

# Draft Initial Environmental Examination

Project Number: 49107-003  
December 2018

**IND: Tamil Nadu Urban Flagship Investment Program  
– Underground Sewerage System for Phase III of  
Vellore City Municipal Corporation Covering Zones 2,  
2A and 8**

Prepared by Vellore City Municipal Corporation (VCMC) for the Asian Development Bank.

## CURRENCY EQUIVALENTS

(as of 1 September 2017)

Currency Unit	–	Indian Rupees (INR)
INR1.00	–	\$0.015
\$1.00	=	INR 65.

## Abbreviations

ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
CI	–	Cast Iron
CPCB	–	Central Pollution Control Board
CTE	–	Consent to establishment
CTO	–	Consent to Operation
DWC	–	Double wall corrugated
EA	–	Executing Agency
EAC	–	Expert Appraisal Committee
EC	–	Environmental Clearance
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan;
ES	–	Environmental Specialist
ESS	–	Environmental and Social Safeguards
GOI	–	Government of India
GoTN	–	Government of Tamil Nadu
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination;
MLD	–	Million liters per day
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NOC	–	No Objection Certificate
PIU	–	Project Implementation Unit;
PMU	–	Project Management Unit
REA	–	Rapid Environmental Assessment Checklist
RoW	–	Right of Way
SEIAA	–	State Environmental Impact Assessment Authority
SO	–	Safeguards Officer
SPS	–	Safeguard Policy Statement, 2009
STP	–	Sewage Treatment Plant
TNPCB	–	Tamil Nadu Pollution Control Board
TNUFIP	–	Tamil Nadu Urban Flagship Investment Program
TNUIFSL	–	Tamil Nadu Urban Infrastructure Financial Services Limited
VCMC	–	Vellore City Municipal Corporation

### **WEIGHTS and MEASURES**

°C	Degree Celsius
km	kilometre
lpcd	litres per capita per day
m	metre
Mgd	million gallons per day
Mld	million litres per day
mm	millimetre
Nos	Numbers
sq.km	Square Kilometer

### **NOTES**

- (i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March.
- (ii) In this report, "\$" refers to US dollars.

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## EXECUTIVE SUMMARY

1. The proposed Asian Development Bank (ADB) funded Tamil Nadu Urban Flagship Investment Program (TNUFIP) is aligned to support in the following: (i) urban infrastructure across the state improved and world class cities focusing on universal access to 24x7 water supply services and sanitation facilities including tertiary treatment of sewage to become engines for economic growth developed ( Vision 2030, Government of Tamil Nadu, GoTN); (ii) five industrial corridors developed (GoTN Vision 2030); (iii) quality of life for all, especially the poor and the disadvantaged improved (Mission Statement and Guidelines, AMRUT Government of India, 2015); (iv) a clean and sustainable environment provided (Smart Cities - Mission Statement and Guidelines, Government of India, 2015). TNUFIP will focus on cities in five priority economic corridors: Chennai - Hosur, Chennai – Tiruchirapalli, Coimbatore –Madurai, Coimbatore - Salem and Madurai – Thoothukudi. The reform-based component of the program will seek to provide results-based performance incentives to select cities and towns. The program shall also focus on transformative investments in 24X7 water supply, full sanitation coverage smart water management, and urban climate change resilience drawing from the support of various Asian Development Bank (ADB) grant technical assistance.

2. **Components.** The TNUFIP is envisaged to be structured under three main components: (i) investment in municipal infrastructure namely water supply and sewerage, (ii) municipal reform based activities, and (iii) technical assistance for design, supervision, program management, reforms, and climate change.

3. **The Subproject.** Vellore is located in the northern part of Tamil Nadu, which is well connected by State Highways and National Highways (NH 46 connecting Bangalore-Chennai) from various part of the Tamil Nadu. Vellore is a very prominent education and health centre in Tamil Nadu and as well as in India. The proposed subproject to be implemented under the ADB funded TNUFIP, is proposed to provide Underground Sewerage System (UGSS) in added areas (Zone 2, 2A and 8 covering areas of (Viruthampattu, Kalinjur, Gandhi Nagar ( East and west ) ,Kangeyanallur and old Katpadi ) of Vellore City Municipal Corporation (VCMC). These areas are located in the south of Palar River and North of Palar River. VCMC area is located on both sides of River Palar. Subproject includes the following civil works components: (i) sewage collection system (281 kilometre (km) length of sewers and 11,494 manholes), (ii) 5 no's of lift stations, (iii) 3 no's of pump stations, (iv) 6.9 km length pumping main sewers, (v) 28,200 house service connections.

4. **Project implementation arrangements.** The Municipal Administration and Water Supply Department (MAWS) of GoTN acting through the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) is the state-level Executing Agency (EA). A Project Management Unit (PMU) will be established in TNUIFSL headed by a Project Director and Deputy Project Director (senior official from Commissionerate of Municipal Administration, CMA), and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. The implementing agencies are project Urban Local Bodies (ULBs).Vellore City Municipal Corporation (VCMC) is the Implementing Agency (IA) for this subproject. A Project Implementation Unit (PIU) will be established in VCMC headed by a full-time Project Manager (Executive Engineer or above) and comprising dedicated full-time staff of the VCMC for day-to-day implementation of the subproject. PIU is assisted by Construction Management and Supervision Consultant (CMSC) in implementation. Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL will have overall responsibility of safeguard compliance with ADB SPS 2009. ESS Managers report to Head, project division. At PIU level, a Safeguards Officer (SO) will be appointed, who

will coordinate monitoring and implementation of safeguards on behalf of VCMC. Experts available at CMSC will monitor implementation of safeguards.

5. **Screening and assessment of potential impacts.** ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. As per the GoI EIA Notification, 2006, this subproject do not require EIA study or Environmental Clearance. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment Checklist for Sewerage. The potential negative impacts were identified in relation to pre-construction, construction and operation phases.

6. **Categorization.** Based on results of the assessment and ADB Safeguard Policy Statement (SPS), the subproject is classified as environmental Category "B", i.e., the subproject is judged to be unlikely to have significant adverse environmental impacts and accordingly, this Initial Environmental Examination (IEE) is prepared.

7. **Description of the Environment.** The subproject components are located in Vellore, in the northern part of Tamil Nadu. It is an important city providing one of the best education and healthcare facilities in the country. Topography of Vellore city is mostly plain with slight slope from west to east. It experiences dry and hot climate and average annual rainfall is nearly 1000 mm. Vellore is an historical city, and there are three national protected monuments: Vellore Fort (located in the centre of the city), a temple and a mosque that are located inside the Fort. None of the subproject components are either located or proposed near the protected monuments. Vellore city is originally developed on the southern bank of River Palar. Due to expansion, the city has grown to the northern bank of the river as well.

8. At present, sewerage system is available in the old town area of Vellore, located in the northern part of the Palar River under this subproject is proposed to provide sewerage system for other areas surrounding the old town area. Project area is split into various zones namely 2, 2A and 8 covering Viruthampattu, Kalinjur, Gandhi Nagar (East and west), Kangeyanallur and old Katpadi. Proposed subproject components are located within the urban area of Vellore City. Sewers will be laid in the public roads, the lifting stations and the pumping stations-will be constructed on the government owned land parcels. The collected sewage will be treated in the STP proposed at Viruthampattu (implemented under Phase-II). The treated sewage will be disposed into Pandiyan Channel at a distance of 2km from the STP. None of the subproject components are located within or near the forest areas.

9. **Potential environmental impacts and mitigation measures.** The subproject is unlikely to cause significant adverse impacts because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) there are no significant sensitive environmental features in the project sites and (iii) predicted impacts are site-specific and likely to be associated with the construction process.

10. Sewerage system performs a crucial function of safely collecting, transporting, treating and disposing domestic wastewater, including, human excreta. Subproject is likely to have numerous positive impacts on the environment and public health. In this IEE, negative impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. Sewage pumping and lifting stations are likely to generate odour. Although utmost care is taken to locate these away from the houses, due to design

considerations and land constraints, some sites are located close to the houses. Another impact of STP operation arises from malfunction or decrease in treatment efficiency and sludge handling and disposal. This will result in release of untreated or partially treated wastewater that will pollute environment and cause public health issues. Mixing of industrial waste in sewage is also identified as one of the risk which could render treatment inadequate. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. may create nuisance, unhealthy and hazardous conditions.

11. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result significant measures have already been included in the designs for the infrastructure. Various measures suggested for odour control including: appropriately locating sewage wells within site as far as away from the houses; developing tree cover; closed facilities; gas collection and treatment facilities, design and operation measures to prevent odour build up; adopting standard operating procedures for operation and maintenance; imparting necessary training; safety and personal protection equipment for workers.

12. Potential impacts during construction are considered significant but temporary, and are common impacts of construction in urban areas, and there are well developed methods to mitigate the same. Except sewer works, all other construction activities (lifting/pumping stations ) will be confined to the selected sites, and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer works will be conducted along public roads in an urban area congested with people, activities and traffic. Therefore these works will have significant impacts arising mainly: from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to deep trench excavations in the road, especially in narrow roads; access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

13. **Environmental Management Plan (EMP).** An EMP has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. As stated above, various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) proper planning of sewer works to minimize the public inconvenience (ii) barricading, dust suppression and control measures (iii) traffic management measures for works along the roads and for hauling activities; (iv) provision of walkways and planks over trenches to ensure access will not be impeded; and (iv) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

14. The EMP is included in the bid and contract documents to ensure compliance to the conditions set out in this document . The contractor will be required to submit to PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. No works are allowed to commence

prior to approval of SEMP. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times.

15. **Consultation, disclosure and grievance redress mechanism.** The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB, VCMC and TNUIFSL websites. The consultation process will be continued during project implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

16. **Monitoring and Reporting.** Contractor will submit a monthly EMP implementation report to PIU. PIU, with the assistance of VCMC, will monitor the compliance of Contractor, prepare a Quarterly Environmental Monitoring Report and submit to PMU. The PMU will oversee the implementation and compliance, and will submit semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted on VCMC and TNUIFSL websites

17. **Conclusions and Recommendations.** Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. This IEE is prepared based on the field reconnaissance surveys and secondary source of information and shall be updated by PIU during detailed design phase to reflect final project design and will be reviewed and approved by PMU.

## I. INTRODUCTION

### A. Background

1. The proposed Asian Development Bank (ADB) funded Tamil Nadu Urban Flagship Investment Program (TNUFIP) is aligned to support in the following: (i) urban infrastructure across the state improved and world class cities focusing on universal access to 24x7 water supply services and sanitation facilities including tertiary treatment of sewage to become engines for economic growth developed ( Vision 2030, Government of Tamil Nadu, GoTN); (ii) five industrial corridors developed (GoTN Vision 2030); (iii) quality of life for all, especially the poor and the disadvantaged improved (Mission Statement and Guidelines, AMRUT Government of India, 2015); (iv) a clean and sustainable environment provided (Smart Cities - Mission Statement and Guidelines, Government of India, 2015). TNUFIP will focus on cities in five priority economic corridors: Chennai - Hosur, Chennai – Tiruchirapalli, Coimbatore –Madurai, Coimbatore - Salem and Madurai – Thoothukudi. The reform-based component of the program will seek to provide results-based performance incentives to select cities and towns. The program shall also focus on transformative investments in 24X7 water supply, full sanitation coverage smart water management, and urban climate change resilience drawing from the support of various Asian Development Bank (ADB) grant technical assistance.

2. **Components.** The TNUFIP is envisaged to be structured under three main components: (i) investment in municipal infrastructure namely water supply and sewerage, (ii) municipal reform-based activities, and (iii) technical assistance for design, supervision, program management, reforms, and climate change.

3. **Impact and outcome.** TNUFIP will be implemented over a 8-year period beginning in 2018, and will be funded by ADB via its multi tranche financing facility (MFF). The impact of the TNUFIP will be improved livability and resilience in urban areas of economic importance in Tamil Nadu. The outcome of TNUFIP will be smart and climate resilient urban services delivered in priority industrial corridors in Tamil Nadu:

- (i) **Output 1: Sewage collection and drainage improved and climate friendly sewage treatment systems introduced.** This will include (i) new and rehabilitated sewage treatment capacity developed with clean energy solar photo-voltaic (PV) installed on a pilot basis; (ii) reuse of treated sewage water for industrial purposes in suitable areas; (iii) new and improved sewage collection pipelines constructed with household connections made; (iv) new sewage pumping capacity added; (v) community water and sanitation committees formed with female participation; and (vi) drainage and flood management systems established.
- (ii) **Output 2: Access to reliable and smart drinking water services improved.** This will include the development of (i) smart water supply distribution systems within new district metering areas to reduce non-revenue water and provide regular water supply; (ii) new transmission mains; and (iii) new water storage reservoirs.
- (iii) **Output 3: Institutional capacity, public awareness, and urban governance strengthened.** This will include (i) establishing a new state-level urban data and governance improvement cell in the Commissionerate of Municipal Administration (CMA); (ii) establishing a new project design and management center in CMA; (iii) implementing a performance-based grant incentive urban governance program for ULBs

to improve in areas of financial management, municipal revenues, administration, service delivery, and gender mainstreaming; and (iv) implementing public awareness campaigns in water conservation, sanitation, and hygiene. Project Design Consultants will be recruited to prepare new projects including: (i) feasibility studies; (ii) surveys and investigations; (iii) engineering design of projects; (iv) preparation of bidding documents; and (v) safeguard assessment .

4. Vellore, located in the northern part of Tamil Nadu, is a very prominent educational and healthcare hub in the Country. It is also an industrial hub, and is a top exporter of leather goods. Existing underground sewerage system cover the core (old) city area of Vellore. At present sewerage system is provided only in the core area of the city, which is covers 5.95 sq.km area, about 6.5% of the total municipal area and about 11% of total population. It is proposed to provide sewerage system in the remaining areas of the city in two phases (phase II and phase III). Phase II covers the area immediately surrounding the core city, on the southern side of Palar River. The remaining areas in the southern and northern outskirts will be taken up for providing sewerage system in phase III and phase IV. Under the ADB funded TNUFIP, it was proposed to develop UGSS in phase II area, covering 26% area and 41% population which is under procurement stage and current proposal is to develop UGSS in Phase III area ,covering 38 % and 31 % population. Proposed subproject includes: (i) sewage collection system (281 kilometre (km) length of sewers and 11,494 manholes), (ii) 5 no's of lift stations, (iii) 3 no's of pump stations, (iv) 6.9 km length pumping main sewers, (v) 28,200 house service connections.

## **B. Purpose of this IEE Report**

5. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment Checklist (**Appendix 1**). The potential negative impacts were then identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment shows that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

6. The prepared IEE is based on the Detailed Project Report (DPR) prepared by VCMC through an external DPR consultant. However, the treatment and disposal system (STP) is proposed under design-build type implementation, therefore, at present only preliminary designs are prepared, which is already considered under Phase –II and hence not considered in this IEE. The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

## **C. Report Structure**

7. This Report contains the following ten (10) sections including the executive summary at the beginning of the report:

- (i) Executive summary;
- (ii) Introduction
- (iii) Description of the project
- (iv) Policy, legal and administrative framework
- (v) Description of the environment;
- (vi) Anticipated environmental impacts and mitigation measures;
- (vii) Public consultation and information disclosure;
- (viii) Grievance redress mechanism;
- (ix) Environmental management plan, and,
- (x) Conclusion and recommendation.

## II. DESCRIPTION OF THE PROJECT

### A. Project Area

8. Project area comprises Viruthampattu, Kalinjur, Gandhi Nagar (East and west), Kangeyanallur and old Katpadi areas covering 22 municipal wards (14 fully and 8 partly, out of total 60 wards) in the southern and Northern part of Palar River in Vellore City in Vellore District, Tamil Nadu (Figure 1). Total population of subproject area is 187,723 (design base population of 2020) and has a geographical area of 22.14 square kilometer (sq. km).

### B. Existing Sewerage System

9. At present, Underground Sewerage System is provided in core town area of Vellore Town covering 24 wards out of the 48 wards of the erstwhile Vellore Municipality. This system covers only 6-7% of area and about 10-11% of population of the present municipal corporation area consisting of total 60 wards. Sewage is collected via underground sewers, conveyed to sewage treatment plant (STP) near Muthumandapam at Old Palar Bridge. The STP process is based on activated sludge process (ASP), and the capacity is 10.28 MLD. After treatment the treated wastewater is discharged into Velavadi Eri (lake/pond) in Alamelumangapuram, which is then used for agricultural purpose.

10. Rest of the households depend on septic tanks and soak pits, and few households also let the sewage directly into open drains. Existing open drains carry both sullage and storm water. The sullage from the northern part of the town is collected from the main drains along Arni road and Katpadi road which is then taken to sewage pumping station site near the existing Palar water supply Head works by gravity and then taken across Palar River to its northern bank by means of pumping and finally let into the sewage farm of about 20 acres located at Viruthampattu Village.

11. The sullage from the southern portion of the town is collected through drains/streams channeling through Salavanpet, Velapadi, Suriyakulam which then runs parallel to the railway line along the western corporation limit and bye-pass road and crosses the Katpadi road and let into Palar river. Wastewater accumulates at many places, resulting in breeding of mosquitoes and flies resulting in insanitary conditions. Indiscriminate disposal of wastewater from the city directly into the River Palar lead to pollution of river.

12. VCMC has proposed to provide sewerage system to cover entire area of the current municipal corporation area in three phases (Phase II ,Phase III and Phase IV ). Phase II covers the area immediately surrounding the core city (which is under procurement stage), on the

southern side of Palar River. Rest of the areas in the southern and northern outskirts are proposed under phase III and phase IV (Please refer Figure 2)

Under phase –II, the following components have been proposed: (i) sewage collection system (209 kilometre (km) length of sewers and 8,652 manholes), (ii) 7 no,s of lift stations, (iii) 5 no,s of pump stations, (iv) 9.4 km length pumping main sewers, (v) sewage treatment plant (STP) of 50 million litres per day (MLD) capacity, and (vi) 43,270 house service connections. This phase-II is under procurement stage.

13. The phase-III covers sewerage zones of 2, 2A and 3 , with 38 % of municipal area and 31 % of municipal population. In terms of municipal wards it will cover 13 wards fully ( 6 to 15, 42 to 44 ) and 13 no of wards partially ( 4,33,37,39,40,41,45,46,49,50,51,52 and 53 ) . The collected sewage will be treated in STP in Viruthampattu. The subproject includes the following civil works components: (i) sewage collection system (281 kilometre (km) length of sewers and 11,494 manholes), (ii) 5 no's of lift stations, (iii) 3 no's of pump stations, (iv) 6.9 km length pumping main sewers, (v) 28,200 house service connections.

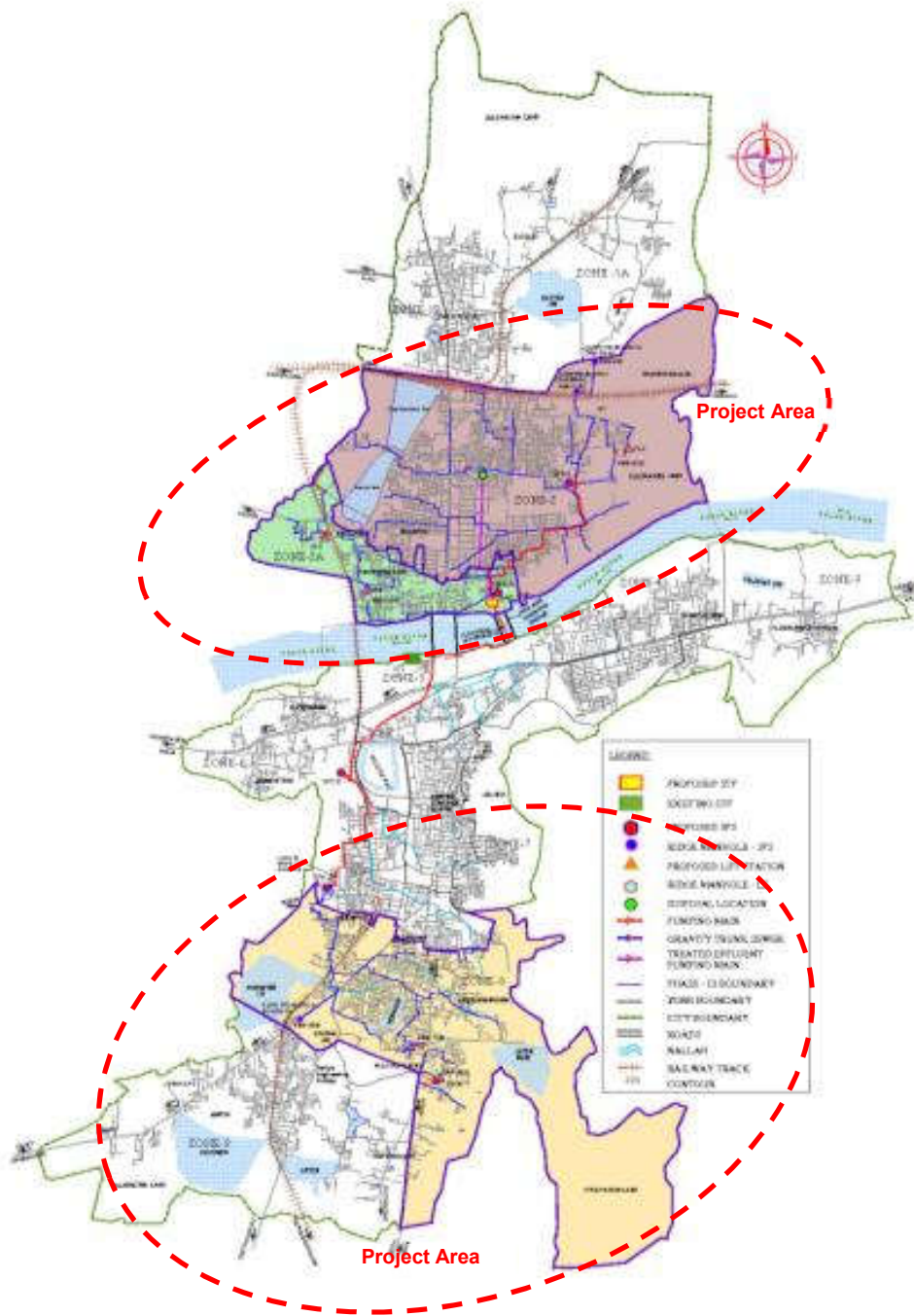
14. STP under Phase-II :The total requirement is 105 mld STP at Ultimate stage. Hence, the STP is proposed in modules with 50 MLD (25 mld + 25 mld ) being constructed under phase II (to cater to Phase-II and Phase –III sub-project area sewage flows) and remaining 55 MLD will be constructed pas the Intermediate Stage.

<b>Sewage Generation in Year in MLD</b>	<b>Total Estimated Sewage Generation</b>	<b>Phase-I (commissioned on 2015)</b>	<b>Phase-II (approved under TNUFIP- Tranche 1)</b>	<b>Phase-III (now proposed under TNUFIP – Tranche 2)</b>	<b>Phase-IV (to be taken)</b>	<b>Total (Phase-II, III and IV)</b>
Base Year 2020	66	7	29	21	9	<b>59</b>
Intermittent Year -2035	87	9	37	29	12	<b>78</b>
Ultimate Year- 2050	115	10	48	39	18	<b>105</b>



**Figure 1: Location of Subproject**

Vellore City Municipal Corporation Map



### C. Proposed Project

15. The phase-III covers sewerage zones of 2, 2A and 3 comprising 38 % of municipal area and 31 % of municipal population. In terms of municipal wards it will cover 13 wards fully (6 to 15,42 to 44) and 13 no of wards partially ( 4,33,37,39,40,41,45,46,49,50,51,52 and 53 ). The areas covered are Viruthampattu, Kalinjur, Gandhi Nagar ( East and west ), Kangeyanallur and old Katpadi. The subproject includes the following components: (i) sewage collection system (281 kilometer (km) length of sewers and 11,494 manholes), (ii) 5 nos of lift stations, (iii) 3 nos of pump stations, (iv) 6.9 km length pumping main sewers, (v) 28,200 house service connections.

16. As discussed earlier, the sewage from Phase-III will be treated in the STP at Viruthampattu proposed under Phase –II. The plant capacity is 50 MLD which is design to cater the Phase-III sewage generation as well. The treated water is proposed to be disposed into Pandiyan Canal, which is an irrigation feeder canal, carrying the surplus from Kalinjur lake and discharges into Palar River. The designed flow of the canal is 13.480 Cumecs and the additional flow from the catchment of the lake is around 5.820 Cumecs. The total flow of the canal is around 19.30 Cumecs. The design calculation details are as follows:

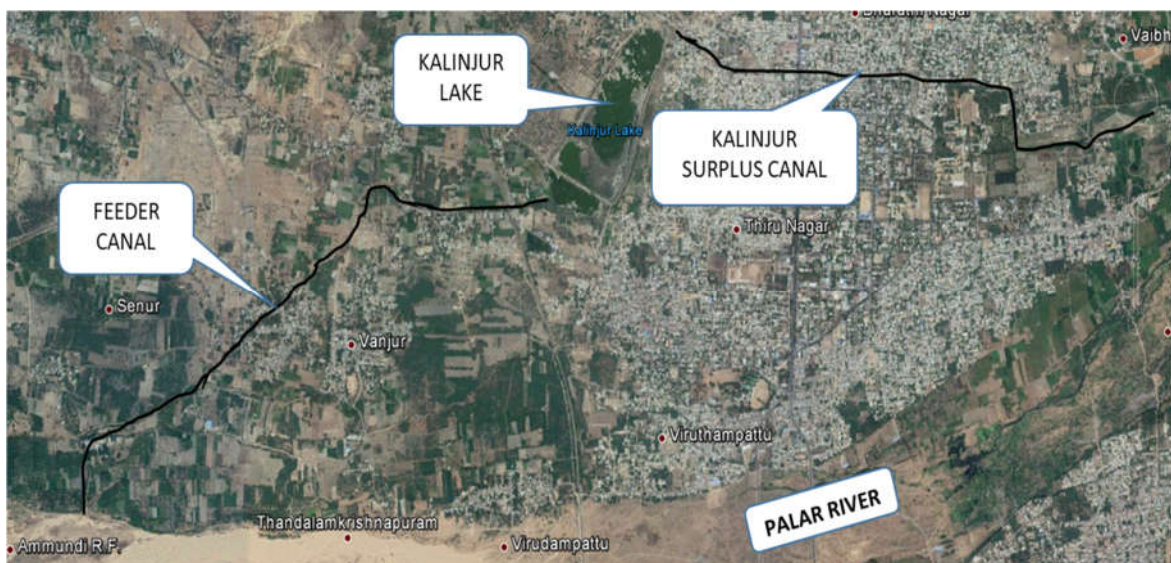
Total design flow from the feeder canal of Palar river = **13.480** Cumecs

Total flow from free and intercepted catchment of the lake and surplus canal = **5.820** Cumecs

Total flow into the surplus canal including flow from feeder canal and catchment = **19.300** Cumecs

Total flow from the STP = **50.000** MLD  
= **0.579** Cumecs

Total flow into the Surplus canal including flow from STP (**Qi**) = **19.879** Cumecs



**Capacity calculations for the surplus canal:**

Minimum Breadth of the channel	B	=	<b>6</b>	m
Minimum Depth of the channel	d	=	<b>1</b>	m
Area	A	$B \times d$ =	<b>6</b>	m <sup>2</sup>
Perimeter	P	$B + 2d$ =	<b>8</b>	m
Hydraulic radius = (A/P)	R	=	<b>0.75</b>	m
Average Slope	S	=	<b>1 in 350</b>	
Rugosity coefficient	n	=	<b>0.013</b>	
Velocity	V	=	<b><math>(1/n) \cdot R^{2/3} \cdot S^{1/2}</math></b>	
		=	<b>3.39</b>	m/s
Discharge Q=AV	Qc	=	<b>20.365</b>	m <sup>3</sup> /s

Since  $Q_c > Q_i$ , Hence Safe

17. **Table 1** shows the nature and size of the various components of the subproject. Location of subproject components and conceptual layout plans are shown in Figure 2 to Figure 6. System is designed as a separate underground system catering only domestic wastewater; storm water will be carried by existing open drains and dispose into natural streams / water bodies. Industrial wastewater will not be disposed into sewers. System is designed for 115 liters per capital per day, based on sewage generation rate of 80% of water supply and considering infiltration per CPHEEO norms. System is design with gravity flow as far as possible, however topography does not permit a complete gravity system from collection to inlet at the STP, and therefore wherever required sewage lifting and pumping stations introduced to optimize the system design.

