Draft Initial Environmental Examination

Project Number:
July2018

IND: Tamil Nadu Urban Flagship Investment Program – Underground Sewerage System for Ambur Municipality(wards - 36 Nos, Sewerage zones - 4 Nos)

Prepared by TamilnaduWatersupply And Drainage Board on behalf of Ambur Municipalityfor the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 1September 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
CMSC	–	Construction Management and Supervision Consultant
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
ESZ	–	Eco Sensitive Zone
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
PPTA	–	Project Preparatory Technical Assistance
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
TWADB	–	Tamil Nadu Water and Drainage Board
WHO	–	World Health Organization
OH&S	-	Occupational Health and Safety

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.

TABLE OF CONTENTS

List of Appendices

Tables

Figures

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.**Ambur, located in the central northern part of Tamil Nadu, in Vellore District. In this subproject to be implemented under the ADB funded TNUFIP, it is proposed to provide underground sewerage system of Ambur Municipality. Subproject includes the following civil works components: (i) sewage collection system (112.503 kilometre (km) length of sewers, 4024 manholes), (ii) 01 no of lift station, (iii) 01 no of Sub Pumping Station, (iv) 01no of Main pump station, (v) sewage treatment plant (STP) of 16.71million litres per day (MLD) capacity, and (vi) 18,387house 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. 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, and comprising dedicated full-time staff from TNUIFSL for overall project and financial management. The implementing agencyis Tamil Nadu Water Supply and Drainage Board (TWAD). A project implementation unit(PIU) will be established in TWAD headed by a full-time Project Manager (Executive Engineer or above) and comprising dedicated full-time staff of the TWADfor day-to-day implementation of the project.Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL will have overall responsibility of safeguard compliance with EMP and EARF. ULB Safeguards Officer will coordinate monitoring and implementation of safeguards. Environmental expert from TWAD Board will assist PIU in implementation of project in compliance with EMP and EARF, and will carry out all necessary tasks.

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.

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. An initial environmental examination (IEE) is required.

7. Description of the Environment. Ambur Municipality is a Ist grade Municipality in Vellore district of Tamil Nadu lies at a latitude of 12^0 78'N and longitude of 78^0 62'E. It is situated at 52 KM from Vellore Town. The Ambur Town is surrounded at with Somalapuram Panchayat in North Solur Panchayat in South Naikkeneri Panchayat in East and Palar river in West. The Town is located along Chennai – Bangalore National Highways road. The Town is located 316.00 m above mean sea level. Ambur has Tropical wet and dry climate, reaching high temperatures during summer and experiences wet winters. The area also experiences light rain fall during South East monsoon. But to its tropical and sub tropical climate Mangoes, Ground Nuts, Coconut and Jasmine are cultivated in and around Town. The mean maximum and minimum temperatures during summer and winter varies between 42℃ and 13℃. Highest temperature ever recorded is 43℃ and lowest is 11 ℃. The humidity ranges are 38% – 61% during summer and 65% – 84% during winter. The maximum rain fall occur during September, October and November through North East monsoon.The area experiences rain fall during the South West monsoon as well. The average annual rain fall is 1000mm. The wind direction is usually predominate towards South West. During winter it is from North to East, in summer from South to West. Topography of the town is mostly Plain with having moderate slope from South to North towards Palar river.

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 and are produced because the process is invasive, involving excavation and earth movements.

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.

11. Sewage pumping and lifting stations, which collect sewage to further pump to a higher elevation manhole, pump station or STP, are likely to generate odour. Although utmost care is taken to locate these away from the houses, due to design considerations and land constraints, only SPS siteis located close to the houses, for which necessary provision for odor control measures were given in the Estimate. Another impact is that of STP operation: 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. 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.

12. 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, and design and operation measures to prevent odour build up; standard operating procedures for operation and maintenance; imparting necessary training; safety and personal protection equipment for workers, measures to maintain the STP treatment efficiency, and development of green buffer zone around the STP etc.,

13. 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 and STP) 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.

14. **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.

15. The EMP is included in the bid documents to ensure compliance withthe 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.

16. **Consultation, disclosure and grievance redress mechanism.** The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at Municipality level, after which views expressed were incorporated into the IEE. The IEE will

be made available at public locations and will be disclosed to a wider audience via the ADB,Ambur Municipality 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.

