WORLD BANK assisted Tamil Nadu Climate Resilient Urban Development Project (TNCRUDP)
Environmental and Social Impact Assessment Report (ESIA)

IMPROVEMENT OF WATER SUPPLY PILOT SCHEME UNDER 24x7 TO SELECTED ZONE IN CUDDALORE CORPORATION IN CUDDALORE DISTRICT - AMRUT 2.0

[DECEMBER 2023]

Report prepared by

CUDDALORE CITY MUNICIPAL CORPORATION

List of acronyms

CMD	Chairperson & Managing Director
CRZ	Coastal Regulation Zone
DPR	Detailed Project Report
E&S	Environmental and Social
EMP	Environmental Management Plan
ESSA	Environmental and Social Systems Assessment
ESIA	Environmental and Social Impact Assessment Report
ESMP	Environmental and Social Management Plan
FI	Financial Institution
GOI	Government Of India
GoTN	Government of Tamil Nadu
GRC	Grievance Redressal Committee
IA	Implementing Agency
MoEF & CC	Ministry of Environment and Forests & Climate Change
PIA	Program implementation Agency
PMC	Project Management Consultant
PMU	Project Management Unit
SEC	Sensitive Environmental Components
SWM	Solid Waste Management
TNCRUDP	Tamil Nadu Climate Resilient Urban Development Program
TNUIFSL	Tamil Nadu Urban Infrastructure Financial Services Limited
TOR	Terms of Reference
TWADB	Tamil Nadu Water Supply and Drainage Board
ULB	Urban Local Body
WB	World Bank

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Executive Summary

1. Introduction and Background

Cuddalore City is the Head quarters of the Cuddalore District. It is located at the estuary of rivers Gadilam and Pennaiyar with Bay of Bengal. The Extent of the Corporation is 26.80 sq.km. The corporation consists of 45 wards and the population as per 2011 census is 173636. This corporation is ranked as Special Grade.

The existing distribution system was laid long back, intermittent supply and the required residual pressure as per 24*7 scheme is not met with in some of the zonal nodes in all the zones. In this context, as per the orders issued by Government of Tamil Nadu, to convert intermittent supply to continuous supply, this project is selected in one of the zones to provide 24*7 water supply.

2. Project Details:

To meet the ultimate demand of 3.48 MLD, Zone 4 capacity is designed. Water pumped from 5 of interlinked proposed bore wells is expected to yield 260LPM and the 3 numbers of infiltration well will yield 750LPM. The water received from the 5 bore wells and 3 infiltration wells will be received in the 4 LL capacity sump located near Thenpennai River and water will be transmitted to OHTs through the newly proposed feeder mains. The existing OHT is not retained as it does not have the desired staging height. However, abandoned existing OHTs shall be utilized as water storage for other water supply scheme during drought.

Proposed project components are as follows:

Proposed Project Components
Providing Infiltration wells (3 Nos) of 4.5m Dia of 7m Depth at Thenpennai River
Providing Bore wells (5 Nos) of 200mm Dia of 200m Depth at ThenPennai River including Pump set, etc., Complete
Construction of Sump of Capacity 2.00 LL including Pump room of size 6m x 9m
Providing Pump sets for Proposed Infiltration wells and Sump
Providing Pumping main from Infiltration wells, Bore wells to proposed Sump (2519 m)
Providing Feeder main from Proposed Sump to Existing OHT(8030 m)
Construction of OHT of capacity 12 LL at Pennaiyar Road 1st Cross
Providing Distribution System with DI and HDPE Pipes (33.897 Km)
Providing Flow control Valve, Sluice Valve, Electromagnetic Flow Meter & Chamber - For Distribution System
Providing House Service connections (6761)
Road restoration with cement concrete 1:4:8, 7.5 cm thick, using 20 mm HBS metal and cement concrete 1:2:4 , 10 cm thick using 20 mm HBS including cost of all materials laying, curing (Total Length: 30.53 Km)
Providing Complete SCADA system for water supply system (Pressure Sensor, Quality Sensor, Monitoring and control units)

The following miscellaneous items proposed in all the zones at each service reservoirs are

- Ultrasonic Level Indicators,
- Bulk Flow meter at outlet of ELSR lightening Arrestor
- Rain Water Harvesting

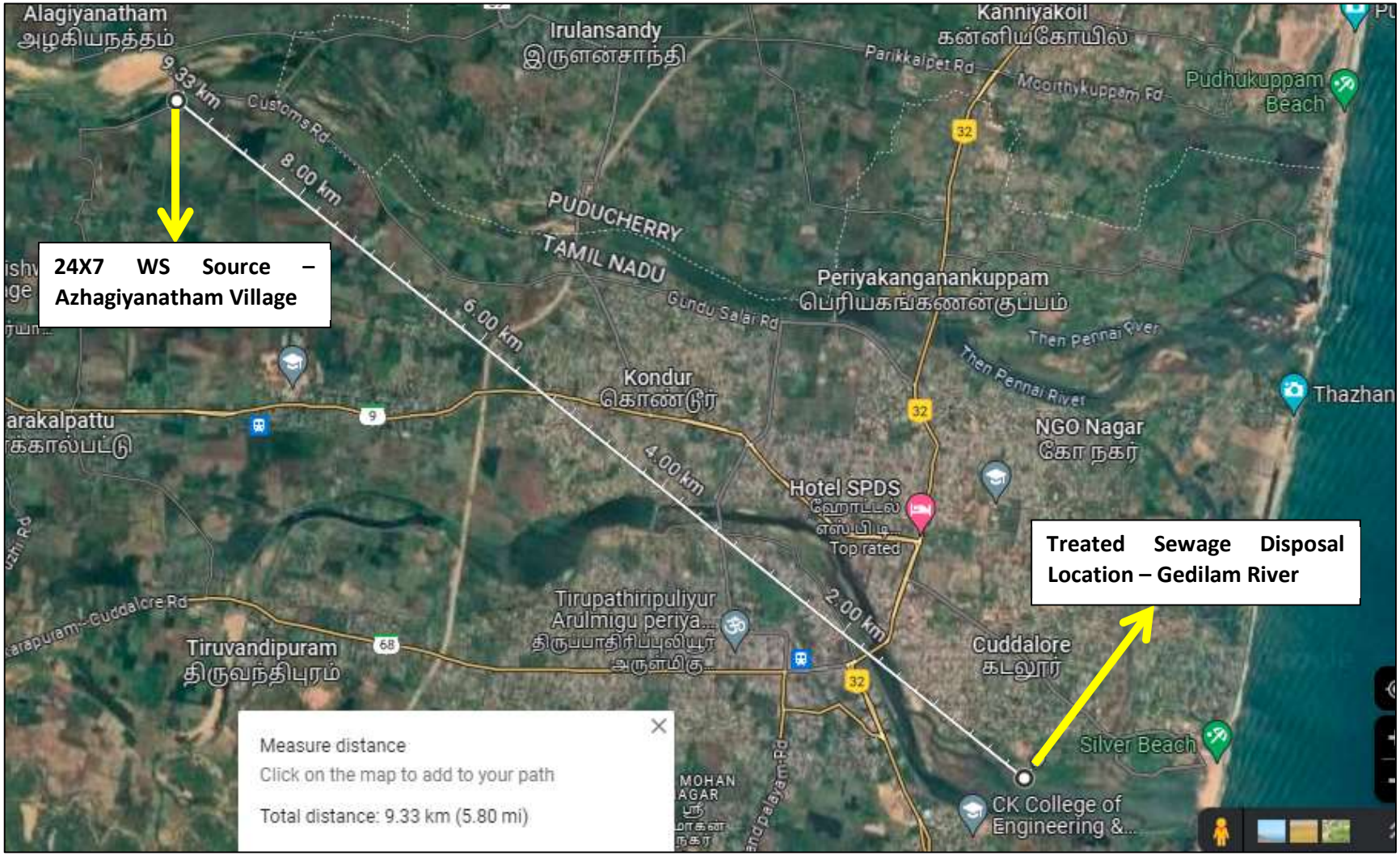
Source

As per the hydrogeological investigation, the existing source Chavadi in recent past the quality of ground water has deteriorated owing to excess iron content gradually released from the formations. Based on the Geophysical investigation study, Geology and Hydrogeology of the area in between Vellambakkam - Azhagiyanatham bridge to Erandayravillagam bridge located 3 nos. of Infiltration well has identified as water source for Water zone – 4 area. The expected yield of each infiltration well is approximately 750 lpm, and by adopting 16 hours of pumping, there will be possibility to extract 2.16 MLD of water.

Based on the geology, hydrogeology and geophysical data interpretation, it is ascertained that, the river Thenpennaiyar, near Azhagiyanatham village is favourable location to create 5nos. of deep sedimentary bore wells to a depth of 200m with 200mm dia. The expecting yield of each sedimentary borewell is around 300 lpm with adopting 16 hours of pumping, there will be possibility to extract 1.44 MLD of water.

In order to meet the ultimate demand of 3.48MLD, Zone-4 sump capacity is designed. Water pumped from 5 nos. of interlinked proposed bore wells & 3 nos of infiltration well will be pumped to Proposed sump of 4 LL capacity and to be pumped to OHTs through 2 nos. of 50 HP HSC pump sets of 3000 LPM with 50 m head (1W+1S). The water from wells is being pumped for 23 hours daily to the OHTs.

The water supply source is located in Azhagiyantham village in Thenpennaiyar river. The source is safe as the disposal of present & proposed UGSS for Cuddalore is downstream of Thenpennaiyar river which is about 9.33 km from the source.



24X7 WS Source – Azhagiyanatham Village

Figure 2A – Map showing locations of Water supply source, STP disposal

Land Availability

The proposed Sump is planned to be constructed to meet the demand for ultimate year. Land availability for the proposed Sump has been confirmed by Local Body. The details of land ownership for the proposed Service reservoirs are provided in the Table below.

Zone No	Location Name	GLSR/ES R/Sump	Land Ownership
Sump	Near Thenpennai river	**New**	Municipality Land
OHT	Pennaiyar Road 1st Cross	**New**	Municipality Land

Costing

The costing has been done for the work proposed, including replacement of pump set and allied works, which is not in working condition and having less efficiency. The project cost is estimated as Rs. 26.66 Crores.

3. Regulatory Framework

Existing regulations environment relating to Environmental, social and climate change analysed for applicability to this sub project are as follows.

- Wildlife Protection Act, 1972
- Water (Prevention And Control of Pollution) Act, 1974 and Tamil Nadu Water (Prevention And Control of Pollution) Rules, 1974
- The Water (Prevention And Control of Pollution) Cess Act, 1977
- Air (Prevention and Control of Pollution) Act 1981 and Tamil Nadu Air (Prevention of Control of Pollution) Rules 1983
- Forest (Conservation) Act, 1980
- Environment (Protection) Act, 1986
- Manufacture, Storage and Import of Hazardous Chemicals Rules (MSIHC Rules), 1989
- Public Liability Insurance Act, 1991
- Bio Medical Waste Management Rules, 2016
- Fly Ash Notification, 2021
- Solid waste Management Rules, 2016
- Hazardous and Other Wastes Management Rules, 2016
- Construction and Demolition Waste Management Rules, 2016
- E-Waste (Management and Handling) Rules, 2022
- Plastic waste (Management & handling) Rules 2016
- The Noise Pollution (Regulation and Control) Rules, 2000
- EIA Notification, dt 2006 (S.O.1533(E), dt.14/09/2006) and subsequent amendments
- Wetlands (Conservation and Management) Rules, 2017
- Biological Diversity Act, 2002
- The National Green Tribunal Act, 2010
- Coastal Regulation Zone (CRZ) Notification, 2019
- The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996
- Prohibition of Employment as Manual Scavengers ‘and their Rehabilitation Act 2013
- National Action Plan on Climate Change
- Energy Conservation Act, 2001
- Energy Conservation Building Code (ECBC)
- Mines and Minerals (Regulation and Development) Act, 1957 as amended in 1972

- The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010
- The Right to Fair Compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR)
- The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006
- The Child Labour (Prohibition and Regulation) Amendment Act, 2016.
- The Child Labour (Prohibition and Regulation) Act,1986
- The Occupational Safety, Health And Working Conditions Code, 2020
- Minimum Wages Act, 1948.
- Workmen Compensation Act, 1923.
- Equal Remuneration Act, 1979.
- State Regulations
- Chennai Metropolitan Area Ground water (Regulation) Amendment Act, 2002
- The Tamil Nadu Preservation of Private Forest Act, 1949
- The Tamil Nadu Hill Areas (Preservation of Trees) Act, 1955
- The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 and Rules 2015 notified by GOTN.
- State Green Committee/District Green Committee
- National Action Plan On Climate Change (30.06.2008)
- TNSAPCC, 31.03.2015
- Energy Conservation Act, 2001
- Energy Conservation Building Code

Based on the review, the permits/ clearances that are required to be obtained for implementation of the project are as follows:

Clearances/ Permits to be obtained by Cuddalore Corporation (PIU)

S. No	Proposed activity	Statutory authority	Applicable legislation	Status
1	Highway crossings for laying of pipes.	NH, NHAI, SH	National Highways Rules 1957	To be applied
2	Power sanctions and charging	TNEB	TAMIL NADU ELECTRICITY SUPPLY CODE (as amended up to 31-12-2009)	To be applied
3	Traffic diversion for Construction of feeder mains and distribution system	Deputy Commissioner of Police - Traffic Cuddalore	MoRTH 112 SP 55 of IRC codes	To be applied
4	CRZ clearance for section of network falling under the provisions	MOEF&CC	CRZ Notification, 2019	To be applied
4	PWD/WRD permission for borewells, construction of infiltration gallery including site enter upon permission	Public Works Department		To be applied

Clearances/ Permits to be obtained by the Contractor

Sl. no.	Construction Activity	Statutory Authority	Statute under which clearance is required	Implement ation	Supervision
1	Labour Licence and all other statutory work permits including Contract Labour& Interstate Migrant Worker License (if any)	- The Contract Labour (Regulations & Abolition) Act, 1970 - The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 -Directorate of Industrial Safety and Health (DISH), GoTN.	Tamil Nadu Labour Department	Contracto r	Cuddalore Corporatio n/PMC
2	Workmen compensation Insurance / Accident Insurance, EPF and ESIC (as applicable)	Tamil Nadu Labour welfare Fund Act	Tamil Nadu Labour Department	Contracto r	Cuddalore Corporation /PMC
3	Hot mix plants, Crushers and Batching plants	Tamil Nadu Pollution Control Board (TNPCB)	Consent to establish And consent to operate under Air Act, 1981	Contracto r	Cuddalore Corporation /PMC
4	Discharges from construction activities	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contracto r	Cuddalore Corporation /PMC
5	Sand mining, quarries and borrow areas	Department of Geology and mining, Government of Tamil Nadu	Contractor to obtain material from the existing Government licensed mines/quarries, Contractor will require prior approval of PIU for obtaining material from a particular source PIU to review and approve only existing licensed mines	Contracto r	Cuddalore Corporation /PMC

Sl. no.	Construction Activity	Statutory Authority	Statute under which clearance is required	Implement ation	Supervision
6	Ground water extraction	Tamil Nadu Groundwater Development and Management Act 2000	Water Resources Department, Government of Tamil Nadu	Contracto r	Cuddalore Corporation /PMC
7	Temporary traffic diversion measures	MoRTH 112 SP 55 of IRC codes	Traffic Police, Cuddalore	Contracto r	Cuddalore Corporation /PMC

4. Baseline Environmental and Social Status

The Baseline has been collected from secondary sources and E&S screening of all the project sites and alignments.

The desk review of the available documentation and reports of this project is carried out including DPR. Also, the additional data were collected from relevant websites, online as well as offline. Data thus collected from the secondary sources- published and unpublished literature, government documents, reports, etc and other reports of other projects in the project town were reviewed.

Climate & Rainfall

The climate in general is moderately hot and humid tropical. The Mean Maximum temperature from January to June varies from 28oC to 34oC. It has hot summer and insignificant to mild winter with moderate to heavy rainfall. The area is affected mainly by NE monsoon with some evening showers during SW monsoon.

Topography & Soils

It has an average ground elevation of 6 m with reference to MSL. The land is almost flat with large deposits of black and alluvial soil inland and coarse sand near the seashore. The elevation levels in the project area vary from 1.04 m to 9m.

Soils:

The soils of the district are classified as the black, red, ferruginous and Arenacious. They are again subdivided into clays, loam and sands. Black soils are observed in the Chidambaram and Vriddhachalam taluks. They sandy soils are seen along the coast in Cuddalore and Chidambaram taluks. The younger alluvial soils are found as small patches along the stream and river courses in the district. Red sandy soil is seen covering the Cuddalore sandstone, laterite and lateritic gravels occur in parts of Vriddhachalam, Panruti and Cuddalore taluks.

Drainage

The district is drained by Gadilam and Pennaiyar rivers in the north, Vellar and coleroon in the south. All these rivers are ephemeral and carry floods during monsoon. They generally flow from west towards east and the pattern is mainly sub parallel. The eastern coastal part near Porto-Novo is characterized by lagoons and back waters. Ponniyar is one of the major seasonal river drains the northern part of the district, which originates from the Nandi hills of Karnataka state. Thurinjalar and Musukundah rivers are the tributaries, which join the Ponnaiyar river, Malattar river is the distributary of the Ponnaiyar river. Vellar, is the other major seasonal river, which drains the major portion in the

southern part of the district. Manimuktha, Gomukhi and Mayura are the major tributaries which join the Vellar river.

Groundwater table

The Ground Water levels from the 42 number of observation wells of TWAD have been analyzed for Post-Monsoon and Pre-Monsoon. 5 years average Ground water level in m Below Ground Level for pre and post monsoon are 26.7m and 23.7m respectively.

Geology & Geomorphology

Geology

The general geological formation of the district is simple with metamorphic rocks belonging to the gneiss family. Resting on these are the three great groups of sedimentary rocks belonging to different geological periods and overlaying each other in regular succession from the coast on the east to the hills on the west. The lowest of these groups is the fossil-bearing cretaceous limestone around Pondicherry and Vriddhachalam. Above this comes a younger form the Red hills near Pondicherry and the Mount Capper hills south-west of Cuddalore. Uppermost are the alluvial beds of the deltas of rivers The area is occupied by Tertiary and Quaternary Formations.

Geomorphology

The entire district can be broadly divided into following 3 zones. Western pediplains of entire area covered by Mangalur and Nallur blocks. This area is occupied by denudational landforms like shallow buried pediment, deep buried pediment and pediments. Central part of the district is characterized by sedimentary high grounds, elevation >80 m of Cuddalore sandstone of Tertiary age. This zone occupies part of Virudhachalam, Kammapuram, Kurinjipadi, Cuddalore and Kattumannarkoil taluks.

Rest of the area in the district is covered by eastern coastal plain, which predominantly occupied by the flood plain of fluvial origin formed under the influence of Penniyar, Vellar and Coleroon river systems.

Marine sedimentary plain is noted all along the eastern coastal region. In between the marine sedimentary plain and fluvial flood plains, fluvio marine deposits are noted, which consists of sand dunes and back swamp areas.

Forests in Cuddalore District

The total area covered under the Forest in the district are 4116.05 hectares. Reserve Forest covers 3689.05 Hectares and Reserve land 427 hectares. Most of the forest areas lie in Panruti, Chidambaram Kattumannarkoil, Vridhachalam and Titakudi Taluks.

There are no forests located in the sub-project area/ infrastructure locations.

Landuse

The Land use of Cuddalore Town is presented in the map below and the major land use observed is primary residential & mixed residential.

The pipeline alignment and sub-project infrastructures are located in areas with predominantly residential landuse.

Hazard Profile Of Cuddalore taluk

In Cuddalore taluk, the low lying areas are inundated because of Gadilam river and Pennaiyar river, which carry the flood water and drained in to the Bay of Bengal at Devanampattinam (Silver Beach) and Tazhanguda.

Locations in Cuddalore identified as very highly vulnerable include K.K nagar (Vanarapalayam), Purushothamannagar, Indra nagar (Dobhigana), Aruthathiyarnagar, Panagkattu colony, etc.

Coastal Regulation Zone

A section of the project area falls under CRZ and hence the distribution network of around 939m falling within this section attracts CRZ notification requiring CRZ clearance. Details of the network concerned are provided in maps and table below. Works in these areas will be commenced upon obtaining CRZ clearance complying with the conditions laid therein.

Air Environment

The annual average concentrations of PM10 recorded are 51µg/m3 at Eachangadu Village, 48 µg/m3 at SIPCOT (Project Office), 61 µg/m3 at DEE Office, Cuddalore. The annual average concentrations of PM2.5 recorded are 32µg/m3 at Eachangadu Village, 26 µg/m3 at SIPCOT (Project Office), 35 µg/m3 at DEE Office, Cuddalore. The annual average SO2 concentrations were recorded as 13 µg/m3 at Eachangadu Village, 11 µg/m3 at SIPCOT (Project Office), 16 µg/m3 at DEE Office, Cuddalore. The annual average NO2 (oxides of Nitrogen) concentrations were recorded as 17µg/m3 at Eachangadu Village, 17 µg/m3 at SIPCOT (Project Office), 22 µg/m3 at DEE Office, Cuddalore.

All the observed values are in the year 2020. The observed air pollutants are within the limits as per CPCB standards except for PM 1061 µg/m3 at DEE Office, Cuddalore.

Water Environment

Ground water Quality

Ground water has been analysed near the existing STP site in Devenampattinam. Results of ground water monitoring indicate that the water quality parameters are not meeting acceptable limits as per the Drinking Water Standards however within the permissible limits except for colour, Iron and Magnesium levels. Hence if this is proposed to be used as drinking water for the sub-project/ by the contractor, adequate treatment is to be provided to meet the requisite standards.

Surface water quality - Source water

For surface water quality, Source water study has been carried out in selected borewell sources in river pennaiyar @ Azhakianatham during DPR preparation.

It is inferred from the above table which is based on the water quality sample taken & tested that the observed that parameters like DO, Ca, Mg, Cl, etc are exceeding acceptable limit of Drinking Water standard, but within permissible limits and this may be considered for use as drinking water in the absence of alternate source.

Noise Environment

Noise levels assessed in 3 locations in Cuddalore at Thirupapuliyur, Cuddalore OT and Manjakuppam. The noise levels ranged between 56.4 - 63.8 dB(A) during day and the night time noise levels ranged between 45.3 to 49.2 dB(A). The locations fall under residential / mixed residential / commercial area. The noise levels measured in these areas are found marginally higher than the permissible limits.

Terrestrial Ecology

Common flora found in the project town are Tamarind, Neem Tree, Palmyra Palm, Peeple Tree, Coconut Tree, Wild date palm, Rain Tree, Ravenna grass, Banana Plant, Knotgrass, Swollen finger Grass, Daobha, Water Hyacinth, Water lily, Castor Oil Plant, Erakku Plan, Papaya.

Along the natural channels, canals, nallahs wild grasses and weeds are found. In locations near the coast in Cuddalore Corporation, few mangrove plantations are found to be present. According to a study the Uppanar backwaters supports 3 species of mangrove, 14 mangrove associates, including facultative halophytes, 11 species of seaweed and varieties of strand and aquatic vegetation along the sandy areas and water. However the project area and infrastructure locations are away from this

location and no project activity is proposed in these locations. Hence due to the proposals made in this project, no major impact on Flora is envisaged.

Fauna
Fauna found in the project area includes mice, squirrels, pigeon, crow, sparrow, duck, eagle, parrot, snakes etc., Domestic animals like cow, buffalo, goat, dogs, cats, pigs. Frogs, water insects, water snakes are also found.

Small fishes are found in the rivers near the mouth. Waterfowl (storks, herons and egrets) were the most common birds in the backwater estuaries. The Uppanar Backwaters has fishes, crabs, prawns and molluscs. The project location is away from the backwaters and hence no impact envisaged. The proposals made in this project have very limited construction activity do not have any adverse impact on the Fauna.

5. Environmental and Social Impact Assessment

In the case of this project most of the individual elements involve simple construction and operation, so impacts will be mainly localized and not greatly significant negative impacts. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

Construction Phase
Construction works in the Cuddalore City Municipal Corporation area, the pipelines are to be laid on or along the roads in the unused vacant land adjacent to the roads within the project area. In the narrow roads (where there is no vacant land adjoining road), pipelines will be buried within the road right of way. However, considering the narrow and busy lanes, temporary impacts are likely during the construction stage.

Sources of Materials. For the construction work, the required materials like coarse aggregate and fine aggregate will be obtained from the permitted / licensed quarries by the Department of Geology & Mining, Government of Tamil Nadu. Contractor should not create/use any new borrow pits / quarries. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible.

Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas:
Priority is to locate these near the project location, but it shall be at least 100m away from residential areas, groundwater wells and surface water bodies. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems.
The contractor will prepare a Construction ESMP (CESMP) including Labour Camp Plan and Waste Management Plan prior to construction and submit it to CCMC.

Noise from pumping operations
The noise from pumping operations is applicable only in the source location and sump. The noise from pumping operations is limited for this project. Procure only Central Pollution Control Board (CPCB) approved generators to meet air emission and noise level requirements.

Energy Efficiency

The entire quantity of water proposed to be drawn from Thenpennaiyar and pumped to sump and again pumped through feeder main to the OHT. The clear water is transmitted for a distance of 10.549km by pumping. From the proposed OHT water will be distributed by gravity to the beneficiaries. For pumping, BEE pumps as per IS 12615 2011, i.e. energy efficient induction motors are proposed and hence this project is energy efficient.

O&M Phase

The main O&M activities of the proposed infrastructure will be detection and repair of leaks and pipe bursts. For Leak repair, trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

Recurrence of blockage and leakage problems. Although impact is likely to be minimal due to new and well-designed efficient system; it should be ensured that leak detection and restoration time is minimized to the extent possible.

To ensure that water delivered to consumers at all times meets the drinking water standards water quality surveillance is to be carried out regularly.

6. Environmental & Social management plan (ESMP).

The ESMP is developed to mitigate the adverse E&S risks and impacts of this sub-project. It explains the mitigation measures, responsibility, implementation phase, monitoring method, monitoring indicators and frequency during pre-construction, construction, operation and decommissioning phases. The Contractor supervised by PIU is mainly responsible for the implementation of plans during the project life cycle. The project specific ESMP is provided in Table 33 of the ESIA report.

Significant activities and measures proposed in this project are provided below.

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
Pre-construction phase						
Utility relocation	(i) Identify the common utilities to be affected such as telephone cables, electric cables, electric poles, water pipelines, public water taps, etc; and (ii) Seek prior approval and inform the concerned agencies for utilities shifting before construction starts.	PIU/PMC, Contractor/ Authority of concerned utilities	Pre-construction phase	Review detailed layout plan and site inspection	Utilities shifted in time where necessary	One time
Permits and approvals	(i) Obtain all permits and approvals required for E&S aspects during pre-construction, construction, operation and decommissioning phases. (ii) These shall be made available from the TNPCB, PWD, and other line departments like National/State highways, Traffic, Police, Telecom, Electricity, etc and regulators of the State and Central governments as applicable. (iii) CRZ clearance for the distribution network attracting the CRZ Notification shall be obtained prior to start of construction in the relevant section. (iv) Obtain prior permission for tree cutting. (v) Ensure that all necessary approvals for construction to be obtained by contractor like labour licence / labour insurance are obtained before start of construction.	PIU/PMC, Contractor	Before construction commences	Keep record of all permit, approvals and authorizations	Permits and approvals are available	One to two times
Source of Materials	(i) Obtain construction materials only from government approved quarries with prior approval of PIU/PMC. (ii) PIU/PMC to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval. (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each sources (quarry/ borrow pit) (iv) No new borrow areas, quarries etc., shall be	PIU/PMC, Contractor	Pre-Construction and Construction Phase	Records, approvals	Approvals available	Periodically

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	developed for the project;					
Labour accommodation and facilities	(i) Identify the suitable building in terms of location, sufficient area, access, security, basic amenities, etc. (ii) Follow all relevant provisions of the Contract Labour (Regulation and Abolition) Act, 1970, Good International Industry Pratices, the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act (Central),1996- and State Rules, ILO convention 62-Safety provisions (Building) Convention and applicable laws for rented labour accommodation; (iii) The location, layout and basic facility provision for labour accommodation will be reviewed by the Project Engineer / PIU and suggestions to be communicated to the contractor prior to the construction; (iv) Maintain necessary living accommodation and ancillary facilities in functional, safe and hygienic conditions; (v) Provide adequate number of toilets and bathing area (separate for females/males), kitchen, safe fuel/ LPG for cooking and uncontaminated water for drinking, cooking and washing; (vi) Drinking water provided to the labourers shall be tested 3 monthly; (vii) Cooking shall be in a separate area: no cooking shall be permitted inside rooms; (viii) Prohibit employees from cutting of trees for firewood; fire wood not allowed; (ix) Labour accommodation and temporary shade near work sites shall provide protection from heat, rain, flooding, insects, snakes and mosquitoes. It should have adequate provisions for emergency such as accidents, disasters, fire safety, security, etc;	Contractor	During Pre-construction	Visual inspection; Consultations with labour, and local communities nearby; Site inspection; Facilities made available; Type of illness and its causes; and Discussions about the level of health awareness and safety precautions taken by the workers while working on the work site.	All the facilities available as per law and standards; Assess the satisfaction level of labourers; Cordial relation between labour and local communities ; Easy access of first-aid box with required medicine and accessories at each working site, labour accommodation, labour and office to	Every day

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(x) Adequate health care is to be provided for the workforce; (xi) Ensure adequate water supply in all toilets and urinals; Provide separate toilets/ bathrooms for women laborers and shall be screened from those for men and marked in vernacular language. (xii) The contractor shall provide separate garbage bins for wet and dry waste in the camps and ensure that these are regularly emptied, treated and disposed off in ULB SWM facilities as per regulations. (xiii) Provide first aid medical kit at labour accommodation, temporary labour shed and work site; train the labour for usage of items in case of injury, emergency, coordinate with nearest government and private medical centers and tie-up for the medical services, display the contact number of ambulance service, medical doctor(s) and keep a vehicle for emergency travel all the time; (xiv) As per provisions of WHO and MOHFW guidelines of COVID-19, sanitizer, soap, mask, etc. should be made available in sufficient quantity and its use by the workers mandatorily and maintain social distancing all the time; (xv) Ensure medical tests and treatment of COVID-19 positive cases immediately; and (xvi) Maintain the required data and documents at site and regularly submit the compliance report to the PIU.				workers all the time; and Arrangement made with the Doctors at the nearest government health and medical center/ private clinic.	
Public disclosure	Ensure timely and full project information dissemination through distribution of prior notice, pamphlet in local language, oral communication, meetings, websites, etc.	PIU/PMC, Contractor	Pre-construction phase/continuous	No of Consultations carried during the months	Methods used for public disclosure; and Project	One time

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
					awareness.	
Grievances redressal system	(i) Establish the efficient grievance redressal mechanism and accordingly constitute the grievance redressal committee (GRC) as outlined in the ESIA project level with representatives of all the stakeholders as members, including women and vulnerable groups of local communities; (ii) Ensure the wider publicity of procedure, functioning and availability of GRC since the inception of the project; (iii) All the grievances received shall be acknowledged and proper recording and tracking should be carried out; (iv) GRC will adjudicate the complaints in 6-8 weeks depending upon the severity of case; (v) Convenor will be the coordinator for organizing GRC meetings as required, writing the proceedings, minutes of meeting, informing the aggrieved party about the decision of GRC, etc;	PIU /PMC, Contractor	Project life cycle	Review the proceeding and minutes of meetings; and Consultations with the members of GRC.	GRC established; GRC meetings held; Number of cases received and resolved; Decision taken within a timeframe; and Court case filed or withdrawn.	Monthly or as required
Sensitive Areas	The sensitive areas like Schools, hospitals to be provided with suitable noise barriers and safety measures, prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement during construction and their effectiveness to be checked. NO material or waste shall be stacked in CRZ areas & near rivers. All applicable regulations & guidance to be followed	PIU/PMC, Contractor	Pre-construction phase	Site inspection	Location and its access; and Basic facilities and civic amenities.	Periodically
Appointment and Mobilization of Environment & Safety Officer	(i) The contractor will appoint qualified and experienced Environment & Safety Officer (ESO), who will be mobilized prior to start of works. (ii) ESO will dedicatedly work and ensure implementation of Environmental Management Plan including Occupational, Health and Safety measures during the project implementation.	Contractor	Pre-Construction Phase	Review reports and records	No compliance at site	One time

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
Submission of updated environmental & social management plan (C-ESMP)/ ESMP implementation and reporting	(i) Before starting the work, Contractor shall prepare/update contract and site specific ESMP (C-ESMP) including: • Location wise Occupational Health & Safety, Community Health & Safety plans shall be prepared by the contractor as part of the updated ESMP. • Site specific Hazards may be identified prior to start of works shall be done and be included in the updated ESMP. • Contractor to prepare SEP, LMP, WMP as required. (ii) Contractor to carry out HIRA (Hazard Identification and Risk Assessment) before starting works, OHS, Waste & sludge Management Plan, trainings, green belt for all facilities, work permit for excavations, work under water including lighting, type of PPEs & hazard assessment, confined spaces work on heights, trench/ excavated area management, lighting, restoration of roads after laying pipes, flag men, and lighting for large equipment's, works under / near water. All workers staff to be trained in OHS during emergencies & heat waves. (iii) Submission of updated ESMP to the PIU/PMC prior to start of construction. (iv) Supervisor to ensure ESMP implementation. (v) Timely submission of monthly monitoring reports including documentary evidence on ESMP implementation such as photographs. (vi) Contractor to submit Labour Management Plan (LMP), Waste Management Plan (WMP), Stakeholder Engagement Plan (SEP), Traffic Management Plan, etc as required along with Contractors ESMP. (vii) The contractor to update ESMP, if there is any change in the design and sites.	Contactor/ PMC	Project cycle	Review of reports and records	Compliance at the site	One-time / As and when need arises