#### **D. Implementation Schedule**

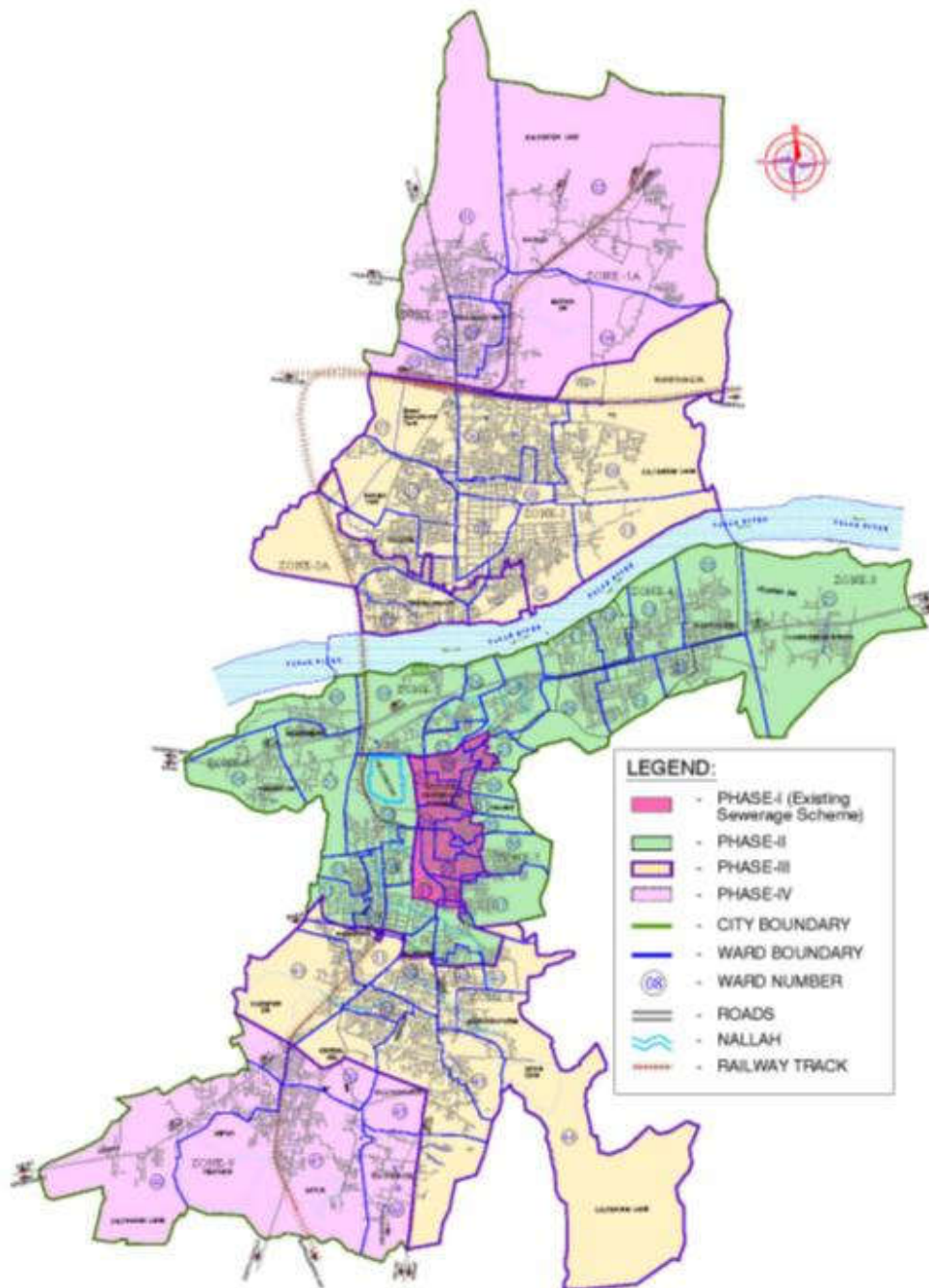
18. Bids for civil works will be invited in June 2018, and the contract will be awarded by January 2019. Construction is likely to start in February 2019, and will take about 36 months to complete. Detailed implementation schedule (including design/pre-construction, construction, commissioning, and operation phases) will be provided in the updated IEE per detailed design.

**Table 1: Proposed Water Supply Subproject Components**

Infrastructure	Function	Description	Location																																																	
Sewer network	Collect wastewater from houses and convey by a combination of gravity and pressure pumping to the STP	<p>281 km 200-900 mm diameter sewers</p> <table border="1"> <thead> <tr> <th>Pipe Diameter</th> <th>Materials</th> <th>Length in m</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>200 mm</td> <td>uPVC</td> <td>216666</td> <td>77.1</td> </tr> <tr> <td>200 mm</td> <td rowspan="3">DWCP</td> <td>25920</td> <td>9.2</td> </tr> <tr> <td>250 mm</td> <td>17578</td> <td>6.3</td> </tr> <tr> <td>300 mm</td> <td>3035</td> <td>1.1</td> </tr> <tr> <td>350 mm</td> <td rowspan="6">Cast Iron</td> <td>1902</td> <td>0.7</td> </tr> <tr> <td>400 mm</td> <td>3343</td> <td>1.2</td> </tr> <tr> <td>450 mm</td> <td>2949</td> <td>1.0</td> </tr> <tr> <td>500 mm</td> <td>379</td> <td>0.1</td> </tr> <tr> <td>600 mm</td> <td>3751</td> <td>1.3</td> </tr> <tr> <td>700 mm</td> <td>3377</td> <td>1.2</td> </tr> <tr> <td>800 mm</td> <td></td> <td>153</td> <td>0.1</td> </tr> <tr> <td>900 mm</td> <td></td> <td>2121</td> <td>0.8</td> </tr> <tr> <td colspan="2">Total</td> <td>281174</td> <td></td> </tr> </tbody> </table> <p style="text-align: right;"><i>m = millimeter</i> <i>m = meter</i></p> <p><b>Manholes</b> 11,494 no's (brickwork &amp; reinforced cement concrete) Minimum distance between manholes of 30 m is adopted for sewer size up to 400 mm and larger spacing up to 100m for large diameter sewers.</p>	Pipe Diameter	Materials	Length in m	%	200 mm	uPVC	216666	77.1	200 mm	DWCP	25920	9.2	250 mm	17578	6.3	300 mm	3035	1.1	350 mm	Cast Iron	1902	0.7	400 mm	3343	1.2	450 mm	2949	1.0	500 mm	379	0.1	600 mm	3751	1.3	700 mm	3377	1.2	800 mm		153	0.1	900 mm		2121	0.8	Total		281174		<p>Sewers will be laid underground in the roads and internal streets in the project area comprising Zone 2, 2A and 8 (Viruthampattu , Kalinjur, Gandhi Nagar ( East and west ) ,Kangeyanallur and old Katpadi covering 26 corporation wards).</p> <p>Sewer lines will be laid in the centre of road by cutting black top, within the road right of way. In wider roads, like SH, NH, divided 2-way roads etc., sewers will be laid in the service roads, and where service roads are unavailable, will be laid along the edge of the road, but mostly within the black top portion. For the roads where adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, pipes will be laid in this earthen shoulder.</p> <p>Large diameter pipes will be laid mostly on main roads (300 – 900 mm), while the tertiary sewers of small size (200 mm to 300 mm dia) that collect wastewater from each house will be laid in all streets in the subproject area.</p> <p>Trench size to bury the sewer will be of 0.8 m to 1.5 m wide and 1.2 m to 6 m deep. Only sewage pumping station 8 is located inside a residential area among 3 pumping stations.</p> <p>For manholes, an area of 1.5 mx1.5m to 2.5m x 2.5m will be excavated.</p>
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Sewage lift stations (LS)	Lifting station is a small pumping station to lift the sewage to higher level and discharge into a ridge manhole for transporting to the pumping station. Lifting station has a collection well with submersible pumps	<p>5 no's <i>Components of LS</i></p> <ul style="list-style-type: none"> <li>Lift well of dia 2.0 m to 2.5 m and depth 5 – 7.5 m</li> <li>Non-clog submersible pump sets</li> <li>Control panel box</li> </ul> <p>4 LS have one suction well each (LS-4 LS-5, LS-13, LS-14), and 1 have two suction wells each (LS-6 )</p>	<p>Lift well will be constructed on the road (like manhole) where the sewer ends terminates into the lift well. Pumps will be installed in the well, and a control panel box will be installed near the well. Lift stations are proposed at following locations:</p> <ol style="list-style-type: none"> <li>LS -4- Vaibavu Nagar ,Opposite to VIT (zone-2)</li> <li>LS-5 – Kalinjur, near railway crossing (Zone-2A)</li> <li>LS-6 – Sakthi Nagar 2 nd cross street , Viruthampattu (Zone-2A)</li> <li>LS- 13 – Vairamuthu street,( Bagayam near post office)</li> </ol>																																																	

Infrastructure	Function	Description	Location																								
	accommodated inside. The screen arrangement is provided in the previous manhole to the lift station.	<i>Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. The general arrangement drawings for lifting station is shown in figure-7.</i>	5. LS-14 – Sanjivipuram street ( Bagayam)																								
Sewage pumping stations (SPS)	Collect sewage and pump to main pumping stations	<p>3 no's <i>Components of SPS</i></p> <ul style="list-style-type: none"> <li>Inlet chamber length (2 – 3.5 m), width (1.5 m) and depth (2.3 – 4.3 m)</li> <li>Screen chamber length (4 – 4.5 m), width (2 - 3.5 m) and depth (2.3 – 5.3 m)</li> <li>Grit well Dia (4.5 – 8 m) and depth (3.3 – 6.3) m)</li> <li>Suction well Circular at SPS 2A Dia (5.5 – 6 m) and depth (6.6 – 8.7 m) Rectangular at SPS 2 and 8 length (9.5 – 15.5 m), width (6 - 12 m) and depth (8.4 – 9.6 m)</li> <li>Pump room (3 x 2 m2)</li> </ul> <p>Non-clog submersible pump sets</p>	<p>Sewage pump stations are proposed at following locations:</p> <ol style="list-style-type: none"> <li>SPS-2 – Located opposite to graveyard at Kangeyanallur (Earlier the SPS-2 was proposed to be located within the graveyard, however, due to the objection from the local community, it was proposed to shift to the opposite side of the graveyard in the VCMC owned land, as per the suggestion given by the local community through consultation held on 23<sup>rd</sup> October 2018.)</li> <li>SPS-2A – inside proposed STP campus at Viruthampattu</li> <li>SPS -8 – Saduperi Road</li> </ol>																								
Pumping main sewers	Transfer sewage from SPS to another SPS or to STP	<p>150 -700 mm diameter CI sewers</p> <table border="1"> <thead> <tr> <th>Pipe Diameter</th> <th>Material</th> <th>Length in m</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>150 mm</td> <td rowspan="5">CI</td> <td>705</td> <td>10.1</td> </tr> <tr> <td>200 mm</td> <td>50</td> <td>0.7</td> </tr> <tr> <td>300 mm</td> <td>80</td> <td>1.1</td> </tr> <tr> <td>600 mm</td> <td>2950</td> <td>42.4</td> </tr> <tr> <td>700 mm</td> <td>3180</td> <td>45.7</td> </tr> <tr> <td colspan="2">Total</td> <td>6965</td> <td></td> </tr> </tbody> </table> <p><i>m = millimeter m = meter</i></p>	Pipe Diameter	Material	Length in m	%	150 mm	CI	705	10.1	200 mm	50	0.7	300 mm	80	1.1	600 mm	2950	42.4	700 mm	3180	45.7	Total		6965		<p>Pumping main will be laid along the main roads, and the internal roads connecting sewage pumping stations and STP. Sewers will be laid underground in the road carriage way. SPS-2A located inside proposed STP campus, from there it will pump to inlet chamber of STP.</p>
Pipe Diameter	Material	Length in m	%																								
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House service connections	Collect sewage from individual houses and convey into network	<ul style="list-style-type: none"> <li>28,200 no's</li> </ul>	At each household, connected to wastewater outlet drain																								

**Figure 2: Proposed Sewerage Schemes and Phasing in Vellore**



*Note: Phase III is proposed in the present subproject under TNUFIP*

Figure 3: Proposed Sewerage Scheme Phase III in Vellore

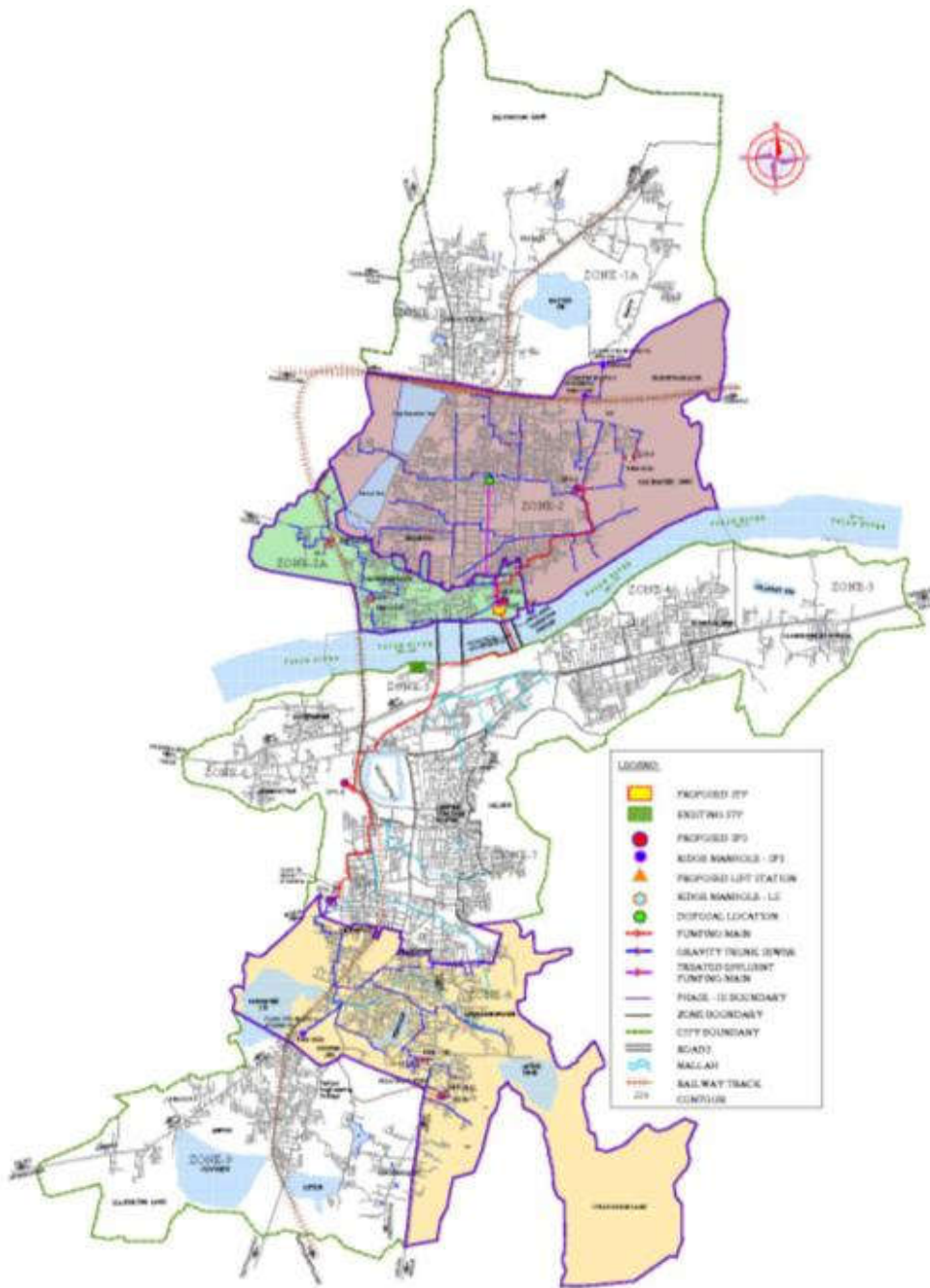






Figure 5: Layout plan on revenue map for SPS-2A

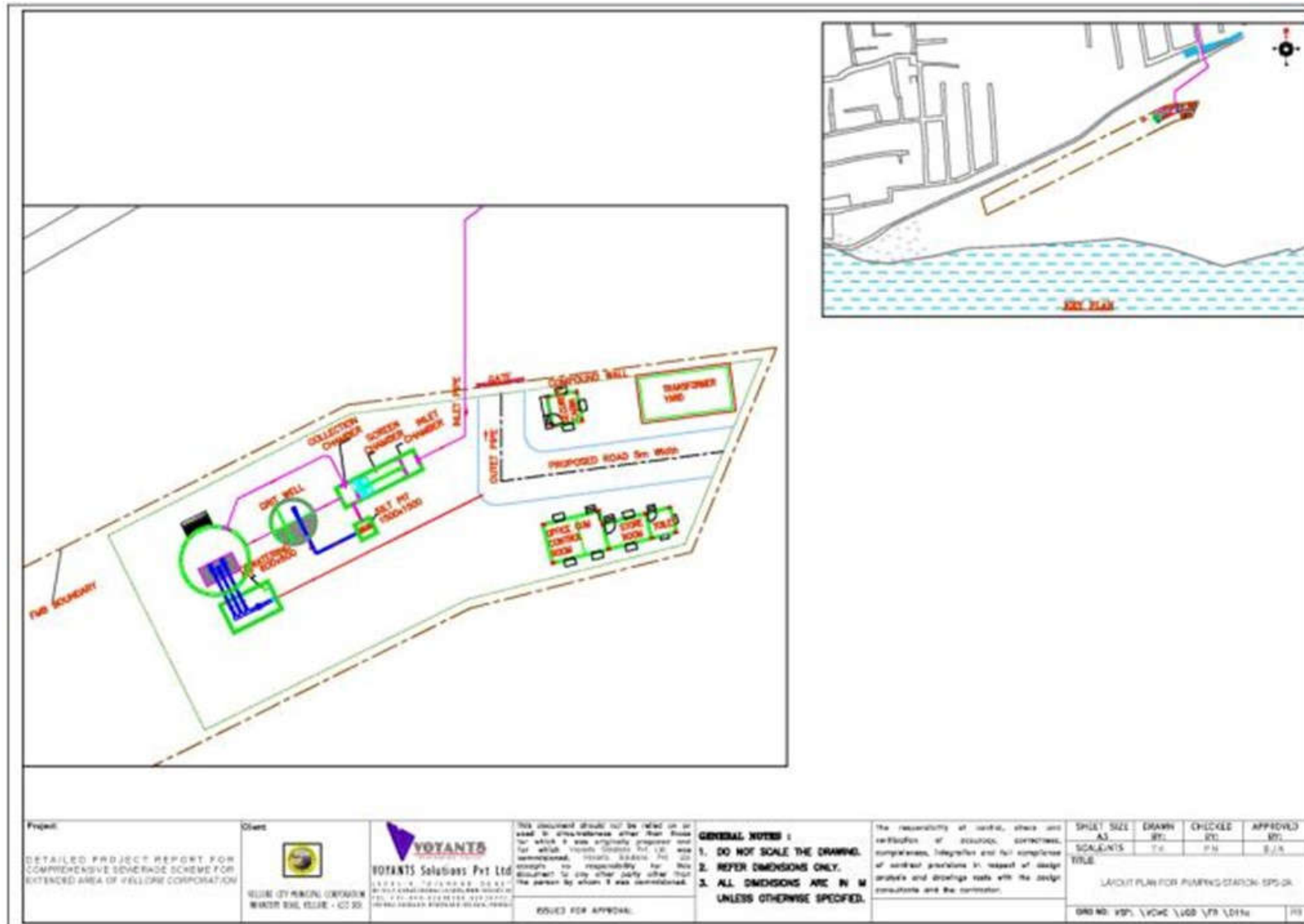
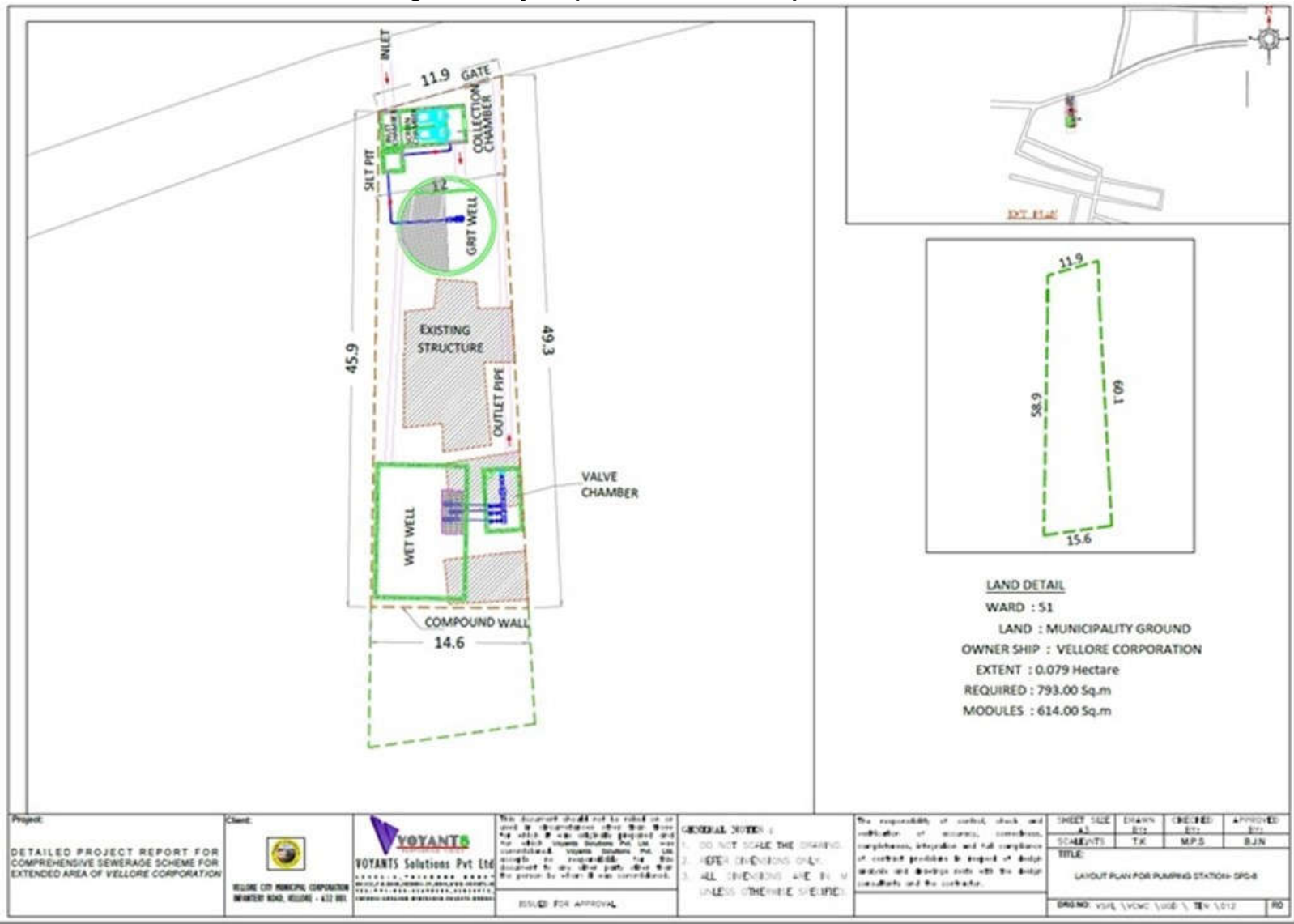
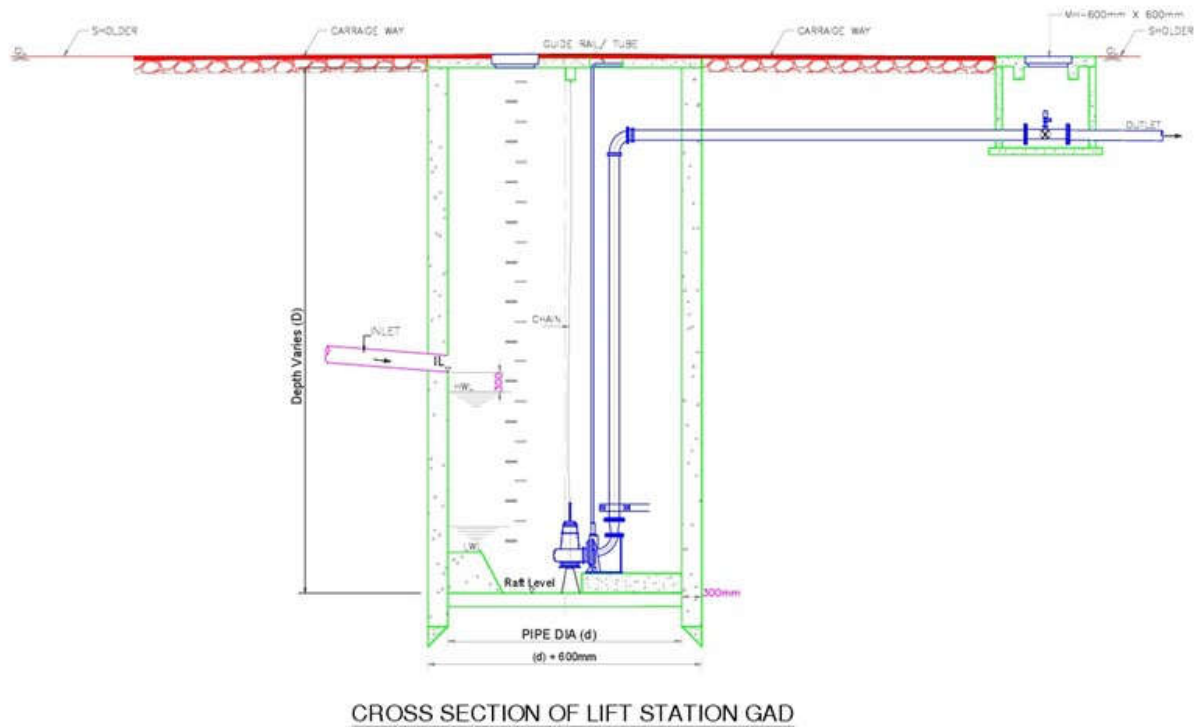


Figure 6: Layout plan on revenue map for SPS-8





**Figure 7: General arrangement of Lifting station**



### III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

#### A. ADB Policy

19. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

20. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

21. **Environmental management plan.** An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

22. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

- (i) for environmental category A projects, draft EIA report at least 120 days before Board consideration;
- (ii) final or updated EIA and/or IEE upon receipt; and
- (iii) environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

## **B. National Environmental Laws**

23. **Environmental assessment.** The GoI EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

24. Category A projects require EC from the central Ministry of Environment, Forests and Climate Change (MoEF&CC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEF&CC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF&CC considers the recommendation of the EAC and provides the EC if appropriate.

25. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

26. None of the components of this underground sewerage system subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or EC is not required for the subproject.

27. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 2.

**Table 2: Applicable Environmental Regulations**

<b>Law</b>	<b>Description</b>	<b>Requirement</b>
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under to this Act. All pollution potential activities will require Consent to Establish (CTE) from Tamil Nadu Pollution Control Board (TNPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	There is no STP proposal under this Phase-III.
Ancient Monuments and Archaeological Sites and Remains Acts, 1958, its Rules, 1959 and notification, 1992.  Ancient Monuments and Archeological Sites and Remains (Amendment and Validation) Act, 2010	This Act provides, inter alia, for the preservation of ancient and historical monuments and archaeological sites and remains of national importance - Notifies 100m around the monument as prohibited area and 100 to 300m as regulated area for construction works; - No excavation/construction work is allowed within 100m of boundary of the protected monument; - Requires prior permission of National Monument Authority (NMA) for taking up works within 300m of the boundary of protected monuments	There is no such Ancient Monument and Archaeological sites in the project area.
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	To comply with applicable notified standards
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	To comply with the noise standards.
Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982.	- Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles); - CTE and CTO from TNPCB; - Compliance to conditions and emissions standards stipulated in the CTE and CTO.	<ul style="list-style-type: none"> <li>• Generators will require CTE and CTO from TNPCB</li> <li>• Generators to comply with applicable emission standards.</li> </ul>
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated at proposed facilities shall be managed and disposed in accordance with the SWM Rules
Construction and Demolition Waste Management Rules, 2016	Rules to manage construction and to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, re-modeling, repair and demolition of any civil structure.	Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall	<b>Appendix 2</b> provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.

Law	Description	Requirement
	not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	

28. **Clearances / permissions to be obtained by Contractor.** Following Table shows the list of clearances/permissions required for project construction. This list indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction.

**Table 3: Clearances and permissions required for Construction**

S. No	Construction Activity	Statutory Authority	Statute under which Clearance is Required	Implementation	Supervision
1	Tree Cutting	Department of Forest and District Collector	Clearances from the authorities as per the Tamil Nadu Timber Transit Rules, 1968 or latest.	PIU	IA and PMU
2	Hot mix plants, Crushers and Batching plants	TNPCB	Consent to Establish and consent to Operate under Air Act, 1981	Contractor	PIU
3	Discharges from construction activities	TNPCB	Consent to Establish and consent to Operate under Water Act, 1974	Contractor	PIU
4	Storage, handling and transport of hazardous materials	TNPCB	Hazardous Wastes (Management and Handling) Rules, 1989 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	Contractor	PIU
5	Sand mining, quarries and borrow areas	Department of Geology and mining, GoTN	Tamil Nadu Minor Mineral Concession Rules, 1959 (corrected up to 31.3.2001)	Contractor	PIU
6	For establishing new quarries and borrow areas	MoEF&CC	Environmental clearance under EIA Notification 2006	Contractor	PIU
7	Groundwater extraction	Public Works Department (PWD)	Tamil Nadu Groundwater Development and Management Act 2000	Contractor	PIU
8	Disposal of bituminous wastes	Tamil Nadu Pollution Control Board	Hazardous Wastes (Management and Handling) Rules, 1989	Contractor	PIU
9	Temporary traffic diversion measures	-	MoRTH 112 SP 55of IRC codes	Contractor	PIU

29. **ADB SPS Requirements.** During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices

consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

**Table 4: WHO Ambient Air Quality Guidelines**

Table 1.1.1: WHO Ambient Air Quality Guidelines <sup>7, 8</sup>		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO <sub>2</sub> )	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO <sub>2</sub> )	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM <sub>10</sub>	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM <sub>2.5</sub>	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

**Table 5: World Bank Group's EHS Noise Level Guidelines**

Table 1.7.1- Noise Level Guidelines <sup>54</sup>		
Receptor	One Hour L <sub>Aeq</sub> (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational <sup>55</sup>	55	45
Industrial; commercial	70	70



## IV. DESCRIPTION OF THE ENVIRONMENT

### A. Methodology Used for Baseline Study

30. **Data collection and stakeholder consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.

