was cultivated with 8701 tonnes of mangoes during 2009-10.

Source: <https://censusindia.gov.in/nada/index.php/catalog/45355>

Ref: Census of India 2011 - Tamil Nadu - Series 34 - Part XII A - District Census Handbook, Kancheepuram, ([DH 2011 3303 PART A DCHB KANCHEEPURAM.pdf](#))

3.4.3.4 Mineral Resources

As the latest district report for Chengalpattu on mineral resources is available, it has been utilized in this section. No important minerals are found in the district except brick clay, salt and sand. The mineral map of Chengalpattu, Tamil Nadu, along with the location of the project area is represented in the **Figure 3.4**.

Source: https://www.gsi.gov.in/webcenter/portal/OCBIS/pages_pageMAPS/pageMapsSeries

District resource map (Second Edition) – Chengalpattu, Tamil Nadu.



3.4.4 Topography of the Study Area

The topographical variation of the study site and its surrounding area, within a 10 km radius from the site's periphery is depicted in the contour map in **Figure 3.5**. The project site is located along the eastern coastal stretch near Mamallapuram, encompassing a low-lying flat terrain predominantly within the 10 m elevation zone. Nearby settlements include Mamallapuram, Pattipulam, Tiruporur, Kelambakkam, and Kovalam. The terrain gradually rises westward (inland), reaching elevations of 30 m, 40 m and up to 50 m indicating gently sloping and undulating land. Contour lines on the map are widely spaced, suggesting a gradual change in elevation without steep slopes. The elevation gradient supports natural drainage flow from inland areas toward the coast.

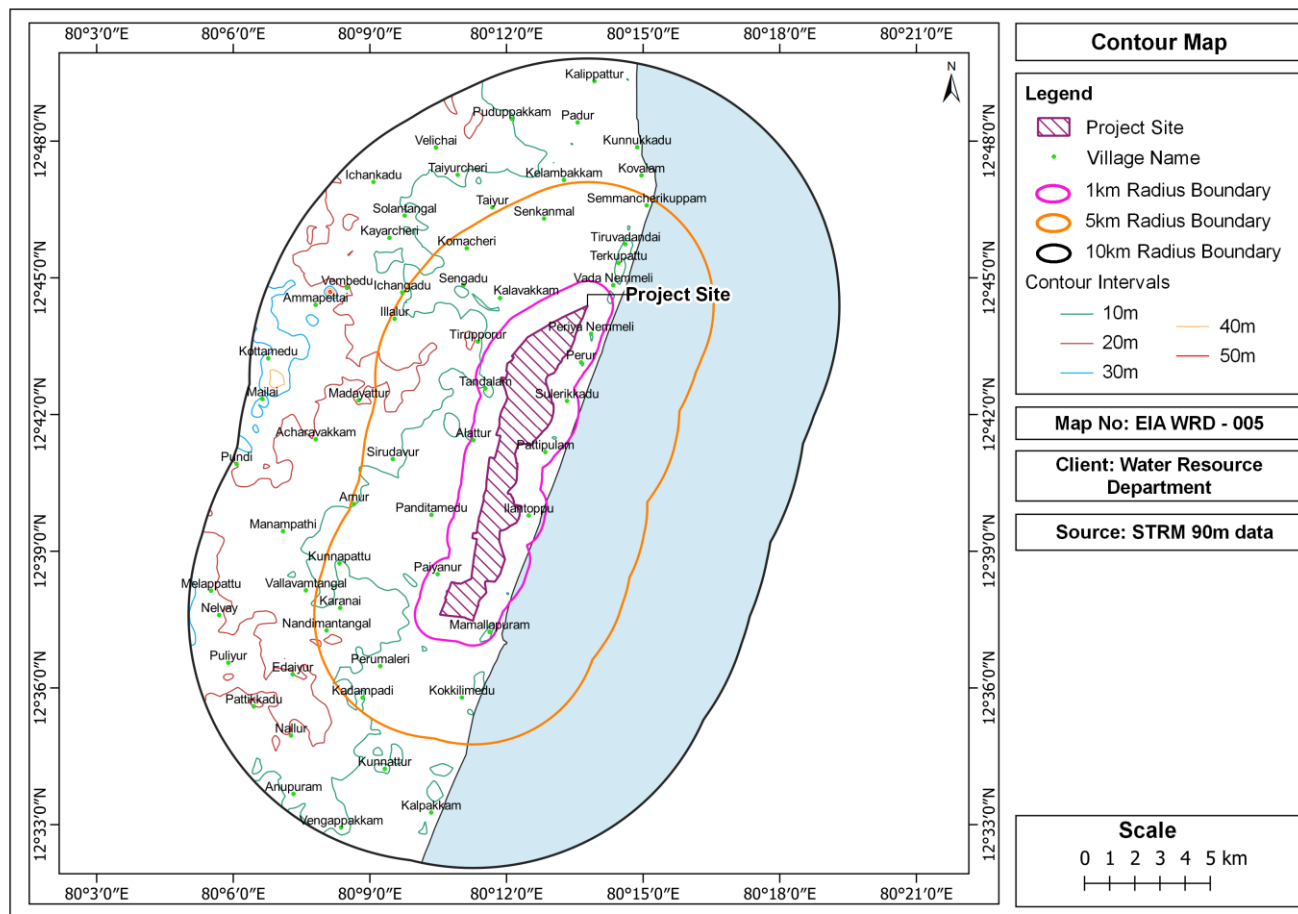


Figure 3-5 Contour map of the Study Area

3.4.5 Drainage Pattern in the PIA District

Palar and Cheyyar are the important rivers in Kancheepuram district. The drainage pattern in general is sub-dendritic and radial. All the rivers are seasonal and carry substantial flows during monsoon period. River Palar, a major river course, which drains this district originates from Western Ghats in Karnataka state, and discharges in Bay of Bengal near Pudupattinam. The Cheyyar, a tributary of Palar originates from the Jawadu Hills of Tiruvannamalai district. It has a north easterly flow in Kancheepuram district and confluences with the Palar near Pazhaiyaseevaram. Other seasonal river like Korattalaiair and Tandiar drain this district partly on the northern and southern part respectively.

Source: <http://cgwb.gov.in/sites/default/files/2022-10/kancheepuram.pdf>

(Ref: Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District")

3.4.6 Geology in the PIA District

As the latest district report for Chengalpattu on Geology resources is available, it has been utilized in this section.

The area exposes crystalline rocks of Archaean-Proterozoic age, sedimentary rocks of the Gondwana Supergroup and Cuddalore Formation belonging to the Miocene-Pliocene age, alluvium and unconsolidated rocks of the Holocene Age. Major parts of the district are covered by charnockite of Southern Granulite Terrain belonging to Archaean-Proterozoic age. The Lower Gondwana sediments (Talchirs) overlie the Archaean rocks unconformably and are seen to the northeast and south of the Palar river preserved in the trough faults and comprise boulder beds, sandstone, siltstone with clasts of rock fragments and shales. Gondwana conglomerates, sandstones, and shales represent the porous, semi-consolidated sediments. Greyish white sandstone, shales, and siltstone belonging to the Sriperumbudur Formation of Early Cretaceous age are seen in the northern part of the district. Conglomeratic sandstone forms the basal part of the formation. The rocks of Mio-Pliocene age, termed as Cuddalore Formation are found along the coast overlying the charnockites and consist of pebbly beds below and coarse gravel friable sand and clay with reddish clayey sandstone above. The marine and fluvial deposits of the Holocene age are mainly found along the coastal region. Dune ridges are observed along the coast in the eastern part. Alluvium and marine landforms such as beach ridges, tidal flats, creeks, lagoons, and salt marshes are found all along the coasts. The tidal flats comprise dark, sticky black clay with marine shells. The strike of the foliation in rocks swerves mostly between NNE-SSW to NE-SW, with moderate to steep dips ranging between 40°-80° both

towards the east and west direction. The reactivation of Pre-Cambrian faults appears to be the main cause of block faults. Three sets of lineaments are recorded in the area, viz., NNE-SSW to N-S, NW-SE and NE-SW direction. Major lineaments and a few faults trending along ENE-WSW are seen. Geological map of Chengalpattu is given in **Figure 3.4**.

Source: <https://employee.gsi.gov.in/cs/groups/public/documents/document/dmkx/mtc5/~edisp/dcport1gsigovi1179537.pdf>

Ref: District resource map (Second Edition) – Chengalpattu, Tamil Nadu.

3.4.7 Soils in the PIA District

As the latest district report for Chengalpattu on Soil resources is available, it has been utilized in this section. Soil map of Chengalpattu is given in **Figure 3.6**

Soils have been classified into 1) clayey soil, 2) red sandy or red loamy soil, 3) red sandy brown clayey soil, 4) alluvial soil. Brown clayey soil is the most common of the above soils, covering more than 71% of the Chengalpattu district. Alluvial soils are found on the banks of the Palar and other rivers. The river alluvium is transported and is seen in the coastal areas of this district. Sandy coastal alluvial (arenaceous soil) occurs along the seacoast as a narrow belt. The depth of formation of soils is moderately deep to very deep, with erosion of soils varying from slight to severely eroded.

Source: <https://employee.gsi.gov.in/cs/groups/public/documents/document/dmkx/mtc5/~edisp/dcport1gsigovi1179537.pdf>

Ref: District resource map (Second Edition) – Chengalpattu, Tamil Nadu

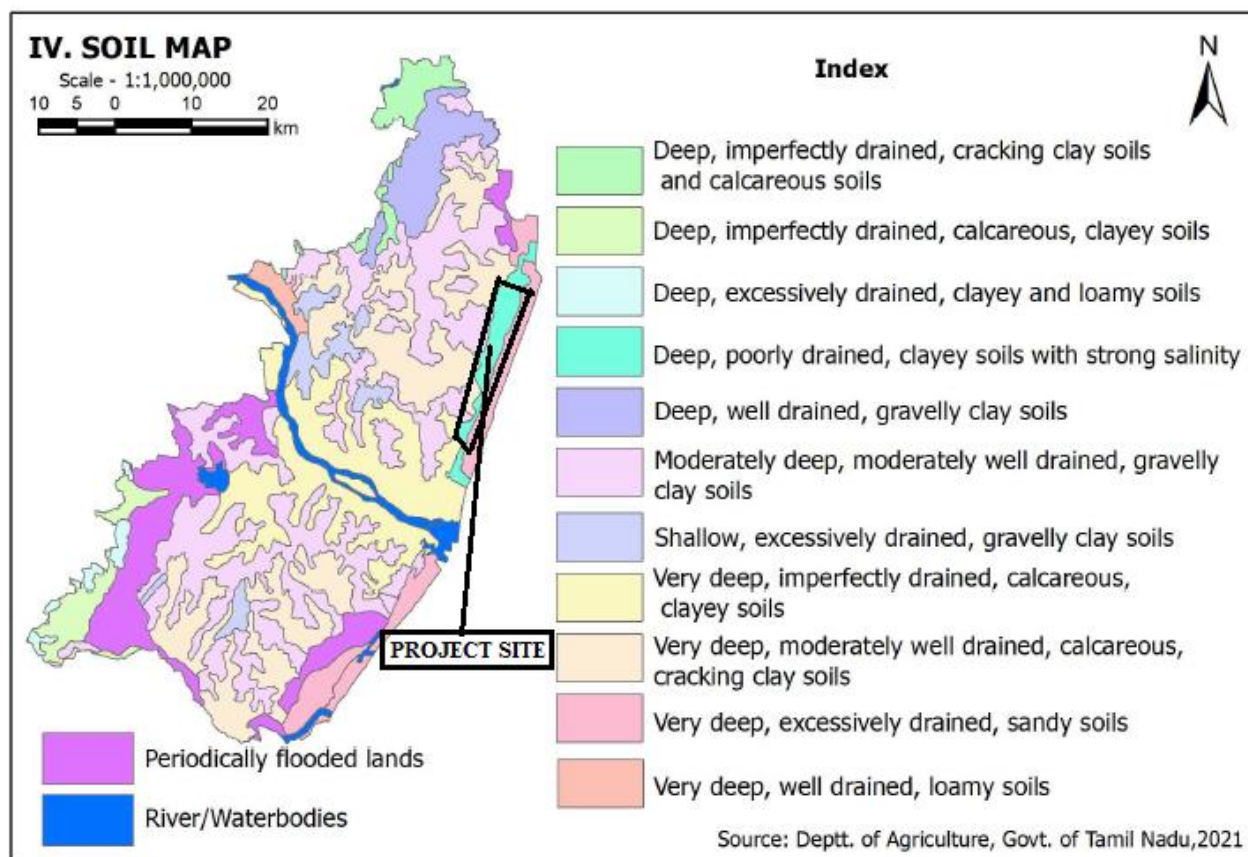


Figure 3-6 Soil map of Chengalpattu, highlighting the project site

3.4.8 Geomorphology of the study area

Total geographical area of the study area is 634.79 Sq.Km. The landform distribution is dominated by the ocean, which occupies 40.41% (256.55 sq.km) of the area, followed closely by the denudational origin pediment-pediplain complex at 36.30% (230.42 sq.km), indicating extensive flat to gently sloping terrain shaped by long-term weathering and erosion. The younger coastal plain accounts for 15.22% (96.63 sq.km), reflecting more recent coastal depositional environments, while waterbodies cover 5.75% (36.47 sq.km). Smaller portions are represented by the older coastal plain (2.21%, 14.03 sq.km), with very minor contributions from aeolian plains (0.07%, 0.44 sq.km) and structural low dissected hills and valleys (0.04%, 0.25 sq.km).

Table 3-2 Geomorphology pattern of the study area

Sl. No.	Description	Percentage (%)	Area (Sq.Km)	Area (Acres)	Area (Hectares)
1.	Ocean	40.41	256.55	63394.79	25655

2.	Denudational Origin- Pediment-PediPlain Complex	36.30	230.42	56937.93	23042
3.	Coastal Origin-Younger Coastal Plain	15.22	96.63	23877.76	9663
4.	Waterbodies	5.75	36.47	9011.92	3647
5.	Coastal Origin-Older Coastal Plain	2.21	14.03	3466.88	1403
6.	Aeolian Origin-Aeolian Plain	0.07	0.44	108.73	44
7.	Structural Origin-Low Dissected Hills and Valleys	0.04	0.25	61.78	25
Total		100	634.79	156859.78	63479



3.4.9 Land Use & Land Cover of study area

The land use pattern of the study area is **634.79** Sq.Km. Land use map of the study area is given in **Figure 3.8** respectively. The land use and land cover analysis reveals that the largest portion of the area is occupied by the ocean, covering 38.75% (245.97 sq.km), followed by crop land which constitutes 22.59% (143.41 sq.km) of the total area. Other significant land uses include rural settlements (7.86%), coastal wetlands (7.05%) and fallow lands (6.01%). Waterbodies account for 5.36%, while scrub land and urban areas cover 3.25% and 3.13% respectively. Forest plantations (2.30%) and other plantations (1.57%) contribute smaller portions, along with sandy areas (1.03%) and deciduous vegetation (0.45%). Minor land uses include river/stream/canals (0.39%), salt-affected lands (0.18%), and mining areas (0.08%).

Table 3-3 land use/land cover statistics for study area

SL. No.	Descriptions	Percentage (%)	Area (Sq.km)	Area (Acres)	Area (Hectares)
1.	Crop land	22.59	143.41	35437.32805	14341
2.	Rural	7.86	49.91	12333.01055	4991
3.	Coastal wetland	7.05	44.77	11062.89085	4477
4.	Fallow	6.01	38.16	9429.5268	3816
5.	Waterbodies	5.36	34.00	8401.57	3400
6.	Scrub land	3.25	20.63	5097.77615	2063
7.	Urban	3.13	19.84	4902.5632	1984
8.	Forest Plantation	2.30	14.57	3600.31985	1457
9.	Plantation	1.57	9.99	2468.57895	999
10.	Sandy area	1.03	6.57	1623.47985	657
11.	Deciduous	0.45	2.87	709.19135	287
12.	River / Stream / Canals	0.39	2.47	610.34935	247
13.	Salt affected land	0.18	1.12	276.7576	112

14.	Mining	0.08	0.51	126.02355	51
15.	Ocean	38.75	245.97	60780.4168 5	24597
Total		100.00	634.79	156859.78 3	63479

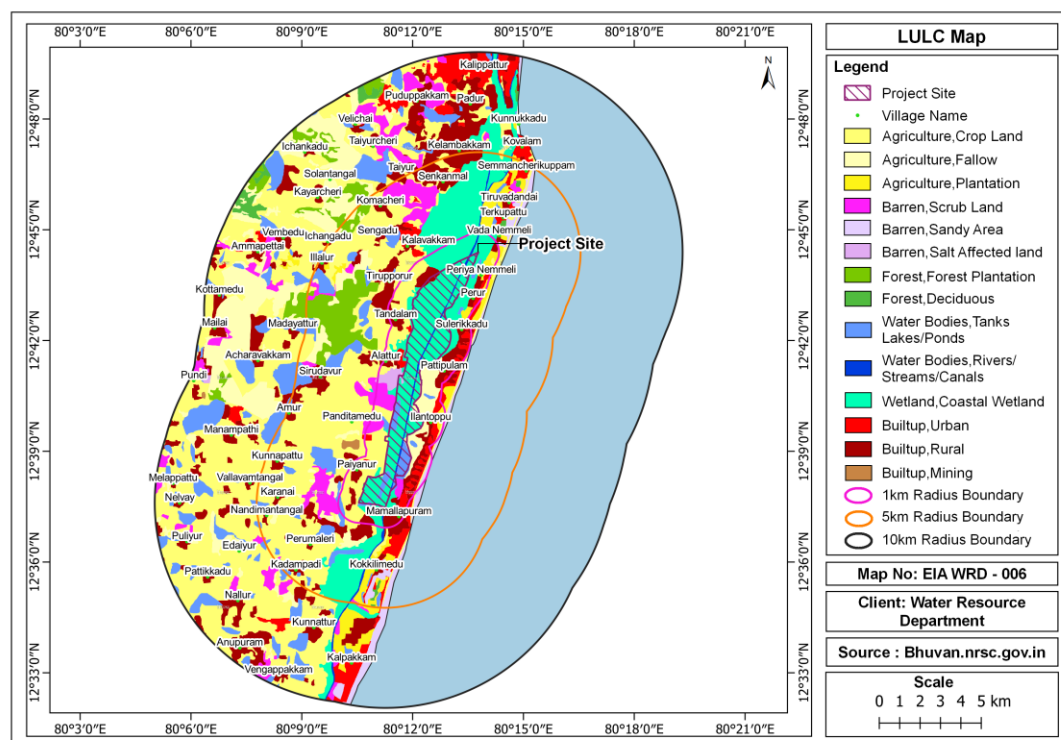


Figure 3-8 Land Use map of the study area

3.4.10 Hydrogeology of PIA District

The Kancheepuram district is underlain by both sedimentary and fissured formations. The important aquifer system in the district are constituted by 1) unconsolidated and semi consolidated formations and 2) weathered, fissured and fractured crystalline rocks. Semi Consolidated formation: Gondwana sandstones and shales and Tertiary mottled clays and sandstones represent the porous, semi-consolidated sediments. Ground water occurs under water table conditions to confined conditions in the inter granular spaces of sandstones, sands and in the bedding planes and thin fractures of shales. The ground water occurs under water table conditions and the depth of the wells ranges from 5 to 10 m bgl. The depth to water level ranged from 2.89 to 4.09 m bgl during May 2006 and 1.05 to 3.40 m.bgl during Jan'2007. The specific capacity of porous formation ranged from 1.00 to 80.00 lpm/m/dd. Ground Water in

Unconsolidated Alluvium: These unconsolidated formations occur mainly along the banks of Palar and Cheyyar rivers and the sand layers of this alluvium form the potential aquifer. Between Walajabad and Kancheepuram, small diameter dug wells tap the alluvium with depths ranging between 6 and 12 m bgl. The yield ranges from 25 to 35 m³/hr. Depth of filter point and dug cum bore wells ranges from 10 – 21 m bgl and yield is around 20 m³/hr. The yield of infiltration wells with varying depths of 5 – 12 mbgl is around 35 m³/hr. In areas covered by the laterites, the ground water is developed by means of dug wells in the depth of 4 to 6 m bgl. Along the coast, windblown sand acts as aquifer zones and ground water extraction is by means of shallow dug wells with radial arms. The wells can sustain for 3 to 6 hours pumping and yield is around 15m³/hour. **Fissured Formation:** The movement of ground water in fissured crystallines is principally controlled by joints, fissured, fractures and their interconnections. Ground water in fissured crystallines is developed by means of dug wells, dug-cum-bore wells and bore wells. The wells range in depth between 6 and 17.00 m bgl. The depth to water level ranged from 3.50 – 8.34 m bgl during May 2006 and 1.32 – 7.53 m bgl during January 2007. The yield of the wells varies from 30 to 100 m/day (January-March). The depth of dug cum bore wells ranges from 25 to 45 m bgl. The depth of bore wells ranges up to 200 m bgl. The piezometric head ranges from 2.05 to 5.98 m bgl during May 2006 and 0.70 – 3.75 m bgl during Jan'2007 and the yield ranges up to 12 lps. The specific capacity in the fissured formation ranges from 10 -250 lpm/m/dd.

Source: <http://cgwb.gov.in/sites/default/files/2022-10/kancheepuram.pdf>

(Ref: Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, "District Ground Water Brochure Kancheepuram District")

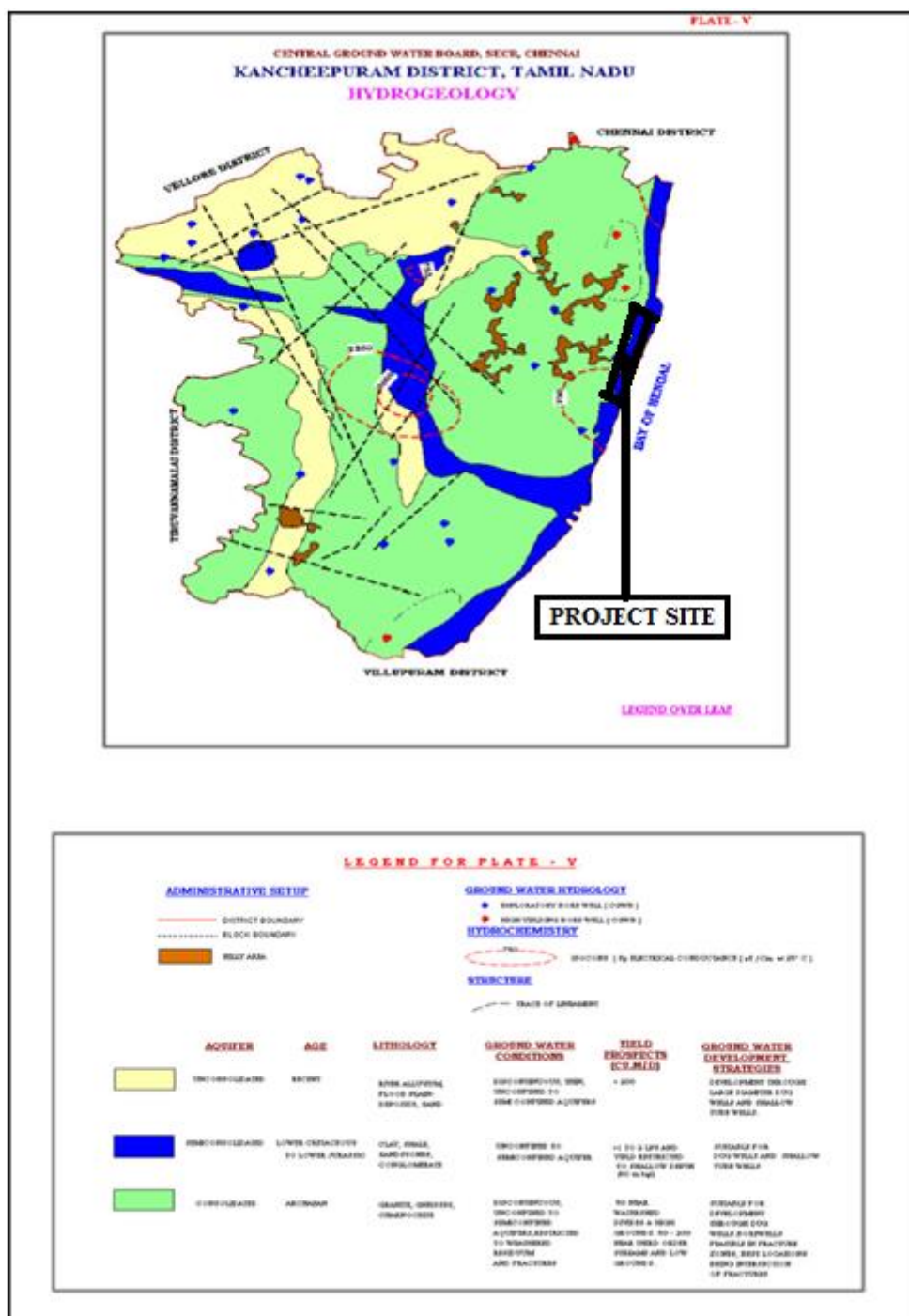


Figure 3-9 Hydrogeology Map of PIA district

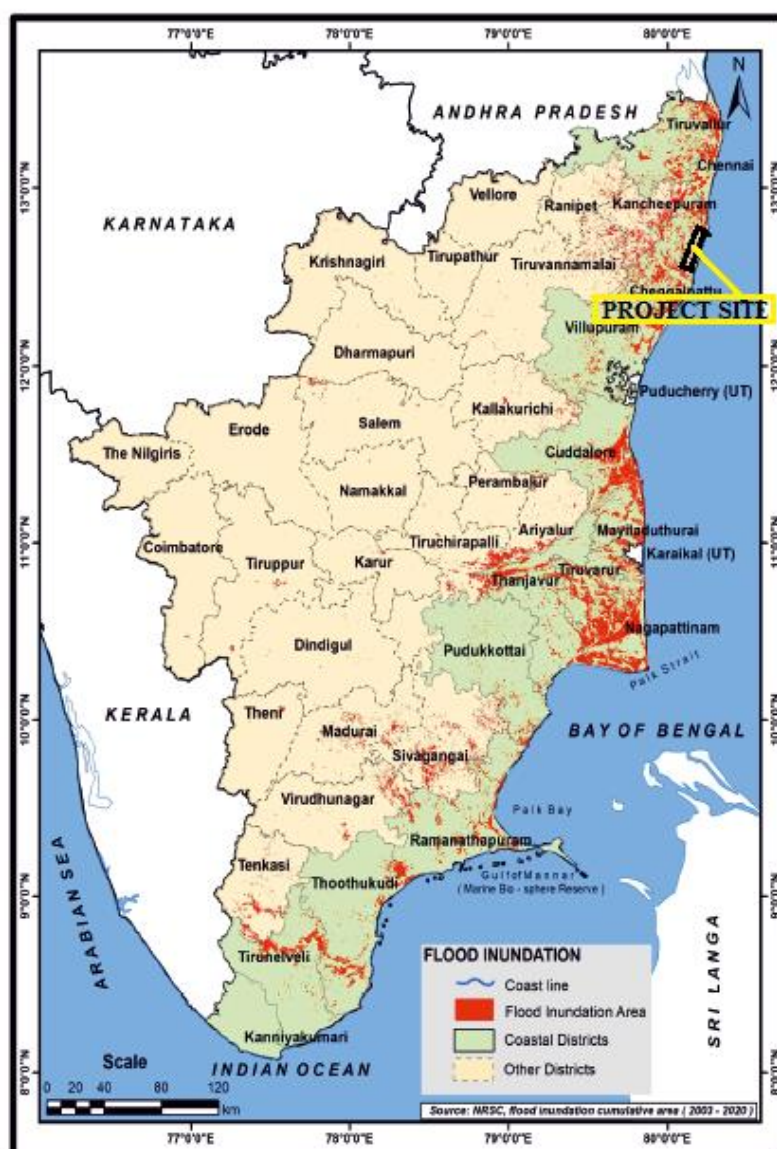
3.4.11 Natural Hazards in PIA District

The Hazard may be termed as any event / object / rivers /industries / earthquake / fire / building / excess or deficit of rainfall which can cause a potential damage to a population / Animals / property / environment etc., an analysis involving occurrence magnitude, volume of

hazards and the impact caused by such hazards gives a proper direction to prepare a plan to deal with such eventualities.

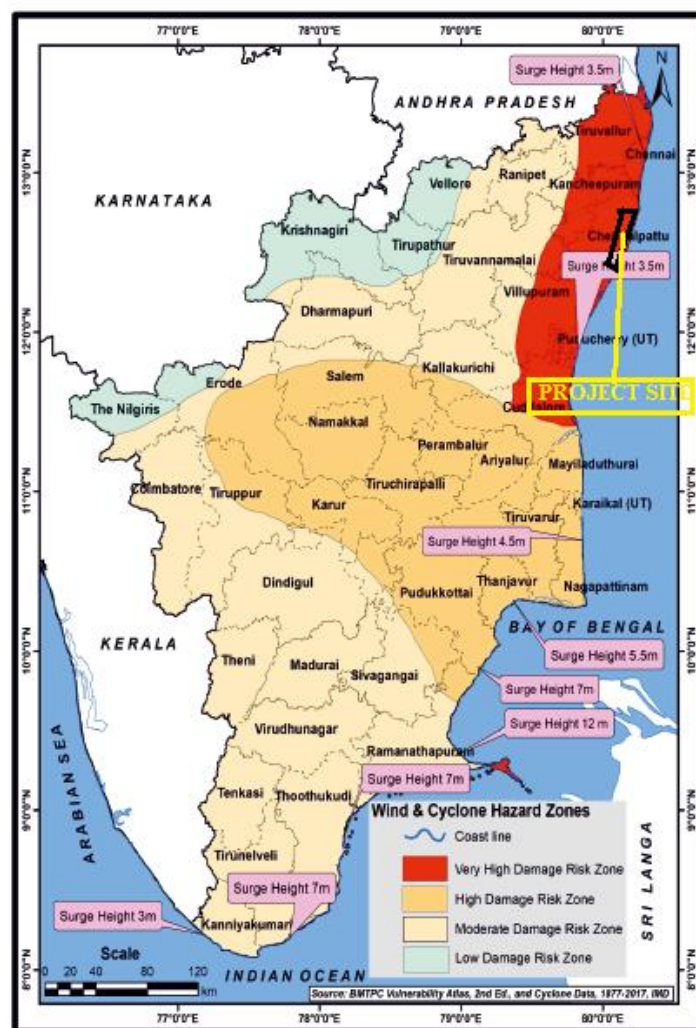
- (i) As per Map of the Flood Zones in Tamil Nadu shown in **Figure 3.10**, study area falls in **- Flood inundations area.**
- (ii) As per Map of the Wind & Cyclone Zones in Tamil Nadu shown in **Figure 3.11**, study area falls in **- Very high damage risk zone**

Source: <https://spc.tn.gov.in/policy/tamil-nadu-state-disaster-management-policy-2023/>



(Source: NRSC)

Figure 3-10 Map of the Flood Zones in Tamil Nadu, highlighting the project site



Source: BMTPC)

Figure 3-11 Map of the Wind & Cyclone Zones in Tamil Nadu, highlighting the project site

3.4.12 Seismicity

The entire Indian landmass, susceptible to different levels of earthquake hazard, has broadly been classified into four distinct seismic Zones, referred to as Zones II to V as per the Seismic Zoning Map of India contained in IS 1893:2002 (Part-1). As per the Foreword to the Seismic Code IS 1893:2002, the general basis of the zones is

- **Zone V:** Covers the areas liable to seismic intensity IX and above on MSK (1964) Intensity Scale. This is the most severe seismic zone and is referred here as Very High Damage Risk Zone.

- **Zone IV:** Gives the area liable to MSK VIII. This zone is second in severity to zone V. This is referred here as High Damage Risk Zone.
- **Zone III:** The associated intensity is MSK VII. This is termed here as Moderate Damage Risk Zone.
- **Zone II:** The probable intensity is MSK VI or less. This zone is referred to as Low Damage Risk Zone.

The Vulnerability Atlas of India (BMTPC, 2019) presents a series of National and State-level maps earthquake hazard, wherein the earthquake hazard risk for Tamil Nadu has been classified into two categories. As per the Vulnerability Atlas, the area in Tamil Nadu that falls into seismic (MSK Intensity Scale) zones is as below:

- Zone II - Low Damage Risk Zone (MSK VI or less)
- Zone III - Moderate Damage Risk Zone (MSK VII)

The Earthquake hazard map of Tamil Nadu is shown in **Figure 3.12**. Based on the Seismic Damage Risk Zones, **the study area falls in the both Zone II - Low Damage Risk Zone (MSK VI or less) and Zone III - Moderate Damage Risk Zone (MSK VII).**



Figure 3-12 Seismicity Map of Tamil Nadu, highlighting the project site**3.5 Establishment of Baseline for valued environmental components****3.5.1 Air Environment**

Baseline ambient air quality assessment gives the status in the vicinity of site and is an indispensable part of environmental impact assessment studies. Significant changes, in predominant winds and weather conditions are observed in winter, summer and post-monsoon seasons apart from the local topographic influences. The baseline status of air environment in the study area is assessed through a systematic air quality surveillance programme.

3.5.2 Meteorological Conditions

The regional air quality is influenced by the meteorology of that region. The principal weather parameters that influence the concentration of the air pollutants in the surroundings are wind speed, wind direction and temperature. The meteorological data is useful for proper interpretation of the baseline data.

3.5.3 Meteorological Data Collection

Available secondary data pertaining to the meteorological parameters was obtained from the IMD Climatological tables. In addition, baseline meteorological data was generated during the study period **April 2025 to June 2025**. The methodology adopted for monitoring surface observations is as per the standard norms laid down by Bureau of Indian Standards (BIS) i.e.IS:8829 and India Meteorological Department (IMD).

3.5.4 General Meteorological Scenario based on IMD Data

The nearest India Meteorological Department (IMD) station located to project site is Chennai (Minambakkam). The Climatological data for **Chennai (Minambakkam)** (13° 00' N and 80° 11' E), published by the IMD, based on daily observations at 08:30 and 17:30 hour IST for a 30 year period(1991-2020),is presented in the following sections on the meteorological conditions of the region. The monthly variations of the relevant meteorological parameters produced in **Table 3-4**.

Table 3-4 Climatological Summary–Chennai (Minambakkam) (1991-2020)

Month	Temp (°C)	Rainfall (mm)	Relative Humidity (%)	Vapour Pressure hPa	Mean Wind Speed	Predominant Wind Directions (From)*
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	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30	(Km/hr)	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	28.4	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 Data given in **Table 3-4**, the observations drawn are as follows

- Highest Daily **maximum** temperature is **38.3°C** and the Lowest Daily **minimum** temperature is **20.9°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 0.2mm** was recorded in the months of **November and March** respectively.
- Annual Wind predominant direction is **SOUTHEAST**.

3.5.5 Meteorological data during Study Period

The site specific meteorological data for three months from **April 2025 to June 2025** and is presented in

Table 3-5. These data's are obtained from secondary sources and processed in AERMET to plot wind rose diagram for the study period is given in **Figure 3.13**. Other data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air pressure, precipitation and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model.

Table 3-5 Meteorology Data for the Study Period (April 2025 to June 2025)

S. No	Parameter	Observation
1	Temperature	Max. Temperature:39°C Min. Temperature: 25°C Avg. Temperature: 31.52°C
2	Average Relative Humidity	71.27%
3	Average Wind Speed	4.07 m/s
4	Predominant Wind Direction	South West to North East

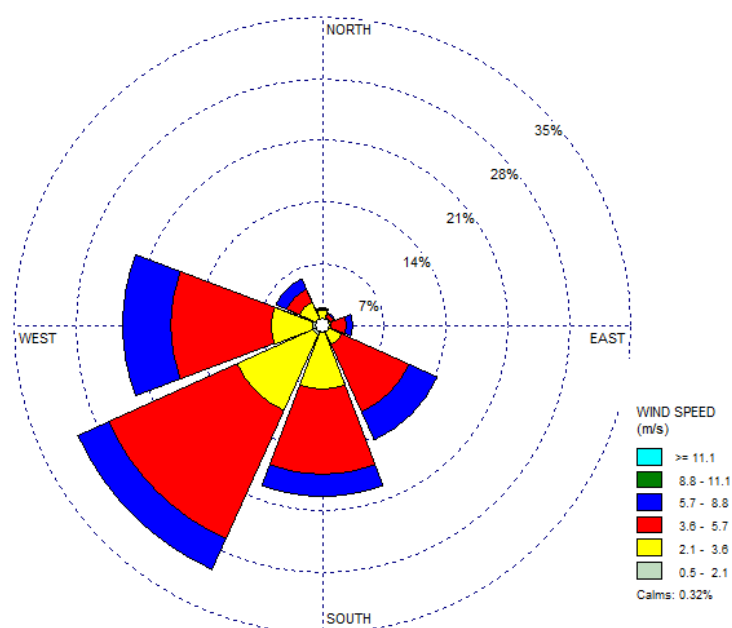


Figure 3-13 Wind Rose during April 2025 to June 2025

3.5.6 Atmospheric Inversion

Atmospheric inversion level at the project site was monitored; the results observed at the site during the study period are as follows

- Average atmospheric temperature: **31.52°C**
- Average Relative humidity:**71.27%**
- Average Wind speed: **4.07 m/s**

The daily inversion level calculated based on the average temperature and average wind speed at the project site and the maximum inversion height is derived by the graph plotted based on the average temperature and average wind speed. The daily inversion level at the project site

varies from 99 m to 4000 m during 12 AM to 11PM, the maximum recorded at 4000 m during March 2025. This is shown in the following **Figure 3-14**.