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
Barricading working site	(viii) Ensure that the construction site should be barricaded at all time with adequate marking, flags, reflectors etc. to isolate it from other operating areas; and (ix) Barricade the pipeline route and identified construction areas at OHT sites prior to construction activities.	Contractor	Prior to start of construction	Site inspection	Proper barricading in place; and Accident or casualty reported	One time
Traffic management	(i) Route for use by construction traffic within site to be planned with proper signage, flagman, barriers and safety to minimize encountering of workers with vehicles as per National Road Safety Policy 2010. Route for movement of heavy machinery shall be designated to avoid the soil compaction in other areas; (ii) All vehicles deployed at site shall be certified for pollution under control (PUC), undertake regular maintenance of vehicles; (iii) Transportation of construction material will be generally scheduled in night when the traffic is minimum; or else have adequate traffic management ensured with the help f Traffic Police and additional flagmen/support (iv) Holding area shall be provided within the site for vehicles waiting to deliver loads at site to avoid queuing outside the site; (v) Ensure that the vehicles follow speed norms of the traffic department; and (vi) Investigate and respond to complaints about traffic.	Contractor, PIU/PMC	Construction phases	Review traffic management plan; and Site inspection	Implementation of traffic management plan adequately; Number of complaints received; and Incidence of accidents	
Construction of Head works	(i) No appreciable change to the river course shall occur due to construction of infiltration wells. (ii) The cofferdam will be provided for construction of head work without any disturbance of river water flow.	Contractor, PIU/PMC	Construction phase	Site inspection; and Review the material record maintained.	No appreciable change to the river course.	Periodically

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(iii) Ensure that the stream is not obstructed, affecting the downstream users due to cofferdams, etc or any disturbance due to works etc. (iv) Establish the baseline water quality prior to initiation of construction and to be periodically monitored. (v) After completion of work, ensure the restoring of river bed to its natural shape free from any debris or construction junk material that may obstruct the flow.				Number of complaints received;	
Noise from vehicles and machineries	(i) Servicing of all vehicles, machinery, power generating equipment shall be done regularly as per the manufacturer's guidelines and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced; (ii) All machines to be used shall conform to the relevant Indian Standards (IS), will be free from patent defect, kept in good working order, properly maintained and inspected regularly; (iii) Acoustic enclosure measures will be provided during operation to reduce noise level of machinery and DG set; (iv) Construction activities shall be carried out in a planned manner restricting high noise generating construction activities only during daytime; (v) Contractor will maintain the proper record for all the construction vehicles which shall have the valid fitness certificate, NOC, insurance, etc. (vi) Ensure noise level in the residential and industrial areas within the permissible limit; Regular monitoring of noise shall be conducted at site during the operations of machines and equipment; and (vii) Technicians/mechanics working on noise generating machineries will use PPEs such as ear plug, muffler, etc.	Contractor, PIU/PMC	Construction phases	Review of monitoring records Random Noise measurements	Level of noise generated; and Number of registered complaints	Regularly

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
Air quality	(i) Maintain all vehicles, DG sets/generators and other equipment in good working condition to minimise GHG emission, exhaust fumes, etc.; (ii) Avoid excavation, handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present; (iii) Water sprinkling, cover dumping and stockpiles of lose material with plastic sheets or nets, particularly in windy conditions should be used to reduce airborne dust at construction sites; and (iv) Prevent burning, fire, use of wood for cooking in the project sites to avoid air contamination.	Contractor	Construction phases	Site inspection; Incidence of air pollution; and Review of fuel emission control measures.	Fuel emission from vehicles; Air pollution mitigation measures followed; and Number of complaints received.	Regularly
Protection of lakes/ water bodies/ Surface water quality	(i) Contractor shall ensure that all vehicle/ machinery and equipment operation, maintenance and refueling will be carried out in such a manner that spillage of fuels and lubricants will not contaminate the waterbodies and construction of pipe carrying bridges across the rivers/ waterbodies; (ii) Storage of fuel and lubricants shall be away from waterbodies. (iii) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management (iv) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (v) Waterbodies need to be cordoned off by using protective barriers such as green cloth and subsequently plantation; and (vi) Install temporary silt traps, oil traps, or sedimentation basins along the water leading to the water bodies;	Contractor	Construction phases	Site inspection; and Review of spillage control measures.	Fuel or lubricant spillage; and Changes in water quality water pollution mitigation measures followed.	Regularly

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(vii) Dispose any wastes generated by construction activities in designated sites as per C&D Waste Management Rules, 2016; (viii) Construction works shall be restricted during the monsoon seasons. (ix) Conduct surface quality inspection waste to the Environmental Monitoring Plan (x) In case of waterlogging, water will be pumped out during the construction of pipelines with adequate safe precautions to workers, communities.					
Protection of archaeological and heritage	(i) For this project, excavation will occur in project sites for headworks, laying pipelines, and for construction of OHTs. (ii) There are no protected monuments present within the project area. However, during construction adequate precautions are to be taken during works near temples and other religious structures. Further, in case chance finds are recognized during excavation, all necessary measures are to be taken to ensure they are protected and conserved. (iii) Construction contractors follow these measures in conducting any excavation work. • Conduct training to impart knowledge and Create awareness among the workers, supervisors and engineers about the significance of archaeological, paleontological and geological aspects and the applicable Indian Treasure Trove Act, 1878 and chance found during excavation work. • The fossils, coins, articles of value of antiquity, human skeletal and other remains or things might be exposed during construction activities. In such situation, stop the work, do not remove and damage any article.	Contractor, PIU /PMC	Construction phases	Site inspection; and Actions taken by the workers, PIU and ASI.	Discovery of archaeological/ paleontological material; Level of awareness among workers; and Protection and reporting of identified material when discovered.	When occurrence of chance finding

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	• Stop work immediately to allow further investigation if any finds are suspected and take any action they require to ensure its removal or protection in situ. • Inform the concerned authority (Archaeological Survey of India) immediately to take-action per referred Act and recommence the work after receiving written permission; and Also, prevent any type of impact on the cultural heritage, monument, etc.					
Safety of workforce Occupational Health - facilities to the labourers	(i) Adequate precautions shall be taken to prevent the accidents from the machineries. All machines shall confirm to the relevant Indian Standards Code and shall be regularly inspected for its working condition; (ii) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil. (iii) Provide job specific safety induction training, including environmental awareness and ensure daily toolbox talk to workers at the working area; (iv) Technical experts / design engineers to Check if discharge / supply pipes are as per specifications, ad review any chances of burst. Awareness shall be given to workers and road/road side users on such safety aspects. Design changes should be approved prior to implementation (v) Design changes need to be validated and signed off by engineer (vi) Pressure testing procedure should be approved by supervising Engineer (vii) Excavations to be backfilled prior to testing or barricaded to keep out members of the public (viii) Ensure availability and mandatory use of PPEs at the site;	Contractor, PIU/PMC	Construction phases	Site inspection; and Observation of workers with PPE and safety measures while working on work site.	Quantity and timely supply of PPEs; Awareness level about the use of PPEs; and Incidence of injury, accident, infirmity.	Everyday

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(ix) Use of protective footwear and protective goggles by the workers involved in mixing of materials like cement, concrete etc. at sites; (x) Use of earplugs by the workers exposed to loud noise, and those engaged in crushing, compaction, concrete mixing operations; (xi) Ensure sufficient quantity of all PPEs, necessary safety appliances such as safety goggles, helmets, boots, safety belts, ear plugs, mask, etc. to workers and staffs; (xii) For workers working at elevated levels (@6 feet) like in OHTs, ensure adequate fall protection system like guardrails, equipments including safety harness, safety nets etc and safe working platform are provided. (xiii) Adequate measures and care to be taken while approaching any open water bodies for construction of bridges. Ensure railing around such sites are intact and in good condition; and (xiv) The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) and applicable laws of India and Tamil Nadu state as applicable. (xv) All labourers shall be provided periodical training on day to day work, equipment handling, emergency preparedness, managing heat stress during construction. (xvi) Contractor shall have tie-up with nearby hospitals for periodical health checks of the labourers and for emergency. (xvii) Names of such hospitals be displayed at prominent location.					

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(xviii) Health check up of all newly appointed staff be done once through these hospitals followed by 6 monthly check up.					
Work-zone safety Management	(i) Temporary barricades shall be provided to delineate construction zone as well material stacking areas. The construction site and the labour facility shall be appropriately barricaded to prevent entry and accidental tress-passing of workers, staff and others into the construction sites. (ii) Ensure adequate fall protection system like guardrails, safety nets etc and safe working platform are provided. (iii) All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor. (iv) Adequate signages shall be provided indicating the work and type of precautions required. (v) Proper retro reflective warning signage will be installed on the access road next to the construction site about movement of construction machinery and vehicles. (vi) In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro reflective signage shall be displayed in vermicular language and English. (vii) Entry of unauthorized persons should be prevented. (viii) Excavations will be adequately barricaded and well lit – with signages/info boards. (ix) There shall be adequate lighting arrangement at night and adequate barricading to prevent mishaps after construction activity ceases for the day. (x) A readily available first aid unit with necessary supplies, drinking water, resting shed, sanitation etc shall be made available in every work zone.	Contractor, PIU/PMC	Construction phase	Site inspection	Availability of safety measures Absence of safety Incidents	Every day

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(xi) On Confined Spaces (all confined spaces as may be required for laying pipes, or utility shifting or crossing other utilities, works under river): (xii) Contractors shall identify, assess and manage the risk of entering and working in a confined space or in oxygen poor environments. Including the following: - Signage on the confined spaces - A Confined Space Register - Confined space entry permit system - Carrying out a confined space entry risk assessment before entering - Safe entry and exit points - Hazards and controls when working in the confined space including Ventilation (natural and mechanical) - Safe emergency response procedures including the need for an emergency rescue plan tailored for each entry into a confined space and that is focused on allowing safe recovery without putting the responder at risk - Training and competency - Isolation of potentially hazardous services (like water, gas, electricity etc.) prior to entry PPE such as Self-Contained Breathing Apparatus (SCBA) - Air testing and monitoring before entry and then during the work - Communication protocols (xiii) Undertake targeted awareness using appropriate language and formats on entering and working in confined spaces					
Emergency response to manage	(i) Contractor shall ensure efficient communication system in place which will be required during occurrence of any natural hazard;	Contractor, PIU/PMC	Project life cycle	Inspect attendance register for	DMP in place; Communication system in	When required

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
cyclone and other disaster conditions	(ii) Evacuation plan shall be in place for the site; (iii) Evacuation plan or route is displayed clearly through signs or picture at prominent places within the sites; (iv) Ensure effective coordination within the workforce and concerned departments and display contact number of concerned persons at prominent places; and (v) Conduct training program and mock drills to workers to deal with the disaster situations due to occurrence of cyclones and tsunami.			training program; and Inspect fire extinguishers and certificate	existence; Display of evacuation route; Capacity of workers to manage; and Disaster and emergency situations	
Loss of access	(i) The contractor shall ensure that access to connecting roads; market, residence and other places should not be blocked. In case, it is unavoidable, then alternate route should be provided to people. The community should be made aware about the diversion plan along with expected deadline for the completion of work. After completion of the work, the access should be restored as per original condition. (ii) The contractor is required to provide notice to the shop owners of the need to shift kiosk/wares displayed on ROW as soon as the work plan is ready with minimum 7 working days. (iii) No works can be commenced unless 100% shifted in sections ready for implementation.	Contractor	Construction	Visual inspection	Crossing/ access closed	Regularly
Site clearance and rehabilitation/ Post-construction clean-up	(i) Remove all construction equipment, vehicles, surplus materials, site office facilities, temporary fencing, structures and other items from the project site including pumping stations and lifting stations; (ii) Clean up and remove any spills and contaminated soil in the appropriate manner; (iii) Do not bury discarded materials on site or on any other land not designated for this purpose;	Contractor	After completion of construction phase and operation phase	Site inspection; and Review of record of activities upon completion of construction phase	Restoration of construction sites in original condition; and	Weekly

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	(iv) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (v) Level the disturbed area and restore to a condition resembling its natural profile; and (vi) Ensure site is fully clean and tidy before the exit and prior to its handover to the officer of PIU and other authorized persons.			and commissioning phase	Sites are fully rehabilitated prior to commissioning of project	
Operation and maintenance of distribution system E-Waste management	(i) Get all required Permits for Operations (ii) Establish regular maintenance program, including: ● Regular cleaning of grit chambers and lines to remove grease, grit, and other debris that may lead to water backups. Cleaning should be conducted more frequently for problem areas. ● Inspection of the condition of storage reservoirs (OHT's) and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals; frequent line blockages; lines that generally flow at or near capacity; and ● Monitoring of water flow to identify potential inflows and outflows ● Periodical monitoring of water quality prior to distribution. (iii) Develop an Emergency Response System for the water system leaks, burst and overflows, etc. (iv) Provide all necessary personnel protection equipments to the O&M staff. (v) Prepare Safety plan in operating the network including Chemical handling- storage & use and implement. (vi) Measures for chemical handling shall include ● display of safety data sheet at sites where storage/usage proposed,	Cuddalore Corporation	Operation and Maintenance	Site inspection Review of records	Nil grievances/ incidents	Regularly

Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	● Providing precautionary measures, accidental release measures etc at sites. ● Use of necessary PPEs by the staff/Operators ● Display of appropriate labels, instructions ● Training the operators on the chemical safety (vii) Provide necessary training to the O&M staff/ operators regarding health and safety during O&M activities including chemical handling, storage and disposal. (viii) Carryout regular monitoring of the distribution water quality and in case of any quality concerns, treatment shall be ensured so that it is in line with Water Quality prescribed by authorities for use. (ix) Applicable permits if any applicable for the O&M activities shall be listed and be monitored for validity. (Source, chemicals handling, waste disposal, O&M contractor permits etc) (x) Necessary ESHS measures to be included in the O & M contract scope (xi) A detailed Waste management plan for various types of wastes shall be prepared by the ULB for the O&M phase and all the wastes generated shall be handled in line with the plan. (xii) E-wastes generated during the O&M phase of the project (due to repair and replacement, including electrical and electronic items used in the SCADA) shall be handled by the ULB in accordance with the provisions of E-waste Management rules, 2022. (xiii) Contractor shall report to PIU every quarter or as required on water quality & EHS during O&M					

The cost of ESMP is estimated to be Rs. 49,691,630.

To monitor the extent of environmental impact of the proposed project, the contractor has to periodically monitor the ambient environmental quality along the proposed project area.

7. Stakeholder Engagement and Grievance Redressal Mechanism

Stakeholders engagement is an integral part of developing an understanding about the project and the associated risks and impacts as perceived by the public. It helps in planning and setting up priorities for project management.

Public disclosure

The awareness for judicious use of water will be created by the PIU and contractor among the beneficiaries, potential temporary economic impacts and other stakeholders in the project area. Also, the details related to project impacts and assistance and safety measures during construction shall be made available to the affected population through meetings and distribution of pamphlets in local language.

Public consultation

During project preparation:

FGD was carried out with members of the Cuddalore Ladies Tailoring Industrial Co-operatives Society Ltd. There were women participants from ward number 7,8, 9, 10 and 12 located in Zone 4 in Manjakuppam. They have water connection in streets but not household connection. People are suffering for accessing drinking water. The existing water connection is only from 6 am to 8 am and it affects their work schedule. They often go late for work and their children also get late to school because of this reason.

The quality of water is poor, it is in pale yellow colour and salty, cannot be used for drinking purposes and hence they rely on packaged drinking water for drinking (rs. 10). The ULB is supplying additional water through tankers who charge Rs. 7 per pot and they can buy as many pots based on their affordability and use it for drinking. Most of them also have borewell water but it is salty, and they use it only for cleaning and toilet use. Participants also pointed about the salt water intrusion in ground water.

During construction:

PIU proposes to conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings, as required, may be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. Project information and construction schedule shall be provided to the public at work sites. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor shall provide prior public information (in Tamil and English) about the construction work in the area, once 7 days prior to the start of work and again a day before the start of work via pamphlets. At the work sites, public information boards is also be provided to disseminate project related information.

Grievance Redress Mechanism

A common GRM will be in place to redress social, environmental or any other project related grievances. Two tier GRM shall be constituted.

Grievance Redress Committee (GRC)

1. 1st level grievance redress: Comprises of
    - PIU Site Engineer

- Safeguard Specialists from PMC
- Contractors site engineer & EHS. To resolve issues on-site in consultation with each other.

2. 2nd Level grievance redress: The Project level GRC shall be constituted with three persons (preferably one of them as woman).

The GRC would assist in amicable settlement of issues/complaints raised by the aggrieved person/ Potential Temporary Economic Impacts without any interruption to the project implementation.

The Project Manager supported by the EHS Officer stationed at the project site will be the first contact person for the d local residents, who will try to settle the concerns of people immediately. The Project Manager will report to the EE/PIU and PMC, who will help, and initiate actions required to resolve the complaints received orally or in writing. The cases not resolved within one or two weeks will be referred to the GRC for taking decision within the four weeks or stipulated time as deemed appropriate.

The concerns and complaints of the labourers will be directly redressed by the Project Manager of the Contractor. The cases not being resolved by the Project Manager or the higher management of the contractor will be presented to the GRC to settle the same with a consultative approach.

The grievances form in Tamil and English including the details of Complaint Receiving Officer (Convenor) will be made accessible at public places.

Institutional Mechanism

The implementation arrangement for this project is as below.

PIU

This sub-project will be implemented by the Cuddalore Corporation. The PIU will be established in the Cuddalore City Municipal Corporation for implementation of this project. PIU will have adequate staff including designated officials as E&S officers to monitor ESMP implementation.

PIU will supervise activities of Environmental and social safeguards, ESHS for ssssssssensuring adoption and compliance of ESSA and report to TNUIFSL.

PMC

A PMC will be appointed and will assist the PIU in the implementation of the project. The PMC will have dedicated Environmental, Social, Gender and ESHS specialists and will supervise implementation of the ESMP, sensitize contractors on ESHS, Safeguards Capacity Building. PMC will prepare periodical progress reports, flag critical issues to PMU/PIU.

CONTRACTOR

The contractor will also prepare Contract specific ESMP. Contractor will appoint ESHS personnel who along with the Project Manager be responsible for implementation of Environmental and Social management plan and mitigation measures and submit the compliance report to PIU.

1 Introduction and Background

A. Project Background:

Cuddalore City is the Head quarters of the Cuddalore District. It is located at the estuary of rivers Gadilam and Pennaiyar with Bay of Bengal. The Extent of the Corporation is 26.80 sq.km. The corporation consists of 45 wards and the population as per 2011 census is 173636. The salient details of the corporation are provided below.

Table 1 Salient Details of Cuddalore City Municipal Corporation

Description	Details
Name of the Local body	Cuddalore
Area of town	27.69 Sqkm
No. of Wards	45
Population Census 2011	173636
Frequency of the water supply (i.e.: Daily/Alternative days/Once in 4 days)	Daily
Present Quantity of Water supply (MLD)	17.8 MLD from local Bore Well to OHTs
Present Per capita Supply (LPCD)	93 LPCD
Total length of Road including SH, NH (Km)	35.58 KM
Length of distribution system pipes (Km)	208 KM
Length of Pumping Main (Km)	60.68 KM
Total Capacity of O.H.T. / Nos.	114.45 LL / 24 No.
Total No of House Holds (Nos.)	49515
Total No. of House service connections (Domestic/Commercial/Bulk) (Nos.)	30000

M/S Sathyam Engineering was appointed as consultants for the preparation of DPR for Providing Improvements to Existing Water Supply Scheme to Cuddalore City Municipal Corporation.

B. Project Area:

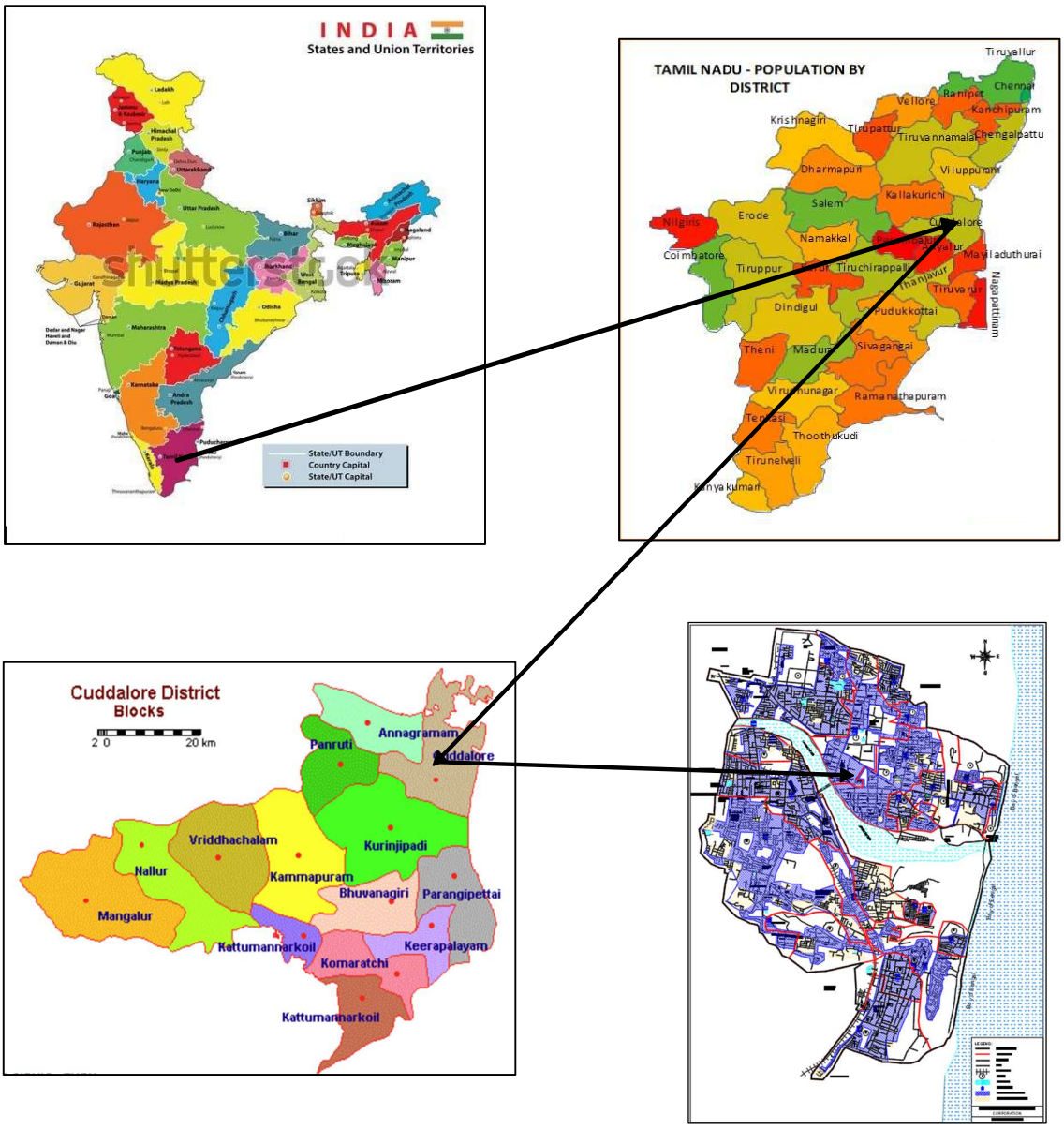


Figure 1 Index map Showing Cuddalore City Municipal Corporation

1.1 Linkages and Connectivity

Cuddalore is well connected by road. The town is located at 200Km away South of Chennai. The state highways SH141 pass through Cuddalore. Regular buses from Vridhachalam to Tholudur road are passing through this town. The town is well connected by road and rail with adjoining urban centers viz. Chidambaram, Vridhachalam, Panruti, Nellikuppam and Villupuram. Pondicherry is at 22Km in the North by road. The Cuddalore O.T.junction and Thiruppathiripuliyur railway stations in Cuddalore provide vital passenger link with various parts of the State. The bus terminus is very close to the Thiruppathiripuliyur railway station.

C. Project Details:

1.2 Project Objective

The objective of the assignment is to study, analyze, design and prepare DPR for providing 24/7 in selected zone of Cuddalore Municipal Corporation by undertaking a technical, financial, economic, environmental and social study, detailed designs, drawings, cost estimates and bidding documents for planning and implementation. The consultant shall also study the existing water supply systems including projects which are under implementation.

1.3 Rationale for the project:

The existing distribution system was laid long back, intermittent supply and the required residual pressure as per 24*7 scheme is not met with in some of the zonal nodes in all the zones. In this context, as per the orders issued by Government of Tamil Nadu, to convert intermittent supply to continuous supply, this project is selected in one of the zones to provide 24*7 water supply. Based on the site visit held with the municipal authorities and site visits, Zone 4 was identified for this project.

Zone 4 has a total administration over 6761 houses spread over ana area of 1.8 sq. km. Water tariff collected per connection per month is Rs. 120 to Rs. 360 for domestic and commercial respectively. The mail source of existing water supply for Zone 4 depends on Chavadi Head Works from infiltration gallery. Of the existing two infiltration galleries one is not in use. The hydrogeological investigation also reveals that the quality of ground water has deteriorated owng to excess iron content. Because of the poor quality of water and intermittent water supply people are dissatisfied with the existing services. As water is supplied once in few days or only for few hours in a day the water stored for use during non-supply timings is likely to get contaminated.

1.4 Project Details:

To meet the ultimate demand of 3.48 MLD, Zone 4 capacity is designed. Water pumped from 5 of interlinked proposed bore wells is expected to yield 260LPM and the 3 numbers of infiltration well will yield 750LPM. The water received from the 5 bore wells and 3 infiltration wells will be received in the 4 LL capacity sump located near Thenpennai River and water will be transmitted to OHTs through the newly proposed feeder mains. The existing OHT is not retained as it does not have the desired staging height. However, abandoned existing OHTs shall be utilized as water storage for other water supply scheme during drought.

Proposed project components are as follows:

Proposed Project Components
Providing Infiltration wells (3 Nos) of 4.5m Dia of 7m Depth at Thenpennai River
Providing Bore wells (5 Nos) of 200mm Dia of 200m Depth at ThenPennai River including Pump set, etc., Complete
Construction of Sump of Capacity 2.00 LL including Pump room of size 6m x 9m
Providing Pump sets for Proposed Infiltration wells and Sump
Providing Pumping main from Infiltration wells, Bore wells to proposed Sump (2519 m)
Providing Feeder main from Proposed Sump to Existing OHT(8030 m)
Construction of OHT of capacity 12 LL at Pennaiyar Road 1st Cross
Providing Distribution System with DI and HDPE Pipes (33.897 Km)
Providing Flow control Valve, Sluice Valve, Electromagnetic Flow Meter & Chamber - For Distribution System
Providing House Service connections (6761)
Road restoration with cement concrete 1:4:8, 7.5 cm thick, using 20 mm HBS metal and cement concrete 1:2:4 , 10 cm thick using 20 mm HBS including cost of all materials laying, curing (Total Length: 30.53 Km)
Providing Complete SCADA system for water supply system (Pressure Sensor, Quality Sensor, Monitoring and control units)

1.5 Source

As per the hydrogeological investigation, the existing source Chavadi in recent past the quality of ground water has deteriorated owing to excess iron content. The iron content in the ground water increases year after year owing to over exploitation. The formations is releasing the iron from the formation water slowly thereby the quality of ground water become increasingly not potable.

Based on the Geophysical investigation study, Geology and Hydrogeology of the area in between Vellambakkam - Azhagiyanatham bridge to Erandayravillagam bridge located 3 nos. of Infiltration well has identified as water source for Water zone – 4 area. The expected yield of each infiltration well is approximately 750 lpm, and by adopting 16 hours of pumping, there will be possibility to extract 2.16 MLD of water.

Based on the geology, hydrogeology and geophysical data interpretation, it is ascertained that, the river Thenpennaiyar, near Azhagiyanatham village is favourable location to create 5nos. of deep sedimentary bore wells to a depth of 200m with 200mm dia. The expecting yield of each sedimentary borewell is around 300 lpm with adopting 16 hours of pumping, there will be possibility to extract 1.44 MLD of water.

In order to meet the ultimate demand of 3.48MLD, Zone-4 sump capacity is designed. Water pumped from 5 nos. of interlinked proposed bore wells with yield of 250LPM and 3 nos of infiltration well with the yield of 750LPM will be pumped to Proposed sump of 4 LL capacity and to be pumped to OHTs through 2 nos. of 50 HP HSC pump sets of 3000 LPM with 50 m head (1W+1S). The water from wells is being pumped for 23 hours daily to the OHTs.

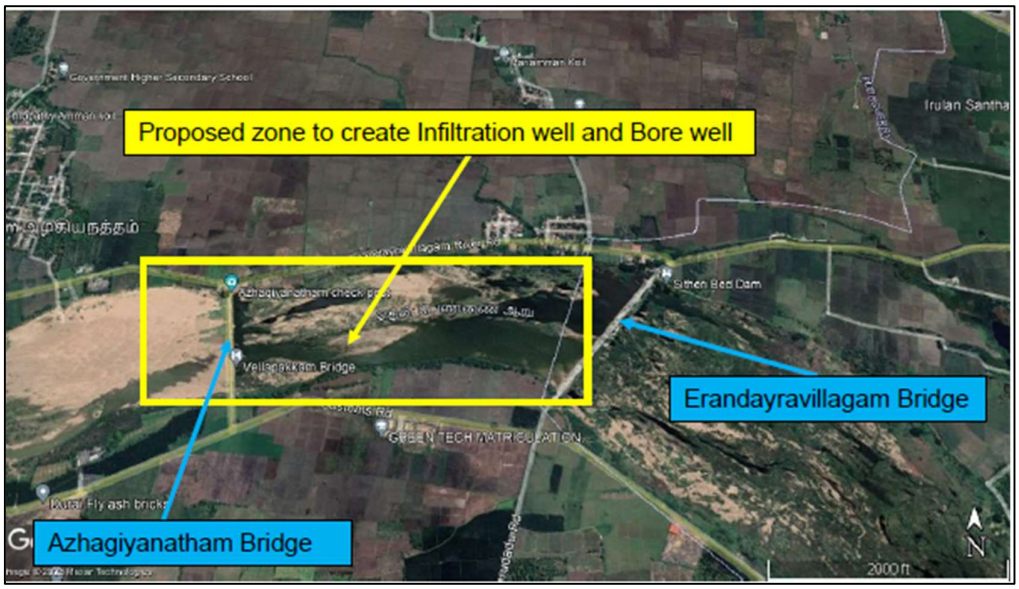


Figure 2 Proposed Source for Zone -4 near Azhagiyanatham

Test test rest

The water supply source is located in Azhagiyantham village in Thenpennaiyar river. The source is safe as the disposal of present & proposed UGSS for Cuddalore is downstream of Thenpennaiyar river which is about 9.33 km from the source.

Figure 2 A – Map showing locations of Water supply source, STP disposal

1.6 Transmission Main

The water received from the 5 Nos Bore wells and 3 IFW will be received in the 4 LL capacity sump of located near Thenpennai River and the water will be transmitted to OHTs through the newly proposed feeder mains.

Table 2 Details of proposed feeder mains

S.No.	Pipe details	Length in m
1	250 mm DI K7 pipe	8030 m
	TOTAL	**8030 m**

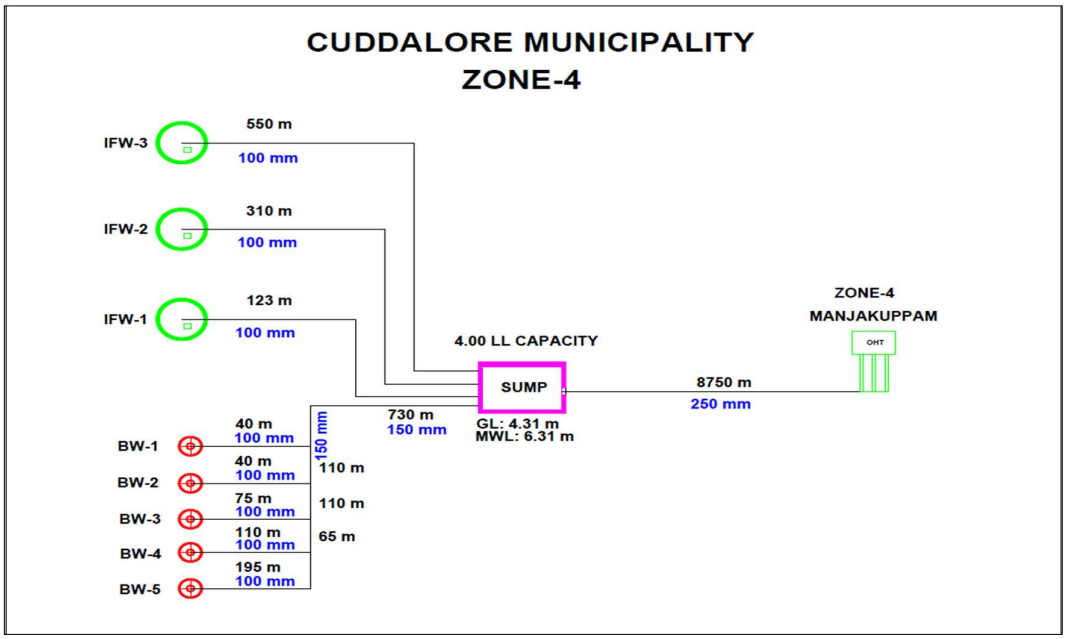


Figure 3 Proposed Water Supply system`

1.7 Proposed Distribution system

Zone -4-The selected zone 4 is designed as single distribution zone.

The pipes are laid down along side of the existing road and in some places at both the sides of the road. The major components of distribution system are Storage/ Service Reservoir and distribution pipeline. The existing distribution system has been analyzed for the proposed design flow in term of adequacy and condition of the system.

In other words, adequacy of storage/Service Reservoir capacity and carrying capacity of pipeline and condition of component to serve for the proposed ultimate demand has been analyzed.

1.8 Service Reservoir / additional Storage facilities.

The storage requirement for the intermediate period is 10.25 LL. Existing storage is of 11.35 LL is not considered since it is not of desired staging height. Hence the total capacity of New storage reservoirs capacity will be 11.35 LL under this project. Existing OHT is not retained as it is not desired staging heights.

The location of Proposed reservoirs with capacities for Zone-4 are given in Table below:

Table 3 Details of Service Reservoir Capacity for the Design Period

Zone No	Zone Name	New/Existing	Capacity in LL
4	Pennaiyar Road 1st Cross	Proposed	11.35

1.9 LAND AVAILABILITY

Land availability at the identified location in terms of the elevation preference is a major tool identified at the start of the project in consultation with the project area. The proposed Sump is planned to be constructed to meet the demand for ultimate year. Land availability for the proposed Sump has been confirmed by Local Body. The details of land ownership for the proposed Service reservoirs are provided in the Table below.

Table 4 Land Ownership Details of Service Reservoirs

Zone No	Location Name	GLSR/ES R/Sump	Land Ownership
Sump	Near Thenpennai river	**New**	Municipality Land
OHT	Pennaiyar Road 1st Cross	**New**	Municipality Land

1.10 Proposed Distribution Network System:

1.10.1 Zoning of Distribution System

Zone-4

The entire water distribution system is designed as a single Zone. The total water demand for proposed zone based on its population and per capita water supply proposed is furnished in the Table below.