17. **Monitoring and Reporting.**Contractor will submit a monthly EMP implementation report to PIU. PIU, with the assistance of Ambur Municipality, will monitor the compliance of Contractor, prepare a Quarterly Environmental Monitoring Report and submit to PMU. The PMUwill 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 ambur municipality and TNUIFSL websites

18. **Conclusions and Recommendations.**Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STP requires consent to establishment (CTE) and consent to operate (CTO) from Tamil Nadu Pollution Control Board (TNPCB). This IEE shall be updated by PIU during the implementation phase to reflect any changes, amendments 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.**13 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.

Output 3:Institutionalcapacity, 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. The area of the town, as per local body records is 17.97Sq.Km. The total length of the street is about 120 KM . The total area of the town is divided into 36 wards. Topography of the town is moderately sloped from South(+322.00m) to North(+305.00m) towards Palar river. The Town is located at an average elevation of 316.00 m above mean sea level. Ambur has Tropical wet and dry climate, reaching high temperatures during summer and experiences wet winters. The area also experiences light rain fall during South East monsoon. But to its tropical and sub tropical climate Mangoes, Ground Nuts, Coconut and Jasmine are cultivated in and around Town. Proposed subproject includes: (i) sewage collection system (112.503 kilometre (km) length of sewers, 4024 manholes), (ii) 01 no of lift station, (iii) 01 no of Sub-pumping station (iv) 01 no of Main pump stations, (v) sewage treatment plant (STP) of 16.71 million litres per day (MLD) capacity, and (vi) 18387 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 (REA) for Water Supply (**Appendix 1**). Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show 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. This IEE is based on the detailed project report prepared by TWAD Board for AmburMunicipality, 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. The area of the town, as per local body records is 17.97 sq. km.. The total length of the street is about 120 KM . The total area of the town is divided into 36 wards in Vellore District in the northern part of Tamil Nadu State (Figure 1). Total population of project area is 1,29,100 (design base population of 2020)

B.Existing Sewerage System

9. Ambur, a fast growing town, is not having underground sewerage system. The town is provided with open drains in the main area of the town. The open drains are constructed on the sides of the roads / streets. The waste water generated from the town is collected through the main drain along the roads / street.

10. The waste water discharged into these drains including the sullage water from kitchen and bathroom of the houses. Waste water from all the open drains is discharged into the nearby lake and ponds. Most of the latrines in this town are flush type. Considerable number of latrines is flushed out directly to street drains without any treatment. As the sewage is let into unprotected open ponds the quality of ground water gets contaminated very easily.

Necessity for implementing sewerage system:

11. The existing open drain system is not functioning satisfactorily. The water is stagnating in many places and which mosquitoes and flies are developed, which cause many diseases and creates unhygienic condition. Therefore, underground sewerage system is a must for Ambur town.

Proposed UGSS system:

12. As per the Govt. directions, UGSS is to be provided to each town in a phased manner in next three years. In the proposal, the anticipated population for the year 2035 and 2050 has been worked out as 155,000 and 183,100 respectively. The water supply rate of 135 lpcd has been considered in the design for working out the total sewage generation including infiltration per CPHEEO norms.

13. Ambur Municipality is the responsible agency for providing basic urban services including sewerage in the Municipality, and is the implementation agency for this subproject. Detailed project report for the underground sewage scheme in Ambur Municipality has been prepared by Tamil Nadu Water and Drainage (TWAD) Board.