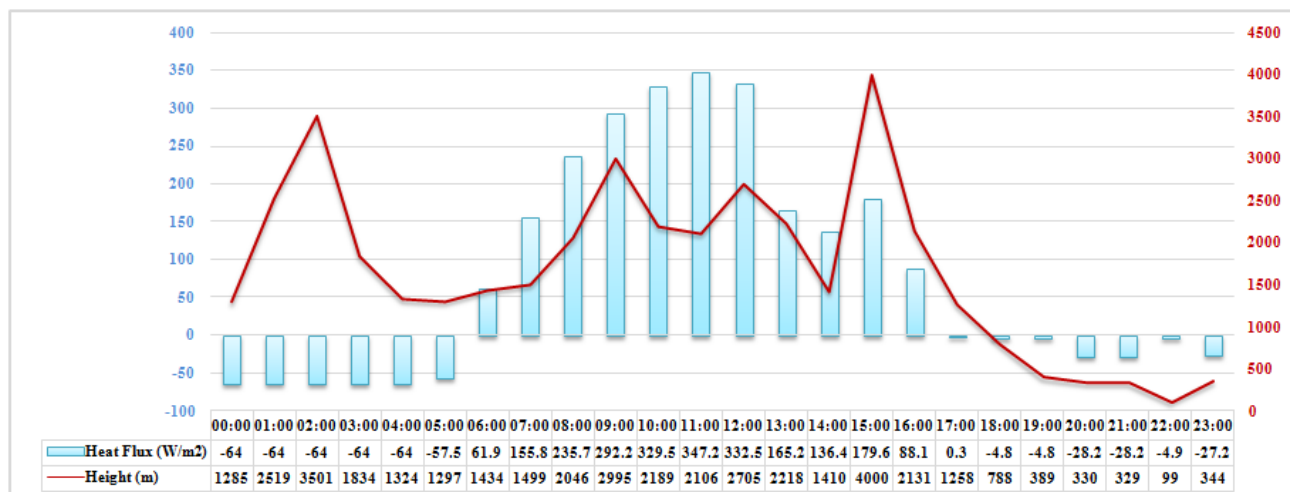


Figure 3-14 Atmospheric inversion level at the project site

3.6 Ambient Air Quality

The selection criteria for monitoring locations are based on the following:

- Topography/Terrain
- Meteorological conditions
- Residential and sensitive areas within the study area
- Representatives of regional background air quality/pollution levels and
- Representation of likely impacted areas

3.6.1 Ambient Air Quality Monitoring Stations

To evaluate the baseline air quality of the study area, Ten (10) monitoring locations have been identified as per annual wind predominance of **Chennai (Meenambakkam)** from IMD data (1991-2020). AAQ monitoring locations are selected based on Annual wind predominance **South East** as per **Table 3.4** the details of the locations are given in **Table 3.6** and map showing the AAQ monitoring locations is given in **Figure 3.15**.

Table 3-6 Details of Ambient Air Quality Monitoring Locations

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Azimuth Directions
AAQ1	Project Site	-	Within the Site	

Station Code	Location	Type of Wind	Distance (~km) from Project boundary	Azimuth Directions
AAQ 2	Periya Nemmeli	c/w	0.48	E
AAQ 3	Pattipuallam	c/w	0.65	E
AAQ 4	Mamallapuram	u/w	0.54	SE
AAQ 5	Perumaleri	c/w	3.06	SW
AAQ 6	Paiyanur	c/w	0.55	W
AAQ 7	Alattur	c/w	0.91	W
AAQ 8	Tirupporur	c/w	1.49	W
AAQ 9	Kayarcheri	d/w	6.66	NW
AAQ 10	Kalavakkam	d/w	2.04	NW

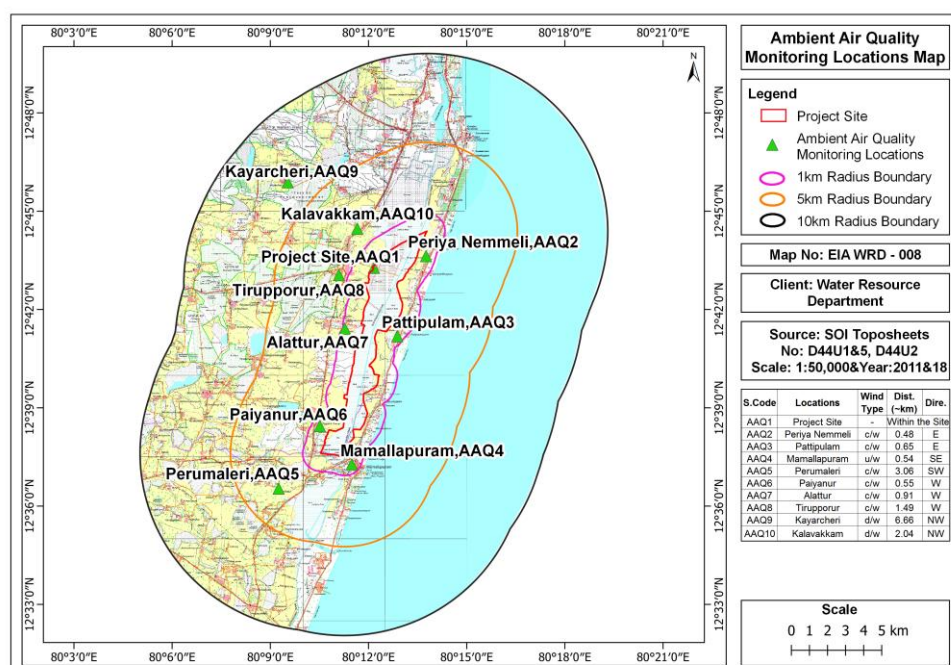


Figure 3-15 Map showing the Ambient Air Quality monitoring locations

3.6.2 Ambient Air Quality Monitoring Techniques and Frequency

Ambient air quality was monitored twice in a week for One (01) season (shall cover 12 weeks), i.e. during **(April 2025 to June 2025)**. PM₁₀, PM_{2.5}, SO₂, NO_x, CO, Pb, O₃, NH₃, C₆H₆, C₂₀H₁₂, As, Ni, TVOC was monitored. Sampling was carried out as per Central Pollution Control Board (CPCB) monitoring guidelines at each location. Analytical methods used for analysis of parameters are given in **Table 3-7**.

Table 3-7 Analytical Methods for Analysis of Ambient Air Quality Parameters (NAAQ)

S. No	Parameters	Analytical method	NAAQ standards: 2009		Sampling Time
1.	Sulphur Dioxide (SO ₂), µg/m ³	IS:5182(Part-2):2001	50 (Annual)	80 (24Hours)	24 Hours
2.	Nitrogen Dioxide (NO ₂), µg/m ³	IS: 5182 (Part - 6): 2006	40 (Annual)	80 (24Hours)	24 Hours
3.	Particulate Matter (PM ₁₀), µg/m ³	IS:5182 (Part- 23): 2006	60 (Annual)	100(24hours)	24 Hours
4.	Particulate Matter (PM _{2.5}), µg/m ³	IS: 5182 (Part - 23): 2006	40 (Annual)	60 (24hours)	24 Hours
5.	Ozone (O ₃),µg/m ³	IS 5182 Part 9: 1974	100(8hours)	180 (1hour)	8 Hours
6.	Lead (Pb),µg/m ³	IS:5182(Part-22):2004	0.5(Annual)	1(24 hours)	24 Hours
7.	Carbon monoxide(CO), mg/m ³	IS:5182(Part-10):1999	2 (8 hours)	4 (1hour)	8 Hours
8.	Ammonia (NH ₃), µg/m ³	IS 5182 Part 25: 2018	100(Annual)	400(24hours)	8 Hours
9.	Benzene(C ₆ H ₆), µg/m ³	IS 5182 Part 11: 2006	5 (Annual)	5 (Annual)	24 Hours
10.	Benzo (a) pyrene(BaP) – particulate phase, ng/m ³	IS 5182 Part 12 : 2004	1 (Annual)	1 (Annual)	24 Hours
11.	Arsenic(As), ng/ m ³	HECS/AA/SOP/019, Issue No:01,Issue Date:16.12.:2016: 2016	6 (Annual)	6 (Annual)	24 Hours
12.	Nickel(Ni), ng/ m ³	HECS/AA/SOP/009, IssueNo.01,Issue Date:16.12:2016: 2016	20(Annual)	20 (Annual)	24 Hours

Table 3-8 Summary of the average baseline concentrations of pollutants

Parameters	Conc.	NAAQ Standards	Locations									
			Project Site	Periya Nemmeli	Pattipulam	Mamallapuram	Perumaleri	Paiyanur	Alattur	Tirupporur	Kayarcheri	Kalavakkam
			AAQ1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8	AAQ 9	AAQ 10
PM ₁₀ Conc. (µg/m ³)	Min.	100 (24 Hours)	39.16	40.66	44.09	42.50	40.33	43.09	44.59	46.51	48.51	47.51
	Max.		55.81	57.95	62.83	60.57	57.48	61.40	63.55	66.28	69.14	67.71
	Avg.		46.96	48.77	52.87	50.97	48.37	51.67	53.47	55.77	58.18	56.98
	98th 'tile		55.49	57.62	62.47	60.22	57.14	61.05	63.18	65.90	68.74	67.32
PM _{2.5} Conc. (µg/m ³)	Min.	60 (24 Hours)	19.76	20.19	22.46	20.96	20.33	21.13	21.79	23.00	24.37	23.83
	Max.		28.17	28.77	32.01	29.87	28.98	30.11	31.06	32.78	34.72	33.96
	Avg.		23.71	24.22	26.94	25.14	24.39	25.34	26.14	27.59	29.22	28.58
	98th 'tile		28.00	28.61	31.83	29.70	28.81	29.93	30.88	32.59	34.52	33.77
SO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	5.26	6.15	9.29	8.26	6.81	9.17	9.63	10.03	10.86	10.60
	Max.		7.50	8.77	13.23	11.77	9.71	13.07	13.72	14.29	15.48	15.10
	Avg.		6.31	7.38	11.14	9.91	8.18	11.00	11.55	12.03	13.03	12.71
	98th 'tile		7.45	8.72	13.16	11.70	9.65	12.99	13.64	14.21	15.39	15.01
NO ₂ Conc. (µg/m ³)	Min.	80 (24 Hours)	10.77	12.47	18.74	16.68	13.79	18.34	19.34	20.27	21.71	21.03
	Max.		15.35	17.78	26.70	23.78	19.66	26.13	27.56	28.89	30.94	29.96
	Avg.,		12.92	14.96	22.47	20.01	16.55	21.99	23.19	24.32	26.04	25.22
	98th 'tile		15.26	17.68	26.55	23.64	19.54	25.98	27.40	28.73	30.76	29.79
Ozone O ₃ (µg/m ³)	Avg.	180 (1hour)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)

Parameters	Conc.	NAAQ Standards	Locations									
			Project Site	Periya Nemmeli	Pattipulam	Mamallapuram	Perumaleri	Paiyanur	Alattur	Tirupporur	Kayarcheri	Kalavakkam
			AAQ1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8	AAQ 9	AAQ 10
			10.0)	10.0)	10.0)	10.0)	10.0)	10.0)	10.0)	10.0)	10.0)	10.0)
Lead (Pb) ($\mu\text{g}/\text{m}^3$)	Avg.	1 (24 hour)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)	BLQ(LOQ 0.002)
Carbon monoxide (CO) (mg/m^3)	Avg.	4 (1hour)	0.39	0.41	0.46	0.44	0.42	0.46	0.47	0.49	0.54	0.51
Ammonia (NH₃) ($\mu\text{g}/\text{m}^3$)	Avg.	400 (24 hour)	BLQ (LOQ 5.0)	BLQ (LOQ 5.0)	5.99	5.13	BLQ (LOQ 5.0)	5.56	6.24	6.52	7.30	7.02
Benzene (C₆H₆) ($\mu\text{g}/\text{m}^3$)	Avg.	5(Annual)	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)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
Benzo (a) Pyrene (C₂₀H₁₂ (a)) , (ng/m^3)	Avg.	1 (Annual)	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)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
Arsenic (As) (ng/m^3)	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)	BLQ(LOQ 2)	BLQ(LOQ 2)
Nickel as Ni (ng/m^3)	Avg.	20 (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)	BLQ(LOQ 2)	BLQ(LOQ 2)

Parameters	Conc.	NAAQ Standards	Locations									
			Project Site	Periya Nemmeli	Pattipulam	Mamallapuram	Perumaleri	Paiyanur	Alattur	Tirupporur	Kayarcheri	Kalavakkam
			AAQ1	AAQ 2	AAQ 3	AAQ 4	AAQ 5	AAQ 6	AAQ 7	AAQ 8	AAQ 9	AAQ 10
TVOC (PPM)	Avg.	-	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)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
AQI Value	-	-	47	49	53	51	48	52	53	56	58	57
AQI Category	-	-	Good	Good	Satisfactory	Satisfactory	Good	Satisfactory	Moderate	Satisfactory	Satisfactory	Satisfactory

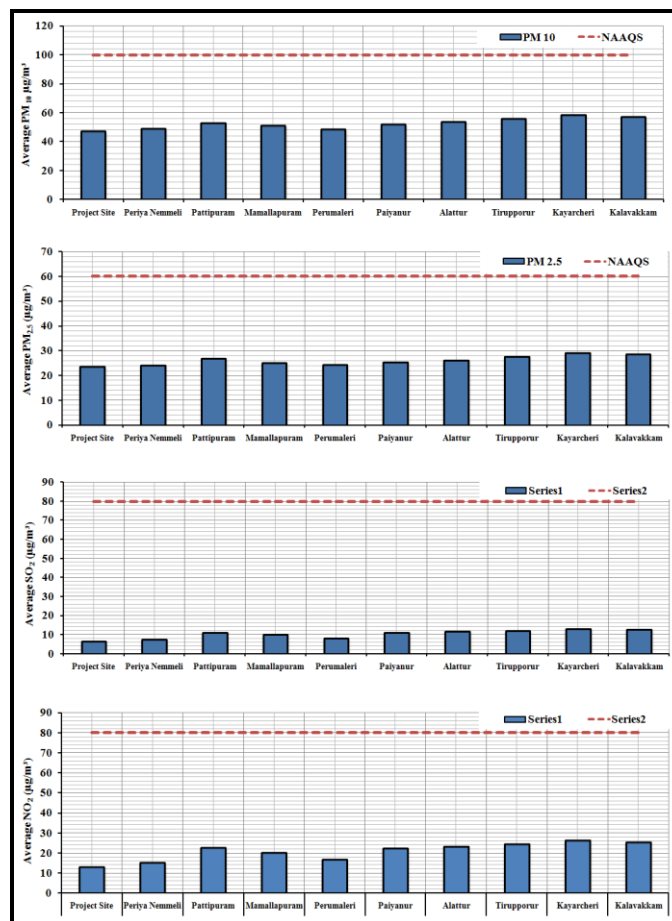


Figure 3-16 Trends of Measured Ambient Concentrations in the Study Area

3.6.3 Results and Discussions

The variations of the pollutants Particulate matter <10 micron size (PM_{10}), Particulate matter <2.5 micron size ($PM_{2.5}$), Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Lead (Pb), Ozone (O_3), Benzene (C_6H_6), Benzo (a) pyrene ($C_{20}H_{12}$), Arsenic (As), Nickel (Ni), Ammonia (NH_3), TVOC are compared with National Ambient Air Quality Standards (NAAQS), MoEF&CC Notification, November 2009. Ambient Air Quality Monitoring Data (**April 2025 to June 2025**) for the study areas were given in **Table 3.8** and trends of measured ambient concentration in the study areas were graphically represented in **Figure 3-16**. The ambient air quality has been monitored at 8 locations as per NAAQS, 2009 within the study area. The results obtained are summarised as below:

- The average baseline levels of PM_{10} vary from $46.96 \mu g/m^3$ to $58.18 \mu g/m^3$.
- The average baseline levels of $PM_{2.5}$ vary from $23.71 \mu g/m^3$ to $29.22 \mu g/m^3$.
- The average baseline levels of SO_2 vary from $6.31 \mu g/m^3$ to $13.03 \mu g/m^3$.
- The average baseline levels of NO_2 vary from $12.92 \mu g/m^3$ to $26.04 \mu g/m^3$.

It is observed that ambient air quality levels at all locations are within prescribed CPCB standards

3.7 Noise Environment

The prevailing ambient noise level at a particular location is nothing but the resultant (total) of all kinds of noise sources existing at various distances around that location. The ambient noise level at a location varies continuously depending on the type of surrounding activities.

Ambient noise levels have been established by monitoring noise levels at Ten (10) locations in and around 10Km distance from project area during the study period using precision noise level meter. Map showing noise monitoring locations is **Figure 3-17**. The noise monitoring locations in the study area were selected after giving due consideration to the various land use categories. The land use categories include Industrial, commercial, residential, and sensitive areas. Noise levels were recorded on an hourly basis for one complete day at each location using pre- calibrated noise levels.

Based on the recorded hourly noise levels at each monitoring location, the day equivalent (L_d) and night equivalent (L_n) were calculated;

- **Ld:** Average noise levels between 6:00 hours to 22.00 hours
- **Ln:** Average noise levels between 22.00 hours to 6.00 hours

The Central Pollution Control Board constituted a Committee on Noise Pollution Control. The Committee recommended noise standards for ambient air and for automobiles, domestic appliances and construction equipment, which were later, notified in Environment (Protection) Rules. Ambient Air Quality Standards in Respect of Noise is given in **Table 3.9**. The measured day and night equivalent noise levels in the study area is given in **Table 3-10**

Table 3-9 Ambient Air Quality Standards in Respect of Noise

S.NO	CODE	CATEGORY	DAY TIME	NIGHT TIME
1.	A	Industrial Area	75	70
2.	B	Commercial Area	65	55
3.	C	Residential Area	55	45
4.	D	Silence Zone	50	40

Table 3-10 Day and Night Equivalent Noise Levels

S. No	Location	Location Code	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1	Project Site Location-1	N1	Within the Site		48.5	40.2	55	45	Residential Area
2	Project Site Location-2	N2	Within the Site		52.3	45.9	65	55	Commercial Area
3	Project Site Location- 3	N3	Within the Site		59.8	49.6	65	55	Commercial Area
4	Periya Nemmeli	N4	0.53	E	51.3	43.0	55	45	Residential Area
5	Pattipulam	N5	0.63	E	52.7	43.1	55	45	Residential Area
6	Mamallapuram	N6	0.75	E	62.1	53.3	65	55	Commercial Area
7	Pavalakkarachattiram	N7	0.68	W	48.9	41.2	55	45	Residential Area
8	Alattur	N8	0.86	W	51.6	42.7	55	45	Residential Area
9.	Tirupporur	N9	1.07	W	53.0	42.9	55	45	Residential Area

S. No	Location	Location Code	Distance (~km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
10.	Kalavakkam	N10	1.96	NNW	51.4	42.6	55	45	Residential Area

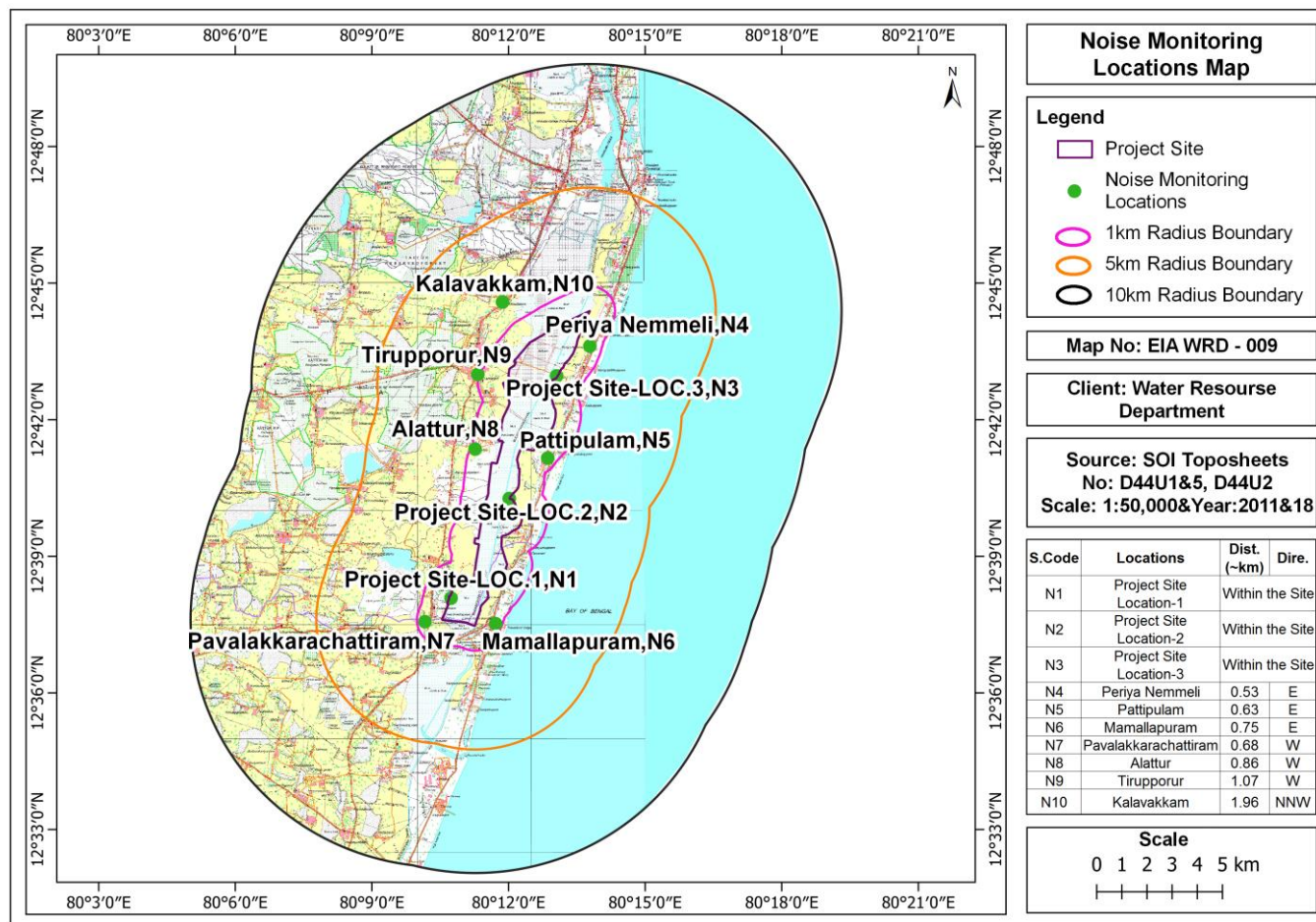


Figure 3-17 Map showing the noise monitoring locations

3.7.1 Results and Discussions

The ambient noise levels in the study area have been monitored in different categories (Industrial Area and Residential Area) as per the noise level standards prescribed by the CPCB and the Environmental Protection Rules, 1986. The monitoring was done during both daytime and night time, and the results are summarized below:

- **Commercial Area (Project Site - Location 2 & Location 3, Mamallapuram):** The daytime noise level in the project site was recorded at approximately 52.3dB(A) to 62.1dB(A) and the nighttime noise level was 45.9 dB(A) to 53.3 dB(A). According to the CPCB standards for commercial areas, the permissible noise limits are 65 dB(A) during the daytime and 55 dB(A) during the nighttime. These recorded levels are well within the prescribed limits, indicating that noise pollution in the commercial area is under control and does not exceed the permissible noise standards, as specified in Category B (Commercial) under the [Noise Pollution \(Regulation and Control\) Rules, 2000](#)
- **Residential Area:** In the residential area, the daytime noise levels ranged from 48.5 dB(A) to 53.0 dB(A), while the nighttime noise levels ranged from 40.2 dB(A) to 43.1 dB(A). According to the CPCB standards for residential areas, the permissible noise levels are 55 dB(A) during the daytime and 45 dB(A) during the nighttime as defined for Category C (Residential Area). The observed noise levels in the residential area fall within these prescribed limits, confirming that the noise pollution in these zones is within acceptable boundaries, ensuring that the residential areas are not exposed to excessive noise that could affect the well-being of the residents.
- **Location-Based Observations:** Based on the observed noise levels, it was found that the Project Site Location- 1 recorded the minimum noise levels during both day and night. On the other hand, the Tirupporur location recorded the maximum noise levels in residential areas during both day and night. In Commercial area, the observed noise levels, indicates that the Mamallapuram recorded the maximum noise levels during both day and night. These variations in noise levels are typical and may be influenced by factors such as proximity to traffic routes or domestic activities in the vicinity.

The noise monitoring results show that the ambient noise levels in the studied areas are within the prescribed limits, as per the CPCB standards under the [Noise Pollution \(Regulation and Control\) Rules, 2000](#). This suggests that noise pollution in the region is under control, ensuring the health and comfort of the residents and workers in both commercial and residential areas.

3.8 Water Environment

The water environment encompasses both surface water and groundwater as vital components of Earth's hydrological cycle. Surface water refers to water found in rivers, lakes and reservoirs, which is easily accessible and plays a crucial role in supporting ecosystems, agriculture and human activities. On the other hand, groundwater is water stored beneath the Earth's surface in aquifers, often tapped for drinking water and irrigation. Both sources are interconnected and essential for maintaining ecological balance. Water quality monitoring and assessment can be used to determine ambient water quality, the extent and causes of a water quality problem or to measure the effectiveness of best management practices being implemented in water system. Monitoring helps to determine the trends in the quality of the aquatic environment and the impact due to the release of contaminants, other anthropogenic activities or by waste treatment operations (impact monitoring).

3.8.1 Surface Water Resources

Palar and Cheyyar are the important rivers in Kancheepuram district. The detailed characteristic features of these rivers are explained in **section 3.4.5**.

3.8.2 Surface Water Quality Assessment

To establish the baseline status of water environment, the representative sampling locations for surface water within a radial distance of 10Km from project site have been selected as per CPCB guidelines of Water Quality Monitoring through an adequate survey of the project area. Test methods used for the analysis of water quality parameters is given in **Error! Reference source not found**. Designated Best Use Water Quality Criteria is given in the **Table 3-12**. Details of the water sampling and map of sampling location are given in **Table 3.13** and **Error! Reference source not found**. Physicochemical Parameters of Surface water samples from the study area given in **Figure 3-18**.

Table 3-11 Test methods used for the analysis of water quality parameters

S.No	Parameters	Test Method
1.	Colour	IS 3025 Part 4: 2021
2.	Odour	IS 3025 Part 5: 2018
3.	Temperature	IS 3025 Part 9: 1984
4.	pH	IS 3025 Part 11: 2022 (Electrometric Method)
5.	Oil & Grease	IS 3025 Part 39: 2021
6.	Electrical Conductivity	IS:3025 Part 14: 2013
7.	Dissolved Oxygen	IS 3025 Part 38: 1989

S.No	Parameters	Test Method
8.	Turbidity	IS 3025 Part 10: 1984
9.	Total Dissolved Solids	IS 3025 Part 16: 1984
10.	Total Suspended Solids	IS 3025 Part 17 : 1984
11.	NH ₃ -N	IS 3025 Part 34 Sec 2: 2021
12.	Nitrate as NO ₂	IS 3025 Part 34 Sec 3 : 2021
13.	Nitrate as NO ₃	APHA 23rd edition Method 4500 NO3B: 2017
14.	Total Phosphorous	IS 3025 Part 31 Sec 1: 2022
15.	BOD	IS 3025 Part 44: 1993
16.	COD	IS 3025 Part 58: 2006
17.	Potassium K	IS 3025 Part 45: 1993
18.	Sodium Na	IS 3025 Part 45: 1983
19.	Calcium as Ca	IS 3025 Part 40: 1991(EDTA Titrimetric Method)
20.	Magnesium as Mg	IS 3025 Part 46: 1994 (Volumetric Method using EDTA)
21.	CO ₃	IS 3025 Part 51: 2001
22.	HCO ₃	IS 3025 Part 51: 2001
23.	Total Hardness	IS 3025 Part 21: 2009
24.	Chloride as Cl	IS 3025 Part 32: 1988 (Argentometric Method)
25.	Sulphate as SO ₄	IS 3025 Part 24 Sec 1: 2022
26.	Boron as B	IS 3025 Part 57: 2021 (Curcumin Method)
27.	Fluorides as F	APHA 23rd edition Method 4500 F-B,D: 2017
28.	Iron as Fe	IS 3025 Part 53: 2003
29.	Copper as Cu	USEPA 200.8 : 1994
30.	Chromium as Cr	USEPA 200.8 : 1994
31.	Nickel as Ni	USEPA 200.8 : 1994
32.	Lead as Pb	USEPA 200.8 : 1994

S.No	Parameters	Test Method
33.	Cadmium as Cd	USEPA 200.8 : 1994
34.	Zinc as Zn	USEPA 200.8 : 1994
35.	Mercury as Hg	USEPA 200.8 : 1994
36.	Arsenic as As	USEPA 200.8 : 1994
37.	Cyanide as CN	IS 3025 Part 27 sec 1: 2021
38.	Faecal Coliform	IS 1622 : 1981
39.	Total Coliform	IS 1622 : 1981

Table 3-12 Designated Best Use Water Quality Criteria

S.No	Designated-Best-Use	Class of water	Criteria
1.	Drinking Water Source without conventional treatment but after disinfection	A	1. Total Coli forms Organism MPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 6mg/l or more 4. Biochemical Oxygen Demand 5 days 20C 2mg/l or less
1.	Outdoor bathing (Organised)	B	1. Total Coli forms Organism MPN/100ml shall be 500 or less 2. pH between 6.5 and 8.5 3. Dissolved Oxygen 5mg/l or more 4. Biochemical Oxygen Demand 5 days 20C 3mg/l or less
2.	Drinking water source after conventional treatment and disinfection	C	1. Total Coli forms Organism MPN/100ml shall be 5000 or less 2. pH between 6 to 9 3. Dissolved Oxygen 4mg/l or more 4. Biochemical Oxygen Demand 5 days 20C 3mg/l or less

3.	Propagation of Wild life and Fisheries	D	1. pH between 6.5 to 8.5 2. Dissolved Oxygen 4mg/l or more 3. Free Ammonia (as N) 1.2 mg/l or less
4.	Irrigation, Industrial Cooling, Controlled Waste disposal	E	1. pH between 6.0 to 8.5 2. Electrical Conductivity at 25C micro mhos/cm Max.2250 3. Sodium absorption Ratio Max. 26 4. Boron Max. 2mg/l

Table 3-13 Details of Surface water sampling locations

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction
SW1	Buckingham Canal – LOC.1	Within the Site	
SW2	Buckingham Canal – LOC.2	Within the Site	
SW3	Buckingham Canal – LOC.3	Within the Site	
SW4	Kovalam Creek	4.94	N
SW5	Marine Sample near llantoppu	0.86	E
SW6	Backwater near Kokkilimedu	5.33	S
SW7	Paiyanur Lake	1.63	W
SW8	Sirudavur Lake	4.38	W
SW9	Thandalam Lake	1.93	W
SW10	Kalavakkam Lake	2.37	NW

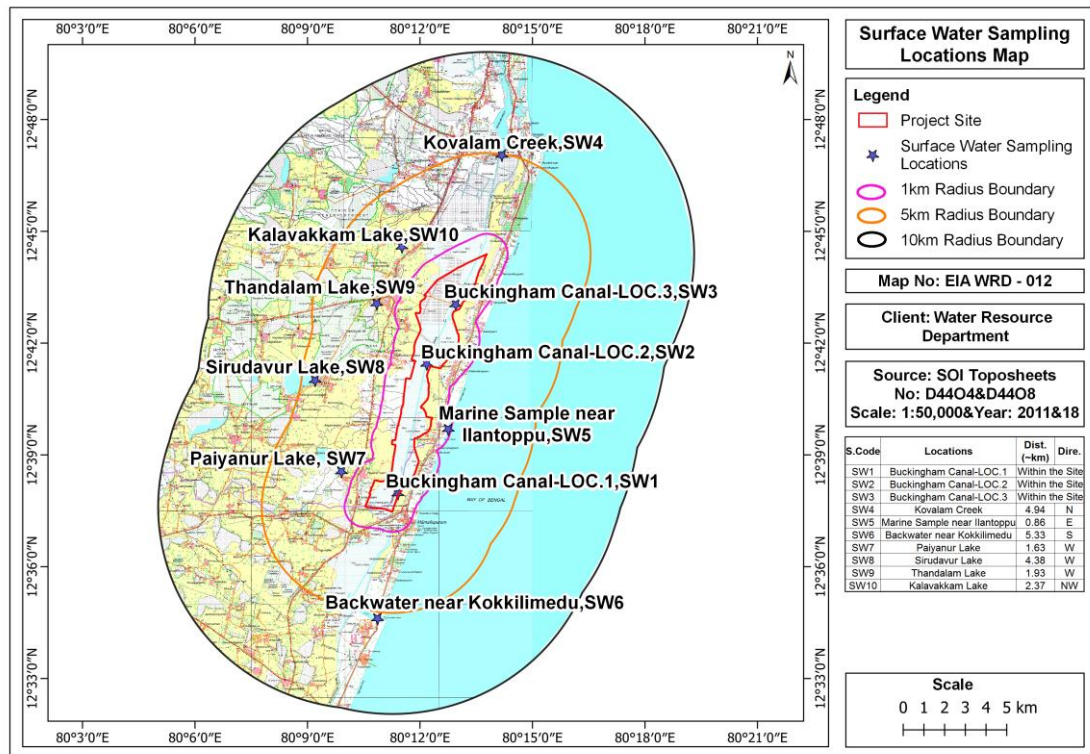


Figure 3-18 Map showing the surface water monitoring locations

Table 3-14 Physicochemical Parameters of Surface water samples from the study area

S.N O	Parameter	Unit	Buckingham Canal Location -1	Buckingham Canal Location -2	Buckingham Canal Location-3	Kovalam Creek	Marine sample near Ilantoppu	Backwater Near Kokkilimedu	Paiyanur Lake	Sirudavur Lake	Thandalam Lake	Kalavakkam Lake
			SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
1.	Colour	Hazen	10.0	10.0	5.0	BLQ (LOQ:1.0)	BLQ (LOQ:1.0)	5.0	BLQ (LOQ:1.0)	BLQ (LOQ:1.0)	BLQ (LOQ:1.0)	BLQ (LOQ:1.0)
2.	pH	-	7.98	7.11	7.29	8.27	8.04	8.14	8.42	7.92	7.71	7.96
3.	Electrical Conductivity(E C)	µS/c m	26100.0	3900.0	17670.0	51200.0	54100.0	17277.0	420.0	541.0	803.0	341.0
4.	Dissolved Oxygen(DO)	mg/l	5.7	5.9	5.8	6.1	6.3	5.9	6.0	5.8	6.1	6.3
5.	Turbidity	NTU	56.2	98.4	12.1	4.2	13.8	24.9	8.1	7.4	16.5	21.3
6.	Alkalinity	mg/l	160.0	150.0	130.0	140.0	110.0	100.0	120.0	90.0	90.0	100.0
7.	Total Suspended Solids(TSS)	mg/l	129.0	BLQ(LOQ: 2.0)	28.0	10.0	32.0	57.0	19.0	17.0	38.0	49.0
8.	Total Dissolved Solids(TDS)	mg/l	13751.0	2065.0	9733.0	29296.0	30681.0	9157.0	234.0	296.0	467.0	189.0
9.	Nitrite as NO ₂	mg/l	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)	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)

S.N O	Parameter	Unit	Buckingham Canal Location -1	Buckingham Canal Location -2	Buckingham Canal Location-3	Kovalam Creek	Marine sample near Ilantoppu	Backwater Near Kokkilimedu	Paiyanur Lake	Sirudavur Lake	Thandalam Lake	Kalavakkam Lake
			SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
10.	Nitrate as NO ₃	mg/l	8.44	32.41	18.2	5.92	2.74	9.22	4.84	5.74	12.82	4.89
11.	Faecal Coli form	MPN/ 100m l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
12.	Total Coli form	MPN/ 100m l	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
13.	Biochemical Oxygen Demand (BOD)	mg/l	8.0	5.0	6.0	5.0	3.0	6.0	2.0	3.0	4.0	2.0
14.	Chemical Oxygen Demand (COD)	mg/l	56.0	36.0	31.2	96.0	112.0	144.0	20.0	17.0	32.0	16.0
15.	Potassium as K	mg/l	260.0	48.0	190.0	568.0	620.0	220.0	3.0	4.0	8.0	3.0
16.	Sodium as Na	mg/l	3700.0	590.0	2700.0	8100.0	8900.0	2150.0	35.0	38.0	98.0	23.0
17.	Calcium as Ca	mg/l	320.64	72.14	240.48	561.12	721.44	402.8	26.05	30.06	28.05	22.04
18.	Magnesium as Mg	mg/l	680.4	43.74	364.5	1409.4	972.0	551.5	15.79	20.65	19.44	12.15
19.	Total Hardness as	mg/l	3600.0	360.0	2100.0	7200.0	5800.0	3270.0	130.0	160.0	150.0	105.0

S.N O	Parameter	Unit	Buckingham Canal Location -1	Buckingham Canal Location -2	Buckingham Canal Location-3	Kovalam Creek	Marine sample near Ilantoppu	Backwater Near Kokkilimedu	Paiyanur Lake	Sirudavur Lake	Thandalam Lake	Kalavakkam Lake
			SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
	CaCO ₃											
20.	Chloride as Cl	mg/l	7720.15	950.17	5468.44	16825.98	17221.89	5590.0	51.96	64.33	108.82	37.11
21.	Sulphate as SO ₄	mg/l	945.8	218.34	653.7	1721.8	2154.2	146.6	5.39	59.25	118.29	6.73
22.	Salinity	mg/l	13946.83 7	1716.530	9879.010	30396.974	31112.20 5	9160	93.868	116.215	196.589	67.04
23.	Boron as B	mg/l	0.19	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	4.36	4.63	1.24	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)
24.	Fluorides as F	mg/l	0.59	0.55	0.53	0.96	1.12	1.24	0.31	0.33	0.39	0.28
25.	Manganese as Mn	mg/l	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)	BLQ (LOQ: 0.05)	BLQ (LOQ: 0.05)
26.	Copper as Cu	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)	BLQ (LOQ:0.01)	BLQ (LOQ:0.01)
27.	Chromium as Cr	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)	BLQ (LOQ:0.01)	BLQ (LOQ:0.01)
28.	Nickel as Ni	mg/l	BLQ	BLQ	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)

S.N O	Parameter	Unit	Buckingham Canal Location -1	Buckingham Canal Location -2	Buckingham Canal Location-3	Kovalam Creek	Marine sample near Ilantoppu	Backwater Near Kokkilimedu	Paiyanur Lake	Sirudavur Lake	Thandalam Lake	Kalavakkam Lake
			SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
			(LOQ: 0.01)	(LOQ: 0.01)			0.01)		0.01)	)	)	)
29.	Lead as Pb	mg/l	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)	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)
30.	Cadmium as Cd	mg/l	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)	BLQ (LOQ: 0.001)	BLQ (LOQ: 0.001)
31.	Zinc as Zn	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)	BLQ (LOQ:0.01)	BLQ (LOQ:0.01)
32.	Mercury as Hg	mg/l	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)	BLQ (LOQ: 0.0005)	BLQ (LOQ: 0.0005)
33.	Arsenic asAs	mg/l	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)	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)
34.	Cyanide as CN	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)	BLQ (LOQ: 0.01)	BLQ (LOQ: 0.01)
35.	SeleniumasS	mg/l	BLQ (LOQ:	BLQ (LOQ:	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)	BLQ (LOQ:	BLQ (LOQ: 0.005)	BLQ (LOQ:	BLQ (LOQ:	BLQ (LOQ:	BLQ (LOQ:

S.N O	Parameter	Unit	Buckingham Canal Location -1	Buckingham Canal Location -2	Buckingham Canal Location-3	Kovalam Creek	Marine sample near Ilantoppu	Backwater Near Kokkilimedu	Paiyanur Lake	Sirudavur Lake	Thandalam Lake	Kalavakkam Lake
			SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7	SW 8	SW 9	SW 10
	e		0.005)	0.005)			0.005)		0.005)	0.005)	0.005)	0.005)

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

3.8.2.1 Results and Discussions

A summary of analytical results are presented below:

- pH values in the surface water samples range from 7.11 to 8.42, indicating neutral to slightly alkaline conditions.
- Total Dissolved Solids vary from 189 mg/L to 54100 mg/L. Higher values observed in estuarine and canal waters reflect marine influence, while lower values in lake samples indicate freshwater conditions.
- Total hardness values range from 105 to 7200 mg/L, with very high values observed in estuarine and marine-influenced waters and comparatively lower levels in inland lake samples.
- Calcium concentrations in surface water samples range from 22.04 to 721.44 mg/L. All lake samples exhibit lower calcium levels compared to marine and estuarine samples.
- Magnesium concentrations range from 12.15 to 1409.4 mg/L across the sampling sites. Highest values are associated with brackish or saline water sources.
- Sodium and potassium concentrations range from 23 to 8900 mg/L and 3 to 620 mg/L respectively, showing a wide variability with elevated levels in coastal and creek waters.
- Chloride ranges from 37.11 to 17221.89mg/L and sulphate from 5.39 to 2154.2mg/L. Both parameters are significantly higher in marine and estuarine environments and lower in inland freshwater bodies.
- Dissolved Oxygen levels across all sites range between 5.7 and 6.3 mg/L, indicating good oxygenation and suitable conditions for aquatic life.
- Biochemical Oxygen Demand ranges from 2.0 to 8.0 mg/L and Chemical Oxygen Demand varies from 16.0 to 144.0 mg/L.