Table 5 Details of Zone wise Water Demand for the Proposed System

Zone	OHT Location	Population		Demand (ML)	
		Int	Ult	Int	Ult
4	Pennaiyar Road OHT	20721	23207	3.077	3.446

The proposed distribution Zones-4 will have 33.897KM length of water supply distribution network of HDPE Material.

1.10.2 Establishment of District Metering Areas (DMA)

Zone 4 - Based on the above design criteria, 5 DMAs have been proposed for the local body for 1 water zone. Details are DMAs are given below

Table 6 Zone wise DMA Count

ZoneNo	Zone Name	No of DMAs
4	Pennaiyar Road	5
Total		**5**

The hydraulic simulations were run under average and peak flow demand conditions, the details of DMAs and the commanding areas are presented below:

The DMA is hydraulically isolated and ensured that it have one entry point and, in each DMA, entry points, provision for Electromagnetic flow meter, PRV and pressure sensors will be fixed to monitor and control the flow, pressure in the DMAs, so as to facilitate equitable and continuous flow in all parts of the DMA. All this equipment is proposed to be housed in a masonry chamber. Multiple feed DMAs are in principle have been avoided, however, in exceptional situations where for hydraulic or other reasons, more than one feed entry has been provided in the DMA.

The DMA concept was applied in the proposed system and the design has been finalized accordingly the salient details are as follows

Table 7 DMA Details Zone

ZONE	DMA NO	Sum of Length (m)	Min of Diameter (mm)	Max of Diameter (mm)	Min of Ground Level (m)	Max of Ground Level (m)	Max of Pressure(m H2O)	Min of Pressure (m H2O)2	Difference
4	DMA-1	14,027	110	160	-0.95	5.29	18.31	12.75	5.56
	DMA-2	8,454	110	250	0.22	5.56	18.4	13.61	4.79
	DMA-3	5,209	110	180	0.89	6.18	19.7	14.5	5.2
	DMA-4	2,130	110	125	0.12	3.51	17.09	12.28	4.81
	DMA-5	2,269	110	110	0.09	1.09	16.89	15.78	1.11

1.10.3 Provision of flow control valves and pressure reducing valves

For efficient management of water supply system and equitable distribution of designed quantity of water supply to the service reservoir and in the distribution system it proposed to provide flow control valve and pressure reducing value in the proposed system, accounting the variation in pressure at deliver end of the system. So, it is proposed to provide flow cum pressure control valves at inlet the reservoir/sump and entry of DMA in distribution system to achieve equitable supply and required residual head. These valves shall have compatibility to link with SCADA system in later stage.

Table 8 Details of Flow Cum Pressure Control Valves at inlet of Sub Zone/ DMA

Zone	Diameter of valves(mm)	Total(Nos.)
Z-4	160	2
	140	1
	110	1
	110	1

To achieve the equitable supply of design flow to the reservoir/sump/DMA, flow control device to be installed at the delivery point of pumping main So, flow cum pressure control valves at inlet of Service Reservoir or Sump / DMA entry needs to be provided. To monitor and control, electromagnetic flow meters (EMF) with PFCM valves with Isolation sluice valves with manual and remote operation are proposed in feeder lines at all the inlet to Each OHTs A typical Drawing of this is shown below,

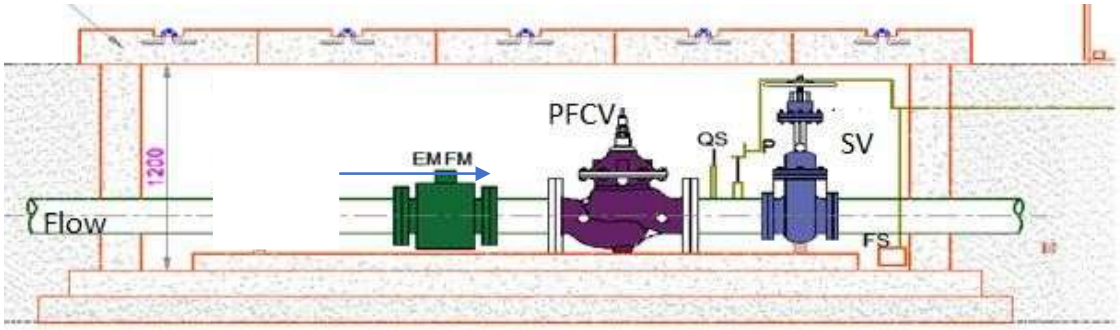


Figure 4 Typical DMA entry point Arrangements

1.10.4 Proposal for Flow Monitoring and Non-Revenue of Water (NRW)

To assess the Non-Revenue of Water, performance of pump set and monitor the flow pumped from each headwork and water delivered to intermediate sump or to Service Reservoirs, it is proposed to install flow meter and pressure gauge at delivery of each pump set (for infiltration well pump set, intake pump set and intermediate booster pump set) and at inlet of service reservoir / intermediate sump. This can be integrated with SCADA so that, the flow can be regulated, water losses in pumping main can be assessed and if there is no flow while pumping then the pump set can be tripped or switched off.

1.11 House Service Connection Details

Under the project it is proposed to provide new house service connections of MDPE pipes material. The details of meters to be provided in the table below:

Table 9 Details of Proposed House Service Connection

Zone	OHT Location	No of DMA	Base year Population	No of House Hold
4	Pennaiyar OHT	5	18236	6761

	Total	**5**	**18236**	**6761**

1.12 HSC Metering:

Under the project it is proposed to provide metering for all new house service connections. The details of meters to be provided in the table below:

Table 10 Proposed distribution system details

Sl. No	Item Description	Total Corporation area
		Zone-4
1	No of Water zones/OHT	1 Nos
2	Establishment of DMAs	5 DMAs
3	Additional Pipelines and Related accessories with civil works	33897
5	Providing Flowmeter with related Accessories	5 Nos
6	Providing Pressure/Flow control ValveCost with related Accessories	5 Nos
4	House Service Connections	6761
7	SCADA & Instrumentation Items for DMA water distribution management	SCADA works for 5 DMAs/ 1 Water supply zones

1.13 Disinfection system.

In the proposed system it is suggested that the water supplied at the service reservoir will be analyzed for residual chlorine and suitable chlorine dosage system will be provided at each location of service reservoir to maintain proper level chlorination. It is proposed to provide disinfection system with liquid hypochlorite at all outlet of service reservoirs. The disinfection system will consist of one HDPE tank of 500 litres capacity, dosing pump with standby arrangement, required piping and electrical system.

Total number of disinfection system – 2 Nos.

1.14 Miscellaneous items

In all the zones the following items are included at each service reservoirs

- Ultrasonic Level Indicators,
- Bulk Flow meter at outlet of ELSR lightening Arrestor
- Rain Water Harvesting

1.15 Costing

The costing has been done for the work proposed, including replacement of pump set and allied works, which is not in working condition and having less efficiency. The project cost is estimated as Rs. 26.66 Crores.

1.16 Energy Efficiency

BEE pumps as per IS 12615 2011, i.e. energy efficient induction motors.

2 Regulatory Framework

2.1 National and State Regulations

The applicability of regulatory environment relating to Environmental, social and climate change and its relevance to this sub project is analysed in the following table.

Table 11: National and State Regulations on Environmental, Climate Change and Social

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
1.	Wildlife Protection Act, 1972	This Act seeks to protect wildlife, by creating protected areas and controlling trade in wildlife products. Project activities that cross over into protected area regimes then requisite permission must be obtained.	Not applicable.
2.	Water (Prevention And Control of Pollution) Act, 1974 and Tamil Nadu Water (Prevention And Control of Pollution) Rules, 1974	These laws seek to control pollution of water and enhance the quality of water. Under this law, it is mandatory to obtain consent for discharge of effluents and pay consent fees to Tamil Nadu State Pollution Control Board (TNPCB) for any municipal projects causing water pollution.	Applicable. Activities involving emission of pollutants like establishing batch mixing plants require consent from TNPCB.
3.	The Water (Prevention And Control of Pollution) Cess Act, 1977	This Act provides for levy and collection of a cess by local authorities on water consumed by persons or industries to augment resources for Pollution Control Boards.	Provisions are applicable. Cess is to be paid for water consumption.
4.	Forest (Conservation) Act, 1980	Forest (Conservation) Act, 1980 was enacted to halt rapid deforestation and governments cannot de-reserve forest land or direct that it be used for non-forest purposes.	Not applicable. The project does not attracts the provisions.
5.	Air (Prevention and Control of Pollution) Act 1981 and Tamil Nadu Air (Prevention of Control of Pollution) Rules 1983	These laws address the prevention and control of air pollution. Under section 21 of this Act, it is mandatory to obtain consent from Pollution Control Board to establish or operate any industrial operation.	Applicable. Activities involving emission of pollutants like establishing batch mixing plants require consent from TNPCB.
6.	Environment (Protection) Act, 1986	Popularly known as EP Act, it is an umbrella legislation that supplements existing environmental regulations. This law essentially links pollution and natural resource issues.	Applicable.
7.	Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989 (MSIHC Rules, 1989)	These rules aim at providing control for the generation, storage and Import of hazardous chemicals. According to these rules, the user of hazardous chemicals has to follow procedures as stipulated in the rules to prevent and control hazards from such chemicals and to ensure safety	Applicable. Chlorine used for disinfection of water is categorised as hazardous chemical as according these rules and usage of these chemicals above 10 tons attracts the

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
		and permission has to be obtained from the authority concerned for such activity. The list of chemicals and threshold limits of handling falling under the purview of these rules is provided in the schedule to the rules.	provisions of these rules.
8.	Hazardous and Other Wastes Management Rules, 2016	This law addresses handling of hazardous and other wastes that fall under specified schedules and necessitates authorisation for such facilities from State Pollution Control Board. Projects attracting these rules will have to follow the guidelines for handling and disposal of hazardous wastes. Measures include storage on a paved surface in a designated area with adequate secondary containment, with adequate labelling and before it is disposed to TNPCB approved vendor.	Applicable. During the construction and during operation, wastes and used oils will be generated which shall be stored and disposed as per the requirements of the rules.
9.	Public Liability Insurance Act, 1991	This act provides for providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith. .	Applicable.
10.	Bio Medical Waste Management Rules, 2016	This notification by MoEF & CC lays down the method of collection of hospital waste, its transportation and disposal based on scientific methods.	Not applicable.
11.	Fly Ash Notification, 2021	This notification necessitates use of fly ash for various construction activities like road laying, road and flyover embankments, shoreline protection structures in coastal districts, building construction projects etc within 300 kms from the lignite or coal based thermal power plants.	Not Applicable.
12.	Solid waste Management Rules 2016	This notification by Ministry of Environment and Forest lays down the methods of handling Municipal Solid Waste and its scientific disposal. Establishing a facility for disposal requires authorisation from State Pollution Control Board.	Provisions are applicable. Solid wastes generated during construction and O&M will be handled as per the rules.
13.	Construction and Demolition Waste Management Rules, 2016	Construction and demolition waste include waste comprising of building materials, debris, and rubble resulting from the construction, remodeling, repair, and demolition	Provisions are applicable. All C&D wastes generated during construction and O&M

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
		of any civil structure. As per rule1. Every waste generator shall prima-facie be responsible for the collection, segregation of concrete, soil, and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules ((Rule 4 sub-rule (1)) 2. there should be no littering or deposition of construction and demolition waste to prevent obstruction to the traffic or the public or drains (Rule 4 sub-rule (4)).	will be handled as per the rules.
14.	E-Waste (Management and Handling) Rules, 2022	The rules prescribe procedures for manufacture, collection, refurbishing, dismantling, recycling, and disposal of electronic wastes and requires registration in the online portal of Central Pollution Control Board.	Provisions are applicable if any electronic devices are replaced. E-wastes generated during construction and O&M will be handled as per the rules.
15.	Plastic waste (Management & handling) Rules 2016	This rules provides for collection, segregation, processing, treatment and disposal of the plastic waste in an environmentally sound manner, restriction on thickness of plastic sheet or like, prohibition on identified use, extended producer responsibility, marking and labelling requirement, registration of manufacturer, producer, importer, brand owner and plastic waste processor, reducing the plastic waste generation.	Provisions are applicable. Plastic wastes generated during construction and O&M will be handled as per the rules.
16.	The Noise Pollution (Regulation and Control) Rules, 2000	The ambient air quality standards in respect of noise for different areas/zones namely industrial, commercial, residential or silence areas/zones are specified in the Schedule of these rules. An area comprising not less than 100 metres around hospitals, educational institutions and courts may be declared as silence area/zone as per these rules. The noise levels in any area/zone shall not exceed the ambient air quality standards in respect of noise as specified in the Schedule.	Provisions are applicable. The noise levels (during construction and during operation) shall not exceed the ambient air quality standards in respect of noise as specified in the Schedule.
17.	EIA Notification, dt 2006 (S.O.1533(E), dt.14/09/2006) and subsequent amendments	The notification specifies that prior environmental clearance is required for the projects listed in the schedule of the notification before any	Not applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
		construction work, or preparation of land by the project management except for securing the land, is started on the project or activity. The Schedule of the notification lists eight broad categories of projects that require prior environmental clearance.	
18.	Wetlands (Conservation and Management) Rules, 2017	The rules list the wetlands that needs to be protected like those covered under Ramsar Convention, those in UNESCO heritage site, those which are ecologically sensitive etc.	Not Applicable. There are no such wetlands within the project area.
19.	Biological Diversity Act, 2002	This act aims to preserve the biological diversity of India and provides mechanism for equitable sharing of benefits arising out of the use of traditional biological resources and knowledge. As per this Act, a foreigner, non-resident Indian, as defined in the clause (30) of section 2 of The Income-tax Act, 1961, or a foreign company or body corporate need to take permission from the National Biodiversity Authority before obtaining any biological resources or associated knowledge from India for research, survey, commercial utilisation. Indian citizens or body corporates need to take permission from the concerned State Biodiversity Board.	Not applicable. The sub-project location and activities do not attract the provisions of the Act.
20.	The National Green Tribunal Act, 2010	This act provides for establishment of National Green Tribunal for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental. The National Green Tribunal established under this act is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues. The Tribunal shall not be bound by the procedure laid down under the Code of Civil Procedure, 1908, but shall be guided by principles of natural justice.	Not Applicable. There are no such wetlands within the project area.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
21.	Coastal Regulation Zone (CRZ) Notification, 2019	This notification under Environment (Protection) Act, 1986 supplements the law on site clearance by declaring certain zones as CRZ and regulates activities in these zones. Projects attracting this notification shall obtain CRZ clearance for implementation from the authority as required.	Applicable. A section of the distribution network (around 939 m) falls under the CRZ and requires permission prior to start of work in the relevant section.
22.	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	An Act to regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measure and for other matter connected therewith or incidental thereto.	Applicable.
23.	Prohibition of Employment as Manual Scavengers 'and their Rehabilitation Act 2013	This act prohibits construction of insanitary latrines and employment or engaging of manual scavenger for the purpose of manual scavenging. No person, local authority or any agency shall, from such date as notified by the State Government (which shall not be later than one year from the date of commencement of this Act), engage or employ, either directly or indirectly, any person for hazardous cleaning of a sewer or a septic tank.	Not applicable.
24.	National Action Plan on Climate Change	India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change.	Provisions are relevant to this project.
25.	Energy Conservation Act, 2001	Aims to reduce specific energy consumption in different sectors and sets up a specialized Bureau of Energy Efficiency to institutionalize energy efficiency measures, monitoring, and measurement at plant and macro-levels.	Provisions are relevant to this project.
26.	Energy Conservation Building Code (ECBC)	The Energy Conservation Act 2001 that was passed by the Indian Parliament empowered the Central Government to prescribe an Energy Conservation Building Code (ECBC). This code applies to new commercial buildings with a connected load of 100 kW & more or contract demand of 120 kVA or more; Introduces passive design features such as daylight requirements and shading provisions; Introduces provisions of installing Renewable Energy Systems; Sets minimum energy efficiency standards for design and	Provisions are relevant to this project.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
		construction; Encourages energy efficient design or retrofit of buildings .	
27.	Mines and Minerals (Regulation and Development) Act, 1957 as amended in 1972 Mining of Minerals as per EIA notification 2006 and Ministry of Environment, Forest & Climate Change circular as per the Supreme Court Order 27.02.2012	Permission of Mining of aggregates and sand. As per the circular all mining project (including minor minerals) irrespective of their lease areas of operation would now require EC.	Not applicable
28.	The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively. Hence, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument and protected area. In respect of regulated area, the competent authority may grant permission for construction, reconstruction, repair and renovation based on recommendation of the National Monument Authority duly taking note of heritage bye-laws, which shall be prepared in respect of each protected monument and protected areas.	Not applicable. There are no protected monuments or heritage sites within the project area.
29.	The Right to Fair Compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR)	The Act provides for enhanced compensation and assistances measures and adopts a more consultative and participatory approach in dealing with the Project Affected Persons. This act came into effect on 1 January 2014 and the Land Acquisition Act, 1894 stands repealed. The Act lays down procedures for estimating fair compensation of the affected families (and not just the titleholders) due to land acquisition, rehabilitation and resettlement. The Act is notified by the GoTN on 21 September 2017 (G.O. Ms. No. 298, Revenue & Disaster Management (LA-I(1), 20th September 2017)	Not applicable.
30.	The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights)	It grants legal recognition to the rights of traditional forest dwelling communities.	Not applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
	Act, 2006		
31.	The Child Labour (Prohibition and Regulation) Amendment Act, 2016. The Child Labour (Prohibition and Regulation) Act,1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule. Child can help his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vations	Provisions are applicable and are to be complied with during construction.
32.	The Occupational Safety, Health And Working Conditions Code, 2020	This **code consolidates and amends the laws regulating the Occupational safety and health and working conditions of the persons employed in an establishment**. The Act replaces 13 old central labour laws.	Provisions of the Code are applicable.
33.	Minimum Wages Act, 1948.	The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, and Runways are scheduled employment.	Provisions are applicable and are to be complied with during construction.
34.	Workmen Compensation Act, 1923.	The Act provides for compensation in case of injury by accident arising out of and during employment.	Provisions are applicable and are to be complied with during construction.
35.	Equal Remuneration Act, 1979.	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.	Provisions are applicable and are to be complied with during construction.
	State Regulations		
36.	Chennai Metropolitan Area Ground water (Regulation) Amendment Act, 2002	This amendment to the original act was made to impose provision of rainwater harvesting in every building either private or government to augment ground water storage in such manner as may be prescribed. The act also mentions that water bodies, including ponds, lakes, tanks and the like, whether public or private should be used only for the purpose of storage of water and not for any other purposes. These provisions are also included in the Panchayats Act and the Municipal Act.	Not applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
37.	The Tamil Nadu Preservation of Private Forest Act, 1949	Guidelines for extraction of trees from non-forest area stipulates that permission for tree cutting shall be taken from State Forest department.	Applicable. Permission is to be obtained if tree cutting is encountered during project implementation.
38.	The Tamil Nadu Hill Areas (Preservation of Trees) Act, 1955	This Act regulates the cutting of trees and cultivation of land in hill areas of Tamil Nadu, (Coonoor, Kodaikanal, Kotagiri, Ootacamund, Yercaud). Any tree cutting in these areas requires permission from the Committee under this Act.	Not applicable.
39.	The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 and Rules[c] 2015 notified by GOTN.	The Street Vendors Act came into force on March 5, 2014, and seeks to protect the livelihoods of street vendors while regulating street vending. The Act recognizes street vendors of different types including mobile (moving) vendors, stationary (vending from a particular place), natural markets (spaces where buyers and sellers traditionally congregate), vendors with temporary built-up structures, hawkers, peddlers and squatters. It provides for regulation of street vendors, defines the rights and duties of street vendors and requires definition of designated vending zones, issue of certificates of vending and identity cards to street vendors, and proposes vending fees and maintenance charges. Under the Act, each state government is required to define the public purpose for which a street vendor may be evicted and the manner of relocation, manner of giving notice, and provides for a dispute resolution mechanism. As per the Act, planning and regulation of street vending is to be undertaken at town level by the Town Vending Committee. The Act also provides for social audit of the activities of the Town Vending Committee. This act that specifically aims to protect the rights of urban street vendors and to regulate street vending activities. It provides for Survey of street vendors and protection from eviction or relocation; issuance of certificate for vending; provides for rights and obligations of street vendors; development of street vending plans; organizing of capacity building	Applicable if the project components are involved in the designated vending zones.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
		programmes to enable the street vendors to exercise the rights contemplated under this Act; undertake research, education and training programmes to advance knowledge and understanding of the role of the informal sector in the economy, in general and the street vendors, in particular and to raise awareness.	
40.	State Green Committee/District Green Committee	To consider the cutting of trees in public places and public offices. Ref G.O.(Ms).no.38 dated 02.07.2021 of the Environmental Climate Change and Forest (FR.13)Department, Government of Tamil Nadu	Applicable. Wherever tree cutting is envisaged, permission to be obtained.
	CLIMATE CHANGE		
41.	**NATIONAL ACTION PLAN ON CLIMATE CHANGE (30.06.2008)** **TNSAPCC, 31.03.2015**	India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. India, in 2008, has set up National Action plan on climate change (NAPCC) which outlined policies aimed at sustainable growth and dealing with climate change concerns effectively. NAPCC outlines eight national missions to address various adaptation and mitigation measures pertaining to Solar Energy, Enhanced Energy Efficiency, Sustainable Habitat, Water, Sustaining Himalayan Ecosystem, Green India, Sustaining Agriculture, Strategic Knowledge on Climate Change.	Provisions are applicable.
42.	**ENERGY CONSERVATION ACT, 2001**	Aims to reduce specific energy consumption in different sectors, and sets up a specialized Bureau of Energy Efficiency to institutionalize energy efficiency measures, monitoring, and measurement at plant and macro-levels	Provisions are applicable.

Sl. No.	Acts/ Rules/ Regulations	Description	Relevance to this sub project
43.	**ENERGY CONSERVATION BUILDING CODE:**	The Energy Conservation Act 2001 that was passed by the Indian Parliament, empowered the Central Government to prescribe an Energy Conservation Building Code (ECBC). ECBC was launched in 2007 on a voluntary basis by the Bureau of Energy Efficiency (BEE and was revised in 2017. ECBC sets minimum energy efficiency standards for design and construction encouraging energy efficient design or retrofit of buildings without constraining the building function, comfort, health, or the productivity of the occupants and appropriate regard for economic considerations Mandatory Scope Covers commercial Buildings having their Connected Load of 100kW and above or contract demand 120kVA and above and is ECBC is recommended for all new buildings and additions to existing buildings with the total load exceeding 200KW or 120kVA.	Not Applicable.

2.2 Applicable Standards

The applicable environmental standards for the project are provided in this section.

A. AIR QUALITY

National Ambient Air Quality Standards have been notified by the MoEF&CC vide Gazette Notification dated 18th November 2009.

Table 12 Applicable Air Quality Standards

S. No	Parameters	Industrial area, Residential, Rural and Other Area
1	Sulphur Dioxide (SO_2)	80 µg/m^3 (24 hours)
2	Nitrogen Dioxides as NO_2	80 µg/m^3 (24 hours)
3	Particular Matter (PM_{10})	100 µg/m^3 (24 hours)
4	Particular Matter ($PM_{2.5}$)	60 µg/m^3 (24 hours)
5	Ozone (O_3)	180 µg/m^3 (8 hours)
6	Lead (Pb)	1.0 µg/m^3 (24 hours)

7	Carbon Monoxide	4.0 µg/m^3 (01 hour)
8	Ammonia (NH_3)	400 µg/m^3 (24 hours)
9	Benzene (C_6H_6)	05 µg/m^3(Annual)
10	Benzo (a) Pyrene	01 ng/m^3(Annual)
11	Arsenic (As)	06 ng/m^3(Annual)
12	Nickel (Ni)	20 ng/m^3(Annual)

Source: **National Ambient Air Quality Standards (**NAAQS), Central Pollution Control Board

B. AMBIENT NOISE STANDARDS

Ambient Noise level standards have been notified by the CPCB notification dated 14th February 2000. It is based on the 'A' weighted equivalent noise level (Leq) and presented below.

Table 13 Ambient Noise Standards

Category of Zones	**Leq in dB(A)**	
	Day *	**Night +**
Industrial	75	70
Commercial	65	55
Residential	55	45
Silence Zone **	50	40
* Day Time is from 6.00 AM and 9.00 PM. + Note –2 :Night Time is reckoned between 9.00 PM and 6.00 AM ** Silence Zone is defined as an area up to 100m around premises of Hospitals, Educational Institutions and Courts. Use of vehicle horn, loudspeaker and bursting of crackers is banned in these zones. ***Note:*** *Mixed categories of areas be declared as one of the four above mentioned categories by the competent Authority and the corresponding standards shall apply*		

Source: Central Pollution Control Board

C. STANDARDS FOR DRINKING WATER

Table 14 Standards for Drinking Water

	National Standards for Drinking Water (IS 10500:2012)		
Group	**Parameter**	**Unit**	**Max. Concentration Limit**
Physical	Turbidity	NTU	1 (5)
	pH		6.5 – 8.5
	Color	Hazen units	5 (15)
	Taste and Odor		Agreeable
	TDS	mg/l	500 (2,000)
	Iron	mg/l	0.3
	Manganese	mg/l	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)

	Cadmium	mg/l	0.003
	Chromium	mg/l	0.05
	Cyanide	mg/l	0.05
	Fluoride	mg/l	1 (1.5)
	Lead	mg/l	0.01
	Ammonia	mg/l	0.5
Chemical	Chloride	mg/l	250 (1,000)
	Barium	mg/l	0.7
	Sulphate	mg/l	200 (400)
	Nitrate	mg/l	45
	Copper	mg/l	0.05 (1.5)
	Total Hardness	mg/l	200 (600)
	Calcium	mg/l	75 (200)
	Zinc	mg/l	5 (15)
	Mercury	mg/l	0.001
	Aluminum	mg/l	0.1 (0.3)
	Anionic detergents	mg/l	0.2 (1.0)
	Phenolic compounds	mg/l	0.001(0.002)
	Residual Chlorine	mg/l	0.2
Microbial indicator	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml	

Table 15 Water Quality Criteria as per Central Pollution Control Board for surface waters

Designated-Best-Use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	•Total Coliforms Organism MPN/100ml shall be 50 or less •pH between 6.5 and 8.5 •Dissolved Oxygen 6mg/L or more •Biochemical Oxygen Demand 5 days 20°C 2mg/L or less
Outdoor bathing(Organized)	B	•Total Coliforms Organism MPN/100mL shall be 500 or less; •pH between 6.5 and 8.5; •Dissolved Oxygen 5mg/L or more •Biochemical Oxygen Demand 5 days 20°C 3mg/L or less
Drinking water source after conventional treatment and disinfection	C	•Total Coliform Organism MPN/100mL shall be 5000 or less; •pH between 6 to 9; •Dissolved Oxygen 4mg/L or more •Biochemical Oxygen Demand 5days 20°C 3mg/L or less
Propagation of Wildlife and Fisheries	D	•pH between 6.5 to 8.5 •Dissolved Oxygen 4mg/L or more •Free Ammonia (as N)1.2mg/L or less

Designated-Best-Use	Class of water	Criteria
Irrigation, Industrial Cooling, Controlled Waste disposal	E	•pH between 6.0 to 8.5 •Electrical Conductivity at 25°C micro mhos/cm Max.2250 •Sodium absorption Ratio Max.26 •BoronMax.2mg/L
	Below-E	Not Meeting A, B, C, D & E Criteria

2.3 Clearances / Permissions

From review of the existing regulations and their applicability for the project, the clearance/ permits to be obtained for the implementation of the project have been listed below.

Table 16 (a) - Clearances/ Permits to be obtained by Cuddalore Corporation (PIU)

S. No	Proposed activity	Statutory authority	Applicable legislation	Status
1	Highway crossings for laying of pipes.	NH, NHAI, SH	National Highways Rules 1957	To be applied
2	Power sanctions and charging	TNEB	TAMIL NADU ELECTRICITY SUPPLY CODE (as amended up to 31-12-2009)	To be applied
3	Traffic diversion for Construction of feeder mains and distribution system	Deputy Commissioner of Police - Traffic Cuddalore	MoRTH 112 SP 55 of IRC codes	To be applied
4	CRZ clearance to be obtained prior to start of work for section of network falling under the provisions (CRZ area)	MOEF&CC	CRZ Notification, 2019	To be applied
4	PWD/WRD* permission for borewells, construction of infiltration gallery, transformer including site enter upon permission	Public Works Department		To be applied

* Clearance from Water Utilization Committee is not required for withdrawal of water if the quantity is lesser than 1 MGD (3.78 MLD). Since proposed withdrawal of water is 3.6 MLD enter upon permission from PWD will be obtained for head works. All the necessary permissions will be obtained prior to start of work.

Table -16 (b) Clearances/ Permits to be obtained by the Contractor

Sl. no.	Construction Activity	Statutory Authority	Statute under which clearance is required	Implement ation	Supervision
1	Labour Licence and all other statutory work permits including Contract Labour& Interstate Migrant Worker License (if any)	- The Contract Labour (Regulations & Abolition) Act, 1970 - The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 -Directorate of Industrial Safety and Health (DISH), GoTN.	Tamil Nadu Labour Department	Contractor	Cuddalore Corporation /PMC
2	Workmen compensation Insurance / Accident Insurance, EPF and ESIC (as applicable)	Tamil Nadu Labour welfare Fund Act	Tamil Nadu Labour Department	Contractor	Cuddalore Corporation/ PMC
3	Hot mix plants, Crushers and Batching plants	Tamil Nadu Pollution Control Board (TNPCB)	Consent to establish And consent to operate under Air Act, 1981	Contractor	Cuddalore Corporation/ PMC
4	Discharges from construction activities	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contractor	Cuddalore Corporation/ PMC
5	Sand mining, quarries and borrow areas	Department of Geology and mining, Government of Tamil Nadu	Contractor to obtain material from the existing Government licensed mines/quarries, Contractor will require prior approval of PIU for obtaining material from a particular source PIU to review and approve only existing licensed mines	Contractor	Cuddalore Corporation /PMC
6	Ground water extraction	Tamil Nadu Groundwater Development and Management Act 2000	Water Resources Department, Government of Tamil Nadu	Contractor	Cuddalore Corporation/ PMC
7	Temporary traffic diversion measures	MoRTH 112 SP 55 of IRC codes	Traffic Police, Cuddalore	Contractor	Cuddalore Corporation/ PMC

Procedure for obtaining CRZ clearance :

The procedure for obtaining CRZ clearance for permissible activities as per the CRZ Notification 2019 is attached in the Annexure 7.

3 Baseline Environmental and Social Status

This chapter presents the baseline data required to understand the environmental, ecological attributes and socio-economic characteristics of the study area, the pipeline route. The baseline includes climate, meteorology, topography, geology, hydrology, drainage, rainfall, land usage, water, air, noise, soil, flora, fauna and social profile of local population. The objective is to comprehend the current environmental conditions and socio-economic status of people which would help in comparing and assessing the impacts on E&S aspects caused by the project in pre-construction, construction and operation phases.

3.1 Methodology

The environmental Baseline has been collected from secondary sources and E&S screening of all the project sites and alignments.

The desk review of the available documentation and reports of this project is carried out including DPR. Also, the additional data were collected from relevant websites, online as well as offline. Data thus collected from the secondary sources- published and unpublished literature, government documents, reports, etc were reviewed.

The ground truthing undertaken on-site, verified and updated the required data. The secondary information collected from different sources include the Ministry of Environment, Forest and Climate Change (MOEF&CC), Census of India 2011, District Census Handbook, Geological Survey of India, Indian Meteorological Department, Tamil Nadu Pollution Control Board (TNPCB), Underground Water department, PWD, tourism and other relevant departments of the state and Central governments. The data sources are indicated at Table below.

Table 27 Sources of E&S data

S.No.	Attribute	Parameter	Source of Data
1	Land use /cover	Land use patterns	Satellite Imagery
2	Geology	Rock formation and mineral profile	Geological Survey of India and project site study
3	Air, water, noise, soil	Measurement levels	Relevant departments/primary data as well as EIA/ ESIA of other projects in Cuddalore (ISWD, UGSS, etc).
4	Meteorology	Temperature, cloud, wind, etc.	IMD Chennai office and other studies.
5	Ecology	Existing terrestrial flora and fauna	Various sources, EIA/ ESIA of other projects in Cuddalore (ISWD, UGSS, etc)
6	Socio-economic aspects	Socio-economic characteristics	Census of India, 2011; District Hand Book, survey in project area
7	Social screening survey	To identify social impacts	Alignment and sites were screened to identify social impacts during the month of August 2023.

3.2 Cuddalore district

3.2.1 Features

The features such as climate, topography, geology, drainage, vegetative cover of Cuddalore District is described in following sections.