31. The literature survey broadly covered the following:

- (i) Project details, reports, maps, and other documents prepared by technical consultants and VCMC.
- (ii) Discussions with TNUIFSL, VCMC, DPR preparation agency, and other relevant government agencies
- (iii) Secondary data from previous project reports and published articles, and
- (iv) Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from Government agencies and websites.

32. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2018 to assess the existing environment (physical, biological, and socio-economic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socio-economic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

### B. Physical Resources

#### 1. Location, Area and Connectivity

33. Vellore city is situated in the northern part of Tamil Nadu, about 135 km northwest of capital city Chennai. This city serves as the District Headquarters of Vellore District. Geographically, the city lies between 12°15' to 13°15' North latitudes and 78° 20' to 79° 50' east longitudes, on the southern bank of River Palar, due to urban agglomeration, the city has expanded on either side of the Palar River.

34. Vellore Municipality was constituted way back in 1866 under the provisions of Town Improvement Act, 1865 and it was upgraded as Corporation in 2008. Vellore City Municipal Corporation area spreads over an area of 87.92 sq.km with a population of 5.02 lakh as per 2011 census. The constituent parts of Vellore City Municipal Corporation (VCMC) are: Vellore city and the two erstwhile municipalities (Sathuvachari and Dharapadavedu), six town panchayats (Katpadi, Gandhi Nagar, Allapuram, Thorapadi, Shenbakkam, and Kalinjur) and nine village panchayats (Alamelumangapuram, Viruthampattu, Kangeyanallur, Virupatchipuram, Palavanchathu, Edyanchathu, Ariyur, Chitteri and Konavattam). VCMC is divided into 60 municipal wards.

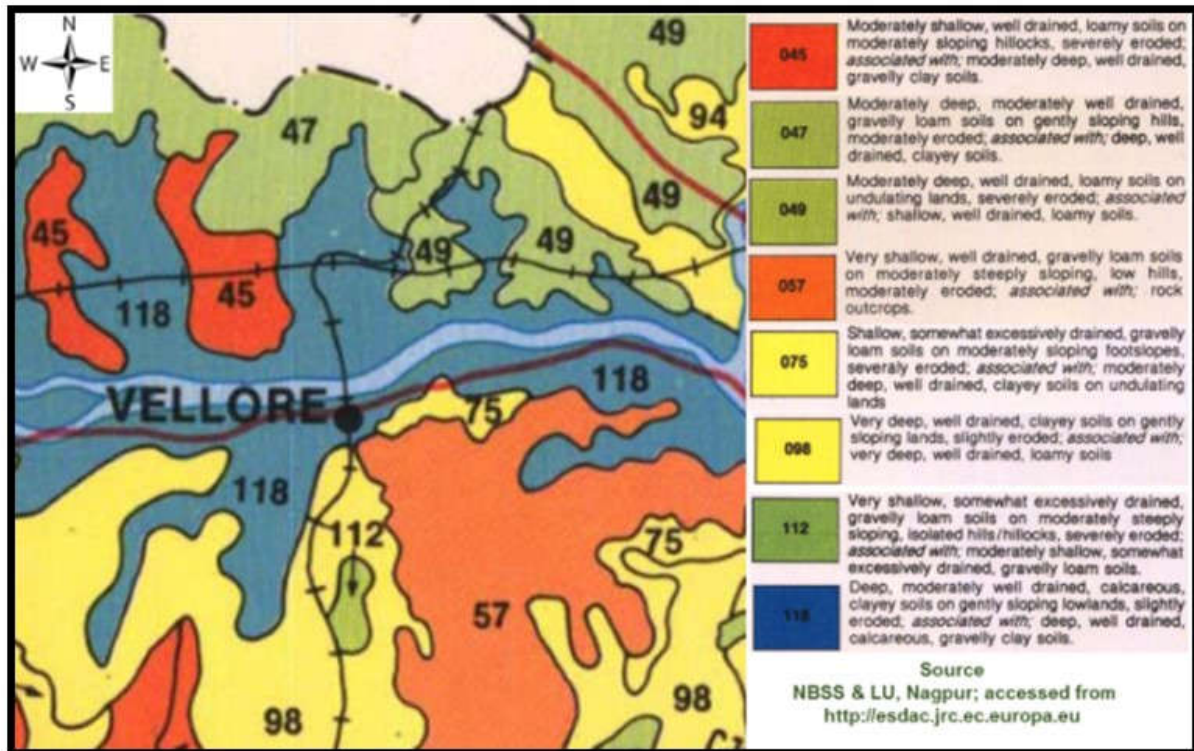
35. Vellore has a well-developed transport infrastructure and is well connected by Roads and Rail network with most cities and towns in India. National Highways NH 234 and NH 46 crisscross the city. Vellore city has three railway stations, namely Katpadi junction, Vellore Cantonment and Vellore Town connecting the city to Chennai, Bangalore, Tirupati and Trichy. Nearest airports are at Chennai (130 km), Bengaluru (200 km); and Tirupati (100 km).

## 2. Topography, Soils and Geology

36. The topography of Vellore city is mostly plain with slight slope from west to east. It is surrounded by hilly terrain in the eastern and south parts. The landscape in the hilly terrain is undulating to rugged, flanked by hill ranges belonging to Eastern Ghats. There is no incidence of land subsidence in and around project area.

37. Soils in the region have been classified into 1) Sandy soil 2) Sandy loam 3) Red loam 4) Clay 5) Clayey loam and 6) Black cotton soils. Black loam soil is found in parts of Vellore Taluk. Gravelly clayey soils are found in most parts of the city and along river Palar. In the southern parts of the city loamy soils are found.

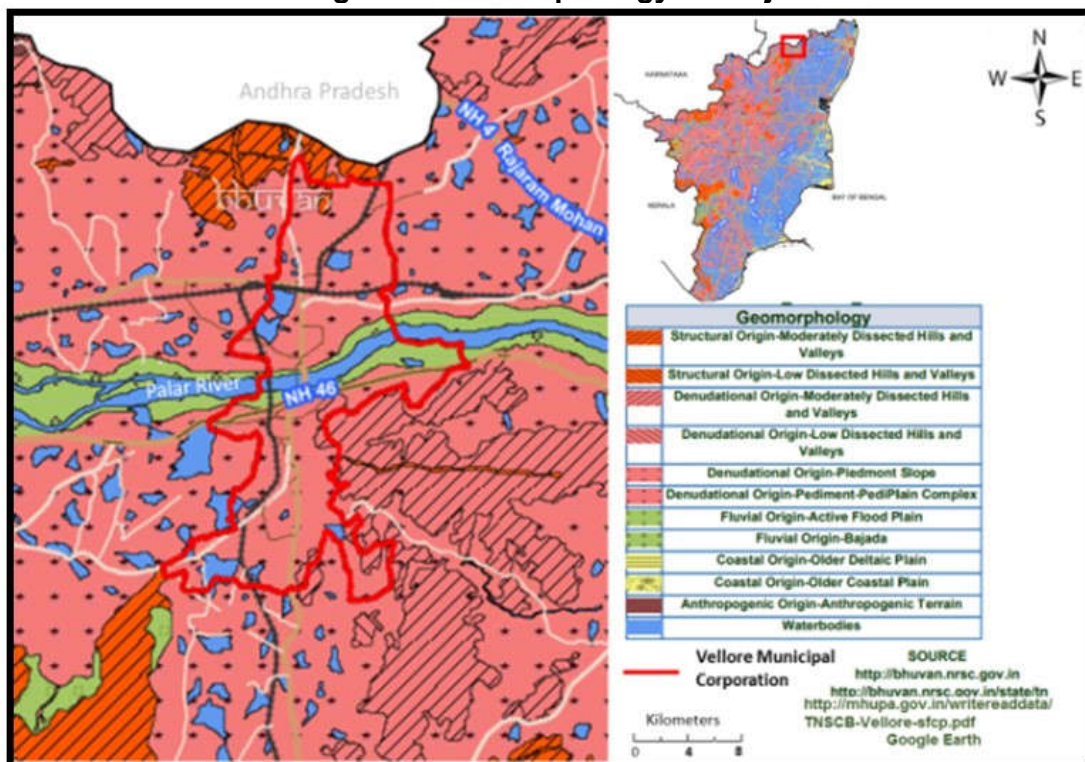
**Figure 8: Soil Types in the Project Area**



38. Geologically, the area is classified into hard rock and sedimentary formations. The Hard rock formations found in the region are the oldest rocks of the earth crust. They are azoic, crystalline and extremely contorted. Most common hard rock formations in the region are gneisses and charnockite Sedimentary deposits are found along Palar River which are transported by running water mainly along the course as isolated patches

39. Geotechnical investigations conducted during the detailed design indicate that the top layer, varying from 1.5 m to 3.5 m, is characterized by soil, and hard rock encounters at the a depth of 4.5 to 5 m. These two layers sandwich soft disintegrated and medium dense rocks.

Figure 9: Geomorphology of Project Area



3. Seismology

40. According to Bureau of Indian Standards (BIS) [IS 1983 (Part I):2002], Vellore town falls under Zone III and on the macro seismic intensity scale the project area falls under MSK VII (Moderate Damage Risk Zone).

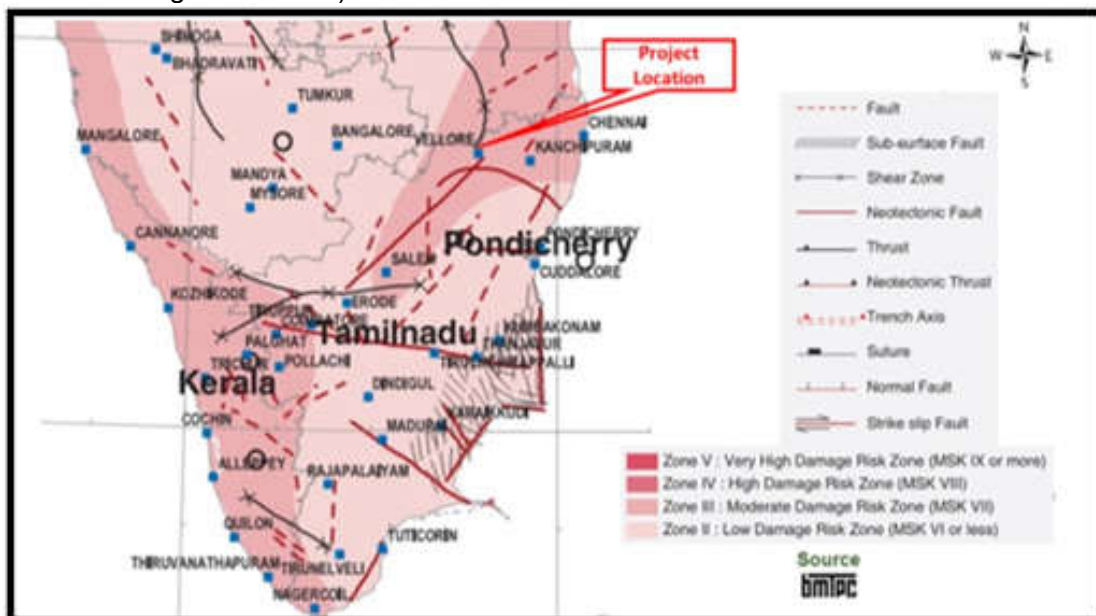
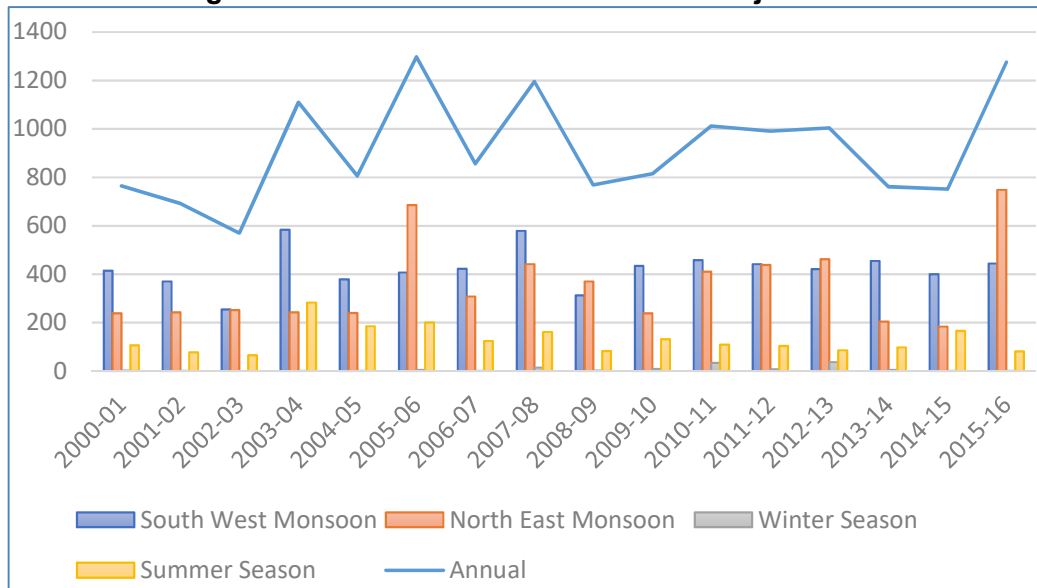


Figure 10: Seismic Zone of Project Area

#### 4. Climatic Conditions

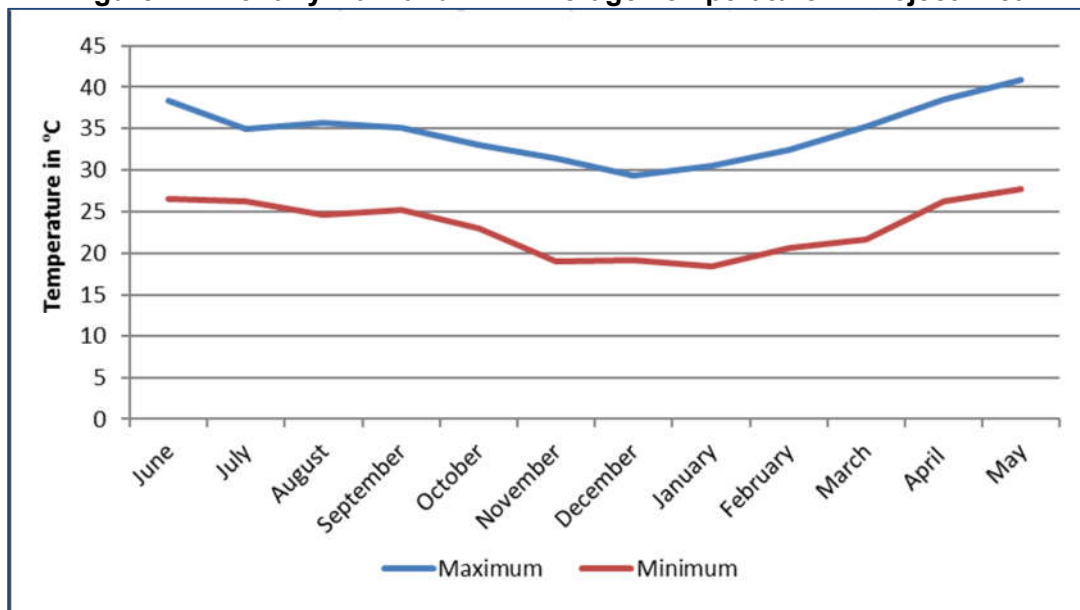
41. Vellore is in tropical zone, away from the sea and has an elevation of 220 m above the mean sea level (msl), hence the town experiences dry and hot climate. The average temperatures drop to around 18°C during November – January and during April – June reach 40°C. In summer the humidity ranges between 40% to 63% and in winter it raises to 67% to 86%. The average annual rainfall is 996.7mm. The maximum rainfall occurs during September and October through northeast monsoon. The area gets a fairly good rain during southeast monsoon as well.

**Figure 11: Annual Seasonal Rainfall in Project Area**



Source: Directorate of Economics and Statistics 2015-16

**Figure 12: Monthly Max and Min Average Temperature in Project Area**



## 5. Surface Water

42. The project area lies within the watershed expanse of the Palar River Basin and consists of a network of tanks and canals. The River Palar is a prominent and historical feature of Vellore. River seldom flows, and according to local information, river experienced flow in 2015 due heavy floods after nearly two decades. There is surface water flow only for a few days in a year in this river. But considerable ground water potential exists in the Palar river bed. There are a number of subsurface water intake structures on the river bed.

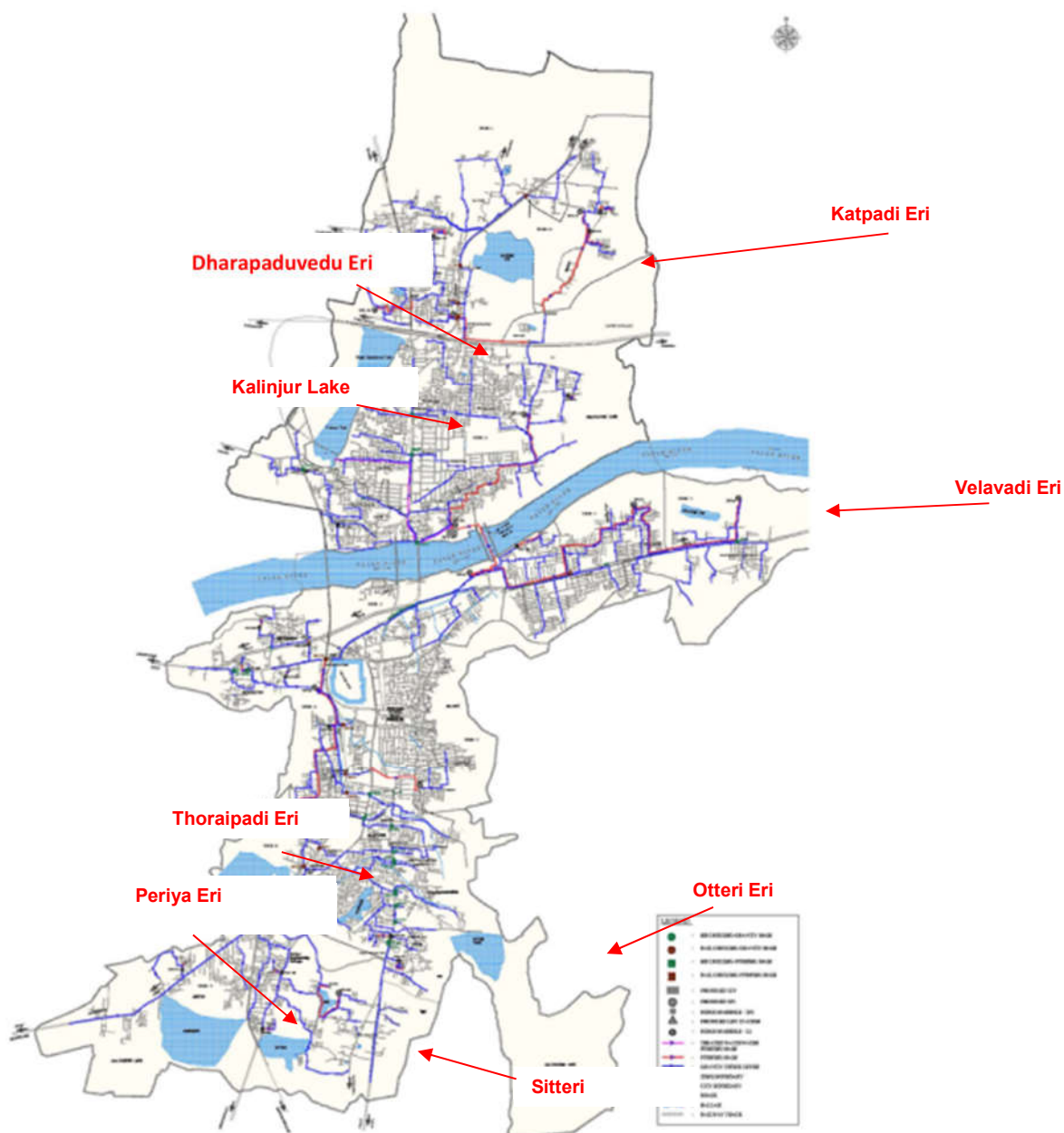


Figure 13: Lakes/ponds in Vellore City

43. Apart from Palar river there are few water bodies that dot in and around the city. Gopal Samuthram (Dharadavedu) and Kalinjur lakes on the north-western side and Sandulperi lake on the south are prominent ones. Other lakes/tanks in municipal are include Vellavadi Eri (meaning lake/pond), Thorapadi Eri, Otteri Eri, Periya Eri, and Sitteri Eri. Except Otteri eri, which is used for drinking purposes by the surrounding villages, other water sources/ surface water bodies are not potable and are generally used for washing and irrigation (Figure 13)

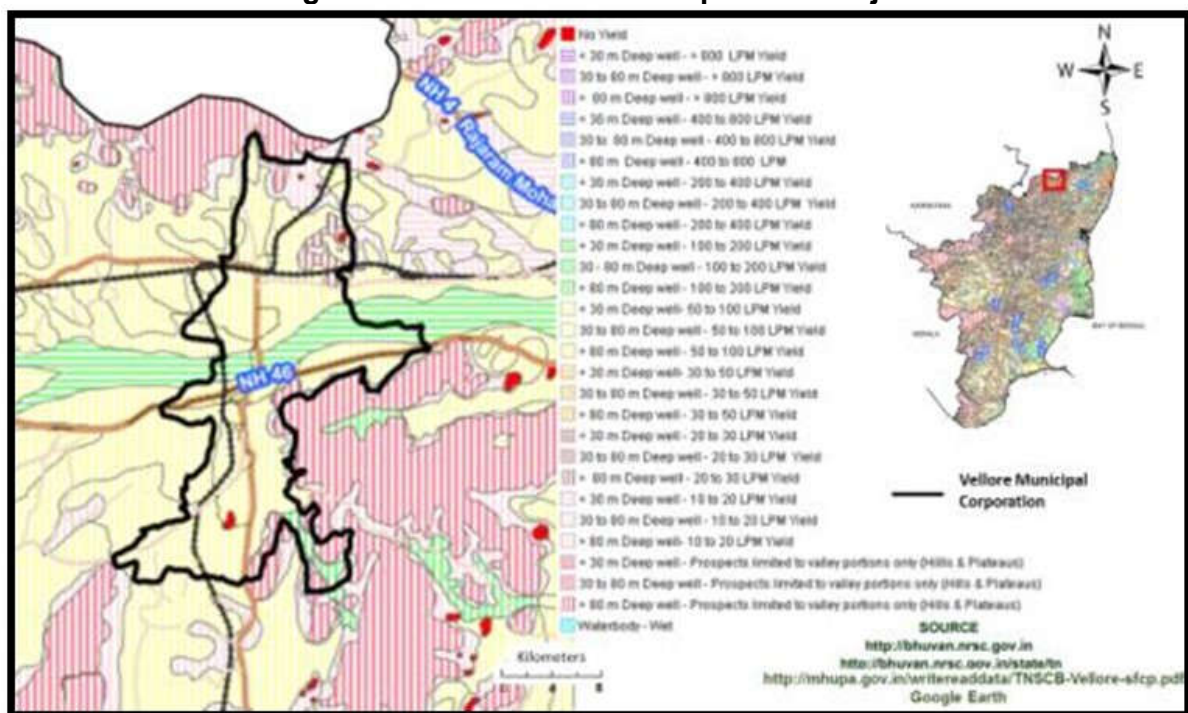
44. Kalinjur lake is mainly fed by Palar River, and substituted by its catchment area. Consequently, lake is mostly dry or have very less water. It was filled to its capacity in 2015 due to heavy rains and flood in River Palar., Presently the lake holds good amount of water due to subsequent monsoons. Wastewater from surrounding areas also enter the lake. Lake water is not used for potable purposes, however, it is used for irrigation purpose in the downstream, when the lake overflows, which is very rare. As per the local information, in the last 20 years, lake overflowed twice – in 2004 and 2015. No commercial or leisure fishing is practiced.

45. Velavadi lake, which is located in the eastern part of the city, is used by VCMC for disposal of treated wastewater from the existing STP. This water is being used for irrigation.

## 6. Groundwater

46. Palar river bed has a considerable ground water potential that facilitates a large-scale groundwater extraction from the river bed. Ground water is the main source of drinking water supply in the absence of reliable surface water source in the region. Million gallons of groundwater per day is pumped from the river bed for the major water supply schemes.

**Figure 14: Ground Water Prospects in Project Area**



Source: Bhuvan

47. Due to over exploitation of groundwater, 5 blocks of upper Palar Zone in Vellore District have been classified as Dark Zone, where annual extraction is more than 85% of annual groundwater recharge and resulted in depletion of water level. All these blocks are located on either bank of Palar river. Vellore district as a whole is categorized as “over-exploited” in terms of groundwater potential as of 2011 by Central Ground Water Board (CGWB). The map below shows the ground water prospects in the project area according to which the water in the region is 30m to 80m deep and yield 100 to 200 LPM.

48. **Groundwater Quality.** As per Central Ground Water Board report of Ground water quality scenario in India, Vellore is categorised as fluoride affected district with concentration of more than 1.5mg/L. Table 6 summarizes the result of water quality analysis conducted during 2012 at 68 groundwater sampling wells that are spread across the district including wells from the project area. Groundwater was found to be alkaline which catalyzed the mineral leaching adding to the high concentration of fluoride in groundwater. Industries along with agricultural fields contribute to the nitrate and fluoride levels in groundwater.

49. In the entire Palar basin, pollution is more prevalent, in upper Palar where tanneries are located in large number from Vaniyambadi to Walajahpet town. These tanning industries let the untreated or partially treated effluents in large volumes into the river system, thus polluting the cultivable soil and groundwater resources. Following Table shows the groundwater quality in Vellore.

**Table 6: Groundwater Quality in Vellore**

Parameters	BIS standard (desirable - permissible)	Minimum	Maximum	Mean
pH	6.5 – 8.5	7.2	8.5	7.5
EC (µS)		670	4210	1663
Total dissolved solids (mg/L)	500 – 2000	388	2686	1059
Calcium (mg/L)	75 – 200	18	240	77
Magnesium (mg/L)	30 – 100	24	199	71
Sodium (mg/L)	200	15	621	204
Potassium (mg/L)	-	2	196	17
Nitrate (mg/L)	45 – 100	<1	46	11
Fluoride (mg/L)	1.0 – 1.5	0.02	3	1
Chloride (mg/L)	250 – 100	25	1170	275
Carbonate (mg/L)		<1	24	10
Bicarbonate (mg/L)	-	238	946	474
Sulphate (mg/L)	200 – 400	7	394	128

Source: P. J. Sajil Kumar, P. Jegathambal, E. J. James (2014), “Factors influencing the high fluoride concentration in groundwater of Vellore District, South India”, *Environ Earth Sci.*, 72:2437–2446

## 7. Ambient Air Quality

50. Secondary information on the air quality from Tamil Nadu Pollution Control Board (TNPCB) is not available for Vellore. As a recent update, the TNPCB has fixed monitoring stations in Vellore for periodic monitoring of air pollution. Based on the reconnaissance survey, the main source of air pollution in the city are attributed to vehicular traffic, road dust, construction and industrial activities. From a secondary source, in 2016, air quality study at Green circle and old bus stand in the city has been conducted and the outcome of the analysis reveals that PM<sub>10</sub> and

PM<sub>2.5</sub> concentration are higher than the prescribed NAAQ standards. Table below gives the concentration of different air pollutants

**Table 7: Ambient Air Quality at Traffic Junctions, Vellore, 2016**

Monitoring Location	Green Circle					Old bus stand				
	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	CO (mg/m <sup>3</sup> )
January	141.1	96.5	42.3	49.2	1.15	128.5	85.2	36.2	44.4	1.15
February	138.2	94.7	41.1	47.5	1.45	127.2	82.2	35.9	43.4	1.2
March	140.9	93.3	41.9	46.2	1.91	126.4	83	34.6	43.2	1.71
<b>NAAQ Standard</b>	<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>4</b>	<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>	<b>4</b>

Source: T.Peganvignesh and Sharpudin J. (2016), "Assessment Of Ambient Air Quality Monitoring In Traffic Junctions, Vellore", *International Journal of Research in Engineering and Technology*, Vol. 5 (5), pp. 214 - 217

## 8. Ambient Noise Levels

51. Following table presents the noise level data across Vellore City from a research study conducted in 2016. Study monitored noise levels along different types of roads at nine locations. The recorded noise levels at all location and at all times (day and night) exceeded the ambient noise standards<sup>1</sup>. Further, due to heavy traffic volumes, noise levels along highways/expressways and arterial roads were much higher than the noise levels on local streets.

**Table 8: Ambient Day-time Noise Levels in Vellore**

Roadways	Area name	Measures of noise levels (dBA)	Morning peak 9:00-9:30	Morning off peak 11:30-12:00	Afternoon off peak 2:30-3:00	Evening peak 6:00-6:30	Night off-peak 9:30-10:00
TYPE I	Local Street Long Bazar	Lmax	78.18	79.23	81.74	78.32	75.33
		Lmin	67.09	68.29	66.23	68.61	61.78
		Leq	72.16	72.68	71.81	74.08	72.33
	Arterial Roadway Scudder Road	Lmax	81.45	82.33	78.81	77.48	79.72
		Lmin	74.44	71	70.8	70.53	70.42
		Leq	78.29	75.63	74.94	74.58	73.89
	Chittor Expressway	Lmax	81.51	79.94	81.58	82.7	78.73
		Lmin	65.24	70.55	68.63	70.16	65.37
		Leq	76.69	76.46	74.83	75.77	73.84
TYPE II	Local Street Gandhi Road	Lmax	74.37	73.09	70.83	76.05	74.81
		Lmin	62.93	62.47	62.47	64.94	64.35
		Leq	70.08	69.36	67.46	71.25	70.43
		Lmax	85.16	85.88	79.95	82.11	79.42

<sup>1</sup> day and night time noise standards for residential areas = 55 dBA and 45 dBA and for commercial areas = 65 dBA and 55dBA.