3.8.3 Groundwater resources

The groundwater availability in an area is governed by various natural factors like rainfall, geomorphological feature, geological set up and hydrogeological conditions. In addition to that ground water withdrawal component from storage and recharge components from irrigation also affects the groundwater balance. Rainfall is the major source of recharge for groundwater.

The shallow alluvial aquifer along Palar and Cheyyar rivers serve as an important source of drinking water between Kancheepuram to Ayyapakkam and Chingleput to Tambaram. Dug wells are the most common ground water abstraction structures used for irrigation. The important tanks, which are being used for drinking water purposes, are given below:

- 1) Chembarampakkam tank - 88.3 m³
- 2) Madurantakam tank - 609.00 m³

- 3) Uttiramerur tank - 958.80 m³
4) Tenneri tank - 1106.70 m³

The shallow alluvial aquifer along Palar River provides drinking water supply for a number of urban and rural habitations in the district. Development of ground water in the district for irrigation is through dug wells, dug cum bore wells fitted with electrical or diesel operated pump sets. Dug wells are the most common ground water abstraction structure in the weathered crystalline rocks. The yield of dug wells can be improved at favourable locations by construction of extension bores of 20 – 40 m length at the bottom.

As the latest district report for Chengalpattu on Water resources is available, it has been utilized in this section.

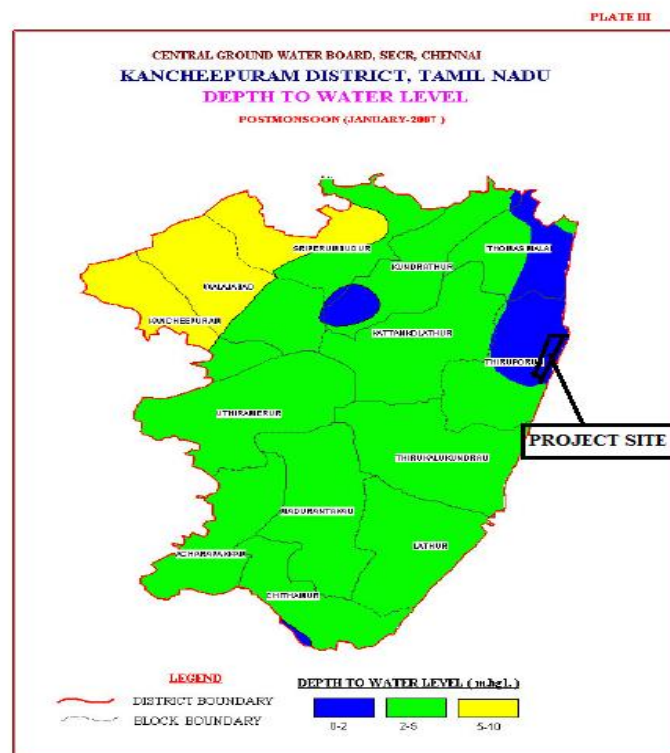
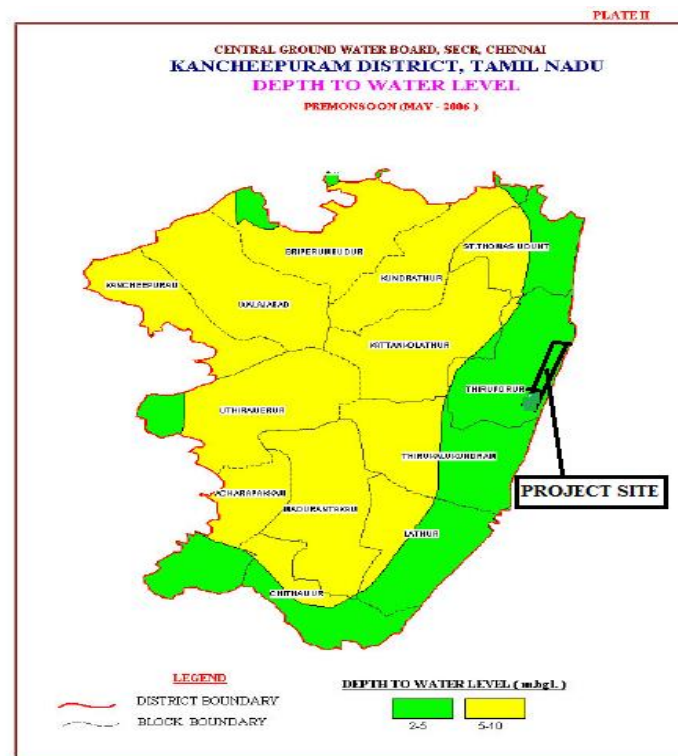
**Table 3-15 Distribution of safe and semi-critical units of Thiruporur taluk, Chengalpattu District
(WRD, 2022 – G.O. (Ms.) No. 15)**

S. No	Name of the District	Name of the Taluk	Safe Category	Semi Critical Category
1	Chengalpattu (No of Firka - 40)	Thiruporur (No of Firka - 06)	Thiruporur, Nellikuppam, Kelambakkam, Manambath, Paiyanur	Karumbakkam

Depth of water level in Pre monsoon season for project site is **2 to 5 mbgl** and depth of water level in Post monsoon season is **0 to 2 mbgl**. Depth to water level during Pre Monsoon & Post Monsoon for project site in Kancheepuram, Tamil Nadu, is given in **Figure 3.19**.

Source: <http://cgwb.gov.in/sites/default/files/2022-10/kancheepuram.pdf>

(Ref: Government of India Ministry of Water Resources Central Ground Water Board South Eastern Coastal Region Chennai, “District Ground Water Brochure Kancheepuram District”)



Source: <http://cgwb.gov.in/sites/default/files/2022-10/kancheepuram.pdf>

Figure 3-19 Depth to water level during Pre-Monsoon & Post Monsoon in Kancheepuram, Tamil Nadu.

3.8.4 Groundwater Quality Assessment

Measuring groundwater quality is essential for ensuring its safety and suitability for drinking, agriculture and industrial use. Various physical, chemical and biological parameters determine groundwater quality, affecting human health and environmental sustainability. Parameters such as pH, electrical conductivity, TDS, turbidity and temperature influence the overall water characteristics, while chemical components like nitrates, fluoride, chloride, sulphate, and heavy metals impact its safety. Contaminants from natural sources or human activities, such as industrial waste, agricultural runoff and improper waste disposal can degrade groundwater quality. Baseline monitoring helps identify contamination, assess water usability and implement corrective measures to prevent health risks and environmental damage.

Comparing groundwater quality with Indian Standards (IS 10500) ensures it meets the prescribed limits for safe consumption and usage. The IS standards define acceptable limits for parameters like pH, TDS, total hardness, nitrate, fluoride and heavy metals like lead, arsenic and cadmium, which should be minimal or absent. Parameters such as iron, copper, and zinc, though essential in trace amounts, can be harmful at higher concentrations. Comparing measured values with IS standards helps in assessing water safety, identifying pollution sources and implementing appropriate treatment methods to ensure groundwater remains a reliable resource.

In this study, a total of Ten (10) groundwater monitoring locations were identified for assessment in different villages around the project site based on the usage by the nearby settlements/ villages in the study area. The groundwater results are compared with the desirable and permissible water quality standards as per IS 10500 (2012) for drinking water. Groundwater quality monitoring locations and results are given in **Table 3.16** and **Table 3.17**. Map showing the groundwater monitoring locations are given in **Figure 3.20**.

Table 3-16 Details of Groundwater Quality Monitoring Locations

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction
GW1	Periya Nemmeli	0.48	E
GW2	Sulerikkadu	0.35	E
GW3	Pattipulam	0.68	E
GW4	Ilantoppu	0.37	E

GW5	Mamallapuram	0.77	SE
GW6	Paiyanur	0.51	W
GW7	Alattur	0.86	W
GW8	Tandalam	0.78	W
GW9	Tirupporur	1.34	W
GW10	Kalavakkam	1.79	NW

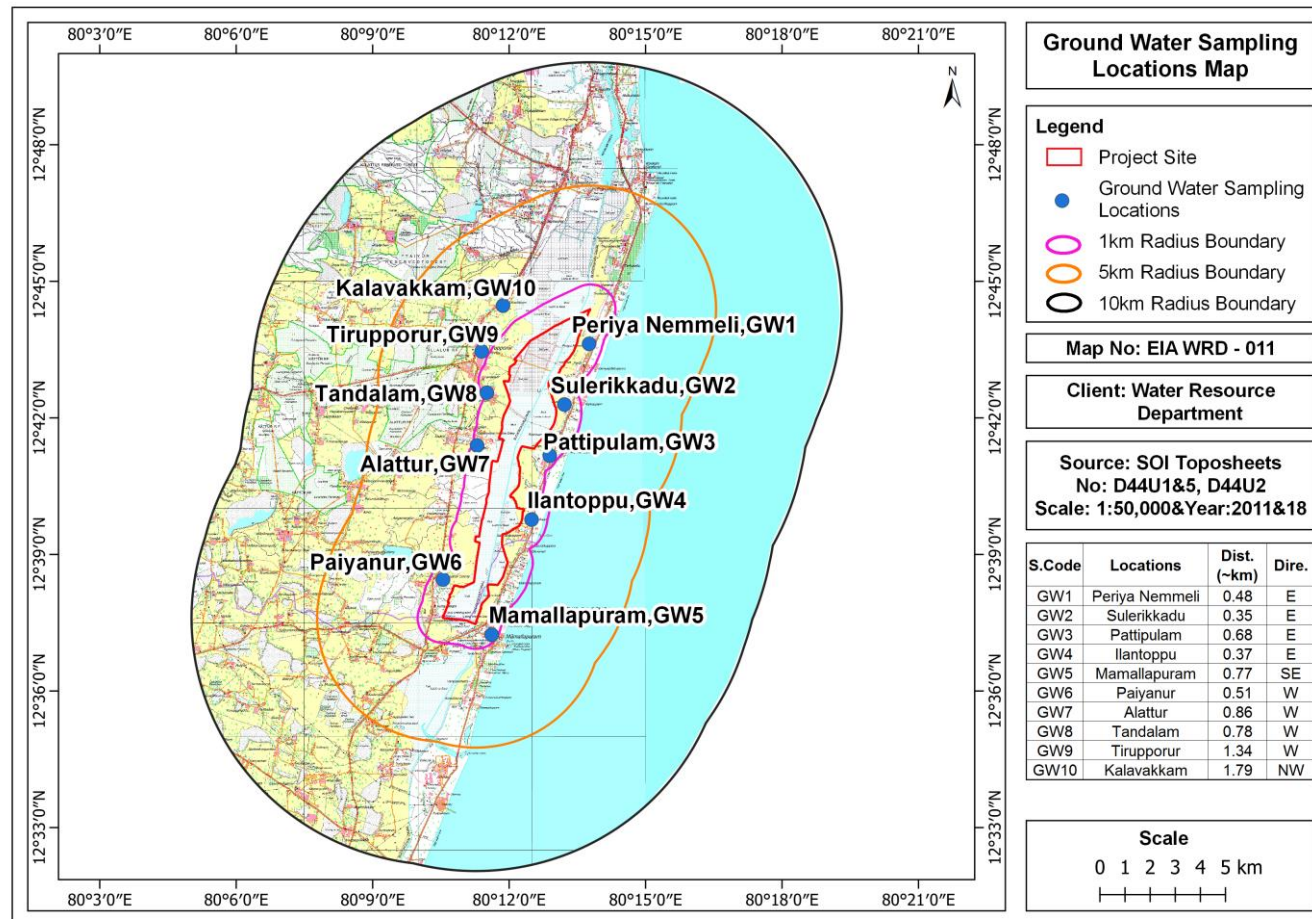


Figure 3-20 Map showing the groundwater monitoring locations

Table 3-17 Physicochemical analysis of Groundwater samples from study area

S. NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Acceptable Limit	Permissible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
Physical Parameters														
1	Colour	Hazen units	5	15	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)	BLQ (LOQ :1.0)
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	pH at 25°C	-	6.5-8.5	No relaxation	6.62	6.58	7.11	7.28	7.04	7.86	7.12	7.42	7.09	7.71
4	Turbidity, NTU	NTU	1	5	48.7	BLQ (LOQ : 0.1)	BLQ(LOQ:0.1)	3.2	BLQ (LOQ : 0.1)	BLQ (LOQ : 0.1)	BLQ (LOQ : 0.1)	BLQ (LOQ : 0.1)	BLQ (LOQ : 0.1)	BLQ (LOQ : 0.1)
5	Total dissolved solids(TDS)	mg/l	500	2000	241.0	681.0	822.0	803.0	456.0	266.0	723.0	413.0	880.0	487.0

S. NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Acceptable Limit	Permissible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
6	Electrical Conductivity at 25°C	µS/cm	NA	NA	412.0	1560.0	1741.0	1658.0	1093.0	543.0	1493.0	836.0	1882.0	910.0
General Parameters														
7	Ammonia as NH ₃	mg/l	0.5	No relaxation	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)	BLQ(LOQ:0.02)
8	Boron as B	mg/l	0.5	1.0	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)	BLQ(LOQ:0.1)	BLQ(LOQ:0.1)
9	Calcium as Ca	mg/l	75	200	10.02	24.05	76.152	28.05	60.12	48.09	104.21	68.13	72.14	60.12
10	Chloride as Cl	mg/l	250	1000	64.33	262.28	291.98	282.08	103.92	27.21	173.2	54.43	193.0	94.02
11	Copper as	mg/l	0.05	1.5	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:	BLQ(LOQ:

S. NO	Parameter s	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Accep table Limit	Permis sible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
	Cu				0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)	0.01)
12	Fluoride as F	mg/l	1.0	1.5	0.24	0.43	0.47	0.45	0.39	0.27	0.41	0.35	0.49	0.37
13	Iron as Fe	mg/l	0.3	No relaxati on	0.24	0.037	0.046	0.17	0.061	0.053	0.041	0.058	0.045	0.043
14	Magnesium as Mg	mg/l	30	100	6.07	17.01	43.74	19.44	26.73	8.50	19.44	24.3	48.6	34.02
15	Nitrate as NO ₃	mg/l	45	No relaxati on	8.46	7.65	1.38	1.95	30.45	2.62	1.75	11.28	23.59	6.39
16	Sulphate as SO ₄	mg/l	200	400	32.37	89.37	62.19	92.03	48.17	9.08	52.87	26.34	39.09	27.81
17	Total Alkalinity as	mg/l	200	600	60.0	100.0	270.0	190.0	170.0	190.0	350.0	270.0	480.0	290.0

S. NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Acceptable Limit	Permissible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
	CaCO ₃													
18	Total hardness as CaCO ₃	mg/l	200	600	50.0	130.0	370.0	150.0	260.0	155.0	340.0	270.0	380.0	290.0
19	Zinc as Zn	mg/l	5	15	BLQ(LO Q: 0.1)	BLQ(LO Q: 0.1)	BLQ(LO Q: 0.1)	BLQ(LO Q: 0.1)	BLQ(LO Q: 0.1)	BLQ(LO Q: 0.1)	BLQ(L OQ: 0.1)	BLQ(L OQ: 0.1)	BLQ(L OQ: 0.1)	BLQ(L OQ: 0.1)
20	Nitrite as NO ₂	mg/l	NA	NA	BLQ(LO Q:0.005)	BLQ(LO Q:0.005)	BLQ(LO Q:0.005)	BLQ(LO Q:0.005)	BLQ(LO Q:0.005)	BLQ(LO Q:0.005)	BLQ(L OQ:0.0 05)	BLQ(L OQ:0.0 05)	BLQ(L OQ:0.0 05)	BLQ(L OQ:0.0 05)
21	Potassium as K	mg/l	NA	NA	6.0	17.0	13.0	21.0	5.0	3.0	12.0	5.0	16.0	7.0
22	Sodium as Na	mg/l	NA	NA	58.0	184.0	152.0	224.0	60.0	33.0	130.0	42.0	180.0	64.0
23	Total Suspended	mg/l	-	-	112.0	BLQ(LO	BLQ(LO	7.0	BLQ(LO	BLQ(LO	BLQ(L OQ:2.0	BLQ(L	BLQ(L	BLQ(L

S. NO	Parameters	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Acceptable Limit	Permissible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
	Solids(TSS)					Q:2.0)	Q:2.0)		Q:2.0)	Q:2.0)	)	OQ:2.0)	OQ:2.0)	OQ:2.0)
Toxic Substances														
24	Cadmium as Cd	mg/l	0.003	No relaxation	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)	BLQ (LOQ: 0.001)	BLQ (LOQ: 0.001)
25	Cyanide as CN	mg/l	0.05	No relaxation	BLQ(LO Q:0.01)	BLQ(LO Q:0.01)	BLQ(LO Q:0.01)	BLQ(LO Q:0.01)	BLQ(LO Q:0.01)	BLQ(LO Q:0.01)	BLQ(L OQ:0.01)	BLQ(L OQ:0.01)	BLQ(L OQ:0.01)	BLQ(L OQ:0.01)
26	Lead as Pb	mg/l	0.01	No relaxation	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)	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)
27	Mercury as Hg	mg/l	0.001	No relaxation	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)	BLQ (LOQ: 0.0005)	BLQ (LOQ: 0.0005)

S. NO	Parameter s	Unit	Drinking water Standard (IS 10500: 2012)		Periya Nemmeli	Sulerikkadu	Pattipulam	Ilantoppu	Mamallapuram	Paiyanur	Alattur	Thandalam	Tirupporur	Kalavakkam
			Acceptable Limit	Permissible Limit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
28	Nickel as Ni	mg/l	0.02	No relaxation	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)	BLQ (LOQ: 0.01)	BLQ (LOQ: 0.01)
29	Total Arsenic as As	mg/l	0.01	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)	BLQ (LOQ: 0.005)	BLQ (LOQ: 0.005)
30	Total Chromium as Cr	mg/l	0.05	No relaxation	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)	BLQ (LOQ: 0.01)	BLQ (LOQ: 0.01)

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

3.8.4.1 Results and Discussions

A summary of analytical results are presented below:

- pH ranges from 6.58 to 7.86 indicating slightly acidic to slightly alkaline conditions. Based on IS 10500:2012 limit of 6.5–8.5 for drinking water, all the samples are falls within the acceptable.
- Total Dissolved Solids vary from 241 mg/L to 880 mg/L which is well below the permissible limit of 2000 mg/L indicating the groundwater samples are suitable for drinking purposes.
- Turbidity levels are mostly below the limit of quantification (LOQ: 0.1 NTU) except two samples in which the groundwater sample collected at Periya Nemmeli reported 48.7 NTU.
- Calcium in groundwater samples ranges from 10.02–104.21 mg/L in which as per BIS the permissible limits is 200 mg/L. Based on the permissible limit, it is found that all the groundwater samples are within the limit.
- Magnesium concentrations in the groundwater samples range from 6.07 to 48.6 mg/L, which is well within the BIS permissible limit of 100 mg/L. Hence, all groundwater samples comply with the standard.
- Sodium and potassium concentrations range from 33 to 224 mg/L and 3 to 21 mg/L respectively.
- Anions such as chloride ranges from 27.21 to 291.98 mg/L and sulphate ranges from 9.08 to 92.03 mg/L are well below the permissible limits of 1000 mg/L and 400 mg/L respectively.
- Nitrate levels range from 1.38 to 30.45 mg/L which is well within the acceptable limit of 45 mg/L.

Total hardness values range from 50 to 380 mg/L which is within permissible range indicating moderately hard to hard water in some areas.

3.9 Soil Quality

Measuring soil quality is crucial for maintaining environmental sustainability and ecosystem health. Soil quality is determined by physical, chemical and biological properties which influence plant growth, water retention and microbial activity. Soil monitoring helps understand the regional soil characteristics in and provide background knowledge about implementing suitable measures if required. Comparing soil quality with standards ensures its suitability for various land uses. A total of Ten (10) soil sampling locations were identified for

assessment in various villages surrounding the project site based on land use patterns in the study area. Soil quality monitoring locations & results are given in **Table 3-18** & **Table 3-19**. Map showing the soil monitoring locations are given in **Figure 3-21**

Table 3-18 Soil & Sediment Quality Monitoring Locations

Location Code	Location	Distance (~km) from Project boundary	Azimuth Direction
S1	Project Site Location- 1	Within the Site	
S2	Project Site Location- 2	Within the Site	
S3	Project Site Location- 3	Within the Site	
S4	Periya Nemmeli	0.53	E
S5	Pattipulam	0.63	E
S6	Mamallapuram	0.75	E
S7	Pavalakkarachattiram	0.68	W
S8	Alattur	0.86	W
S9	Tirupporur	1.07	W
S10	Kalavakkam	1.96	NNW

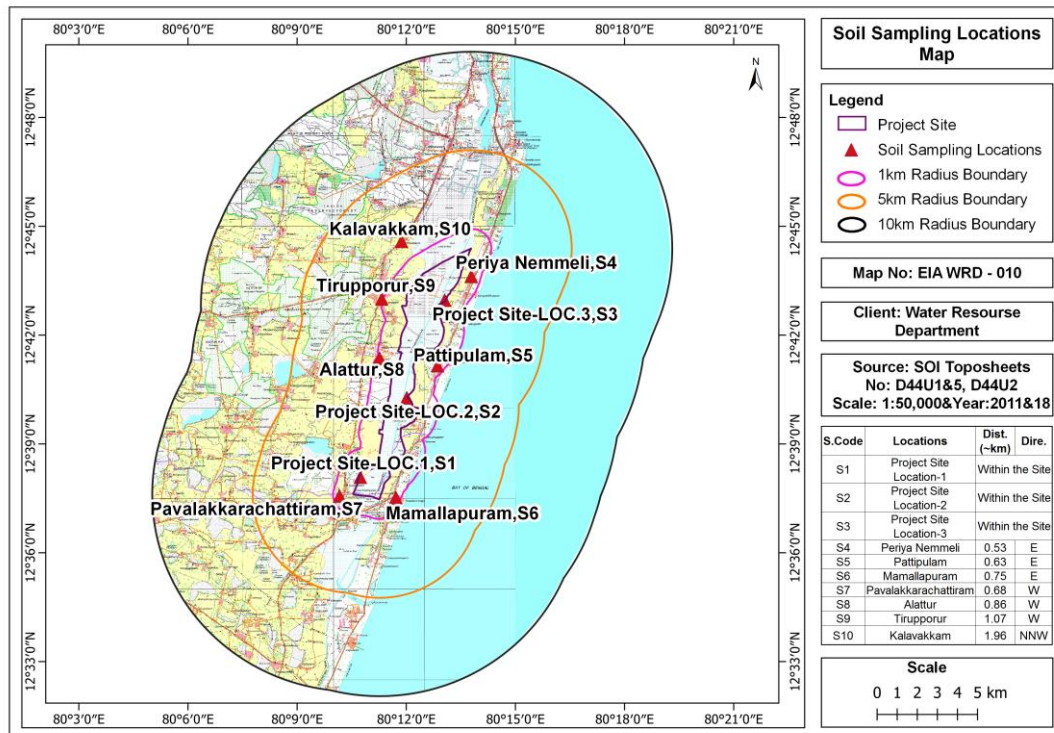


Figure 3-21 Map showing the soil monitoring location

Table 3-19 Physicochemical parameter of soil samples from the study area

S. No	Parameters	Units	Project Site Location -1	Project Site Location-2	Project Site Location-3	PeriyaNemmeli	Pattipulam	Mamallapuram	Pavalakkarachattiram	Alattur	Tirupporur	Kalavakkam
			S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
1	Cadmium as Cd	mg/kg	0.66	0.59	0.60	0.61	0.64	BLQ (LOQ: 0.1)	0.57	0.59	0.66	0.64
2	Chromium as Cr	µg/kg	11.00	7.83	10.24	10.87	9.15	BLQ (LOQ: 0.1)	0.56	11.91	8.86	8.30
3	Selenium as Se	mg/kg	0.22	BLQ (LOQ: 0.1)	0.16	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	0.11	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)
4	Copper as Cu	mg/kg	21.97	10.69	31.17	8.56	20.79	BLQ (LOQ: 0.1)	0.52	7.32	12.89	10.54
5	Nickel as Ni	mg/kg	8.28	4.88	6.50	2.89	4.70	BLQ (LOQ: 0.1)	0.40	3.77	4.36	4.60
6	Zinc as Zn	mg/kg	7.56	28.13	10.27	8.99	12.32	BLQ (LOQ: 0.1)	BLQ (LOQ: 0.1)	4.51	213.39	27.11
7	Soil Texture	-	clay	Clay loam	clay	Sandy loam	Sandy loam	Loam	Sandy loam	Loam	Sandy loam	Loam

S. No	Parameters	Units	Project Site Location -1	Project Site Location-2	Project Site Location-3	PeriyaNemmeli	Pattipulam	Mamallapuram	Pavalakkarachattiram	Alattur	Tirupporur	Kalavakkam
			S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
8	Soil Texture i) Sand	%	17.6	28.0	15.2	64.6	71.2	38.2	76.2	39.9	51.2	28.7
9	Soil Texture ii) Clay	%	56.2	39.6	52.6	7.6	3.26	19.2	6.6	10.9	2.2	22.6
10	Soil Texture iii) Silt	%	26.2	32.4	32.2	27.8	25.54	42.6	17.2	49.2	46.6	48.7
11	pH Value @ 25 ° C (1 : 2.5)	-	7.79	7.68	8.64	6.20	6.47	5.98	5.94	5.95	5.62	9.15
12	Electrical conductivity @ 25 ° C (1 : 2)	μS/cm	2390.0	2860	1702	30.8	29.1	15.5	16.0	21.6	70.7	126.1
13	Bulk Density	gm/cm ³	0.98	1.21	1.05	1.12	1.06	0.99	1.07	0.98	0.99	0.97
14	Organic Carbon	%	0.53	0.62	0.51	0.59	0.56	0.56	0.57	0.57	0.48	0.60
15	Organic Matter	%	0.92	1.08	0.88	1.02	0.98	0.95	0.99	0.99	0.83	1.04
16	Phosphorous as	mg/kg	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)	BLQ (LOQ)

S. No	Parameters	Units	Project Site Location -1	Project Site Location-2	Project Site Location-3	PeriyaNemmeli	Pattipulam	Mamallapuram	Pavalakkarachattiram	Alattur	Tirupporur	Kalavakkam
			S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
	P		5.0)	5.0)	5.0)	5.0)	5.0)	5.0)	5.0)	5.0)	5.0)	5.0)
17	Available Potassium as K	mg/kg	12.20	14.25	13.30	10.44	13.06	15.02	12.36	13.46	14.06	15.28
18	Boron as B	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)	BLQ(LOQ 0.1)	BLQ(LOQ 0.1)
19	Manganese as Mg	mg/kg	262.75	118.45	164.29	50.58	100.16	13.08	12.85	66.96	94.66	114.73
20	Iron as Fe	mg/kg	2.14	1.92	3.02	3.12	1.70	3.76	2.70	2.83	3.05	1.75
21	Total Nitrogen as N	%	0.0088	0.0102	0.0090	0.0103	0.0106	0.0095	0.0101	0.0098	0.0100	0.0094
22	Sodium Absorbtion Ratio	Square root of (millimole/litr	3.20	2.32	3.25	2.35	2.58	3.25	2.75	3.12	2.24	2.96
23	Calcium as Ca	mEq/L	13.46	15.86	14.10	9.58	11.52	14.25	10.40	12.20	12.30	14.75

S. No	Parameters	Units	Project Site Location -1	Project Site Location-2	Project Site Location-3	PeriyaNemmeli	Pattipulam	Mamallapuram	Pavalakkarachattiram	Alattur	Tirupporur	Kalavakkam
			S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
24	Magnesium as Mg	mEq/L	12.50	12.12	12.83	13.25	12.75	13.08	12.85	10.53	10.58	13.06
25	Sodium as Na	mg/kg	144.82	160.82	160.28	130.82	170.25	224.16	180.25	210.82	165.16	230.56
26	Infiltration Rate	cm/hr	0.4	0.6	0.5	0.6	0.5	0.7	0.5	0.6	0.4	0.5
27	Cation Exchange Capacity	mEq/100g	2.2	2.7	2.8	2.8	2.7	2.9	2.5	3.1	2.8	2.9
28	Moisture	%	7.28	4.26	8.26	4.26	3.72	4.16	4.64	5.62	3.25	5.18
29	Water Holding capacity	%	16.20	19.32	17.08	19.80	21.52	24.30	18.52	22.58	19.22	22.74
30	Porosity	-	0.47	0.68	0.44	0.42	0.45	0.48	0.48	0.47	0.46	0.49

3.9.1 Results and Discussions

A summary of analytical results are presented below:

- The pH of the soil samples ranged from 5.62 to 9.15.
- Electrical conductivity values ranged from 15.5µS/cm to 2860µS/cm.
- Nitrogen content ranged from 0.0088% to 0.0106%.
- Potassium content ranged from 10.44mEq/100g to 15.28mEq/100g.
- Phosphorus content in the all the samples are BLQ(LOQ:5.0)

3.10 Biological Environment

Biodiversity Assessment includes both terrestrial, aquatic species flora and fauna. It aims at ensuring that development proposals integrate biodiversity considerations and are legally compliant, and include mechanisms for the conservation of biodiversity, result in sustainable use of biodiversity resources, and to provide fair and equitable sharing of the benefits.

The overall objective of the biodiversity assessment is to optimize the biodiversity outcome. In order to achieve this, the current state of biodiversity and the potential assets derived from biodiversity in the area needs to be assessed, and then predict potential impacts of the project on biodiversity, which in turn allows for its suitable changes in order to minimize impacts on biodiversity and/or realize opportunities; to achieve the overall objective being no net biodiversity loss.

Assessment of individual flora and fauna species and their habitats, ecosystems and communities, and threatening processes in the project site as well as the study area (10 Km Buffer area) and to propose suitable conservation plan.

3.10.1.1 Floral Study

Plants species were identified based on their specific diagnostics characters of family, genus and species using available floral, other related literature. Besides the identification of plant species, information was collected on the vernacular names and uses of plants made by local inhabitants.

Quadrat sampling method was used for the study of community structure of the vegetation. The sampling consisted of randomly placed quadrats of 10m x 10m for trees, 5m x 5m for shrub, 1m x 1m herb, grasses and sedges.

3.10.2 Bird Survey and Data Analysis

Bird surveys were conducted across the entire study region from July 2025 to November 2025 to establish a scientific baseline of the bird species present. This period

covered the broad regional seasons of pre-monsoon and monsoon. Bimonthly surveys were undertaken throughout the wetland habitat.

Bird counts were performed in the morning between 06:00 and 11:00 hrs, a period of peak avian activity, and included both low and high tide cycles. Care was taken to avoid double-counting individuals. Birds flying over the study area were also recorded.

The population was estimated using the total count and block count method (Howes and Bakewell, 1989). For the total count, a suitable vantage point was selected to census all birds within a defined area. The block count method was additionally employed for large, single-species flocks. Species identification was aided by standard field guides (Ali, 1997; Kumar et al., 2005; Grimmett et al., 2016). Observations and counts were made using 10x50 binoculars, and birds were photographed using a Nikon Coolpix camera with a 55-300 mm lens.

3.10.3 Other Fauna Study

Transect method was used to evaluate the reptiles, mammals and insect diversity in the project area. The sampling consisted of randomly located transects of 100m length. List of the endangered and endemic species as per the schedule of The Wildlife Protection Act, 1972.