3.2.2 Climate & Rainfall

The climate in general is moderately hot and humid tropical. The Mean Maximum temperature from January to June varies from 28oC to 34oC. It has hot summer and insignificant to mild winter with moderate to heavy rainfall. The area is affected mainly by NE monsoon with some evening showers during SW monsoon. Month wise temperature variations in Cuddalore district is given the table below

Table 18: Month wise temperature variations in Cuddalore district

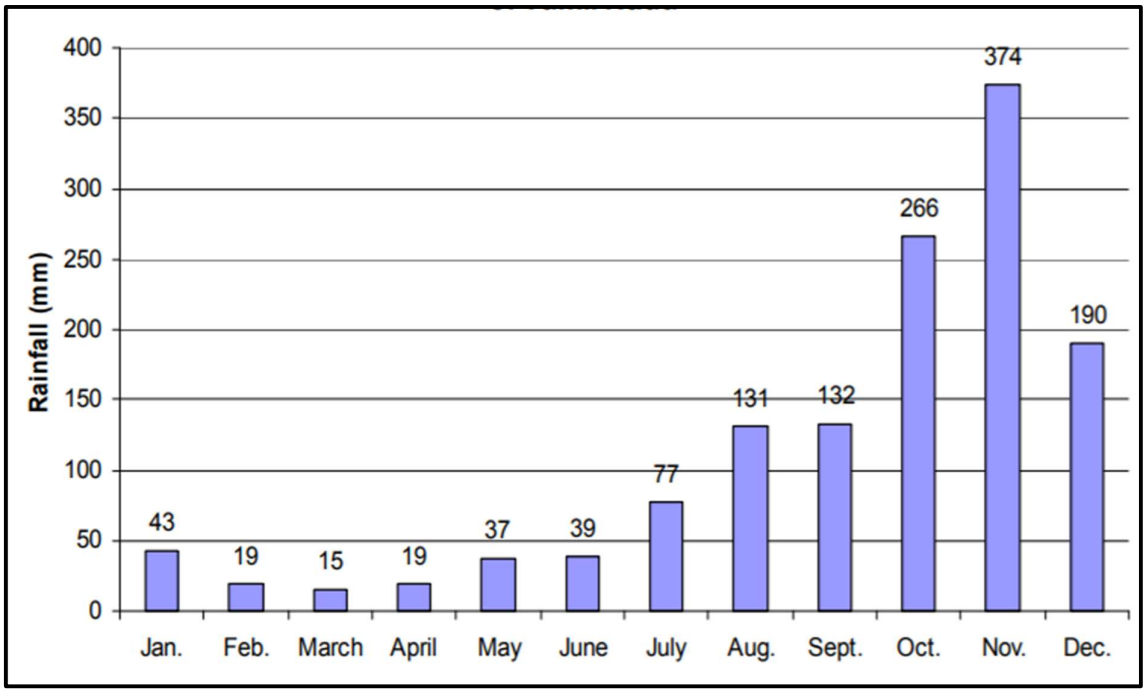
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C	28.1	29.2	31.1	33.2	36.1	37	35.5	34.6	34	31.7	29.1	28	32.3
Average low °C	20.8	21.2	23	25.8	27.1	27	26.1	25.4	25.1	24.3	22.8	21.5	24.18
Average rainfall mm	30	13	11	16	46	38	85	144	121	247	329	172	1252

Table 19: Average Rainfall of Cuddalore district

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	28.1 (82.6)	29.2 (84.6)	31.1 (88)	33.2 (91.8)	36.1 (97)	37.0 (98.6)	35.5 (95.9)	34.6 (94.3)	34.0 (93.2)	31.7 (89.1)	29.1 (84.4)	28.0 (82.4)	32.3 (90.16)
Average low °C (°F)	20.8 (69.4)	21.2 (70.2)	23.0 (73.4)	25.8 (78.4)	27.1 (80.8)	27.0 (80.6)	26.1 (79)	25.4 (77.7)	25.1 (77.2)	24.3 (75.7)	22.8 (73)	21.5 (70.7)	24.18 (75.51)
Average rainfall mm (inches)	30 (1.18)	36.8 (1.449)	11 (0.43)	21.5 (0.846)	71 (2.8)	70 (2.76)	85 (3.35)	144 (5.67)	129 (5.08)	247 (9.72)	330 (12.99)	216 (8.5)	1,391.3 (54.775)

Source Agriculture Contingency Plan for District: CUDDALORE

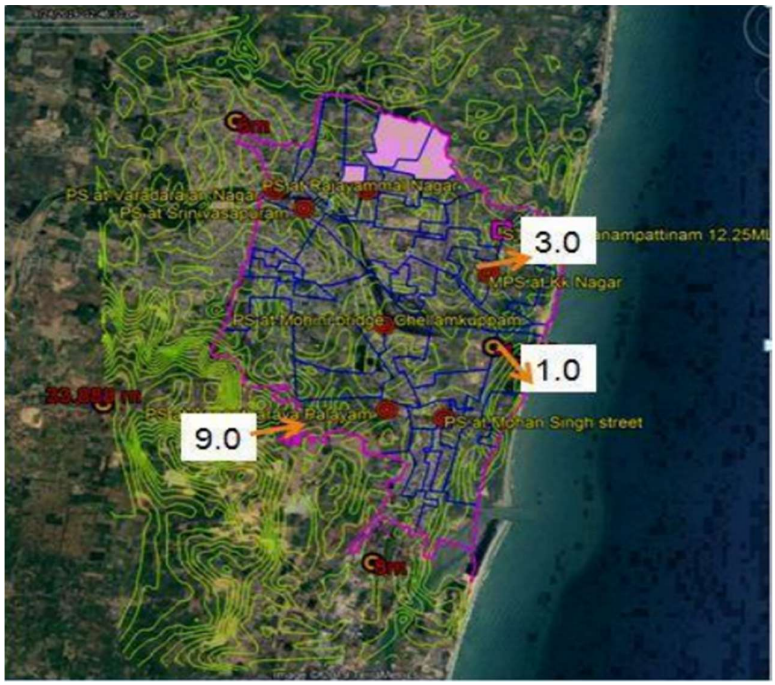
Figure 5 Average Monthly Rainfall



3.2.3 Topography & Soils

It has an average ground elevation of 6 m with reference to MSL. The land is almost flat with large deposits of black and alluvial soil inland and coarse sand near the seashore. The elevation levels in the project area vary from 1.04 m to 9m. The following figure shows the terrain slope in project area.

Figure 6 Topography of the Project Area



Soils[1]:

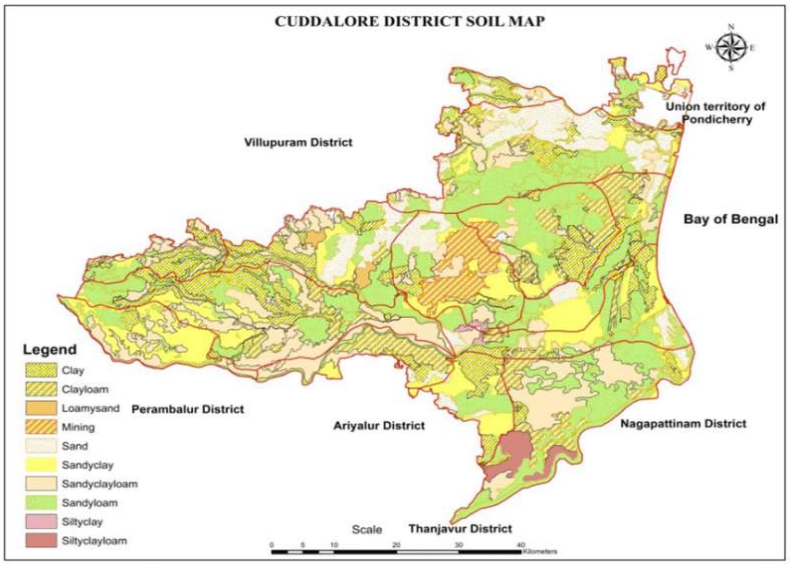
The soils of the district are classified as the black, red, ferruginous and Arenacious. They are again subdivided into clays, loam and sands. Black soils are observed in the Chidambaram and Vriddhachalam taluks. They sandy soils are seen along the coast in Cuddalore and Chidambaram taluks. The younger alluvial soils are found as small patches along the stream and river courses in the district. Red sandy soil is seen covering the Cuddalore sandstone, laterite and lateritic gravels occur in parts of Vriddhachalam, Panruti and Cuddalore taluks.

Table 20: Types of soil and their area covered.

S.No	Taluk	Red soil	Black soil	Alluvial soil	Red loamy soil	Sandy soil	Sandy loamy soil	Total
1	Cuddalore	18.3	0.55	0.99	1.32	76.6	2.24	100
2	Vridhachalam	48.0	40.4	6.98	2.7	0.78	1.23	100
3	Kattumannarkoil	35.56	58.9	0.88	2.9	0.42	1.33	100
4	Panruti	76.35	7.39	15.2	-	0.36	0.7	100
5	Thittagudi	35	60.5	3.48	0.7	1.06	0.17	100
6	Chidambaram	18	75.9	3.58	0.6	1.07	0.85	100

The soil map is given below

Figure 7 Soil Map of Cuddalore district



[1](*Source: https://www.researchgate.net/figure/Soil-map-of-Cuddalore-district_fig4_331400385* ***Flood hazard mapping using geospatial techniques and satellite images—a case study of coastal district of Tamil Nadu*** *by* ***ThirumuruganPerumal*** *Anna University, Chennai* ***KrishnaveniMuthiah*** *Anna University, Chennai)*

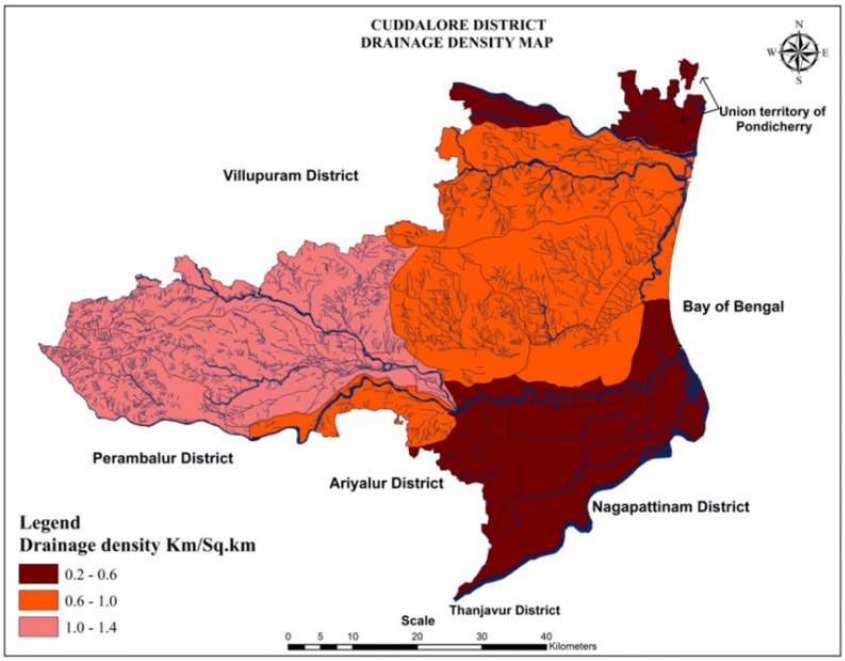
3.2.4 Physiography & Drainage[2]:

Basin and sub-basin: The district has Gadilam and Pennaiyar rivers in the north, Vellar and Coleroon river in the south.

Drainage

The district is drained by Gadilam and Pennaiyar rivers in the north, Vellar and coleroon in the south. All these rivers are ephemeral and carry floods during monsoon. They generally flow from west towards east and the pattern is mainly sub parallel. The eastern coastal part near Porto-Novo is characterized by lagoons and back waters. Ponniyar is one of the major seasonal river drains the northern part of the district, which originates from the Nandi hills of Karnataka state. Thurinjalar and Musukundah rivers are the tributaries, which join the Ponnaiyar river, Malattar river is the distributary of the Ponnaiyar river. Vellar, is the other major seasonal river, which drains the major portion in the southern part of the district. Manimuktha, Gomukhi and Mayura are the major tributaries which join the Vellar river. Drainage pattern in Cuddalore district is given in the figure below

Figure 8: Drainage Pattern in Cuddalore district



3.2.5 Groundwater table

The Ground Water levels from the 42 number of observation wells of TWAD have been analyzed for Post-Monsoon and Pre-Monsoon. 5 years average Ground water level in m Below Ground Level for pre and post monsoon is as follows:

Table 21 Ground water level in Cuddalore Municipality

5 Years Pre-Monsoon Average (2015-2020)	5-Years Post-Monsoon Average (2015- 2020)
26.7 m	23.7 m

Source: TWAD Board web site

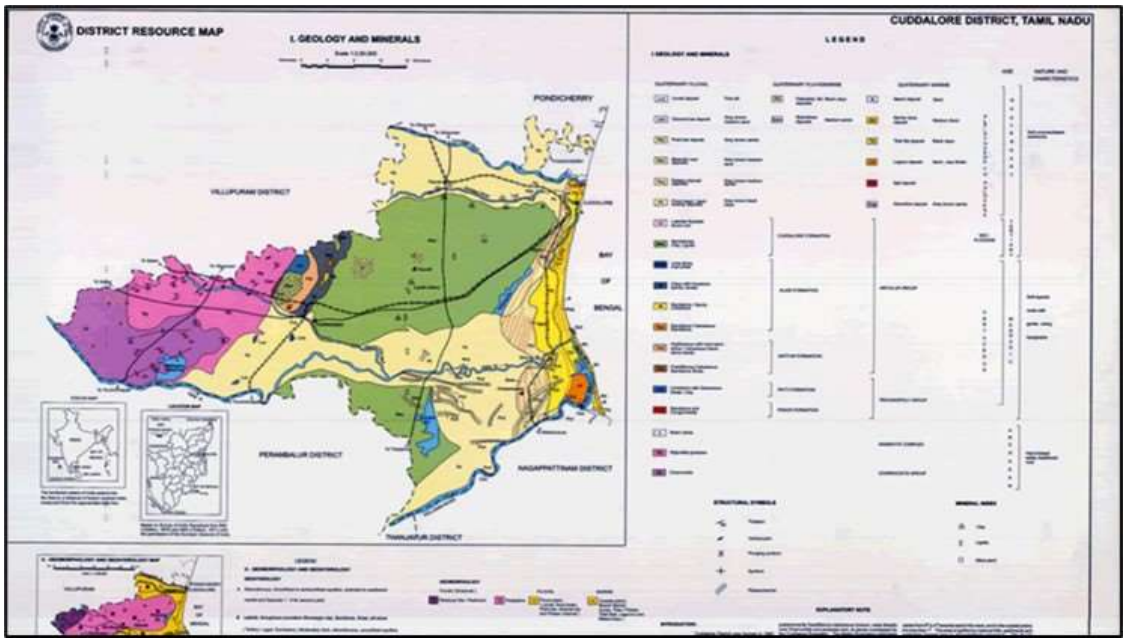
[2] *(Source: https://www.researchgate.net/figure/Soil-map-of-Cuddalore-district_fig4_331400385* ***Flood hazard mapping using geospatial techniques and satellite images—a case study of coastal district of Tamil Nadu by*** *ThirumuruganPerumal Anna University, Chennai KrishnaveniMuthiah Anna University, Chennai)*

3.2.6 Geology & Geomorphology[3]

Geology

The general geological formation of the district is simple with metamorphic rocks belonging to the gneiss family. Resting on these are the three great groups of sedimentary rocks belonging to different geological periods and overlaying each other in regular succession from the coast on the east to the hills on the west. The lowest of these groups is the fossil-bearing cretaceous limestone around Pondicherry and Vriddhachalam. Above this comes a younger form the Red hills near Pondicherry and the Mount Capper hills south-west of Cuddalore. Uppermost are the alluvial beds of the deltas of rivers The area is occupied by Tertiary and Quaternary Formations and the generalised stratigraphy is shown in the figure below.

Figure 9 Resource Map of Cuddalore District



The geological formations of the underlying strata of the study area, located in Cuddalore district comprises of various rock formations, from oldest Archeans to recent sedimentary forms. Sedimentary deposition forms are overlaid by the Archeans form. The geological succession and the geological features of Cuddalore district are given Table below.

[3] *(Source: District Survey report Cuddalore)*

Era	Age	Formation	Lithology
Quaternary	Recent to Sub Recent	Alluvium & Laterite	Soils, Alluvium, Coastal sands, clays, Kankar and Laterite
-	-	Unconformity	-
Tertiary	Miopliocene	Cuddalore Sandstone	Sandstone – Argillaceous and pebble bearing grits, Clays (variegated) with lignite seams and pebble beds
-	-	Unconformity	-
Cenozoic	Lower Eocene to Palaeocene	Gopurapuram formations	Black clays or shades, grey coloured sandstone, calcareous sandstone, shales and siliceous limestone with fossils
-	-	Unconformity	-
Mesozoic	Upper Cretaceous	Ariyalur	Fossil ferrous and siliceous limestones, Calcareous sandstones clays and marls
-	-	Unconformity	-
Azoic	Archean		Geniss's granites, charnockites and associated acid and basic intrusive

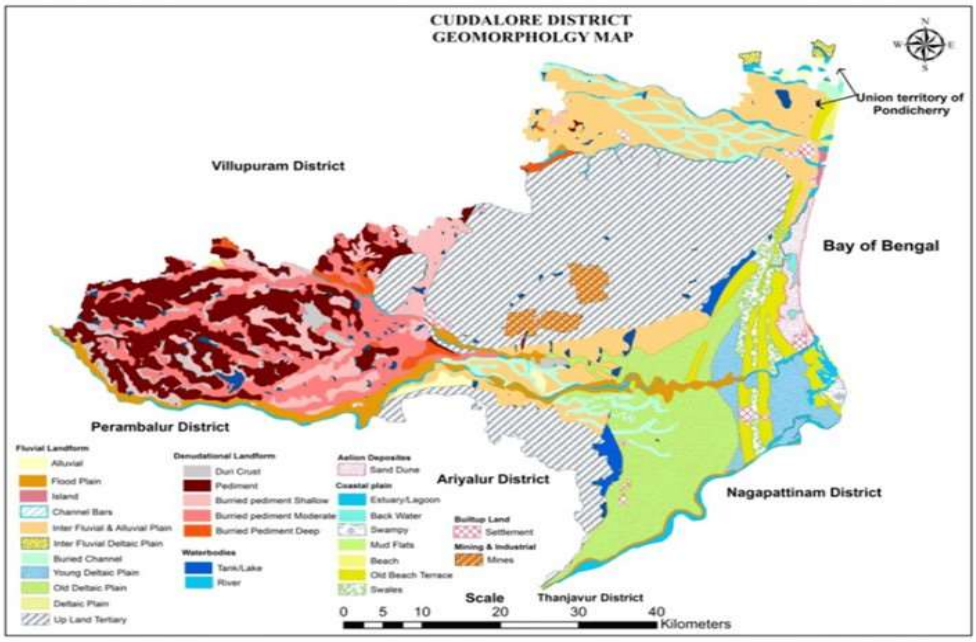
Geomorphology[4]

The entire district can be broadly divided into following 3 zones. Western pediplains of entire area covered by Mangalur and Nallur blocks. This area is occupied by denudational landforms like shallow buried pediment, deep buried pediment and pediments. Central part of the district is characterized by sedimentary high grounds, elevation >80 m of Cuddalore sandstone of Tertiary age. This zone occupies part of Virudhachalam, Kammapuram, Kurinjipadi, Cuddalore and Kattumannarkoil taluks.

Rest of the area in the district is covered by eastern coastal plain, which predominantly occupied by the flood plain of fluvial origin formed under the influence of Penniyar, Vellar and Coleroon river systems. Marine sedimentary plain is noted all along the eastern coastal region. In between the marine sedimentary plain and fluvial flood plains, fluvio marine deposits are noted, which consists of sand dunes and back swamp areas.

[4] *(Source: https://www.researchgate.net/figure/Soil-map-of-Cuddalore-district_fig4_331400385 Flood hazard mapping using geospatial techniques and satellite images—a case study of coastal district of Tamil Nadu by ThirumuruganPerumalAnna University, ChennaiKrishnaveniMuthiahAnna University, Chennai)*

Figure 10 Resource Map of Cuddalore District

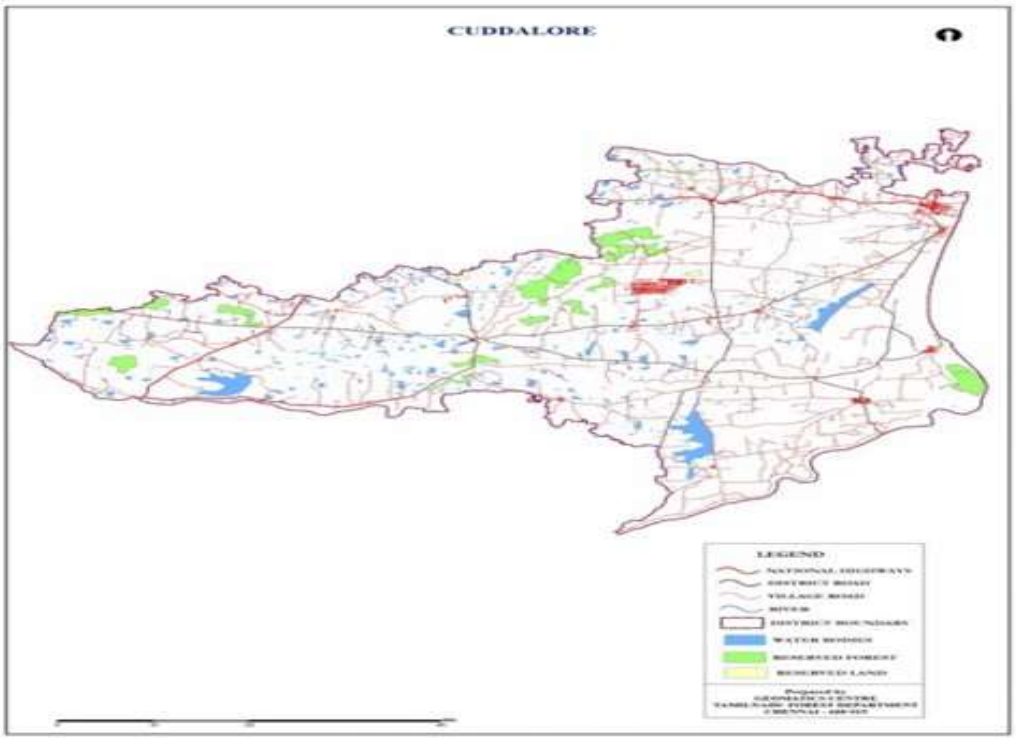


3.2.7 Forests in Cuddalore District[5]

The total area covered under the Forest in the district are 4116.05 hectares. Reserve Forest covers 3689.05 Hectares and Reserve land 427 hectares. Most of the forest areas lie in Panruti, Chidambaram Kattumannarkoil, Vridhachalam and Titakudi Taluks.
There are no forests located in the sub-project area/ infrastructure locations.

[5] *Source:https://www.forests.tn.gov.in/tnforest/app/webroot/img/contact-map/cuddalore.jpg*

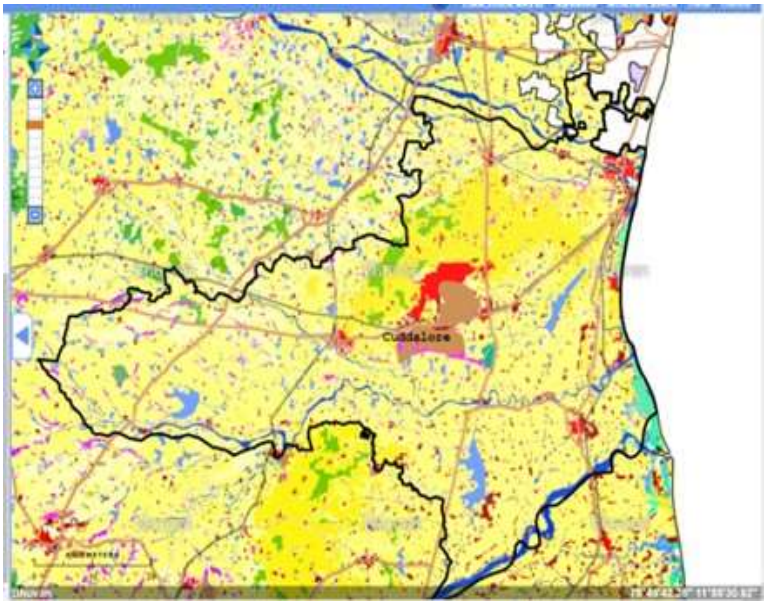
Figure]11: Forest Map Cuddalore District



3.2.8 Land Use

The Land use of Cuddalore District is presented in the map below and the major land use observed is Built up – Urban.

Figure12: Land Use Map of Cuddalore district



Source:Bhuvan

Table 22: Land use classification in Cuddalore district

S. No.	Classification	District Area in Ha
1	Forest	1414.525
2	Barren and Uncultivable uses	14622.745
3	Land put to Non-Agricultural uses	58942.735
4	Cultivable Waste	6033.690
5	Permanent Pastures and other Grazing Land	603.730
6	Land Under Miscellaneous Tree Crops and Graces not included in Net Area Sown	13601.470
7	Current Fallows	27197.885
8	Other Fallows Land	25604.845
9	Net Area Sown	219759.375
10	Geographical Area According to Village Papers	367781.000
11	Total Cropped Area	332303.045
12	Area sown more than once	112543.670

Source : DISTRICT STATISTICAL HANDBOOK

The Land use of Cuddalore Town is presented in the map below and the major land use observed is primary residential & mixed residential.

The pipeline alignment and sub-project infrastructures are located in areas with predominantly residential landuse.

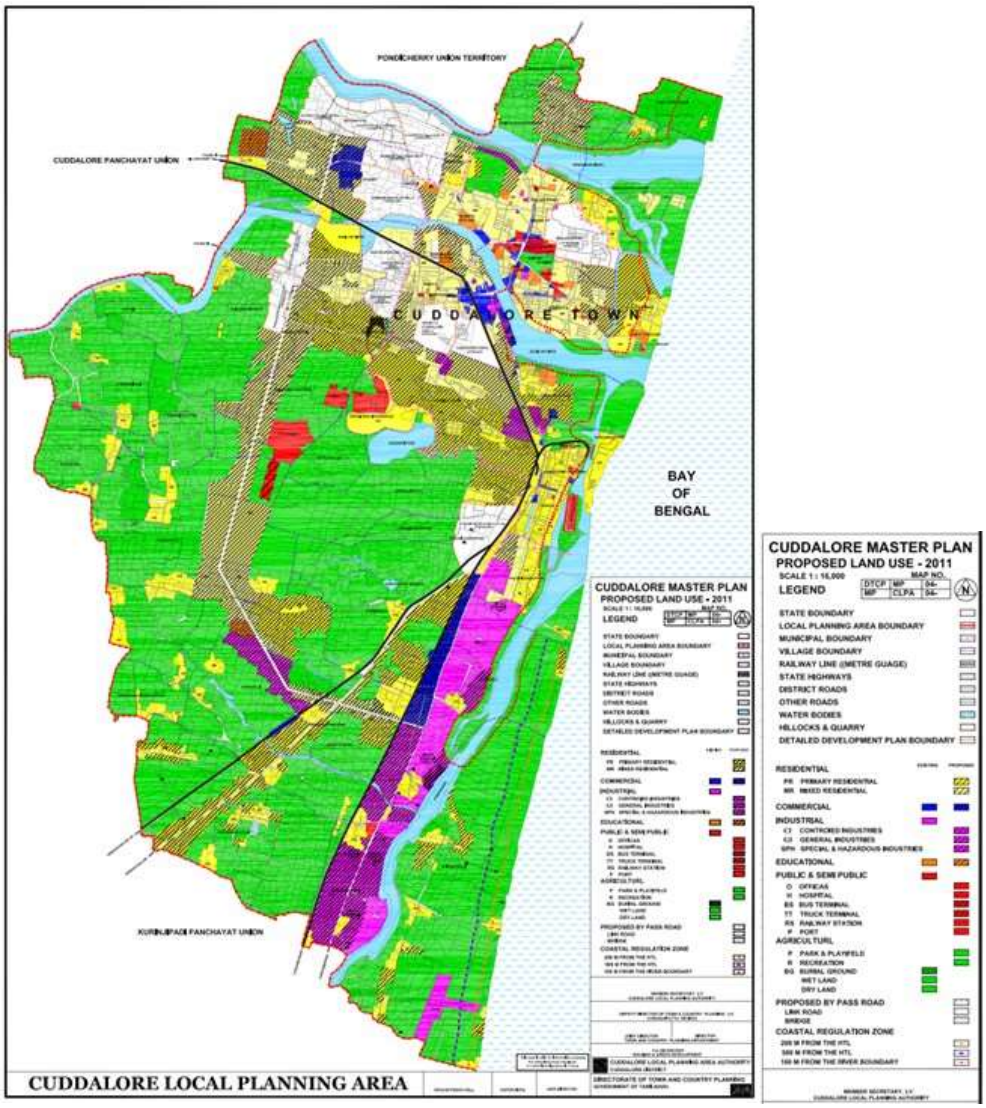


Figure 13: Land-use Map

3.3 Solid waste management in Study area

Rapid growth of population and urbanization has resulted in increasing the volume of solid waste generation. Cuddalore town generates around 48 MT of waste every day at the rate of 286 gm/capita/day as per 2019 population of 1, 67,340.

System of door to door collection of solid waste exists in all wards of the town. Primary and secondary collection and transportation of solid waste is practiced with Cycle rickshaws, Push carts, tractors, compactors and Lorries.

Solid waste dumping sites exists in four locations namely VasantharayanPalayam, Kammiyampettia, Pachiyankuppam and Pachiyankuppam village spread in 7.70 acres, 6.10 acres, 1.90 acres and 0.40 acres respectively. Solid waste is processed for compost in VasantharayanPalayam. Onsite compost centres are proposed at 60 locations in the town for garden waste.

3.4 Storm Water Drains

In Cuddalore, 84.30 km length of stormwater drains exist, out of which 78.30 km drains are open and Six Kilometer are closed drains. Project under progress for construction and improvement of 56.24 km drains in two packages.

3.5 Status of Existing Sewerage facilities

In Cuddalore, out of total 45 wards, 30 wards are covered by UGSS and remaining wards are uncovered by UGSS. Sewers were laid for 148 km for collection sewage across the town. Sewage is pumped through 10 Lift Stations and Seven Pumping Stations including one Main Pumping Station at KK Nagar to the Sewage Treatment Plant at Devanampattinam of capacity 12.25 MLD with ASP technology. After chlorination the treated effluent from STP is being pumped to VaniyarPalayam at a distance of two km to dispose in Gadilam River

3.5.1 Seismic Details of the Area[6]:

The entire district falls under the category of Zone II with an intensity of Medvedev-Sponheuer-Karnik (MSK) VII or less as per the Seismic Zoning Map of India contained in IS 1893:2002 Fifth Revision. This zone is referred as Low Damage Risk Zone as per Building Material and Technology Promotion Council (BMPTC), which has no history of earthquakes above 5 magnitudes in its vicinity.

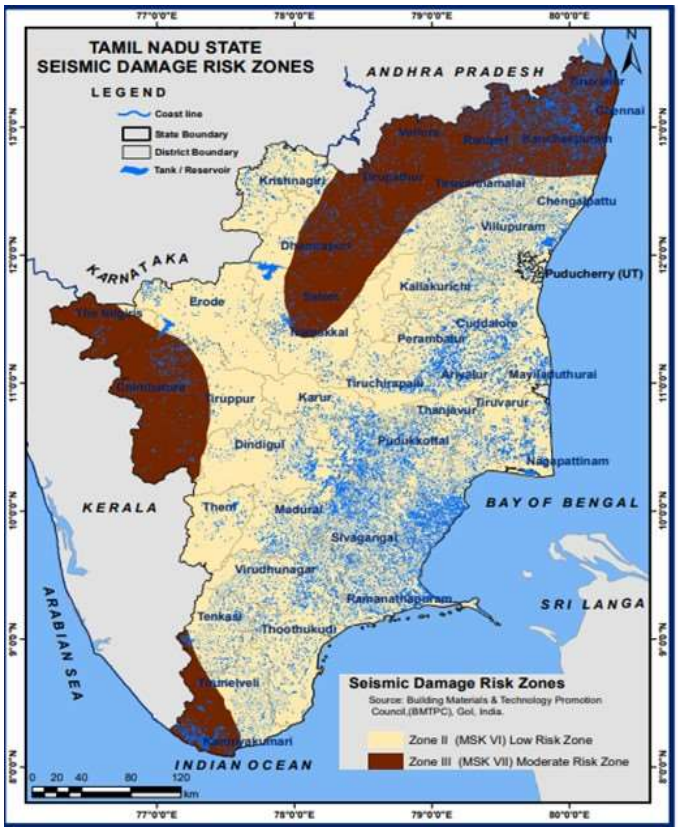


Figure 14 Seismic zone map Earthquake Vulnerability Mapping-Tamil Nadu.

[6] *Source Building Materials & Technology Promotion Council,(BMTPC), GoI, India.*

3.6 Disaster Prone Area (Cyclone and Flood Probability)[7]

This District consists of Ten Taluks viz. Cuddalore, Panruti, Kurinjipadi, Chidambaram, Bhuvanagiri, Kattumannarkoil, Srimushnam, Vridhachalam, Tittagudi and Veppur, out of which Cuddalore, Kurinjipadi, Bhuvanagiri, and Chidambaram are coastal taluks lying in the heavy wind and cyclone zone while other six taluks lie in the flood prone zone.
The Cuddalore district is categorically classified as Disaster Prone Area because of its geological position and Low Lying Areas. The Cuddalore district is frequently subjected to natural disasters such as Flood, Tsunami, Drought, Cyclone (ex: Thane, Nisha) etc.,
The major reasons for flooding in Cuddalore district are: All the rivers are draining into Bay of Bengal at closer intervals. Since the terrain is flat and just 1.50m above M.S.L, all the flood water gets accumulated in this area is not easily drained in to the Sea. The bed level of rivers is lying minus 1m from the sea. Due to this, the backwater in the rivers cause all the flood damages.

3.6.1 Hazard Profile Of Cuddalore taluk

In Cuddalore taluk, the low lying areas are inundated because of Gadilam river and Pennaiyar river, which carry the flood water and drained in to the Bay of Bengal at Devanampattinam (Silver Beach) and Tazhanguda.
Flood Prone Basins in the project area

- Gadilam River
- Pennaiyar River
- Cuddalore town

Then pennaiyar: Originating from Chennakesava hills of Karnataka state, Confluence in Bay of Bengal at Thazhanguda of Cuddalore District Length of river is 432 km. Length in Cuddalore District 45 km.

Gadilam: Originating from Sankarapuram Taluk of Villupuram District, confluence in Bay of Bengal at Devanampattinam of Cuddalore District. Length of river is 121 km. Length in Cuddalore District 52 km.