Roadways	Area name	Measures of noise levels (dBA)	Morning peak 9:00-9:30	Morning off peak 11:30-12:00	Afternoon off peak 2:30-3:00	Evening peak 6:00-6:30	Night off-peak 9:30-10:00
	Arterial Roadway Katpadi Road	Lmin	74.21	76.98	72.34	76.73	66.09
		Leq	79.77	79.79	76.13	79.12	75.29
	Madras Expressway	Lmax	81.62	84.62	80.68	82.35	78.71
		Lmin	74.11	72.03	68.98	71.86	69.75
		Leq	78.15	77.54	76.66	76.77	75.42
	TYPE III	Local Street Main Bazar	Lmax	80.22	74.95	71.10	78.75
Lmin			67.83	66.28	65.3	68.79	61.11
Leq			72.66	70.24	68.05	73.46	69.52
Arterial Roadway Officer's Line		Lmax	87.39	84	82.37	90	82.95
		Lmin	72.47	72.81	71.29	73.63	68.1
		Leq	80.99	78.26	77.36	77.79	75.2
Thiruvannamalai Arni Expressway		Lmax	85.78	84.99	80.72	82.89	80.83
		Lmin	70.95	63.27	65.95	69.96	66.4
		Leq	79.65	76.98	74.53	77.73	77.02

Source: SS Reddy, SK Hasan (2016), "Vehicular traffic noise in Vellore Municipality, Tamil Nadu, India – An Analysis", *Amity journal of engineering and technology* 1 (1), 48-52

### C. Ecological Resources

52. Vellore city is located in the Eastern Ghats region and on the banks of Palar River basin. A part of the town (~103 ha, 8.90% of municipal area) forms part of the reserved forest. The Vellore and Palamathi reserved forest areas are located on the eastern side of the town. The southern and western sides of the town are mostly plain agricultural lands with a number of irrigation tanks. The southern bank of Palar River forms the northern boundary of the town. There are seven reserve forest areas in and around the Vellore municipal corporation, Punganur, Vilapakam, Palamathi, Kunjanur, Bagayam, Kannamangalam and Kavanur respectively.

18. These forests are devoid of any large wildlife. Small mammals, reptiles and birds are commonly found in the reserve forests. Common monkeys are also frequently sighted on the outskirts of the city. Trees such as tamarind, teakwood, neem and other avenue species are found within the city and along the roads. Lemon grass, known as 'manjampul,' is found in abundance on the surrounding hills.

53. Subproject components are all located in urban land parcels surrounded by developed lands or along the river which were converted to agricultural and/or urban use many years ago, and therefore there are no sensitive environmental features in or near the subproject sites. Sathuvachari hills in the eastern side of the city (see figure below) are partly located in the city area, and are close to the project area. But none of the components are located in the forests.

**Figure 15: Vellore Forest Area Map**

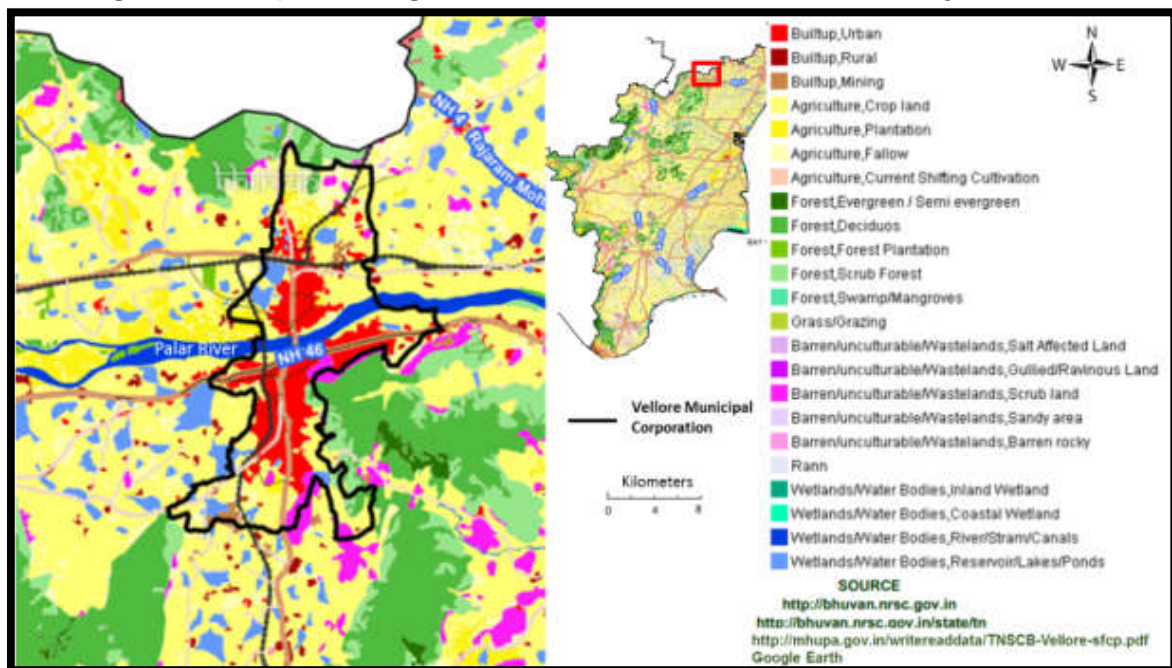


**D. Economic Development**

**1. Land use**

54. According to existing master plan that gives details of land use pattern in the city and vicinity area residential areas occupies major percentage of the developed land in the city limits with 55.76% followed by public & semi-public with 16.46%, transport and communications with 14.49%, public and semi-public with 13.94% and commercial with 8.34%. Agriculture land in the undeveloped area is 26.9%. The thematic map below shows the general land use in the project area.

**Figure 16: Map showing Land Use and Land Cover in the Project Area**



Source: Bhuvan, ,Indian Geo-Platform of ISRO

## 2. Industry and Agriculture

55. The economy of Vellore city depends mostly on service sector and manufacturing sector than the primary sector. The city is host to India's two most premiere educational institutions namely Vellore Institute of Technology and Christian Medical College. Tanneries, Chemicals and Greaves, Brakes, foundry, Explosives industries are some of the contributors to the city's economy.

56. Major employment in the city is provided by leather industry, agricultural trading and industries located in and around the City Corporation. Approximately 83.35 per cent of the workforce is employed in tertiary sector comprising transport, services and commerce. The secondary sector activities like manufacturing and household industries employ 13.52 per cent of the total workforce in the city.

57. Vellore leather accounts for more than 37 percent of the country's export of leather and leather-related products. Tirumalai Chemicals and Greaves are among the international brands that have their manufacturing units in the city. Automobile and mechanical companies of global Brands, including SAME Deutz-Fahr, TVS-India, Mitsubishi, Greaves Cotton and MRF have their manufacturing units in the area. Brakes India Sholingur's division is located at Vellore-Sholingur and is a major employer in the area. Asia's biggest explosives manufacturing company, Tamil Nadu Explosives Limited (TEL), is located in Vellore at Katpadi. This is India's only government explosives company with more than a thousand employees. Kramski Stamping and Molding India Pvt Ltd, a German precision metal and plastic integrated-component manufacturing company with automotive, telecommunications, electronics and medical applications is located in Erayankadu, near Vellore. Major businesses in the city center are located on Officer's Line, Town Hall Road, Long Bazaar and Bangalore, Scudder, Arni, Gandhi and Katpadi Roads.

58. Agriculture is generally practiced along the Palar river banks and in the outskirts of the city. The workforce depending on agriculture is insignificant when compared to secondary and tertiary sectors, so is the contribution to the city economy.

## 3. Infrastructure

59. **Water Supply.** The city has intermittent water supply and availability. Unaccounted water loss is less than 30%. Treated water supply from the Combined Water Supply Scheme (CWSS) with river Cauvery as source has started recently. The combined water scheme has helped the city deliver water at a frequency of 2 days cycle from an earlier 5-9 day cycle. The city envisages to reach the National Standards of water supply per capita (135 LPCD) & NRW (15%) by FY 2019. The city does not measure all its supply. It does not recycle waste water to meet its requirements.

60. **Solid Waste Management.** Rapid growth of population and urbanization has resulted in increasing the volume of solid waste generation. The corporation produces around 240 to 300 Tons of waste per day. Day to day waste collection is done in 85% of the areas. But the collected waste is not segregated but dumped in the corporation dump yard. Decentralised segregation is practiced in 10 out of the 60 wards. The city municipal corporation took steps to move towards 100% resource recovery mechanisms through a decentralized framework for waste management systems. Around 42 locations across VCMC have been identified for operations. Current source segregation efficiency has increased from 44.4% (FY13-14) to 62.5% (FY15-16).

61. **Transportation.** The NH 46 from Ranipet to Krishnagiri (forming part of Madras – Bangalore corridor) and the State Highway No.1 (Cuddalore – Chittoor) cut across the Vellore town. The city has two bus terminals: Town Bus Terminus and the Central Bus Terminus, Other bus terminals are located at Chittor Bus Stand, Bagayam and Katpadi (Junction bus stop). The Villupuram – Tirupathy metre gauge railway line passes through the town with Vellore cantonment and Vellore town railway station located within the town. One of the major B.G. railway corridors in the country, Chennai – Bangalore/ Coimbatore/ Ernakulam runs about 5 km north of this town with Katpadi being the feeder railway junction to the town. The Vellore Katpadi Junction is a major railway junction on this BG railway corridor. The city has an airport near Abdullapuram used for aeronautical training programmes. The nearest international airports are Chennai International Airport (130 km) and Bengaluru International Airport (200 km); the nearest domestic airport is Tirupati Airport (100 km).

## **E. Socio Cultural Resources**

### **1. Demography**

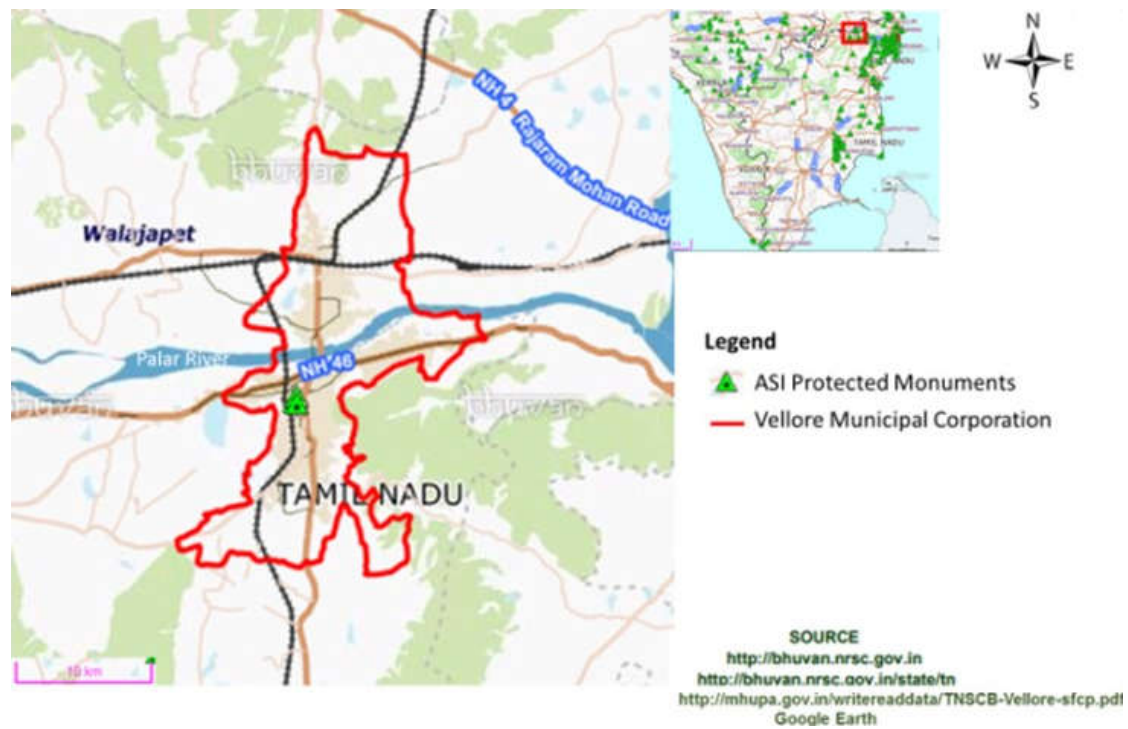
62. As per Census of India (2011), population density of the city is 15949 persons per km<sup>2</sup>. There are 48 wards in the city, among them Vellore (m. Corp) Ward No 06 is the most populous ward with a population of 7901 and Vellore (m. Corp) Ward No 27 is the least populous ward with population of 1622.

63. Vellore has 38% (about 70 thousand) population engaged in either main or marginal works. 58% male and 18% female population are working population. 54% of total male population are full time workers and 4% are marginal (part time) workers. For women 16% of total female population are fulltime and 3% are marginal workers. A total of about 1.4 lakh people in the city are literate, among them about 74 thousand are male and about 69 thousand are female. Literacy rate (children under 6 are excluded) of Vellore is 86%. 91% of male and 82% of female population are literate here.

### **2. History, Culture and Tourism**

64. Vellore city has a unique heritage base that traces its roots back to the Megalithic period (C, 2500 years). The city was ruled by Vijayanagara Kings, Bijapur Sultans to Marathas, the Carnatic Nawabs and the British and traces of each of their periods in terms of sculpture and art is scattered across the city. Vellore District was a part of the then North Arcot District. Vellore was the base of Lord Cornwallis in his campaign against Tippu Sultan. It was here the family of Tippu was kept under the arrest after his fall. In A.D. 1806, the Sepoys of Vellore rose heroically in mutiny against the British army officer which was promptly quelled.

**Figure 17: ASI Protected Monument In Vellore**





Source: Bhuvan, Indian Geo-Platform of ISRO




65. The Vellore city and the periphery areas have several iconic spots for tourism such as Vellore Fort, Golden temple, Government museum, Science park, Vainu Bappu Observatory, Amirthi Zoological Park and Yelagiri hills. The Vellore fort retains its past glory with its ramparts, barlements, turrets, posts, and sally gates and with perennial water supply. The fort houses a church, Jalakantesvara temple, and many buildings. Many Government offices are located in these buildings. The Fort, Mosque inside the fort and Jalakantesvara temple are protected by the ASI.

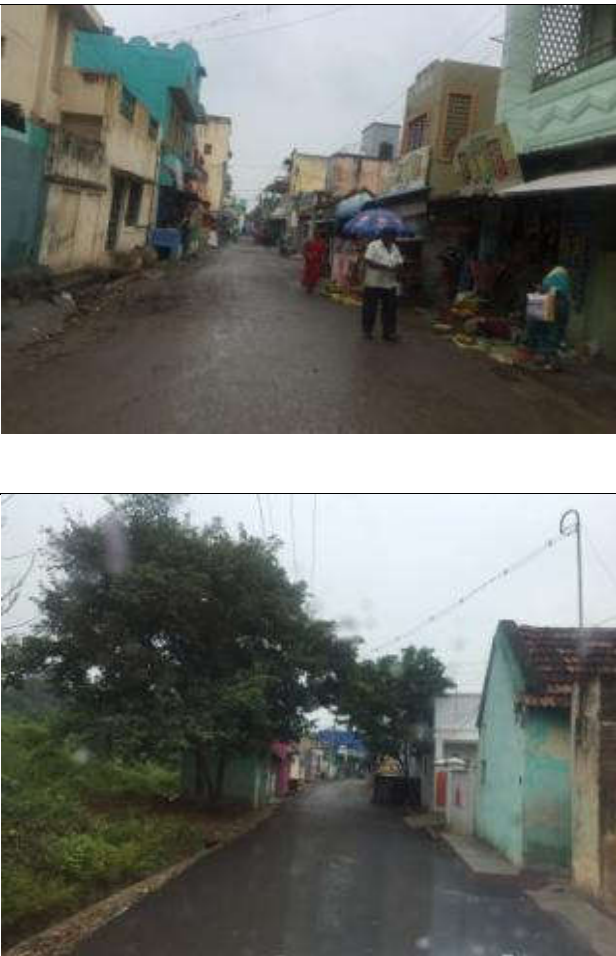
**F. Subproject Site Environmental Features**

66. Features of the selected subproject sites are presented in the following table.

**Table 9: Site Environmental Features**

Infrastructure	Location and Environmental Features	Site Photographs
<p>Sewage pumping stations (SPS)</p>	<p><b>SPS – 2 Opposite to Graveyard, Kangeyanallur</b></p> <p>The proposed SPS-2 site is a vacant land (0.11 hectare, owned by Vellore City Municipal Corporation), which is covered with shrubs and bushes. The nearest settlement/ residential area is located at a distance of 80m towards northern side.</p> <p>Earlier the SPS-2 was proposed to be located within the graveyard, however, due to the objection from the local community, it was proposed to shift to the opposite side of the graveyard in the VCMC owned land, as per the suggestion given by the local community through consultation held on 23<sup>rd</sup> October 2018.</p> <p>The location of the SPS - 2 is indicated in the Google earth</p>	
	<p><b>SPS – 2A inside proposed STP campus at Viruthampattu</b></p> <p>SPS -2A is proposed inside the STP campus site at Viruthampattu on the banks of River Palar (northern part VCMC area). There are residential buildings located at a distance of 100 m from the SPS boundary.</p> <p>Total area of the site is 0.20 acres for SPS-2A and land is owned by VCMC.</p>	

Infrastructure	Location and Environmental Features	Site Photographs
	<p><b>SPS – 8 Saduperi Road</b></p> <p>Site is located in the southern part of the City. There are about 2 houses in 50 m distance from SPS boundary.</p> <p>It extends 0.042 ha and the whole site will be required for SPS units. This site will require design based measure for odour control.</p> <p>Totally 4 structures are there in the existing slaughter house campus including septic tank . it is proposed to demolish the septic tank and middle building structure of slaughter house. Corporation is changing the name/classification of land from Slaughter house to Sewage pumping station. It is under progress</p>	
Sewage lift stations (LS)	<p>Road side lifting station is a small pumping station to lift the sewage to higher level and to discharge into ridge manhole for transporting to the pumping station.</p> <p>Lifting station has a collection well with submersible pumps accommodated inside.</p> <p>Lift stations are essentially proposed as enlarged manholes (either road-side on available land or on road center by enlarging a collection system manhole) fitted with two sewage pumps (small capacity) and a curb or road-side wall mounted Pump Control Panel. Where lifting stations are proposed along the roads, there is no buffer land for trees and high compound available, at such places other design and operation related measures are included in the project design. The general arrangement drawing for Lifting station is shown in Figure -.7.</p>	 

Infrastructure	Location and Environmental Features	Site Photographs
Sewer network	<p>Sewer lines will be laid in the centre of road by cutting black top, within the road right of way. In wider roads, like SH, NH, divided 2-way roads etc., sewers will be laid in the service roads, and where service roads are unavailable, will be laid along the edge of the road, but mostly within the black top portion. For the roads where adequate land in the road shoulder is available along the blacktop and is clear of any structures or activities, pipes will be laid in this earthen shoulder.</p> <p>There are avenue trees along the roads, which will be mostly avoided by slightly changing the alignment locally where required.</p> <p>Large diameter pipes will be laid mostly on main roads (300 – 900 mm), while the tertiary sewers of small size (200 mm to 300 mm dia) that collect wastewater from each house will be laid in all streets in the subproject area.</p> <p>Trench size to bury the sewer will be of 0.8 m to 1.5 m wide and 1.2 m to 6 m deep.</p>	

## V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

67. Potential environmental impacts of the proposed infrastructure components are presented in this section. 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.

68. Screening of potential environmental 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 and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
- (iv) **O and 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.

69. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/ severe – in the order of increasing degree) and impact duration (temporary/permanent).

70. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

71. The ADB Rapid Environmental Assessment Checklist in [http://www.adb.org/documents/guidelines/environmental\\_assessment/eaguidelines002.asphas](http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asphas) been used to screen the project for environmental impacts and to determine the scope of the IEE.

72. In the case of this project (i) most of the individual elements involve straightforward construction and operation, so impacts will be mainly localized and not significant; (ii) negative impacts associated with sewage facilities such as odour are already considered in the design and siting, (iii) 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 (iv) 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.

#### **A. Pre-Construction Impacts – Design and Location**

73. **Design of the Proposed Components.** Technical design of the (i) sewage pumping and lifting stations; and (ii) sewer network including manholes and house connections, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable.

74. **Sewer system – collection and conveyance.** The sewerage system is designed as a separate system of sewage collection (i.e. caters only to wastewater). Existing surface road side drains in the project area cater to collection and conveyance of runoff during rains. The underground gravity sewers will carry sewage from households to the nearest lifting or pumping station, from where the sewage is pumped to the STP. To maximize the benefits as intended, City Corporation will ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system.

75. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that are taken into consideration during the sewer system design. Measures such as the following

are included in sewer system design to ensure that the system provides the benefits as intended:

- (i) Limit the sewer depth where possible
- (ii) Sewers shall be laid away from water supply lines and drains (at least 1m, wherever possible);
- (iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm)
- (iv) In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)
- (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;
- (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry
- (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation

76. **Design of Sewage Treatment Plant.** For this subproject, there is no provision for STP. The collected sewage/waste water shall be treated in a 50 MLD STP, which is proposed under Phase -II to be constructed. It is proposed that the treated wastewater will be disposed into Pandiyan Channel in the downstream of Kalinjur Lake, and will be further utilized for irrigation in the lake command area.

77. **Sewage sludge** generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Since no industrial wastewater is allowed into sewers, it is unlikely that sludge contains heavy metals. The sludge from reactors will be collected in sludge sump and conveyed to centrifuge for dewatering. The sludge in the form of a wet cake will be further air-dried in the sludge drying beds. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria.

78. To achieve adequate drying minimum drying period (15 days) shall be ensured. The drying period, which will be varying depending on the season will be determined during operation and be followed. A Sludge Management Plan will be developed by the STP facility designer. Sludge shall be periodically tested for presence of heavy metals. Proper sludge handling methods should be employed. From the sludge drying bed, the treated sludge will be disposed into Solid waste Dumping yard located at Mulakolai, Rangapuram (Sathuvacheri).

79. **Sewage Pumping stations and lift stations.** It is proposed to construct 5 sewage lift stations, and 3 sewage pumping stations, which will receive sewage from the catchment area via the sewer network and pump to higher level manholes or pumping stations or to STP as per the design. Lift stations are necessitated where in the design the depth of sewer exceeds the downstream interlinking manhole invert levels.

80. Lift stations will cater to small area, and will be located at lowest point where the sewage from catchment area will be collected, and then pumped to a higher level manhole for further gravity flow or to a pumping station, from where it is ultimately pumped to the STP. Lift station will consist of a sewage sump or suction well of dia 2 m to 2.5 m and 5 m to 7.5 m deep, below the

ground, to receive sewage, submersible pumps in the sump to pump out, and an electrical panel board for operation of pumps above the ground. A generator set will also be provided at each lift station of required size.

81. **Sewage pump stations** will also perform same function as sewage lift stations but cater to much larger area or sewage flow, and will also have several components, and occupy comparatively larger area. Components of sewage pumping station include:

- Inlet chamber - length (2 – 3.5 m), width (1.5 m) and depth (2.3 – 4.3 m)
- Screen chamber - length (4 – 4.5 m), width (2 - 3.5 m) and depth (2.3 – 5.3 m)
- Grit well - Dia (4.5 – 8 m) and depth (3.3 – 6.3 m)
- Suction well - Circular at SPS 2A - Dia (5.5 – 6 m) and depth (6.6 – 8.7 m)
- Suction well - Rectangular at SPS 2, and 8 - length (9.5 – 15.5 m), width (6 - 12 m) and depth (8.4 – 9.6 m)
- DG set platform
- Pump room

82. At these pumping or lifting stations, the operation involves accumulation of incoming sewage in the suction well, and then pumping out as the sewage level reaches the designed pumping depth. The water level in the well rises up before the pumping cycle starts, and as the pumping is performed the water level goes down, registering its lowest depth at the end of pumping of cycle. This cycle of rising and lowering will continue throughout the day and night, however, the duration between successive pumping cycles will significantly vary depending on the sewage generation. During morning and evening peak hours, sewage will accumulate quickly, and pumping frequency will be high. The sewage retention time in the suction well therefore varies throughout the day, with very high retention periods during the nights and mid-days.

83. **Odour from pump stations.** In the suction wells, the sewage emits gases, which accumulated in the air above water surface. The gas may include odorous compounds like hydrogen sulphides ( $H_2S$ ), amines, fatty acids, aldehydes, ketones and other volatile organic compounds (VOCs). As the water level rises before the pumping cycle, it physically displaces the air, along with the odorous gas compounds.  $H_2S$  is the most dominant odour causing compound, and therefore can cause nuisance to nearby households. When sewage becomes stagnant,  $H_2S$  is generated in the anaerobic conditions. The quantum of  $H_2S$  generation depends on quantity of accumulated sewage and sewage retention time that create anaerobic conditions. Both increase in quantity of sewage accumulation and retention time will increase the  $H_2S$  generation. Design considerations are included to minimize the both as much as possible. Pumping stations cater to large area and will have high capacity of suction wells and pump sets, while lift stations are small with lower capacity of suction wells and pumps sets. The retention time is kept to its lowest possible so that there is no stagnation of sewage for long time which could create anaerobic conditions.

84. Pumping stations are to be located at technically feasible locations (eg, lowest point to where sewage can be conveyed from households by gravity) within or close to the residential areas which are being served by respective pumping station. Given the very limited land availability in urban areas like the project area, that too of government owned lands, locating the pumping stations ideally about 50-100 m away from the houses is not practical. The sites for pumping stations were identified based on the technical suitability and availability of government owned land parcels to avoid land acquisition. Given the comparatively higher potential of odour

generation, priority has been given to accommodate pumping stations at more suitable locations away from houses, however sites which are located close have been selected only in cases where there are no other alternative lands available. There are no standards notified by Government of India or Government of Tamil Nadu for odor. However, Central Pollution Control Board (CPCB) has stipulated Guidelines on Odor Pollution and its Control which deal with the basics of odor pollution, its sources and measurement, technologies for its control etc, but do not specify any threshold limits for odor-causing pollutants. Therefore, as part of mitigation, provision for odor control measures has been made in the sewage pumping stations for all UGSS subprojects. However, in case of STPs, the odor-causing processing units will be located far off to the extent possible within the premises so as to mitigate the odor nuisance. Further, the technology for treating sewage plays a vital role since release of gases like H<sub>2</sub>S cannot be avoided in the process involving anaerobic decomposition whereas release of H<sub>2</sub>S will almost be nil in case of aerobic treatment. PIU and design engineers have not specified any odor standards adopted elsewhere in the preliminary design as not to limit the technology that can be considered by the bidders in the treatment of domestic sewage. Sufficient mitigation measures have been taken for all sewage pumping stations and will be taken for all STPs when finalizing/revising the IEEs based on the detailed engineering design.

85. Following design related measures are included in the sewage pumping and lifting station design. As presented in the baseline profile, few lifting stations are located along the roads within the road right of way. In such cases there is no buffer space between the houses and the lifting station, and also no layout planning related measures as given below including creating buffer area around the facility may not be feasible. Odour potential of lifting stations is very minimal given small scale operation, however, given close location to houses, design related measures as given below are included.

#### **Layout planning related measures**

- (i) Siting of wells within the identified site at an internal location as far as possible from adjoining residential buildings
- (ii) Develop green buffer zone around the facilities with a combination of tall and densely growing trees in multi rows as per the land availability to control odour and also act as visual shield, and improve aesthetical appearance
- (iii) Provision of high compound wall

#### **Design related measures to prevent and control odour from pumping/lifting station operations**

- (i) Proposed wells to be closed using RCC slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells.
- (ii) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes.
- (iii) Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metallised grating / grill work shall be provided over the sections (or full cross section if required) where workers will stand / work for inspection and repair/O and M purposes.
- (iv) Provision of passive gas ventilation arrangement by providing a take-off vent from top of well by positioning vent in such a way that cover slab fitment / movement /

- drawl if required for maintenance purposes is not compromised.
- (v) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.
  - (vi) Submersible sewage pumps of suitable rating, minimum submergence requirements, open impeller with cutting-tearing arrangement and high strength-corrosion resistant heavy duty construction shall be proposed.
  - (vii) In locations / cases where sewage flow in the present to intermediate design stage is envisaged to be low, position of the submersible pumps and design of the collection well floor by providing necessary side benching / sloped flooring to allow for higher submergence during low flow shall be made to ensure regular pump operation and avoid sewage stagnation beyond the permissible limit.
  - (viii) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In cases of lift manholes (road-side or road-center type structures with only provision of kerb-side kiosk), an electrical cut-out provision shall be made for connecting an Emergency Mobile / Skid Mounted Diesel Generator for pumping out during long period of electricity supply interruption.
  - (ix) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations
  - (x) Provide training to the staff in SOPs and emergency procedures
  - (xi) Periodically monitor odour generation

86. **Provision of odour treatment system:** Besides the above measures, which are to be implemented at all sewage pumping and lifting stations, following measures are to be implemented for facilities located very close to the houses/properties.

- (i) For sewage pumping station SPS 8 which is located backside two houses, provide a suitable arrangement so as to capture the gaseous emissions from the wells and treat via scrubber/activated carbon filter before letting out into the ambient air; such system should be designed appropriately to meet the likely emissions/flow rate of respective pumping stations
- (ii) For lifting stations, the above arrangement should be provided where the buffer distance between sewage well and nearest house/property as per site requirement.