Floral Diversity: A total of 233 species recorded at project site and around 10km radius

S.No	Binomial Name	Family	Common Name	IUC N
Herb				
1.	<i>Acalypha fruticose</i>	Euphorbiaceae	Chinni	LC
2.	<i>Acalypha indica</i>	Euphorbiaceae	Kuppaimeni	NE
3.	<i>Acanthospermum hispidum</i>	Asteraceae		NE
4.	<i>Achyranthes aspera</i>	Amaranthaceae	Nayuruvi	NE
5.	<i>Aerva lanata</i>	Amaranthaceae	Cherula	NE
6.	<i>Aerva persica</i>	Amaranthaceae	Cimili	NE
7.	<i>Aeschynomene indica</i>	Fabaceae	-	NE
8.	<i>Ageratum conyzoides</i>	Asteraceae	Vaadaichedi	NE

9.	<i>Alternanthera pungens</i>	Amaranthaceae	-	NE
10.	<i>Alternanthera sessilis</i>	Amaranthaceae	Ponnanganni	NE
11.	<i>Alternanthera tenella</i>	Amaranthaceae	-	NE
12.	<i>Amaranthus spinosus</i>	Amaranthaceae	Mullukkeerai	LC
13.	<i>Andrographis echinoides</i>	Acanthaceae	Gopuram tangi	NE
14.	<i>Andrographis paniculata</i>	Acanthaceae	Nilavembu	NE
15.	<i>Argemone mexicana</i>	Papaveraceae	-	NE
16.	<i>Aristolochia indica</i>	Aristolochiaceae	Garudakodi	NE
17.	<i>Asystasia gangetica</i>	Acanthaceae	-	NE
18.	<i>Atriplex repens</i>	Chenopodiaceae	Herb	NE
19.	<i>Bacopa monnieri</i>	Plantaginaceae	Brahmi	NE
20.	<i>Barleria sp.</i>	Acanthaceae	Vajradanti	NE
21.	<i>Bidens Pilosa</i>	Asteraceae	-	NE
22.	<i>Blumea lacera</i>	Asteraceae	Kattumullangi	NE
23.	<i>Boerhavia diffusa</i>	Nyctaginaceae	Punarnava	NE
24.	<i>Boerhavia erecta</i>	Nyctaginaceae	-	LC
25.	<i>Cardiospermum halicacabum</i>	Sapindaceae	Modakkathan	NE
26.	<i>Cassia absus</i>	Fabaceae	Mulaipaalvirai	LC
27.	<i>Chloris roxburghii</i>	Poaceae	-	NE
28.	<i>Citrullus colocynthis</i>	Cucurbitaceae	Pikkumutti	NE
29.	<i>Cleome viscosa</i>	Cleomaceae	-	NE
30.	<i>Commelina benghalensis</i>	Commelinaceae	kanavazhai	LC
31.	<i>Corchorus olitorius</i>	Malvaceae	-	NE
32.	<i>Corchorus tridens</i>	Malvaceae	Naruvalli	NE
33.	<i>Cressa cretica</i>	Convolvulaceae	Uppucanaka	NE
34.	<i>Crotalaria verrucosa</i>	Fabaceae	-	LC

35.	<i>Croton bonplandianus</i>	Euphorbiaceae	Reil poondu	NE
36.	<i>Cyanotis tuberosa</i>	Commelinaceae	-	NE
37.	<i>Cyanthillium cinereum</i>	Asteraceae	Puvamkuruntal	NE
38.	<i>Cymbopogon sp.</i>	Poaceae	-	NE
39.	<i>Cyphostemma setosum</i>	Vitaceae	Puliaranai	NE
40.	<i>Datura metel</i>	Solanaceae	-	NE
41.	<i>Digera muricata</i>	Amaranthaceae	Toyya-kirai	NE
42.	<i>Dipteracanthus patulus</i>	Acanthaceae	Vedichchedi	NE
43.	<i>Dipteracanthus prostratus</i>	Acanthaceae	Pottakanchi	NE
44.	<i>Dyschoriste madurensis</i>	Acanthaceae	Snakeherb	NE
45.	<i>Eclipta prostrata</i>	Asteraceae	Karisilanganni	LC
46.	<i>Elephantopus scaber</i>	Asteraceae	Aanaikaa	NE
47.	<i>Elytraria acaulis</i>	Acanthaceae	Pumikatampam	NE
48.	<i>Enicostema axillare</i>	Gentianaceae	Vellarugu	LC
49.	<i>Epaltes divaricata</i>	Asteraceae	-	NE
50.	<i>Epaltes divaricate</i>	Asteraceae	-	NE
51.	<i>Euphorbia hirta</i>	Euphorbiaceae	Ammanpacharisi	NE
52.	<i>Euphorbia thymifolia</i>	Euphorbiaceae	Chinnammanpachar isi	NE
53.	<i>Evolvulus alsinoides</i>	Convolvulaceae	Vishnukiranthi	NE
54.	<i>Geniosporum axillare</i>	Lamiaceae	-	NE
55.	<i>Gomphrena serrata</i>	Amaranthaceae	-	NE
56.	<i>Grona triflora</i>	Fabaceae	-	NE
57.	<i>Hedyotis articularis</i>	Rubiaceae	Kudal-churiki	NE
58.	<i>Hedyotis aspera</i>	Rubiaceae	-	NE
59.	<i>Hedyotis biflora</i>	Rubiaceae		NE
60.	<i>Hemidesmus indicus</i>	Apocynaceae	Nannari	NE

61.	<i>Hybanthus enneaspermus</i>	Violaceae	Orital tamarai	NE
62.	<i>Hydrilla verticillata</i>	Hydrocharitaceae	-	LC
63.	<i>Indigofera aspalathoides</i>	Fabaceae	Sivanar Vembu	NE
64.	<i>Indigofera linnaei</i>	Fabaceae	Ceruppu-nerunci	NE
65.	<i>Indigofera tinctoria</i>	Fabaceae	Avuri	NE
66.	<i>Ipomoea aquatica</i>	Convolvulaceae	-	NE
67.	<i>Justicia procumbens</i>	Acanthaceae	-	NE
68.	<i>Justicia prostrata</i>	Acanthaceae	-	NE
69.	<i>Kyllinga neomoralis</i>	Cyperaceae		NE
70.	<i>Leucas aspera</i>	Lamiaceae	Thumbai	NE
71.	<i>Leucas diffusa</i>	Lamiaceae	-	NE
72.	<i>Martynia annua</i>	Martyniaceae	-	NE
73.	<i>Merremia emarginata.</i>	Convolvulaceae	Elikkadhu-keerai	NE
74.	<i>Micrococca mercurialis</i>	Phyllanthaceae	-	NE
75.	<i>Murdania sp.</i>	Commelinaceae		NE
76.	<i>Nelumbo nucifera</i>	Nelumbonaceae	Lotus	NE
77.	<i>Neptunia prostrata</i>	Fabaceae		NE
78.	<i>Nerium tenella</i>	Apocynaceae		NE
79.	<i>Nymphaea nouchali</i>	Nymphaeaceae		LC
80.	<i>Nymphaea pubescens</i>	Nymphaeaceae		LC
81.	<i>Ocimum americanum</i>	Lamiaceae		NE
82.	<i>Ocimum basilicum</i>	Lamiaceae		NE
83.	<i>Ocimum sp.</i>	Lamiaceae		NE
84.	<i>Ocimum tenuiflorum</i>	Lamiaceae		NE
85.	<i>Oldenlandia herbacea</i>	Rubiaceae		NE
86.	<i>Oldenlandia umbellate</i>	Rubiaceae		NE

87.	<i>Ottelia alismoides</i>	Hydrocharitaceae		LC
88.	<i>Oxylobium esculentum</i>	Apocynaceae		NE
89.	<i>Pavonia odorata</i>	Malvaceae		NE
90.	<i>Pedaliium murex</i>	Pedaliaceae		NE
91.	<i>Phyla nodiflora</i>	Verbenaceae		LC
92.	<i>Phyllanthus amarus</i>	Phyllanthaceae		NE
93.	<i>Phyllanthus maderaspatensis</i>	Phyllanthaceae		LC
94.	<i>Phyllanthus urinaria</i>	Phyllanthaceae		NE
95.	<i>Platostoma menthoides</i>	Lamiaceae		NE
96.	<i>Portulaca oleracea</i>	Portulacaceae		LC
97.	<i>Ruellia patula</i>	Acanthaceae		NE
98.	<i>Ruellia tuberosa</i>	Acanthaceae		NE
99.	<i>Salicornia brachiata</i>	Amaranthaceae		NE
100.	<i>Scoparia dulcis</i>	Plantaginaceae		NE
101.	<i>Senna tora</i>	Fabaceae		NE
102.	<i>Sesuvium portulacastrum</i>	Aizoaceae		NE
103.	<i>Sida acuta</i>	Malvaceae		NE
104.	<i>Sida cordata</i>	Malvaceae		NE
105.	<i>Solanum americanum</i>	Solanaceae		NE
106.	<i>Solanum trilobatum</i>	Solanaceae		NE
107.	<i>Solanum virginianum</i>	Solanaceae		NE
108.	<i>Spermacoce hispida</i>	Rubiaceae		NE
109.	<i>Spermacoce ocymoides</i>	Rubiaceae		NE
110.	<i>Sphaeranthus indicus</i>	Asteraceae		NE
111.	<i>Striga asiatica</i>	Orobanchaceae		NE
112.	<i>Suaeda maritima</i>	Amaranthaceae		NE

113.	<i>Suaeda vermiculata</i>	Amaranthaceae		NE
114.	<i>Synostemon bacciformis</i>	Phyllanthaceae		NE
115.	<i>Spinifex littoreus</i>	Poaceae	Ravananmeesai	NE
116.	<i>Tecticornia indica</i>	Amaranthaceae		NE
117.	<i>Tephrosia maxima</i>	Fabaceae		NE
118.	<i>Tephrosia purpurea</i>	Fabaceae	Kozhunchi	NE
119.	<i>Tephrosia tinctoria</i>	Fabaceae		LC
120.	<i>Tephrosia villosa</i>	Fabaceae		LC
121.	<i>Trapa natans</i>	Lythraceae		NE
122.	<i>Trianthema portulacastrum</i>	Aizoaceae		NE
123.	<i>Tridax procumbens</i>	Asteraceae	Vetukaya poondur	LC
124.	<i>Typha angustifolia</i>	Typhaceae	-	LC
125.	<i>Urena lobata</i>	Malvaceae	-	LC
126.	<i>Vahlia dichotoma</i>	Vahliaceae	-	NE
127.	<i>Vallisneria natans</i>	Hydrocharitaceae	-	LC
128.	<i>Vernonia cinerea</i>	Asteraceae		NE
129.	<i>Vicoa indica</i>	Asteraceae		NE
130.	<i>Vigna trilobata</i>	Fabaceae		NE
131.	<i>Waltheria indica</i>	Malvaceae		LC
132.	<i>Xanthium indicum</i>	Asteraceae		
Sedge				
133.	<i>Bulbostylis barbata</i>	Cyperaceae		NE
134.	<i>Cyperus dubius</i>	Cyperaceae		NE
135.	<i>Cyperus iria</i>	Cyperaceae		NE
136.	<i>Cyperus rotundus</i>	Cyperaceae		NE
137.	<i>Fimbristylis acuminata</i>	Cyperaceae		NE

138.	<i>Fimbristylis argentea</i>	Cyperaceae		NE
139.	<i>Fimbristylis falcata</i>	Cyperaceae		NE
140.	<i>Fimbristylis sp.</i>	Cyperaceae		NE
141.	<i>Kyllinga brevifolia</i>	Cyperaceae		NE
142.	<i>Kyllinga bulbosa</i>	Cyperaceae		NE
Grass				
143.	<i>Aeluropus lagopoides</i>	Poaceae		NE
144.	<i>Apluda mutica</i>	Poaceae		NE
145.	<i>Aristida adscensionis</i>	Poaceae		NE
146.	<i>Aristida setacea</i>	Poaceae		NE
147.	<i>Brachiaria ramosa</i>	Poaceae		NE
148.	<i>Brachiaria reptans</i>	Poaceae		NE
149.	<i>Chloris barbata</i>	Poaceae		NE
150.	<i>Chloris virgata</i>	Poaceae		NE
151.	<i>Cynodon barberi</i>	Poaceae		NE
152.	<i>Cynodon dactylon</i>	Poaceae		NE
153.	<i>Dactyloctenium aegyptium</i>	Poaceae		NE
154.	<i>Dichanthium annulatum</i>	Poaceae		NE
155.	<i>Dichanthium caricosum</i>	Poaceae		NE
156.	<i>Digitaria abludens</i>	Poaceae		NE
157.	<i>Digitaria ciliaris</i>	Poaceae		NE
158.	<i>Echinochloa colona</i>	Poaceae		LC
159.	<i>Echinochloa crus-galli</i>	Poaceae		LC
160.	<i>Eleusine indica</i>	Poaceae		LC
161.	<i>Enneapogon schimperanus</i>	Poaceae		NE
162.	<i>Eragrostis sp.</i>	Poaceae		NE

163.	<i>Eragrostiella bifaria</i>	Poaceae		NE
164.	<i>Eragrostis japonica</i>	Poaceae		LC
165.	<i>Eragrostis Pilosa</i>	Poaceae		NE
166.	<i>Eragrostis tenella</i>	Poaceae		NE
167.	<i>Eragrostis viscosa</i>	Poaceae		NE
168.	<i>Heteropogon contortus</i>	Poaceae		NE
169.	<i>Hygroryza aristata</i>	Poaceae		NE
170.	<i>Panicum repens</i>	Poaceae		LC
171.	<i>Panicum sp.</i>	Poaceae		NE
172.	<i>Paspalidium flavidum</i>	Poaceae		LC
173.	<i>Pennisetum glaucum</i>	Poaceae		LC
174.	<i>Perotis indica</i>	Poaceae		NE
175.	<i>Saccharum spontaneum</i>	Poaceae		LC
176.	<i>Stapfochloa elata</i>	Poaceae		NE
177.	<i>Tragus roxburghii</i>	Poaceae		NE
Climber				
178.	<i>Abrus precatorius</i>	Fabaceae		NE
179.	<i>Asparagus racemosus</i>	Asparagaceae		NE
180.	<i>Ceropegia candelabrum</i>	Apocynaceae		NE
181.	<i>Cissus quadrangularis</i>	Vitaceae		NE
182.	<i>Cissus vitiginea</i>	Vitaceae		NE
183.	<i>Coccinia grandis</i>	Cucurbitaceae		NE
184.	<i>Cocculus hirsutus</i>	Menispermaceae		NE
185.	<i>Clitoria ternatea</i>	Fabaceae		NE
186.	<i>Gmelina asiatica</i>	Lamiaceae		NE
187.	<i>Ichnocarpus frutescens</i>	Apocynaceae		NE

188.	<i>Ipomoea pes-tigridis</i>	Convolvulaceae		NE
189.	<i>Passiflora foetida</i>	Passifloraceae		NE
190.	<i>Pergularia daemia</i>	Apocynaceae		LC
191.	<i>Pentatropis capensis</i>	Apocynaceae		NE
192.	<i>Rivea hypocrateriformis</i>	Convolvulaceae		NE
193.	<i>Sarcostemma secamone</i>	Apocynaceae		NE
194.	<i>Scutia myrtina</i>	Rhamnaceae		NE
195.	<i>Tinospora cordifolia</i>	Menispermaceae		NE
196.	<i>Toddalia asiatica</i>	Rutaceae		NE
197.	<i>Tragia involucrate</i>	Euphorbiaceae		NE
198.	<i>Tylophora indica</i>	Apocynaceae		NE
199.	<i>Vincetoxicum indicum</i>	Apocynaceae		NE
Shrub				
200.	<i>Abutia indicum</i>	Malvaceae		LC
201.	<i>Agave americana</i>	Asparagaceae		LC
202.	<i>Anisomeles indica</i>	Lamiaceae		NE
203.	<i>Calotropis gigantea</i>	Apocynaceae		NE
204.	<i>Canthium parviflorum</i>	Rubiaceae		NE
205.	<i>Catunaregam spinosa</i>	Rubiaceae		NE
206.	<i>Chromolaena odorata</i>	Asteraceae		NE
207.	<i>Clerodendrum inerme</i>	Lamiaceae		NE
208.	<i>Crotalaria laburnifolia</i>	Fabaceae		NE
209.	<i>Crotalaria pallida</i>	Fabaceae		NE
210.	<i>Flueggea leucopyrus</i>	Phyllanthaceae		LC
211.	<i>Hygrophila auriculata</i>	Acanthaceae		NE
212.	<i>Hyptis suaveolens</i>	Lamiaceae		NE

213.	<i>Jatropha curcas</i>	Euphorbiaceae		LC
214.	<i>Jatropha glandulifera</i>	Euphorbiaceae		NE
215.	<i>Jatropha gossypifolia</i>	Euphorbiaceae		NE
216.	<i>Lantana camara</i>	Verbenaceae	-	LC
217.	<i>Nerium oleander</i>	Apocynaceae	Alari	LC
218.	<i>Opuntia dillenii</i>	Cactaceae	-	NE
219.	<i>Phyllanthus reticulatus</i>	Phyllanthaceae	-	LC
220.	<i>Ricinus communis</i>	Euphorbiaceae	-	NE
221.	<i>Senna alata</i>	Fabaceae	-	LC
222.	<i>Senna auriculata</i>	Fabaceae	Avaram	NE
223.	<i>Senna occidentalis</i>	Fabaceae	-	NE
224.	<i>Ziziphus oenopolia</i>	Rhamnaceae	Ampulam	NE
225.	<i>Ziziphus xylopyrus</i>	Rhamnaceae	Kottai-Y-Ilantai	NE
Tree				
226.	<i>Avicennia marina</i>	Acanthaceae	karu-n-kantal	NE
227.	<i>Azadirachta indica</i>	Meliaceae	Neem	LC
228.	<i>Borassus flabellifer</i>	Arecaceae	Panai	NE
229.	<i>Ficus benghalensis</i>	Moraceae	Aalamaram	NE
230.	<i>Morinda tinctoria</i>	Rubiaceae	Manjanathi	NE
231.	<i>Thespesia populnea</i>	Malvaceae	Povarassu	LC
232.	<i>Ziziphus mauritiana</i>	Rhamnaceae	-	LC
233.	<i>Prosopis juliflora</i>	Fabaceae	Velikaruvel	NE

Birds Diversity

A total of 102 bird species were recorded during the site visit, categorized as follows:

- Large Waders – 16 species
- Small Waders – 18 species
- Water Birds – 20 species

➤ Terrestrial Birds – 48 species

124 bird species were recorded as per the secondary source, comprising Large Waders (21 species), Small Waders (25 species), Water Birds (26 species), Aerial Insectivores (4 species), and Terrestrial Birds (48 species).

S. No.	Common name	Scientific name	Migratory status	IUCN	Ecological Group	WPA
1	Greater Flamingo	<i>Phoenicopterus roseus</i>	WM	LC	Large Wader	II
2	Grey-headed Lapwing	<i>Vanellus cinereus</i>	V	LC	Large Wader	II
3	Whimbrel	<i>Numenius phaeopus</i>	R	LC	Large Wader	II
4	Eurasian Curlew	<i>Numenius arquata</i>	R	NT	Large Wader	II
5	Black-tailed Godwit	<i>Limosa limosa</i>	WM	NT	Large Wader	II
6	Spotted Redshank	<i>Tringa erythropus</i>	WM	LC	Large Wader	II
7	Common Greenshank	<i>Tringa nebularia</i>	WM	LC	Large Wader	I
8	Asian Openbill	<i>Anastomus oscitans</i>	R	LC	Large Wader	II
9	Painted Stork	<i>Mycteria leucocephala</i>	R	LC	Large Wader	II
10	Yellow Bittern	<i>Ixobrychus sinensis</i>	R	LC	Large Wader	II
11	Black Bittern	<i>Ixobrychus flavicollis</i>	R	LC	Large Wader	II
12	Grey Heron	<i>Ardea cinerea</i>	R	LC	Large Wader	II
13	Purple Heron	<i>Ardea purpurea</i>	R	LC	Large Wader	II
14	Great Egret	<i>Ardea alba</i>	R	-	Large Wader	II
15	Intermediate Egret	<i>Ardea intermedia</i>	R	LC	Large Wader	II
16	Cattle Egret	<i>Bubulcus ibis</i>	R	LC	Large Wader	II
17	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	R	LC	Large Wader	II
18	Western Reef Heron	<i>Egretta gularis</i>	WM	-	Large Wader	II
19	Glossy Ibis	<i>Plegadis falcinellus</i>	WM	LC	Large Wader	II
20	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	R	LC	Large Wader	II
21	Eurasian Spoonbill	<i>Platalea leucorodia</i>	R	LC	Large Wader	I
22	Black-winged Stilt	<i>Himantopus himantopus</i>	R	LC	Small Wader	II
23	Pacific Golden-Plover	<i>Pluvialis fulva</i>	WM	LC	Small Wader	-
24	Red-wattled Lapwing	<i>Vanellus indicus</i>	R	LC	Small Wader	II
25	Lesser Sand-Plover	<i>Charadrius mongolus</i>	WM	-	Small Wader	-
26	Greater Sand-Plover	<i>Charadrius leschenaultii</i>	WM	LC	Small Wader	-
27	Kentish Plover	<i>Charadrius alexandrinus</i>	WM	LC	Small Wader	II
28	Common Ringed Plover	<i>Charadrius hiaticula</i>	R	LC	Small Wader	II
29	Little Ringed Plover	<i>Charadrius dubius</i>	WM	LC	Small Wader	II
30	Pin-tailed Snipe	<i>Gallinago stenura</i>	R	LC	Small Wader	-
31	Curlew Sandpiper	<i>Calidris ferruginea</i>	WM	VU	Small Wader	II

32	Temminck's Stint	<i>Calidris temminckii</i>	WM	-	Small Wader	II
33	Sanderling	<i>Calidris alba</i>	WM	LC	Small Wader	II
34	Little Stint	<i>Calidris minuta</i>	WM	LC	Small Wader	II
35	Terek Sandpiper	<i>Xenus cinereus</i>	WM	LC	Small Wader	II
36	Common Sandpiper	<i>Actitis hypoleucos</i>	R	LC	Small Wader	II
37	Green Sandpiper	<i>Tringa ochropus</i>	WM	LC	Small Wader	II
38	Marsh Sandpiper	<i>Tringa stagnatilis</i>	R	LC	Small Wader	II
39	Wood Sandpiper	<i>Tringa glareola</i>	WM	LC	Small Wader	II
40	Common Redshank	<i>Tringa totanus</i>	WM	LC	Small Wader	II
41	Little Tern	<i>Sternula albifrons</i>	WM	LC	Small Wader	II
42	Little Egret	<i>Egretta garzetta</i>	R	LC	Small Wader	II
43	Indian Pond-Heron	<i>Ardeola grayii</i>	R	LC	Small Wader	-
44	Striated Heron	<i>Butorides striata</i>	R	LC	Small Wader	II
45	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	R	LC	Small Wader	II
46	Citrine Wagtail	<i>Motacilla citreola</i>	WM	LC	Small Wader	II
47	Northern Shoveler	<i>Anas clypeata</i>	WM	LC	Water Bird	II
48	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	LM	LC	Water Bird	II
49	Little Grebe	<i>Tachybaptus ruficollis</i>	LM	LC	Water Bird	II
50	Pied Kingfisher	<i>Ceryle rudis</i>	R	LC	Water Bird	II
51	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	R	LC	Water Bird	II
52	Common Kingfisher	<i>Alcedo atthis</i>	R	LC	Water Bird	II
53	Common Moorhen	<i>Gallinula chloropus</i>	R	LC	Water Bird	II
54	Grey-headed Swamphen	<i>Porphyrio porphyrio</i>	R	-	Water Bird	II
55	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R	LC	Water Bird	II
56	Eurasian Coot	<i>Fulica atra</i>	R	LC	Water Bird	II
57	Black-headed Gull	<i>Chroicocephalus ridibundus</i>	WM	LC	Water Bird	II
58	Brown-headed Gull	<i>Chroicocephalus brunnicephalus</i>	WM		Water Bird	II
59	Lesser Black-backed Gull	<i>Larus fuscus</i>	WM	LC	Water Bird	II
60	Bridled Tern	<i>Onychoprion anaethetus</i>	WM	LC	Water Bird	II
61	Caspian Tern	<i>Hydroprogne caspia</i>	R	LC	Water Bird	II
62	Gull-billed Tern	<i>Gelochelidon nilotica</i>	WM	LC	Water Bird	I
63	Whiskered Tern	<i>Chlidonias hybrida</i>	R	LC	Water Bird	II
64	Great Crested Tern	<i>Thalasseus bergii</i>	R	LC	Water Bird	II
65	Lesser Crested Tern	<i>Thalasseus bengalensis</i>	R	LC	Water Bird	II
66	Sandwich Tern	<i>Thalasseus sandvicensis</i>	WM	LC	Water Bird	II
67	Oriental Darter	<i>Anhinga melanogaster</i>	LM	LC	Water Bird	II

68	Little Cormorant	<i>Microcarbo niger</i>	R	LC	Water Bird	II
69	Great Cormorant	<i>Phalacrocorax carbo</i>	R	LC	Water Bird	II
70	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	R	LC	Water Bird	II
71	Spot-billed Pelican	<i>Pelecanus philippensis</i>	R	NT	Water Bird	II
72	Osprey	<i>Pandion haliaetus</i>	WM	LC	Water Bird	I
73	Barn Swallow	<i>Hirundo rustica</i>	R	LC	Aerial Insectivore	II
74	Streak-throated Swallow	<i>Petrochelidon fluvicola</i>	R	LC	Aerial Insectivore	II
75	Little Swift	<i>Apus affinis</i>	R	LC	Aerial Insectivore	-
76	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	R	LC	Aerial Insectivore	II
77	Indian Peafowl	<i>Pavo cristatus</i>	R	LC	Terrestrial Bird	I
78	Gray Francolin	<i>Ortygornis pondicerianus</i>	R	LC	Terrestrial Bird	-
79	Black-rumped Flameback	<i>Dinopium benghalense</i>	R	LC	Terrestrial Bird	II
80	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	R	LC	Terrestrial Bird	II
81	Common Hoopoe	<i>Upupa epops</i>	R	LC	Terrestrial Bird	II
82	Indian Roller	<i>Coracias benghalensis</i>	R	NT	Terrestrial Bird	II
83	Green Bee-eater	<i>Merops orientalis</i>	R	LC	Terrestrial Bird	II
84	Blue-tailed Bee-eater	<i>Merops philippinus</i>	R	LC	Terrestrial Bird	II
85	Asian Koel	<i>Eudynamys scolopaceus</i>	R	-	Terrestrial Bird	II
86	Greater Coucal	<i>Centropus sinensis</i>	R	LC	Terrestrial Bird	II
87	Pied Cuckoo	<i>Clamator jacobinus</i>	M	NT	Terrestrial Bird	II
88	Common Hawk-Cuckoo	<i>Hierococcyx varius</i>	R	LC	Terrestrial Bird	-
89	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R	LC	Terrestrial Bird	II
90	Spotted Owlet	<i>Athene brama</i>	R	LC	Terrestrial Bird	II
91	Common Pigeon	<i>Columba livia</i>	R	LC	Terrestrial Bird	-
92	Spotted Dove	<i>Spilopelia chinensis</i>	R	LC	Terrestrial Bird	II
93	Indian Thick-knee	<i>Burhinus indicus</i>	R	LC	Terrestrial Bird	II
94	Black-winged Kite	<i>Elanus caeruleus</i>	R	LC	Terrestrial Bird	II
95	Shikra	<i>Accipiter badius</i>	R	LC	Terrestrial Bird	I
96	Black Kite	<i>Milvus migrans</i>	R	LC	Terrestrial Bird	II
97	Indian Golden Oriole	<i>Oriolus kundoo</i>	R	LC	Terrestrial Bird	II
98	Ashy Woodswallow	<i>Artamus fuscus</i>	R	LC	Terrestrial Bird	II
99	Black Drongo	<i>Dicrurus macrocerus</i>	R	LC	Terrestrial Bird	II
100	Indian Paradise-Flycatcher	<i>Terpsiphone paradisi</i>	WM	LC	Terrestrial Bird	II
101	Rufous Treepie	<i>Dendrocitta vagabunda</i>	R		Terrestrial Bird	II
102	House Crow	<i>Corvus splendens</i>	R	LC	Terrestrial Bird	-
103	Large-billed Crow	<i>Corvus macrorhynchos</i>	R		Terrestrial Bird	II

104	Jerdon's Bushlark	<i>Mirafra affinis</i>	R	-	Terrestrial Bird	II
105	Common Tailorbird	<i>Orthotomus sutorius</i>	R	LC	Terrestrial Bird	II
106	Ashy Prinia	<i>Prinia socialis</i>	R	LC	Terrestrial Bird	II
107	Plain Prinia	<i>Prinia inornata</i>	R	LC	Terrestrial Bird	II
108	Zitting Cisticola	<i>Cisticola juncidis</i>	R	LC	Terrestrial Bird	II
109	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	R	-	Terrestrial Bird	II
110	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R	LC	Terrestrial Bird	II
111	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R	LC	Terrestrial Bird	II
112	White-browed Bulbul	<i>Pycnonotus luteolus</i>	R	LC	Terrestrial Bird	II
113	Yellow-billed Babbler	<i>Argya affinis</i>	R	LC	Terrestrial Bird	II
114	Common Myna	<i>Acridotheres tristis</i>	R	LC	Terrestrial Bird	II
115	Indian Pied Starling	<i>Gracupica contra</i>	R	LC	Terrestrial Bird	-
116	Indian Robin	<i>Copsychus fulicatus</i>	R	LC	Terrestrial Bird	II
117	Oriental Magpie-Robin	<i>Copsychus saularis</i>	R	LC	Terrestrial Bird	-
118	Pied Bushchat	<i>Saxicola caprata</i>	R	LC	Terrestrial Bird	II
119	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>	R	LC	Terrestrial Bird	II
120	Purple Sunbird	<i>Cinnyris asiaticus</i>	R	LC	Terrestrial Bird	II
121	Loten's Sunbird	<i>Cinnyris lotenius</i>	R	-	Terrestrial Bird	II
122	House Sparrow	<i>Passer domesticus</i>	R	LC	Terrestrial Bird	II
123	Paddyfield Pipit	<i>Anthus rufulus</i>	R	LC	Terrestrial Bird	II
124	Jerdon's Nightjar	<i>Caprimulgus atripennis</i>	R	-	Terrestrial Bird	II

Migratory status: R-Resident; LM-Local Migrant; MM-Monsoon Migrant; WM-Winter Migrant; V-Vagrant

Migratory Status and Ecological Group

1. Resident (R) Species (21 species)

These species are present year-round and their conservation relies on protecting local habitats.

S. No.	Common Name	Scientific Name	Ecological Group
Large Waders (11 species)			
1.	Whimbrel	<i>Numenius phaeopus</i>	Large Wader
2.	Eurasian Curlew	<i>Numenius arquata</i>	Large Wader
3.	Asian Openbill	<i>Anastomus oscitans</i>	Large Wader
4.	Painted Stork	<i>Mycteria leucocephala</i>	Large Wader
5.	Yellow Bittern	<i>Ixobrychus sinensis</i>	Large Wader
6.	Black Bittern	<i>Ixobrychus flavicollis</i>	Large Wader
7.	Grey Heron	<i>Ardea cinerea</i>	Large Wader
8.	Purple Heron	<i>Ardea purpurea</i>	Large Wader
9.	Great Egret	<i>Ardea alba</i>	Large Wader
10.	Intermediate Egret	<i>Ardea intermedia</i>	Large Wader
11.	Cattle Egret	<i>Bubulcus ibis</i>	Large Wader
12.	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	Large Wader
13.	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	Large Wader

14.	Eurasian Spoonbill	<i>Platalea leucorodia</i>	Large Wader
Small Waders (10 species)			
1.	Black-winged Stilt	<i>Himantopus himantopus</i>	Small Wader
2.	Red-wattled Lapwing	<i>Vanellus indicus</i>	Small Wader
3.	Common Ringed Plover	<i>Charadrius hiaticula</i>	Small Wader
4.	Pin-tailed Snipe	<i>Gallinago stenura</i>	Small Wader
5.	Common Sandpiper	<i>Actitis hypoleucos</i>	Small Wader
6.	Marsh Sandpiper	<i>Tringa stagnatilis</i>	Small Wader
7.	Little Egret	<i>Egretta garzetta</i>	Small Wader
8.	Indian Pond-Heron	<i>Ardeola grayii</i>	Small Wader
9.	Striated Heron	<i>Butorides striata</i>	Small Wader
10.	White-browed Wagtail	<i>Motacilla maderaspatensis</i>	Small Wader

2. Winter Migrant (WM) Species (24 species)

These species are highly dependent on the project area as critical non-breeding habitat. Their presence is seasonal.

S. No.	Common Name	Scientific Name	Ecological Group
Large Waders (6 species)			
1.	Greater Flamingo	<i>Phoenicopterus roseus</i>	Large Wader
2.	Black-tailed Godwit	<i>Limosa limosa</i>	Large Wader
3.	Spotted Redshank	<i>Tringa erythropus</i>	Large Wader
4.	Common Greenshank	<i>Tringa nebularia</i>	Large Wader
5.	Western Reef Heron	<i>Egretta gularis</i>	Large Wader
6.	Glossy Ibis	<i>Plegadis falcinellus</i>	Large Wader
Small Waders (18 species)			
1.	Pacific Golden-Plover	<i>Pluvialis fulva</i>	Small Wader
2.	Lesser Sand-Plover	<i>Charadrius mongolus</i>	Small Wader
3.	Greater Sand-Plover	<i>Charadrius leschenaultia</i>	Small Wader
4.	Kentish Plover	<i>Charadrius alexandrinus</i>	Small Wader
5.	Little Ringed Plover	<i>Charadrius dubius</i>	Small Wader
6.	Curlew Sandpiper	<i>Calidris ferruginea</i>	Small Wader
7.	Temminck's Stint	<i>Calidris temminckii</i>	Small Wader
8.	Sanderling	<i>Calidris alba</i>	Small Wader
9.	Little Stint	<i>Calidris minuta</i>	Small Wader
10.	Terek Sandpiper	<i>Xenus cinereus</i>	Small Wader
11.	Green Sandpiper	<i>Tringa ochropus</i>	Small Wader
12.	Wood Sandpiper	<i>Tringa glareola</i>	Small Wader
13.	Common Redshank	<i>Tringa totanus</i>	Small Wader
14.	Little Tern	<i>Sternula albifrons</i>	Small Wader
15.	Citrine Wagtail	<i>Motacilla citreola</i>	Small Wader

3. Vagrant (V) Species (1 species)

This species is a rare visitor and its occurrence is unpredictable.

S. No.	Common Name	Scientific Name	Ecological Group
1	Grey-headed Lapwing	<i>Vanellus cinereus</i>	Large Wader

Other faunal species

S.No	Common Name	Scientific Name	Family	IUCN	WPA	Direct/Indirect
Butterflies						
1.	Plain Tiger	<i>Danaus chrysippus</i>	-	LC	-	
2.	Striped Tiger	<i>Danaus genutia</i>	-	LC	-	
3.	Common Caster	<i>Ariadne merione</i>	-	LC	-	
4.	Common Sailor	<i>Neptis hylas</i>	-	LC	-	
5.	Common Leopard	<i>Phalanta phalantha</i>	-	LC	-	
6.	Common Bush	<i>Mycalesis perseus</i>	-	LC	-	

	Brown					
7.	Common Three Ring	<i>Ypthima asterope</i>	-	LC	-	
8.	Baronet	<i>Euthala nais</i>	-	LC	-	
9.	Indian Fritillary	<i>Argynnis hyperbius</i>	-	LC	-	
10.	Joker	<i>Byblia ilithya</i>	-	LC	-	
11.	Crimson Tip	<i>Colotis danae</i>	-	LC	-	
12.	Small Orange Tip	<i>Colotis etrida</i>	-	LC	-	
13.	Common Grass Yellow	<i>Eurema hecabe</i>	-	LC	-	
14.	Common Emigrant	<i>Catopsillia pomona</i>	-	LC	-	
15.	Common Gull	<i>Cepora nerissa</i>	-	LC	-	
16.	Grass Jewel	<i>Freyeria trochylus</i>	-	LC	-	
17.	Lime Butterflies	<i>Papilio demoleus</i>	-	LC	-	
18.	Rice Swift	<i>Borbo cinnara</i>	-	LC	-	
Reptiles						
(i)Turtles						
19.	Indian Black Turtle*	<i>Melanochelys trijuga</i>	-	LC	Sch II	Indirect
20.	Sea turtle	<i>Lepidochelys olivacea</i>	-	LC	Sch I	Indirect
(ii)Lizards						
21.	Snake Skink	<i>Lygosoma punctatus</i>	-	LC	-	Direct
22.	Fan-throated Lizard	<i>Sitana ponticeriana</i>	-	LC	-	Direct
23.	Common Garden Lizard	<i>Calotes versicolor</i>	-	LC	-	Direct
(iii)Snakes						
24.	Common Sand Boa	<i>Gongylophis conicus</i>	-	LC	-	Direct
25.	Common Vine snake	<i>Ahaetulla nasuta</i>	-	LC	-	Direct
26.	Striped-keelback	<i>Amphiesma stolata</i>	-	LC	-	Direct
27.	Common Cat Snake	<i>Boiga trigonota</i>	-	LC	-	Indirect
Amphibians						
28.	Common Indian Toad	<i>Duttaphrynus melanostictus</i>	Bufonidae	LC	-	Direct
29.	Cricket Frog	<i>Fejervarya mudduraja</i>	Dicroglossidae	LC	-	Direct
30.	Indian Bull Frog	<i>Hoplobatrachus tigerinus</i>	Dicroglossidae	LC	-	Direct
31.	Indian Burrowing Frog	<i>Sphaerotheca breviceps</i>	Dicroglossidae	LC	-	Direct
# Venomous species, * aquatic						

Mammals						
32.	Jungle cat	<i>Felis chaus</i>	-	LC	-	Indirect
33.	Common mongoose	<i>Herpestes edwardsii</i>	-	LC	-	Indirect
34.	Black naped hare	<i>Lepus nigricollis</i>	-	LC	-	Indirect
35.	Bandicoot rat	<i>Bandicota indica</i>	-	LC	-	Direct
36.	Three-striped palm squirrel	<i>Funambulus palmarum</i>	-	LC	-	Direct
37.	Wild boar	<i>Sus scrofa</i>	-	LC	-	Indirect

7 Schedule I species were recorded in the core & buffer zone. A comprehensive central legislation, the Wildlife (Protection) Act of 1972, was enacted to safeguard wild animals. The list of wild animals and their conservation status, as per the Wildlife (Protection) Act of 1972, is provided for the study area.