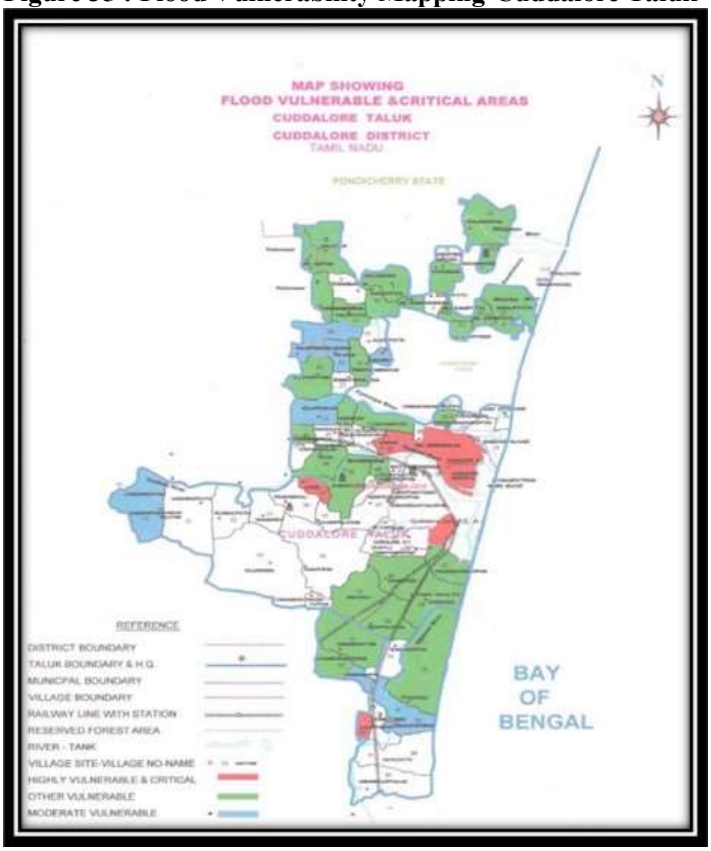
Table 23: Areas Identified as Very Highly Vulnerable by district administration

Cuddalore District- Very High Vulnerable (38)				
S. No	**Village**	**Firka**	**Taluk**	**Block**
1	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. Alazhappanagar			
	2. Purushothamannagar			
	3. Deepan nagar			
	4. Kumasthapallam			
2	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. K.K nagar(Vanarapalayam)			
	2. Anna nagar			
	3. Co-operative nagar (Kamara nagar)			
	4. Sanjivi St. Irrattaipilliyar Colony			
3	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore

[7] *(Source: Cuddalore Disaster Management Plan 2021)*

Cuddalore District- Very High Vulnerable (38)				
S. No	**Village**	**Firka**	**Taluk**	**Block**
	1. Indra nagar (Dobhigana)			
	2. Kammiyampettai (Dhanamnagar)			
	3. Thangarajnagar			
4	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. Kannaginagar			
	2. Market colony			
	3. Kuzhalanthai (Alai Colony)			
5	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. Aruthathiyarnagar			
	2. Kesavanthottam			
	3. Perappankuttai (Vanankuttai)			
6	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. Eswarinagar			
	2. Arumugam nagar			
	3. Nehru nagar I, II			
7	**Cuddalore (Municipal)**	Manjakuppam	Cuddalore	Cuddalore
	1. Panagkattu colony			
	2. Singarathoppu			
	3. Akaraikori			
	4. Kuttakarast			
	5. Kinjampettai			
	6. Five well nagar			

Figure 35 : Flood Vulnerability Mapping-Cuddalore Taluk

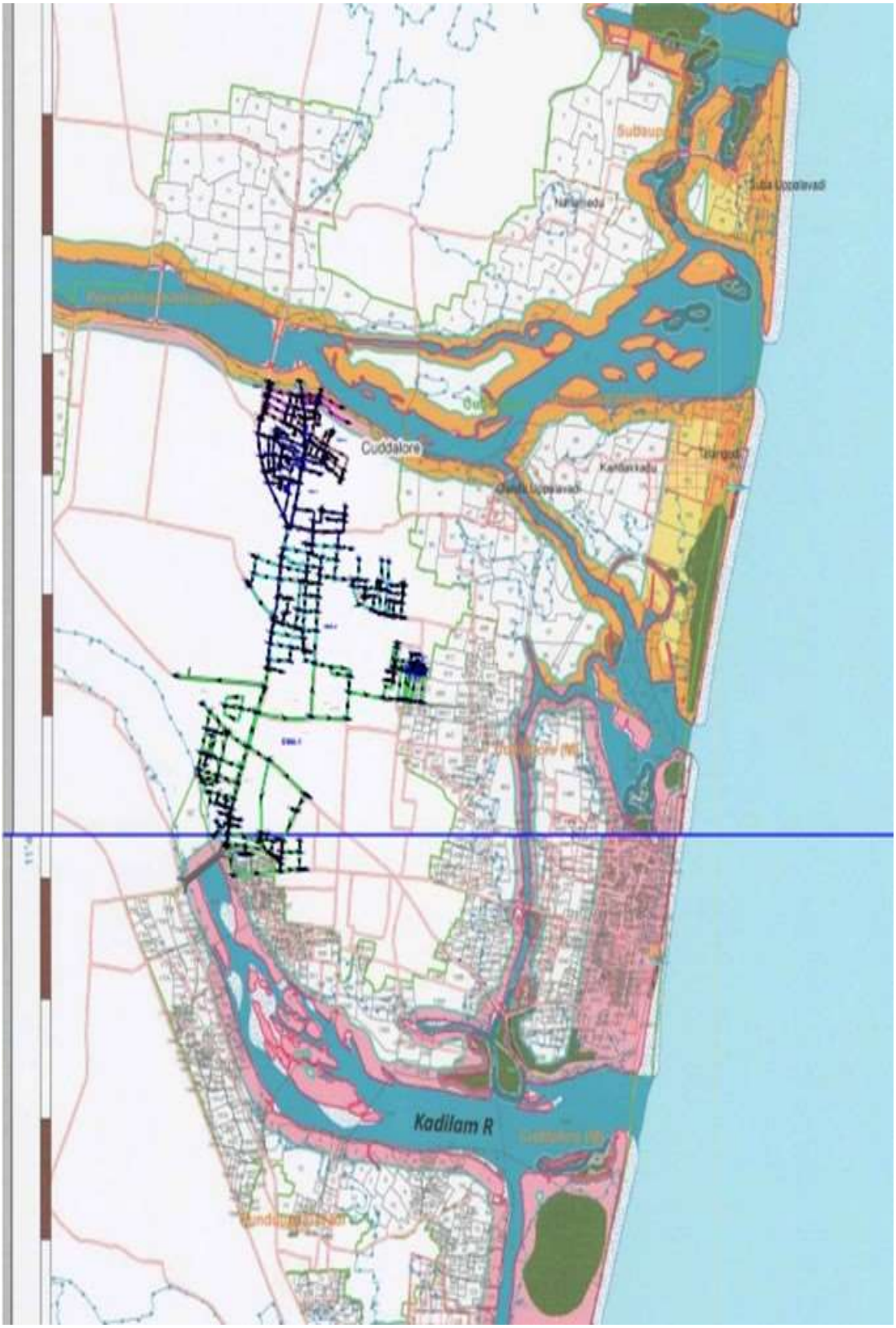


3.6.2 Coastal Regulation Zone

A section of the project area falls under CRZ and hence the distribution network of around 939m falling within this section attracts CRZ notification requiring CRZ clearance. Details of the network concerned are provided in maps and table below. Works in these areas will be commenced upon obtaining CRZ clearance complying with the conditions laid therein.

Figure 16 CRZ Map - Overall

Figure 17 CRZ Map – Relevant Section



Approved CZMP maps as per CRZ notification, 2011 published by Department of Environment and Climate Change, Government of Tamil Nadu is considered. Length of the pipes to be laid in the CRZ area along with Dia and CRZ zone is provided in the following table.

Table 24 CRZ Length Statement in D' System

Cuddalore WSS CRZ Length Statement		
Dia	**Length**	**CRZ Zone**
110	69	CRZ-III
110	35	CRZ-III
110	76	CRZ-III
110	121	CRZ-III
110	30	CRZ-III
110	32	CRZ-III
110	162	CRZ-III
110	247	CRZ-II
110	9	CRZ-II
110	158	CRZ-II

Table 25: Cuddalore WSS CRZ Length Summary in D'System

Cuddalore WSS CRZ Length Summary		
Diameter	**Length**	**CRZ Zone**
110	414	CRZ-II
110	525	CRZ-III

3.6.3 Air Environment

Tamil Nadu Pollution Control Board (TNPCB) regularly monitors the ambient air quality of Cuddalore through a network of three ambient air quality monitoring stations established under the National Air Quality Monitoring Programme (NAMP). Ambient air quality data is collected from secondary sources under the National ambient air quality management program carried out for the year 2020.

Ambient Air Quality Standards

The National Ambient Air Quality standards prescribed is given below				
Area	Annual average concentrations of pollutants in µg/m3			
	SO_2	NO_2	PM_{10}	$PM_{2.5}$
Industrial; Residential, Rural & other areas	50	40	60	40

3.6.4 Ambient Air Quality Monitoring Stations

(Source TNPCB)

S. No	Station Location	Landuse Zone/ Area
1	Echankadu Village	Residential Zone

2	DEE office	Commercial Zone
3	SIPCOT	Industrial Zone

Table 26: Annual Average Air Quality Data for the year 2020

State/ UT	City/ Town/ Village	Location	SO_2 Concentration in µg/m³		
			Minimum (24-Hourly average)	Maximum (24-hourly average)	Annual average
Tamilnadu	Cuddalore	Eachangadu Village	7	16	13
		SIPCOT (Project Office)	5	17	11
		DEE Office, Cuddalore	10	25	16
State/ UT	**City/ Town/ Village**	**Location**	**NO_2 Concentration in µg/m³**		
			Minimum (24-Hourly average)	**Maximum (24-hourly average)**	**Annual average**
Tamilnadu	Cuddalore	Eachangadu Village	10	20	17
		SIPCOT (Project Office)	9	22	17
		DEE Office, Cuddalore	11	51	22
State/ UT	**City/ Town/ Village**	**Location**	**PM_{10} Concentration in µg/m³**		
			Minimum (24-Hourly average)	**Maximum (24-hourly average)**	**Annual average**
Tamilnadu	Cuddalore	Eachangadu Village	34	60	51
		SIPCOT (Project Office)	33	66	48
		DEE Office, Cuddalore	36	90	61
State/ UT	**City/ Town/ Village**	**Location**	**$PM_{2.5}$Concentration in µg/m³**		
			Minimum (24- Hourly average)	**Maximum (24- hourly average)**	**Annual average**
Tamilnadu	Cuddalore	Eachangadu Village	24	37	32
		SIPCOT (Project Office)	20	38	26
		DEE Office, Cuddalore	25	45	35

Result: The annual average concentrations of PM_{10} recorded are 51µg/m³ at Eachangadu Village, 48 µg/m³ at SIPCOT (Project Office), 61 µg/m³ at DEE Office, Cuddalore. The annual average concentrations of $PM_{2.5}$ recorded are 32µg/m³ at Eachangadu Village, 26 µg/m³ at SIPCOT (Project Office), 35 µg/m³ at DEE Office, Cuddalore. The annual average SO_2 concentrations were recorded as 13 µg/m³ at Eachangadu Village, 11 µg/m³ at SIPCOT (Project Office), 16 µg/m³ at DEE Office, Cuddalore. The annual average NO_2 (oxides of Nitrogen) concentrations were recorded as 17µg/m³ at Eachangadu Village, 17 µg/m³ at SIPCOT (Project Office), 22 µg/m³ at DEE Office, Cuddalore.

All the observed values are in the year 2020. The observed air pollutants are within the limits as per CPCB standards except for PM $_{10}$61 µg/m³ at DEE Office, Cuddalore.

3.6.5 Water Environment

The water quality monitoring carried out as part of the ESIA for the UGSS to Cuddalore Corporation has been taken into consideration for representation of the baseline ground and surface water quality in the project area.

A. Ground water Quality

Ground water has been analysed near the existing STP site in Devenampattinam. Parameters for analysis of water quality had been selected based on the utility of the particular source of water as per MoEF&CC guidance. Hence quality of groundwater is compared with IS10500:2012 for drinking purposes. The results of the Ground and surface Water analysis are given below.

/Figure 18 4Ground water monitoring location on Google earth

***GW-Ground water monitoring location**

Table 27: Results of Ground water analysis in Cuddalore

PARAMETERS	UNIT	RESULTS	IS 10500:2012	
			Acceptable	Permissible
Colour	Hazen	25	5	15
Odour	-	Disagreeable		
pH @ 25°C	--	7.03	6.5-8.5	No Relaxation
Turbidity	NTU	4.9	1	5
Total Dissolved Solids (TDS)	mg/l	710	500	2000
Total Hardness as CaCO3	mg/l	305	200	600
Total Alkalinity	mg/l	72	200	600
Calcium as Ca	mg/l	30	75	200
Magnesium as Mg	mg/l	260	30	100
Chloride as Cl	mg/l	294	250	1000
Sulphate as SO4	mg/l	80	200	400
Total Chromium (as Cr)	mg/l	BDL (DL:0.05)		
Lead as P	mg/l	BDL (DL:0.1)		
Fluoride as F^-	mg/l	0.6	1	1.5
Nitrate as NO_3^{2-}	mg/l	4.2	45	No relaxation
Iron as Fe	mg/l	0.68	0.3	No relaxation
Cadmium as Cd	mg/l	BDL (DL:0.01)	0.003	No relaxation
Mercury as Hg	mg/l	BDL (DL:0.01)	0.001	No relaxation

Inference: Results of ground water monitoring indicate that the water quality parameters are not meeting acceptable limits as per the Drinking Water Standards however within the permissible limits except for colour, Iron and Magnesium levels. Hence if this is proposed to be used as drinking water for the sub-project/ by the contractor, adequate treatment is to be provided to meet the requisite standards.

3.6.6 Surface water quality - Source water

Source water quality study has been carried out in selected borewell sources in River pennaiyar @ Azhakianatham during DPR preparation.

Table 28: Results of borewell source in river Cuddalore

Sl.No	Parameter	Vellampakkam (Bore water)	Drinking Water Standards (IS 10500: 2012 – Acceptable limit)	Drinking Water Standards (IS 10500: 2012 – Permissible limit in the absence of alternate source)	WHO Drinking Water Standards, 1993 (Health Based Guidelines)	Inference
1	Temp^0 C	30.8^0				
2	pH	6.94	6.5 – 8.5	No relaxation		pH is found within the acceptable limit
3	EC	842 µs/cm				
4	TDS	597 ppm	500	2000		Dissolved solids exceed the acceptable limit but within the permissible limit
5	Salt	413 ppm				
6	Ca	79.4	75	200		Calcium is found slightly above the acceptable limit but within the permissible limit
7	Mg	62.2	30	100		Magnesium is found above the acceptable limit but within the permissible limit
8	Na	57.5			200	
9	K	45.2				
10	Cl	268.4	250	1000		Chloride is found slightly above the acceptable limit but within the permissible limit
11	CO_3	2.2				
12	HCO_3	329.5				
13	SO_4	82	200	400		Sulphate is found within the acceptable limit
14	NO_3	0.65	45	No relaxation		Nitrate is found within the acceptable limit
15	H_2SiO_4	64				
16	PO_4	0.55				

17	F	0.65	1	1.5		Fluoride is found within the acceptable limit

Note: All value in mg/l (except pH and EC in µs/cm)

From the results of the water quality sample taken from source & tested it is observed that parameters like DO, Ca, Mg, Cl, etc are exceeding the acceptable limit of Drinking Water standard, but within permissible limits and this may be considered for use as drinking water in the absence of alternate source.

3.6.7 Noise Environment

Table 29: Noise levels have been assessed[8] in 3 locations in Cuddalore and the details are provided below.

Location Code	Sample location	Lday [dB(A)]	Lnight [dB(A)]	Leq [dB(A)]	Standards*	
					Lday [dB(A)]	Lnight [dB(A)]
N1	Thirupapuliyur	63.8	49.2	62.1	65	55
N2	Cuddalore OT	58.6	46.8	56.9	55	45
N3	Manjakuppam	56.4	45.3	54.8	55	45

The values of Noise level measured have been assessed during the day and at the night at the three sampling locations. The locations fall under residential / mixed residential / commercial area. The noise levels measured in these areas are found marginally higher than the permissible limits.

3.6.8 Terrestrial Ecology

3.6.8.1 Flora

Common flora found in the project town are Tamarind, Neem Tree, Palmyra Palm, Peeple Tree, Coconut Tree, Wild date palm, Rain Tree, Ravenna grass, Banana Plant, Knotgrass, Swollen finger Grass, Daobha, Water Hyacinth, Water lily, Castor Oil Plant, Erakku Plan, Papaya.

Along the natural channels, canals, nallahs wild grasses and weeds are found. In locations near the coast in Cuddalore Corporation, few mangrove plantations are found to be present. According to the study[9] the Uppanar backwaters supports 3 species of mangrove, 14 mangrove associates, including facultative halophytes, 11 species of seaweed and varieties of strand and aquatic vegetation along the sandy areas and water. However the project area and infrastructure locations are away from this location and no project activity is proposed in these locations. Hence due to the proposals made in this project, no major impact on Flora is envisaged.

3.6.8.2 Fauna

Fauna found in the project area includes mice, squirrels, pigeon, crow, sparrow, duck, eagle, parrot, snakes etc., Domestic animals like cow, buffalo, goat, dogs, cats, pigs. Frogs, water insects, water snakes are also found.

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[8] *EIA report - DPR for Integrated Storm Water Drains (SWDs) for Cuddalore Municipality 2017* (https://documents1.worldbank.org/curated/pt/449811508147665926/pdf/SFG3527-V3-EA-P150395-Box405303B-PUBLIC-Disclosed-10-16-2017.pdf)

[9] https://www.cbd.int/doc/meetings/mar/ebsaws-2015-02/other/ebsaws-2015-02-india-submission1-en.pdf

Small fishes are found in the rivers near the mouth. Waterfowl (storks, herons and egrets) were the most common birds in the backwater estuaries[10]. The Uppanar Backwaters has fishes, crabs, prawns and molluscs. The project location is away from the backwaters and hence no impact envisaged. The proposals made in this project have very limited construction activity do not have any adverse impact on the Fauna.

3.7 Social Screening:

Proposed Area Wise Subproject Components and Probable Impact:

Table 30 Identifying probable impact in the different project components

Sub Project Component	Details	Scope of Land acquisition and Social Impact
New Sump of 2LL camapcity near Thenpennai River	1 Sump	No social Impact identified.
New OHT with capacity of 12 LL at Pennaiyar Road 1st Cross Street	1 OHT	No social impact identified
District metered area (DMA) – Pennaiyar Road	5 DMAs	No social impact identified
Distribution System with HDPE pipes	33.879 kms	No social impact identified

Town Planning section of the ULB and consultants identified government vacant lands for the proposed water supply scheme. The lands records were verified and made site visit to all identified lands. The details of the identified lands are given below.

To identify the social impact the following screening processes were involved:

a. Reconnaissance of the sub-project areas and their surroundings;
b. Disscussion with the residents in the locality;
c. Identification of the major sub-project activities, and
d. Preliminary assessment of the impacts of these activities on the ecological, physico-chemical, and socio-economic environment of the sub-project surrounding areas

Lands Availability & Social Impact Screening:

Findings:

The land located in Pennaiyar Road 1st is a vacant land belonging to the ULB.

- The identified land for construction is currently vacant land
- The land is surrounded by e-sevai center one side.
- Opposite side parking shed for garbage collection vehicles.
- There is no social impact in the land.
- Consistent with the subproject selection criteria as mentioned Table 2, new construction will avoid/minimize involuntary resettlement impacts. There is no permanent/temporary land acquisition in the implementation of the subproject components.

[10] https://www.tangedco.org/static/tangedco/assets/files/linkpdf/package2cuddalore-EA%20report.pdf

Table 31 Land Ownership Details of Service Reservoirs

S. No.	Location Name	Survey No	Extent of Land Available	Land Required	Present Landuse	Zone No.	Purpose	Land Ownership
1	Near Thenpennai River (Sump)					4	WSS	ULB
2	Pennaiyar Road 1st Cross (OHT)	1288	1.04	0.9	Vacant land	4	WSS	ULB

3.8 Socio-economic profile of Cuddalore District

3.8.1 District Demographic Profile[11]

- In 2011, Cuddalore district had population of 2,605,914 of which male and female were 1,311,697 and 1,294,217 respectively.
- Cuddalore District population constituted 3.61 percent of total Tamilnadu population.
- Density of Cuddalore district for 2011 is 704 people per sq. km. In 2001, Cuddalore district density was at 617 people per sq. km. Cuddalore district administers 3,703 square kilometers of areas.
- Total literates in Cuddalore District were 1,815,281 of which male and female were 1,000,322 and 814,959 respectively.
- Sex Ratio in Cuddalore, it stood at 987 per 1000 male compared to 2001 census figure of 986. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 896 girls per 1000 boys compared to figure of 957 girls per 1000 boys of 2001 census data.
- There were total 279,950 children under age of 0-6 against 284,964 of 2001 census. Of total 279,950 male and female were 147,644 and 132,306 respectively.
- Child Sex Ratio as per census 2011 was 896 compared to 957 of census 2001. In 2011, Children under 0-6 formed 10.74 percent of Cuddalore District compared to 12.47 percent of 2001. There was net change of -1.73 percent in this compared to previous census of India.

Urban Population

Out of the total Cuddalore population for 2011 census, 33.97 percent lives in urban regions of district. In total 885,189 people lives in urban areas of which males are 442,836 and females are 442,353. Sex Ratio in urban region of Cuddalore district is 999 as per 2011 census data. Similarly child sex ratio in Cuddalore district was 934 in 2011 census. Child population (0-6) in urban region was 87,249 of which males and females were 45,119 and 42,130. This child population figure of Cuddalore district is 10.19 % of total urban population. Average literacy rate in Cuddalore district as per census 2011 is 86.38 % of which males and females are 91.88 % and 80.90 % literates respectively. In actual number 689,236 people are literate in urban region of which males and females are 365,439 and 323,797 respectively.

Rural Population

As per 2011 census, 66.03 % population of Cuddalore districts lives in rural areas of villages. The total Cuddalore district population living in rural areas is 1,720,725 of which males and females are 868,861

[11] Source : Directorate of Census operations – Govt. Of India Tamil nadu. – Chennai – Compailed in NIC – Cuddalore

and 851,864 respectively. In rural areas of Cuddalore district, sex ratio is 980 females per 1000 males. If child sex ratio data of Cuddalore district is considered, figure is 880 girls per 1000 boys. Child population in the age 0-6 is 192,701 in rural areas of which males were 102,525 and females were 90,176. The child population comprises 11.80 % of total rural population of Cuddalore district. Literacy rate in rural areas of Cuddalore district is 73.69 % as per census data 2011. Gender wise, male and female literacy stood at 82.85 and 64.48 percent respectively. In total, 1,126,045 people were literate of which males and females were 634,883 and 491,162 respectively.

The details of population by rural- urban, male-female and literacy rates in Cuddalore district as per Census 2011 are presented as follows. The demographic profile of the district is given below

Table 32 : Demographic Profile (Taluk wise in Cuddalore district)

Name of the Taluks	Population			Literates			Scheduled caste			Scheduled Tribe		
	No. of Persons	Male	Female	No. of Persons	Male	Female	No. of Persons	Male	Female	No. of Persons	Male	Female
Cuddalore	426466	212812	213654	309211	165451	143760	95667	47678	47989	1710	861	849
Panruti	413639	207946	205693	275075	153888	121187	108190	53885	54305	856	453	403
Kurinjipadi	331755	167497	164258	241787	132666	109121	83196	41948	41248	2390	1229	1161
Chidambaram	467909	235146	232763	345581	186237	159344	138837	69668	69169	5286	2665	2621
Kattumannarkoil	276947	139188	137759	194344	106117	88227	99771	50047	49724	1608	800	808
Viruthachalam	426592	216699	209893	285988	162517	123471	132645	67177	65468	2813	1411	1402
Tittagudi	262606	132409	130197	163295	93446	69849	105638	53540	52098	1039	524	515
District Total	2705914	1311697	1294217	1815281	1000322	814959	763944	383943	380001	15702	7943	7559

Source: DISTRICT STATISTICAL HANDBOOK2018-19

3.9 Project Area - Cuddalore Municipality

Source: (https://www.census2011.co.in/data/town/803650-cuddalore-tamil-nadu.html)

Cuddalore is in district of Cuddalore, Tamil Nadu. The Cuddalore is divided into 45 wards for which elections are held every 5 years. The Cuddalore Municipality has population of 173,636 of which 85,700 are males while 87,936 are females as per report released by Census India 2011.
Population of Children with age of 0-6 is 17403 which is 10.02 % of total population of Cuddalore (M). In Cuddalore Municipality, Female Sex Ratio is of 1026 against state average of 996. Moreover Child Sex Ratio in Cuddalore is around 962 compared to Tamil Nadu state average of 943.

3.10 Connectivity

a) Road : Cuddalore is connected to other routs of Tamil Nadu through a very good rail and road Network. National Highways covered 194.80 Kms. National Highway NH45A Road links Villupuram

and Nagapattinam district, NH45C Road connects the district with Trichy district. The state Highways links the various parts of the district with the nearby urban areas and they cover 1899.10 Kms.
b) Rail : Three railways lines are diverging from Cuddalore junction connecting 27 railway stations in the district. They are Cuddalore-Villupuram-Chennai, Cuddalore – Mayiladuthurai – Tiruchirappalli, Cuddalore – Mayiladuthurai – Velankanni and Cuddalore-Vridhachalam-Salem. The length of broad gauge line is 188 Kms.

c) Ports : The District has two ports, one being Cuddalore Old Town (O.T.) and the other at Parangipettai. While there is no activity at Parangipettai port, limited imports and exports being are carried out at Cuddalore O.T port. The exports at iron ore and imports of chemicals and fertilizers. In 17th Century the Parangipettai port was associated with the Portuguese, Dutch and the British.

3.11 Economy

The per capital income per annum of the Cuddalore district in 2011 is Rs 41,840/- which was at Rs.30,864/- during 2001. However this is low compared to the Tamil Nadu State's per capital income of Rs.48,216/-. The total number of households in the district is 615,346 and the total no. of households below poverty line is 2,27,472 and they comprise 36.97% of the total households. The census data 2001 and 2011 reveals that the worker participation, both male and female workers of the district has marginally increased.

3.12 Social structure

The vulnerable groups such as Scheduled Caste (SC) and Scheduled Tribe (ST) population were 1.22 % and 0.3% of the total population respectively. An overwhelming majority (85.40%) population belong to other backward caste (OBC).

3.13 Literacy Level

Literacy rate of Cuddalore city is 87.71 % higher than state average of 80.09 %. It varied from under primary (including basic knowledge of reading and writing) to metric and higher education level. Amongst them the male literacy rate was higher (92.34%) compared to the females (83.22%) in the study area.

3.14 Occupational pattern

Out of total population, 62,115 were engaged in work or business activity. Of this 48,047 were males while 14,068 were females. In census survey, worker is defined as person who does business, job, service, and cultivator and labour activity. Of total 62115 working population, 84.07 % were engaged in Main Work while 15.93 % of total workers were engaged in Marginal Work.

Based on the secondary baseline information and proposed project components, the Environmental and Social Management Plan (ESMP) has been prepared and included in this ESIA. The ESIA Report is based on National, State regulations and as per draft Environmental and Social System Assessment Report (ESSA-Draft Disclosed) for TNCRUDP.

4 Environmental and Social Impact Assessment

This section identifies and assesses the potential changes in the environment and social aspects that could be expected from the proposed project. The proposed project activities would create impact on the environment in two distinct phases i.e., construction and operation phases. Impacts are identified, predicted and evaluated based on the analysis of the information collected from following:

- Project information (as discussed in Chapter-2) and
- Baseline information and site visits of the study area (as discussed in Chapter-4)

This section also describes mitigation measures, which have been suggested for the adverse impacts likely to be caused due to activities of both construction and operation phases of the project. The details of the activities and their impacts have been worked out in the following sections. Mitigation measures to minimize / mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

4.1 Identification of likely impacts

Screening of potential environmental and social impacts are categorized into four categories Considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

(i) Location impacts include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.

(ii) Design impacts include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.

(iii) Construction impacts include impacts caused by site clearing, earthworks, machinery, vehicles, workers, occupational health and safety. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

(iv) O&M impacts include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

This section of the ESIA reviews possible project-related impacts, in order to identify Issues requiring further attention and screen out issues of no relevance. The Environmental and Social Screening format are provided in the Annexure 1.

In the case of this project most of the individual elements involve simple construction and operation, so impacts will be mainly localized and not greatly significant negative impacts. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

4.2 Design & Location impacts

Design of the Proposed Components. The Central Public Health and Environment Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years. The water supply components were designed following the recommendations of the CPHEEO manual for water supply and treatment.

Impacts arise from the design of the project including the technology used, scale of operation, waste production, discharge specification, pollution sources and ancillary services.

Impacts associated with the planning mainly depend on the site selection. Location impacts include on-site biophysical array and encroachment / impact either directly or indirectly on adjacent environments. It also includes the impacts on the people who might lose their properties or livelihoods due to the development of the proposed site.

Construction works in the Cuddalore City Municipal Corporation area, the pipelines are to be laid on or along the roads in the unused vacant land adjacent to the roads within the project area. In the narrow roads (where there is no vacant land adjoining road), pipelines will be buried within the road right of way. However, considering the narrow and busy lanes, temporary impacts are likely during the construction stage.

Sources of Materials. For the construction work, the required materials like coarse aggregate and fine aggregate will be obtained from the permitted / licensed quarries by the Department of Geology & Mining, Government of Tamil Nadu. Contractor should not create/use any new borrow pits / quarries. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible.

The construction contractor will be required to:

(i) Obtain construction materials only from government-approved quarries with prior approval from Cuddalore City Municipal Corporation;
(ii) Cuddalore City Municipal Corporation to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval;
(iii) Contractor to submit to Cuddalore City Municipal Corporation on a monthly basis documentation on material obtained from each source (quarry/ borrow pit) and
(iv) Avoid creation of new borrow areas, quarries, etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including environmental clearance prior to approval by Cuddalore City Municipal Corporation.

4.2.1 Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas

Priority is to locate these near the project location, but it shall be at least 100m away from residential areas, groundwater wells and surface water bodies. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems.

Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution, dust, noise etc. It is also intended to prevent any social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or its nearby areas. The contractor will prepare a Construction ESMP (CESMP) including Labour Camp Plan and Waste Management Plan prior to construction and submit it to CCMC.

4.2.2 Noise from pumping operations

The noise from pumping operations is applicable only in the source location and sump. The noise from pumping operations is limited for this project.

Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise, use acoustic enclosures – manufacturer specified, for all pumps, motors. Procure only Central Pollution Control Board (CPCB) approved generators to meet air emission and noise level requirements. Provide sound mufflers for ventilators in the plant rooms; and sound proof doors. Provide ear plugs designated for noise reduction to workers.

4.2.3 Energy Efficiency

The entire quantity of water proposed to be drawn from Thenpennaiyar and pumped to sump and again pumped through feeder main to the OHT. The clear water is transmitted for a distance of 10.549km by pumping. From the proposed OHT water will be distributed by gravity to the beneficiaries. For pumping, BEE pumps as per IS 12615 2011, i.e. energy efficient induction motors are proposed and hence this project is energy efficient.

To optimize the power consumption, the hydraulic design shall follow optimal approach and the following is also considered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed by Bureau of Energy Efficiency (BEE) and International Finance Corporation in 2008), energy savings, at minimum, of 25% to 40% is possible with appropriate measures. The following measures have been considered and incorporated into the subproject designs wherever possible:

- Using low-noise and energy efficient pumping systems
- Energy Efficient Motors and Pumps
- Installation of Variable Frequency Drives (VFDs) and energy efficient than conventional starters, this will ultimately reduce the energy cost. This VFD will take care of fluctuations in pumping of water at source locations in terms of extreme variations.

Utilities

The utilities that are located above the ground level and below the ground level will be shifted after obtaining necessary permission from the competent authority.

4.3 Construction impacts

Impact on Air Quality. During the construction period, the impacts on air quality are mainly due to the material movement and the actual construction activities. Due to material movement air quality over the immediate influence area will be affected though, not in significant levels. There will be an increase in the dust levels. In order to reduce the dust emissions in the construction area due to material transport and construction activities, provisions should be made for sprinkling of water on all the roads in the area of improvement. It should be ensured that

(i) construction debris is removed daily;
(ii) construction requiring street closings should be performed during off-peak hours;
(iii) Idling of delivery trucks or other equipment should not be permitted during periods of unloading or when they are not in active use;
(iv) low emission construction vehicles should be used wherever possible; and

(v) As soon as construction is over the surplus earth should be utilised to fill up low-lying areas. In no case, loose earth should be allowed to pile up in the streets.

Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize or mitigate those impacts to acceptable levels.

Air Pollution during Construction work, especially from earthwork activities, coupled with dry and windy working conditions, material and debris transports, and works along the public roads carrying significant traffic, have high potential to generate dust. Significant quantities of earthwork will be conducted in the subproject, spread all over the project area. Nearly 90-95% of the earthwork will be reused for filling the trenches. Also, emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. Anticipated impacts include dust and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. Dust generation from construction work in individual and confined work sites for sump, OHT, etc., will be mainly during the initial construction phase of earthwork, as the site is confined, dust can be effectively controlled with common measures. Dust generation will be significant during pipe laying along the roads. Increase in dust/ particulate matter in ambient air is detrimental and may have adverse impacts on people and environment. To mitigate the impacts, construction contractors will be required to:

(i) For all construction works

(a) Damp down the soil and any stockpiled material on site by water sprinkling (3-4 times a day before the start of work, 1-2 times in between, and at the end of the day) when working in the roads there should permanently be one person responsible for directing when water sprinkling needs to take place to stop the dust moving;
(b) Reduce the need to sprinkle water by stabilizing surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition;
(c) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process;
(d) Cover the soil stocked at the sites with tarpaulins and surround by dust screens;
(e) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation;
(f) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by open trucks;
(g) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area, minimize the drop height when moving the excavated soil;
(h) For sections involving controlled blasting, ensure that adequate cover is provided to prevent emission of dust during controlled blasting.
(i) Clean wheels and undercarriage of haul trucks prior to leaving construction site;
(j) Ensure that all the construction equipment, machinery is fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate; and
(k) No vehicles or plants to be left idling at site generators to be at placed maximum distance from properties.

(ii) For pipe laying works

(a) Inform the residents likely to be affected by the works in the locality about the upcoming pipe laying works well in advance so that necessary arrangements are planned by the residents with reduced inconvenience.

(b) For sections where the controlled blasting is proposed, the residents are provided with the schedule of blasting at least three days in advance and the residents are explained about the preventive, precautionary, mitigation and emergency response measures being taken to address their concerns.

(c) The project staff from the PIU, consultants and contractors would undertake a survey of structures (including videography and/or photography) lying within the area of influence of blasting from the impacts (preferably in the presence of the owners of the said structures) during pre- and post-blasting situations to assess and/or ascertain regarding the damages, if any, caused to the structures because of blasting activities.

(d) Barricade the construction area using hard barricades (of 2 m height) on both sides;

(e) Initiate site clearance and excavation work only after barricading of the site is done;

(f) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes, etc.), to the barricaded area;

(g) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area;

(h) Undertake the work section wise a 100 m section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different zones;

(i) The section proposed for blasting shall be supervised by properly trained staff to ensure no movement of pedestrians, motorized or non-motorized vehicles, and residents takes place during blasting within the area of influence.

(j) For sections involving controlled blasting, ensure that dust curtains of adequate height are provided to the trenches to prevent emission of dust during drilling for charge holes and controlled blasting.