87. **Noise from pumping operations.** Operation of pumps and motors and diesel generators is a major source of noise. As the pumping and lifting stations are located in the residential areas, with few located very close to the houses, noise generated from lifting/pump stations can have continuous negative impacts on the surrounding population. Although STP is located outside the city, noise control measures are necessary. High inside noise levels can affect the health of operators and staff at the facilities, and therefore, noise levels needs to be maintained within and outside the plant at acceptable levels. Internal noise level in a room measured at a distance of 1m from these pump sources typically will be in the range from 80 dB(A) to 100 dB(A) .

- (i) Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1 m<sup>2</sup>
- (ii) Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise
- (iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors
- (iv) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures
- (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors
- (vi) Provide ear plugs to workers

88. **Energy Efficiency.** Project area is mostly plain and gently sloping ground, it is therefore not technically feasible or economical to design a completely gravity system to collect sewage from individual houses and transfer the same the STP on the outskirts of the city. It necessitated provision of lifting and pumping stations, which are optimized to the extent possible to minimize the overall pumping. In the current design, sewage will be collected from the houses via sewer network and conveyed by gravity to the lifting or pumping station. In several places, lifting stations are designed just to lift the sewage to higher level and deliver it to a nearby sewer manhole on the higher elevation, from there it can flow by again by gravity, rather than pumping directly to a pumping station. This optimized the energy consumption.

89. To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following 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 shall be considered and incorporated into the subproject designs:

- Using low-noise and energy efficient pumping systems
- Efficient Pumping system operation
- Installation of Variable Frequency Drives (VFDs)

90. **Tree cutting at selected project sites.** As presented in the baseline profile of subproject sites, few trees are on the selected SPS sites at SPS 2A . Following measures need to be implemented to minimize and/or compensate for the loss of tree cover.

- (i) Minimize removal of trees by adopting to site condition and with appropriate layout design of pumping stations,
- (ii) Obtain prior permission for tree cutting
- (iii) Plant and maintain 10 trees for each tree that is removed

91. **Utilities.** Telephone lines, electric poles and wires, water lines, drains, if exists within the proposed project locations may require to be shifted. All the selected project sites are vacant and unused government lands, there are no notable existing utilities. Sewer lines are proposed within the road way, where there are no utilities. In the outer areas where there is adequate earthen shoulder along the road carriage way, sewer lines can be accommodated in the shoulder. In such cases, the work may require shifting of utilities on the shoulder. To mitigate the adverse impacts

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<sup>2</sup> Indian Standards require to maintain the noise level of 70 dBA or less during night time. However, in case of STPs/WTPs/Water Supply Head works, where heavy duty pump sets are to be installed and the noise levels may even exceed 80 decibels at 1 m distance, noise level will be measured at the time of commissioning the units and necessary mitigation measures such as noise barriers will be installed if required.

due to relocation of the utilities, the contractor, in collaboration with the Vellore City Municipal Corporation will

- (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and
- (ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services

92. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. 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 and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, or in areas.

93. **Site selection of sources of materials.** Significant quantities of coarse aggregate and fine aggregate will be required for construction works. Contractor should procure these materials only from the quarries permitted/licensed by Department of Geology and Mining. Contractor should, to the maximum extent possible, procure material from existing quarries, and creation of new quarry areas should be avoided as far as possible. If new quarries are required then the contractor will be responsible for obtaining all permissions and clearances, including environmental clearance for mining. Contractor should factor in the time required for obtaining clearances including conduct of EIA if required under the law. It will be the construction contractor's responsibility to verify the suitability and legal status of all material sources and to obtain the approval of Department of Geology and Mining and local revenue administration, as required.

94. **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 underground structures at pumping/lifting stations and at STP. Vellore has very rich history and heritage and is home to three nationally important protected monuments: Fort, Jalakanteshwara Temple and Old Mosque. The Temple and Old Mosque both are situated within the Fort. Fort is located within the city, surrounded by a wide moat. No subproject components are proposed within or nearby protected monuments.

## **B. Construction Impacts**

95. Main civil works in the subproject include construction of sewage treatment plant, sewage pumping and lifting stations at the identified sites. These works will be confined to sites, and construction will include general activities like site clearance, excavation for foundations, and creation of concrete structures will be one of the major construction activities for this project, as many of the subproject components will be fixed to concrete plinths and most will be housed in buildings with at least some concrete structural elements. Most such structures will be constructed from reinforced concrete (RC), where steel reinforcing rods and bars are placed and attached by hand to create an interior skeleton for the foundations, walls, columns, plinths, etc., and heavy-duty metal and timber/plywood formwork is bolted around the outside to build a mould into which pre-mixed concrete is poured. Once the concrete has set, the formwork is removed, and the concrete surface is finished by masons by hand if necessary. Some buildings, such as the pump

station, facilities, etc., may be constructed from brick work, in which case this work will be done using standard house-building techniques.

96. In works confined to the boundary of identified sites like pumping stations, there is no direct or significant interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps etc., will have negative impacts, which needs to be avoided or mitigated properly.

97. Subproject also include linear works (laying of 281 km sewers along the roads). This covers entire project area comprising Viruthampattu , Kalinjur, Gandhi Nagar ( East and west ) ,Kangeyanallur and old Katpadi (Zone 2, 2A and 8). and sewers will be laid along almost all the roads. Small sewers (tertiary sewers) that collect sewage from households will be laid in all streets and roads, the larger sewers that collect sewage from tertiary sewers and convey to pumping stations and STP will be laid mostly on wider main roads. Sewers will be laid by open cut method. SPS 8 is located in residential areas, and for a short distance from main road to sites, sewers will need to be laid in the internal roads.

98. Open cut trenching method of sewer laying involves trench excavation in the road, placing sewers in the trench, jointing and testing, and refilling with the excavated soil. Proposed pipes for tertiary sewers are double wall corrugated (DWC) pipes and conveying mains (pumping mains) are of cast iron (CI). Diameter of sewer ranges from 200 mm to 900 mm, of which 85% of the sewers are of 200 mm. According to the design the sewers will be laid at a depth of 1 to 6 m. The width of the trench excavation along the roads will vary from 0.6 m to 1.8 m, and the depth varies from a minimum of 1.0 m to 6 m. Nearly 90% length of sewers will be laid in trench of depth 3 m or less. The design is optimized to restrict the sewer depth to a maximum of 6 m with an optimal combination of sewer depth and pumping requirements.

99. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades. The work will also be supplemented manually where there is no proper working area (eg, very narrow streets) for the backhoe excavators. As trenches are deep (up to 6 m), there is risk of collapse of trenches and/or damage to surrounding buildings, safety risk to pedestrians and traffic. Necessary precautions such as bracing / shoring in the trench will be provided for trenches of more than 1.2 m deep. The normal working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Excavated soil will be used for refilling the trench after placing the sewer and therefore residual soil after pipe laying and refilling is not significant. Total earthwork excavation will be over 481,000 m<sup>3</sup>, of which nearly 95% of excavated soil will be reused, and the remaining 24,050 m<sup>3</sup> of excess soil needs to be disposed safely.

100. Although sewer laying work involves quite simple techniques of civil work, the invasive nature of excavation in the urban area where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration, however, needs to be mitigated.

101. Situated around the old core city of Vellore, the project area is well developed, and has dense population, except in the outskirts and along the banks of Palar River. Agriculture and vacant lands can be observed in the outskirts. There are large vacant lands in the eastern part of the city. Two National highways (NH 46 and NH 234) pass through project area. Besides there are several important roads, Bangalore Road, Arcot Road, Old bypass road, SH 207, Vellore-Thoothkudi highway that pass through the project area. The next level roads are internal main



roads providing connectivity within the city. These include: Azad road, Fort round road, Pillayar koil street, Shenabakkam road, shankarapalayam road, south avenue road, main bazaar road, Vasanathapuram road, etc.,

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

103. **Sources of Materials.** Significant amount of sand and coarse aggregate will be required for this project, which will be sourced from quarries. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or levelling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from government approved licensed quarries only, to ensure these controls are in place. In Vellore, construction sand is normally obtained from Virunchipuram (about 15 km), and gravel and aggregate from Bagayam. Contractor should avoid new borrow pits / quarries as far as possible, if necessary, all the permissions, including conduct of environmental assessment, and environmental clearance as necessary shall be obtained prior to start of quarrying activity. 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 of PIU
- (ii) PIU 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) 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 (EC) prior to approval by PIU

104. **Air Quality.** Construction work, especially from earthwork activities, coupled with dry and windy working conditions, material and debris transport, 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. 95% of the excavates soil 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 like, pumping stations will be mainly during the initial construction phase of earth work, as the site is confined, dust can be effectively controlled with common measures. While pumping and lifting stations are located within residential neighbourhoods, STP is located outside the city, away from habitation area. Dust generation will be significant during sewer 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:

**105. For all construction works**

- (i) Provide a dust screen around the construction sites of pumping and lifting stations .
- (ii) Damp down the soil and any stockpiled material on site by water sprinkling;
- (iii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition
- (iv) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process
- (v) Cover the soil stocked at the sites with tarpaulins
- (vi) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation
- (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc..) when transported by open trucks;
- (viii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area
- (ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site
- (x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate

**106. For sewer works**

- (i) Barricade the construction area using hard barricades (of 2 m height) on both sides
- (ii) Initiate site clearance and excavation work only after barricading of the site is done
- (iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area
- (iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area
- (v) Undertake the work section wise: a 500 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
- (vi) Conduct work sequentially - excavation, sewer laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.
- (vii) 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 back filling, this will avoid stocking of material, and minimize the dust.
- (viii) 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 backfilled section. Road restoration shall be undertaken immediately.

**107. Immediate road restoration after refilling the trench.** Excavation and refilling activities disturb the top soil, 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 top soil along the roads will generate maximum dust, and create very unhealthy conditions. Moreover, as the barricades/dust screens will removed after the trench is refilled, there will be absolutely nothing to control the dust generation. Dust control activities like

wetting of top soil 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 technique shall be used so that road can be restored immediately.

108. Immediately consolidate the backfilled soil and restore the road surface; if immediate road restoration is not possible, provide a layer of plain cement concrete (PCC) of suitable mix on the backfilled trench so that dust generation, erosion is arrested and it will also provide a smooth riding surface for the traffic until the road is properly restored. Backfilled trench without any road restoration is a major source of dust.

109. **Surface Water Quality.** Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate water quality of the receiving water bodies and streams/ivers. Project area receives rainfall in southwest and northeast monsoon seasons, with major share of its annual 1000 mm rain in northeast (Oct to Dec). River Palar flowing through the city forms northern boundary of project areas. River runs mostly dry throughout the year; it rarely flows. Saduperi lake in the eastern part of the city is a big and important water body. Velavadi eri (lake) is situated in the western part of the City. Besides, there are other small water bodies in and around the project area. Project area mostly drains into Palar River. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter the river and the water bodies. Impact will be temporary, and but needs to be mitigated. Construction contractor will be required to:

- (i) All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
- (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management
- (vii) Dispose any wastes generated by construction activities in designated sites; and
- (viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

110. To reach the STP located on the northern part from the project area located in the south, the pumping main sewer will be laid over a bridge across River Palar. Construction of bridge in the river may pollute river water, and degrade the river bed. Although river is mostly dry, following measures to be implemented by the contractor:

- (i) Schedule and complete the bridge works prior to onset of monsoon, and ensure that works are conducted during low flow time, when the river bed is dry
- (ii) Works shall be conducted with minimum disturbance to river bed; implement best construction methods to minimize disturbance / consolidation of river bed; as far as possible avoid using heavy equipment mobilization
- (iii) No labour camps or material storage camps shall be located in or near the river (500 m distance from river shall be maintained)
- (iv) Ensure no spillage of construction chemicals, fuels, oils etc.,

- (v) Ensure that construction site is cleared off of all the material and debris immediately after completion of works
- (vi) Submit a site clean-up and restoration report to PIU for approval
- (vii) Conduct environmental monitoring as per the EMP.

111. **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. In the project area, groundwater table is much deeper than the anticipated excavation depth and therefore this impact is not envisaged. However during the rains, water will be collected in open pits and trenches. The water collected in excavated pits will contain silt and disposal of this in drainage channels lead to silting. To avoid this the contractor needs to be implement the following measures:

- (i) As far as possible control the entry of runoff from upper areas into the excavated pits, and work area by creation of temporary drains or bunds around the periphery of work area
- (ii) Pump out the water collected in the pits / excavations to a temporary sedimentation pond; dispose off only clarified water into drainage channels/streams after sedimentation in the temporary ponds
- (iii) Consider safety aspects related to pit collapse due to accumulation of water

112. **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 odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. Total earthwork excavation will be over 481,000 m<sup>3</sup>, of which nearly 95% will be reused, and the remaining 24,050 m<sup>3</sup> of excess soil needs to be disposed safely. 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 3)
- (ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.,
- (iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed off to approved designated areas immediately
- (iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should located away from residential areas, forests, water bodies and any other sensitive land uses
- (v) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market
- (vi) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed off in disposal sites approved by TNPCB;
- (vii) Prohibit burning of construction and/or domestic waste;
- (viii) Ensure that wastes are not haphazardly thrown in and around the project site; provide proper collection bins, and create awareness to use the dust bins.

- (ix) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate

113. **Noise and Vibration Levels.** Except SPS-8, Sasuperi Road, which is slightly away from habitations, all other components are located within the developed area of the city, where there are houses, schools and hospitals, religious places and businesses in the surrounding area. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for laying of sewers, operation of construction equipment, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearby buildings. This impact is negative short-term, and reversible by mitigation measures. 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;
- (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; and
- (iii) Maintain maximum sound levels not exceeding 70 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.
- (iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- (v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- (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.

114. **Accessibility and Traffic Disruptions.** Excavation along the roads for laying of sewers, hauling of construction materials and operation of equipment on-site will cause traffic problems. There are four types of roads/highways in the project area that provide regional connectivity: national highway (NH), state highway (SH), major district roads (MDR) and other district roads (ODR). Sewers are proposed along:

- NH 46 Bangalore-Chennai highway
- NH 234 Mangalore-Villupuram
- SH 207 – Krishnagiri - Vellore
- Old Bangalore Road,
- Old Arcot Road,
- Old bypass road,
- Vellore-Thoothkudi highway

115. National Highways and State Highways carry considerable traffic, followed by other roads. Sewers will also be laid along the internal main roads that provide connectivity within the city.

116. Many Internal roads in the project area are narrow, and in outer areas roads are comparatively wide. As the sewer lines are proposed to be laid within the road carriage way, it

will disrupt the traffic in one-traffic lane. In the narrower roads, sewers will be laid in the center of the road, and therefore during the work traffic movement will be mostly disrupted.

117. For construction of manholes, an area of 1.5 mx1.5m to 2.5m x 2.5m will be excavated at regular interval's depending on the design - minimum distance between manholes of 30 m is adopted for sewer size up to 400 mm and larger spacing up to 100m for large diameter sewers. This will be kept open for longer duration (15- 20 days).

118. Works related to pumping stations will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility.

119. Hauling of construction material, equipment, construction waste, etc., to and from the work site may increase the road traffic on local roads. This will further inconvenience the local community and road users. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

120. **Sewer works**

- (i) Prepare a sewer work implementation plan in each zone separately and undertake the work accordingly; ensure that for each road where the work is being undertaken there is an alternative road for the traffic diversion; take up the work in sequential way so that public inconvenience is minimal
- (ii) Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with general public
- (iii) Avoiding conducting work in all roads in a colony at one go; it will render all roads unusable due to excavations at the same time, creating large scale inconvenience
- (iv) Undertake the work section wise: a 500 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
- (v) Confine work areas in the road carriageway to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required
- (vi) Limit the width of trench excavation as much as possible by adopting best construction practices; adopt vertical cutting approach with proper shoring and bracing; this is especially to be practiced in narrow roads and deeper sewers; if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period
- (vii) In the roads that connect to SPS sites, which need to accommodate two main sewers (income and outgoing main sewers of SPS), plan work so that access to houses is maintained throughout the construction phase; first lay one sewer and close the trench, restore the road, and lay the second sewer;
- (viii) 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
- (ix) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
- (x) Inform the affected local population 1-week in advance about the work schedule

- (xi) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
- (xii) Keep the site free from all unnecessary obstructions;
- (xiii) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. Provide information to the public through media – newspapers and local cable television (TV) services
- (xiv) At work site, public information/caution boards shall be provided including contact for public complaints

#### 121. **Hauling (material, waste/debris and equipment) activities**

- (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) Drive vehicles in a considerate manner
- (v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

122. **Socio-Economic – Income.** Sites for all projects components are carefully selected in government owned vacant lands and therefore there is no requirement for land acquisition or any resettlement. Blocking of access to the business / livelihood activities, especially during pipeline laying along the roads, may impact the income of households. However, given the alignment of pipeline within the road carriage way, and also the measures suggested for ensuring accessibility during sewer works, no notable impact is envisaged. Some shops and other premises along the roads may lose business income if the access will be impeded by excavation of trenches, the presence of heavy vehicles and machinery, etc. Access disruption to hospitals, socio cultural places etc., will inconvenience public. Implementation of the following best construction measures will avoid the disturbance reduce the inconvenience and disturbance to the public. Resettlement and social issues are being studied in a parallel resettlement planning study of this subproject.

- (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.

123. **Socio-Economic – Employment.** Manpower will be required during the 24-months 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

124. **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 (indicative list is in **Appendix 2**);
- (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<sup>3</sup> 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<sup>4</sup>.
- (iii) Ensure that qualified first-aid is provided 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 H and S 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 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; and

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<sup>3</sup> Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

<sup>4</sup> <http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>



- (x) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
- (xi) Provide supplies of potable drinking water;
- (xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances

125. **Community Health and Safety.** Sewers works and deep excavations along the roads and narrow streets, and hauling of equipment and vehicles have potential to create safety risks to the community. Deep 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 sewer trench 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 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
- (xiii) Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

126. **Construction Camps.** Contractor may require to set up construction camps – for temporary storage of construction material (sewer, cement, steel, fixtures, fuel, lubricants etc.), and stocking of surplus soil, and may also 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) Consult PIU before locating project offices, sheds, and construction plants;
- (ii) 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 City Corporation
- (iii) Avoid tree cutting for setting up camp facilities
- (iv) Provide a proper fencing/compound wall for camp sites
- (v) 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
- (vi) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit
- (vii) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers
- (viii) Camps shall be provided with proper drainage, there shall not be any water accumulation
- (ix) Provide drinking water, water for other uses, and sanitation facilities for employees
- (x) Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed
- (xi) Train employees in the storage and handling of materials which can potentially cause soil contamination
- (xii) 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
- (xiii) Recover used oil and lubricants and reuse or remove from the site;
- (xiv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for bio degradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market
- (xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (xvi) 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

### **C. Operation and Maintenance Impacts**

127. Operation and Maintenance of the sewerage system will be carried out by Vellore City Municipal Corporation. Operation will involve collection and conveyance of wastewater from houses to nearest lifting / pumping stations; operation of lifting/pumping stations to pump accumulated sewage main pumping stations; operation of main pumping stations to pump accumulated sewage to STP; treatment of sewage at STP to meet the disposal standards; and final disposal of treated wastewater, and treatment and disposal of sludge.

STP is proposed under phase-II with design-build modality in which , the contractor will prepare detailed designs for STP including the outfall sewer and disposal arrangements. the treated water will be disposed into Pandiyan channel at 2km from STP site. O & M impacts and measures will be separately handled by the prospective contractor and VCMC.

128. **Odour and Noise from Sewage lifting and pumping stations.** Various measures are included in the design of these facilities giving utmost importance to odour and noise. Therefore it is anticipated there will not be any significant generation of odour or noise that will impact the surrounding households. Following measures are to be implemented during the operation:

- (i) Strictly follow standard operating procedures / operational manual for operation and maintenance of lifting and pump stations
- (ii) Ensure that operating staff is properly trained, and have clear understanding of odour issues vis-à-vis its related with operational practices
- (iii) Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells
- (iv) Conduct H<sub>2</sub>S monitoring (periodically at pumping stations and lifting stations);

129. **Sewer network.** During the system design life (15/30 years for mechanical/civil components) it shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

130. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated faecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should be followed:

- (i) Establish regular maintenance program, including:
  - Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas
  - Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
  - Monitoring of sewer flow to identify potential inflows and outflows
  - Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures or sewer line blockages);
- (ii) Maintain records; review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
- (iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum

- equipment or use other measures to divert it back to the sanitary sewer system.
- (iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers
- (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
- (vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance
- (vii) Provide all necessary personnel protection equipment
- (viii) Do not conduct manual cleaning of sewers; for personnel engaged sewer maintenance work, there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use

## **VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**

### **A. Overview**

131. The active participation of stakeholders including local community, NGOs/CBOs, etc., in all stages of project preparation and implementation is essential for successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

132. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and businesspeople who live and work near sites where facilities will be built (sewer network, pumping/lifting stations and STP), government and utility agencies responsible for provision of various services in project area. Secondary stakeholder are: NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, TNUFSL, Government of Tamil Nadu and the ADB.

### **B. Public Consultation**

133. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

#### **1. Consultation during Project Preparation**

134. The subproject proposal is formulated by Vellore City Municipal Corporation in consultation with the public representatives in the project area to suit their requirements.

135. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio economic household survey has been conducted in the project area, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted. A project area level consultation workshop is conducted in Vellore on January 10th ,

2018, with the public representatives and prominent citizens, etc., The consultations included significant participation by women representatives.

136. It was observed that people are willing to extend their cooperation as the proposed project will provide sewerage system, enhance basic infrastructure service levels and overall living standard of the public. The public expressed their concern regarding the safety, traffic issues, disturbance utilities during construction. Stakeholder suggested that road restoration works to be taken up immediately after laying the sewers to minimize the public inconvenience.. Project team explained proposed EMP to manage the negative impacts, including odour prevention and control measures included in the design and operation.

## **2. Consultation during construction**

137. Prior to start of construction, PIU will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will 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 will be provided to the public via mass media (newspapers, ULB websites etc.,). A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor will 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 4). At the work sites, public information boards will also be provided to disseminate project related information.

### **C. Information Disclosure**

138. Executive summary of the IEE will be translated in Tamil and made available at the offices of PMU, PIU, and Vellore City Municipal Corporation and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Tamil will be placed in the official website of the TNUIFSL and Vellore Corporation after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

139. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future plans. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction sites for the information of general public.

140. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction as required. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

## **VII. GRIEVANCE REDRESS MECHANISM**

141. 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. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per project entitlement matrix, and Project Management Unit (PMU) and concerned Project Implementation Unit (PIU) will ensure that their grievances are addressed.

142. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaints register in ULB or PIU or implementing agency offices. PIU Safeguards officer will have the responsibility for timely grievance redress on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party.

143. GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating resolution of affected persons' grievances related to the project. A two-tier grievance redress mechanism is conceived, one, at project level and another, beyond project level. For the project level GRM, a Grievance Redress Cell (GRC) will be established in PIUs; Safeguards officer, supported by the social, gender and environmental safeguards specialist of CMSC will be responsible for creating awareness among affected communities and help them through the process of grievance redress, recording and registering grievances of non-literate affected persons.

144. GRM aims to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. All grievances – major or minor, will be registered. Documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken. PIU will also be responsible for follow-through for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

145. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the CMSC and PIU will resolve the issue on site, and any issue that is not resolved at this level will be dealt at PIU head level for immediate resolution. Should the PIU fail to resolve any grievance within the stipulated time period, the unresolved grievances will be taken up at ULB level. In the event that certain grievances cannot be resolved even at ULB level, particularly in matters related to land purchase/acquisition, payment of compensation, environmental pollution etc., they will be referred to the district level Grievance Redress Committee (GRC) headed by the District Collector. Any issue which requires higher than district level inter-departmental coordination or grievance redress, will be referred to the state level Steering Committee.

146. GRC will meet every month (if there are pending, registered grievances), determine the merit of each grievance, and resolve grievances within specified time upon receiving the complaint-filing which the grievance will be addressed by the state-level Steering Committee (SC). The SC will resolve escalated/unresolved grievances received.

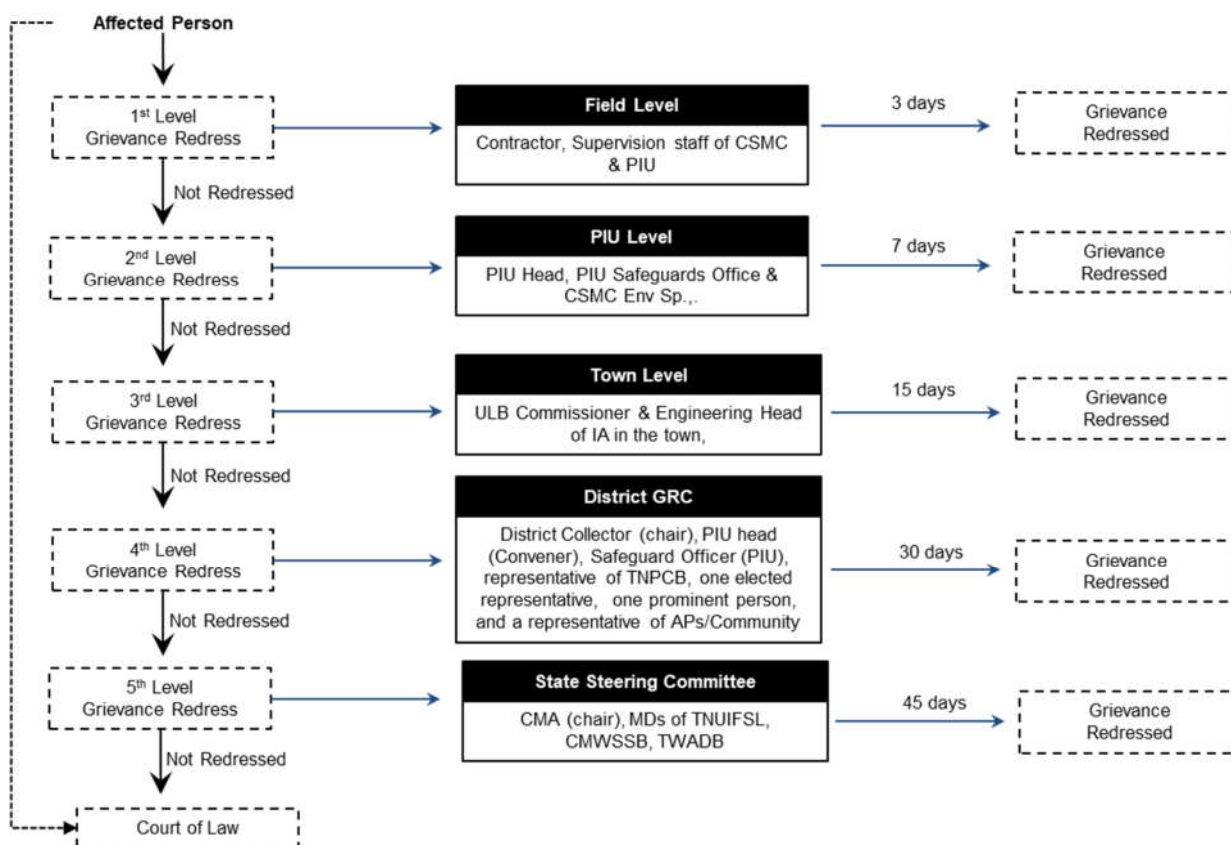
147. **Composition of GRC.** GRC will be headed by the District Collector, and members include: PIU head, Safeguards Officer of PIU, representative of TNPCB, one elected representative / prominent citizen from the area, and a representative of affected community. GRC must have a women member.

148. **State level steering committee** will include Commissioner of Municipal Administration as chair, member include managing directors of TNUIFSL, CMWSSB, TWAD Board and others as necessary.

149. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collector will be (i) all locations or sites within the district where subproject facilities are proposed, or (ii) their areas of influence within the District. The SC will have jurisdictional authority across the state (i.e., areas of influence of subproject facilities beyond district boundaries, if any).

150. The multi-tier GRM for the project is outlined below (Figure 18), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ULBs shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

**Figure 18: Proposed TNUFIP Grievance Redress Mechanism**



151. **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 (with the support of CSMC) and submitted to PMU.

152. **Information dissemination methods of the GRM.** The PIU, assisted by CMSC will be responsible for information dissemination to affected persons and general public in the project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU, offices, ULB notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB. A Sample Grievance Registration Form has been attached in Appendix 5.

153. **Periodic review and documentation of lessons learned.** The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

154. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement cost estimates.

155. **Country legal procedure.** An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

156. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

## VIII. ENVIRONMENTAL MANAGEMENT PLAN

### A. Environmental Management Plan

157. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

158. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between TNUIFSL, PMU, Implementing agency, PIU, consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and



control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

159. The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to approval of SEMP.

160. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

161. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEMP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and SEMP. The contractor shall allocate budget for compliance with these SEMP measures, requirements and actions.

162. The following tables show the potential environmental impacts, proposed mitigation measures and responsible agencies for implementation and monitoring.