The Conservation Plan would focus on conservation of habitats of Schedule-I species identified during the study.

S.No	Common Name	Species Name	IUCN	WPA 1972
Birds				
1	Shikra	<i>Accipiter badius</i>	LC	Schedule I
2	Peafowl	<i>Pavo Cristatus</i>	LC	Schedule I
3	Osprey	<i>Pandion haliaetus</i>	LC	Schedule I
4	Gull-billed Tern	<i>Gelochelidon nilotica</i>	LC	Schedule I
5	Eurasian Spoonbill	<i>Platalea leucorodia</i>	LC	Schedule I
6	Common Greenshank	<i>Tringa nebularia</i>	LC	Schedule I
Reptiles				
1	Sea Turtle	<i>Lepidochelys olivacea</i>	LC	Schedule I

Management Plan

The presence of industry may not have direct impacts on the wildlife habitat since the dominant mega faunal species are already being conserved by the Forest Department. However, the following steps will be carried out to reduce the impacts on the wildlife and environment;

Capacity Building: Capacity building program on protection would be of high significance. Creation of awareness among local people as well as employees about the importance of protecting the habitat and foraging grounds.

Anti-Poaching Plan: Poaching being one of the causes for depletion of wildlife in general and it being one of the main reasons for the poor faunal assemblage, it is necessary to increase protection for the RET species. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird more specifically the threatened species.

Habitat Improvement: Sufficient food, water resources, vegetation cover, and breeding sites must be available at the release location. The mass public of the areas should be informed with the value of the species as bio-indicator for the wetland condition. The public of the studied area were covered by several public meeting for their awareness.

Further suggestion/ recommendation

- Restricted uses of pollutants in their habitat.
- Stopping the increased vehicle pollution, wildlife road fatalities and damaged to precious habitat by people to start movement towards these areas.
- To carry annual census research project to ecology and habitat use by peacock.
- By making provision of veterinary care and cages for injurious or sick deformed birds.
- Sufficient food, water resources, vegetation cover, and breeding sites must be available at the release location.

The proponent has proposed a sum of Rs. 33,62,500/-for the “Schedule – I species” conservation plan under the following heads:

S.No	Work / Activity	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Year 5 (Rs.)	Total (Rs.)
1	Habitat Improvement	6,52,500	6,52,500	1,52,500	1,52,500	1,52,500	17,62,500
2	One Awareness Programme	20,000	20,000	20,000	20,000	20,000	1,00,000
3	Habitat Restoration (Sea Turtle)	15,00,000	–	–	–	–	15,00,000
Total		–	–	–	–	–	33,62,500

(Not including water supply, grass seed collection and plantation)

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3.11 Socio Economic profile

The socio-economic study of the project area is to determine how a proposed project will affect or change the lives of current or future residents of the geographical area.

Methodology: To conduct door-to-door surveys and interact with people in the project area, transect walk study in the project area. The interference is arrived at by extrapolation of secondary data with the current situation (primary data)

A transect walk is a mapping exercise that uses a systematic walk along a defined path within a community with local people. It is a participatory research method that explores environmental and social resources, conditions, and systems by listening, asking, observing, and producing a transect diagram alongside community members.

District Profile:

Chengalpattu district came into existence on 29.11.2019, when it was carved out of the erstwhile Kancheepuram district. Chengalpattu district being part of the Kancheepuram district until recently and being in close geographical proximity to the city of Kancheepuram. The district is bounded on the north by the Chennai district, West by the Kancheepuram district and Thiruvananthapuram districts and on the south by the Vilupuram district. With a coastal length of 57 Kms, the district is bounded in the east by the Bay of Bengal.

As per the 2011 census, the total population of the Kancheepuram (Combined) district is 39, 98,252, of which 20, 12,958 are males and 19, 85,294 are females.

3.11.1 Socio Economic Aspects

A socio-economic study was undertaken to assess aspects dealing with social and cultural conditions, and economic status in the study area. The study provides information such as demographic structure, population dynamics, infrastructure resources, and the status of human health and economic attributes like employment, per-capita income, agriculture, trade, and industrial development in the study area. The study of these characteristics helps in identification, prediction and evaluation of impacts on socio-economic and parameters of human interest due to proposed project developments. The parameters are:

- Demographic structure
- Infrastructure Facility
- Economic Status
- Health status
- Cultural attributes
- Awareness and opinion of people about the project and Industries in the area.

The following **Table 3-20** provides the certain important social indicators of Kancheepuram (Combined) district in Tamil Nadu.

Table 3-20 Social Indicators

S. No	Social Indicators	Kancheepuram (Combined) district
1	Decadal growth rate %	38.95
2	Urban population %	63.49
3	Sex ratio(female per 1000 males)	986
4	Population density (Persons per square Km)	892
5	Scheduled caste population %	23.71
6	Scheduled tribe population %	1.03
7	Literacy rate %	84.49
8	Work Participation rate %	41.86
9	Main Workers %	81.69
10	Marginal Workers %	18.31
11	Cultivators %	5.34
12	Agricultural labourers %	16.28
13	Workers in household industries %	3.27
14	Other workers %	75.11

Source: <https://censusindia.gov.in/census.website/data/handbooks>

3.11.2 Social Economic Profile of the study area

As the latest district report for Chengalpattu on existing industries is available, it has been utilized in this section. Chengalpattu District is one of the most vital and vibrant district in terms of industrial development in the state. The existing industries in the district is detailed below

Table 3-21 Existing Industries Details

S.No	Location	Major types of industries existing
1.	Maraimalai Nagar	Auto Components, Engines, Motors, Dies and Moulds, Pressure Die castings, PVC pipes, Structural Engineering
2.	Alathur	Pharmaceutical products
3.	Pallavaram	Leather and allied products
4.	Thiruporur	IT/ITES Industries, Rice Milling, Readymade garments, Packing materials

The existing Industrial estates are SIPCOT Siruseri, ,SIDCO Industrial Estate, Maraimalai Nagar, SIDCO Industrial Estate, Alathur, SIDCO, Thandarai and SIDCO, Kodur.

The population of the project area is 1,54,825 and the projected population is 2,15,129.

The percentage of female population is 49.17. The girl child population is 49.29%. When the female population is 49.17%, that means nearly half of the population is female. A girl child population of 49.29% suggests that equal distribution of the female population is under the age of 18.

Most of the people belong to the General (62.95%) category and rest are Schedule Caste (35.08%), Schedule tribe (1.96) as per 2011 Census. Given these numbers, it does indicate that the sex ratio is relatively balanced in the area, as the percentage of females and males are almost equal.

The villages and towns covering 10 km radius from the boundary of the project site is taken for the study **Table 3-22** shows the list of locations which comes under the study area. The statistics regarding the Social Characteristics of villages in the study area are also given in **Table 3-23**

Table 3-22 Population profile within the study area

S.No	Name	Households	Total Population	Male	Female	Children below 6	Scheduled Caste	Scheduled Tribe
0 to 2 Km								
Thiruporur taluk- Chengalpattu district								
1	Krishanankaranai	144	538	268	270	67	12	0
2	Nemmeli	1009	3822	1974	1848	476	203	124
3	Paiyanur	1088	4532	2298	2234	489	2486	136
4	Pattipulam	591	2250	1140	1110	264	955	28
5	Salavankuppam	316	1194	596	598	151	236	7
6	Alathur	534	2189	1125	1064	252	765	80
7	Karunguzhipallam	4	13	8	5	1	0	0
8	Thiruporur (TP)	3256	13666	7028	6638	1552	4210	195
9	Vengaleri	157	659	316	343	88	504	0
Tirukalukundram taluk- Chengalpattu district								
10	Mamallapuram (TP)	3590	15172	8036	7136	1572	3750	533
2 to 5 Km								
Thiruporur taluk- Chengalpattu district								
11	Agaram	108	408	218	190	38	22	0
12	Amoor	311	1320	673	647	175	1009	0
13	Edayankuppam RF	34	121	59	62	17	4	111
14	Illalur	606	2446	1232	1214	281	927	12
15	Illalur RF	3	15	9	6	0	7	0

16	Karanai	404	1677	836	841	213	535	3
17	Kunnappattu	222	908	464	444	118	0	105
18	Panchanthiruthy	70	272	138	134	30	155	11
19	Sengadu	175	708	348	360	110	7	0
20	Sirudavoor	755	2975	1500	1475	358	2309	25
21	Thaiyur	2646	10675	5323	5352	1213	7105	84
22	Thandalam	1456	5546	2771	2775	719	1194	24
23	Thiruvidadanthai	765	3422	1800	1622	344	877	67
Tirukalukundram taluk- Chengalpattu district								
24	Kadambady	440	1774	915	859	189	1053	59
25	Kokilamedu	308	1159	585	574	119	366	7
5 to10 Km								
Thiruporur taluk- Chengalpattu district								
26	Acharavakkam	192	822	422	400	85	313	0
27	Amaiampattu	157	652	312	340	66	647	0
28	Arungundram	267	1056	509	547	105	863	43
29	Chettipatturayamankuppam	17	54	27	27	12	0	0
30	Edarkundram	125	516	245	271	50	91	0
31	Kayar	790	3316	1664	1652	356	841	18
32	Kayar RF	17	66	29	37	10	0	66
33	Kelambakkam	1288	5189	2571	2618	588	1160	3
34	Kizhur	328	1305	671	634	170	983	4
35	Kolathur RF	19	78	40	38	13	0	73
36	Kottamedu	279	1233	605	628	143	246	81

37	Kovalam (CT)	1974	8124	3980	4144	1008	1492	0
38	Madayathur	369	1442	701	741	142	398	0
39	Mailai	292	1148	558	590	161	198	16
40	Manamathy	874	3457	1739	1718	391	1393	235
41	Mannavedudevadaram	116	400	198	202	64	55	169
42	Melkanagampattu	124	483	237	246	48	343	11
43	Muthukadu (CT)	1957	7610	3855	3755	785	2378	105
44	Otteri	58	287	147	140	40	0	0
45	Padur	1276	5710	2974	2736	606	2148	26
46	Poondi	131	545	291	254	56	262	0
47	Rayamangalam	116	478	260	218	61	0	0
48	Santhanampattu	194	869	431	438	79	868	0
49	Sembakkam	907	3700	1876	1824	396	1442	0
50	Thirunilai	228	811	415	396	93	207	20
51	Valavanthangal	116	449	235	214	42	220	0
52	Vembedu	443	1802	882	920	206	530	87
53	Vengur u	176	663	330	333	90	79	0
54	Viralpakkam	113	449	216	233	46	260	0
Tirukalukundram taluk- Chengalpattu district								
55	Acharavakkam	92	370	181	189	46	0	0
56	Echur	274	1098	592	506	139	318	19
57	Edaiyur	188	759	382	377	71	184	0
58	Kuhipanthandalam	775	3117	1579	1538	398	1369	0
59	Kunnathur	427	1713	849	864	162	489	8

60	Manamai	654	2965	1558	1407	317	2108	34
61	Perumaleri	581	2314	1178	1136	258	650	6
62	Pudupakkam	159	635	333	302	69	2	0
63	Vengabakkam	366	1448	704	744	139	205	19
Vandalur taluk- Chengalpattu district								
64	Kolathur	306	1279	636	643	136	557	98
65	Pudupakkam	1828	7279	3765	3514	923	2016	290
66	Sonallur	210	852	419	433	82	314	0
67	Velichi	180	821	435	386	97	8	0
Total		37975	154825	78691	76134	17585	54328	3042

(Source: Census2011)

3.11.2.1 Employment and Livelihood within study area

The majority of the population in the study area falls under 'other workers' categories, likely due to the areas is under high level of urbanization.

A summary of employment and livelihood within the study is given in **Table 3-23**.

Table 3-23 Summaries of Employment and Livelihood within the study area

S.No	Name	Total Worker s	Main Worker s	Margina l Worker s	Agriculture Workers				Household Industry Workers		Other Workers	
					Cultivators		Agri. Labourers		Main	Margina l	Main	Margina l
					Main	Margina l	Main	Margina l				
0 to 2 Km												
Thiruporur taluk- Chengalpattu district												
1	Krishanankaranai	200	199	1	42	0	6	0	9	0	142	1
2	Nemmeli	1402	1319	83	58	2	28	3	22	2	1211	76
3	Paiyanur	1914	1326	588	127	26	211	380	37	26	951	156
4	Pattipulam	923	834	89	48	3	27	5	13	4	746	77
5	Salavankuppam	432	414	18	4	6	1	3	0	0	409	9
6	Alathur	1230	854	376	118	29	40	62	15	7	681	278
7	Karunguzhipallam	8	5	3	0	0	0	0	0	0	5	3
8	Thiruporur (TP)	4640	4034	606	95	21	299	35	56	20	3584	530
9	Vengaleri	307	217	90	13	10	5	20	1	1	198	59
Tirukalukundram taluk- Chengalpattu district												
10	Mamallapuram (TP)	5542	4680	862	17	11	32	75	162	44	4469	732
2 to 5 Km												
Thiruporur taluk- Chengalpattu district												
11	Agaram	193	191	2	5	0	61	1	0	0	125	1

12	Amoor	691	631	60	30	2	271	4	4	1	326	53
13	Edayankuppam RF	60	59	1	1	0	1	0	0	0	57	1
14	Illalur	1211	1155	56	302	1	345	8	9	3	499	44
15	Illalur RF	10	9	1	0	0	0	1	0	0	9	0
16	Karanai	606	551	55	19	6	12	5	20	1	500	43
17	Kunnappattu	511	489	22	134	3	211	5	2	0	142	14
18	Panchanthiruthy	82	81	1	10	0	44	1	4	0	23	0
19	Sengadu	219	215	4	75	0	21	1	2	0	117	3
20	Sirudavoor	1155	962	193	29	106	669	8	14	6	250	73
21	Thaiyur	4541	2765	1776	148	49	339	445	91	112	2187	1170
22	Thandalam	2234	1905	329	87	17	167	84	55	27	1596	201
23	Thiruvидanthai	1314	419	895	6	13	16	75	9	12	388	795
Tirukalukundram taluk- Chengalpattu district												
24	Kadambady	777	571	206	94	36	121	123	3	0	353	47
25	Kokilamedu	420	406	14	11	1	6	0	4	0	385	13
5 to10 Km												
Thiruporur taluk- Chengalpattu district												
26	Acharavakkam	416	319	97	29	3	212	74	9	2	69	18
27	Amaiyampattu	292	219	73	29	33	142	8	0	3	48	29
28	Arungundram	514	508	6	94	0	305	3	0	0	109	3
29	Chettipatturayamankuppa m	23	17	6	4	0	2	5	0	0	11	1
30	Edarkundram	225	160	65	2	0	58	41	4	2	96	22
31	Kayar	1365	1216	149	290	8	350	85	21	3	555	53
32	Kayar RF	24	23	1	0	0	17	0	0	0	6	1

33	Kelambakkam	1982	1733	249	24	15	26	4	40	11	1643	219
34	Kizhur	613	572	41	133	2	179	23	16	1	244	15
35	Kolathur RF	22	18	4	8	4	3	0	0	0	7	0
36	Kottamedu	724	489	235	225	25	47	176	3	3	214	31
37	Kovalam (CT)	2799	2035	764	1	2	11	13	40	9	1983	740
38	Madayathur	685	511	174	141	3	83	153	15	1	272	17
39	Mailai	452	426	26	75	4	88	0	8	1	255	21
40	Manamathy	1616	870	746	27	27	113	408	48	58	682	253
41	Mannavedudevadaram	232	172	60	6	0	130	55	8	0	28	5
42	Melkanagampattu	271	249	22	2	0	190	22	1	0	56	0
43	Muthukadu (CT)	3181	2727	454	8	1	21	5	22	12	2676	436
44	Otteri	130	123	7	7	1	79	4	0	1	37	1
45	Padur	1950	1815	135	45	24	169	3	43	1	1558	107
46	Poondi	181	131	50	31	1	3	6	0	1	97	42
47	Rayamangalam	220	159	61	13	3	65	38	1	0	80	20
48	Santhanampattu	274	72	202	0	16	1	146	1	1	70	39
49	Sembakkam	1590	1411	179	51	8	349	56	87	21	924	94
50	Thirunilai	496	236	260	72	22	65	148	5	13	94	77
51	Valavanthangal	300	177	123	24	1	49	122	23	0	81	0
52	Vembedu	853	629	224	175	16	57	91	4	1	393	116
53	Vengur u	254	165	89	1	0	5	78	3	0	156	11
54	Viralpakkam	148	135	13	6	2	60	2	22	3	47	6
Tirukalukundram taluk- Chengalpattu district												
55	Acharavakkam	166	76	90	37	4	14	54	0	0	25	32

56	Echur	536	164	372	26	77	46	170	6	3	86	122
57	Edaiyur	439	198	241	19	3	14	219	1	0	164	19
58	Kuhipanthandalam	1743	1323	420	283	8	570	89	29	280	441	43
59	Kunnathur	648	155	493	3	44	5	175	2	36	145	238
60	Manamai	1299	591	708	38	33	45	249	8	17	500	409
61	Perumaleri	1034	884	150	88	5	132	58	11	5	653	82
62	Pudupakkam	255	187	68	28	4	7	6	4	2	148	56
63	Vengabakkam	722	308	414	172	12	5	278	2	5	129	119
Vandalur taluk- Chengalpattu district												
64	Kolathur	546	495	51	15	5	313	19	8	1	159	26
65	Pudupakkam	3019	2400	619	64	31	262	211	41	27	2033	350
66	Sonallur	328	62	266	22	4	6	172	3	7	31	83
67	Velichi	332	310	22	173	7	6	0	0	0	131	15
Total		63521	48761	14760	3964	800	7237	4813	1071	797	36489	8350

(Source: Census 2011)

3.11.2.2 Educational Infrastructure within study area

The district has good primary and secondary education infrastructure in urban and rural areas. The people around the study area have well connected to educational infrastructures. The following **Table 3-24** shows the literates population and the percentage within the study area

Table 3-24 Literates population and the percentage within the study area

S.No	Name	Total Population	Literates Population	Literates Population Male	Literates Population Female	% Literates (excluding up to 6 years)
0 to 2 Km						
Thiruporur taluk- Chengalpattu district						
1	Krishanankaranai	538	294	175	119	62.42
2	Nemmeli	3822	2752	1546	1206	82.25
3	Paiyanur	4532	3350	1816	1534	82.86
4	Pattipulam	2250	1757	966	791	88.47
5	Salavankuppam	1194	800	440	360	76.70
6	Alathur	2189	1672	929	743	86.32
7	Karunguzhipallam	13	10	5	5	83.33
8	Thiruporur (TP)	13666	10239	5665	4574	84.52
9	Vengaleri	659	406	209	197	71.10
Tirukalukundram taluk- Chengalpattu district						
10	Mamallapuram (TP)	15172	11631	6609	5022	85.52
2 to 5 Km						
Thiruporur taluk- Chengalpattu district						
11	Agaram	408	313	186	127	84.59
12	Amoor	1320	832	456	376	72.66
13	Edayankuppam RF	121	73	39	34	70.19

14	Illalur	2446	1549	913	636	71.55
15	Illalur RF	15	9	6	3	60.00
16	Karanai	1677	1220	653	567	83.33
17	Kunnappattu	908	498	283	215	63.04
18	Panchanthiruthy	272	229	119	110	94.63
19	Sengadu	708	438	247	191	73.24
20	Sirudavoor	2975	1829	1036	793	69.89
21	Thaiyur	10675	7719	4176	3543	81.58
22	Thandalam	5546	4173	2255	1918	86.45
23	Thiruvidanthai	3422	2456	1432	1024	79.79
Tirukalukundram taluk- Chengalpattu district						
24	Kadambady	1774	1142	687	455	72.05
25	Kokilamedu	1159	746	425	321	71.73
5 to10 Km						
Thiruporur taluk- Chengalpattu district						
26	Acharavakkam	822	560	319	241	75.98
27	Amaiampattu	652	380	201	179	64.85
28	Arungundram	1056	671	355	316	70.56
29	Chettipatturayamankuppam	54	32	19	13	76.19
30	Edarkundram	516	371	197	174	79.61
31	Kayar	3316	2352	1305	1047	79.46
32	Kayar RF	66	31	14	17	55.36
33	Kelambakkam	5189	4154	2157	1997	90.28
34	Kizhur	1305	811	461	350	71.45

35	Kolathur RF	78	34	20	14	52.31
36	Kottamedu	1233	896	476	420	82.20
37	Kovalam (CT)	8124	5925	3113	2812	83.26
38	Madayathur	1442	962	509	453	74.00
39	Mailai	1148	752	420	332	76.19
40	Manamathy	3457	2310	1286	1024	75.34
41	Mannavedudevadaram	400	208	115	93	61.90
42	Melkanagampattu	483	299	165	134	68.74
43	Muthukadu (CT)	7610	5691	3099	2592	83.38
44	Otteri	287	202	113	89	81.78
45	Padur	5710	4283	2375	1908	83.91
46	Poondi	545	368	221	147	75.26
47	Rayamangalam	478	316	192	124	75.78
48	Santhanampattu	869	559	312	247	70.76
49	Sembakkam	3700	2764	1522	1242	83.66
50	Thirunilai	811	530	308	222	73.82
51	Valavanthangal	449	249	153	96	61.18
52	Vembedu	1802	1197	666	531	75.00
53	Vengur u	663	429	258	171	74.87
54	Viralpakkam	449	324	176	148	80.40
Tirukalukundram taluk- Chengalpattu district						
55	Acharavakkam	370	240	144	96	74.07
56	Echur	1098	776	442	334	80.92
57	Edaiyur	759	475	266	209	69.04

58	Kuhipanthandalam	3117	2108	1189	919	77.53
59	Kunnathur	1713	1152	662	490	74.27
60	Manamai	2965	2044	1181	863	77.19
61	Perumaleri	2314	1562	882	680	75.97
62	Pudupakkam	635	447	245	202	78.98
63	Vengabakkam	1448	971	544	427	74.18
Vandalur taluk- Chengalpattu district						
64	Kolathur	1279	994	515	479	86.96
65	Pudupakkam	7279	5516	3008	2508	86.78
66	Sonallur	852	661	341	320	85.84
67	Velichi	821	563	327	236	77.76
Total		154825	111306	61546	49760	81.10

(Source: Census2011)

3.11.2.3 Health facility within the study area

The majority of people visit nearby Hospitals/health services provided by the Government. The area has got good public health facilities at easily reachable distances. There were no major health issues reported in our survey. Even for any minor ailments they contact medical facilities immediately as it is very accessible to them. The incidents of institutional delivery are high due to awareness, education, economic development, and proximity to health delivery system. The Infant mortality rate and the maternal mortality rate have significantly reduced

3.11.3 Summary

The Socioeconomic profile of the study area shows that the majority of people in the study area work in the non-agricultural sector, however in rural areas majority of the people in the rural area depend on the agricultural sector. They have good educational infrastructures and the people in the study area are well connected to the educational infrastructures. The average literacy rate of the study area is 81.10%. The people in the study area are well connected to Government primary health centres and Primary health sub-centres

Table 3-25 Summaries of Socio-economic indicators within the study area

S. No	Particulars	Study area	Unit
1	Number of villages in the Study Area	67	Nos.
2	Total Households	37975	Nos.
3	Total Population	154825	Nos.
4	Urban Population	40.43	%
5	Children Population (<6 Years Old)	17585	Nos.
6	SC Population	54328	Nos.
7	ST Population	3042	Nos.
8	Total Working Population	63521	Nos.
9	Main Workers	48761	Nos.
10	Marginal Workers	14760	Nos.
11	Literates	111306	No

(Source: Census 2011)

CHAPTER - 4

ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

4 Anticipated Environmental Impacts and Mitigation measures

4.1 Details of Investigated Environmental impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project

Rapid Environmental Impact Assessment (REIA) is a process of evaluating the likely environmental impacts of the project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape project to suit the local environment and present the predictions and options to decision-makers.

By using REIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoiding treatment/clean-up costs and impacts of laws and regulations. The main purpose of identifying the impacts is that it helps in adopting appropriate mitigation measures for the adverse consequences if any. The impacts on the environmental indices viz. air, water, soil, noise, biological and socioeconomic conditions are scrutinized methodically and assessed.

The most likely impacts on the environment due to the project need to be appraised during the two different phases of the project namely pre-operation/construction phase and operation phase. The impacts that could be triggered on the environmental attributes by the activities of the project are discussed below;

4.2 Construction Phase

Impact assessment during the construction phase of the project is of importance as the construction activities lead to adverse effects on the environment on a short term basis. The major activities that are undertaken during this phase are civil works, machinery works and transportation works.

4.2.1.1 Air Environment

Micro-meteorological factors have direct bearing on the dispersion and dilution of Pollutants/contaminants discharged into the atmosphere with consequent impact on air environment. In order to predict the impact of the proposed project in the ambient air quality, baseline data on

emission and meteorological data along with the historical data collected from IMD were used to predict the ground level concentration of SO₂, NO_x, PM 10 and PM 2.5.

Baseline data reveals that ambient air quality in the study area for the Parameters PM, SO₂, NO_x, and CO are well within the permissible Limits as prescribed by the National Ambient Air Quality Standards (NAAQS) for Industrial Area, Residential, Rural & Other areas.

4.2.1.2 Meteorological Data

The meteorological data for a month, i.e. from **01/04/2025 to 30/06/2025** was considered for the study. Data included for AERMET were daily wind speed, wind direction, temperature, relative humidity, air pressure, precipitation, and solar radiation recorded during the period. AERMET reformats meteorological data so that it can be used as input for AERMOD model. Meteorology considered for modelling is shown below.

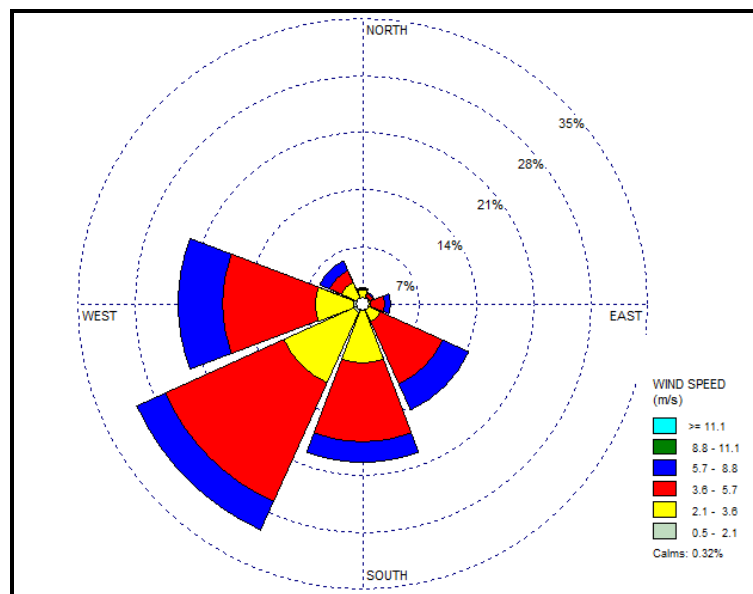


Figure 4-1 Wind rose diagram of Meteorological data considered for Modelling (April 2025 to June 2025)

4.2.1.3 AERMET Process

For the 3 phase AERMET processing of the meteorological data, specifications of the land use in the area are required to determine the terrain roughness for modelling. The land use was characterized for in and around the site. The surface characteristics for the site and surroundings were selected and used to calculate the Albedo, Bowen ratio and surface roughness parameters.

4.2.1.4 AERMOD Process

AERMOD Software Version 8.0.5 was used for air dispersion modelling and is applicable to a wide range of buoyant or neutrally buoyant emissions up to a range of 50 km. In addition to more straight forward cases, AERMOD is also suitable for complex terrain and urban dispersion scenarios.

AERMOD is a steady-state plume model. In the stable boundary layer (SBL), it assumes the concentration distribution to be Gaussian in both the vertical and horizontal. In the convective boundary layer (CBL), the horizontal distribution is also assumed to be Gaussian, but the vertical distribution is described with a bi-Gaussian probability density function (pdf). This behavior of the concentration distributions in the CBL was demonstrated by Willis and Deardorff (1981) and Briggs (1993). Additionally, in the CBL, AERMOD treats “plume lofting,” whereby a portion of plume mass, released from a buoyant source, rises to and remains near the top of the boundary layer before becoming mixed into the CBL. AERMOD also tracks any plume mass that penetrates into the elevated stable layer, and then allows it to re-enter the boundary layer when and if appropriate. For sources in both the CBL and the SBL AERMOD treats the enhancement of lateral dispersion resulting from plume meander. The emissions from proposed stacks are estimated and used for the air dispersion modeling as shown in **Table 4.1** respectively. Maximum incremental values for PM, SO₂, NO_x and CO have been represented as pictorial concentration contours and as tabular concentration values in following sections.

Point Source:

4.2.1.5 Emission

Table 4-1 Stack Emissions for Proposed Project

S.No.	Source	Fuel Type	Stack Details					Emissions (g/s)			
			No. of Stack	Height (m)	Temp (°C)	Dia (m)	Exit Velocity (m/s)	PM	SO ₂	NO _x	CO
1	DG - 58.5 kVA	HSD	1	3.0	160	0.1	8.0	7.25E-04	6.75E-04	1.02E-02	2.20E-03
2	DG - 58.5 kVA	HSD	1	3.0	160	0.1	8.0	7.25E-04	6.75E-04	1.02E-02	2.20E-03
Total								1.45E-03	1.35E-03	2.04E-02	4.40E-03

Note:

1. DG Emission calculation is based on the DG capacity.

Source:

1. Emission reference: AP-42: Compilation of Air Emissions Factors.

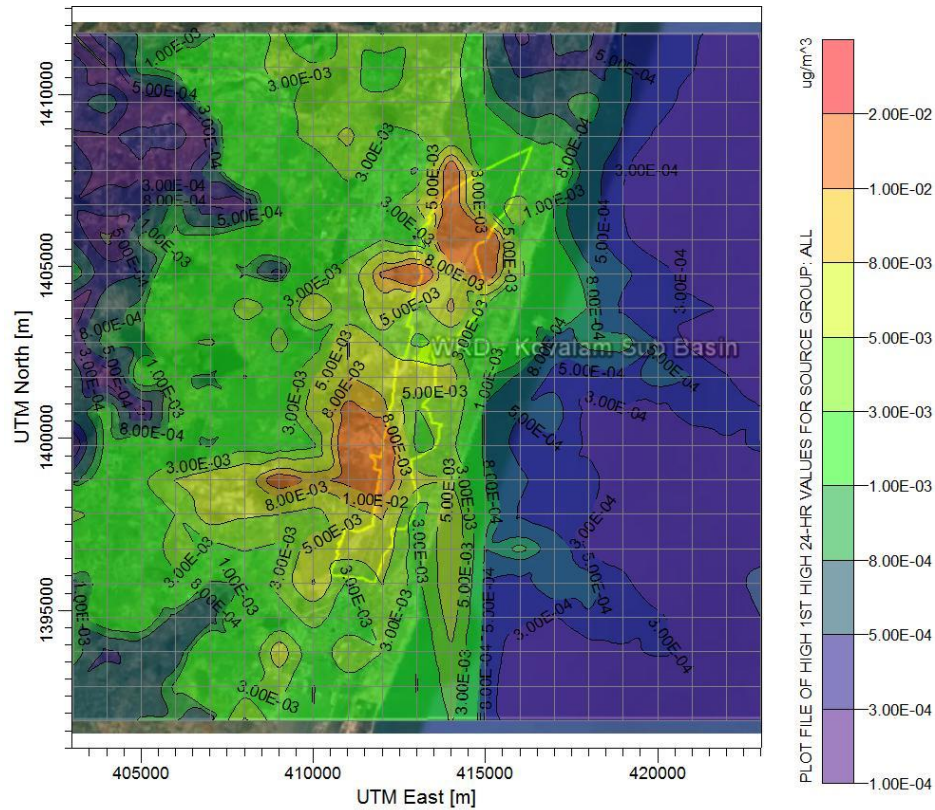


Figure 4-2 Predicted 24-Hrs GLC's of Particulate matter PM within 10 km Radius of the Study Area

Table 4-2 Estimated Top 10 Highest Concentrations of Particulate Matter PM obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	414004	1405790	0.01974	4.12	NNE
2.	412004	1399790	0.01608	2.23	SSW
3.	415004	1405790	0.01581	4.47	NNE
4.	413004	1404790	0.01535	3.00	N
5.	411004	1399790	0.01413	2.82	SW
6.	415004	1404790	0.01327	3.60	NNE
7.	414004	1407790	0.01305	6.08	NNE
8.	412004	1398790	0.01281	3.16	SSW
9.	414004	1406790	0.01242	5.09	NNE
10.	409004	1398790	0.01241	5.00	WSW

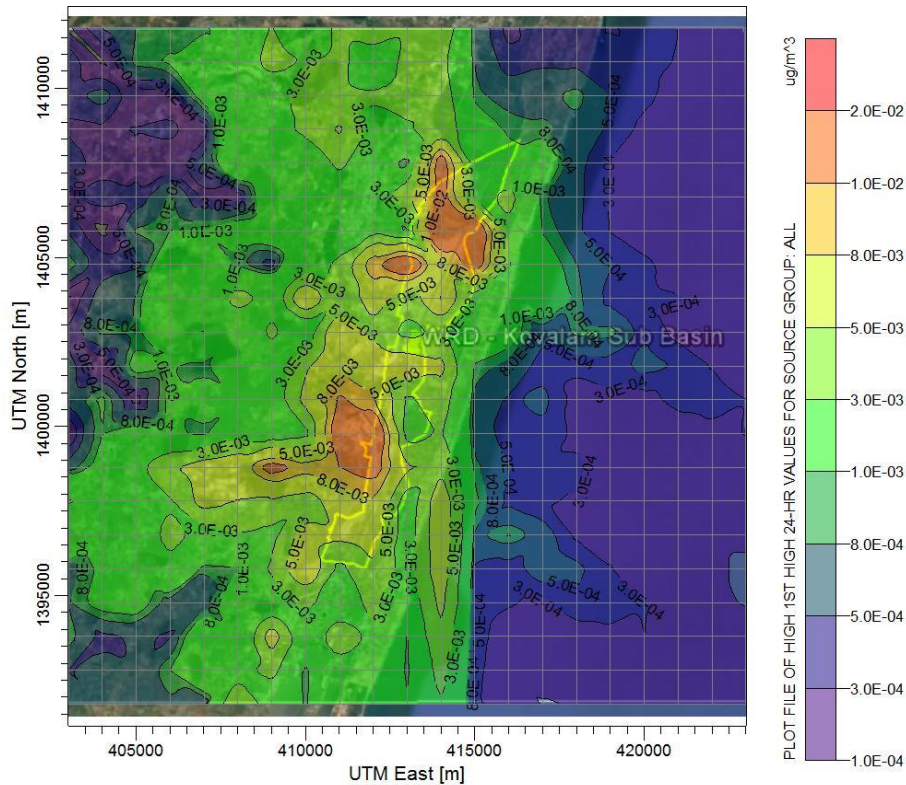


Figure 4-3 Predicted 24-Hrs' GLC's of SO₂ within 10 km Radius of the Study Area

Table 4-3 Estimated Top 10 Highest Concentrations of Sulfur dioxide Obtained through Modeling

S. No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	414004	1405790	0.01838	4.12	NNE
2.	412004	1399790	0.01497	2.23	SSW
3.	415004	1405790	0.01472	4.47	NNE
4.	413004	1404790	0.0143	3.00	N
5.	411004	1399790	0.01315	2.82	SW
6.	415004	1404790	0.01235	3.60	NNE
7.	414004	1407790	0.01215	6.08	NNE
8.	412004	1398790	0.01193	3.16	SSW
9.	414004	1406790	0.01157	5.09	NNE
10.	409004	1398790	0.01156	5.00	WSW

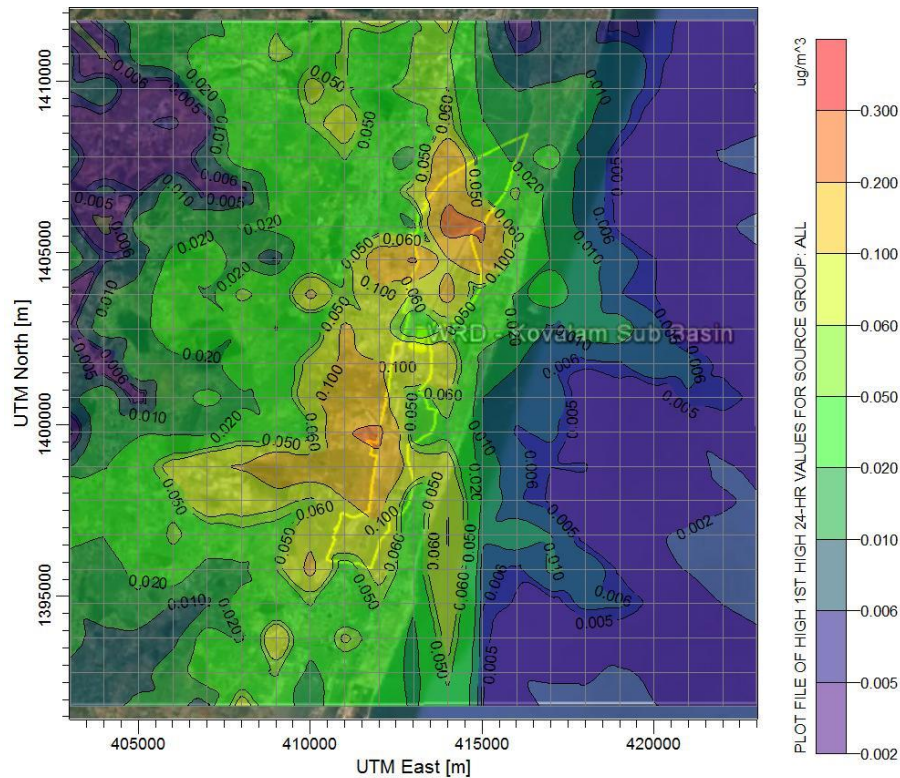


Figure 4-4 Predicted 24-Hrs' GLC's of NOx within 10 km Radius of the Study Area

Table 4-4 Estimated Top 10 Highest Concentrations of oxide of Nitrogen Obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	414004	1405790	0.27775	4.12	NNE
2.	412004	1399790	0.22625	2.23	SSW
3.	415004	1405790	0.2224	4.47	NNE
4.	413004	1404790	0.21602	3.00	N
5.	411004	1399790	0.19874	2.82	SW
6.	415004	1404790	0.18664	3.60	NNE
7.	414004	1407790	0.18365	6.08	NNE
8.	412004	1398790	0.18023	3.16	SSW
9.	414004	1406790	0.17478	5.09	NNE
10.	409004	1398790	0.17464	5.00	WSW

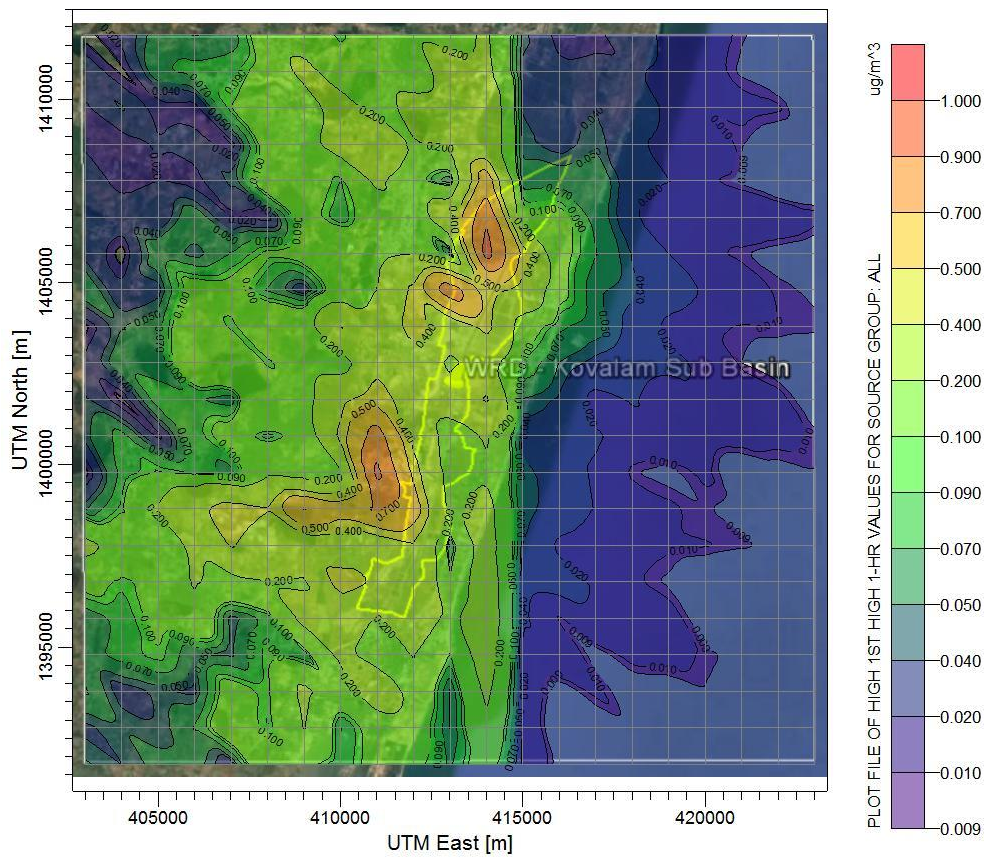


Figure 4-5 Predicted 1-Hrs' GLC's of CO within 10 km Radius of the Study Area

Table 4-5 Estimated Top 10 Highest Concentrations of Carbon Monoxide Obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	414004	1405790	0.9786	4.12	NNE
2.	411004	1399790	0.94951	2.82	SW
3.	414004	1406790	0.88969	5.09	NNE
4.	413004	1404790	0.83522	3.00	N
5.	411004	1400790	0.80225	2.23	WSW
6.	411004	1398790	0.73588	3.60	SSW
7.	409004	1398790	0.70804	5.00	WSW

8.	414004	1407790	0.59543	6.08	NNE
9.	412004	1398790	0.58903	3.16	SSW
10.	410004	1398790	0.58769	4.24	SW

4.2.1.6 Conclusion

Maximum pollutant concentrations of PM, SO₂ and NO_x observed due to proposed for an 24hr-average period have been studied and CO maximum concentration for 1 hr- average period have been studied . The total increase in concentrations above baseline status is summarized in **Table 4-6**.