(k) Ensure that the excavated soil and debris along the section identified for blasting is sprinkled with adequate water prior to blasting to reduce dust emissions upon explosion of charge placed for breaking the hard rock;

(l) Ensure that adequate precautions are taken to avoid flying debris post blasting (such as covering the trench with sturdy metallic sheets having sufficient weights to absorb the blast waves);

(m) Conduct work sequentially - excavation, pipe laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done;

(n) Remove the excavated soil of first section to the disposal site; as the work progresses sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for backfilling, this will avoid stocking of material, and minimize the dust; and

(o) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from the backfilled section. Road restoration shall be undertaken immediately.

Excavation and refilling activities disturb the topsoil, and under the influence of wind, traffic, pedestrians, and other activities etc., produces dust. There is large potential to generate significant quantities of dust after refilling the trench, and prior to road relaying. It is a common practice not to restore the road immediately after refilling the trench so as to allow sufficient time for the refilled material to stabilize naturally. Given the dry and windy conditions, and heavy traffic and other activities along the roads, the refilled trenches with loose topsoil along the roads will generate maximum dust and create very unhealthy conditions. Moreover, as the barricades/ dust screens will be removed after the trench is refilled, there will be absolutely nothing to control the dust generation. Dust control activities like wetting of topsoil will not be effective given the site conditions. It is therefore necessary

to restore/ relay the road surface immediately or take suitable steps to arrest the dust. Soil consolidation techniques shall be used so that roads can be restored immediately.

While obtaining permission for the proposed clear water transmission mainly from NH, SH roads, the necessary restoration charges will be paid and accordingly the respective department will restore their roads.

4.3.1 Generation of Construction Wastes.

Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odour and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. Earthwork excavation in the road will be reused for levelling the roadside and earth excavation from other locations will be safely disposed by CCMC along with C&D wastes .

The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

(i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in Appendix 4);
(ii) Avoid stockpiling any excess spoils at the site for a long time. Excess excavated soils should be disposed to corporation lands;
(iii) If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should locate away from residential areas, forests, water bodies and any other sensitive land uses;
(iv) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable and be handled in consultation with PIU in compliance with regulatory requirements. non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market;
(v) Prohibit burning of construction and/or domestic waste;
(vi) Ensure that wastes are not haphazardly thrown in and around the project / work sites; provide proper collection bins, and create awareness to use the dustbins; recycle waste material where possible; and

Conduct site clearance and restoration to original condition after the completion of construction work; CCMC to ensure that site is properly restored prior to issuing of construction completion certificate.

4.3.2 Surface Water Quality

Runoff from the excavated areas and material and waste soil stocks likely to contain silt, and this silt runoff will deteriorate the water bodies due to silting. Large-scale silting is likely to lead to flooding. This impact will however be considered only during the rainy season. These potential impacts are temporary and are of short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(ii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Cuddalore city municipal corporation on designated disposal areas;
(iii) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(iv) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; and
(v) Dispose any wastes generated by construction activities in designated sites; and
(vi) Conduct surface water quality inspection according to the ESMP.

Aquatic Environmental Impacts:
The proposed activities in headworks in the river involve infiltration galleries which will be by push-through. Hence the proposed headworks is not envisaged to have any impact on the aquatic environment. However adequate precautions are to be taken during work for ensuring safety.

4.3.3 Noise and Vibration Levels.

The project sites are located within habitations, where there are houses, schools and hospitals, religious places and businesses. During the construction stage, an increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads and controlled blasting if any, for removal of hard rocks in sites and along the alignment for the purpose of laying of pipe, operation of construction equipment, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of explosives for controlled blasting and pneumatic drills, will have an impact on nearby buildings. The construction contractor will be required to:

(i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors;
(ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor;
(iii) Maintain maximum sound levels within the limits as prescribed by the prevailing Indian regulations and standards;
(iv) Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the sites or section of alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimise such impacts.
(v) Horns should not be used unless it is necessary to warn road users or animals of the vehicle's approach; and
(vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
(vii) All the controlled blasting, shall be done by an approved and licensed Explosive contractor after submitting a blasting plan to PIU.

4.3.4 Social and Cultural Resources – Chance Finds

Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in project sites for foundations, laying pipelines, and for construction of OHT. There are no protected monuments within the sub-project town/ infrastructure locations/ pipeline alignment. But there are temples and other religious sites in the project town. During construction adequate precautions will be taken not to cause any disturbance to the temples and other religious structures. Further during construction if any chance finds encountered, then necessary management measures as identified in the ESMP would be implemented to ensure they are protected and conserved.

Construction contractors follow these measures in conducting any excavation work.

(i) Conduct training to impart knowledge and create awareness among the workers, supervisors and engineers about the significance of archaeological, paleontological and geological aspects and the applicable Indian Treasure Trove Act, 1878 and chance found during excavation work.
(ii) The fossils, coins, articles of value of antiquity, human skeletal and other remains or things might be exposed during construction activities. In such situation, stop the work, do not remove and damage any article

(iii) Stop work immediately to allow further investigation if any finds are suspected and take any action they require to ensure its removal or protection in situ.
(iv) Inform the concerned authority (Archaeological Survey of India) immediately to take-action per referred Act and recommence the work after receiving written permission; and Also, prevent any type of impact on the cultural heritage, monument, etc..

4.3.5 Accessibility and Traffic Disruptions.

The main roads in the CCMC carries considerable traffic. These roads are also centers of commercial activities. Internal roads in the project area are narrow, except in the newly developing residential layout, which comparatively have wide roads. Pipes to be laid across some of the arterial roads. In other corporation maintained busy roads, work will be taken up during non-traffic hours/ night hours without much hindrance to the free flow of traffic. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(ii) schedule transport and hauling activities during non-peak hours;
(iii) locate entry and exit points in areas where there is low potential for traffic congestion;
(iv) keep the site free from all unnecessary obstructions;
(v) drive vehicles in a considerate manner;
(vi) coordinate with City Traffic Office for temporary road diversions and necessary provision of traffic aids if transportation activities cannot be avoided during peak hours;
(vii) notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints;
(viii) provide planks across trenches in front of businesses, and ensure works are completed quickly to avoid disruption; and
(ix) avoid full street closure.

4.3.6 Surface and Groundwater Quality.

Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. To ensure that water will not pond in pits and voids near subproject location, the construction contractor will be required to conduct excavation works on non-monsoon season.

4.3.7 Socio-Economic – Income.

Sites for all project components are carefully selected in government owned lands. During the project implementation, blocking of access to the business / livelihood activities are envisaged, especially during pipeline laying along the roads, may impact the income of households. However, given the alignment of pipeline is within the road carriage way, and also the measures suggested for ensuring accessibility during pipe laying works are notable but temporary impact is envisaged. Some shops and other premises along the roads may lose business income if the access will be impeded due to excavation of trenches, the presence of heavy vehicles and machinery, etc. Access disruption to hospitals, socio cultural places etc., will cause inconvenience to the public. Implementation of the following best construction measures will avoid the disturbance reduce the inconvenience and disturbance to the public.

(i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;
(ii) Do not block any access; leave spaces for access between barricades/mounds of excavated soil and other stored materials and machinery, and providing footbridges so that people can crossover open trenches;
(iii) Barricade the construction area and regulate movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around
(iv) Control dust generation;
(v) Immediately consolidate the backfilled soil and restore the road surface, this will also avoid any business loss due to dust and access inconvenience of construction work;

(vi) Employee best construction practices, speed up construction work with better equipment, increase workforce, etc., in the areas with predominantly commercial, and with sensitive features like hospitals, and schools;
(vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
(viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

4.3.8 Socio-Economic – Employment.

Manpower will be required during the construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be required to:

(i) Employ local labour force as far as possible;
(ii) If available, secure construction materials from local market;

4.3.9 Occupational Health and Safety.

Workers need to be mindful of the occupational hazards which can arise from working in confined areas such as trenches, working at heights, near the heavy equipment operating areas, etc. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Follow all national, state and local labour laws
(ii) Develop and implement site-specific occupational health and safety (OHS) plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training for all site personnel; (d) excluding public from the work sites; and (e) documentation of work-related accidents; follow international standards such as the World Bank Group's Environment, Health and Safety Guidelines;
(iii) Ensure that qualified first aid trained professional is deployed at all times. Equipped first-aid stations shall be easily accessible throughout the sites;
(iv) Secure all installations from unauthorized intrusion and accident risks;
(v) Provide OHS orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(vi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(vii) Ensure the visibility of workers through their use of high visibility vests and other PPEs when working in or walking through heavy equipment operating areas;
(viii) Ensure moving equipment is outfitted with audible back-up alarms;
(ix) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate;
(x) Provide supplies of potable drinking water;
(xi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; and
(xii) Disallow worker exposure to noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

(xiii) A separate health and safety plan has been prepared to respond to ongoing coronavirus disease (COVID-19) pandemic, which would be implemented by the contractor in addition to the provisions outlined here.

4.3.10 Community Health and Safety.

Excavations along the roads & narrow streets and hauling of equipment and vehicles have potential to create safety risks to the community. Excavations without any proper protection may endanger the close by buildings. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Confine work areas; prevent public access to all areas where construction works are on-going through the use of barricading and security personnel;
(ii) Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation;
(iii) Minimize the duration of time when the trench for laying pipe is left open through careful planning; plan the work properly from excavation to refilling and road relaying;
(iv) Control dust pollution – implement dust control measures as suggested under air quality section;
(v) Ensure appropriate and safe passage for pedestrians along the work sites;
(vi) Provide road signs and flag persons to warn of on-going trenching activities;
(vii) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency);
(viii) Enforce strict speed limit (20-30 kmph) for plying on unpaved roads, construction tracks;
(ix) Provide temporary traffic control (e.g., flagmen) and signs where necessary to improve safety and smooth traffic flow;
(x) Where traffic is diverted around crossings, traffic control or careful selection of the exit from the working areas will be provided with the aim of ensuring that vehicles join the road in a safe manner;
(xi) At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighbourhood awareness meetings;
(xii) All drivers and equipment operators will undergo safety training; and
(xiii) Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

4.3.11 Construction Camps.

Contractor may require to set up construction camps – for temporary storage of construction material (pipes, cement, steel, fixtures, fuel, lubricants, etc.), and stocking of surplus soil, and may include separate living areas for migrant workers. The contractor will however be encouraged to engage local workers as much as possible. Operation of work camps can cause temporary air, noise and water pollution, and may become a source of conflicts, and unhealthy environment if not operated properly. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) select a camp site away from residential areas (at least 100 m buffer shall be maintained) or locate the camp site within the existing facilities of CCMC;
(ii) avoid tree cutting for setting up camp facilities;
(iii) provide a proper fencing/compound wall for camp sites;
(iv) camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas

(v) separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit;
(vi) camp shall be provided with proper drainage, there shall not be any water accumulation;
(vii) provide drinking water, water for other uses, and sanitation facilities for employees drinking water should be regularly tested to confirm that drinking water standards are met;
(viii) prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); firewood not allowed;
(ix) train employees in the storage and handling of materials which can potentially cause soil contamination;
(x) wastewater from the camps shall be disposed properly either into sewer system, if sewer system is not available, provide on-site sanitation with septic tank and soak pit arrangements (100 m away from surface water body or groundwater well);
(xi) recover used oil and lubricants and reuse or remove from the site;
(xii) manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market;
(xiii) remove all wreckage, rubbish, or temporary structures which are no longer required; and at the completion of work, camp area shall be cleaned and restored to pre-project conditions and submit report to PIU; PIU to review and approve camp clearance and closure of work site.

4.4 Operation and Maintenance Impacts

The main O&M activities of the proposed infrastructure will be detection and repair of leaks and pipe bursts. These are, however, likely to be minimal as proper design and selection of good quality pipe material should mean that leaks are minimal. Leak repair work will be similar to the pipe laying work as earlier explained. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

1. Recurrence of blockage and leakage problems. Although impact is likely to be minimal due to new and well-designed efficient system; it should be ensured that leak detection and restoration time is minimized to the extent possible.

2. To ensure that water delivered to consumers at all times meets the drinking water standards, the following measures are suggested:

(i) Preparation and implementation of a water quality surveillance to ensure that supplied water meets the drinking water standards; and
(ii) Surveillance program will be organized to ensure the water quality of the consumer water.

SCADA systems and DMAs are proposed in the project. The parameters like pressure reduction, leakage, pollution etc will be captured in the system. This system will help to zero in on the issues and speedy redressal.

5 ANALYSIS OF ALTERNATIVES

5.1 No Project Alternative:

The existing distribution system was laid long back, and the supply is intermittent. In this context, as per the orders issued by Government of Tamil Nadu, to convert intermittent supply to continuous supply, this project is selected in one of the zones to provide 24/7 water supply.

This is a 24/7 pilot project in Zone 4 of Cuddalore Corporation and once it is implemented successfully, this will be extended to all the wards in the Corporation. Hence, no project alterative has not been considered.

5.2 Source Alternatives Considered

As per the hydrogeological investigation, the existing source Chavadi in recent past the quality of ground water has deteriorated owing to excess iron content. The iron content in the ground water increases year after year owing to over exploitation. The formations is releasing the iron from the formation water slowly thereby the quality of ground water become increasingly not potable.

Based on the Geophysical investigation study, Geology and Hydrogeology of the area in between Vellambakkam - Azhagiyanatham bridge to Erandayravillagam bridge located 3 nos. of Infiltration well has been identified as water source for Water zone – 4 area. The expected yield of each infiltration well is approximately 750 lpm, and by adopting 16 hours of pumping, there will be possibility to extract 2.16 MLD of water.

Based on the geology, hydrogeology and geophysical data interpretation, it is ascertained that, the river Thenpennaiyar, near Azhagiyanatham village is favourable location to create 5nos. of deep sedimentary bore wells to a depth of 200m with 200mm dia. The expecting yield of each sedimentary borewell is around 300 lpm with adopting 16 hours of pumping, there will be possibility to extract 1.44 MLD of water.

6 Environmental & Social management plan (ESMP).

6.1 Environmental and Social Management Plan

The ESMP is developed to mitigate the adverse E&S risks and impacts of this sub-project. It explains the mitigation measures, responsibility, implementation phase, monitoring method, monitoring indicators and frequency during pre-construction, construction, operation and decommissioning phases. The Contractor supervised by PIU is mainly responsible for the implementation of plans during the project life cycle. The project specific ESMP is provided in Table 33.

Table 33: Environmental and Social Management Plan

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
1.0 Pre-construction phase							
1.1	Engineering design and alternative analysis	(i) All National/State Regulatory requirements shall be followed, and Guidances as applicable (ii) Ensure that the investigation and analysis of alternative engineering design and technologies, and the route location of the proposed pipeline network (the project) cause minimum environmental and social risk and impact during the project cycle; (iii) Ensure the activities like trenching, excavation, pipes joint welding result into minimum or no loss to terrestrial ecosystem; and (iv) Alternatives in terms of cost effectiveness, low maintenance, minimum and area for pipeline route selected along the existing roads for the project will cause minimum E&S impact. (v) For reducing energy consumption, evaluate use of low-noise and energy efficient pumping systems, efficient Pumping system operation, and Installation of Variable Frequency Drives (VFDs). (vi) Construction of compound wall around project sites / pumping stations, chain-link mesh above with climbers and creepers are proposed to act as screen. (vii) Tree cover, shrubs having dense foliage (depending upon space availability) along the compound wall is proposed.	PIU/PMC, Contractor	Design/Pre-construction	Review the performance of design and technology and route decided for the project; and Consult the experts and learn from the experiences gained from such projects elsewhere	Minimum E&S risk and impact; Minimum or no impact on local ecology, water bodies and forest; Minimum impact on land and local communities ; and cost effective and O&M efficient.	Periodically
1.2.	Visual impacts	(i) Ensure that the design of the water pipeline causes no visual impact to the landscape, local scenery and sustain the aesthetic importance in project area; (ii) Ensure construction of pipeline without obstruction to natural topography and flow of water into water bodies; (iii) Maintain limit on the outdoor security lighting for unobtrusive sight to people; and (iv) Make use of local material and appropriate construction techniques.	PIU/PMC, Contractor	Design and construction phase	Review detailed layout plan; and site inspection	Visual measures are addressed in layout plan; and No visual impact due to construction of structures at	Monthly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
						pumping house in project.	
1.3	Utility relocation	Identify the common utilities to be affected such as telephone cables, electric cables, electric poles, water pipelines, public water taps, etc; and Seek prior approval and inform the concerned agencies for utilities shifting before construction starts.	PIU/PMC, Contractor/ Authority of concerned utilities	Pre-construction phase	Review detailed layout plan and site inspection	Utilities shifted in time where necessary	One time
1.4.	Permits and approvals	(i) Obtain all permits and approvals required for E&S aspects during pre-construction, construction, operation and decommissioning phases. (ii) These shall be made available from the TNPCB, PWD, and other line departments like National/State highways, Traffic, Police, Telecom, Electricity, etc and regulators of the State and Central governments as applicable. (iii) Obtain prior permission for tree cutting. (iv) Ensure that all necessary approvals for construction to be obtained by contractor like labour licence / labour insurance are obtained before start of construction.	PIU/PMC, Contractor Contractor	Before construction commences	Keep record of all permit, approvals and authorizations	Permits and approvals are available	One to two times
1.5	Source of Materials	(i) Obtain construction materials only from government approved quarries with prior approval of PIU/PMC. (ii) PIU/PMC to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval. (iii) Contractor to submit to PIU on a monthly basis documentation on material obtained from each sources (quarry/ borrow pit) (iv) No new borrow areas, quarries etc., shall be developed for the project;	PIU/PMC, Contractor	Pre-Construction and Construction Phase	Records, approvals	Approvals available	Periodically
1.6.	Material storage and portable office cabin	(i) Storing the pipeline fittings and associated materials; (ii) Establish a suitable place for site camp at the start of the civil works, which will allow for site offices in portable cabin.	Contractor/ PIU/ PMC	Pre-construction	Site inspection	Location and its access; Basic	Semi-annually

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
						facilities and civic amenities.	
1.7.	Labour accommodation and facilities	(i) Identify the suitable building in terms of location, sufficient area, access, security, basic amenities, etc. (ii) Follow all relevant provisions of the Contract Labour (Regulation and Abolition) Act, 1970, Good International Industry Pratices, the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act (Central),1996- and State Rules, ILO convention 62-Safety provisions (Building) Convention and applicable laws for rented labour accommodation; (iii) The location, layout and basic facility provision for labour accommodation will be reviewed by the Project Engineer / PIU and suggestions to be communicated to the contractor prior to the construction; (iv) Maintain necessary living accommodation and ancillary facilities in functional, safe and hygienic conditions; (v) Provide adequate number of toilets and bathing area (separate for females/males), kitchen, safe fuel/ LPG for cooking and uncontaminated water for drinking, cooking and washing; (vi) Drinking water provided to the labourers shall be tested 3 monthly; (vii) Cooking shall be in a separate area: no cooking shall be permitted inside rooms; (viii) Prohibit employees from cutting of trees for firewood; fire wood not allowed; (ix) Labour accommodation and temporary shade near work sites shall provide protection from heat, rain, flooding, insects, snakes and mosquitoes. It should have adequate provisions for emergency such as accidents, disasters, fire safety, security, etc;	Contractor	During Pre-construction	Visual inspection; Consultations with labour, and local communities nearby; Site inspection; Facilities made available; Type of illness and its causes; and Discussions about the level of health awareness and safety precautions taken by the workers while working on the work site.	All the facilities available as per law and standards; Assess the satisfaction level of labourers; Cordial relation between labour and local communities ; Easy access of first-aid box with required medicine and accessories at each working site, labour accommodation, labour and office to	Every day

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(x) Adequate health care is to be provided for the workforce; (xi) Ensure adequate water supply in all toilets and urinals; Provide separate toilets/ bathrooms for women labourers and shall be screened from those for men and marked in vernacular language. (xii) The contractor shall provide separate garbage bins for wet and dry waste in the camps and ensure that these are regularly emptied, treated and disposed off in ULB SWM facilities as per regulations. (xiii) Provide first aid medical kit at labour accommodation, temporary labour shed and work site; train the labour for usage of items in case of injury, emergency, coordinate with nearest government and private medical centers and tie-up for the medical services, display the contact number of ambulance service, medical doctor(s) and keep a vehicle for emergency travel all the time; (xiv) As per provisions of WHO and MOHFW guidelines of COVID-19, sanitizer, soap, mask, etc. should be made available in sufficient quantity and its use by the workers mandatorily and maintain social distancing all the time; (xv) Ensure medical tests and treatment of COVID-19 positive cases immediately; and (xvi) Maintain the required data and documents at site and regularly submit the compliance report to the PIU.				workers all the time; and Arrangement made with the Doctors at the nearest government health and medical center/ private clinic.	
1.8	Public disclosure	Ensure timely and full project information dissemination through distribution of prior notice, pamphlet in local language, oral communication, meetings, websites, etc.	PIU/PMC, Contractor	Pre-construction phase/continuous	No of Consultations carried during the months	Methods used for public disclosure; and Project awareness.	One time

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
1.9	Grievances redressal system	(i) Establish the efficient grievance redressal mechanism and accordingly constitute the grievance redressal committee (GRC) as outlined in the ESIA project level with representatives of all the stakeholders as members, including women and vulnerable groups of local communities; (ii) Ensure the wider publicity of procedure, functioning and availability of GRC since the inception of the project; (iii) All the grievances received shall be acknowledged and proper recording and tracking should be carried out; (iv) GRC will adjudicate the complaints in 6-8 weeks depending upon the severity of case; (v) Convenor will be the coordinator for organizing GRC meetings as required, writing the proceedings, minutes of meeting, informing the aggrieved party about the decision of GRC, etc;	PIU /PMC, Contractor	Project life cycle	Review the proceeding and minutes of meetings; and Consultations with the members of GRC.	GRC established; GRC meetings held; Number of cases received and resolved; Decision taken within a timeframe; and Court case filed or withdrawn.	Monthly or as required
1.10	Sensitive Areas	The sensitive areas like Schools, hospitals to be provided with suitable noise barriers and safety measures, prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement during construction and their effectiveness to be checked. NO material or waste shall be stacked in CRZ areas & near rivers. All applicable regulations & guidance to be followed. The contractor to comply with all the conditions of CRZ .	PIU/PMC, Contractor	Pre-construction phase	Site inspection	Location and its access; and Basic facilities and civic amenities.	Periodically
2.0 Construction and operation phases							
2.1.	Labour mobilization	(i) Obtain site management and labour plan approval from the Convenor; and (ii) Accordingly, mobilize the labour on worksite for the laying of pipeline, OHTs, and construction of headworks, pipe carrying bridges, etc.	Contractor, PMC/PIU	Construction phase	Review site management and labour plan; and Site inspection	Number and date of labour mobilization; and Date of starting	Periodically

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(iii) Contractor shall prepare a Labour Management Plan which shall be reviewed by the Engineer in charge of PIU and approved.				works.	
2.2	Appointment and Mobilization of Environment & Safety Officer	(i) The contractor will appoint qualified and experienced Environment & Safety Officer (ESO), who will be mobilized prior to start of works. (ii) ESO will dedicatedly work and ensure implementation of Environmental Management Plan including Occupational, Health and Safety measures during the project implementation.	Contractor	Pre-Construction Phase	Review reports and records	No compliance at site	One time
2.3	Submission of updated environmental & social management plan (C-ESMP)/ ESMP implementation and reporting	(i) Before starting the work, Contractor shall prepare contract and site specific ESMP (C-ESMP) including : (ii) Location wise Occupational Health & Safety, Community Health & Safety plans shall be prepared by the contractor as part of the updated ESMP. (iii) Site specific Hazards may be identified prior to start of works shall be done and be included in the updated ESMP. (iv) Contractor to prepare SEP, LMP, WMP as required. (v) Contractor to carry out HIRA (Hazard Identification and Risk Assessment) before starting works, OHS, Waste & sludge Management Plan, trainings, green belt for all facilities, work permit for excavations, work under water including lighting, type of PPEs & hazard assessment, confined spaces work on heights, trench/ excavated area management, lighting, restoration of roads after laying pipes, flag men, and lighting for large equipment's, works under / near water. All workers staff to be trained in OHS during emergencies & heat waves. (vi) Submission of updated ESMP to the PIU/PMC prior to start of construction. (vii) Supervisor to ensure ESMP implementation. (viii) Timely submission of monthly monitoring reports including documentary evidence on ESMP implementation such as photographs.	Contactor/ PMC	Project cycle	Review of reports and records	Compliance at the site	One-time / As and when need arises

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(ix) Contractor to submit Labour Management Plan (LMP), Waste Management Plan (WMP), Stakeholder Engagement Plan (SEP), Traffic Management Plan, etc as required along with Contractors ESMP. (x) Contractor to update ESMP whenever there are any change in the design(s) and site(s).					
2.4.	Site clearance and tree cutting	(i) Identify the number of trees that will be affected with girth size and species type. Avoid tree cutting and loss of vegetation, shrubs, grasses, etc. to the maximum extent possible; (ii) Trees where necessary shall be removed from the construction site before commencement of construction with prior permission from the concern department and other authority as applicable; (iii) Compensatory plantation for every tree cut by way of re-plantation at ten times the trees cut; (iv) Growth and survival of trees planted shall be ensured and monitoring should be conducted at least for 3 years. Survival rate of plants shall be reported to the PIU/PMC on monthly basis; (v) Contractor shall develop plantation program for the site;	Contractor, PIU/PMC	Construction phase	Review site management and labour plan; and Site Inspection.	No tree cutting Minimum vegetation loss; Number and species of trees cut and replanted; and Survival of number and species of trees planted.	Monthly
2.5.	Site preparation	(i) Disturbance to land surface contours to be kept to minimum; (ii) Maintaining the natural drainage pattern existing onsite; (iii) Adequate drains and slopes to be laid across the proposed project site prior to start of excavation work to ensure adequate cross drainage; and (iv) Ensure that the earmarked operational area for laying of pipeline and pumping house is barricaded with specific access (entry and exit) points. (v) Barricading of the earmarked sites, besides the safety, will limit the disturbances or construction impacts to the adjacent areas within the premises.	Contractor, PIU/PMC	Beginning of construction	Site inspection	Natural drainage maintained; and Minimum excavation for drainage and levelling	One time and periodically

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(vi) Necessary precautions such as bracing / shoring in the trench will be provided for trenches of more than 1.2 m deep or as required based on site conditions.					
2.6	Site Camp	(vii) Locate the suitable place for site camp at the start of civil works for the labours. (viii) Provide water and/or other facilities at the site camp; (ix) Establish a suitable site office in portable cabin at the start of the civil works in the land provided at pumping station; and (x) Designate the area beyond the boundary of the site as No-Go areas for all personnel on site. (xi) No vehicles, machinery, materials and people shall be permitted in the No-Go area at any time without the permission.	Contractor, PIU/PMC	Prior to start of construction	Review approved site camp and site office layout; and Site inspection	Approved site plan layout; and Area outside the site camp and site office designated as No-go area.	Once
2.7	Barricading working site	(i) Ensure that the construction site should be barricaded at all time with adequate marking, flags, reflectors etc. to isolate it from other operating areas; and (ii) Barricade the pipeline route and identified construction areas at OHT sites prior to construction activities.	Contractor	Prior to start of construction	Site inspection	Proper barricading in place; and Accident or casualty reported	One time
2.8	Stakeholder consultations	(i) Undertake detailed mapping and analysis of key stakeholders. Based on the stakeholder analysis, stakeholder engagement plan is prepared that will be updated as required; (ii) Ensure that stakeholder including impacted persons are consulted and made aware about the project's purpose, risks/ impacts, mitigation measures and time- frame; and (iii) Maintain the records and documentation of the procedure followed and the output of stakeholder engagement.	Contractor/ PIU/PMC	Construction phase	Consultations with local communities, beneficiaries, and other stakeholders	Awareness level of stakeholders, particularly the local communities, beneficiaries of the proposed water supply; and Perception of local communities,	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
						about the project and its impact and mitigation measures.	
2.9	Traffic management	(i) Route for use by construction traffic within site to be planned with proper signage, flagman, barriers and safety to minimize encountering of workers with vehicles as per National Road Safety Policy 2010. Route for movement of heavy machinery shall be designated to avoid the soil compaction in other areas; (ii) All vehicles deployed at site shall be certified for pollution under control (PUC), undertake regular maintenance of vehicles; (iii) Transportation of construction material will be generally scheduled in night when the traffic is minimum; or else have adequate traffic management ensured with the help f Traffic Police and additional flagmen/support (iv) Holding area shall be provided within the site for vehicles waiting to deliver loads at site to avoid queuing outside the site; (v) Ensure that the vehicles follow speed norms of the traffic department; and (vi) Investigate and respond to complaints about traffic.	Contractor, PIU/PMC	Construction phases	Review traffic management plan; and Site inspection	Implementation of traffic management plan adequately; Number of complaints received; and Incidence of accidents	
2.10	Accessibility to adjacent land uses	(i) Leave spaces for access between mounds of soil to maintain access to the houses / properties; access to any house or property shall not be blocked completely; alternative arrangements, at least to maintain pedestrian access at all times to be provided (ii) Provide pedestrian access in all the locations; provide wooden/metal planks with safety rails over the open trenches at each house to maintain the access. (iii) Inform the affected local population about the work schedule a week before, and a day before to start of work	Contractor, PIU/PMC	Construction phases	Site Inspection	Number of grievances received	Periodically

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(iv) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (v) Keep the site free from all unnecessary obstructions; (vi) Notify affected public-by-public information notices, providing signboards informing nature and duration of construction works and contact numbers for concerns/complaints. (vii) At work site, public information/caution boards shall be provided including contact for public complaints.					
2.11.	Construction material and machinery	(i) Modern machineries such as JCBs, poclain, road roller, etc. shall be used to increase work efficiency and minimize the construction period; (ii) Ensure that material transported is properly covered with Tarpaulin, etc. (iii) Schedule material deliveries after daylight hours; and (iv) Identify and repair minor leaks and prevent machineries/equipment failures.	Contractor, PIU/PMC	Construction phase	Review the material procurement detail; and Site inspection	Noise level and working of heavy machineries in order; and Construction material and its transportation follow the norms.	
2.12	Construction material storage	(i) Ready mix concrete (RMC) will be outsourced and contractor shall identify designated covered area for storage of construction material such as pipeline fittings, etc. with proper marking and measures to avoid dust emissions; (ii) Construction material stored in open shall be covered in order to avoid wind-blown dust emissions; (iii) Ensure and maintain record of proper stacking, loading and unloading of material and provide sufficient space for the movement of heavy vehicles inside the yard; (iv) Ensure handling the construction material safely by the labour;	Contractor, PIU/PMC	Construction phase	Site inspection; and Review the material record maintained.	Clean and organized storage site; and Incidence of injury in loading, unloading and handling the material.	Periodically
2.13	Construction of Head works	(i) No appreciable change to the river course shall occur due to construction of infiltration wells.	Contractor, PIU/PMC	Construction phase	Site inspection; and	No appreciable change to the	Periodically

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(ii) The cofferdam will be provided for construction of head work without any disturbance of river water flow. (iii) Ensure that the stream is not obstructed, affecting the downstream users due to cofferdams, etc or any disturbance due to works etc. (iv) Establish the baseline water quality prior to initiation of construction and to be periodically monitored. (v) After completion of work, ensure the restoring of river bed to its natural shape free from any debris or construction junk material that may obstruct the flow.			Review the material record maintained.	river course. Number of complaints received;	
2.14	Construction works (concrete, Cement, etc.)	(i) Use ready-mix concrete outsourced for the works on pumping station and lift station site and construction of machine holes and chambers to the maximum extent possible; and (ii) If required, ensure that cement is mixed on mortar boards and not directly on the ground unless unavoidable.	Contractor	Construction phase	Site inspection	Incidence of mixing concrete on working site; Visible concrete on site; and Contamination of water and soil.	Regularly
2.15	Top soil protection	(i) Topsoil removed prior to commencement of construction activities shall be stored (stockpile no higher than 2 meter) separately and reused for backfilling and landscape development within the project area; (ii) Keep topsoil stockpiles in an area protected from the wind and water; (iii) Land disturbance shall be restricted to the footprint of the project components and remaining area will be kept undisturbed to the extent possible; (iv) Ensure suitable control of run-off during the construction phase to prevent erosion of topsoil on adjacent land and undeveloped portions of the site; and	Contractor, PIU/PMC	Construction phase	Site inspection; and Assessment of disturbed (project components construction area) and undisturbed area.	Incidence of erosion; Storage and uses of top soil; and Topsoil erosion on adjacent land.	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(v) All excavations should be closed at the earliest before the start of rainy season.					
2.16	Noise from vehicles and machineries	(i) Servicing of all vehicles, machinery, power generating equipment shall be done regularly as per the manufacturer's guidelines and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced; (ii) All machines to be used shall conform to the relevant Indian Standards (IS), will be free from patent defect, kept in good working order, properly maintained and inspected regularly; (iii) Acoustic enclosure measures will be provided during operation to reduce noise level of machinery and DG set; (iv) Construction activities shall be carried out in a planned manner restricting high noise generating construction activities only during daytime; (v) Contractor will maintain the proper record for all the construction vehicles which shall have the valid fitness certificate, NOC, insurance, etc. (vi) Ensure noise level in the residential and industrial areas within the permissible limit; Regular monitoring of noise shall be conducted at site during the operations of machines and equipment; and (vii) Technicians/mechanics working on noise generating machineries will use PPEs such as ear plug, muffler, etc.	Contractor, PIU/PMC	Construction phases	Review of monitoring records Random Noise measurements	Level of noise generated; and Number of registered complaints	Regularly
2.17.	Dust emissions	(i) Avoid clearing of vegetation until absolutely necessary; (ii) Trucks carrying construction material shall be adequately covered with tarpaulin sheet to avoid the dust pollution and the material spillage; (iii) DG set shall have adequate stack height as per TNPCB requirement;	Contractor	Construction phase	Site inspection; Incidence of dust plumes; and Review of dust emission control measures.	Emission from construction site; Incidence of dust plumes observed;	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(iv) Dust levels will be controlled, through spraying of water from water tankers fitted with pressurized fine spray; (v) Maintain all generators, vehicles, vessels and other equipment in good working order to minimise exhaust fumes; and (vi) Locate soil stockpiles in sheltered areas where they are not exposed to the erosive effects of wind, water/floods..				Dust mitigation measures followed; and Number of complaints received.	
2.18.	Air quality	(i) Maintain all vehicles, DG sets/generators and other equipment in good working condition to minimise GHG emission, exhaust fumes, etc.; (ii) Avoid excavation, handling and transport of materials which may generate dust under high wind conditions or when a visible dust plume is present; (iii) Water sprinkling, cover dumping and stockpiles of lose material with plastic sheets or nets, particularly in windy conditions should be used to reduce airborne dust at construction sites; and (iv) Prevent burning, fire, use of wood for cooking in the project sites to avoid air contamination.	Contractor	Construction phases	Site inspection; Incidence of air pollution; and Review of fuel emission control measures.	Fuel emission from vehicles; Air pollution mitigation measures followed; and Number of complaints received.	Regularly
2.19.	Underground water	(i) Contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a manner that spillage of fuels and lubricants will not contaminate the ground water. (ii) Workforce will be trained about environmental pollution aspect and activities should stop immediately and resume only when problem is resolved; and (iii) Faulty equipment, vehicles and other source of possible oil and lubricant contamination should be repaired on priority and must be kept in good condition all the time.	Contractor	Construction & operation phases	Site inspection; and Review of spillage control measures.	Fuel or lubricant spillage; and Underground water pollution mitigation measures followed.	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(iv) If the sub project proposes to utilise the ground water, necessary pre-treatment/ treatment will be done prior to use.					
2.20	Protection of lakes/ water bodies/ Surface water quality	(i) Contractor shall ensure that all vehicle/ machinery and equipment operation, maintenance and refueling will be carried out in such a manner that spillage of fuels and lubricants will not contaminate the waterbodies and construction of pipe carrying bridges across the rivers/ waterbodies; (ii) Storage of fuel and lubricants shall be away from waterbodies. (iii) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management (iv) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (v) Waterbodies need to be cordoned off by using protective barriers such as green cloth and subsequently plantation; and (vi) Install temporary silt traps, oil traps, or sedimentation basins along the water leading to the water bodies; (vii) Dispose any wastes generated by construction activities in designated sites as per C&D Waste Management Rules, 2016; (viii) Construction works shall be restricted during the monsoon seasons. (ix) Conduct surface quality inspection waste to the Environmental Monitoring Plan (x) In case of waterlogging, water will be pumped out during the construction of pipelines with adequate safe precautions to workers, communities.	Contractor	Construction phases	Site inspection; and Review of spillage control measures.	Fuel or lubricant spillage; and Changes in water quality water pollution mitigation measures followed.	Regularly
2.21	Protection of archaeologic	(i) For this project, excavation will occur in project sites for headworks, laying pipelines, and for construction of OHTs.	Contractor, PIU /PMC	Construction phases	Site inspection; and Actions taken by the	Discovery of archaeologic al/	When occurrence of

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	al and heritage	(ii) There are no protected monuments present within the project area. However, during construction adequate precautions are to be taken during works near temples and other religious structures. Further, in case chance finds are recognized during excavation, all necessary measures are to be taken to ensure they are protected and conserved. (iii) Construction contractors follow these measures in conducting any excavation work. • Conduct training to impart knowledge and Create awareness among the workers, supervisors and engineers about the significance of archaeological, paleontological and geological aspects and the applicable Indian Treasure Trove Act, 1878 and chance found during excavation work. • The fossils, coins, articles of value of antiquity, human skeletal and other remains or things might be exposed during construction activities. In such situation, stop the work, do not remove and damage any article. • Stop work immediately to allow further investigation if any finds are suspected and take any action they require to ensure its removal or protection in situ. • Inform the concerned authority (Archaeological Survey of India) immediately to take-action per referred Act and recommence the work after receiving written permission; and Also, prevent any type of impact on the cultural heritage, monument, etc.			workers, PIU and ASI.	paleontological material; Level of awareness among workers; and Protection and reporting of identified material when discovered.	chance finding
2.22	Safety of workforce Occupational Health -	(i) Adequate precautions shall be taken to prevent the accidents from the machineries. All machines shall confirm to the relevant Indian Standards Code and shall be regularly inspected for its working condition; (ii) Where loose soil is met with, shoring and strutting shall be provided to avoid collapse of soil.	Contractor, PIU/PMC	Construction phases	Site inspection; and Observation of workers with PPE and safety measures while working on work site.	Quantity and timely supply of PPEs; Awareness	Everyday

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	facilities to the labourers	(iii) Provide job specific safety induction training, including environmental awareness and ensure daily toolbox talk to workers at the working area; (iv) Technical experts / design engineers to Check if discharge / supply pipes are as per specifications, ad review any chances of burst. Awareness shall be given to workers and road/road side users on such safety aspects. Design changes should be approved prior to implementation (v) Design changes need to be validated and signed off by engineer (vi) Pressure testing procedure should be approved by supervising Engineer (vii) Excavations to be backfilled prior to testing or barricaded to keep out members of the public (viii) Ensure availability and mandatory use of PPEs at the site; (ix) Use of protective footwear and protective goggles by the workers involved in mixing of materials like cement, concrete etc. at sites; (x) Use of earplugs by the workers exposed to loud noise, and those engaged in crushing, compaction, concrete mixing operations; (xi) Ensure sufficient quantity of all PPEs, necessary safety appliances such as safety goggles, helmets, boots, safety belts, ear plugs, mask, etc. to workers and staffs; (xii) For workers working at elevated levels (@6 feet) like in OHTs, ensure adequate fall protection system like guardrails, equipments including safety harness, safety nets etc and safe working platform are provided. (xiii) Adequate measures and care to be taken while approaching any open water bodies for construction of bridges. Ensure railing around such sites are intact and in good condition; and (xiv) The contractor will comply with all the precautions as required for ensuring the safety of the				level about the use of PPEs; and Incidence of injury, accident, infirmity.	