Figure 1: Location of Subproject

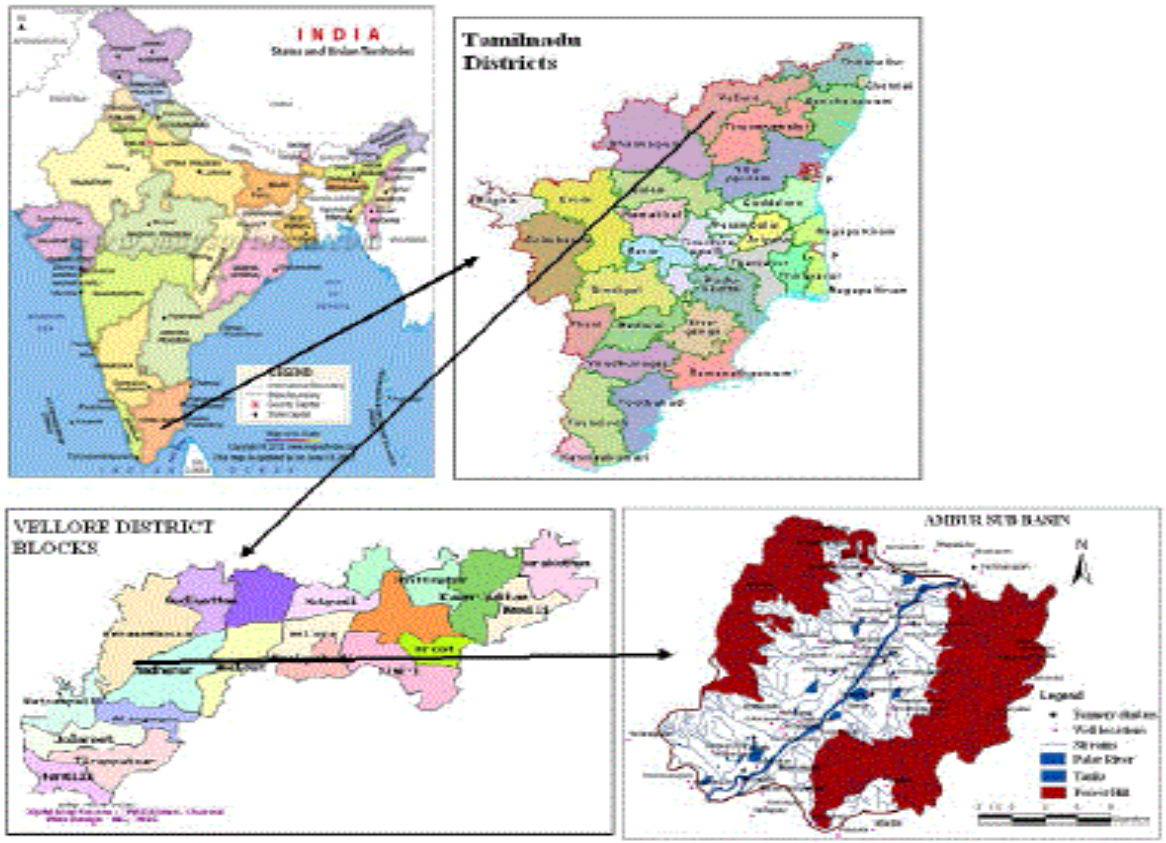


Fig. 1 Location map of Ambur sub basin

C. Proposed Project

14. Following Table shows the nature and size of the various components of the project. Location of project components and conceptual layout plans are shown in Figure 2 to Figure 5. System is designed as a separate underground system catering only to domestic wastewater; storm runoff generated during rains 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. System is designed 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 have been introduced to optimize the system design.

Table 1:Proposed Water Supply Subproject Components

<table>
<tr><th>Infrastructure</th><th>Function</th><th>Description</th><th>Location</th></tr>
<tr><td>Sewer network</td><td>Collect wastewater from houses and convey by a combination of gravity and pressurepumpingto the STP</td><td>New
112.503 km;
200-350 mm dia: DWC (double walled corrugated) pipes (10.039 km)
250-700 mm dia: CI (cast iron) pipes (11.012 km)
200mm-Upvc pipes: (91.452 km)

<table>
<tr><th>Type of Pipe</th><th colspan="2">Length</th></tr>
<tr><td>uPVC</td><td colspan="2"></td></tr>
<tr><td>200 mm</td><td>91452</td><td>m</td></tr>
<tr><td>DWC</td><td colspan="2"></td></tr>
<tr><td>200 mm</td><td>7913</td><td>m</td></tr>
<tr><td>250 mm</td><td>1316</td><td>m</td></tr>
<tr><td>300 mm</td><td>810</td><td>m</td></tr>
<tr><td>CI LA CLASS S/S PIPE</td><td colspan="2"></td></tr>
<tr><td>250 mm</td><td>1522</td><td>m</td></tr>
<tr><td>300 mm</td><td>1145</td><td>m</td></tr>
<tr><td>350 mm</td><td>680</td><td>m</td></tr>
<tr><td>400 mm</td><td>822</td><td>m</td></tr>
<tr><td>450 mm</td><td>480</td><td>m</td></tr>
<tr><td>500 mm</td><td>1968</td><td>m</td></tr>
<tr><td>600mm</td><td>200</td><td>m</td></tr>
<tr><td>700 mm</td><td>100</td><td>m</td></tr>
</table>

Manholes
3411 nos (brickwork)</td><td>Sewers will be laid underground in the roads and internal streets in the project area.</td></tr>
</table>