**Table 10: Design Stage Environmental Impacts and Mitigation Measures (Sewer network including SPS & LS)**

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Sewer network	Nuisance due to leaks, overflows, contamination of water supplies, occupation health and safety of workers, etc.	<ul style="list-style-type: none"> <li>(i) Limit the sewer depth where possible</li> <li>(ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);</li> <li>(iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm)</li> <li>(iv) In unavoidable cases, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)</li> <li>(v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;</li> <li>(vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry</li> <li>(vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation</li> </ul>	PIU	PIU costs
Sewage lifting and pumping stations	Odour nuisance	<p><b>Site layout planning</b></p> <ul style="list-style-type: none"> <li>(i) Siting of wells within the identified site at an internal location as far as possible from adjoining residential buildings</li> <li>(ii) Develop green buffer zone around the facilities with a combination of tall and densely growing trees in multi rows as per the land availability to control odour and also act as visual shield, and improve aesthetical appearance</li> <li>(iii) Provision of high compound wall</li> </ul> <p><b>Design measures</b></p> <ul style="list-style-type: none"> <li>(i) Proposed wells to be closed using RCC slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells.</li> <li>(ii) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes.</li> </ul>	PIU	PIU costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		<p>(iii) Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metalled grating / grill work shall be provided over the sections (or full cross section if required) where workers will stand / work for inspection and repair/O and M purposes.</p> <p>(iv) Provision of passive gas ventilation arrangement by providing a take-off vent from top of well by positioning vent in such a way that cover slab fitment / movement / drawl if required for maintenance purposes is not compromised.</p> <p>(v) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.</p> <p>(vii) Submersible sewage pumps of suitable rating, minimum submergence requirements, open impeller with cutting-tearing arrangement and high strength-corrosion resistant heavy duty construction shall be proposed.</p> <p>(viii) In locations / cases where sewage flow in the present to intermediate design stage is envisaged to be low, position of the submersible pumps and design of the collection well floor by providing necessary side benching / sloped flooring to allow for higher submergence during low flow shall be made to ensure regular pump operation and avoid sewage stagnation beyond the permissible limit.</p> <p>(ix) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In cases of lift manholes (road-side or road-center type structures with only provision of kerb-side kiosk), an electrical cut-out provision shall be made for connecting an Emergency Mobile / Skid Mounted Diesel Generator for pumping out during long period of electricity supply interruption.</p> <p>(x) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations</p> <p>(xi) Provide training to the staff in SOPs and emergency procedures</p>		

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
	Sewage pumping and lifting stations located close to houses	(i) For sewage pumping stations SPS 8, which is located adjacent to houses, a suitable arrangement so as to capture the gaseous emissions from the wells and treat via scrubber/activated carbon filter before letting out into the ambient air; such system should be designed appropriately to meet the likely emissions/flow rate of respective pumping stations (ii) For lifting stations, the above arrangement should be provided as per site requirement.	PIU	PIU costs
	Noise	(i) Procure good quality latest technology high pressure pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1 m. (ii) Use appropriate building materials and construction techniques for pump houses which can absorb sound rather than reflect noise (iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors (iv) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors (vi) Provide ear plugs to workers	PIU	PIU costs
Sewerage system	Energy consumption	(i) Using low-noise and energy efficient pumping systems (ii) Efficient Pumping system operation (iii) Installation of Variable Frequency Drives (VFDs)	PIU	PIU costs
	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design/alignment (ii) Obtain prior permission for tree cutting (iii) Plant and maintain 10 trees for each tree that is removed	PIU	PIU costs

**Table 11: Pre Construction Stage Environmental Impacts and Mitigation Measures (Applicable for all components)**

<b>Field</b>	<b>Anticipated Impact</b>	<b>Mitigation Measures</b>	<b>Responsible for Implementation</b>	<b>Cost and Source of Funds</b>
Submission of updated EMP / SEMP; EMP implementation and reporting	Unsatisfactory compliance to EMP	(i) Appoint EHS Supervisor to ensure EMP implementation (ii) Submission of updated EMP/ SEMP (ii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs	Contractor	Contractor costs
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services.	Contractor in coordination with PIU	PIU costs
Construction work camps, stockpile areas, storage areas, and disposal areas.	Conflicts with local community; disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.	Contractor to finalize locations in consultation and approval of PIU	Contractor costs
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion,	(i) Obtain construction materials only from government approved quarries with prior approval of PIU (ii) PIU 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) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as	Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	PIU costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
	disturbance in natural drainage patterns, ponding and water logging, and water pollution.	required under law, including Environmental Clearance (EC) prior to approval by PIU		
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc.	CC and PIU	PIU costs for project approvals Contract cost for construction approvals
Chance finds	Damage / disturbance to artifacts	(i) Construction contractors to follow these measures in conducting any excavation work <ul style="list-style-type: none"> <li>• Create awareness among the workers, supervisors and engineers about the chance finds during excavation work</li> <li>• Stop work immediately to allow further investigation if any finds are suspected;</li> <li>• Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.</li> </ul>	CC and PIU	Contractor Costs

**Table 12: Construction Stage Environmental Impacts and Mitigation Measures (applicable for all components)**

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
EMP Implementation Training	Irreversible impact to the environment, workers, and community	(i) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH and S), core labor laws, applicable environmental laws, etc.	Contractor	Project cost / PMU cost
Air Quality	Dust, emissions from construction vehicles,	<b>For all construction works</b>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	<p>equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.</p>	<p>(i) Provide a dust screen around the construction sites of pumping and lifting stations  (ii) Damp down the soil and any stockpiled material on site by water sprinkling;  (iii) Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition  (iv) Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process  (v) Cover the soil stocked at the sites with tarpaulins  (vi) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation  (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.) when transported by open trucks;  (viii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area  (ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site  (x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate</p> <p><b>For sewer works</b>  (i) Barricade the construction area using hard barricades (of 2 m height) on both sides  (ii) Initiate site clearance and excavation work only after barricading of the site is done  (iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area  (iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area  (v) Undertake the work section wise: a 500 section should be demarcated and barricaded; open up several such sections at a</p>		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>time, but care shall be taken to locate such sections in different zones</p> <p>(vi) In the roads that connect to SPS sites, which need to accommodate two main sewers (income and outgoing main sewers of SPS), plan work so that access to houses is maintained throughout the construction phase; first lay one sewer and close the trench, restore the road, and lay the second sewer;</p> <p>(vii) Conduct work sequentially - excavation, sewer laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.</p> <p>(viii) 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 back filling, this will avoid stocking of material, and minimize the dust.</p> <p>(ix) 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 backfilled section. Road restoration shall be undertaken immediately.</p> <p>(x) Immediately consolidate the backfilled soil and restore the road surface; if immediate road restoration is not possible, provide a layer of plain cement concrete (PCC) of suitable mix on the backfilled trench so that dust generation, erosion is arrested and it will also provide a smooth riding surface for the traffic until the road is properly restored. Backfilled trench without any road restoration is a major source of dust.</p>		
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality.	<p>(i) All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains</p> <p>(ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;</p> <p>(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;</p> <p>(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;</p> <p>(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;</p>	Contractor	Contractor costs



Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	Ponding of water in the pits / foundation excavations	(vi) Store fuel, construction chemicals etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management (vii) Dispose any wastes generated by construction activities in designated sites; (viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).		
	Pollution of surface water due to construction of pipe bridge	(i) Schedule and complete the bridge works prior to onset of monsoon, and ensure that works are conducted during low flow time, when the river bed is dry (ii) Works shall be conducted with minimum disturbance to river bed; implement best construction methods to minimize disturbance / consolidation of river bed; as far as possible avoid using heavy equipment mobilization (iii) No labour camps or material storage camps shall be located in or near the river (100 m distance from river shall be maintained) (iv) Ensure no spillage of construction chemicals, fuels, oils etc., (v) Ensure that construction site is cleared off of all the material and debris immediately after completion of works (vi) Submit a site clean-up and restoration report to PIU for approval (vii) Conduct environmental monitoring as per the EMP.	Contractor	Contractor costs
	Water accumulation in trenches/pits	(i) As far as possible control the entry of runoff from upper areas into the excavated pits, and work area by creation of temporary drains or bunds around the periphery of work area (ii) Pump out the water collected in the pits / excavations to a temporary sedimentation pond; dispose off only clarified water into drainage channels/streams after sedimentation in the temporary ponds Consider safety aspects related to pit collapse due to accumulation of water	Contractor	Contractor costs
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(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; (ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<ul style="list-style-type: none"> <li>(iii) Maintain maximum sound levels not exceeding 70 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s.</li> <li>(iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;</li> <li>(v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;</li> <li>(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.</li> </ul>		
Landscape and aesthetics – waste generation	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	<ul style="list-style-type: none"> <li>(i) Prepare and implement a Construction Waste Management Plan (refer Appendix 3)</li> <li>(ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.,</li> <li>(iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed off to approved designated areas immediately</li> <li>(iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; sites should be located away from residential areas, forests, water bodies and any other sensitive land uses</li> <li>(v) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; create a compost pit at workers camp sites for disposal of biodegradable waste; non-biodegradable / recyclable material shall be collected separately and sold in the local recycling material market</li> <li>(vi) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed off in disposal sites approved by TNPCB;</li> <li>(vii) Prohibit burning of construction and/or domestic waste;</li> <li>(viii) Ensure that wastes are not haphazardly thrown in and around the project site; provide proper collection bins, and create awareness to use the dust bins.</li> <li>(ix) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that site is</li> </ul>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		properly restored prior to issuing of construction completion certificate		
Accessibility and traffic disruptions	Traffic problems and conflicts near project locations and haul road	<p><b>Sewer works</b></p> <p>(i) Prepare a sewer work implementation plan in each zone separately and undertake the work accordingly; ensure that for each road where the work is being undertaken there is an alternative road for the traffic diversion; take up the work in sequential way so that public inconvenience is minimal; prepare traffic management plans for each section (refer sample in Appendix 6)</p> <p>(ii) Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with general public</p> <p>(iii) Avoiding conducting work in all roads in a colony at one go; it will render all roads unusable due to excavations at the same time, creating large scale inconvenience</p> <p>(iv) Undertake the work section wise: a 500 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</p> <p>(v) Confine work areas in the road carriageway to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required</p> <p>(vi) Limit the width of trench excavation as much as possible by adopting best construction practices; adopt vertical cutting approach with proper shoring and bracing; this is especially to be practiced in narrow roads and deeper sewers; if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period</p> <p>(vii) 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</p>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(viii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.</p> <p>(ix) Inform the affected local population 1-week in advance about the work schedule</p> <p>(x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.</p> <p>(xi) Keep the site free from all unnecessary obstructions;</p> <p>(xii) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. Provide information to the public through media – newspapers and local cable television (TV) services</p> <p>(xiii) At work site, public information/caution boards shall be provided including contact for public complaints</p> <p><b>Hauling (material, waste/debris and equipment) activities</b></p> <p>(i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites</p> <p>(ii) Schedule transport and hauling activities during non-peak hours;</p> <p>(iii) Locate entry and exit points in areas where there is low potential for traffic congestion;</p> <p>(iv) Drive vehicles in a considerate manner</p> <p>(v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.</p>		
Socio-Economic Loss of access to houses and business	Loss of income	<p>(i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;</p> <p>(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</p> <p>(iii) Barricade the construction area and regulate movement of people and vehicles in the vicinity, and maintain the surroundings</p>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>safely with proper direction boards, lighting and security personnel – people should feel safe to move around</p> <p>(iv) Control dust generation</p> <p>(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.</p> <p>(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;</p> <p>(vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and</p> <p>(viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p>		
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	<p>(i) Employ local labour force as far as possible</p> <p>(iii) Comply with labor laws</p>	Contractor	Contractor costs
Occupational Health and Safety	Occupational hazards which can arise during work	<p>(i) Follow all national, state and local labour laws (indicative list is in Appendix 2);</p> <p>(ii) Develop and implement site-specific occupational health and safety (OH and S) 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) OH and S 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<sup>5</sup>.</p> <p>(iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites;</p> <p>(iv) Secure all installations from unauthorized intrusion and accident risks</p>	Contractor	Contractor costs

<sup>5</sup> <http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<ul style="list-style-type: none"> <li>(v) Provide H and S 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;</li> <li>(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;</li> <li>(vii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</li> <li>(viii) Ensure moving equipment is outfitted with audible back-up alarms;</li> <li>(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; and</li> <li>(x) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.</li> <li>(xi) Provide supplies of potable drinking water;</li> <li>(xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances</li> </ul>		
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	<ul style="list-style-type: none"> <li>(i) Consult PIU before locating project offices, sheds, and construction plants;</li> <li>(ii) 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 City Corporation</li> <li>(iii) Avoid tree cutting for setting up camp facilities</li> <li>(iv) Provide a proper fencing/compound wall for camp sites</li> <li>(v) 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</li> <li>(vi) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit</li> </ul>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(vii) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers</p> <p>(viii) Camp shall be provided with proper drainage, there shall not be any water accumulation</p> <p>(ix) Provide drinking water, water for other uses, and sanitation facilities for employees</p> <p>(x) Prohibit employees from cutting of trees for firewood; contractor should provide cooking fuel (cooking gas); fire wood not allowed</p> <p>(xi) Train employees in the storage and handling of materials which can potentially cause soil contamination</p> <p>(xii) 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</p> <p>(xiii) Recover used oil and lubricants and reuse or remove from the site;</p> <p>(xiv) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; provide a compost pit for bio degradable waste, and non-biodegradable / recyclable waste shall be collected and sold in local market</p> <p>(xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and</p> <p>(xvi) 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</p>		
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	<p>(i) As far as possible located the camp site within the work sites (at STP or large pumping station sites); if any camp to be established outside these, then select a camp site away from residential areas (at least 100 m buffer shall be maintained)</p> <p>(ii) Avoid tree cutting for setting up camp facilities</p> <p>(iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around</p>	Contractor	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	Unsanitary and poor living conditions for workers	<ul style="list-style-type: none"> <li>(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</li> <li>(v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit</li> <li>(vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of liveability at work camps are maintained at the highest standards possible at all times;</li> <li>(vii) Consult PIU before locating project offices, sheds, and construction plants;</li> <li>(viii) Minimize removal of vegetation and disallow cutting of trees</li> <li>(ix) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be allowed as accommodation for workers</li> <li>(x) Camp shall be provided with proper drainage, there shall not be any water accumulation</li> <li>(xi) Provide drinking water, water for other uses, and sanitation facilities for employees</li> <li>(xii) Prohibit employees from cutting of trees for firewood; contractor should be provide proper facilities including cooking fuel (oil or gas; fire wood not allowed)</li> <li>(xiii) Train employees in the storage and handling of materials which can potentially cause soil contamination</li> <li>(xiv) Recover used oil and lubricants and reuse or remove from the site</li> <li>(xv) 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</li> <li>(xvi) Remove all wreckage, rubbish, or temporary structures which are no longer required</li> </ul>		



Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(xvii) 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		
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	<p>(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and</p> <p>(ii) All excavated roads shall be reinstated to original condition.</p> <p>(iii) All disrupted utilities restored</p> <p>(iv) All affected structures rehabilitated/compensated</p> <p>(v) 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.</p> <p>(vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document.</p> <p>(vii) The contractor must arrange the cancellation of all temporary services.</p> <p>(viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.</p>	Contractor	Contractor costs

**Table 13: Operation Stage Environmental Impacts and Mitigation Measures**

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
Operation of sewage lifting and pumping stations	Odour nuisance	<p>(i) Strictly follow standard operating procedures / operational manual for operation and maintenance of lifting and pump stations</p> <p>(ii) Ensure that operating staff is properly trained, and have clear understanding of odour issues vis-à-vis its related with operational practices</p> <p>(iii) Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells</p> <p>(iv) Conduct monitoring (periodically at pumping stations and lifting stations);</p>	PIU / VCMC	Operating costs
Operation and maintenance	Blocks, overflows,	<p>(i) Establish regular maintenance program, including:</p> <ul style="list-style-type: none"> <li>• Regular cleaning of grit chambers and sewer lines to remove grease,</li> </ul>	PIU / VCMC	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
of sewerage system	system malfunction, occupational health and safety	<p>grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas</p> <ul style="list-style-type: none"> <li>• Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and</li> <li>• Monitoring of sewer flow to identify potential inflows and outflows</li> <li>• Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);</li> </ul> <p>(ii) Maintain records; review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;</p> <p>(iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.</p> <p>(iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers</p> <p>(v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.</p> <p>(vi) Provide necessary health and safety training to the staff in sewer cleaning and maintenance</p> <p>(vii) Provide all necessary personnel protection equipment</p> <p>(viii) Do not conduct manual cleaning of sewers; for personnel engaged sewer maintenance work, there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use</p>		

**Table 14: Construction Stage Environmental Monitoring Plan (Sewer network including SPS & LS)**

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at <b>Appendix 7</b>	Weekly during construction	Supervising staff and safeguards specialists of CMSC	Staff and consultant costs are part of incremental administration costs
Ambient air quality	4 locations (4 monitoring locations 50 m downwind direction near sewer and pumping station work sites in the city,);	<ul style="list-style-type: none"> <li>PM<sub>10</sub>, PM<sub>2.5</sub> NO<sub>2</sub>, SO<sub>2</sub>, CO</li> </ul>	Once before start of construction Quarterly (yearly 4-times) during construction (3 year period considered)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (48 samples x 5000 per sample = 240,000)
Ambient noise	4 locations (4 monitoring locations 50 m downwind direction near sewer and pumping station work sites in the city,);	<ul style="list-style-type: none"> <li>Day time and night time noise levels</li> </ul>	Once before start of construction Quarterly (yearly 4-times) during construction (3 year period considered)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (48 samples x 1500 per sample = 72,000)
Surface water quality	2 sampling locations (1 - Palar River, downstream work sites, 2 - Pandiyan Channel )	<ul style="list-style-type: none"> <li>pH, Oil and grease, Cl, F, NO<sub>3</sub>, TC, FC, Hardness, Turbidity BOD, COD, DO, E-coli, Total Alkalinity, heavy metals and pesticides.</li> </ul>	Once before start of construction Half yearly during construction (3 year construction period considered)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (14 samples x 4000 per sample = 56,000)

**Table 15: Operation Stage Environmental Monitoring Plan (Sewer network including SPS & LS)**

<b>Monitoring field</b>	<b>Monitoring location</b>	<b>Monitoring parameters</b>	<b>Frequency</b>	<b>Responsibility</b>	<b>Cost and Source of Funds</b>
Odour monitoring at pumping stations	3 points (downwind direction) at all pumping stations: near inlet/suction well; outside the pumping station and at nearest house	Hydrogen sulphide (H <sub>2</sub> S)	Half yearly (yearly twice) and as and when based on public complaints (throughout the operation phase)	VCMC	O and M Costs
	1 point (at each SPS (downwind direction) at the boundary wall of the pumping stations	Hydrogen sulphide (H <sub>2</sub> S)	Periodically	VCMC	O and M Costs
Odour monitoring at lifting stations	3 points (downwind direction) at all lifting stations: near inlet/suction well; outside the pumping station and at nearest house	Hydrogen sulphide (H <sub>2</sub> S) in ambient air •	Half yearly (yearly twice) and as and when based on public complaints (throughout the operation phase)	VCMC	O and M Costs
	1 point at each LS (downwind direction)	Hydrogen sulphide (H <sub>2</sub> S) in ambient air	Periodically.	VCMC	O and M Costs

## B. Implementation Arrangements

163. The Municipal Administration and Water Supply Department (MAWS) of GoTN acting through the Tamil Nadu Urban Infrastructure Financial Services Ltd. (TNUIFSL) is the state-level executing agency. A project management unit (PMU) will be established in TNUIFSL headed by a Project Director and Deputy Project Director (senior official from Commissionerate of Municipal Administration, CMA), and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. A Project Steering Committee, headed by Principal Secretary, MAWS, and members include managing directors of TNUIFSL, CMA, and Chennai Metro Water Supply and Sewerage Board (CMWSSB) will be established.

164. The implementing agency for this subproject is Vellore City Municipal Corporation (VCMC). A Project Implementation Unit (PIU) will be established in VCMC headed by full-time a Project Manager (a senior official of VCMC) and comprising dedicated full-time staff from engineering and other departments of VCMC. PIU under the VCMC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject. A Construction, Management and Supervision Consultant (CMSC) will be appointed to assist PIU in day-to-day implementation of the subproject.

165. **Safeguards Compliance Responsibilities.** Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL will have overall responsibility of safeguard compliance with ADB SPS 2009. ESS Managers report to Head, project division. At PIU level, a Safeguards Officer (SO) will be appointed, who will coordinate monitoring and implementation of safeguards on behalf of VCMC Experts available at CMSC will monitor implementation of safeguards.

166. **PMU Safeguard Responsibilities.** Key tasks and responsibilities of the ESS Manager (Environment) for this subproject include the following:

### **DPR finalization and Bidding stage:**

- (i) Ensure that all design related measures of the EMP are included designs
- (ii) Ensure that EMP is included in bidding documents and civil works contracts including requirement for EHS supervisor with the contractor
- (iii) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards
- (iv) Ensure that staff required for implementation of EMP (EHS officer) is included in the bid requirements
- (v) Ensure that EMP cost is included in the project cost
- (vi) Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of subproject are in place, to the extent possible.

### **Construction stage:**

- (i) Prior to start of construction:
  - Ensure that all necessary clearances/permissions/licences, including that of contractor's are in place prior to start of construction
  - provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIUs and contractors
- (ii) Oversee and provide guidance to the PIU to properly carry out the environmental monitoring as per the EMP

- (iii) Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained
- (iv) Consolidate quarterly environmental monitoring reports from PIU and submit semi-annual monitoring reports to ADB
- (v) Oversee site closures to ensure that all work / facility sites are restored properly prior to issuing work completion certificate to the contractor

**Operation stage:**

- (i) Ensure that all clearances as required for operation of project are in place prior to operation, such as consent to operate (CTO) for STP from TNPCB

167. **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU assisted by CMSC for this subproject include the following:

**DPR finalization and Bidding stage:**

- (i) Include design related measures of the EMP in the project design and DPR
- (ii) Include EMP in the bidding documents and civil works contracts, including requirement of staff (EHS supervisor) with contractor for EMP implementation
- (iii) Provide necessary budget in the project as IEE for EMP Implementation
- (iv) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards including:
  - a. Labour welfare measures and provision of amenities
  - b. prohibition of child labour as defined in national legislation for construction and maintenance activities;
  - c. equal pay for equal work of equal value regardless of gender, ethnicity, or caste;
  - d. elimination of forced labour;
  - e. the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.
- (v) In the pre-bid meeting, provide insight into EMP measures, and overall compliance requirements to the bidders
- (vi) Obtain all clearance/permissions as required for implementation of subproject, including consent to establish (CTE) from TNPCB for STP prior to invitation of bids and/or prior to award of contract as appropriate

**Construction stage:**

- (i) Identify regulatory clearance requirements and obtain all necessary clearances prior to start of construction; ensure construction work by contractor is conducted in compliance with all government rules and regulations including pollution control, labour welfare and safety etc.,
- (ii) Prior to start of construction organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
- (iii) Ensure contractor compliance with staff resources as per the IEE/EMP/Bid Document
- (iv) Guide contractor on updating EMP / preparing Site Environmental Plan at the start of the project

- (v) Update IEE and EMP; ensure that IEE reflects the final design being implemented by contractor
- (vi) Conduct public consultation and information disclosure as necessary
- (vii) Take necessary action for obtaining rights of way
- (viii) Supervise day-to-day EMP implementation on site by contractor, including the environmental monitoring plan;
- (ix) Supervise ambient environmental monitoring by contractors
- (x) Take corrective actions when necessary to ensure no environmental impacts
- (xi) Conduct continuous public consultation and awareness
- (xii) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP
- (xiii) Monitor Contractor's compliance with the measures set forth in the EMP and any corrective or preventative actions set forth in a safeguards monitoring report that the PMU will prepare from time to time;
- (xiv) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts;
- (xv) Inform PMU promptly in case if any significant impacts surfaces, which were not identified in the IEE and develop necessary corrective actions as necessary and ensure implementation by the contractors; include all such impacts and suggested actions in the Quarterly Environmental Monitoring Reports
- (xvi) Implementation grievance redress system, and undertake appropriate actions to redress the complaints; ensure that complaints/grievances are addressed in a timely manner and resolutions are properly documented;
- (xvii) Review and approve monthly progress reports submitted by Contractor on EMP compliance,
- (xviii) Prepare quarterly environmental monitoring reports and submit to PMU / TNUIFSL
- (xix) Provide any assistance in environmental safeguard related tasks as required by PMU to ensure compliance and reporting to ADB

**Operation stage:**

- (ii) Obtain all clearances as required for operation of project prior to operation, such as consent to operate (CTO) for STP from TNPCB
- (iii) Conduct environmental management and monitoring activities as per the EMP

**168. Contractor's Responsibilities:**

**Bidding stage:**

- (i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.,)
- (ii) Understand the regulatory compliance requirements related to labour welfare, safety, environment etc.,

**Construction stage:**

- (i) Mobilize EHS Supervisor prior to start of work
- (ii) Prepare SEMP and submit to PIU
- (iii) Ensure that all regulatory clearances (both project related and contractor related) are in place prior start of the construction work.
- (iv) Confirm with PIU availability of rights of way at all project sites prior to start of work.
- (v) Prepare and submit:

- a. Construction waste management (CWM) plan (sample is in **Appendix 3**)
- b. Traffic management (TM) plan (sample is **Appendix 6**)
- (vi) Implement the mitigation measures as per the EMP including CWM and TM Plans
- (vii) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material borrow areas, etc.,
- (viii) Implement EMP and ensure compliance with all the mitigation and enhancement measures
- (ix) Conduct environmental monitoring (air, noise, water etc.,) as per the EMP
- (x) Undertake immediate action as suggested by PIU to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation
- (xi) Submit monthly progress reports on EMP implementation to PIU
- (xii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU and CMSC
- (xiii) Comply with applicable government rules and regulations

### C. Training Needs

169. The following **Table 16** presents the outline of capacity building program to ensure EMP implementation. These capacity building and trainings will be conducted at the offices of PMU and PIU by the environmental safeguards specialist of PMU/PIU and their consultants, which are part of project implementation set-up, and therefore no separate or additional costs are envisaged. Adequate costs are already considered in project's capacity building program. The detailed program and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the PMU.

**Table 16: Outline Capacity Building Program on EMP Implementation**

Description	Target Participants and Venue	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) <ul style="list-style-type: none"> <li>- ADB Safeguards Policy Statement</li> <li>- Government of India and Tamil Nadu applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH and S, etc.</li> <li>- Incorporation of EMP into the project design and contracts</li> <li>- Monitoring, reporting and corrective action planning</li> </ul>	All staff and consultants involved in the project  At PMU (combined program for all PIU)	Included in the overall program cost
2. EMP implementation (1/2 day) <ul style="list-style-type: none"> <li>- EMP mitigation and monitoring measures</li> <li>- Roles and responsibilities</li> <li>- Public relations, - Consultations</li> <li>- Grievance redress</li> <li>- Monitoring and corrective action planning</li> <li>- Reporting and disclosure</li> <li>- Construction site standard operating procedures (SOP)</li> <li>-- Chance find (archeological) protocol</li> <li>- AC pipe protocol</li> <li>- Traffic management plan</li> <li>- Waste management plan</li> <li>- Site clean-up and restoration</li> </ul>	All PIU staff, contractor staff and consultants involved in the subproject  At PIU	To be conducted by CSMC at the PIU office; part of project implementation cost



Description	Target Participants and Venue	Cost and Source of Funds
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work  All workers (including unskilled laborers)	Contractors' EHS officer to conduct program, with guidance of CMSC

#### D. Monitoring and Reporting

170. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Baseline Environmental monitoring as indicated in the construction stage environmental monitoring plan should be conducted and the analysis outcome should be shared in the compliance report. Contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review, and approve the report and permit commencement of works.

171. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. CMSC will monitor, review and advise contractors for corrective actions if necessary. Quarterly Environmental Monitoring Report summarizing compliance and corrective measures, if any, taken will be prepared by CMSC team at PIU and submitted to PMU (Report format is at **Appendix 8**). During operation, PIU will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU an annual report.

172. Based on PIU quarterly environmental monitoring reports and oversight visits to subproject work sites, PMU will submit semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed on TNUIFSL, PMU and VCMC websites.

173. ADB will review project performance against the TNUFIP commitments as agreed in the legal documents (loan and project agreements etc.,). The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system

#### E. EMP Implementation Cost

174. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

**Table 17: Cost Estimates to Implement the EMP**

	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
<b>A.</b>	<b>Implementation staff</b>						
1	EHS Supervisor ( 2 persons)	Construction	per month	72	35,000	25,20,000	Civil work contract
	<b>Subtotal (A)</b>					<b>25,20,000</b>	
<b>B.</b>	<b>Mitigation Measures</b>						
1	Providing gas capture and treatment system at selected pumping and lifting stations	Design	Lump sum provision	-	-	5,000,000	Provisional sums of contract (PIU)
2	Provision for tree cutting and compensatory plantation measures (1: 10 ratio replantation)	Construction	Per tree	100	1,000	100,000	Project costs (PIU)
3	Preparation of plans traffic management plan, waste (spoils) management plan etc., ), traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump sum	-	-	250,000	Civil works contract
4	Safety barricading	Construction	Lump sum	Lump sum		2,000,000	Civil works contract
	<b>Subtotal (B)</b>					<b>7,350,000</b>	
<b>C.</b>	<b>Monitoring Measures</b>						
1	Air quality monitoring	Construction	per sample	48	5,000	240,000	
2	Noise levels monitoring	Construction	Per sample	48	1,500	72,000	
3	Surface water monitoring	Construction	Per sample	14	4,000	56,000	
	<b>Subtotal (C)</b>					<b>368,000</b>	
<b>D.</b>	<b>Capacity Building</b>						
1.	Training on EMP implementation	Pre-construction				-	Part of PIU and PMU , consultant tasks
2.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite				-	Civil works contractor cost
	<b>Subtotal (D)</b>						
	<b>Total (A+B+C+D)</b>				<b>INR</b>	<b>10, 238,000</b>	

Contractor Cost -5,138,000

PIU Cost -5,100,000

## IX. CONCLUSION AND RECOMMENDATIONS

175. The process described in this document has assessed the environmental impacts of all elements of the proposed underground sewerage subproject in Zone 2, 2A and 8 of Vellore City Municipal Corporation. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result significant measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design. Various design related measures suggested for providing safe disposal of treated wastewater; efficient treatment to meet disposal standards, odour control at pumping stations, uninterrupted power supply provision; standard operating procedures for operation and maintenance; and imparting necessary training for ULB staff; providing necessary safety no manual cleaning of sewers, and personal protection equipment for workers (protection against oxygen deficiency, harmful gaseous emissions).