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		workmen as per the International Labor Organization (ILO) and applicable laws of India and Tamil Nadu state as applicable. (xv) All labourers shall be provided periodical training on day to day work, equipment handling, emergency preparedness, managing heat stress during construction. (xvi) Contractor shall have tie-up with nearby hospitals for periodical health checks of the labourers and for emergency. (xvii) Names of such hospitals be displayed at prominent location. (xviii) Health check up of all newly appointed staff be done once through these hospitals followed by 6 monthly check up.					
2.23	Work-zone safety Management	(i) Temporary barricades shall be provided to delineate construction zone as well material stacking areas. The construction site and the labour facility shall be appropriately barricaded to prevent entry and accidental tress-passing of workers, staff and others into the construction sites. (ii) Ensure adequate fall protection system like guardrails, safety nets etc and safe working platform are provided. (iii) All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor. (iv) Adequate signages shall be provided indicating the work and type of precautions required. (v) Proper retro reflective warning signage will be installed on the access road next to the construction site about movement of construction machinery and vehicles. (vi) In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro reflective signage shall be displayed in vermicular language and English.	Contractor, PIU/PMC	Construction phase	Site inspection	Availability of safety measures Absence of safety Incidents	Every day

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(vii) Entry of unauthorized persons should be prevented. (viii) Excavations will be adequately barricaded and well lit – with signages/info boards. (ix) There shall be adequate lighting arrangement at night and adequate barricading to prevent mishaps after construction activity ceases for the day. (x) A readily available first aid unit with necessary supplies, drinking water, resting shed, sanitation etc shall be made available in every work zone. (xi) On Confined Spaces (all confined spaces as may be required for laying pipes, or utility shifting or crossing other utilities, works under river): (xii) Contractors shall identify, assess and manage the risk of entering and working in a confined space or in oxygen poor environments. Including the following: - Signage on the confined spaces - A Confined Space Register - Confined space entry permit system - Carrying out a confined space entry risk assessment before entering - Safe entry and exit points - Hazards and controls when working in the confined space including Ventilation (natural and mechanical) - Safe emergency response procedures including the need for an emergency rescue plan tailored for each entry into a confined space and that is focused on allowing safe recovery without putting the responder at risk - Training and competency - Isolation of potentially hazardous services (like water, gas, electricity etc.) prior to entry - PPE such as Self-Contained Breathing Apparatus (SCBA) - Air testing and monitoring before entry and then during the work					

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		- Communication protocols (xiii) Undertake targeted awareness using appropriate language and formats on entering and working in confined spaces					
2.24	Removal of rock during excavation	(i) During excavation for works, wherever removal of rock is identified, alternatives like drilling and chiselling, controlled blasting etc will be examined and the suitable technology shall be finalised depending upon the site conditions. Following measures for ensuring safety shall be ensured during controlled blasting. (ii) Carryout controlled blasting in consultation with PIU so that blasting activities with the least potential to generate impacts are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors. (iii) Permission shall be obtained from The District Collector for controlled blasting for excavation. Conditions stipulated in the permission issued by the District Collector shall be complied with during implementation. (iv) The contractor shall submit a blasting plan in advance to PIU; and implement in accordance to the plan. (v) Blasting shall be done through an licensed Explosive Contractor only (vi) For controlled blasting, explosives including blasting caps shall be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives shall be returned to the licensed storage. (vii) Cost for implementation of mitigation measures and liability are the responsibility of contractor. (viii) Proper prior notice will be issued to the Residents before Commencing project activity works Schedule (ix) Proper information will be Given to Police Officials	Contractor, PIU/PMC	Construction phase			

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(x) Workers (Flagman) shall be stationed on both end of roads to warn people before firing any blasts and not to permit the traffic. (xi) When blasting, ample warning shall be given to all persons within the vicinity prior to blasting. Warning signs shall be erected a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast. (xii) Contractor shall ensure necessary precautions / protection (like excavated earth, sand-filled bags, etc) to reduce noise levels, etc., Sites shall be provided with necessary shields all around. (xiii) Minimum Explosive will be used for Control Blasting for Residential areas (xiv) After a blast has been fired, the Blast Control Specialist shall make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation. (xv) The contractor shall be responsible for any and all damage to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with his use of explosives. (xvi) The contractor shall do the activities after obtaining the blasting permission from District Collector. (xvii) For the diversion of traffic in the blasting area, the contractor shall prepare a traffic management plan and obtain permission from Cuddalore Corporation and traffic police. (xviii) Ensure to conduct a pre-blasting survey through videography and photography of residential properties and other structures falling along the pipeline alignment to ascertain the prevailing conditions of the structures likely to be impacted by the controlled blasting and take adequate measures to minimize such impacts.					

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
2.25.	Exposure to electrical equipment	(i) The Contractor shall take all required precautions to prevent danger from electrical equipment at pumping room, etc. and ensure that: (ii) No material will be so stacked or placed as to cause danger or inconvenience to any person or the public; (iii) All necessary fencing and lights will be provided in construction area; (iv) Deactivation and proper grounding of live power equipment and distribution lines to be ensured before initiating work; (v) All energized electrical devices to be marked with warning signs. Use the symbol of danger as warning of high electricity voltage or current flow on cable boxes or where required to avoid any incidence of current shock or electrocution; and (vi) Provision of specialized electrical safety training to those workers working with or around exposed components of electric circuits.	Contractor, PIU/PMC	Construction phase	Site inspection; Observation of power supply system; and Electricity safety precaution taken by workers while working on work site.	Incidence of current shock, injury, electrocution	Daily
2.26.	Fire Safety	(i) Ensure that no fires are permitted on or adjacent to site; (ii) Ensure that no smoking is permitted on the working site; (iii) Ensure that sufficient and certified fire fighting equipment are placed and maintained on the site; (iv) Equip all fuel stores and waste storage areas with fire extinguishers; (v) Ensure that all workforce and staff on site are aware of the location of fire fighting equipment on the site; and (vi) Conduct training program on use of extinguishers, sand, etc. for fire-fighting and ensure that they are trained in its operations.	Contractor	Project life cycle	Inspect Attendance register for fire fighting training conducted; and Observation of fire extinguishers and certificate at the sites.	Number of Fire incidents; Certified extinguishers in appropriate locations; and Workers knowledge to operate the fire extinguisher	When required

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
2.27	Emergency response to manage cyclone and other disaster conditions	(i) Contractor shall ensure efficient communication system in place which will be required during occurrence of any natural hazard; (ii) Evacuation plan shall be in place for the site; (iii) Evacuation plan or route is displayed clearly through signs or picture at prominent places within the sites; (iv) Ensure effective coordination within the workforce and concerned departments and display contact number of concerned persons at prominent places; and (v) Conduct training program and mock drills to workers to deal with the disaster situations due to occurrence of cyclones and tsunami.	Contractor, PIU/PMC	Project life cycle	Inspect attendance register for training program; and Inspect fire extinguishers and certificate	DMP in place; Communication system inexistence; Display of evacuation route; Capacity of workers to manage; and Disaster and emergency situations	When required
2.28	Demolition of existing structures from proposed OHT site (if required)	(i) Prior to carrying out any building demolition, detailed building appraisal by means of surveys and appropriate assessments shall be carried out. (ii) Hoarding and covered walkway is to be provided for protection of the public during the demolition of buildings since hoarding isolates the demolition site from the public, thus preventing unauthorized access and trespassing. (iii) Metal scaffolds shall be used for top down demolition. Both bamboo scaffolds and metal scaffolds are considered acceptable provided that they are erected according to the Construction Sites (Safety) Regulations and the codes of practices on scaffolding safety. (iv) Concrete breaking, handling of debris and hauling process are main sources of dust from building demolition. Dust mitigation measures complying with the Air Pollution Control (Construction Dust) Regulations shall be adopted to minimize dust emissions.	Contractor, PIU/PMC	Construction phases	Site Inspection; Review of waste management plan; disposal registers	Air quality, noise level;	When required

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		(v) Silent type power mechanical equipment shall be used to reduce noise impact as much as practicable or possibilities of engaging man power with light dismantling tools with PPE are studied and engaged. (vi) Debris waste and other materials shall not be thrown, tipped or shot down from a height where they are liable to cause injury to any person on or near the site. (vii) Disposal of debris has to be controlled and to be reused in line with C&SD Waste Management Rules 2016 as guided by & with due permissions from local authority. Wasted reinforcement will be handled as per the departmental procedure. (viii) Construction debris shall be handled, managed and disposed in compliance with the provisions of C&D waste management rules, 2016.					
Social aspect							
2.29	Compensation and Assistances to affected (Not applicable for this sub project)	(i) Provide compensation and assistance to the affected; (ii) Employ people of local communities for project works based on their skills; (iii) Employ the locals, particularly willing women on priority in project related unskilled, semi-skilled and skilled works as applicable;	Contractor, PIU/PMC	Construction Phase	Verify the disbursement of compensation and assistance; and Conduct consultations with local communities	No affected compensated were compensated at replacement cost against the income loss	One time
2.30	Loss of access	(i) The contractor shall ensure that access to connecting roads; market, residence and other places should not be blocked. In case, it is unavoidable, then alternate route should be provided to people. The community should be made aware about the diversion plan along with expected deadline for the completion of work. After completion of the work, the access should be restored as per original condition. (ii) The contractor is required to provide notice to the shop owners of the need to shift kiosk/wares displayed on	Contractor	Construction	Visual inspection	Crossing/ access closed	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		ROW as soon as the work plan is ready with minimum 7 working days. (iii) No works can be commenced unless 100% shifted in sections ready for implementation.					
3.0 Decommissioning phase							
3.1	Site clearance and rehabilitation/ Post-construction clean-up	(i) Remove all construction equipment, vehicles, surplus materials, site office facilities, temporary fencing, structures and other items from the project site including pumping stations and lifting stations; (ii) Clean up and remove any spills and contaminated soil in the appropriate manner; (iii) Do not bury discarded materials on site or on any other land not designated for this purpose; (iv) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (v) Level the disturbed area and restore to a condition resembling its natural profile; and (vi) Ensure site is fully clean and tidy before the exit and prior to its handover to the officer of PIU and other authorized persons.	Contractor	After completion of construction phase and operation phase	Site inspection; and Review of record of activities upon completion of construction phase and commissioning phase	Restoration of construction sites in original condition; and Sites are fully rehabilitated prior to commissioning of project	Weekly
4.0 Operation and Maintenance phase							
4.1	Operation and maintenance of distribution system	(i) Get all required Permits for Operations (ii) Establish regular maintenance program, including: ● Regular cleaning of grit chambers and lines to remove grease, grit, and other debris that may lead to water backups. Cleaning should be conducted more frequently for problem areas. ● Inspection of the condition of storage reservoirs (OHT's) and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals; frequent line blockages; lines that generally flow at or near capacity; and ● Monitoring of water flow to identify potential inflows and outflows	Cuddalore Corporation	Operation and Maintenance phase	Site inspection	Nil grievances/ incidents	Regularly

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
	E-Waste management	● Periodical monitoring of water quality prior to distribution. (iii) Develop an Emergency Response System for the water system leaks, burst and overflows, etc. (iv) Provide all necessary personnel protection equipments to the O&M staff. (v) Prepare Safety plan in operating the network including Chemical handling- storage & use and implement. (vi) Measures for chemical handling shall include ● display of safety data sheet at sites where storage/usage proposed, ● Providing precautionary measures, accidental release measures etc at sites. ● Use of necessary PPEs by the staff/Operators ● Display of appropriate labels, instructions ● Training the operators on the chemical safety (vii) Provide necessary training to the O&M staff/ operators regarding health and safety during O&M activities including chemical handling, storage and disposal. (viii) Carryout regular monitoring of the distribution water quality and in case of any quality concerns, treatment shall be ensured so that it is in line with Water Quality prescribed by authorities for use. (ix) Applicable permits if any applicable for the O&M activities shall be listed and be monitored for validity. (Source, chemicals handling, waste disposal, O&M contractor permits etc) (x) Necessary ESHS measures to be included in the O & M contract scope. (xi) A detailed Waste management plan for various types of wastes shall be prepared by the ULB for the O&M phase and all the wastes generated shall be handled in line with the plan. (xii) E-wastes generated during the O&M phase of the project (due to repair and replacement, including electrical and electronic items used in the SCADA)			Review of records		

S. No.	Aspect	Mitigation measures	Responsibility	Implementation phase	Monitoring method	Monitoring indicator	Frequency
		shall be handled by the ULB in accordance with the provisions of E-waste Management rules, 2022. (xiii) Contractor shall report to PIU every quarter or as required on water quality & EHS during O&M					

6.2 Monitoring and Evaluation

The E&S experts of the PMC will review the updated ESMP and sub-plans submitted by the contractor and will ensure that such plans are in line with the applicable laws and regulations. The experts will supervise the implementation of plans and will report on the E&S safeguard status and performance under the project. The internal monitoring reports will at minimum include, but may not be limited to the following:

- Reporting period and context;
- Summary of project status;
- Regulatory compliance;
- Institutional set up and manpower management status;
- Environmental, social, health and safety of workers and local communities;
- Implementation status of ESMP, SEP, WMP;
- Monitoring of waste disposal and management;
- Monitoring of environmental attributes (air, water, noise) and social mitigation measures (e.g. compensation to impacts at replacement value);
- Complaints and grievances redressal; and
- Stakeholder engagement and community development activities.
- Labour Management

PMC will prepare the internal monitoring report and submit it to the PIU every month, and PIU will submit a monthly report to TNUIFSL. An indicative budget for monitoring the implementation of ESMP and WMP for construction phase. Accordingly, the required budget for monitoring will be made available during the construction and the budget for the operation phase will be updated and allocated later. The PIU in consultation with Contractor and PMC will update the monitoring parameters, frequency and budget as appropriate. Details of schedule of activities are given in Table 8.2 and indicative budget for construction phase is reflected in Table 34.

Table 34 Schedule of activities

S.No.	Schedule of activities	Responsibility	Time line
1	Obtain required permits and licenses	PIU/Contractor	Prior to Pre- construction
2	Designate the Convenor	PIU	Pre- construction
3	Constitute the GRC& disclose in all the project work sites and zonal offices.	PIU	Pre- construction
4	Mobilization of EHS officer	Contractor	Prior to construction
5	Mobilization of one environment expert	PMC	During construction
6	Mobilization of one social expert	PMC	During construction
7	Social Safeguards Monitoring	PMC	During construction

6.3 Environment Monitoring Plan

To monitor the extent of environmental impact of the proposed project, the contractor has to periodically monitor the ambient environmental quality along the proposed project area. The monitoring requirement for the different environmental components is presented in table below:

Table 35. Stage Wise Environmental Monitoring Plan

Project Stage: Construction Air Quality Monitoring

A	Parameter	PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO and Pb
B	Sampling Method	Use method specified by CPCB for analysis
C	Standards	National Ambient Air Quality Standards 2009, Air (Prevention and Control of Pollution) Act,1981 Or relevant CPCB standards/guidelines
D	Frequency	Once every season except monsoon during construction period
E	Duration	As per CPCB guidelines for monitoring
F	Location	Sensitive locations, especially in the downwind direction along the network alignment, OHT sites.
G	Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	PIU/PMC

Project Stage: Construction & operation and maintenance -Water Quality Monitoring

A	Parameter	Parameters for Surface water quality standards (IS; 2296) Water pH, TDS, Total hardness, Sulphate, Fluorides, Chloride, Fe, Pb for groundwater.
B	Sampling Method	Grab sample to be collected and analysis as per Standard Methods for Examination of water and Wastewater.
C	Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and Drinking water (IS; 10500,2012) for Ground Water Or relevant CPCB standards / guidelines
D	Frequency	Once every season during construction and during operation period.
E	Duration	--
F	Location	Suitable location within project area (preferable near headworks, borewell location, pipeline network, OHT sites)
G	Measures	At locations of variation in water quality/increased pollution, remedial measures to be adopted /all inflow channels shall be checked for pollution loads
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	PIU/PMC

Project Stage: Construction & Operation - Noise Level Monitoring

A	Parameter	Noise levels on dB (A) scale
B	Sampling Method	Free field at 1 m from the equipment whose noise level are being measured Equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of pavement
C	Standards	National Ambient Air Quality Standards in respect of Noise, Noise Pollution (Regulation and Control) Rules, 2000
D	Frequency	Seasonal during construction period. Periodical during O&M.
E	Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour and then average out for analysis
F	Location	During Construction - Near the work sites (Sump site, OHT site, Wherever the contractor decides to locate the equipment yard.) At sensitive locations such as schools, hospitals etc along the alignment. During O&M - Near Pumping operation.
G	Measures	In case of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the ESMP shall be carried out.
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	PIU/PMC

Project Stage: Construction & Operation - Soil Monitoring

A	Parameter	Soil quality parameters (Pb, SAR and Oil & Grease, monitoring silt for presence of toxic metals , etc)
B	Sampling Method	Sample of soil collected to be acidified and analyzed using absorption Spectrophotometer
C	Standards	Threshold for each contaminated set by IRIS database of USEPA until national standards are promulgated
D	Frequency	During the pre-monsoon post monsoon seasons each year for the entire construction and operation phase
E	Duration	Grab sampling
F	Location	At sample locations in the receiving water bodies, at the places of dumping silt, excavated earth
G	Measures	At the location of increased pollution levels, sources shall be identified and measures adopted.
H	Implementation	Contractor through approved monitoring agencies
I	Supervision	PIU/PMC

6.4 Cost Estimate for Environmental and Social Management Plan

The ESMP costs are under two heads, one is already covered in the Detailed Project Report and cost provisions are made. Secondly, ESMP costs as per the outcome of ESIA.

Table 36 ESMP Cost as per DPR

S. No	Description	Rate of BOQ's	Unit Cost	Quantity	Total cost in RS`
a	Barricading and other safety measures	Connecting main, Gravity Main, Feeder Main, Distribution System (Included in BOQ)	100 - per RM	13134 - RM	13,13,400
		Connecting main, Gravity Main, Feeder Main, Distribution System (Included in BOQ)	53 - per RM	30646 - RM	16,24,238
b	Restoration of cut open trenches collection, Pumping mains & HSC's	Gravity Main, Feeder Main, Distribution System (Included in BOQ)	1478 - per RM	31156 -RM	4,60,48,568
c	Carting and de carting excess Earth	Connecting main, Gravity Main, Feeder Main, Distribution System, OHTs (Included in BOQ)	101.50 - CUM	841.62 - CUM	85,424
				TOTAL	**4,90,71,630**

Table 37 Estimate as per ESIA study

S.No.	E&S monitoring parameters	Frequency	Responsibility	Total Cost in Rs.
1	Air quality monitoring	Quarterly	PMC/ Contractor	50000
2	Surface water quality monitoring	Quarterly	PMC/ Contractor	50000
3	Ground water quality monitoring	Quarterly	PMC/ Contractor	50000
4	Soil quality monitoring	Bi-annual	PMC/ Contractor	30000
5	Noise quality monitoring	Quarterly	PMC/ Contractor	20000
6	Wind speed and direction	Bi-annual	PMC/ Contractor	20000
7	Tree Plantation/ Greenbelt Development at project sites	One time/ plus lump sum	PMC/ Contractor	200000
4	Consultations with stakeholders	As and when required	PIU/PMC/ Contractor	150000
5	Meetings of GRC	As and when required.	PIU	50000
			Total	**620000**

Table 38 Total Estimated ESMP Cost

S. No	Item	Cost in Rs.
1	Cost as per DPR	**49,071,630**
2	Cost as per ESIA Study	**620,000**
	Total Cost	**49,691,630**

7 Stakeholder Engagement and Grievance Redressal Mechanism

Stakeholders engagement is an integral part of developing an understanding about the project and the associated risks and impacts as perceived by the public. It helps in planning and setting up priorities for project management.

7.1 Public disclosure

Public disclosure is aimed at making information accessible to interested and affected persons. Communicating such information in a manner that is understandable to stakeholders is an important first step in the process of stakeholder engagement. All activities in the process from consultation and informed participation to negotiation and resolution of grievances will be more constructive if stakeholders have accurate and timely information about the project.

Information disclosure demonstrates the fact that transparency and accountability are being upheld in the planning and development of a proposed project and general public is aware of it. This would create awareness among the local people and instil the participation and public involvement in the project management.

The awareness for judicious use of water will be created by the PIU and contractor among the beneficiaries, potential temporary economic impacts and other stakeholders in the project area. Also, the details related to project impacts and assistance and safety measures during construction shall be made available to the affected population through meetings and distribution of pamphlets in local language.

7.2 Public consultation

Public consultation is a continuous process throughout the project planning, preparation, implementation, and monitoring stages. The sustainability of any infrastructure development project depends on the participatory planning in which public consultation plays a major role. Experiences indicate that environmental and social impacts, particularly the involuntary resettlement generally causes numerous problems for the affected population. Such problems may be reduced to a great extent if people are properly informed and consulted about the project, its impacts, mitigation measures and potential temporary economic impacts allowed to make meaningful choices or preferences. This helps to reduce the sense of insecurity and opposition of potential temporary economic impacts to the project which otherwise are likely to occur during project implementation. The overall objective of the consultation process is to minimize, mitigate or offset negative impact of the project and make people aware about the rationale and positive impacts of the impact.

The practical measures will be taken through consultative process to make the stakeholders as partners in project planning, implementation and monitoring stages. One way to help satisfy stakeholder concerns and promote transparency is to involve project affected stakeholders in monitoring the implementation of mitigation measures or other environmental and social impact related activities. The stakeholders will be informed about relevant policies, laws, types and severity of impacts, entitlements for compensation and mitigation measures through the proper communication channel, verbally or distribution of pamphlets in local language with required details. Once consultations have taken place, stakeholders will want to know which of their suggestions have been taken on board, what risk or impact mitigation measures will be put in place to address their concerns. Such information will be disseminated in time and regularly. The consultations shall be arranged with the beneficiaries, potential temporary economic impacts and other stakeholders to understand and solicit their views about risk and impact due to the project at the pre-construction stage.

Consultation During construction

During construction, PIU proposes to conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings, as required, may be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. Project information and construction schedule shall be provided to the public at work sites. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor shall provide prior public information (in Tamil and English) about the construction work in the area, once 7 days prior to the start of work and again a day before the start of work via pamphlets (a sample public information template is provided in Appendix 2). At the work sites, public information boards is also be provided to disseminate project related information.

7.3 Grievance Redress Mechanism

A common GRM will be in place to redress social, environmental or any other project related grievances. The GRM described below has been developed in consultation with stakeholders. Two tier GRM shall be constituted.

Grievance Redress Committee (GRC)

3. 1st level grievance redress: Comprises of
    - PIU Site Engineer
    - Safeguard Specialists from PMC
    - Contractors site engineer & EHS. To resolve issues on-site in consultation with each other.
4. 2nd Level grievance redress: The Project level GRC shall be constituted with three persons (preferably one of them as woman).

The Executive Engineer at project level, the Convenor for the project, will be designated as the Secretary, who will coordinate with all the members, convene meetings and perform other activities required to ensure the efficient grievance redressal system. Such meetings will be held as per requirements. The GRC would assist in amicable settlement of issues/complaints raised by the aggrieved person/ Potential Temporary Economic Impacts without any interruption to the project implementation. As referred, the Executive Engineer of PIU, Team Leader and Safeguard Specialists of PMC, Project Manager and the EHS officer will also act as the community liaison officers (CLOs). They will inform the Potential Temporary Economic Impacts, workers and other stakeholders / public about the set-up of GRC, its constitution, functioning and procedure to address their project related E&S concerns and complaints. They will conduct consultations with the Potential Temporary Economic Impacts and other stakeholders regularly to keep them informed about the project progress and future activities, as required. The Project Manager supported by the EHS Officer stationed at the project site will be the first contact person for the d local residents, who will try to settle the concerns of people immediately. The Project Manager will report to the EE/PIU and PMC, who will help, and initiate actions required to resolve the complaints received orally or in writing. The cases not resolved within one or two weeks will be referred to the GRC for taking decision within the four weeks or stipulated time as deemed appropriate. The concerns of any aggrieved person or issues of Potential Temporary Economic Impacts regarding the compensation at replacement value, income restoration and other losses and adverse impact will be examined and decided in consultation with the GRC members.

The concerns and complaints of the labourers will be directly redressed by the Project Manager of the Contractor. The cases not being resolved by the Project Manager or the higher management of the contractor will be presented to the GRC to settle the same with a consultative approach.

The phone numbers of these personnel and addresses will be disclosed on the hoardings fixed at prominent public places and will be shared with the GRC members. Potential temporary economic impacts and other stakeholders usually communicate grievances orally and those submitted in writing will be logged in the register maintained at the CLO office. The grievances form in Tamil and English including the details of Complaint Receiving Officer (Convenor) will be made accessible at public places.

Recordkeeping. Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU and submitted to TNUIFSL. A Sample Grievance Registration Form has been given in the Annexure 3.

Consultations

Findings of the focus group discussion:

Discussion was conducted with members of the Cuddalore Ladies Tailoring Industrial Co-operatives Society Ltd., who stiches government school uniform. There were women participants from ward number 7,8, 9, 10 and 12 located in Zone 4 in Manjakuppam. They have water connection in streets but not household connection. In Ward 9, house to house connection is also available but because of laying of cement road, the piplelines are damaged. People are suffering for accessing drinking water. The existing water connection is only from 6 am to 8 am. Women must cook, get ready for office, and even send their children to school and hence they are unable to store water. As the responsibility for collecting and storing water is on women, it affects their work schedule. They often go late for work and their children also get late to school because of this reason.

The quality of water is poor, it is in pale yellow colour and salty, cannot be used for drinking purposes and hence they rely on packaged drinking water for drinking (rs. 10). The ULB is supplying additional water through tankers who charge Rs. 7 per pot and they can buy as many pots based on their affordability and use it for drinking. Most of them also have borewell water but it is salty, and they use it only for cleaning and toilet use. Particants also pointed about the salt water instrusion in ground water.

Impact of Climate Change on beneficiaries:

They face recurring floods during monsoon and intesnse water scarcity during summer. They do not have storm water drains and have open drains only. During floods the sewer waste from the open drains and the septic tanks contaminate the flooded water resulting in diseases.

8 Institutional Mechanism

The implementation arrangement for this project is as below.

PIU
This sub-project will be implemented by the Cuddalore Corporation. The PIU will be established in the Cuddalore City Municipal Corporation for implementation of this project. PIU will have adequate staff including designated officials as E&S officers to monitor ESMP implementation.
PIU will supervise activities of Environmental and social safeguards, ESHS for ensuring adoption and compliance of ESSA and report to TNUIFSL.

PMC
A PMC will be appointed and will assist the PIU in the implementation of the project. The PMC will have dedicated Environmental, Social, Gender and ESHS specialists and will supervise implementation of the ESMP, sensitize contractors on ESHS, Safeguards Capacity Building. PMC will prepare periodical progress reports, flag critical issues to PMU/PIU.

CONTRACTOR
The contractor will also prepare Contract specific ESMP. Contractor will appoint ESHS personnel who along with the Project Manager be responsible for implementation of Environmental and Social management plan and mitigation measures and submit the compliance report to PIU.

Annexure-1 Environmental, Climate Change and Social Screening form

Date:_____ **Contact Person:_____**

Name of ULB:_____

Background and Objective: Suggest to add a few brief sentences on the objective of this Screening and how it will be used.

Project Details		Details
S.no	**Components**	
1	Project Objective and components	The objective of the project is to provide water supply to the beneficiaries 24/7 on pilot basis in selected wards.
2	Details of Alignment / Components (main components including construction activities)	• Providing Infiltration wells (3 Nos) of 4.5m Dia of 7m Depth at Thenpennai River • Providing Bore wells (5 Nos) of 200mm Dia of 200m Depth at ThenPennai River including Pumpset, etc., Complete • Construction of Sumps of Capacity 2.00 LL including Pump room of size 6m x 9m • Providing Pumpsets For Proposed Infiltration wells and Sump • Providing Pumping main from Infiltration wells, Bore wells to proposed Sump (2519 m) • Providing Feeder main from Proposed Sump to Existing OHT(8030 m) • Construction of OHT of capacity 12 LL at Pennaiyar Road 1st Cross • Providing Distribution System with DI and HDPE Pipes (33.897 Km) • Providing Flow control Valve, Sluice Valve, Electromagnetic Flow Meter & Chamber - For Distribution System • Providing House Service connections (6761) • Road restoration with cement concrete 1:4:8, 7.5 cm thick, using 20 mm HBS metal and cement concrete 1:2:4 , 10 cm thick using 20 mm HBS including cost of all materials laying, curing (Total Length: 30.53 Km) • Providing Complete SCADA system for water supply system (Pressure Sensor, Quality Sensor, Monitoring and control units).

<table>
<tr>
<td>3</td>
<td>Location of the Project Sites (all sites including alignment of networks, other structures like pumping stations; offices, locations where treated wastewater, sludge & C&D wastes will be disposed/reused directly, any other)
Current Land use (Provide information for all sites involved in the project), any historic land use (related to heritage, or contamination)
Site Survey No:/s (with ownership), Geographical coordinates of the site</td>
<td>Location of the project site:

The location is Cuddalore Municipal Corporation.