Table 4-6 Total Maximum GLCs from the Stack Emissions

Pollutant	Max. Base line Conc. (µg/m ³)	Estimated Incremental Conc. (µg/m ³)	Total Conc. (µg/m ³)	NAAQ standard (µg/m ³)
PM	69.14	0.019	69.159	100
SO ₂	15.48	0.018	15.498	80
NO _x	30.94	0.277	31.217	80
CO	540	0.978	540.978	4000

Line Source:

Table 4-7 Transportations Emissions for Proposed Project

S.No.	Type of Vehicle	No. of Vehicle	Emissions (g/s)		
			PM	NO _x	CO
1	2W	30	3.75E-04	7.50E-03	4.17E-02
2	4W	10	1.25E-04	3.47E-03	2.06E-02
3	HW	135	3.75E-03	1.73E-01	1.50E+00
Total			4.25E-03	1.83E-01	1.56E+00

Source:

1. Indian Emission Regulations by the Automotive Research Association of India.

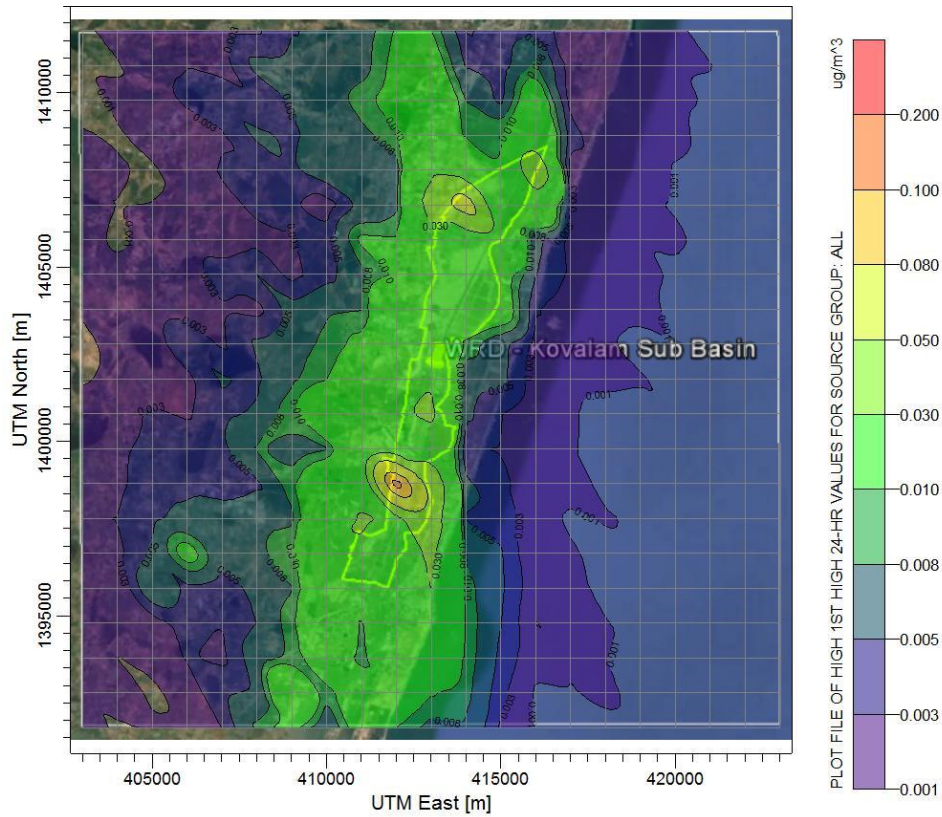


Figure 4-6 Predicted 24-Hrs GLC's of Particulate matter PM within 10 km Radius of the Study Area

Table 4-8 Estimated Top 10 Highest Concentrations of Particulate Matter PM obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	0.10941	3.16	SSW
2.	414004	1406790	0.06135	5.09	NNE
3.	413004	1398790	0.04545	3.00	S
4.	416004	1407790	0.04516	6.70	NNE
5.	413004	1397790	0.04032	4.00	S
6.	413004	1406790	0.0377	5.00	N
7.	413004	1400790	0.03299	1.00	S
8.	413004	1396790	0.03295	5.00	S
9.	411004	1397790	0.03202	4.47	SSW
10.	413004	1395790	0.03008	6.00	S

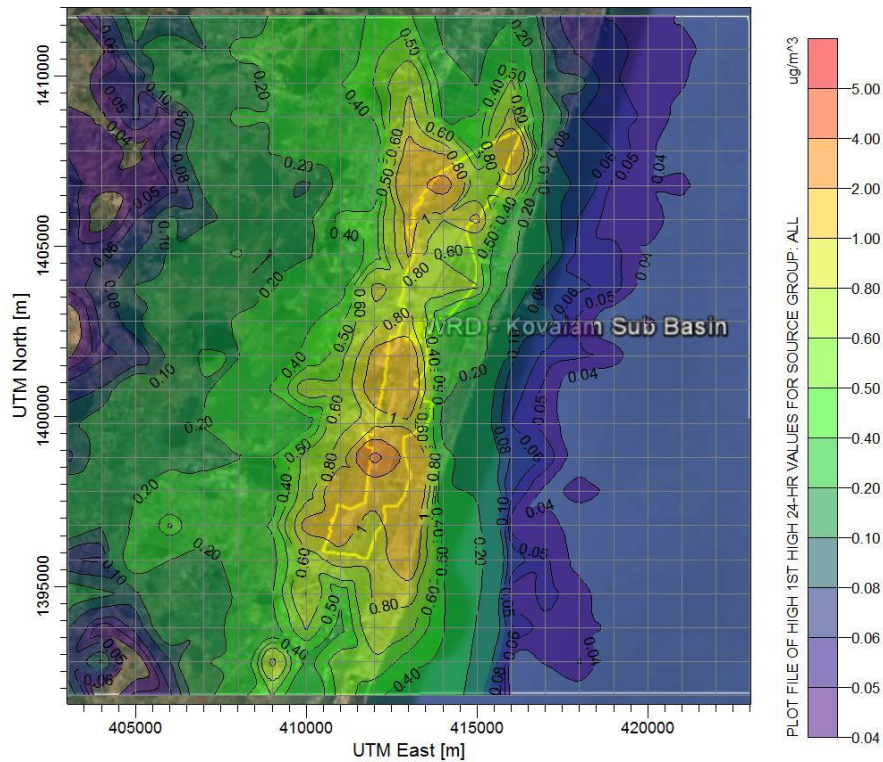


Figure 4-7 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-9 Estimated Top 10 Highest Concentrations of oxide of Nitrogen Obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	4.71452	3.16	SSW
2.	414004	1406790	2.64374	5.09	NNE
3.	413004	1398790	1.95865	3.00	S
4.	416004	1407790	1.94629	6.70	NNE
5.	413004	1397790	1.73727	4.00	S
6.	413004	1406790	1.62457	5.00	N
7.	413004	1400790	1.4214	1.00	S
8.	413004	1396790	1.4199	5.00	S
9.	411004	1397790	1.3796	4.47	SSW

10.	413004	1395790	1.29602	6.00	S
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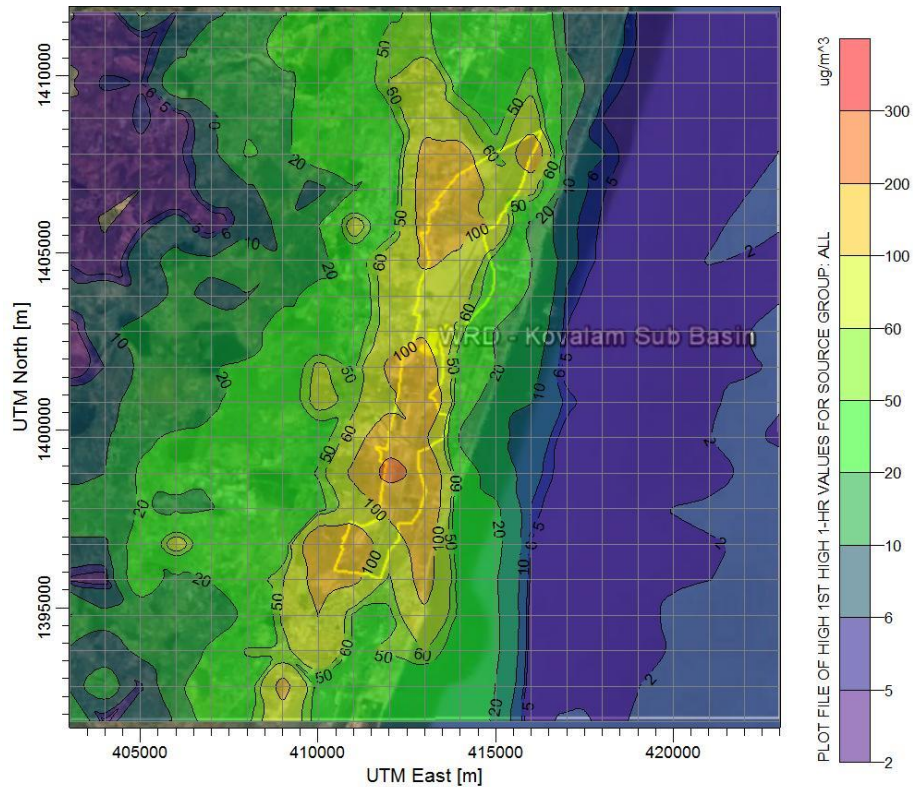


Figure 4-8 Predicted 1-Hrs' GLC's of CO within 10 km Radius of the Study Area

Table 4-10 Estimated Top 10 Highest Concentrations of Carbon Monoxide Obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	249.1568	3.16	SSW
2.	413004	1400790	185.2336	1.00	S
3.	414004	1406790	177.0147	5.09	NNE
4.	410004	1396790	175.321	5.83	SSW
5.	413004	1398790	173.316	3.00	S
6.	416004	1407790	164.7687	6.70	NNE
7.	412004	1399790	162.8572	2.23	SSW

8.	413004	1397790	157.7214	4.00	S
9.	411004	1396790	154.1391	5.38	SSW
10.	413004	1401790	136.4746	Project Site	Project Site

Conclusion

Maximum pollutant concentrations of PM and NO_x observed due to proposed for an 24hr-average period have been studied and CO maximum concentration for 1 hr- average period have been studied . The total increase in concentrations above baseline status is summarized in

Table 4-11 Total Maximum GLCs from the Transportations Emissions

Pollutant	Max. Base line Conc. (µg/m ³)	Estimated Incremental Conc. (µg/m ³)	Total Conc. (µg/m ³)	NAAQ standard (µg/m ³)
PM	69.14	0.10	69.24	100
NO _x	30.94	4.71	35.65	80
CO	540	249.15	789.15	4000

Cummulative

Table 4-12 Stack & Transportations Emissions (Cumulative) for Proposed Project

S.No.	Source	Fuel Type	Stack Details					Emissions (g/s)			
			No. of Stack	Height (m)	Temp (°C)	Dia (m)	Exit Velocity (m/s)	PM	SO ₂	NO _x	CO
1	DG - 58.5 kVA	HSD	1	3.0	160	0.1	8.0	7.25E-04	6.75E-04	1.02E-02	2.20E-03
2	DG - 58.5 kVA	HSD	1	3.0	160	0.1	8.0	7.25E-04	6.75E-04	1.02E-02	2.20E-03
Transportations											
S.No.	Type of Vehicle	No. of Vehicle					Emissions (g/s)				
							PM	SO ₂	NO _x	CO	
1	2W	30					3.75E-04	-	7.50E-03	4.17E-02	
2	4W	10					1.25E-04	-	3.47E-03	2.06E-02	
3	HW	135					3.75E-03	-	1.73E-01	1.50E+00	
Total							5.70E-03	1.35E-03	2.04E-01	1.57E+00	

Note:

1. DG Emission calculation is based on the DG capacity.

Source:

1. Emission reference: AP-42: Compilation of Air Emissions Factors.
2. Indian Emission Regulations by the Automotive Research Association of India.

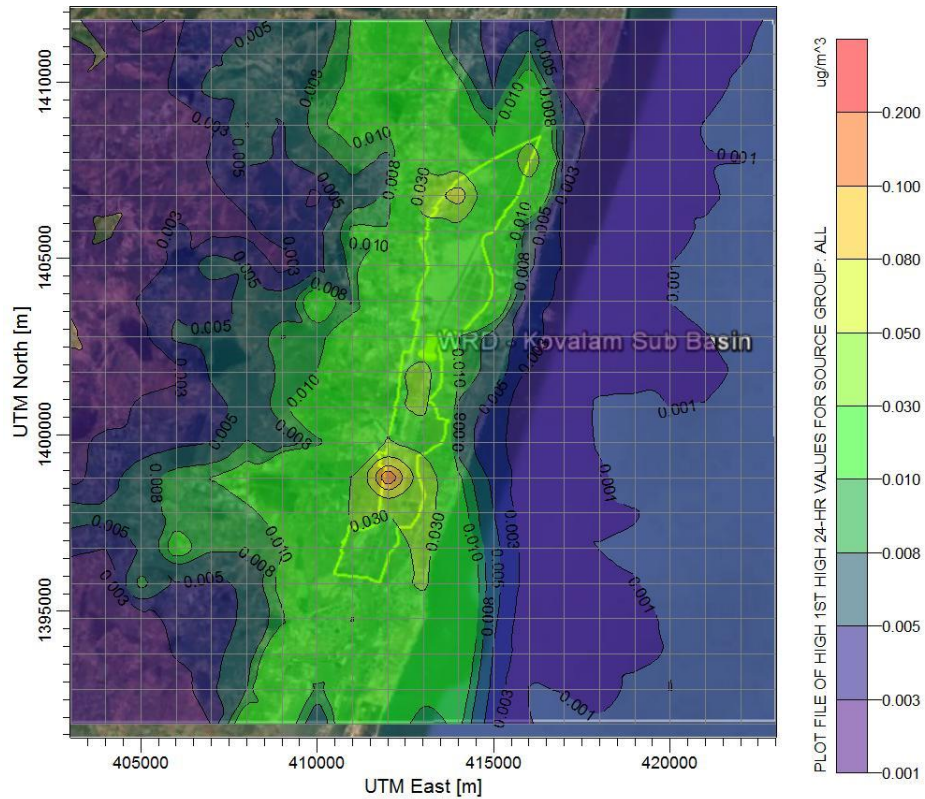


Figure 4-9 Predicted 24-Hrs GLC's of Particulate matter PM within 10 km Radius of the Study Area

Table 4-13 Estimated Top 10 Highest Concentrations of Particulate Matter PM obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	0.12222	3.16	SSW
2.	414004	1406790	0.0616	5.09	NNE
3.	413004	1398790	0.04582	3.00	S
4.	416004	1407790	0.04525	6.70	NNE
5.	413004	1397790	0.04074	4.00	S
6.	413004	1406790	0.03781	5.00	N
7.	413004	1401790	0.03619	Project Site	Project Site
8.	413004	1396790	0.03446	5.00	S
9.	413004	1400790	0.03312	1.00	S
10.	413004	1395790	0.03248	6.00	S

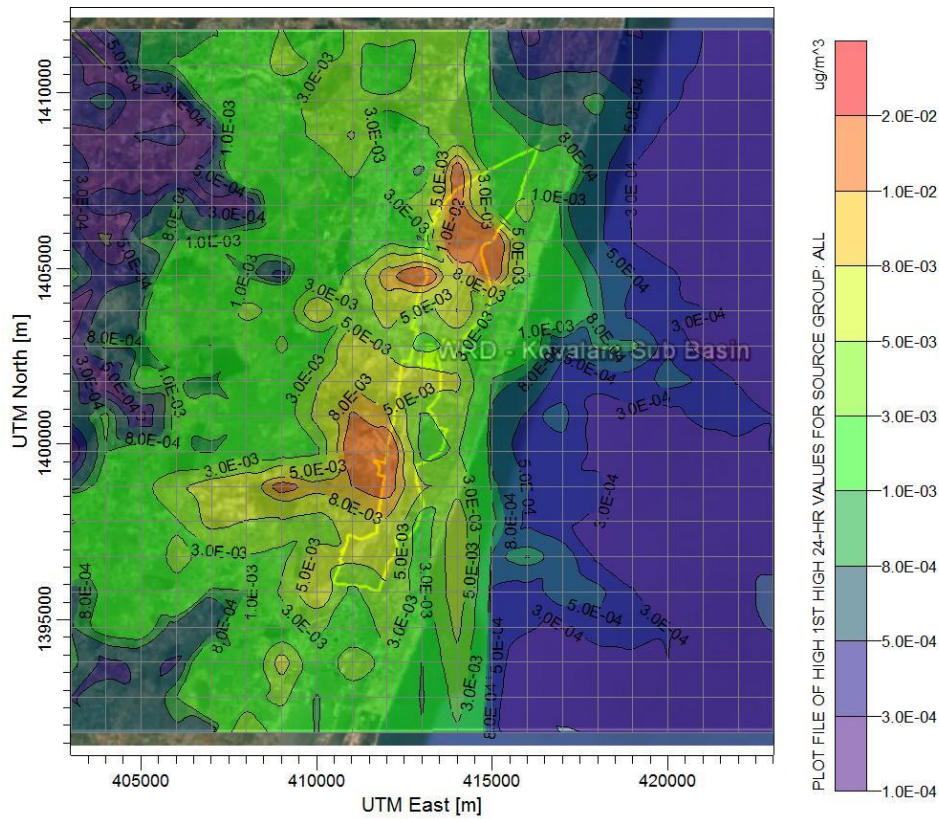


Figure 4-10 Predicted 24-Hrs' GLC's of SO₂ within 10 km Radius of the Study Area

Table 4-14 Estimated Top 10 Highest Concentrations of Sulfur dioxide Obtained through Modeling

S. No	UTM coordinates (m)		Conc. (µg/m ³)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	414004	1405790	0.01838	4.12	NNE
2.	412004	1399790	0.01497	2.23	SSW
3.	415004	1405790	0.01472	4.47	NNE
4.	413004	1404790	0.0143	3.00	N
5.	411004	1399790	0.01315	2.82	SW
6.	415004	1404790	0.01235	3.60	NNE
7.	414004	1407790	0.01215	6.08	NNE
8.	412004	1398790	0.01193	3.16	SSW

9.	414004	1406790	0.01157	5.09	NNE
10.	409004	1398790	0.01156	5.00	WSW

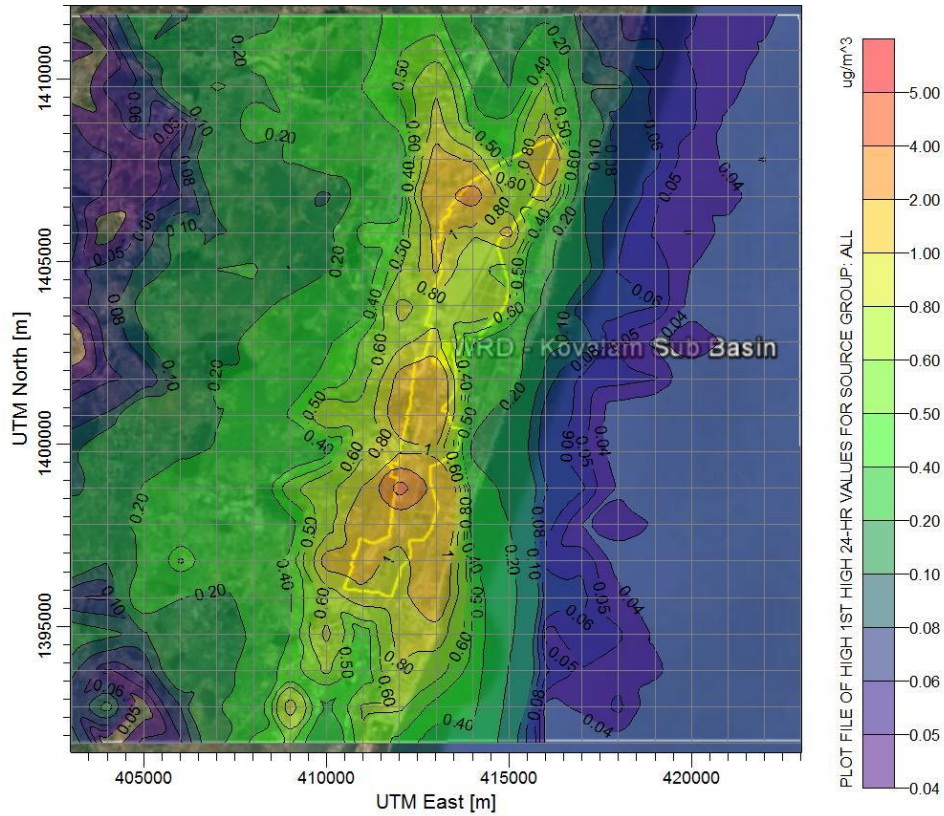


Figure 4-11 Predicted 24-Hrs' GLC's of NO_x within 10 km Radius of the Study Area

Table 4-15 Estimated Top 10 Highest Concentrations of oxide of Nitrogen Obtained through Modeling

S. No	UTM coordinates (m)		Conc. (µg/m³)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	4.89476	3.16	SSW
2.	414004	1406790	2.64721	5.09	NNE
3.	413004	1398790	1.96382	3.00	S
4.	416004	1407790	1.94752	6.70	NNE
5.	413004	1397790	1.74325	4.00	S
6.	413004	1406790	1.62617	5.00	N

7.	413004	1396790	1.44109	5.00	S
8.	413004	1400790	1.42334	1.00	S
9.	411004	1397790	1.38116	4.47	SSW
10.	413004	1401790	1.34956	Project Site	Project Site

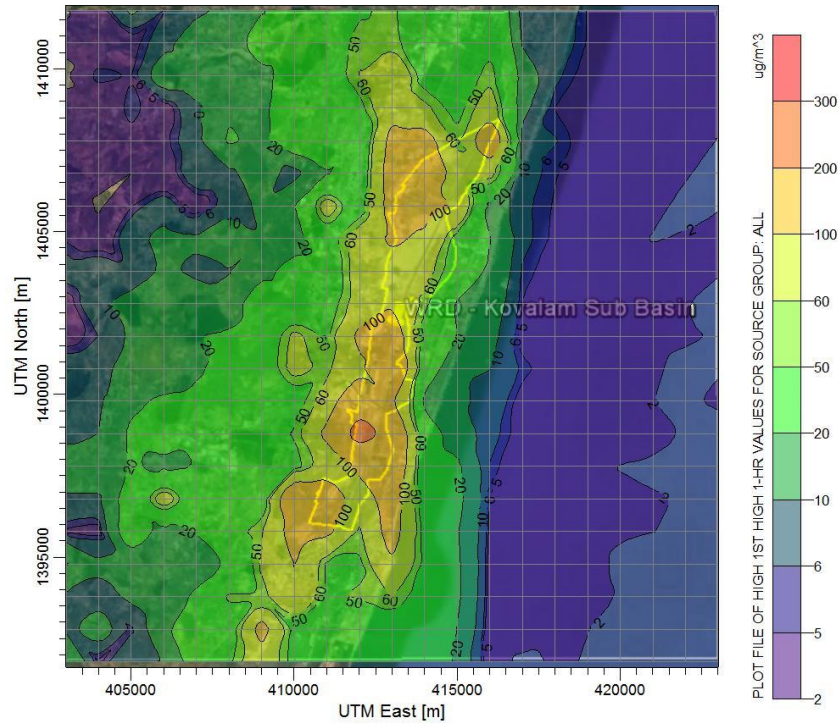


Figure 4-12 Predicted 1-Hrs' GLC's of CO within 10 km Radius of the Study Area

Table 4-16 Estimated Top 10 Highest Concentrations of Carbon Monoxide Obtained through Modeling

S. No	UTM coordinates (m)		Conc. ($\mu\text{g}/\text{m}^3$)	Distance from Centre of Project Site (~Km)	Direction from Centre of Project Site
	E	N			
1.	412004	1398790	249.1574	3.16	SSW
2.	413004	1400790	185.2353	1.00	S
3.	414004	1406790	177.0166	5.09	NNE
4.	410004	1396790	175.3219	5.83	SSW
5.	413004	1398790	173.3172	3.00	S
6.	416004	1407790	164.7709	6.70	NNE
7.	412004	1399790	162.8602	2.23	SSW

8.	413004	1397790	157.7228	4.00	S
9.	411004	1396790	154.1403	5.38	SSW
10.	413004	1401790	136.4769	Project Site	Project Site

Conclusion

Maximum pollutant concentrations of PM, SO₂ and NO_x observed due to proposed for an 24hr-average period have been studied and CO maximum concentration for 1 hr- average period have been studied . The total increase in concentrations above baseline status is summarized in

Table 4-17 Total Maximum GLCs from the Stack Emissions

Pollutant	Max. Base line Conc. (µg/m ³)	Estimated Incremental Conc. (µg/m ³)	Total Conc. (µg/m ³)	NAAQ standard (µg/m ³)
PM	69.14	0.12	69.26	100
SO ₂	15.48	0.01	15.49	80
NO _x	30.94	4.89	35.83	80
CO	540	249.15	789.15	4000

4.2.1.7 Sources of Impacts

- The most significant emission during construction would be dust generation and emission by heavy vehicles, earth works, bund formation and deposition of soil.
- Diesel operating vehicles used for transportation and machineries will also contribute to air pollution.

4.2.1.8 Mitigation Measures

- Regular water sprinkling on haul roads and embankment.
- Transport vehicles and construction equipments/ machineries will be properly maintained to reduce air emissions.
- Providing necessary personal protective equipment to the workers.
- Covering the construction material during transport and storage.

4.2.2 Noise Environment

4.2.2.1 Sources of Impacts

Increase in noise level from DG sets and Vehicles during construction of earth bund is the main factor to be considered. The impact however will be limited to the construction phase only and for short duration.

4.2.2.2 Mitigation Measures

- Adoption of Acoustic enclosure and provision of adequate protective equipment like ear plugs, ear muffs, noise helmets etc., to the workers.
- Periodic maintenance of the construction machinery and transportation vehicles should be undertaken to reduce the noise impacts.
- Restrict the working hours (daytime only).

4.2.3 Land Environment

4.2.3.1 Impacts

- The impact on land environment would be mainly due to construction activities, excavation, and earthwork.
- Top Soil will be removed.

4.2.3.2 Mitigation measures

- Since the quantity of earthwork involved in the project is not significant, no changes in topography of the project area are anticipated due to the project.

4.2.4 Water environment

4.2.4.1 Impacts

- Contamination of local water sources.
- Improper waste water disposal
- Salination of groundwater/ nearby surface water due to excavation of salt pans overburden.

4.2.4.2 Mitigation measures

- An appropriate water management system will be implemented.
- Proper sanitation facilities will be provided to workers.

4.2.4.3 Wastewater management

No effluent generation from construction phase.

4.2.4.4 Waste Generation

- Municipal Solid waste generated will be stored in adequate bins and disposed in local Municipal bins.

4.2.4.5 Ecology

- Temporary habitat loss, vegetation clearance.
- Site clearance for reservoir and drain.

4.2.4.6 Social environment

- Local people will be given priority in employment.

4.3 Operation Phase

4.3.1 Air Environment

Minimal emissions may arise from vehicle movements, pump operations, or generator use. However in operation phase there will not be any pump operation or DG set operation or any process activity takes place.

4.3.2 Noise Environment

No any impact envisaged during operation phase of reservoir.

4.3.3 Water Environment

4.3.3.1 Sources of Impacts

- Potential contamination from runoff, algae growth, reduced dissolved oxygen, or stagnation.
- During monsoon / due to excess runoff from the upstream along with storage of water, the reservoir may lead to flooding to nearby region.
- Possibility of sea water intrusion during high tide level.

4.3.3.2 Mitigation Measures

- Based on the HEC HMS study the reservoir storage will be optimised based on the rainfall the excess water will be released in to the sea.
- Proper maintenance of outlet regulator.
- Water samples will be monitored continuously and the report will be submitted to TNPCB.

4.3.4 Soil and sediment

4.3.4.1 Sources of Impacts

- Sedimentation reducing capacity; erosion in surrounding catchment areas.

4.3.5 Mitigation Measures

- Periodic surveys of soil physical and chemical properties (texture, pH, organic content, nutrients) around the reservoir area.
- Maintain buffer strips and embankments to reduce erosion and sediment inflow.

4.4 Traffic study

Impacts due to Traffic and Transportation

The vehicular movement for the proposed project is given in below table

Existing & proposed vehicular movement per day- SH 49 Chennai -Thoothukudi - ECR Road

S. No	Type of Vehicle	Existing vehicles	Existing PCU	Proposed vehicles	Proposed PCU	Total vehicles after project implementation	PCU Factors IRC (SP 41)	Total PCU after project implementation
1	2 wheelers	3710	2783	30	23	3740	0.75	2805
2	3 wheelers	751	901	0	0	751	1.2	901
3	4 wheelers/ cars	2840	2840	10	10	2850	1	2850
4	Trucks/ Bus/HCV	616	1355	135	500	751	2.2	1652
5	Agricultural tractor	21	84	0	0	21	4	84
6	Light emission vehicle-LCV	1029	2058	0	0	1029	2.0	2058
Total		8967	10021	175	532	9142	-	10350

Table 4-18 Traffic Volume after Implementation of the Project

For the Road	Volume of Traffic	Volume (V)	Road Capacity (C)	V/C Ratio	LOS Category*	Traffic Classification
Existing	8967	10021	35000	0.29	" A "	Free Flow Traffic
After implementation	9142	10350	35000	0.30	" A "	Free Flow Traffic

*LOS (Level of Service) categories are A-Free Flow, B- Stable Traffic Flow, C- Restricted Flow, D- High Density Flow, E- Unstable flow, F- Forced or breakdown flow

Standards:

*LOS (Level of Service) categories are

Level of Service	V/C	Classification
A	<0.35	Free Flow Traffic
B	0.35 - 0.55	Stable Traffic Flow
C	0.55 - 0.77	Restricted Flow
D	0.77 - 0.92	High Density Flow
E	0.92 - 1.0	Unstable Flow
F	>1.0	Forced Traffic Flow

Conclusion:

Due to propose project there will be slight increment in the vehicle movement but the level of service (LOS) anticipated will be “**Free Flow Traffic**”

CHAPTER 5 ANALYSIS OF ALTERNATIVES

5. Analysis of Alternatives

5.1 Introduction

A necessary part of the EIA process is the consideration of alternatives to the proposed activity. The many complex factors controlling the location like surface and subsurface Geology, topography, communications etc, usually means that there are only a few viable alternatives that can be genuinely considered.

5.2 Alternate locations

No, selected location of reservoir is optioned for storage. No other alternative site examined for storage of water.

The natural flood plain land located between the OMR and ECR in the southern portion of the kovalam sub-Basin is natural flood bowl, partially influenced by the tidal waters and fresh water supply from the hinterland catchment.

The overall geographical area of these wetlands, classified as Government lands such as Uppangali and Kaliveli in the Revenue Records is identified as 8408.26 acres (or) 3404.15 Ha in Thiruporur and Thirukalukundram Taluk.

Hydrology of Kovalam basin:

In Kovalam basin, between Muttukadu mouth in north side and Kokilamedu mouth in south sandwiched between ECR and OMR geographically. The Buckingham canal runs with adjoining backwater area and Uppangazhi. The movement of water in Buckingham canal and adjoining area influenced by the discharge of surplus water from catchment area of around 121 tanks system in which 69 tanks are maintained by Water Resources Department with major tanks such as Thaiyur, Kayar, Siruthavoor and Manampathy. The entire flow from the combined catchment of all tanks with converging at this flood bowl and emptying into sea after passing through the Uppangazhi area and further draining through the Buckingham canal confluent into sea at Muttukadu and Kokilamedu estuaries. Around 70% of the flow originating from the influencing catchment area flows through the Uppangazhi , B'canal to Muttukadu and rest of it to Kokilamedu.