176. Vellore is an historical city, and there are three nationally important (ASI protected) monuments in the city. Vellore Fort, located in the centre of the city, and temple and a mosque located inside the Fort are the protected monument. There are no components located in the monument area.

177. Sewage and pumping stations sites, which collect sewage from the sewer network and pump to higher level to convey to sewage to STP for safe treatment and disposal, are located within or near residential areas, which it will serve. These facilities may generate odour and may cause nuisance to nearby households. Site selection is done with utmost care to located as far as away from the houses, however, given design considerations and land constraints, the SPS-2A (viruthampattu) and SPS 8 (Sadupuri Road)sites identified are close to the houses. Various site planning, green buffer and design related measures are included in the project to prevent and control odour generation. These include appropriately locating sewage wells within site maintaining maximum distance from the nearby houses; developing tree cover; closed facilities; design and operation measures to prevent odour; and, providing gas collection and treatment facilities. Odour monitoring is proposed at pumping and lifting stations periodically.

178. Except sewer works, all other construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer line works will be conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

179. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the

operation and maintenance manual and standard operating procedures to be developed for all the activities.

180. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor odour at pumping stations. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

180. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU, VCMC and ADB websites. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

181. The EMP will assist the project agencies and contractor in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project. A copy of the updated EMP/ SEMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

182. The citizens of Vellore City will be the major beneficiaries of this subproject. The new sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard, and treated wastewater is utilized beneficial purposes. In addition to improved environmental conditions, the subproject will improve the over-all public health in the project area. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

183. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment to reflect if any change is required. This IEE shall be updated by PIU during the implementation phase to reflect any changes, amendments and will be reviewed and approved by PMU.

## APPENDIX 1: REA CHECKLIST

## Sewerage

## Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

Country/Project Title: India / Tamil Nadu Urban Flagship Investment Program – Underground Sewerage Subproject in Zone 2, 2A and 8 of Vellore City Municipal Corporation

Sector Division: Urban Development

Screening Questions	Yes/No	Remarks
<b>A. Project Siting Is the project area...</b>		
• Densely populated?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Subproject activities are located in Vellore City, some parts of which are densely populated. However, the core city area, which is highly dense, is not part of the project area. Newly developing residential areas have low density and well planned layouts. Agriculture is still practiced in the outer areas.
• Heavy with development activities?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	VCMC is a developing area; urban expansion is considerable
• Adjacent to or within any environmentally sensitive areas?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Cultural heritage site	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Vellore is an historical city, and there are three nationally important (ASI protected) monuments in the city. Vellore Fort, located in the centre of the city, and temple and a mosque located inside the Fort are the protected monument. However, for the proposed UGSS alignment there are no protected area monument in the vicinity.
• Protected Area	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Wetland	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Mangrove	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Estuarine	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Buffer zone of protected area	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	-
• Special area for protecting biodiversity	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
• Bay	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
<b>B. Potential Environmental Impacts Will the Project cause...</b>		

Screening Questions	Yes/No	Remarks
<b>Sewerage</b>		
<ul style="list-style-type: none"> <li>▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No impairment envisaged as no components are located in the monument.
<ul style="list-style-type: none"> <li>▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?</li> </ul>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	SPS 2A (Viruthampattu) and SPS 8 (Saduperi Road) are located close to the houses, and odour may create nuisance. Necessary measures are included to prevent and control odour; Hence, no net negative impacts envisaged
<ul style="list-style-type: none"> <li>▪ dislocation or involuntary resettlement of people?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Do not involve land acquisition or resettlement
<ul style="list-style-type: none"> <li>▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No such possibilities; sewerage system will cover entire population including urban poor; In fact, it will have positive health impact due to improved sanitation condition.
<ul style="list-style-type: none"> <li>▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Adequate capacity sewage treatment facility is being development under this subproject; proper treatment process, regular monitoring is part of the project, so no degradation of water quality envisaged
<ul style="list-style-type: none"> <li>▪ overflows and flooding of neighboring properties with raw sewage?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sewerage system has been designed considering the population growth. It has been designed to accommodate sewage until design year. Design considers standard peak factors and therefore no such impacts are envisaged.
<ul style="list-style-type: none"> <li>▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Proper sludge collection, treatment and disposal process is part of STP; sewerage system caters only domestic sewage; no industrial effluent is allowed into sewers
<ul style="list-style-type: none"> <li>▪ noise and vibration due to blasting and other civil works?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.
<ul style="list-style-type: none"> <li>▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	In appropriate handling of sludge may have occupational health hazard. All necessary safety precautions will be taken to avoid any risk.
<ul style="list-style-type: none"> <li>▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	There are no sources of hazardous material that will find its way into the sewers. Wastewater other than domestic will not be discharged into the sewers.
<ul style="list-style-type: none"> <li>▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?</li> </ul>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Due to technical constraints and land availability, two pumping stations (SPS 2A and SPS 8) are located close to residential area, however, necessary measures are included in site planning, design and operation. Hence, no net negative impacts are envisaged
<ul style="list-style-type: none"> <li>▪ road blocking and temporary flooding due to land excavation during the rainy season?</li> </ul>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Complete road blocks are not envisaged; in narrow roads, traffic may be diverted but access will be ensure for pedestrians. All necessary precautions will be taken to prevent flooding during construction; flooding is unlikely as work will be mostly be conducted during dry season.
<ul style="list-style-type: none"> <li>▪ noise and dust from construction activities?</li> </ul>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	No major noise generating activities like rock blasting is envisaged. As the sewers will be lain on the road surface, cutting open of road surface using pneumatic drills will produce noise. Appropriate measures are suggested to minimize impact. Dust will be temporary and will be controlled with proper

Screening Questions	Yes/No	Remarks
		measures.
▪ traffic disturbances due to construction material transport and wastes?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Proper planning, such as selection of routes and scheduling to avoid peak traffic hours, will be carried out in consultation with concerned authorities
▪ temporary silt runoff due to construction?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Earthworks will not be conducted during rains; plain topography and moderate to low rains, so no such impact envisaged
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	A chance of failure of sewerage system is very remote; proper design and standard operating procedures will be followed in O and M; necessary equipment and training to workers will be provided
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The STP ( proposed under phase-II) include adequate sludge treatment facilities
▪ contamination of surface and ground waters due to sludge disposal on land?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The STP ( proposed under phase-II) include adequate sludge treatment facilities and the dried sludge will be utilized as manure
▪ Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Manual cleaning of sewers and facilities will be avoided. All necessary health and safety training and necessary personal protection equipment will be given to workers and staff during operation of sewerage system
▪ Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No such impact anticipated; local communities in the vicinity of the project would be employed as much as possible.
▪ Social conflicts between construction workers from other areas and community workers?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No such impact anticipated; local communities in the vicinity of the project would be employed as much as possible.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Not applicable. Construction/operation will not involve use of explosives and chemicals.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the construction sites.

<b>Climate Change and Disaster Risk Questions</b>	Yes	No	Remarks
The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.			
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	√		Moderate earth quake risk zone (Zone III)
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?		√	No

<p>Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?</p>		√	No
<p>Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?</p>		√	No



**APPENDIX 2: SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION OF CIVIL WORKS**

- (i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- (ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
- (iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.
- (iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.
- (vi) 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, Runways are scheduled employment.
- (vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
- (viii) 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.
- (ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.
- (x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what

are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

### **APPENDIX 3: SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) MANAGEMENT PLAN**

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

#### **I. Spoils information**

The spoil information contains the details like a) The type / material, b) Potential contamination by that type, c) Expected volume (site / component specific), d) Spoil Classification etc.

#### **II. Spoils management**

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

#### **III. Documentation**

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

**Appendix 4: Public Information Notice Template**

**Public Announcement  
Providing Underground Sewerage System in Vellore City  
Vellore City Municipal Corporation**

Under this project, works are being conducted by xxxx Contractor to provide sewerage network in Vellore.

As part of this, works for laying pipeline / sewerage 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.

**APPENDIX 5: SAMPLE GRIEVANCE REGISTRATION FORM**

(To be available in Tamil and English)

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**

Registered by: (Name of official registering grievance)	
Mode of communication: Note/letter E-mail Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

## APPENDIX 6: SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

### A. Principles for TMP around the Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
  - (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
  - (ii) protection of work crews from hazards associated with moving traffic;
  - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
  - (iv) maintenance of access to adjoining properties; and
  - (v) addressing issues that may delay the project.

### B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
  - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
  - (ii) Inhibit traffic movement as little as possible.
  - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
  - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
  - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
  - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
  - (vii) Keep the public well informed.
  - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.
3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

### C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
  - (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
  - (ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
  - (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
  - (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
  - (v) considering how access will be provided to the worksite;

- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

**Figure A11.1: Policy Steps for the TMP**

<b>Review</b>	<ul style="list-style-type: none"> <li>• Review construction schedule and methods</li> </ul>
<b>Traffic Re-Circulation</b>	<ul style="list-style-type: none"> <li>• Identify initial traffic recirculation and control policy</li> </ul>
<b>Traffic Diversions</b>	<ul style="list-style-type: none"> <li>• Identify routes for traffic diversions</li> <li>• Analyse adverse impact and mitigation at the detours</li> </ul>
<b>Full Road Closures</b>	<ul style="list-style-type: none"> <li>• Begin community consultation for consensus</li> <li>• Finalise or determine alternate detours</li> </ul>
<b>Temporary parking</b>	<ul style="list-style-type: none"> <li>• Identify temporary parking (on and off -street )</li> <li>• Discuss with CMC, owner, community for use</li> </ul>
<b>Police Coordination</b>	<ul style="list-style-type: none"> <li>• Coordinate with the Traffic Police to enforce traffic and diversions</li> </ul>
<b>Install control devices</b>	<ul style="list-style-type: none"> <li>• Install traffic control devices (traffic cones, signs, lightings, etc)</li> </ul>
<b>Awareness</b>	<ul style="list-style-type: none"> <li>• Conduct campaigns, publicity, and notify public about street closure</li> </ul>
<b>Public Redress</b>	<ul style="list-style-type: none"> <li>• Develop a mechanism to address public grievances regarding disruptions (traffic, utilities, and diversions)</li> </ul>

**D. Public awareness and notifications**

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for

this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:

- (i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) defensive driving behaviour along the work zones; and
- (iii) reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;
- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behaviour to emulate at the work zones;
- (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) indicate the office hours of relevant offices.

#### **E. Install traffic control devices at the work zones and traffic diversion routes**

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal



roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. **Figure A11.2 to Figure A11.6** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

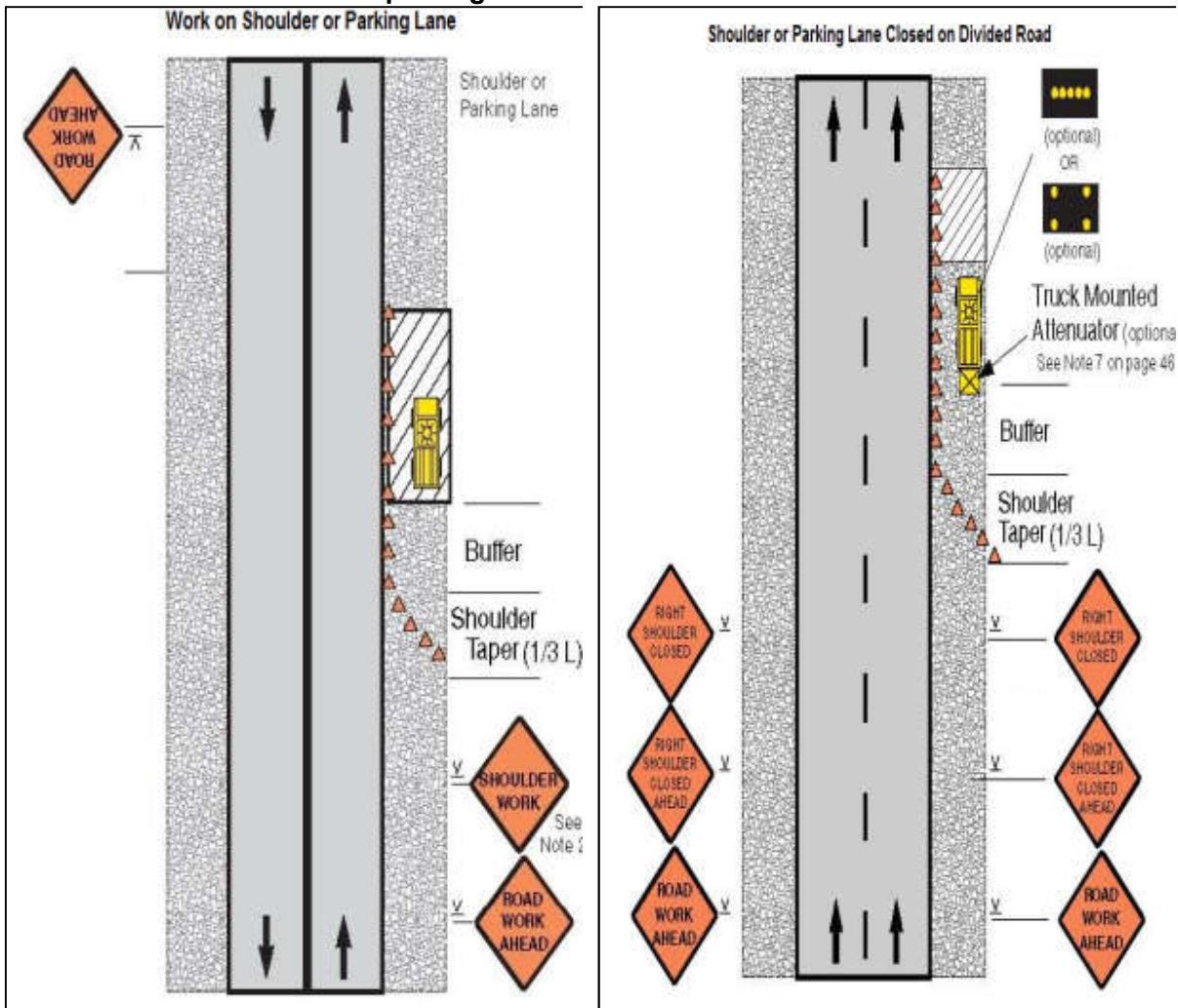
- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Street closure with detour

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

**Figure A11.2 and A11.3: Work on shoulder or parking lane and Shoulder or parking lane closed on divided road**



**Figure A11.4 and A11.5: Work in Travel lane and Lane closure on road with low volume**

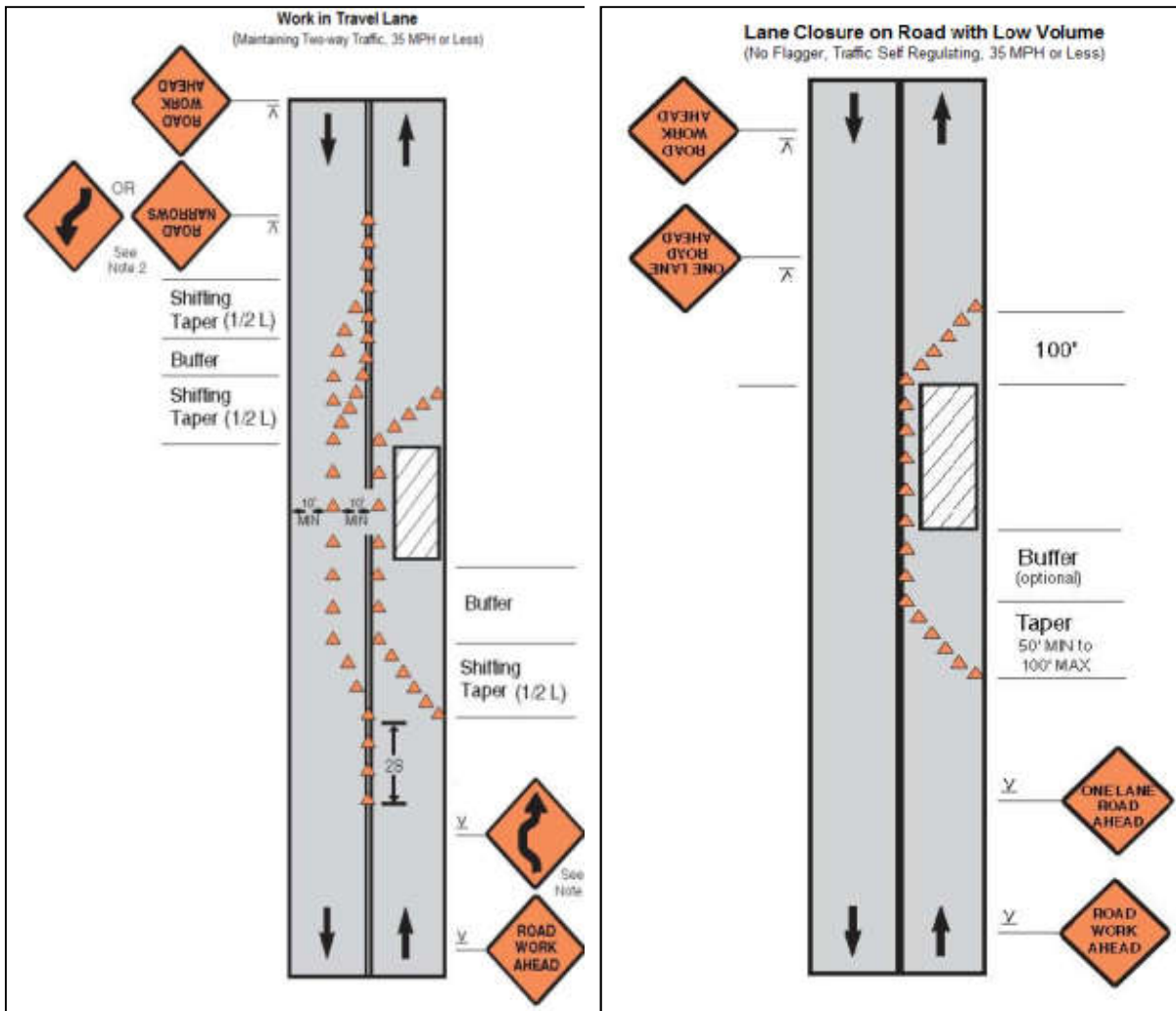
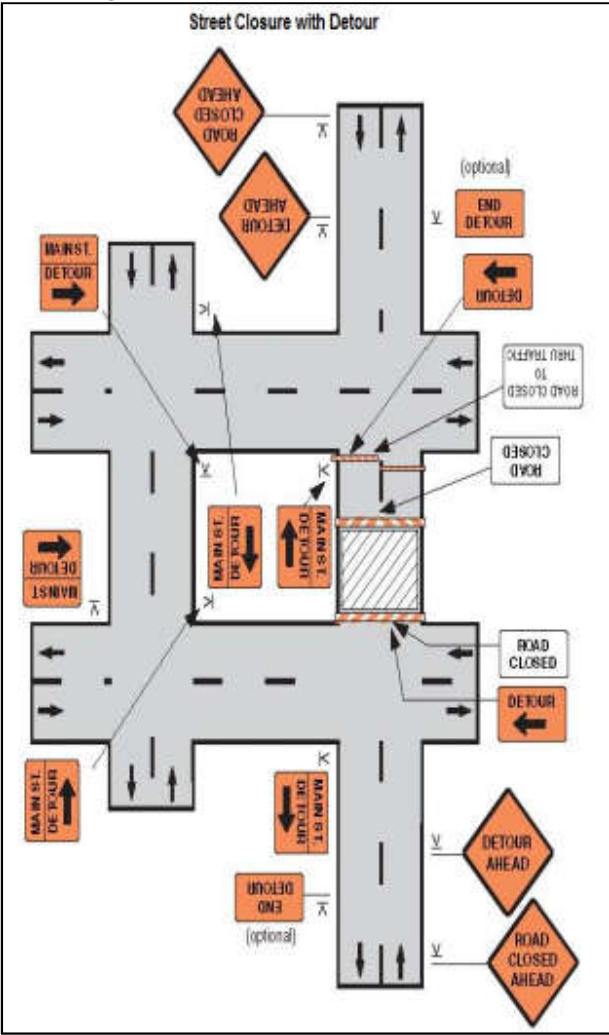


Figure A11.6: Street closure with detour



**APPENDIX 7: SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT**

Project Name  
 Contract Number

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
 TITLE: \_\_\_\_\_ DMA: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ GROUP: \_\_\_\_\_

WEATHER:

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
<b>Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)</b>	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as and when required only	
Tarpaulins used to cover sand and other loose material when transported by vehicles	
After unloading, wheels and undercarriage of vehicles cleaned prior to leaving the site	
No AC pipes disturbed/removed during excavation	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying and backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided and public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	
Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard and safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Toilet facility provided at the site	

Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet and bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

\_\_\_\_\_

**Sign off**

\_\_\_\_\_  
**Name**  
**Position**

\_\_\_\_\_  
**Name**  
**Position**

**APPENDIX 8:****SAMPLE SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE****1. INTRODUCTION**

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

<b>Name</b>	<b>Designation/Office</b>	<b>Email Address</b>	<b>Contact Number</b>
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

<b>Package Number</b>	<b>Components/List of Works</b>	<b>Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&amp;M)<sup>6</sup></b>	<b>Contract Status (specify if under bidding or contract awarded)</b>	<b>If On-going Construction</b>	
				<b>%Physical Progress</b>	<b>Expected Completion Date</b>

<sup>6</sup> If on-going construction, include %physical progress and expected date of completion

**2. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS<sup>7</sup>**

Package No.	Subproject Name	Statutory Environmental Requirements <sup>8</sup>	Status of Compliance <sup>9</sup>	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish <sup>10</sup>

**3. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS**

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

**4. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)**

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

**Package-wise Implementation Status**

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

<sup>7</sup> All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the “remarks” column.

<sup>8</sup> Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

<sup>9</sup> Specify if obtained, submitted and awaiting approval, application not yet submitted

<sup>10</sup> Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.



- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
  - (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
  - (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
    - Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
    - Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
    - Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
    - Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
    - Confirm spill kits on site and site procedure for handling emergencies.
    - Identify any chemical stored on site and provide information on storage condition. Attach photograph.
    - Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
    - Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
    - Provide information on barricades, signages, and on-site boards. Provide photographs.
    - Provide information on
    - Checking if there are any activities being under taken out of working hours and how that is being managed.

**Summary of Environmental Monitoring Activities (for the Reporting Period)<sup>11</sup>**

<b>Impacts (List from IEE)</b>	<b>Mitigation Measures (List from IEE)</b>	<b>Parameters Monitored (As a minimum those identified in the IEE should be monitored)</b>	<b>Method of Monitoring</b>	<b>Location of Monitoring</b>	<b>Date of Monitoring Conducted</b>	<b>Name of Person Who Conducted the Monitoring</b>
<b>Design Phase</b>						
<b>Pre-Construction Phase</b>						
<b>Construction Phase</b>						
<b>Operational Phase</b>						

<sup>11</sup> Attach Laboratory Results and Sampling Map/Locations

**Overall Compliance with CEMP/ EMP**

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

**5. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT**

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

**6. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)**

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

*As a minimum the results should be presented as per the tables below.*

**Air Quality Results**

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 $\mu\text{g}/\text{m}^3$	SO2 $\mu\text{g}/\text{m}^3$	NO2 $\mu\text{g}/\text{m}^3$

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 $\mu\text{g}/\text{m}^3$	SO2 $\mu\text{g}/\text{m}^3$	NO2 $\mu\text{g}/\text{m}^3$

**Water Quality Results**

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

**Noise Quality Results**

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA <sub>eq</sub> (dBA) (Monitoring Results)	
			Day Time	Night Time

**7. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS**

- Summary of follow up time-bound actions to be taken within a set timeframe.

**APPENDIXES**

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

**SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT**

Project Name  
 Contract Number

---

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
 TITLE: \_\_\_\_\_ DMA: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_ GROUP: \_\_\_\_\_

WEATHER CONDITION:

---

INITIAL SITE CONDITION: \_\_\_\_\_

CONCLUDING SITE CONDITION:

Satisfactory \_\_\_\_\_ Unsatisfactory \_\_\_\_\_ Incident \_\_\_\_\_ Resolved \_\_\_\_\_ Unresolved \_\_\_\_\_

INCIDENT:  
 Nature of incident:

---

Intervention Steps:

---

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

**Inspection**

Emissions	Waste Minimization			
Air Quality	Reuse and Recycling			
Noise pollution	Dust and Litter Control			
Hazardous Substances	Trees and Vegetation			
Site Restored to Original Condition	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

Signature

---

**Sign off**

\_\_\_\_\_  
**Name**  
**Position**

\_\_\_\_\_  
**Name**  
**Position**

**Appendix 9: Stakeholder Consultation  
Conducted in Vellore on 10-January -2018 by VCMC**

The administrative sanction has given by Principal Secretary for Municipal Administration and water supply (MC.6) Department vide GO (2D) No 5 date : 22.01.2018 to ULB for Underground sewerage scheme for vellore corporation – Phase –III – Scheme No : Estimate cost **Rs. 293 Crores.** with following funding pattern :

<b>Sanctioned Project Cost</b>	<b>Rs. 293.77 Crore</b>
As per AMRUT	Rs. 381.86 Crore
Appraised by TNUIFSL	Rs. 293.77 Crore
GOI share 50 %	Rs.124.13 Crore
GOTN Share 20 %	Rs. 49.65 Crore
ULB under own fund (10% )	Rs.29.38 Crore
Balance fund under ADB	Rs.90.61 Crore
<b>Total</b>	<b>Rs 343.69 Crore</b>

Under AMRUT scheme, the underground sewerage scheme to Vellore Corporation Phase –III has got Administrative sanction and the technical sanction is under processing. The stakeholders meeting has arranged by the commissioner and the Municipal Engineer, Vellore City Municipal Corporation on 10.1.2018 after 3.00 pm.

During the stakeholder meeting the Commissioner and Municipal Engineer has explained about the Scheme details of area coverage and wards coverage , the location of Sub- Sewage Pumping station ( 3 Nos ) ,lifting stations (7 Nos) and Pumping main routes.

List of stakeholders attended in Meeting: Presentation given by Vellore City Municipal Corporation, Vellore

<b>S.No</b>	<b>Presentation given by Vellore City Corporation ,Vellore</b>
1	Mr. Kuberan Commissioner , Vellore City Municipal Corporation, Vellore
2	Mr. T.Balasubramanian , Municipal Engineer, Vellore City Municipal Corporation, Vellore
	<b>Presentation given by UGSS Consultant</b>
2	Mr. P.M.Saravanan, Senior Design Engineer, Voyants Solutions Pvt Ltd, Chennai.
	<b>Answers given regarding Pumping station locations and land details</b>
3	Mr.M. Kannan, Town Planning Officer, Vellore City Municipal Corporation, Vellore
	<b>List local residents and welfare associations attendees</b>
1	K Assumpta Mary, No:23/A, Indira Street, Anna Nager, Tolgate, Vellore - 1.
2	V. Amutha, No:55/25, Indira Street, Anna Nager, Tolgate, Vellore - 1.
3	A. Anthony, No:24, Indira Street, Anna Nager, Tolgate, Vellore - 1.
4	R. Ramani & Ranga Nasi, No:31/1, Indira Street, Anna Nager, Tolgate, Vellore - 1.
5	Vasantha, No:7, Indira Street, Anna Nager, Tolgate, Vellore - 1.

6	Jaya Rani & Joseph, No:23, Indira Street, Anna Nager, Tolgate, Vellore - 1.
7	A R. Nadarajan, No.39, Othavaadai Street, Annanagar, Vellore - 1
8	Sjayapal, V.G Rao Nagar, Vellore - 1
9	A. Shankari, 41, Indiravethi, Annanagar, Tolgate, Vellore
10	V. Poongudi, No.48, Othavaadai Street, Annanagar, Vellore - 1
11	Kupammal, No.47, Othavaadai Street, Annanagar, Vellore - 1
12	J. Saraswati, No.1, Othavaadai Street, Tolgate, Annanagar, Vellore - 1
13	R. Dhanalakshmi, No.3, Othavaadai Street, Tolgate, Annanagar, Vellore - 1
14	Arasese Kumari, No.2, Othavaadai Street, Tolgate, Annanagar, Vellore - 1
15	Saretha S, No.6, Othavaadai Street, Tolgate, Annanagar, Vellore - 1
16	G. Sivalingam, No.5, Chinna Street,, Vasanthapuram, Vellore - 1.
17	N. Sivalingam, M/36, New Police Quarters, Phase2, Thorapadi, Vellore.
18	A Sarala, No.44, Othavadi Street, Annanagar, Tolgate, Vellore.
19	P. Bhuvaneswari, No.49, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
20	Vasantha, No.36, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
21	Sumathi, No.35, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
22	T. Suguna, No.35, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
23	Rajkumar, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
24	Ramunesai & Rathinam, No.38, Othavaadai Street, Tolgate, Annanagar, Vellore - 1.
25	M. Uma Sankar, No.66, Venkatasalapillai Street, VOC Nagar, Sankarapuram, Vellore.
26	S Jamal, No.4/3, Pillaiyarkovil Street, R V Palayam, Vellore
27	V Veni, No. 30/2, Annanagar, Othavadu Street, Vellore.
28	D Kasturi, No.25, Annanagar, Othavadu Street, Vellore.
29	S. Komathi, No.58/22, Annanagar, Othavadu Street, Vellore.
30	M. Rani, No.14/13, Annanagar, Othavadu Street, Vellore.
31	T. Mythili, No.19, Annanagar, Othavadu Street, Vellore.
32	P. Kalyani, No.9, Annanagar, Othavadu Street, Vellore.
33	M. Sumithradevi, No.6, Annanagar, Othavadu Street, Vellore.
34	D. Roselin, No.9, Annanagar, Othavadu Street, Vellore.
35	J. Ramesh, No.10, Sainahapuram, Vellore.
36	S. Kamalakannan, Janaki Mahal, Otere, Bagayam
37	S. Senthilkumar, No.21, Ottivadai Street, Annanagar (Uzaver sandai backside), Allapuram, Vellore.
38	D. Jayanthi, Annanagar, Othavadu Street, Tolgate, Vellore.
39	C. Chakravarthi, No.42, Annanagar, Othavadu Street, Tolgate, Vellore.
40	R.S, Mani. V.G Rao Nagar, Slumboard Society.
41	D. William Vedhakkan, Sakthi Nagar, Viridampet ward No.15.
42	T.S Purusothaman, V.O. Nagar, Vellore.
43	S. Janagharaj, Sainathapuram.
44	Anandhan, GHA
45	K.L.M.D Hareef, No.24/1, KAV Street, R.N. Palayam, Vellore
46	Md. Haneef, 42, Janipoonthottam, R.N Palayam, Vellore.
47	R.J Moorthi, No.L/47, Ploice Quarters, Thorapadi, Vellore.
48	A. Magbuljan, No.21, Jani Flowergarden, R.N. Palayam, Vellore.
49	A. S. Abdul Kadeer, No.19, Jani Flowergarden, R.N Palayam, Vellore.
50	Mohammed Sadique, No.22, Jani Poonthottam, R. N. Palayam, Vellore.
51	L. Vijayan, No.26, Appugowtan Street, C. A Puram, Vellore.
52	Vellikannu, No.273, Gandhi Main Road, Vellore.
53	Shanbasha, No.51 Ward, Salim Abu, Vellore.