Proposed sump and OHT sites belong to the Corporation.
<table>
<tr><th>Zone No</th><th>Location Name</th><th>GLSR/ ESR/ Sump</th><th>Land Ownership</th></tr>
<tr><td>Sump</td><td>Near Thenpennai river</td><td>New</td><td>Corporation Land</td></tr>
<tr><td>OHT</td><td>Pennaiyar Road 1st Cross</td><td>New</td><td>Corporation Land</td></tr>
</table>
</td>
</tr>
</table>

Proposed Resource Use

Resource Use				
Sl.no	**Proposed Resources**	**Area/Quantity**	**Unit**	**Details**
(i).	Land Area proposed to be used: Location wise (in sq km / sq m)			
(ii).	Estimated energy consumption for the project activities – Source wise			
(iii).	Estimated usage of water quantity for the project: Groundwater and Surface water?			3.06 MLD from River Pennaiyar

Baseline Environmental Conditions

Sl.no	Environmental Aspects	Yes	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components excluded / regulated based on location/activities as per National / State regulations& need permits/follow guidance)
1	Is the project site located on or adjacent to any of the following (Provide information for all sites and alignment of the project components/subcomponents, associated activities; mention distance to these features in meters/kilometres)			
i)	Critically Vulnerable Coastal Areas, Eco-sensitive Areas		√	
ii)	Cultural Heritage site, Protected monuments		√	
iii)	Natural Forests / Protected Areas Is the project in an eco- sensitive or adjoining an eco-sensitive area or its demarcated buffers?		√	

	If Yes, provide details.			
iv)	Any other Wetlands/ Mangrove/ Estuarine Region?		√	
v)	Any Natural Habitat areas, areas with natural features such as the Coasts, Lakes/ other water bodies?		√	
vi)	Any other Sensitive Environmental Components?		√	
vii)	Any Residences, schools, hospitals, sensitive receptors?	√		The project area consists of both residential and commercial entities.
viii)	Any culturally – socially important paths, areas/religious occupancies, sacred groves, burial grounds, tourist or pilgrim congregation areas, borders, etc?		√	
ix)	Any Drinking water source, upstream and downstream uses of rivers, etc which may be impacted by proposed discharge of treated sewage / sludge from water supply or sewage treatment plant?		√	
x)	Any Low-lying areas prone to flooding/areas of Tidal Influence used as part of the Project or near the project components?	√		Gedilam and Pennaiyar Rivers are flood-prone and located near the project area. A section of the distribution network attracts CRZ and permission would be obtained prior to implementation of works in the relevant section.
xi)	Details of Surface water quality at intake point or Disposal point of treated sewage			The water quality at the intake point has been analysed and are found to be complying with the drinking water standards.
xii)	Any areas affected by other disasters?	√		The project town is prone to river floods and Cyclones.
2	Groundwater: Is the site in Critical / Over Exploited condition?		√	
3	Is the area disaster-prone? If yes; list all disaster zone categories applicable	√		The project town is prone to river floods and Cyclones.
4	Describe the soil and vegetation on site			The project involves construction of new collector& infiltration wells, borewell, laying of feeder mains, construction of 1 OHT, 1

				sump, distribution network & HSCs, and providing SCADA. Lines will be laid at the edges of the road and the sump/OHT sites are proposed in the sites belonging to ULB. All the project sites earmarked are vacant and clear from vegetation. No tree cutting required.
5	Is the site area and condition suitable for proposed development?	√		
6	Describe existing pollution/contamination or degradation in the site(s)		√	
7	Near Dams, Barrages		√	
8	Any other remark on baseline condition?		√	

Anticipated Environmental Impacts: Impacts on Land, Geology and Soils

Sl.no	**Impacts**	**Yes/ May create**	**No**	**Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)**
8.	Will the proposed project cause the following on Land / Soil?			
i)	Impact on Surrounding Environmental Conditions including Occupation on Low lying lands/flood plains		√	
ii)	Substantial removal of Top Soil (mention area in sqm)		√	
iii)	Any degradation of land / eco-systems expected due to the project?		√	
iv)	Loss or impacts on Cultural/heritage properties/precincts, features		√	
v)	Does the project activity involve cutting and filling/ blasting etc?	√		During pipe laying, soil cutting and filling activities will be carried out. Blasting for hard rock removal is not identified. However, if encountered during construction, measures identified in the ESMP will be followed.

vi)	Will the project cause physical changes in the project area (e.g., changes to the topography) due to earth filling, excavation, earthwork or any other activity?		√	No change in topography anticipated. During pipe laying, excavation, refilling of soil, road restoration will be carried out. Construction of OHT and sump will be restricted to identified site.
vii)	Will the project involve any quarrying/ mining etc?		√	
viii	Will the project / any of its component contaminate or pollute the Land? (for example sludge, disposal of untreated sewage/bypass)		√	
ix)	Pre-existing contamination on site/s		√	

Impacts on Water Environment

Sl.no	Impacts	Yes/ May Create	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)
9	Will the subproject or its components cause any of the following impact on Water sources (Quantity or Quality):			
i)	Will the activities proposed at the site(s) impact water quality (surface or underground) and water resource availability and use? Will this sub-project involve the dredging of water bodies, sea, canals, etc.		√	
ii)	Impacts on Water Resources	√		The project proposes withdrawal of 3.06MLD for distribution.
iii)	Pollution of Water bodies/ground water nearby or downstream		√	
iv)	Will the project affect the river /cannel flow pattern, stream pattern or any other irrigation canal?		√	Temporarily during construction. And will be restored to the original condition after completion of the work
v)	Will the project result in stagnation of water flow or pondage or weed growth due to increased pollution/siltation		√	

Impacts on Biodiversity and Host Communities

Sl.no	Environmental Impacts	Yes/ May Create	No	Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State

				regulations & need permits/follow guidance)
10	Will the subproject or its components cause any of the following impacts on Biodiversity or the neighbourhood			
i)	Will the project necessitates cutting of? Trees / Loss of Vegetation		√	No tree cuttings involved in the project.
ii)	Will the project result in Health & Safety Risks in the neighbourhood including the release of toxic gases, accident risks		√	
iii)	Potential risk of habitat fragmentation due to the clearing activities? (e.g. Hindrance to the local biodiversity like disturbing the migratory path of animals/ birds etc.)		√	
iv)	Potential Noise and Light Pollution or disturbance to surrounding habitats/communities		√	
v)	Potential disruption to common property, accessibility, traffic disruptions, conflicts or disruption to the local community within the subproject area?		√	

Impacts due to Storage and Wastes: Pollution and Hazards

Sl.no	**Type**	**Yes**	**No**	**Details (mention distance to these features in meters/kilometres, and quantities in g/kg/T as applicable. Also mention if any project components is excluded / regulated based on location/activities as per National / State regulations & need permits/follow guidance)**
11	Will the subproject or its components cause any impact due to storage of materials, wastes or pollution due to releases during various project activities			
i)	Will the project use or store dangerous substances (e.g., large quantities of hazardous chemicals/ materials like Chlorine, Diesel, Petroleum products; any other?	√		Diesel will be used by vehicles for excavation during construction phase.
ii)	Will the project produce solid or liquid wastes; including construction/demolition wastes (including dredging, de-weeding wastes, muck/silt, dust, sludge, C&D wastes, hazardous wastes (such as asbestos from existing network), e-wastes (from equipment)); polluted liquids?	√		Waste generated from the project will be handled as per the WMP which will be prepared by the contractor. C&D waste if any will be handled by Cuddalore Corporation as per the

				provisions of C&D waste Rules.
iii)	Will the project cause or increase air pollution or odour nuisance?		√	During construction, increase in dust particles may generate due to excavation activities and demolition of old structures. Proper dust control measures to be provided e.g. water sprinkling.
iv)	Will the project generate or increase noise levels which will impact surrounding biodiversity or communities?		√	The major source of noise in the proposed project are horizontal split case centrifugal pumps proposed in existing Booster station. These may not contribute for the cumulative effect due to the existing noise levels as the pumps selected in the way that they will not produce noise levels more than 40-50 db.
v)	Will the project generate or increase visual blight or light pollution?		√	
vi)	Will the project cause water pollution? (of water bodies/ groundwater)?		√	
vii)	Will the project involve dangerous construction activities which may be a safety concern to workers/ host communities		√	ESHS measures will be followed during construction especially while at elevated levels for construction of OHT.
viii	Is there a potential for release of toxic gases or accident risks (e.g. potential fire outbreaks)		√	
12	Describe any other features of the project that could influence the ambient environment		√	

Baseline Climate Data		
13. Project Area Baseline Please provide quantitative information where relevant.		Note: Please provide details for ULB and also site.
i)	Agro climatic zone	Cauvery Delta Zone (part)North eastern agrizone
ii)	No of Water Bodies in the ULB area	
iii)	Name of the River(s) in the ULB	River Gedilam River Then Pennal River Pennaiyar
iv)	Proximity to River (kms)	Criss crossesGedilam River Passing through the project areaULB Then Pennal River N of the ULB
v)	Proximity to Sea (kms)	It'sThe project town is a sea shore coastal town.
vi)	Proximity to hilly terrains (kms)	About 10.9 km – Capper Quary Hills
vii)	High Flood Level of the River	
viii)	Flooding Events (Years) (Based on historic data of extreme flood events and future projections based on available analysis)	As per thinkhazard analysis years life-threatening river floods are expected to occur at least once in the next 10 years
ix)	Flooding hotspots in the ULB	
x)	Available Water sources (Surface / ground)	
xii)	Groundwater Level and potential zone	
xiii)	Normal Temperature &long-term average; trends in changes in temperature	
xiv)	Rainfall trends &long-term average	
xv)	Land Use	
xvi)	% of Green Cover in the ULB area	
xvii)	% of Water Bodies/Rivers	
xviii)	Seismic Zone	Zone II (Moderate Risk Zone)
xix)	Coverage rain water harvesting structures (in %)	
	a) Residential	

	b) Commercial & Institutional				
	c) Government/ULB				
xx)	RWH in buildings – Mandating byelaws				
xxi)	Frequency of drought in study area. Does the area face water scarcity? Please provide details.				
xxii)	Frequency and intensity of cyclones in study area.		Prone to cyclones		
14	Climate Change Impacts in project area				
(i)	Climate signal Please select the relevant signals	Climate hazard Please select the relevant hazards	Yes	No	Details
	☐ Sea level rise ☐ Frequency of tropical storms ☐ Intensity of tropical storms ☐ Higher precipitation amounts ☐ Shifting seasons ☐ Higher temperatures ☐ Less precipitation ☐ Lower temperatures ☐ Others	☐ Salt water intrusion	√		
		☐ Flooding of the coast	√		
		☐ River flood	√		Floods in River Pennaiar & River Gedilam
		☐ Bank erosion (sea/river)		√	
		☐ Flash flood (heavy rain)		√	
		☐Landslides		√	
		☐ Forest/Bush fires		√	
		☐ Water shortage/drought		√	
		☐ Effects of heat		√	
		☐ Effects of cold		√	
		☐ Effects of winds		√	
		☐ Effects of air quality		√	
		☐Effects of storm surge	√		
		☐Soil quality/land degradation		√	
		☐ Others		√	
ii)	Energy consumption for the project? Will the project result in GHG emission?			√	
iii)	Will the project affect any other water or other user? (downstream intake points of Water Supply projects, downstream water use by people, animals; irrigation)			√	The potential yield of the source has been evaluated and finalised.

iv)	Is the project located in exploited ground water block?		√	The project area is in safe zone.
v)	Is the project area vulnerable to temperature fluctuations and drought?	√		
vi)	Is the site vulnerable to hazards such as Earthquakes, Landslides, Flooding, Storm surge, Severe wind damage, Fire, Explosion, Other (specify)	√		There are low-lying areas in the city which are vulnerable to flooding.
vii)	Will the project result in generation of wastes / by-product?	√		Construction waste.
viii)	Will the project impact the water resource availability (surface/ ground water) and use (effluent/sewage disposal, bypasses from STPs/PS, leachate, runoff, wastes deposition, erosion)		√	Source sustainability is assessed and finalised.
ix)	Will the project cause flooding of adjoining low lying areas		√	
(x)	Will the project impact water quality or quantity in natural/constructed Lakes, or ponds		√	

Project Environmental Enhancement Measures

Sl.No	Enhancement Measures	Yes	No	Details
15	Has the subproject design considered environmental enhancement measures?			
i)	Energy conservation measures/ energy recovery options incorporated in subproject design? Quantify the reduction in CO_2emission from the sub-project.	√		
ii)	Has the project considered alternate /renewable energy?		√	
iii)	Has the project considered waste minimization (waste reuse/recycle options/circular economy)		√	
iv)	Rainwater harvesting, water recycling and other water resource enhancement measures proposed in the project?		√	
v)	Does the project include measures for prevention of wastage of water resource?	√		Metering and SCADA proposed will result in efficient monitoring of water supply distribution

				and prevent wastage of water.
vi)	What waterbody conservation/ drinking water source improvements/drought management options are being proposed?		√	This is a water supply improvement project aiming to meet the drinking water requirement.
vii)	Design Considerations for protection of project components from extreme events - flood, drought, other natural disasters	√		Headworks has been designed considering MFL.
viii)	Greenbelt development proposed for the project?	√		Greenbelt is proposed in the project sites based on the availability of space
ix)	Is the sub-project including design elements to strengthen infrastructure resilience? If so what?	√		
x)	Has the project considered nature-based solutions and if so what?		√	
xi)	Is the sub-project combining infrastructure and nature-based solutions? If so how?		√	
xii)	What design considerations is the project including to mitigate heat island effect?	√		
xiii)	What design considerations is the project including to preserve and expand green cover?		√	
Land Use, Resettlement, and/or Land Acquisition				
Sl.no	Components	Yes	No	Details
1	Does the project involve acquisition of private land?		√	All the sites are owned by ULB/Government. No private land acquisition in envisaged in this project
2	Alienation of any type of Government land including that owned by Urban Local Body?	√		Yes
3	Clearance of encroachment from Government/ Local body Land?		√	
4	Clearance of squatters/hawkers from Government/ Local Body Land?		√	
5	Number of structures, both authorized and/or unauthorized to be acquired/ cleared/		√	
6	Number of households to be displaced?		√	
7	Village common properties to be alienated Pasture Land (acres) Acquisition / burial ground and others specify?		√	

8	Existing land uses on and around the project area (e.g., community facilities, agriculture, tourism, private property) will be affected?		√	
9	Will the project result in construction workers or other people moving into or having access to the area (for a long-time period and in large numbers compared to permanent residents)?		√	
10	Are financial compensation measures expected to be needed?		√	

Loss of Crops, Fruit Trees, Household Infrastructure and livelihood				
Sl.no	Components	Yes	No	Details
11	Will the project result in the permanent or temporary loss of the following?			
11.1	Crops?		√	
11.2	Fruit trees? Specify with numbers		√	
11.3	Petty Shops		√	
11.4	Vegetable/Fish/Meat vending		√	
11.5	Cycle repair shop		√	
11.6	Garage		√	
11.7	Tea stalls		√	
11.8	Grazing		√	
11.9	Loss of access to forest produce		√	
11.10	Any others - specify		√	
Welfare, Employment, and Gender				
12	Is the project likely to provide local employment opportunities, including employment opportunities for women?	√		
13	Is the project being planned with sufficient attention to local poverty alleviation objectives?	√		
14	Is the project being designed with sufficient local participation (including the participation of women) in the planning, design, and implementation process?	√		
Historical, Archaeological, or Cultural Heritage Sites				
15	Historical heritage site(s) require excavation near the same?		√	

16	Archaeological heritage site(s) require excavation near the same?		√	
17	Cultural heritage site(s) require excavation near the same?		√	
18	Graves or sacred locations require excavations near the same?		√	
Tribal Population/Indigenous People				
19	Does this project involve acquisition / alienation of any land belonging to Tribal people?		√	
20	Will the project lead to displacement / other adverse impacts on tribal / indigenous people?		√	
Beneficiaries				
21	Population proposed to be benefitted by the proposed project	Approx. no.:		
22	No. of Females proposed to be benefitted by the proposed project	Approx. no.:		
23	Vulnerable households /population to be benefitted[12]	Approx. no.:		
24	No. of Families to be benefitted	Approx. no.:		

Date: _____

Signature and name of the Borrower

Authorised Signatory

Note: This Screening sheet must be completed for each of the proposed subproject along with the DPR and ESIA Report.

Indicative Enclosures:

1. Provide maps with the geographical location of the project; Google maps with project sites and project alignment
2. An appropriately scaled map clearly showing the project area and project sites with land use, existing buildings, infrastructure, vegetation, adjacent land use, utility lines, access roads and any planned construction, and

[12]Vulnerable PAPs are those living below poverty line, SC / ST families and women headed households, Widows, Physically Challenged persons; Elderly persons above the age of 60 years among the affected families.

3. Any other information to describe the project, locations and possible impact as required.
4. Provide relevant maps on flooding hotspots, LULC, etc
5. Land details for the project sites with (i) extent available and required, (ii) location, (iii) survey numbers, (iv) FMB extract, (v) current land use, land use classification (vi)land ownership, alienation/acquisition status, (vii) certificate giving availability of sites required for the project by the borrower, (viii) location photographs with Geo-coordinates of all project sites and alignment.

Annexure 2 Public Information Notice Template

Public Announcement

Improvement of Water Supply Pilot Scheme under 24x7 to selected zone in Cuddalore Corporation

Under this project, works are being conducted by xxxx Contractor to provide water supply system in Cuddalore Corporation.

As part of this, works for laying pipeline / distribution network will be taken up in -------- road----/ street/ lane ……. From……to (provide dates).

We request you to kindly co-operate for smooth implementation of the works.

We also request you to drive vehicles / pedestrians to walk carefully.

Inconvenience caused is regretted.

PIU - Contact No.
Contractor – Contact no.

Annexure 3 - Sample Grievance Registration Form

The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration	Project Town Project:			
Contact information/personal details					
Name		Gender	* Male * Female	Age	
Home address					
Place					
Phone no.					
E-mail					
Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Annexure -4 Waste Management Plan

S. No.	Aspect	Mitigation measure/Procedure	Responsibility	Implementation	Monitoring methods	Performance indicators	Frequency
1.	Up keep of storage/yard	Dispose-off the waste from the material storage to the designated site; and Ensure regular collection and removal of refuse and litter from the working site, office, labour accommodation, etc.	Contractor	Construction phase	Visual Inspection	Incidence of contamination	Daily
2.	Labour accommodation	Place sufficient number of garbage bins/containers at prominent locations of the project working sites and labour accommodations; Ensure emptying the garbage bins and dispose-off from the labour accommodation regularly in a hygienic manner; Dispose-off domestic waste water into drainage; Ensure sufficient number of bathing and ablution facilities in labour accommodations, sheds, and all the site staff; Create awareness about the importance and safe disposal of waste at work sites, labour accommodation and surroundings among the workers; and Impart training about handling the different types of wastes, waste management, including hazardous waste.	Contractor	Construction phase	Visual inspections; and Records of waste disposal.	Incidence of staff not using facilities; and Incidence of pollution.	Daily

3.	Waste management measures	Collect all waste bins, containers from all sites; Collect recyclable wastes separately and arrange for its collection by the authorized vendor; Prevent littering and pollution by construction staff at work sites by providing bins or waste bags in sufficient locations; Provide separate bins/containers for hazardous materials and mark these clearly; Store hazardous / polluting materials on impermeable ground until disposed-off or collected by the authorized vendor; Do not allow any burning or burying of waste on site; and Disposal of rubble and other waste construction materials at the designated site.	Contractor	Throughout project life cycle	Regular audits of the CWMP implementation; Visual inspection of waste collection and disposal; and Construction areas for littering	CWMP in place; Extent to which CWMP is complied with; Presence of litter; Extent of filling rubbish bins; Total volume of general and hazardous waste storage capacity on sites; Extent of waste segregation; and Frequency of waste collection and disposal	Daily/ weekly as applicable
4.	Disposal of residual construction debris, excess soil and other materials	The contractor shall identify the site for debris and waste disposal that should be finalized prior to start of the earthworks; Apply good practices and minimize the construction debris by the optimum use of material; Reuse the excavated soil and other material in backfilling, landscaping, filling low lying area and public places.	Contractor	Construction phase	Audit of excess and residual construction material disposal records and data; and Visual inspection.	Excavated soil and other wastes visible; and Cleanliness and maintenance of sites.	Daily and regularly.

		Yet the unused residue of soil and sedimentation left will be disposed of; Ensure that disposed waste do not cause soil and ground water pollution; Contractor should ensure that designated landfill site should be located in non-residential area at least 1000 meter away so that residents, flora and fauna are not impacted; Regularly clean up concretes pilled during construction; Sweep / rake / stack excess aggregate / stone chip / gravel / pavers into piles; Emptied cement and other material bags, containers and unusable bins sold to a licensed vendor; Dispose excess and residual waste to the designated site; The training should be imparted to all staff about the effects of waste and litter and follow the appropriate disposal procedures; and Construction waste at site should be handled as per Construction and Demolition Waste Management Rules, 2016.					
5.	Hazardous waste disposal	Ensure that contaminants (including cement) are not placed directly on the	Contractor	Construction and operation phases	Audit of hazardous material disposal records and data; and	Incidence of non-compliance with safety procedures	Daily or as required

		ground to prevent runoff reaching the water resources; Ensure that the spillage of fuels, oil, lubricants collected does not contaminate the soil and water; Ensure the training work force about environmental pollution and its management; Ensure disposal of hazardous waste at the designated site by the authorized vendor and prevention of pollution therein; Ensure hazardous materials such as solvent based paints, fuel, cleaning and polishing chemicals are handled with extreme precaution during their storing, transportation, and usage. Such material should be stored on impervious space/ floor; Ensure that only trained workers are involved in collection, storage, and disposal process; All precautions, safety and health measures are followed; Dispose of non- recyclable and recyclable metal objects through authorized vendor; and Regularly audit the records maintained for hazardous and other waste			Visual inspection of hazardous materials handling, storage areas and disposal practices.	concerning hazardous waste material; Availability of spillage kits; Incidence of spillage of hazardous materials on site; and Evidence of leaks and contamination of soil and water	

		generated and disposal to designated site.					
6.	Closure and rehabilitation of construction and labour sites	Contractor to restore the original condition of the site prior to demobilization; Upon works completion, clear all structures, rubbish, fill-in and seal all the pits and trenches; Remove all construction equipment, vehicles, equipment, waste and surplus materials, temporary fencing and other items from the site; Clean up and remove any spills and contaminated soil in the appropriate manner; Do not bury discarded materials on site or any other land not designated for this purpose; Handover the completed construction site and the sites used for materials to rage and labour accommodations and sheds will be handed over; and Handover the project site after completion of operation phase.	Contractor	After completion of the civil works in construction phase	Physical verification of the site as well as items listed in the records of contractor; and Rehabilitation measures conducted after completion of construction and operation works.	Clean and clear site; Site rehabilitated; and Original condition of construct ion and other sites restored	Onetime

Annexure 5 Labour Management Plan

LMP shall be prepared by the contractor following the requirements of the ESS2 on Labour and Working Conditions. The LMP is a living document, which is initiated early in project preparation, and is reviewed and updated throughout development and implementation of the project. Outline for LMP is provided below which is indicative and shall be made specific to the sub-project.

Description	Mitigation Measures	Responsibility	
		Implementation	Supervision
Applicable Laws	The contractor should ensure the compliance of applicable Indian Labour Laws such as Factories Act 1948, Building and Other Construction Workers Act 1996, Inter State Migrant Workmen Act 1979, Contract Labour (Regulation & Abolition) Act 1970, Workmen Compensation Act 1923, Child Labour (Prohibition & Regulation) Act 1986, Minimum Wages Act 1948, Employee State Insurance Act 1948, Employees Provident Fund Act 1991, Payment of Wages Act 1936, Payment of Bonus Act 1965, Equal Remuneration Act 1976, Payment of Gratuity Act 1972 and other International Labour organization conventions as ratified by India.	Contractor	PIU/PMC
Applicable Licences	Labour Licence and all other statutory work permits including Contract Labour& Interstate Migrant Worker License. Workmen compensation Insurance / Accident Insurance, EPF and ESIC.	Contractor	PIU/PMC
Site layout	The location of the site, design and basic facility provision in the labor accommodation will be reviewed and approved by the PIU prior to the construction;	Contractor	PIU/PMC
Facilities	Maintain necessary living accommodation and ancillary facilities in functional and hygienic conditions; Provide adequate number of toilets separate for men and women workers, bathing area, kitchen, safe fuel/LPG for cooking and uncontaminated water for drinking, cooking and washing; Ensure adequate water supply in all toilets and urinals; The labour camp should have protection from heat, rain, flooding, insects, snakes and mosquitoes. It should have adequate provisions for emergency such as fire safety, security, etc; Require the non-discrimination and harassment and should be socialized/basis for training, and covers potential ethnic discrimination.	Contractor	PIU/PMC
Health and Safety	Provide first aid medical kit at labour accommodation;	Contractor	PIU/PMC

	train the labour for usage of items in injury, emergency, coordinate with nearest government and private medical centers for the medical services, display the contact number of medical doctor(s) and keep a vehicle for emergency travel all the time; necessary HIV/AIDS prevention measures will be taken at labour camp; HIV/AIDS awareness program will be organized by the contractor's Environment & Safety Officer; Where feasible, manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; ULB shall ensure proper segregated storage, collection, transport, treatment and disposal of all wastes following the SWM / C&D waste Rules 2016; remove all wreckage, rubbish, or temporary structures which are no longer required;		
Labour use	The total number of workers to be employed on the project, and the different types of workers: direct workers, contracted workers, temporary or seasonal workers and community workers. (Where numbers are not yet firm, an estimate should be provided) broad description and an indication of the likely characteristics of the project workers e.g. local workers, national or international migrants, female workers, workers between the minimum age and 18; details of the migrant workers, labour camp location should be shared with local Police station as per regulatory norms.	Contractor	PIU/PMC
Grievance	Establish a mechanism for grievance redressal for both direct and contract labourers, disclose contact details of officials concerned. Sign boards and GRC name boards should be written in local, multilingual languages and English at the labour camp.	Contractor	PIU/PMC
Policies and Procedures	Provide workers with contracts with fair terms and conditions Require the contractor to preferentially engage unskilled local workforce form the local communities Make all contracted workers to follow the rules for on-site behaviour (with colleagues) and conduct in the community.	Contractor	PIU/PMC

	Conduct induction and toolbox talks outlining expected conduct and local community values. Introduce disciplinary measures for violations and misbehaviours. Set the minimum age of project workers eligible for any type for work. Train the labour for environmental protection, occupational and community health and safety and gender equality. Follow the equal wages policy without any discrepancies or gender partialities. Ensure minimum legal labour standards as per ILO regulations (child/forced labour, no discrimination, working hours, minimum wages) are met with. Contractors shall implement codes of conduct concerning employment and workforce behaviour (including but not limited to safety rules, zero tolerance for substance abuse, environmental sensitivity of the area, dangers of sexually transmissible diseases and HIV/AIDS, gender equality and sexual harassment, respect for the beliefs and customs of the populations and community relations in general).		

Annexure 6 Immediate Incident Notification Form

Any Major Incident occurring on the Construction site of the Sub-Projects or caused by the Construction activities shall be reported by the Contractor/ Borrower / PIA to the Project Executing Agency (PEA) as soon as possible and not later than 24 hours after the incident occurred.
Definition of Major Incident:

Any social, labour, health and safety, security or environmental incident or accident having or which would reasonably be expected to have a negative impact on the Project. This may include explosions, fires, spills or workplace accidents which result in serious or multiple injury or major pollution. Any Injury of any employee (of Contractor or subcontractors/ suppliers) that causes loss of working time (Loss Time Injury) is considered as a major Incident.

Guidance for Accidents and Incidents Reporting

1 Basic Information

- *date, time, weather / lighting / conditions*
- *statement of facts*
- *details of deaths, injuries, damage, immediate losses*
- *details of witnesses*
- *details of whether scene was secured / photographed*
- *details of any item tested / sampling / sent for testing / removed from scene*
- *details of person leading investigation*
- *time lapse between accident and investigation*

Basic data should be clear, unambiguous, and factual (i.e. free from interpretation). Any gaps in the data should be highlighted and addressed in the investigation.

2 Investigation

- *reconstructed timeline of events, with the incident/accident in the mid-point, and linked events streamed either side, with clear identification of individuals/teams/third parties (e.g. contractors) that are linked and therefore require interviewing*
- *robust but sensitive questioning of witnesses and linked individuals/third parties to*
- *clarify facts, assist with timeline reconstruction and advance the investigation. Statements/ notes of interviews to be included.*

The investigation must follow the facts, witnesses and linked individuals/third parties and the timeline, and not be constrained by the incident/accident event in isolation.
In case publications on the event are available, these should be attached to the report (e.g. press articles, online articles, radio and TV- spots).

3 Analysis

- *using basic data, interview outcomes and reconstructed timeline, identification of:*
  - *immediate causes*
  - *underlying causes (actions in the past that have allowed or caused undetected unsafe conditions/acts)*
  - *root causes (generally organisational/management failings, sometimes not directly/ obviously in relation to accident/incident regarding location/time)*
  - *identification of absent/inadequate/failed/unused risk identification,- management- and control measures, reference/gap analysis against relevant national legislation and against the international standards as applicable and agreed upon for the Project*
- *conclusions and summary of root causes and underlying causes for the accident/incident.*

Analysis must be sufficiently rigorous to go wherever the investigation has led. Identification of root, underlying and immediate causes must be sufficiently credible and robust to withstand third-party scrutiny.

4 Way forward

- *for EACH root cause, underlying and immediate cause, a corrective/preventive action is required (these may be numerous and interlinked)*

- *for EACH action, a named person with sufficient resource to deliver upon it and a clear timeline (action plan) is required. In addition, a named person should have overall responsibility for monitoring / reporting on progress (with timelines).*
- *demonstration, that all actions together will prevent recurrence; evidence that current risk assessments/procedures have been revised to reflect this*
- *details of communications to stakeholders, to include a concise summary of the investigation, including the action plan, and lessons learned.*
- *details of ongoing support and assistance to those impacted directly or indirectly by the accident.*

Types of reportable injury

The death of any person

All deaths to workers and non-workers, with the exception of suicides, must be reported if they arise from a work-related accident, including an act of physical violence to a worker.

Specified injuries to workers

- fractures, other than to fingers, thumbs and toes
- amputations
- any injury likely to lead to permanent loss of sight or reduction in sight
- any crush injury to the head or torso causing damage to the brain or internal organs
- serious burns (including scalding) which:
  - covers more than 10% of the body
  - causes significant damage to the eyes, respiratory system or other vital organs
- any scalping requiring hospital treatment
- any loss of consciousness caused by head injury or asphyxia
- any other injury arising from working in an enclosed space which:
  - leads to hypothermia or heat-induced illness
  - requires resuscitation or admittance to hospital for more than 24 hours

Source:http://www.hse.gov.uk/riddor/reportable-incidents.htm

IMMEDIATE INCIDENT NOTIFICATION
1. Incident Details

Project Company		**Date of incident**			
		Time of Incident			
Location of incident		**Type of Incident**	**Environmental**	☐	
			Injury	*Workforce*	☐
				Public/Local community	☐
			Social incident (e.g. violent labor unrest)	☐	

2. WHAT HAPPENED
Brief description of incident

3. INJURED WORKERS						
Employee / Contractor	**Sex**	**Age**	**Job Title / Description**	**Time with company**	**Cause**	**Injury Type (Major / Fatal)**

4. INJURED MEMBERS OF PUBLIC

Name	Sex	Age	Community	Place of Residence	Cause	Injury Type (Major / Fatal)

5. ENVIRONMENTAL INCIDENT			
Type (Spill / Gas Release)	**Total Loss (Litres /kG)**	**Cause**	**Damage**

6. WITNESSES TO INCIDENT			
Name	**Sex**	**Place of Residence**	**Description of incident**

7. OTHER RELEVANT INFORMATION				
Have the authorities been informed?	**Yes**	☐	**No**	☐
Please provide further information here				
Media attention?	**Yes**	☐	**No**	☐
Please provide further information here				

Any effects off-site?	**Yes**	☐	**No**	☐
Please provide further information here				
Photographs taken? *(please include them in this report)*	**Yes**	☐	**No**	☐
Date				
Which immediate corrective actions have been taken after the accident? By whom?				
Please describe here if the accident lead to changes into the works organisation or process, if specific equipment has been acquired/mobilised, if protection measures were implemented, if works have stopped etc.				
Person completing form:				
Name and position:				
Contact details:	**Phone**		**Email**	

Annexure 7 Procedure for CRZ Clearance

The procedure for clearance of permissible activities as per the CRZ Notification, 2019 and ICRZ Notification, 2019 shall be as under:-

(i). The project proponents shall apply on PARIVESH portal (https://parivesh.nic.in/) along with the following set of documents for seeking prior clearance under the CRZ / ICRZ Notification, 2019 to the concerned State or the Union Territory Coastal Zone Management Authority (CZMA):-

a. Project summary details as per Annexure-V to the notification.
b. Rapid Environment Impact Assessment (EIA) Report including marine and terrestrial component, as applicable, except for building construction projects or housing schemes.
c. Comprehensive EIA with cumulative studies for projects, (except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006) if located in low and medium eroding stretches, as per the CZMP to this notification.
d. Risk Assessment Report and Disaster Management Plan, except for building construction projects or housing schemes with built-up area less than the threshold limit stipulated for attracting the provisions of the EIA Notification, 2006.
e. CRZ map in 1:4000 scale, drawn up by any of the agencies identified by the Ministry using the demarcation of the HTL or LTL, as carried out by NCSCM.
f. Project layout superimposed on the CRZ map duly indicating the project boundaries and the CRZ category of the project location as per the approved CZMP under this notification.
g. The CRZ map normally covering 7 km radius around the project site also indicating the CRZ-I, II, Ill and IV areas including other notified ecologically sensitive areas.
h. "Consent to Establish" or No Objection Certificate from the concerned State Pollution Control Board or Union territory Pollution Control Committee for the projects involving treated discharge of industrial effluents and sewage, and in case prior consent of Pollution Control Board or Pollution Control Committee is not obtained, the same shall be ensured by the proponent before the start of the construction activity of the project, following the clearance under this notification.

(ii). The concerned State / Union Territory Coastal Zone Management Authority (CZMA) shall examine the above documents in accordance with the approved Coastal Zone Management Plan (CZMP) / Island Coastal Regulation Zone (ICRZ) Plans or Integrated Islands Management Plan (IIMP) in accordance with the procedure laid down and make recommendations as per the provisions of CRZ Notification, 2019 / ICRZ Notification, 2019, clearly specifying the permissibility, section/ clause of the notification permitting the project/ activity, to the concerned authority as under :-

a.

S.	Scenario as per the CRZ Notification, 2019	Clearance	Approving Authority	Procedure
Projects requiring only CRZ clearance				
2	b) Permissible and regulated	Standalone	CZMA	Application at CZMA by

	activities which fall purely in CRZ-11 and CRZ-1II areas.	CRZ		the PP; ↓ Clearance by the CZMA