Reason for flooding of the Western fringe area along Old Mahabalipuram Road:

The top level of OMR and ECR road levels are (+)3.500m, (+)6.000m respectively. The average bed level of B'canal and average ground level of Uppangali are (-)0.300m, (+)1.250m respectively.

During North east monsson rainfall period, combined flow in B'canal with back water and Uppangazhi area levels observed as (+)3.100m. In rainfall period, the western part srea of OMR road such as Thaiyur, Kalavakkam,, Illathur, Thandalam, Paiyanoor, Ammor, Panchntheerthi, Pandithamedu, Poonjeri and Siruthavoor are found with severe flooding and inundation with observed maximum flood level upto (+)3.800m.

The flooding at the Western fringe area of this flood plain and Uppangazhi due to the following reasons.

1. High raised levees and bunds of Uppangazhi in western side which worsley affects the draining of flood water and causes afflux in upstream of OMR and flooding residential and commercial settlement.
2. Insufficient linear water way in Kovalam to Kelambakkam link road and insufficient outlets at OMR such as Kalavakkam outlet. For discharging peak discharge of about 25000 Cusecs the only culvert in the link road is having 16m linear waterway which is causing higher pondage in these floods plain leading to flooding of OMR and upstream areas.

WRD Recommendations:

The numerical model study was carried out by Water resources department and found out the solutions to mitigate the flood in and around OMR areas as follows.

1. The High raised levees and bunds of Uppangazhi should be removed upto the level of (+)0.000m.
2. The new reservoir should be formed to store the fresh water from catchment shed with proper inlet regulator arrangements.
3. The outer Peripheral drains should be formed for effective draining of flood water and catchment water in between OMR and ECR roads for flood mitigation.

Site Justification:

The entire southern part of the Kovalam sub basin (Surplus water from 69 upper tanks) draining into the present Uppangazhi in between ECR and OMR and further confluence into Bay of Bengal through two estuaries in North and south part of Muttukkadu and Kokilamedu respectively.

During flood period, the surplus water causing heavy inundation in upstream areas of OMR due to non-availability of flood routing and also no storage.

Now the drainage area through existing Uppangazhi in between OMR and ECR is the only available land to create reservoir for augmenting drinking water supply and also to form the

peripheral drains in OMR and ECR side to drain out the flood water after filling into reservoir for flood mitigation.

CHAPTER 6

ENVIRONMENTAL MONITORING

PROGRAM

6. Environmental Monitoring Program

6.1 Introduction

Environmental monitoring is required to protect the public and the environment from toxic contaminants and pathogens that can be released into a variety of media including air, soil and water.

The plan framed for the intended facility will describe

- The details of the proposed mitigation measures taken for safeguarding the environment at the project site
- The specifics of the suggested mitigation methods for protecting the environment at the proposed area and in the surrounding residential area.
- Post project environmental monitoring programme to be undertaken after commissioning of the project.

For each of the environmental attributes, the monitoring plan specifies the parameters to be monitored, location of monitoring sites, frequency and duration of monitoring and it also denotes the applicable standards, implementation and supervising responsibilities.

6.2 Objectives

- To provide a database this can be used to determine any short or long-term environmental impacts of the Project.
- To verify the environmental impacts predicted in the REIA study.
- To monitor the performance and effectiveness of mitigation measures employed.
- To determine project compliance with regulatory requirements, standards and Government policies.
- To provide an early indication and suggest appropriate additional or remedial measures should any of the environmental mitigation measures or controls fail to achieve acceptable standards.

- To ensure that the areas of environmental concern identified during REIA process are carried through to and appropriately considered and incorporated into the detailed design and tender stage of project.
- To take remedial action if unexpected problems or unacceptable impacts arise.
- To implement water quality, air quality and noise impact monitoring programme during the operational phase.
- To conduct regular reviews of monitored data as the basis for assessing compliance with defined criteria.
- Adequate safety equipment will be available within the project site.
- Adequate protection against stray current and interference will be provided.

6.3 Environmental Monitoring Programme

The goal of having an Environmental monitoring programme is to ensure that, action has been implemented in accordance with the conditions specified, that appropriate measures corresponding with those required and the conditions imposed on the action have been adequately met. It is imperative that the Project Authorities set up regular monitoring stations to assess the quality of the neighboring environment after the commissioning of the project.

In the process, project proponent is supposed to provide essential feedback about the actual environmental impacts of the project and also check if the implementation of the environment management plan is having the desired mitigative effects.

6.3.1 Monitoring Programme for Construction Phase

Monitoring of environmental parameters will be carried out at regular intervals during construction phase. The outcomes of the impact assessment studies were used to guide the monitoring programme in various sectors of the environment. The monitoring programme including areas, number and location of monitoring stations, frequency of sampling and parameters to be covered is summarized in **Table 6-1**.

Table 6-1 Environmental Monitoring Program during construction phase

S. No	Area of Monitoring	Number of Sampling Stations	Frequently of Sampling	Parameters to be Analyzed
1.	Ambient Air Quality	3 Stations	Twice a week:24 hourly period	All the 12 parameters as per NAAQ Standards
2.	Water	3 Stations	Every month during construction phase	All the parameters
3.	Noise	3Stations	Once every season	Ambient Equivalent continuous Sound Pressure Levels (L_{eq}) at day and Night time.
4.	Vehicular Emissions	Construction zone	Periodic monitoring of vehicles	Air emission and noise, PUC
5	Soil	3 Locations near Project Site	Monthly once	Physico chemical properties, Nutrients, Heavy metals

6.3.2 Monitoring Programme for Operation Phase

Post project monitoring of environmental parameters will be carried out at regular intervals. The monitoring programme in different areas of the environment has been based on the findings of the impact assessment studies. The post project monitoring programme including areas, number and location of monitoring stations, frequency of sampling and parameters to be covered is summarized in

Table 6-2.

Table 6-2 Post Project Environmental Monitoring Program

S. No	Area of Monitoring	Number of Sampling Stations	Frequently of Sampling	Parameters to be Analyzed
1.	Water Quality	3 Stations	Once in a month	All the parameters
2.	Ambient Air Quality	3 Stations	Twice a week:24 hourly period	RPM, SO ₂ and NO _x
3.	Noise	3 Stations	Once every season	Ambient Equivalent continuous Sound Pressure Levels (L _{eq}) at day and Night time.
5	Soil	3 Locations near Project Site	Monthly once	Physico chemical properties, Nutrients, Heavy metals
6	Ecology	Near by Kazhuveli	Once every season	Flora &Fauna

6.4 Institutional Set-up for Monitoring

The responsibility of environmental management of an operating station lies mainly with the Management Staff operating the Plant who handle the Environmental Management at site and co-ordinate with all other Zone & HQO and CC for environmental matters as well as outside agencies like State Pollution Control Board. An environmental management group shall be established at project consisting of Senior Executives and supporting staff.

6.5 Legal and Statutory compliance

All the environmental standards/stipulations will be fully complied. The project area has to obtain regular renewal of Consent from the State Pollution Control Board for liquid and gaseous wastes disposal as per Water (Prevention & Control of Pollution) Act and Air (Prevention & Control of Pollution) Act respectively at Stations. It will be supervised that all requirements under these acts and rules are met, and if not met, the satisfactory explanations for it are sought. The officer in charge for environmental aspects will prepare these reports.

6.6 Information Dissemination and Public Relations

Everybody nowadays is concerned about environment. It is needed that people should be provided with environmental data related to the plant so that wrong apprehensions can be removed. This requires a well planned public relation and information dissemination process so that unnecessary public intervention is avoided. This can be done through organizing different programmes with participation from local bodies, encouraging local community in environmental projects etc. The management in the project will be entrusted with all these responsibilities.

6.7 Greenbelt Development

As per the rules and regulations laid by Ministry of Environment Forests and Climate Change (MoEF&CC), Central Pollution Control Board (CPCB) it is legally mandatory to provide greenbelt development to promote integration of environmental issues

The total land area is 4375 Acres. Greenbelt area provided is 437.5 acres (10%) of total area.

Around 5,25,000 numbers of trees (1200 trees / Ha) will be planted with the consultation of local Forest Department.

The purpose of developing greenbelt in and around the site is for:

1. Preventing land degradation and erosion of topsoil due to activities during construction phase.

2. Serving as a barrier for attenuating the intensity of noise generated.
3. Enhancing the biodiversity index of the region.
4. Adding aesthetic value to the project area.
5. Maintaining the ecological equilibrium of the area.

CHAPTER 7

ADDITIONAL STUDIES

7. Additional Studies

7.1 Impact Assessment and Habitat Mitigation Plan of Kazhuveli Wetlands

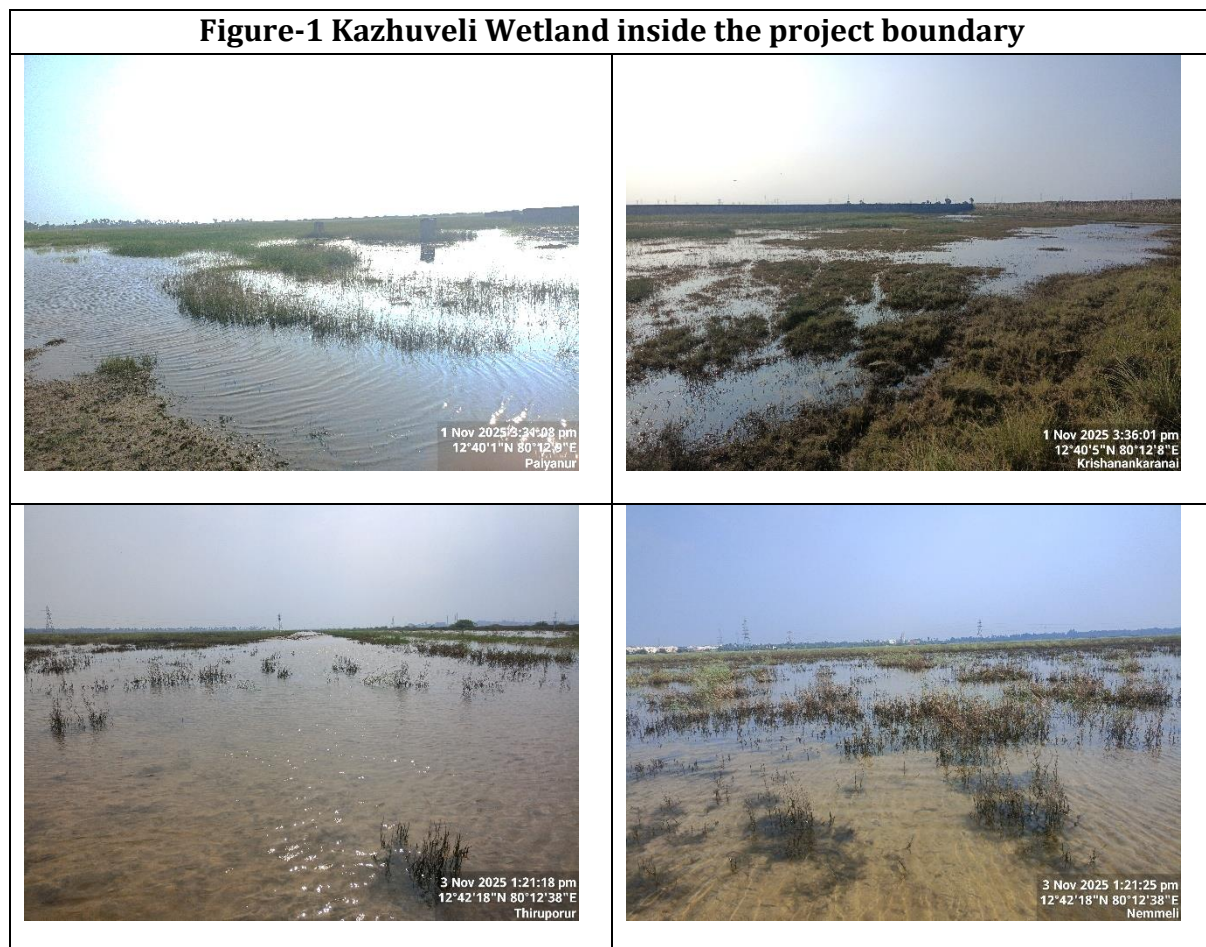
- During the site visit and detailed field survey, it was observed that the project area comprises approximately 65% Kazhuveli land (marshy land) and 35% Uppangazhi land (salt pans).
- Water depth across 95% of the site ranged between 0.5 to 1.5 feet. Mixing of freshwater and marine water pH values range from 7.11 to 8.42, indicating neutral to slightly alkaline conditions.
- The proposed project area supports floral and faunal diversity, particularly wader species and migratory birds only for feeding and roosting during monsoon season.
- A total of 102 bird species were recorded during the site visit, categorized as follows:
 - Large Waders –16 species
 - Small Waders – 18 species
 - Water Birds – 20 species
 - Terrestrial Birds – 48 species

Most of the wader species were found in the Nemmeli & Vadanemmeli region.

- The Kazhuveli region is covered with grasses and sedges, ranging in height from 15 cm to 45 cm.
- *Prosopis juliflora* was observed in the Uppangazhi area and along the embankment of the Buckingham Canal at Nemmeli and Mahabalipuram region.
- Nearest Mangrove plantation is present at 0.92 km towards South of the project boundary.
- Snakes and amphibians were also recorded at soolerikaadu village of the project site.

- During the site visit, the villagers and fisherman informed that they witnessed Jungle Cat and the team witnessed common Mongoose.
- 18 butterfly species were recorded, including *Danaus chrysippus*, *Papilio demoleus*, and *Eurema hecabe*.
- A few tree species namely Neem and Palmyra are present in Nemmeli, soolerikaadu and Alathur villages at the project area .

The following photographs depict the Kazhuveli Wetland and the project boundary:





The following photographs shows the field survey, carried out

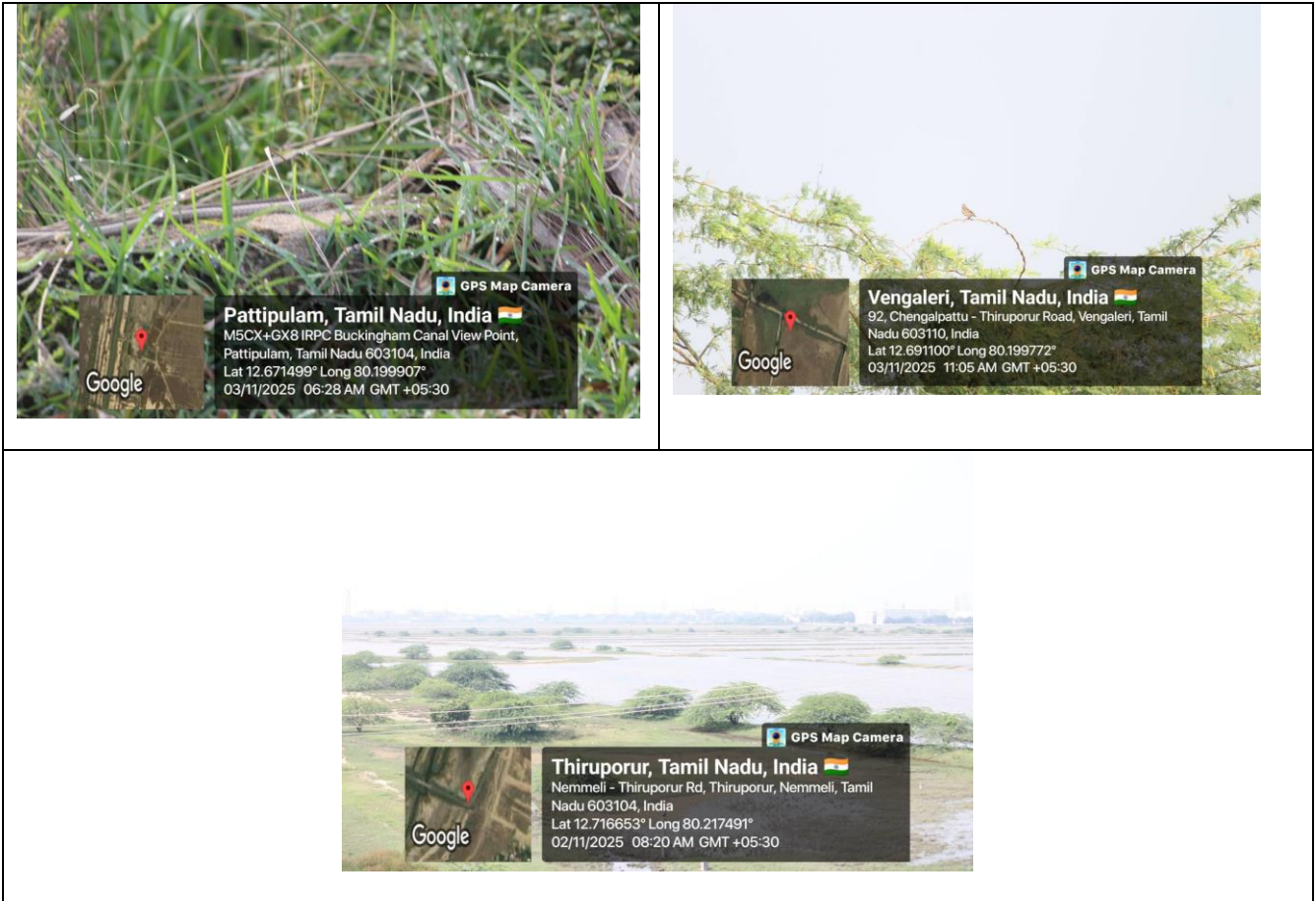
Figure -2 Field survey



The different types of birds, observed at the project site has been shown in Figure 3

Figure-3 Birds diversity in Project site





1.0 Land use

The details of land use and land cover analysis were carried out and the data is presented in **Table 2**

Table 2 Land use and Land cover analysis of the study area (10km periphery from the project site)

LULC Total Project Study Area of 10 km radius : 634.79 Sq.km					
	Description	%	sq.km	Acr.	Hec.
	Ocean	40.05	254.24	62823.975	25424
	Crop land	21.26	134.95	33346.82	13495
	Rural	7.87	49.96	12345.366	4996
	Coastal wetland	7.05	44.78	11065.362	4478

	Fallow	6.03	38.29	9461.6505	3829
	Waterbodies	5.36	34.00	8401.57	3400
	Scrub land	3.25	20.63	5097.7762	2063
	Urban	3.13	19.84	4902.5632	1984
	Forest Plantation	2.30	14.57	3600.3199	1457
	Plantation	1.57	9.99	2468.579	999
	Sandy area	1.03	6.57	1623.4799	657
	Deciduous	0.45	2.87	709.19135	287
	River / Stream / Canals	0.39	2.47	610.34935	247
	Salt affected land	0.18	1.12	276.7576	112
	Mining	0.08	0.51	126.02355	51
	Total	100.00	634.79	156859.78	63479

Source: LULC Vector data of 2011-12, Multi-temporal satellite data of 2015-16 from Resourcesat-2 LISS III.

As per Bhuvan, the proposed project site is classified as a coastal wetland. However, according to the *Wetlands of India* database, the proposed site is not notified as a Ramsar site or listed among the officially notified wetlands.

As per the LULC the proposed project site of 1770.5 Ha (17.71 Sq.km).

- Coastal wetland -14.68 Sq.km
- Water bodies (Tanks/Lakes/Ponds) - 1.52 Sq.Km
- Water bodies (Canals/Streams/River) -0.94Sq.km
- Classification of project area-0.57 Sq.km.

After implementation of project the entire area will be classified as wetland region and act as drinking water storage for Chennai metropolitan area.

2.0 Impact matrix:

S. No.	Parameter	During the Survey	During construction phase	After implementation of the project	Ecological Impact	Mitigation / Management Measures	Post-Mitigation Condition	Ecological Improvement
1	Water level	Predominately the water level is 0.5 ft to 1.5 ft in 90-95% of the total area.	Temporary disturbance from excavation and bund formation; minor water level fluctuation	Water level will likely to increase 10ft (3m) during monsoon season, as entire Kazhuveli area (project site) will be converted into Fresh water Reservoir.	Kazhuveli ecosystem could be changed to aquatic ecosystem. Large waders and small wader used the land for their feeding and resting purpose. Wading birds will migrate to Adjacent Kazhuveli ecosystem within proximity of 1.85 km from project area.	Existing Kazhuveli land of 3.45Sq.km is located at the Kokilamedu village near to the project area approximately 1.85km About 5.12 Sq.km abandoned salt pan area (uppalam &Uppangazhi) will be converted into kazhuveli region as a compensatory. Creation of 6 Artificial island inside the water spread area will act as roosting and feeding region to the aquatic birds	Water levels will be maintained in shallow areas and wetland pockets; seasonal variation will be restored	Provides shallow-water habitats for waders; maintains aquatic and marsh ecosystems
3	Sediment	5 -10 cm Diversity of micro-Floral & Faunal species, Benthos.	During excavation and bund formation, exposed soil may get washed into adjacent wetlands and canals. Resulting siltation can smother benthic organisms and reduce water clarity, thereby affecting foraging efficiency of waders dependent on shallow, clear water.	Sediment will be removed for making a Bund and Reservoir basin.	Micro-Floral & Faunal species, Benthos and Nutrition level will be affected	Avoidance of sediment dynamics by forming the Earthen bund with relevant IS code : 7894:1975, 9429 :1999, 8826:1978 Periodic monitoring of sediment analysis nearby water bodies.	Compensatory area for making kazhuveli region will be maintained Stabilize sedimentation, nutrient cycling restoration and benthos populations will be recovered.	Improves foraging efficiency for waders; enhances soil and water quality at the compensatory area.
4	Bund	Bund is absent in Kazhuveli land. Saltpan embankment (cross bund) is present. In the bund area 10 species of flora is present.	Construction activity will involve only the removal of grass cover and <i>Prosopis juliflora</i> —an invasive species.	Bund width is 5m Height is 4.8m Water birds alone utilise the area rather than Wading Birds.	This will have minimal ecological impact and can aid in habitat improvement post-restoration. Replacing <i>Prosopis</i> with native vegetation or allowing natural regeneration can increase species diversity and improve nutrient cycling.	Formation of earthen bund with revetment; buffer vegetation along the edges; planting of native species.	Bunds stabilize water bodies; vegetated edges provide perching and shelter for avian species.	Supports small birds, maintains perching/nesting sites; reduces habitat fragmentation

					It can help revive natural grazing areas and enhance soil fertility. its removal can improve local water tables and reduce soil salinity, benefiting surrounding ecosystems			
5	Inlet of water	From all kind of sources like canals, streams, rainwater etc.	Formation of embankment may alter water flow into adjacent wetlands or salt pan, possible impacting fish and prawn populations until natural hydrology is restored.	Water will be entered into the reservoir through inlet regulators.	It will decrease the Kazhuveli area and feeding area for wading birds.	Provide suitable water inlet to the compensatory wetland to maintain controlled inflow.	Regulated flow supports both aquatic and shallow wetland habitats	Ensures compensatory wetlands and Existing kazhuveli; sustains fish, prawns, and bird food sources
6	Bird diversity	102 Bird Species was recorded during the survey. Based on Secondary Data - 124 Bird Species.	Operation of JCB and vehicle movement will generate continuous noise and vibration (>80 dB), causing flight responses and temporary disturbance to sensitive avifaunal species, particularly migratory ducks, waders, and herons.	Only Aquatic bird species will utilize the reservoir and it will lead to affect the wading bird's population.	Nearly 46 Wading Bird species may face the pressure for their feeding practice.	Provision of a compensatory kazhuveli (wetland) region will serve as an important ecological offset. This designated area will support feeding and roosting habitats for waders and migratory birds, compensating for any temporary reduction in available foraging grounds due to construction activities.	Diverse habitats maintained; waders and aquatic birds both utilize area	Migratory and resident waders, herons, egrets, terns supported; increased bird diversity.
7	Sedge vegetation	10 species – (<i>Bulbostylis barbata</i> , <i>Cyperus dubius</i> , <i>Cyperus iria</i> , <i>Cyperus rotundus</i> , <i>Fimbristylis acuminata</i> , <i>Fimbristylis argentea</i> , <i>Fimbristylis falcate</i> , <i>Fimbristylis sp</i> , <i>Kyllinga brevifolia</i> , <i>Kyllinga bulbosa</i>)	Clearance of sedge and marsh vegetation during site preparation will lead to temporary loss of feeding and roosting sites for resident and migratory bird species such as sandpipers, stilts, plovers, and egrets. These areas can be restored post-construction through natural regeneration and supplementary planting.	Sedge vegetation is likely to disappear.	Diurnal activities of aquatic birds likely to be disturbed temporarily.	Plant native sedges (<i>Cyperus</i>, <i>Fimbristylis</i>); reedbeds in restoration areas. Embankment will be provided with grass turfing and native plantation will be provided along the peripheral drain.	Sedge vegetation restored in shallow regions of the compensatory land	Provides foraging habitat for shorebirds; enhances microhabitat diversity.

3.0 Mitigation and Management Plan for Birds

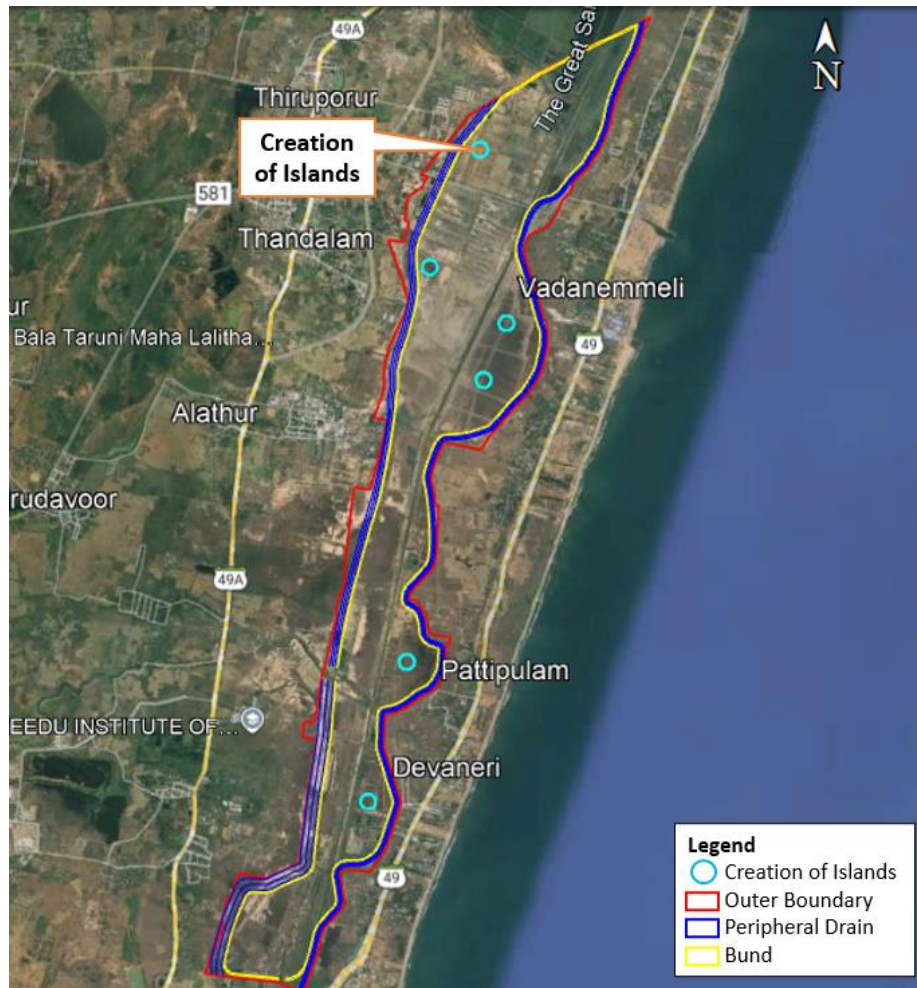
- The proposed reservoir and its associated developments are expected to modify portions of the existing Kazhuveli wetland and salt pan habitats, which currently support a variety of wader birds and migratory shorebirds.
- To offset these potential impacts, the project proposes establishing a network of nearby Existing Kazhuveli wetland habitats of 3.45 Sq.km and converting the a abandoned salt pans (uppalam &Uppangazhi) area of 2.37 Sq.km from southern side and 2.75 Sq.km from northern side of the project boundary to kazhuveli land and formation of 6 artificial islands inside the water spread area.
- These conservation measures aim to sustain and enhance avian diversity—particularly for species such as the Asian Open bill Stork, Painted Stork, Egrets, Herons, Lapwings, Terns, and Ducks—by maintaining a mosaic of freshwater, brackish, and shallow marsh conditions across different ecological zones.

4.0 Mitigation and Restoration plan

1. Creation of Artificial Islands (6 Nos. 200Sq.m =1200 Sq.m) within the site:

Mitigation:

- ✓ Creation of artificial islands vegetation using native grasses (*Eragrostis*, *Paspalum*), reeds (*Typha*), and shrubs to stabilize banks and planted native thorns trees.
- ✓ The creation of the island provides suitable plantation for roosting area for painted stork , egrets , kingfishers and sand pipers .



2. Existing Kazhuveli Area

- ✓ The proposed project area falls within a portion of the Kazhuveli region, which will be developed as a freshwater reservoir.
- ✓ With the conversion of this section into managed water storage area, existing bird populations are expected to naturally relocate and utilize the adjacent Kazhuveli wetland zones situated adjacent to the project site.
- ✓ These nearby wetlands, located within close proximity (approximately 1.85 km south of the project boundary), will continue to provide suitable foraging and roosting habitats for waders and other migratory birds.
- ✓ The hydrological connectivity between the new freshwater reservoir and the surrounding Kazhuveli ecosystem will ensure continued ecological functionality, enabling birds to adjust their habitat use without significant disruption.
- ✓ Furthermore, with the implementation of wetland enhancement and habitat management measures such as the maintenance of shallow feeding areas, saline pockets, and vegetated buffers the overall availability and quality of bird habitats

in the region are expected to improve, resulting in a positive net impact on avifaunal diversity.

- ✓ Additional mangrove plantation will be implemented at ecologically suitable zones identified through site assessment, with species selection and plantation in coordination with the Forest Department to ensure environmental sustainability and biodiversity enhancement.
- ✓ Removal of invasive plant species (*Prosopis juliflora*) will be undertaken in the proposed reservoir and Kazhuveli formation areas to restore native ecological balance.



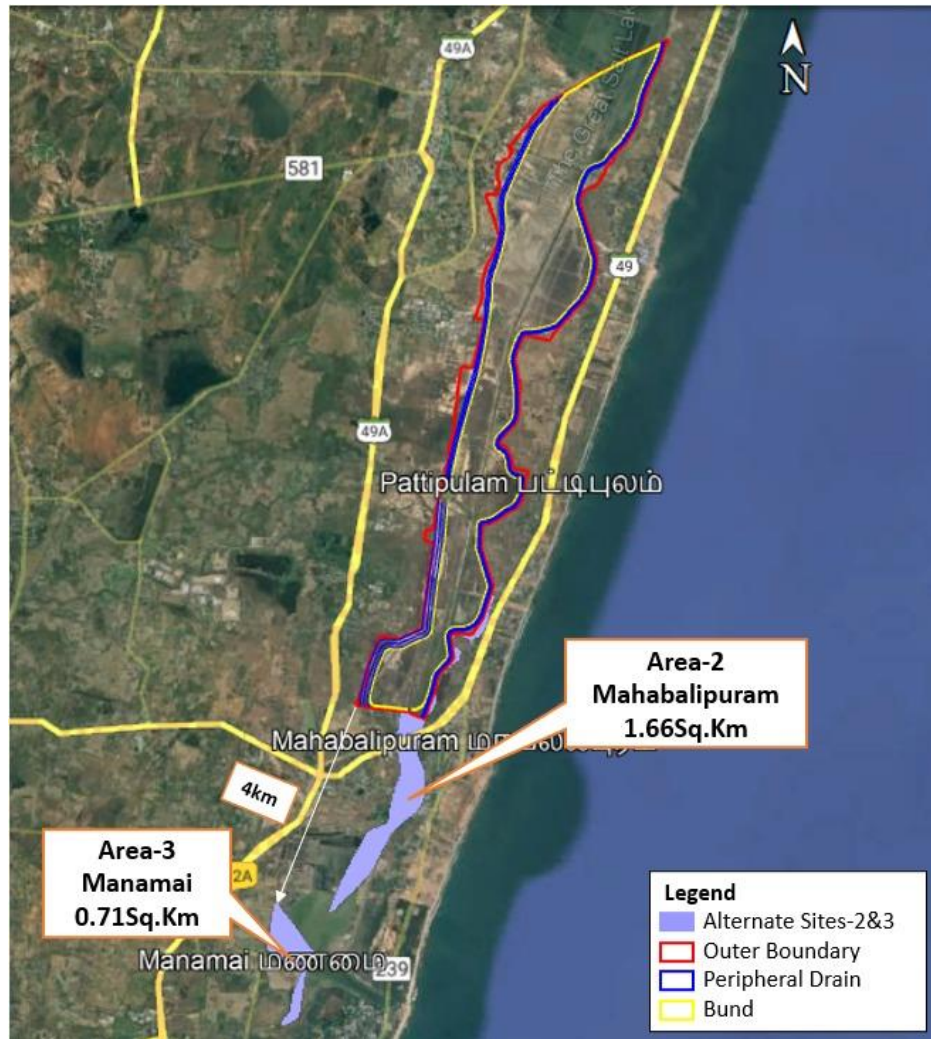
Existing Kazhuveli at Kokilamedu

3. Proposed Kazhuveli Creation

- In addition, the Water Resources Department (WRD) plans to convert the nearby abandoned salt pans (Uppalam & Uppangazhi) area about 2.75 sq.km located northern side and 2.37 Sq.km from southern side of project boundary into a newly created Kazhuveli wetland habitat.
- This initiative aims to enhance regional biodiversity and improve habitat connectivity within the Kazhuveli ecosystem.



Alternate Site 1 - At Thiruvидanthai village



Alternate Site 2&3- At Mahabalipuram & Manamai village

Proposed Habitat Enhancement and Mitigation Measures:

- To ensure that avian diversity is sustained and potentially enhanced, the following wetland management and mitigation measures are proposed:
- Develop a managed wetland area hydraulically connected to the adjoining canal through an entrance regulator structure to control water inflow and outflow.
- Preserve a saline microhabitat of the site to retain halophytic (salt-tolerant) vegetation.
- This zone will provide essential foraging and roosting habitats for shorebirds such as sandpipers, stilts, and plovers.
- Develop a network of shallow depressions (0.2–0.4 m depth) within the wetland area to serve as feeding grounds during low-water periods.
- These areas will attract wading birds and waterfowl such as herons, egrets, ibises, and ducks.

- Maintain a mosaic of freshwater, brackish, and saline zones with graded vegetation to support diverse ecological niches.
- Promote the growth of native wetland plants (e.g., Typha, Cyperus and Phragmites) that provide nesting and roosting substrates.
- Establish a minimum 50–100 m vegetated buffer zone around the wetland to prevent encroachment and filter surface runoff.
- Conduct periodic bird surveys during pre-monsoon and post-monsoon seasons to monitor avian population trends and habitat use.
- Implement adaptive management based on monitoring outcomes to improve wetland functionality.
- Engage local communities, bird watching groups, and schools in awareness and participatory conservation programs along with Local forest department.
- Promote eco-restoration and sustainable livelihood options such as eco-tourism and bird guiding.

5.0 Overall Budget Estimate – Bird Mitigation and Management Plan

The detailed budget estimation with different activities and the cost involved is presented in **Table -3**.

Table 3 - Total Estimated Budget

S. No.	Component / Activity	Description & Rationale (Aligned with National/International Best Practices)	Estimated Cost (₹ Lakhs)
Habitat Creation & Restoration (Enhanced Scale & Resilience)			
1	Comprehensive Earthwork & Hydro-period Management	Excavation of 5.12 km ² of basins, creating gentle slopes (littoral shelves), and building inlet/outlet regulators for water control.	700
2	Permanent islands of 6*200m.	Extends restoration using bio-engineering (coir logs, native vegetation) for erosion control, creating a continuous reservoir buffer. Building multiple predator-proof islands of varying sizes and substrates to cater to terns, gulls, and roosting water birds.	170
3	Native Vegetation (Sedge and Grass)	Native vegetation, particularly sedges and grasses, will be collected from the Kazhuveli wetland and used for restoration in the new compensation area.	200
4	Maintain the Existing kazhuveli of 3.45Sq.km	Maintenance activities will include preventing encroachment, controlling pollution and invasive species, monitoring water quality, and enhancing native vegetation	60

		around the wetland fringes.	
5	Removal of invasive species	Removal of <i>Prosopis juliflora</i> with consultation of forest department.	50
6	Development of mangroves	Suitable location will be identified for the creation of mangrove forest adjoining project area with consultation of forest department.	250
		Total Estimated Budget	1430

6.0 Conclusion

- The present ecological assessment recorded 102 bird species with an estimated 45,000 individuals, dominated by large and small waders, water birds, and terrestrial birds.
- The proposed reservoir and its associated developments are expected to alter the natural hydrological gradient, leading to a moderate impact on wader populations that depend on exposed shallow foraging areas.
- Conversely, deep-water species such as pelicans, cormorants, and ducks have adapted well, showing localized increases in abundance.
- Despite these shifts, the area continues to function as a vital feeding, roosting, and stopover site for both resident and migratory bird species, emphasizing its ecological importance within the coastal wetland network.
- To offset these potential impacts, the project proposes establishing a network 6 Artificial Islands inside the water spread area of the project site and creation of 5.12 Sq.km of new kazhuveli land near the project site.
- Also new variety of birds and other faunal species will accommodate the area. It will improve the ecosystem.
- To maintain this ecological balance, existing kazhuveli wetland area in the Kokilamedu region and controlled water-level management are recommended.
- Such measures will ensure habitat heterogeneity, sustain species diversity, and secure the long-term conservation value of the new reservoir ecosystem.
- This proposal is taken-up mainly for providing drinking water supply to the Metropolitan Chennai City which is facing severe shortage of drinking water with growing needs of public.
- The proposed Reservoir will store 1.655 TMC as one time with an annual storage capacity of 2.25 TMC which will meet the requirements of the region.
- The Reservoir in addition to flood water conservation will cater to the city water requirements to the tune of 170 MLD of water
- The Reservoir will act as a Flood Buffer and avert Sea Water intrusion.