54	G. Sampath, Konavattam.
55	M. Vasudevan, No.789, Poykar Road, Konavattam, Housing Board Association.
56	P. Jayaraman, No.22/58, Indira Vethi, Annanagar, Tolgate, Vellore.
57	B. Manikandan, No.35, Indira Veethi, Anna Allapuram, Vellore.
58	A. Madhavan, No. M27, New Police Quarters Association, Thorapadi 2.
59	M. Murugan, No. 13, Othavadi Street, Annanagar (East), Tolgate, Vellore.
60	A. Antonyraj, General Secretary No.1, Shanmuga Nagar, Welfare Association, Thorapadi, Vellore - 632002.
61	S. Dhinakaran, No.52, Nethaji Strret, Chinna Allapuram, Vellore.
62	D. Venkatesan, No.22/27, Indra Strret, Annanagr, Tolgate, Vellore 632001.
63	K. Gunasekaran S/o, K. Kannan, No.8, Kutthander Kvil Street, Iddaiasathu, Vellore 46.
64	A. Ganeshkumar, S/o, Arumugam, Iddaiyarn , Vellore 46.
65	T. Ganeshkumar, S/o, Thandavarayan(Ex. Counselor), Ashokar Vethi, Vellore 46.
66	K. Ravikumar, No.12, Othavadi Street, Annanagar, Togate, Vellore.
67	K. Surya Achari, Ex. M.C, 41 Ward.
68	S. Sundar, Pilliyarkovil Street, Jani Poonthotham.
69	Rathishkumar, Thoraipadi.
70	Ramkumar, Thoraipadi.
71	Vasanthkumar, Pooniammamn Koil Street.
72	M. Subramaniyan, katpadi Muththziah Housing Board Association.
73	G. Anbu, Ex. MC, 42nd Ward, Palavansathu.
74	P. Madhan, No.1/23, 3rd ramset Nagar, Thoraipadi, Vellore. C.R. Palazhi, S/o. Rajagopal, No.2/112, Ancheneyar Koil Strret, Chithare, Vellore.
75	C.R. Palani, S/o. Rajagopal, No.2/112, Ancheneyar Koil Strret, Chithare, Vellore.
76	J. Ayyupkan, S.L.A Street, R.N Palayam, Vellore.

### Details of discussion

1 R.S, Mani. V.G Rao Nagr, Slum board Society.

S.No	Questions	Answers
1	What is the minimum and maximum pipe diameter considered for this scheme ?	200 mm to 900 mm diameter is designed and the same has to be considered for execution also.
2	What is maximum depth considered and kindly confirm the safety measures ?	The excavation depth is restricted to 6m and the shoring and strutting are considered and through-out excavating length barricading is considered for safety measures.

2. V Veni, No. 30/2, Annanagar, Othavadu Street, Vellore.

S.No	Questions	Answers
1	What is duration of the scheme and when it will start?	The execution period is 3 years
2	The House service connection, from outlet of building to Compound wall ( inside premises ) also to be considered under this contract work.	In this UGSS Phase –III scheme, inside premises also HSC pipe line will be laid by contractor.



## 3. K. Ravikumar, No.12, Othavadi Street, Annanagar, Togate, Vellore.

S.No	Questions	Answers
1	The construction quality should be maintained properly.	Corporation is arranging Project Management Consultancy for this Phase –III scheme. So Corporation and PMC will closely monitor the quality of the works.
2	Safety measures to be considered while executing the works	While execution of work , the traffic diversion and safety measures like providing barricading system also be considered to minimize the disturbance of local residents.
3	The treated sewage should meet the effluent standards.	The appropriate modernize technology is proposed, considering techno-economic analysis and meet out latest effluent standards (CPCB).

## 4. S. Dhinakaran, No.52, Nethaji Strret, Chinna Allapuram, Vellore.

S.No	Questions	Answers
1	The stone-ware pipes shall not be used for sewerage scheme.	The stone-ware pipes and RCC pipes are not considered for this scheme.
2	Manhole cover should be strong.	Heavy duty manhole covers is considered in the BOQ and same will be provided at site. .
3	The quality of pipe line should be double checked.	Including pipeline, manhole cover and other material will be checked in factory test as well as by third party inspection party also . Hence quality of pipe lines and others materials will be checked and will be used for execution.
4	Once pipe line works has over, the excavated trench in the road has to be refilled.	After completion of hydraulic test for the laid pipe line, the excavated trench will be refilled immediately by contractor.

## 5. CNR. Srinivasan, Vellore

S.No	Questions	Answers
1	While doing sewerage scheme , the other utilities like potable water supply works , side storm water drain , telephone cables etc should not be disturbed and affect local residents.	Before the starting the excavation works , contractor will do trial pits at frequent interval of proposed pipeline alignment to identify other utilities (i.e. Water supply line ,telephone cables) passing through road.. the utilities getting damaged while doing works will be restored by the contractor
2	The road restoration has to finish once pipe lines works has finished and the manhole cover has to be leveled with road surface level.	Contractor will do similar way .PMC and Corporation will monitor road restoration works also

## 6. K. Ravikumar, No.12, Othavadi Street, Annanagar, Togate, Vellore.

S.No	Questions	Answers
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1	Kindly select qualified contractor. The contractor should not give sub-contract.	Both experience-wise and financial-wise qualified contractor only will consider for this works.
2	Definition of sewage?	Sewage also called domestic sewage contains human wastes and wash water from public buildings ,commercial including spent water from bathrooms ,kitchen, wash basin sinks and human excreta

7 L. Vijayan, No.26, Appugowtan Street, C. A Puram, Vellore.

S.No	Questions	Answers
1	Manholes has to locate in the middle of the road	Yes. Manhole will be located in the middle of the road. HSC will be connected fom houses to Manholes.
2	scheme to has to be finished within stipulated time	Corporation arranging Project Management Consultancy for this UGSS Phase –III scheme. So Corporation and PMC will closely monitor the works and will be completed within period ( 3 Years).

8. A. Madhavan, No. M27, New Police Quarters Association, Thorapadi 2.

S.No	Questions	Answers
1	While execution of works, the traffic diversion and safety measures has to considered.	While execution of work , the traffic diversion and safety measures like providing barricading system also be considered to minimize the disturbance of local residents.

### Consultation Workshop Photographs






**வேலூர் மாநகராட்சி**

பாதாள சாக்கடை திட்டம் பகுதி-3 பொது மக்கள் கருத்து கேட்பு  
கூட்டம் நாள்.10.01.2018

வ.எண்	பெயர் மற்றும் முகவரி	கைபேசி எண்.	கையொப்பம்
1.	K Assumpta Mary No: 83/a Indira Street Anna Nagar, Tolgate Vellore 1	9944847627	K. Assumpta Mary
2.	V. Amutha NO: 55/35 Indira Street Anna Nagar, Tolgate Vellore 1	9600277224	V. அமுதா
3.	A. Anthony No: 24, Indira Street Anna Nagar, Tolgate Vellore 1	9894922360	A. Saverimani.
4.	R. Ramani & Ranga Redi No: 31/1, Indira Street Anna Nagar, Tolgate Vellore 1	9944966012	R. ரமணி
5.	Vasuntha NO: 7, Indira Street Anna Nagar, Tolgate Vellore 1	9790513416	வசுந்தா
6.	Jaya Rani & Josep, NO: 23 Indira Street Anna Nagar, Tolgate Vellore	9994891214	M. ஜெயரணி
7.	R. ரமணி & ரங்கா ரெடி 31/1 இலாண்ட் இந்திரா சாத்திரி அண்ணா நகர்	8608705266	R. ரமணி
8.	சு. ஜயராஜ் V. கு. ராஜ் வாலா. Vellore 7	94425 74437	சு. ஜயராஜ்

9.	A. சந்திரி 41. சிவசிகாமல் செய்யலி செய்யலி	9840650873	A. சந்திரி
10.	V. பூங்கோடி 49. இத்தழவை தெரு செய்யலி மதுகை செய்யலி	9894796857	V. Poongodi
11.	செய்யலி 47. இத்தழவை தெரு செய்யலி மதுகை செய்யலி	9791499065	செய்யலி
12.	J. சரசுவதி NO: 1 இத்தழவை தெரு செய்யலி மதுகை செய்யலி	9487321594	S. Saraswathi
13.	R. சரசுவதி NO: 3 இத்தழவை தெரு செய்யலி மதுகை செய்யலி	7708072119	R. Saralathi
14.	செய்யலி NO: 2 இத்தழவை தெரு செய்யலி மதுகை செய்யலி		R. Saralathi
15.	S. சரசுவதி NO: 6 இத்தழவை தெரு செய்யலி மதுகை செய்யலி	9842381152	S. Saritha
16.	G. சரசுவதி NO: 5 இத்தழவை தெரு செய்யலி மதுகை செய்யலி	9626715735	G. Saralathi
17.	N. சரசுவதி M/36 4 இத்தழவை தெரு செய்யலி மதுகை - 2 செய்யலி மதுகை	9894628402	N. Saralathi

18.	A. சீராம NO, 44 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்	9791731682	A. சீராம
19.	P. யஸோதா NO, 49 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்	9994027269	P. யஸோதா
20.	யசந்தா NO, 36 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்		யசந்தா
21.	சுமத்ரி NO, 35 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்		சுமத்ரி
22.	T. சிவசுமதி NO. 27 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்	9092144366	
23.	ராஜசுமதி சிவகாமநகர், பெரும்பேட்டை, வேலூர்		
24.	ராஜசுமதி NO 38 ஒத்தியாடைபுத்தூ, சிவகாமநகர், பெரும்பேட்டை, வேலூர்	9600426925 9344468647	ராஜசுமதி
25.	Rtn. M. Uma Sankar 66, Venkata Saha Pillai St. V.O.C Nags. Sankarapaly, V.R.	9443294761	M. <u>Uma</u>
26.	S Saji 4/3 அண்ணாதுறை Ravuntharavali வேலூர்	9597730977	S Saji

27.	V. Venu	30/2, Anna Nagar Othavada Street	
28.	D. Kasthuri	25, Anna Nagar Othavada Street	
29.	S. Komathi	58/22, Anna Nagar Othavada Street 9566539566	S. Komathi
30.	M. J. Ramesh	93450/0436 19, Sainathampalayam Vellore	M. J. Ramesh
31.	T. Lakshmi	638037449 19, Sainathampalayam Vellore	T. Lakshmi
32.	P. Kalyani	9629909873 No. 9, Sainathampalayam Vellore	P. Kalyani
33.	M. Sumithra Devi	No: 6 Othai Vada Street Anna Nagar Tolgate (748605201) Vellore - 1	M. Sumithra Devi
34.	D. Reddi	No. 9, Othavada Street Anna Nagar, Tolgate, Vellore.	D. Reddi
35.	J. Ramesh	10, Sainathampalayam Vellore.	

36.	D. Kamalakannan JANAKI MAHAJ STEREI Bagayam 9894127577	9894127577	D. Kamalakannan
37.	S. SENTHILKUMAR, 21, Ottivada Street Anna Nagar (Uzaversandai Back Side) ALLAPURAM, V.R.	9994041140 8428077544	S. Senthil
38.	D. SANYANTHI Ottivada Street Anna Nagar Tol 34 - Vellore	9893538686	D. Thabari
39.	C. Chakravarthi 21/2, Ottivada Street Anna Nagar Tol 34 - Vellore		K. G. S. S.
40.	DR. J. J. JOSEPH, M.B.B.S., V.G. Road 1565, Chennai 600 015	9443099847	J. J. Joseph 15/01/2018
41.	D. William Vedlakka Sakthi Nagar, Vindampet ward no. 15	9467511738	D. W. V. 10/01/2018
42.	T. S. Y. Srinivasan M.A. Srinivasan Srinivasan 2-2 Srinivasan Srinivasan	9843797516	T. S. Y.
43.	S. Srinivasan Srinivasan	8144476760	S. Srinivasan
44.	Srinivasan Srinivasan Srinivasan	9677339070	Srinivasan Srinivasan

45.	K. L. M. D. Haniff, MC 2411, K. AV. ST. R.N. PALAYAM VELLORE.	9443032412	
46.	I. Md. HANEEF 42, JANI POONTHOTTAM R.N. PALAYAM. VLR.	9442557865	
47.	R. J. MOORTHY L/47 POLICE QUARTERS THORAPADI VELLORE - 2	9791645799	R. J. moorthy.
48.	A. MACBULJAN NO. 21, JANI FLOWER GARDEN R.N. PALAYAM Vellore	9883182601	
49.	A.S. Abdul Kader, NO. 19, JANI FLOWER - GARDEN, R.N. PALAYAM, VELLORE.	9791718874	A.S. K
50.	Mohammed Salim 22, JANI POONTHOTTAM R.N. PALAYAM. VLR.	9443350937	
51.	L. 275 uam (2004/2005) 26. 21/2/2005/2005/2005 S. A. Y. S. C. S. S.	9840932707	
52.	273. 21/2/2005/2005/2005 S. A. Y. S. C. S. S.	8695608469	V. S. S. S. S.
53.	51. 21/2/2005/2005/2005 S. A. Y. S. C. S. S.	9994924943	



54.	<p>சி. சிவசுந்தரி                  27 மலர் வீதி                  அண்ணாபுரம்</p>	9789781257	G. Sampak
55.	<p>M. சந்திரசேகரி                  789 அண்ணாபுரம்                  அண்ணாபுரம்                  அண்ணாபுரம்</p>	9994516736	M. Chandrasekari
56.	<p>P. சிவசுந்தரி,                  22/57 அண்ணாபுரம்                  அண்ணாபுரம்</p>	9943620811	P. Chandrasekari
57.	<p>B. சிவசுந்தரி                  No. 35, அண்ணாபுரம்                  அண்ணாபுரம்</p>	8056838147	B. Chandrasekari
58.	<p>A. மதுரை                  No. 27, அண்ணாபுரம்                  அண்ணாபுரம்</p>	9442626403	A. Madurai
59.	<p>M. முருகன்                  No. 13, அண்ணாபுரம்                  அண்ணாபுரம்</p>	8148339929	M. Murugan
60.	<p>A. ANTONY RAJ                  GEN. SECRETARY-NO:1                  Shanmuga Nagar Welfare Area                  THE RAPADI                  VELLORE-632002</p>	9994049015	A. Antony Raj
61.	<p>S. சிவசுந்தரி                  No. 52, அண்ணாபுரம்                  அண்ணாபுரம்</p>	9566771979	S. Dinakaran
62.	<p>D. Venkatesan                  No. 22/27, அண்ணாபுரம்                  அண்ணாபுரம்</p>	9894832375	D. Venkatesan

63.	K. @ Emerson St K. Emerson No 8. @ jmil ni Cam... @ ... 46	9443803683	K. Emerson
64.	A. @ ... 127 P.K.A. @ @ ...	9994126667	A. @
65.	T. @ ... @ ... @ ...	9367754175	T. @
66.	K. Ravikumar. No 12 Othavadi Street. Annapuram - Tolgati - 1	9952260908	Jayal
67.	K. @ ... Ex. M.C. 41 St	9443262948	K. @
68.	S. @ ... @ ...	9009442418	S. @
69.	Rathish Kumar Thiruvadi	9952388648	Rathish Kumar
70.	Ramesh Kumar Thiruvadi	8668835299	Ramesh Kumar
71.	Vasanth Kumar Ponnambalapuram St	9794432033	V. U.

	೧೨೫ನಿ ಲೆಕ್ಕಿ ಕರಾರಿ	೧೨೫ನಿ ಲೆಕ್ಕಿ ಕರಾರಿ	ಸಹಾಯಕಿ
72.	M. K. S. Lakshmi B. S. Lakshmi N. S. Lakshmi N. S. Lakshmi - Mysore	9940132561	M. Subramanyam
73.	G. S. Lakshmi MC EX 42-2 Lakshmi Lakshmi 2 Lakshmi Lakshmi Lakshmi	9894363699	G. S. Lakshmi
74.	P. Madhan Y. S. Ram S. S. Madhan Madhan - Mysore	9952118816	P. Madhan
75.	C. R. Lakshmi S/O S. R. Lakshmi S/O S. R. Lakshmi Lakshmi S. R. Lakshmi Lakshmi	9443103899	C. R. Lakshmi
76.	J. S. Lakshmi S/O N. S. L. A. S/O R. N. Palayam, V. H. H.	9894682409	J. S. Lakshmi
77.			
78.			
79.			
80.			



**Appendix 10: Public Consultation  
Conducted in Vellore on 23 -October -2018 by VCMC  
Venue : Thiruvalluvar Nagar, Kangaiyanalur Road & Saduperi Road, Vellore.**

Under AMRUT scheme, the underground sewerage scheme to Vellore Corporation Phase –III has obtained administrative sanction<sup>12</sup> and the technical sanction is under processing. As per the UGSS design proposed for the scheme, it was proposed to install three Sewage Pumping Stations (SPS) at various locations for pumping the sewage to the STP. Out of which two SPS (2A and 8) are proposed to be located in a burial ground at Kangaiyanalur and Saduperi respectively. However, it was strongly objected by the local communities and hence, the VCMC has organized a public consultation meeting on 23.10.2018 in Thiruvalluvar Nagar, Kangaiyanalur Road & Saduperi Road, Vellore to get feedback from the community to do necessary alteration in the plan. The Consultation has been preceded by the Commissioner and the Municipal Engineer, Vellore City Municipal Corporation.

**List of stakeholders attended the meeting:**

Sl.no	Name	Designation
1	Mr. Vijaya Kumar ,	Commissioner, Vellore City Municipal Corporation, Vellore
2	Mr. Jegadesan	Municipal Engineer, Vellore City Municipal Corporation, Vellore
3	Mr.M. Kannan,	Town Planning Officer, Vellore City Municipal Corporation, Vellore
4	Mr. Madhi	Town Planning Inspector, Vellore City Municipal Corporation, Vellore
5	Mr.Ravi,	Assistant Engineer, Vellore City Municipal Corporation, Vellore
6	Mr.Armugam,	Overseer, Vellore City Municipal Corporation, Vellore
7	Mr. Selvaraj ,	Overseer, Vellore City Municipal Corporation, Vellore
8	Mr.M.Thiyagu	Design Engineer, Voyants Solutions Pvt Ltd, Chennai

**Details of Public consultations held on 23<sup>rd</sup> October, 2018**

The Commissioner and Municipal Engineer have explained the details of the proposed UGSS Scheme (including the area coverage, wards coverage, location of Sewage Pumping Station 2 and 8) to the local community, who had attended the meeting.

<sup>12</sup> The administrative sanction is given by Principal Secretary for Municipal Administration and water supply (MC.6) Department vide GO (2D) No 5 date : 22.01.2108 to ULB for Underground sewerage scheme for Vellore City Municipal Corporation – Phase –III

**Consultation 1: Govt. School, Thiruvallur Nagar, Kagaiyanallur, Vellore at 11.00am**

Sewage Pumping Station # 2, which was proposed inside the Kagaiyanallur graveyard, has been objected by the local community due to the Mayana Poojai celebration/ festival which is being held inside the graveyard. They have requested the VCMC to look for an alternative location. They have even suggested an alternate location, which is opposite to the graveyard. Accordingly the VCMC commissioner along with other officials and the local people have visited the alternate site. The commissioner has further instructed the officials to verify the land ownership details and classification of the land to do the needful.

Sl.no	Query raised by public	Clarification given by the officials
1.	During commissioning of the project whether odour problem will arise from the pumping station	In this scheme, Odour control devices are proposed in the SPS and hence the odour problem will be controlled at the source itself. Moreover, trees will be planted surrounding the SPS units, which will even reduce the odour intensity. Hence the odour nuisance will not be significant at any of the SPS locations
2.	When will the scheme be completed	The scheduled period of completion is within 36 months (3 years)
3.	Awaiting for this sewerage scheme for the long periods and kindly finish the works at the earliest and reduce disturbance of local residents while executing the works.	While executing the construction works, the traffic diversion and safety measures shall be adopted (i.e.) Barricading the trenches, safety instruction signages, diversion boards shall be placed in the construction site to minimize the disturbance to local residents.
4.	Which are the areas covered in this scheme	Gandhi nagar, Kumaran nagar, Jyothi nagar, V.G. Rao Nagar, Gajaraja nagar Bhavani Nagar etc.,
5.	The open area, which is available in the Burial Ground is used for conducting Mayana Poojai during Siva Rathiri and also it will be used for Burial purpose.	Noted. Alternative site will be identified.
6.	Which are the others areas, where the generated sewage would be collected in this SPS	Old katpadi, Golden Nagar and Venkatraman nagar areas are also considered in this SPS-2
7.	Kindly provide separate SPS for those areas in their location itself. Do not bring their waste into our SPS.	Providing separate SPS at various locations is not feasible either Technically or economically. The proposed SPS shall have odour control devices and the SPS shall be covered by Tree plantation for further reducing the odour intensity and hence, the odour nuisance will be very much controlled.
8.	What are the units that will be constructed in sewage pumping station	Screen well, Grit well, Pump well security room and DG sets will be provided in sewage pumping station.

**Attendance Sheet for the Consultation held at Govt. School, Thiruvallur Nagar, Kagaiyanallur, Vellore at 11.00am**

உள்ளே க்குப் பங்குபெற்றோர்		
முகவர்	தொலைபேசி (10)	கையொப்பம்
1. N. சீவானி சி. சி. சி. சி. சி. சென்னை	5-4331 மெட்ராஸ் தொலைபேசி அலுவலகம் சென்னை - T 936032-9345	
2. N. சிவசுந்தரி சி. சி. சி. சி. சென்னை	NO: 18. சிவசுந்தரி தெரு - சென்னை 600 035 தொலைபேசி - T.V. Nagar 90035 82188	N. Sivashankari
3. T.N. சிவசுந்தரி சென்னை	NO: 16. சிவசுந்தரி தெரு சென்னை 600 035 9994106702	T.N. Sivashankari
4. D. சிவசுந்தரி சி. சி. சி. சி. சென்னை	12/8 4950 056. சிவசுந்தரி தெரு சென்னை - 600 007. Cell - 8754147613	D. Sivashankari
5. சி. சி. சி. சி. சென்னை	26/2 சிவசுந்தரி தெரு சிவசுந்தரி தெரு சென்னை Cell. 9994825459	
6. E. சிவசுந்தரி சென்னை	113 சிவசுந்தரி தெரு சென்னை 9345051665	E. Sivashankari
7. D. சிவசுந்தரி சென்னை	தொலைபேசி 8870200773	

8.	P. Gnanapavan T: E L	6. Jothilaya T. V. Ramin 944 3913 226	P. Anand
9	D. RUBAN, B.E	No. 21 Jothilaya Main road (8056907859)	D. R.
10.	J. Anand D. Ramin. Ex MC	Bharathi St. road P. N. Nagar Kotpady திருவிழாவின்படி	D. Ramin

Public Consultation Snap Shots (October 23, 2018 at 11.00am)





**Consultation 2: R.N.Palayam, Sathuperi Road, Vellore at 3.00pm**

The proposed SPS # 8 in the existing slaughter house has been welcomed by the local public and they have given their consent for the construction

Sl.no	Query raised by public	Clarification given by the officials
1.	Why Corporation is converting Slaughter-house building to sewage pumping station.	Slaughter-house is not in use for more than 4 years and due to the constraints in land availability for the construction of SPS, it was decided to construct the SPS in the slaughter house area
2.	When the scheme will be completed and Commissioned	The schedule period of completion is within 36 months (3 years)
3.	Which are the areas covered by this sewage pumping station ?	KK nagar, jevan Nagar, MGR Nagar , Kamaraja Nagar , Periya Allapuram , Rahima Nagar

**Attendance Sheet for the Consultation held at R.N.Palayam, Sathuperi Road, Vellore at 3.00pm**

Sl.no	Name	Address	Contact No.	Signature
1.	Subir	Subir Sathuperi Road		[Signature]
2.	K. Sathish		99 5279 6076	[Signature]
3.	Uthappa		86 8282 8084	[Signature]
4.	N. Chitra	Pillayar Koil Street		[Signature]
5.	J. Kalmani			[Signature]
6.	S. Ganesh			[Signature]
7.	Subir			[Signature]
8.	K. Sathish			[Signature]

M. SURESH		
P. சிவசுப்பிரமணியன்		M. சிவசுப்பிரமணியன்
V. SARATH KUMAR		V. Sarath
P. Sivakumar		P. Sivakumar
N. சிவசுப்பிரமணியன்		N. சிவசுப்பிரமணியன்
T. Anand		T. ANAND
J. கதிர்		J. கதிர்

NAME	PHONE NO.	NAME
அலகி P. சிவசுப்பிரமணியன்	9790419650	அலகி P. சிவசுப்பிரமணியன்
ச. சிவசுப்பிரமணியன்	9626569503	ச. சிவசுப்பிரமணியன்
T. சிவசுப்பிரமணியன்	9994439910	T. சிவசுப்பிரமணியன்
T. சிவசுப்பிரமணியன்		T. சிவசுப்பிரமணியன்
V. சிவசுப்பிரமணியன்	9787338804	V. சிவசுப்பிரமணியன்
V. சிவசுப்பிரமணியன்	978733804	V. சிவசுப்பிரமணியன்
M. சிவசுப்பிரமணியன்	9791687518	M. சிவசுப்பிரமணியன்

## Public Consultation Snap Shots (October 23, 2018 at 3.00pm)



## Leaflet distributed in the local community (local language)


**வேலூர் மாநகராட்சி**


திருவள்ளூர் நகர் (காங்கேயநல்லூர் சாலை)  
 பாதாள சாக்கடை திட்ட கழிவு நீர்  
 ஏற்று நிலையம்  
**பொதுமக்கள் கருத்து கேட்பு**  
**மற்றும் ஆலோசனை கூட்டம்**  
 நாள்: 23.10.2018                      நேரம்: காலை 11.00 மணி  
 ஆணையாளர்  
 வேலூர் மாநகராட்சி

## Newspaper Clippings of October 24, 2018 about public consultations

கல்லறை தோட்டம் வழியாக  
பாதாள சாக்கடை அமைக்க பொதுமக்கள் எதிர்ப்பு

காட்பாடி, அக்.24-  
வேலூர் மாநகராட்சி சார்பில் காட்பாடியில் பாதாள சாக்கடை திட்டம் செயல்படுத்தப்பட்டு வருகிறது. திருவள்ளூர் நகருக்கு காங்கேயநல்லூர் சாலையேராம் உள்ள கிறிஸ்துவ கல்லறை தோட்டம் வழியாக பாதாள சாக்கடை திட்டம் கொண்டு வர திட்டமிட்டதாக கூறப்படுகிறது. இதையறிந்த அப்பகுதி இதற்கு கடும் எதிர்ப்பு தெரிவித்தனர். மேலும் அப்பகுதி மக்கள் கலெக்டர் ராமனிடம் இதுதொடர்பாக மனு அளித்திருந்தனர்.

இந்த நிலையில் நேற்று வேலூர் மாநகராட்சி கமிஷனர் விஜயகுமார், உதவி கமிஷனர் மதிவாணன், நகர்நல அலுவலர் மணிவண்ணன் மற்றும் அதிகாரிகள் அப்பகுதி மக்களிடம் பேச்சுவார்த்தை நடத்தினர். அப்போது பொதுமக்கள், கல்லறை தோட்டம் வழியாக பாதாள சாக்கடை திட்டம் நிறைவேற்றுவதற்கு எதிர்ப்பு தெரிவித்தனர். அதனால் பேச்சுவார்த்தை தோல்வியடைந்தது.

இதையடுத்து மாநகராட்சி அதிகாரிகள் சம்பந்தப்பட்ட இடத்துக்கு நேரில் சென்று ஆய்வு செய்தனர். அப்போது அப்பகுதி பொதுமக்கள் கல்லறை தோட்டம் அருகே மாநகராட்சிக்கு சொந்தமான இடம் உள்ளது. அதன் வழியாக பாதாள சாக்கடை திட்டத்தை நிறைவேற்றுங்கள் என்று கோரிக்கை விடுத்தனர்.