- The water stored in the reservoir will be supplied to extended GCC areas like Sholinganallur, Medavakkam, Pallikaranai, Siruseri, Kelambakkam, Mamallapuram etc.,

In light of the above the proposed reservoir will be eco-friendly and benefit availability of drinking water for the Chennai metropolitan city.

7.2 Risk Assessment

7.2.1 Purpose of the Report

This is a risk assessment study report for the Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the inhabitants in Thiruporur & Thirukazhukundram Taluks of Chengalpattu District. This risk assessment study report mainly involves in the risk analysis and hazard identification of the proposed project site and aims to minimize the impact on both the environment and human health.

7.2.2 Hazard Identification and Risk Assessment (Hira) Study

7.2.2.1 Introduction

Risk assessment is the systematic examination of a job intended to identify potential hazards, assess the level of risks and evaluate practical measures to control risks. Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exists in the activities of TNWRD, during the construction and operation of the proposed project. On the other hand, risk analysis deals with the recognition and computation of risks, the equipment in the working area and personnel are prone to, due to accidents resulting from the hazards present in the site. Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighbouring populations are exposed to as a result of hazards present. This requires a thorough knowledge of failure probability, credible accident scenario, vulnerability of population etc.

7.2.2.2 Risk Assessment Steps

There are five steps followed to assess the risks in workplace. They are;

Step 1: Identify the hazards

Step 2: Decide who might be harmed and how

Step 3: Evaluate the risks and decide on precautions

- Identify the existing control measures and recommendations, if necessary
- Evaluate the residual risks

Step 4: Record the findings and implement them

Step 5: Review the assessment and update if necessary

7.2.2.3 Hazard Identification

- This step seeks to identify the hazards and risks to be managed. Comprehensive identification using a well-structured systematic process is critical, because of hazard or risk not identified at this stage may be excluded from further analysis. Identification shall include actual and potential risks, whether or not they are under the control of the entity.
- The aim is to generate a comprehensive list of risks and events that might have an impact on the achievement of each of the objectives identified in the context. These events might prevent, degrade, delay or enhance the achievement of those objectives. These are then considered in more detail to identify what can happen.
- Having identified what can happen, it is necessary to consider possible causes and scenarios. There are many ways an event can occur.

7.2.2.4 Types of Hazards

A source or a situation with a potential for harm in terms of human injury or ill health, damage to property, damage to the environment or a combination of these. The different kinds of hazards are:

1. Physical hazards.
2. Mechanical hazards.
3. Chemical hazard.
4. Biological hazard.
5. Ergonomic hazard.
6. Psychosocial hazards

7.2.3 Hazard Identification and Risk Assessment Matrix

HIRA Matrix for Construction Phase

S.No	Activity	Hazard	Consequence	Existing Risk				Control Measures	Residual Risk			
				P	S	R	C		P	S	R	C
1.	Excavation for syphon and drainage channels	Risk of trench collapse due to unstable coastal or water-saturated soil	Workers may become trapped or buried, leading to serious injury or death	4	5	20	E	Provide shoring or trench boxes in all excavations deeper than 1.2 meters. Maintain proper benching and sloping. Restrict entry without supervision. Implement confined space entry protocols and use gas monitors if required.	2	3	6	M
2.	Embankment formation and bund construction	Working on steep slopes or raised edges without fall protection	Fall from embankment edge may cause bone fractures or critical injury	3	4	12	H	Construct embankments with safe slope angles and compact properly. Use barricades or handrails at high-risk edges. Ensure workers use safety harnesses and anti-slip boots on slope work.	2	3	6	M
3.	Lifting and placing gates, RCC beams or	Mechanical lifting failure or load	Load drop could result in crush injuries, head	4	5	20	E	Use only certified cranes, slings, and lifting tools. Conduct pre-lift checks	2	3	6	M

	panels	slippage during crane operations	trauma, or fatalities					and load testing. Ensure rigging is done by trained personnel. Keep unauthorized persons out of lifting zones.				
4.	Welding, gas cutting, or hot work	Hot work near flammable materials or fuel drums can ignite fire or explosion	Severe burns, fire spread, or asset damage in confined workspaces	4	4	16	E	Enforce a strict hot work permit system. Clear the area of flammable materials before cutting or welding. Keep fire extinguishers within reach. Use flame-resistant PPE. Ensure good ventilation.	2	2	4	L
5.	Operation of excavators, dumpers, and rollers	Poor visibility or operator error may result in collision with workers or tipping	Crush injuries to workers or operator, and damage to equipment	3	4	12	H	Only trained and licensed operators should use heavy vehicles. Install reverse alarms, lights, and mirrors. Use banksmen for movement in congested areas. Carry out daily maintenance checks.	2	3	6	M
6.	Manual handling of boulders, sandbags, formwork, or	Lifting heavy or awkward loads improperly may	Workers may suffer from back injuries, muscle tears, or long-	3	3	9	M	Provide training on ergonomic lifting techniques. Use team lifting or lifting tools for heavy objects. Rotate	2	2	4	L

	shuttering	cause physical strain	term musculoskeletal disorders					manual handling tasks and limit maximum weight per worker.				
7.	Deep excavation or reservoir bed scraping	Dust generation due to dry soil and machinery movement	Workers exposed to respiratory hazards such as cough, eye irritation, or silicosis	3	3	9	M	Regularly spray water to suppress dust. Mandate the use of dust masks or respirators. Enclose cabins of excavators and restrict access of non-essential personnel.	1	2	2	L
8.	Temporary power supply installation	Exposed wires or water ingress may cause electric shock or arc flash	Electric shock, burns, or electrocution leading to hospitalization or death	3	5	15	H	Use weatherproof distribution boxes. Ensure cables are routed above water level and have insulation. Install ELCBs and grounding. Regularly inspect all connections and install lock-out/tag-out systems.	2	2	4	L
9.	Material transportation in narrow coastal access roads	Limited space may cause collision, overturning of vehicles, or slipping of loads	Workers or bystanders may be hit or crushed; material loss and traffic blockage may occur	3	3	9	M	Use spotters and flagmen to guide vehicles. Schedule transport during off-peak hours. Avoid night driving. Ensure all loads are properly tied and speed limits are enforced.	2	2	4	L
10.	Waste handling	Improper disposal	Pollution of marine	3	4	12	H	Allocate temporary waste bins and	1	2	2	L

	near marine buffer zones	or overflow of construction waste in to CRZ	ecosystems, regulatory violations, and fines					spoil disposal zones away from buffer areas. Use tarpaulins for debris transport. Train workers on CRZ norms and prevent run-off with silt fences.				
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HIRA Matrix for Operational Phase

S.No	Activity	Hazard	Consequence	Existing Risk				Control Measures	Residual Risk			
				P	S	R	C		P	S	R	C
1	Routine Inspection of Reservoir Structure	Slippery surfaces due to algae or moisture on steps, walkways, or bunds	Slip and fall can cause fractures, head injuries, or drowning risk if near reservoir edge	3	4	12	H	Provide anti-skid flooring or coating. Regularly clean walkways to remove algae. Use handrails where possible. Instruct staff to wear slip-resistant footwear and always use life jackets when near water edges.	1	3	3	L
2	Gate and Valve Operation for Water Release	Sudden release of water under high pressure or equipment	Operator injury due to mechanical force or being caught in	3	4	12	H	Operate gates only after verifying pressure conditions. Use remote-controlled systems where possible.	1	3	3	L

		malfunction during gate operation	moving parts; risk of uncontrolled flow					Ensure operators are trained and keep safe distance from gate slots. Maintenance must be scheduled regularly to prevent failure.				
3	Monitoring Water Levels and Tidal Influence (in CRZ area)	Inaccurate level readings or sensor failure during high tide or storm surges	Overfilling or under-draining of reservoir, risk of overtopping, flooding, or ecological damage	3	4	12	H	Install reliable and redundant water level monitoring systems. Calibrate sensors regularly and cross-check with manual readings. Establish alert protocols for high tide or monsoon alerts.	1	3	3	L
4	Maintenance of Syphons and Channels	Entry into confined or poorly ventilated ducts for cleaning	Exposure to low oxygen or toxic gases leading to asphyxiation or fainting	3	5	15	H	Treat all enclosed channels as confined spaces. Monitor gas levels before entry and use blowers for ventilation. Ensure standby person and communication system are in place. Mandatory use of harness and gas mask.	1	3	3	L
5	Site Access and Public Movement	Unauthorized access of locals or tourists near	Drowning, injury due to slips/falls, or	4	4	16	E	Install boundary fencing and entry gates with signage. Assign security	2	3	6	M

	Control	reservoir embankments or structures	tampering of control systems					personnel to monitor entry points. Place visible warning boards near high-risk zones. Restrict public access during high tide or storm events.				
6	Wastewater or Runoff Discharge into Buffer Zone	Discharge of untreated or muddy water into marine buffer during cleaning or overflow	CRZ violation, contamination of marine life, ecological disturbance, and regulatory penalties	3	4	12	H	Route all outflows through sedimentation pits. Use silt traps and bio-filters before discharge. Monitor discharge quality and maintain logbook. Comply with CRZ and CPCB norms.	1	2	2	L
7	Vegetation Growth on Bunds or Channels	Overgrown vegetation may damage the reservoir structure or harbor reptiles/snakes	Obstruction of inspection access, weakening of embankment, snake bites or injuries	3	3	9	M	Conduct regular vegetation clearing. Use non-destructive, eco-friendly clearing methods. Train staff to identify hazardous species and use protective gear.	1	2	2	L
8	Heavy Rainfall or Flash Flood Events	Sudden inflow into reservoir may exceed design capacity	Risk of overtopping, bund breach, flooding of downstream zones, or spillway failure	3	5	15	H	Maintain freeboard as per design. Regularly clear spillways and drainages. Integrate reservoir monitoring with district flood control	2	3	6	M

								system. Conduct annual monsoon mock drills.				
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Detailed Risk Assessment is attached as Annexure 8

7.3 Disaster Management Plan

7.3.1 Onsite Disaster Management Plan

7.3.1.1 Introduction

The Disaster Management Plan (DMP) provides a comprehensive strategy for mitigating and managing risks associated with the Reservoir Development Project located near a Coastal Regulation Zone (CRZ). Given the project's location near the sea and its inclusion of major civil works such as earthen embankments (30.436 km), surplus inlet improvements, reservoir deepening, and barrage reconstruction, this DMP emphasizes proactive preparedness, emergency response readiness, and environmental responsibility. The goal is to safeguard human life, infrastructure, and sensitive coastal ecosystems while ensuring compliance with CRZ Notification, 2011 and other regulatory frameworks.

7.3.1.2 Objectives of the Disaster Management Plan

- To identify and analyze potential hazards linked to large-scale hydraulic and structural interventions near coastal zones.
- To integrate disaster resilience into engineering and environmental design for sustainable reservoir development.
- To minimize impact on coastal communities, ecosystems, and project assets during natural or man-made disasters.
- To establish standard operating procedures (SOPs) for emergency response, restoration, and communication.
- To coordinate effectively with CRZ authorities, State Disaster Management Authority (SDMA), and relevant local agencies.
- To ensure disaster recovery with minimal ecological disruption and CRZ compliance.

Detailed Disaster Management Plan is attached as Annexure 8.

7.4 Hydrological Modelling and Water Balance Analysis

HEC HMS Water Balance Study Model:

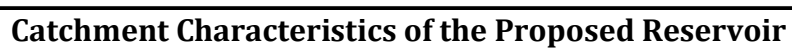
Hydrologic Engineering Centre (HEC) - Hydrologic Modelling System (HMS) developed by the U.S. Army Corps of Engineers is designed to simulate precipitation—runoff processes of dendritic systems. The HEC-HMS model is physically based, conceptually semi-distributed model that includes many traditional Hydrologic processes such as

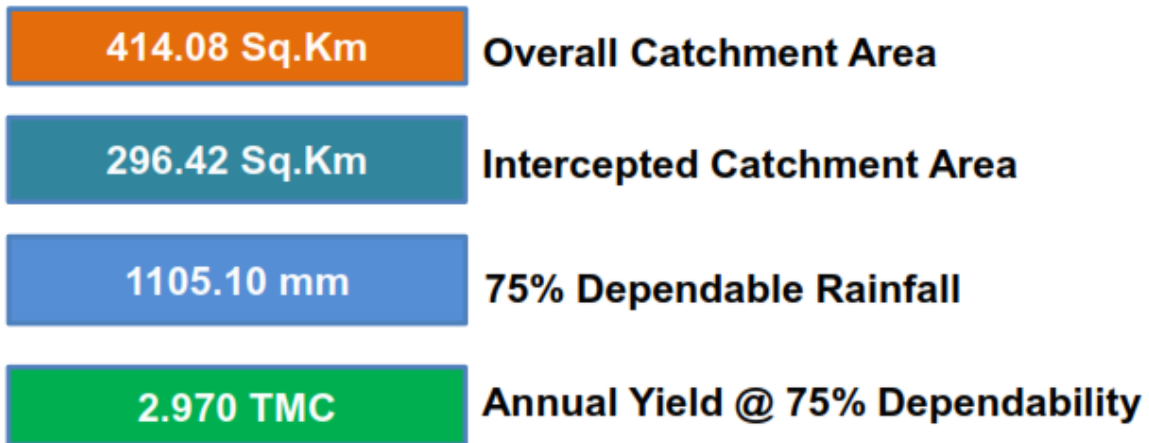
Infiltration, Unit Hydrographs, and Hydrologic routing. It is designed as a generalized modelling system to be applicable in a wide range of geographical areas for solving the widest possible range of problems including un-gauged basins. It also includes procedures necessary for continuous simulation of precipitation – runoff process including evapotranspiration, snowmelt, and soil moisture accounting.

The HEC-HMS Model is applied to estimate the dependable yield of the Reservoir. The catchment area of the sub-basin is divided into a number of manageable pieces i.e., Watersheds with each watershed being lumped one. The hydrologic elements namely watershed, junction, and sink are used to form the sub-basin model utilizing the topology of the stream network and watersheds. For continuous simulation, the Loss Method chosen out of five methods available is the Layered Green and Ampt method. This is to be accompanied by a canopy method, and a surface method. For the canopy method simple canopy method is chosen and for the surface method simple surface method is chosen. The Thornthwaite method is used for computing the monthly Evapotranspiration values. The monthly evapotranspiration values determined is provided as input to the model. In order to enable the generation of a direct surface runoff hydrograph, it is necessary to select a transform method. Out of the seven methods available, SCS unit hydrograph method is chosen. To run the model, control specifications are:

1. Starting date and time
2. Ending date and time
3. Time Interval.

The model is run on daily basis. Water year, 1st July to 30th June of the ensuing year, is considered for modelling. The annual Rainfall values from the influencing Rain Gauge stations for a period of 31 years were assigned with a rank and the 75% dependable rainfall year was selected to run the model at an interval of 1 Day for 365 days to estimate the balance available yield for the proposed Reservoir.





Catchment Characteristics

The overall catchment area is identified as 41,408 Ha, out of which 29,642 Ha. of catchment area is intercepted by the 69 Nos. of Cascade of Thaiyur, Manamathy and other minor Group of Tanks with a balance free catchment area of 11,766 Ha feeding the proposed Reservoir. The Catchment land use is significantly occupied with Agricultural fields, fallow lands and forest canopy. The Reservoir besides its free catchment is fed by Manamathy Maduvu and Thaiyur Surplus course.

Draft study report has been attached as **Annexure 3**.

CHAPTER 8

PROJECT BENEFITS

8. Project Benefits

- The primary goal of the reservoir is to enhance water availability for domestic consumption, particularly in a region experiencing rapid urbanization and groundwater stress.
- Improved drinking water supply: Ensures a reliable source of potable water for households in the fast-growing suburbs and rural areas between ECR and OMR.
- Reduced groundwater dependency. With surface water available, reliance on borewells will decrease, allowing for groundwater table recharge.
- Support to urban planning: Water security is crucial to support residential and commercial developments along ECR and OMR.
- Buffer against drought: Acts as a storage source during dry months, improving climate resilience.

8.1 Financial Benefits of the Project

- Reduced cost of water supply infrastructure: A local reservoir reduces the need for expensive long-distance water transfers
- Lowered tanker water usage: Currently, many areas rely on private tankers. A reservoir reduces this dependency, leading to significant household and municipal savings.
- Reliable water supply attracts residential, commercial, and IT park investments, especially along OMR.
- Increases land value in surrounding areas due to improved amenities and water availability.

8.2 Social Benefits of the Project

- Access to clean, reliable water improves public health, hygiene, and overall living standards.
- Reduces burden on women and children in rural households who often manage water collection.

8.3 Employment potential–skilled; semi-skilled and unskilled

- Construction phase creates jobs for locals (engineers, laborers, contractors).

- Post-construction opportunities in reservoir management, maintenance, and tourism (if eco-tourism is developed).

8.4 Other tangible benefits

- Strengthens local governance and participatory water resource conservation.
- Creation of wetland habitats for migratory birds and biodiversity.
- Enhances microclimate around the reservoir, moderating heat and humidity

CHAPTER 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

9. Environmental cost Benefit Analysis

(Not recommended for scoping stage)

CHAPTER 10

ENVIRONMENTAL MANAGEMENT PLAN

10. Environmental Management Plan

10.1 Description of the administrative aspects of ensuring that mitigate measure are implemented and their effectiveness monitored

An Environmental Management Plan (EMP) is a plan or programme data achieving a desired end state and describes how activities that adversely affect, or have the potential to affect, the environment will be mitigated, controlled and monitored. Doing EMP addresses environmental impacts during the design, construction and operation phases of projects. Environmental protection should be considered throughout the project. They are created to achieve this number of environmental specifications/recommendations. These are intended to help contractors maintain good control.

- Minimize the magnitude of impacts during construction.
- Ensure proper rehabilitation of areas affected by construction, if any.
- Prevention of long-term environmental degradation

10.2 Objectives of EMP

- To suggest the formation of a core group (Environment Management Cell) responsible for implementation of environmental control & protective measures as well as monitoring of such implementation.
- To ensure project components comply with all laws and approval conditions.
- Facilitate a continual review of operation activities.
- To suggest preventive and mitigation measures to minimize adverse impact and to maximize beneficial impacts like.
- To prepare a capital cost estimate and annual recurring cost for Environmental Management Plan.
- To prepare a detailed action for implementation of mitigation measures.
- Measure the effectiveness and success of proposed mitigation measures

10.3 EMP Roles and Responsibilities

- Each industry should identify within its setup a Department/ Section/ Cell with trained personnel to take up the model responsibility of environmental management as required for planning and implementation of the projects.
- Environmental Cell consisting of Vice President and Assistant General Manager will be created for efficient management of the environmental activities in the industry.
- The EMC will handle all issues related to different environmental attributes; it will be responsible for overall environmental and social management in projects undertaken from investigation level to execution at project level.
- The EMC will be responsible for the technical planning, implementation and monitoring of all environmental mitigation and compensation measures.

10.4 Responsibilities of Environmental Management Cell

The Environment Management Cell will be responsible for monitoring of the following

Checking of safety related operating conditions. Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed.

Other responsibilities of the cell will include: Mitigation / corrective measures as specified by TNPCB. Keeping the management updated on regular basis about the conclusions / results of monitoring activities and proposes measures to improve environment preservation and protection.

Conducting regular safety drills and training programs to educate employees on safety practices. A qualified and experienced safety officer will be responsible for the identification of the hazardous conditions and unsafe acts of workers and advise on corrective actions, organize training programs and provide professional expert advice on various issues related to occupational safety and health. Conducting safety

and health audits to ensure that recommended safety and health measures are followed.

10.4.1 EMP for construction phase

Environmental component	Impact	Source/Activity	Mitigation measures
Air Environment	Dust, increased PM levels Exhaust emission	Excavation, Earthwork, vehicle movement , DG sets	➤ Regular water sprinkling on haul roads and embankment. ➤ Transport vehicles and construction equipments/ machineries will be properly maintained to reduce air emissions. ➤ Providing necessary personal protective equipment to the workers. ➤ Covering the construction material during transport and storage.
Water Environment	➤ Increased turbidity ➤ siltation ➤ Risk of oil/grease runoff	➤ Construction runoff, ➤ storage of the fuels for DG, ➤ excavation near drains	➤ Silt traps , silt curtain will be used in the construction phase ➤ No direct discharge of waste water discharge. ➤ Proper Sanitation will be provided to workers.
Soil environment	➤ Loss of topsoil, ➤ Soil erosion, ➤ Contaminations from spills	➤ Site clearance ➤ Accidental leaks	➤ Topsoil will be reused for construction. ➤ Reuse of excavated materials. ➤ Spill prevention plan will be prepared and it will be implemented.

Land Environment	Change in land use, loss of marshy/salt-pan areas, flood pathway alteration	Land acquisition, reservoir impoundment	➤ Flood modeling and hydrology modeling has been conducted. ➤ Adequate culverts will be provided ➤ spillways will be controlled
Noise Environment	Increase in noise level	DG sets and Vehicles	➤ Adoption of Acoustic enclosure and provision of adequate protective equipment like ear plugs, ear muffs, noise helmets etc., to the workers. ➤ Periodic maintenance of the construction machinery and transportation vehicles should be undertaken to reduce the noise impacts. ➤ Restrctited the working hours (daytime only).
Traffic congestion	Closures of Road may cause Traffic constraint	Diverting the road while consruction	➤ Part of Thiruporur to Nemmili road has to be raised upto a level of (+)4.800m. So temporary diversion arrangements will be made at the time of construction phase.

10.4.2 EMP for operation phase

Environmental component	Impact	Source/Activity	Mitigation measures
Air Environment	Minor emissions from vehicular traffic & pump	Routine traffic & maintenance equipment	➤ Regular maintenance of vehicles & equipment. Planting trees around reservoir will mitigate the minor emission. ➤ use of low-emission pumps ➤ Developing a dense greenbelt around the project site boundary and within the open space sing native species with high pollutant absorption capacity.
Water Environment	Sewage/wastewater ingress, possible saline intrusion, water quality	➤ Potential contamination from runoff, algae growth, reduced	➤ Based on the HEC HMS study the reservoir storage will be optimised based

	deterioration	dissolved oxygen, or stagnation. ➤ During monsoon / due to excess runoff from the upstream along with storage of water, the reservoir may lead to flooding to nearby region. ➤ Possibility of sea water intrusion during high tide level.	on the rainfall the excess water will be released in to the sea. ➤ Propoeer maintence of outlet regulator. ➤ Water samples will be montonered continuously and the report will be submitted to TNPCB.
Soil environment	Risk of siltation of reservoir bed	➤ Sedimentation reducing capacity; erosion in surrounding catchment areas.	➤ Periodic surveys of soil physical and chemical properties (texture, pH, organic content, nutrients) around the reservoir area. ➤ Maintain buffer strips and embankments to reduce erosion and sediment inflow. ➤ periodic desilting ➤ Proposing greenbelt around the reservoir using deep rooted native species that helps in slope stabilization and prevent soil wash off.
Noise Environment	No any impact envisaged during operation phase of reservoir.		
Ecology	Disruption of aquatic ecology,	Nutrient enrichment, Stagnant water	

	algal blooms, invasive species		
Social Environment	➤ Public health risk ➤ Changes in local livelihoods as positive impacts	➤ Wastewater entry ➤ Water demand supply will increased	➤ Multi-barrier water safety plan (catchment protection, WTP with disinfection) ➤ Community water awareness programs will be conducted to support livelihood.

10.5 Budgetary Provisions for EMP

Adequate budgetary provisions have been made for execution of environmental management plan. The details of capital and recurring budget earmarked are given **Table 10-1**

Table 10-1 Details of EMP budget

S. No	Component	Capital Cost Rs.(Lakhs)	Recurring cost Rs.(lakhs) per Annum
1.	Greenbelt Development	30	5
2.	Water Sprinkling	10	-
3.	Environment monitoring	-	10
4.	PPE for workers	5	15
5.	Conservation plan of Habitat Creation & Restoration (Enhanced Scale & Resilience)	1430	-
Total		1475	40

CHAPTER 11

SUMMARY & CONCLUSION

11. Summary & Conclusion

11.1 Summary of the Project

The new drinking water reservoir formation under Phase I will be in an extent of **4375 acres** vested with WRD & Revenue lands. The site can be accessed from Kelambakkam – Kovalam Link Road on the North, Thiruporur – Nemmeli link Road in the middle and OMR – ECR connecting Bypass Road on the South near Mamallapuram. The Reservoir site is bounded by the ECR Road on the eastern periphery, OMR Road on the western periphery and Muttukadu – Kovalam on the North and Mamallapuram on the South.

The overall catchment area is identified as **41,408 hectares** (Ha), of which 29,642 Ha are intercepted by a cascade system of 69 tanks in Thaiyur, Manamathy, and other minor groups. The remaining free catchment area of **11,766 Ha** is available to feed the proposed reservoir.

Land use in the catchment is dominated by agricultural fields, fallow lands, and forested areas. The current average bed level of the site is +0.350m, the foreshore level is +1.800m, and the Full Reservoir Level (FRL) is +3.000m. The plan involves excavation of bund and levees of kazhuveli area, top soil of water spread area and constructing a foreshore bund along with a peripheral catchment drain to prevent localized inundation. With a total storage depth of 3.00 meters and a water spread area of 17.71 square kilometers, the proposed reservoir is expected to achieve a single filling storage capacity of approximately 1.655 TMC with an annual storage of 2.25TMC. The reservoir will indirectly augment groundwater recharge, check seawater intrusion, and directly supplement the Chennai city water supply with up to 170 MLD for nine months each year.

Sr. No.	Particulars	Details
1.	Name of Project	Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the inhabitants in Thiruporur & Thirukazhukundram Taluks of Chengalpattu District
2.	Project Location	Village: Thiruvidanthai,Kalavakkam,Nemmeli,Thiruporur,Thandalam, KrishnanKaranai,Pattipulam,Paiyanur,Saluvankuppam,Mamallapuram.

		Taluk : Thiruporur, Thirukalukundram District: Chengalpattu State: Tamil Nadu			
3.	Proposed project activities	Component I: Formation of new drinking water Reservoir and its appurtenances (Eastern & Southern Side) Component II: Formation of new drinking water Reservoir and its appurtenances (Eastern & Southern Side). Component III: Improvements to Manamathy Inlet			
4.	Purpose	Drinking water storage			
5.	Basin	Kovalam sub basin			
6.	Catchment area	The overall catchment area is identified as 41,408 hectares (Ha), of which 29,642 Ha are intercepted by a cascade system of 69 tanks in Thaiyur, Manamathy, and other minor groups. The remaining free catchment area of 11,766 Ha is available to feed the proposed reservoir.			
7.	Mean Annual Rainfall	1105.10mm			
8.	Total Annual Yield	2.2TMC			
9.	Water requirement	For construction Phase : Total water Requirement is 34.35 KLD For construction activities- 20 KLD Domestic : 14.35 KLD including Flushing. Source: Nearby WRD tank.			
10.	Proposed Storage Capacity	Approximately 1.655 TMC with an annual storage of 2.25TMC.			
11.	Power requirement		Description	Quantity	Source
			Power requirement	110kVA	TANGEDCO
			DG set	2x 58.50kVA	--

12.	Manpower	Phase	Temporary	Permanent	Total
		Construction phase	-	410	410
		Operation phase	3	4	7
13.	Project cost	The capital cost is INR 471.00 Crores			

11.2 Conclusion

This proposal will be serving for the larger public welfare by providing drinking water supply to the Chennai city which play vital role on National building and economy. The key benefits of New reservoir proposal is below.

The proposed Reservoir will store 1.655 TMC as one time Storage Capacity and 2.25 TMC of Annual Storage Capacity.

The overall storage capacity of City Reservoirs will be augmented to 15.25TMC from the existing 13.10TMC with the addition of this new Reservoir.

The Reservoir in addition to flood water conservation will cater City water requirements tune to 170 MLD. This will benefit about 13 lakh people.

The Reservoir will act as a Flood Buffer and avert Sea Water intrusion.

The water stored in the Reservoir will be supplied to extended GCC areas like Sholinganallur, Medavakkam, Pallikaranai, Siruseri, Kelambakkam, Mamallapuram etc.,

The Reservoir will supplement Eco-Tourism activities, Pisciculture and inland Navigation.

The reservoir will ensure a sustainable and reliable source of drinking water for Chennai, reducing dependence on expensive water imports, desalination plants, or private water suppliers, thereby saving public funds in the long term.

By addressing water scarcity issues proactively, the reservoir will mitigate the financial losses incurred during droughts and water crises, offering long-term economic resilience.

The reservoir will directly benefit local communities by providing a reliable and safe source of drinking water, contributing to better health and hygiene conditions, especially in water-stressed localities.

The construction and maintenance of the reservoir will generate significant employment opportunities for local workers, contractors, and service providers, thereby contributing to local economic growth.

Continuous access to water will improve household sanitation, reduce the burden of water collection and improve the overall quality of life for local residents.

Educational institutions, healthcare centers, and public facilities in nearby areas will benefit from improved water supply, enhancing their operational efficiency and service quality.

CHAPTER 12

DISCLOSURE OF CONSULTANT

12 Disclosure of consultant

In order to assess the potential environmental impacts due to the “Formation of New Drinking water Reservoir in Kovalam Sub Basin in between ECR and OMR Roads for the Inhabitants at Thiruporur & Thirukazhukundram Taluks of Chengalpattu District”, engaged M/s. Hubert Enviro Care Systems (P) Limited, Chennai to undertake EIA study. The nature of consultancy service rendered covers terrestrial environmental assessment.

12.1 Brief Profile of Hubert Enviro Care Systems (P) Limited (HECS)

HECS is a total Environmental management company which provides Environmental consultancy services, Analytical testing services, turnkey solutions and Operation-Maintenance services for water and wastewater facilities.

The company provides solutions to several industries like Refineries, Thermal Power Plant, Pharma, R&D Facilities, Electroplating and Manufacturing, IT Parks, Residential Complexes, Mines, Dairies, Food Processing, Textile mills, Breweries, etc.

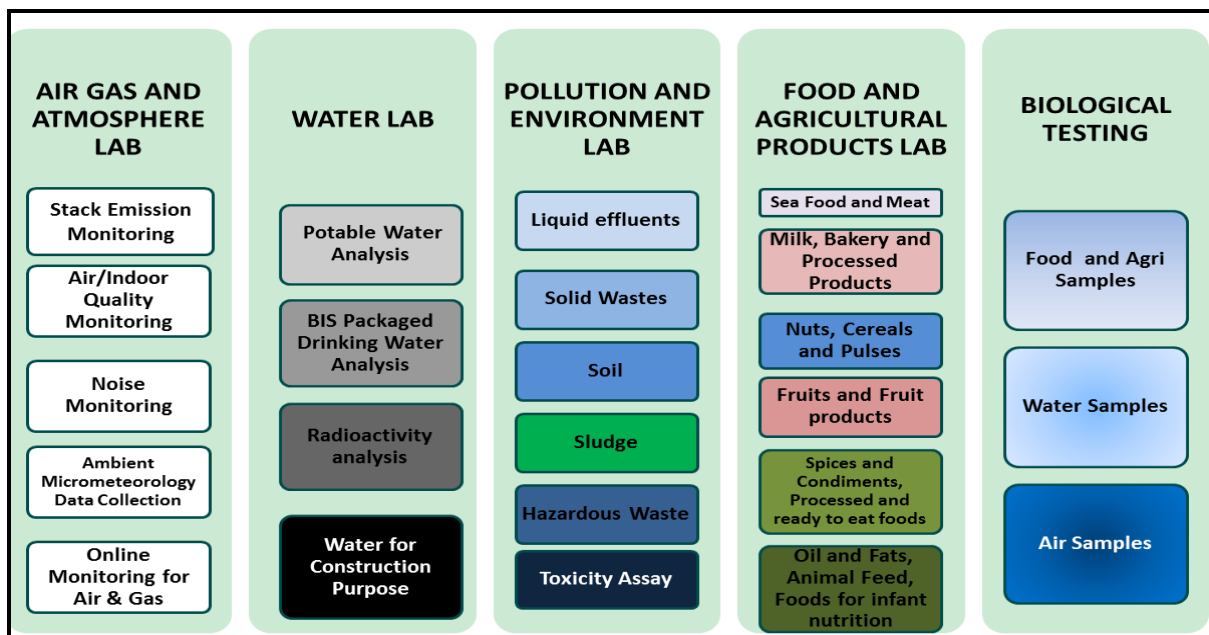
The company is specialized in executing projects right from concept development, supply, erection, commissioning and operation on turnkey basis. HECS has successfully executed more than 300 environmental engineering projects for various industrial sectors both in India and overseas.

Consultancy Profile

-  HECS is accredited by QCI-NABET
-  An approved consultant for carryout EIA studies across India
-  India's leading multidisciplinary Environmental Consultancy organization
-  HECS- Consultancy division comprises of technical skilled and competent Team of 40 people. The team consists of Three Doctorates & about thirty postgraduates
-  HECS has industry specific prominent expert to provide solutions & recommendations
-  Serving client more than 25 years & pan India presence in the following sectors:
 - Environmental Clearance
 - Coastal Regulation Zone

- Risk Assessment, DMP, HAZOP studies
- Feasibility/ treatability studies
- Due diligence studies
- Ground water Clearance
- DISH, PESO and other statutory approvals
- Consent to Establish, Consent to Operate
- Hazardous waste, bio medical waste authorization
- Other environmental approvals

✚ Has an in-house laboratory wherein the following activities are being carried out:



QCI – NABET Accreditation

Consultancy	Hubert Enviro Care Systems Pvt. Ltd., Chennai
NABET Certificate No	NABET/ EIA/24-27/ RA 0335 Valid up to 31.03.2027
MoEF Reg. Lab	LB/99/7/2021-INST LAB-HO-CPCB-HO/Pvt

National Accreditation Board for Education & Training (NABET) is a constituent board of the Quality Council of India (QCI). QCI, NABET has accredited HECS for carrying out Category 'A & Category B' EIA studies in the following sectors:




National Accreditation Board for Education and Training

Certificate of Accreditation

Hubert Enviro Care Systems, Chennai

A-21, III Phase, Thiru Vi Ka Industrial Estate- 600032

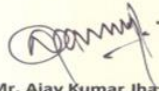
The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA/EMP reports in the following Sectors-

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1.	Mining of minerals including opencast / underground mining	1	1 (a) (i)	A
2.	Offshore and onshore oil and gas exploration, development & production	2	1 (b)	A
3.	River Valley projects	3	1 (c)	A
4.	Thermal power plants	4	1 (d)	A
5.	Mineral beneficiation	7	2 (b)	A
6.	Metallurgical industries (ferrous & non-ferrous)	8	3 (a)	A
7.	Cement plants	9	3 (b)	A
8.	Petroleum refining industry	10	4 (a)	A
9.	Pesticides industry and pesticide specific intermediates (excluding formulations)	17	5 (b)	A
10.	Petro-chemical complexes	18	5 (c)	A
11.	Petrochemical based processing	20	5 (e)	A
12.	Synthetic organic chemicals industry	21	5 (f)	A
13.	Industrial estates/ parks/ complexes/areas, export processing Zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes	31	7 (c)	A
14.	Bio-medical waste treatment facilities	32A	7(d a)	B
15.	Ports, harbours, break waters and dredging	33	7 (e)	A
16.	Highways,	34	7 (f)	B
17.	Common Effluent Treatment Plants (CETPs)	36	7 (h)	B
18.	Common Municipal Solid Waste Management Facility (CMSWMF)	37	7 (i)	B
19.	Building and construction projects	38	8 (a)	B
20.	Townships and Area development projects	39	8 (b)	B

Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated May 31, 2024, posted on QCI-NABET website.

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/24/3292 dated June 25, 2024. The accreditation needs to be renewed before the expiry date by Hubert Enviro Care Systems, Chennai following due process of assessment.

Issue Date
June 25, 2024

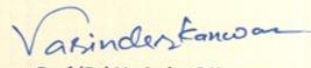


Mr. Ajay Kumar Jha
(Sr. Director, NABET)



Certificate No.
NABET/EIA/24-27/RA 0335

Valid up to
March 31, 2027



Prof (Dr) Varinder S Kanwar
(CEO- NABET)

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

Further details may be seen on the following URL: www.hecs.in