Infrastructure	Function	Description	Location
		613 nos (reinforced cement concrete)	
Sewage lift stations (LS)	Collect sewage from low level sewer and pump to higher sewer or to pumping stations	1 no *Components of LS* • Collection well of dia 2.30 m and depth 8.37 m (closed) with a vent pipe • Non-clog submersible pump sets • Control panel box	Lift well will be constructed on the road shoulder (and in the road itself when there is no earthen shoulder) 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 station isproposed at Zone 1A.
Sewage pumping station (SPS)	Collect sewage and pump to main pumping stations	1 No *Components of SPS* • Screen well Dia (6.60m) and depth (4.77 m) • Grit well Dia (4.5 m) and depth (6.02 m) • Collection well Dia (6.00m) and depth (8.45 m) Non-clog submersible pump sets	Sewage pump station is proposed at Rafeeque Nagar.
Main Sewage pumping station(MPS)	Collect sewage from lift stations and pumping stations and pump to sewage treatment plant	1 no, *Components of MPS* • Screen well Dia (7.80 m) and depth (4.78 m) • Grit well Dia (5.90 m) and depth (6.12 m) • Collection well Dia (7.50 m) and depth (10.05 m) • Non-clog submersible pump sets	Main sewage pump station are proposed at Kaspa-A

Infrastructure	Function	Description	Location
Sewage Treatment Plant (STP)	Treatment of collected wastewater to comply with disposal standards	STP– 16.71 MLD Since the treatment and disposal system is proposed under DBOT contract, the STP will be designed by the DBOT contractor. The STP process will be designed to meet the stipulated disposal standards for STP.	Site is located at Kaspa-A and adjacent to MPS site at Palar River bank.
Outfall sewer	Disposal of treated water from STP intoPalar river.	200m length open earthen channel from Polishing pond	Within the site located at Kaspa-A to Palar River.
House service connections	Collect sewage from individual houses and convey into network	• 16,600nos. (domestic) • 1,757 nos. (non-domestic – commercial, institutional, etc.), no connections to industrial establishments	At each household, connected to wastewater outlet drain

D. Implementation Schedule

15. Bids for civil works will be invited in June 2018, and the contract will be awarded by July 2018. Construction is likely to start in August 2018, 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.

Figure 2: Location of Lifting and Pumping Stations

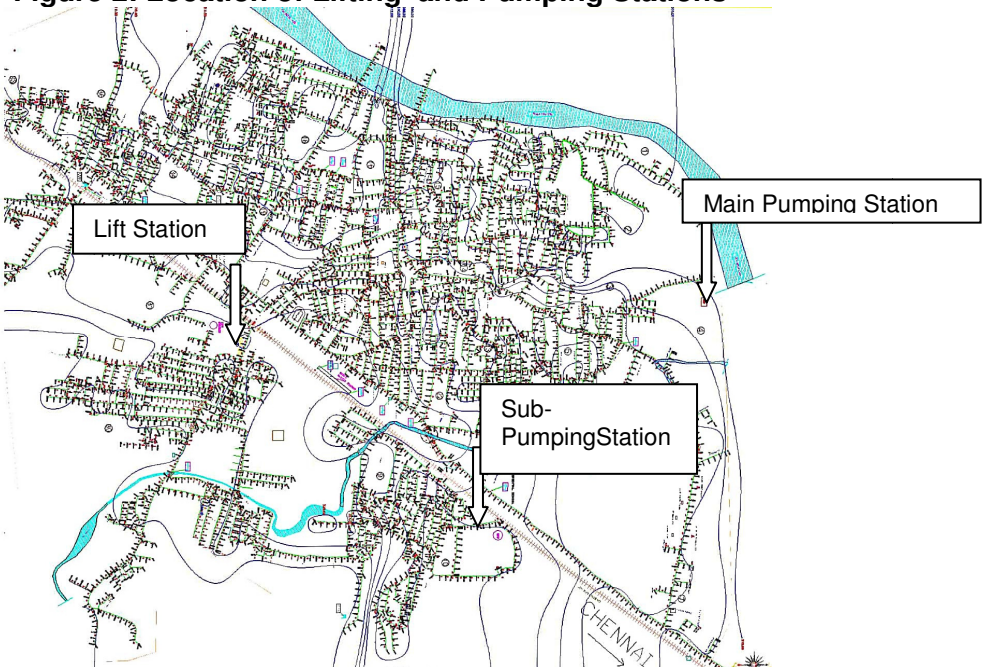
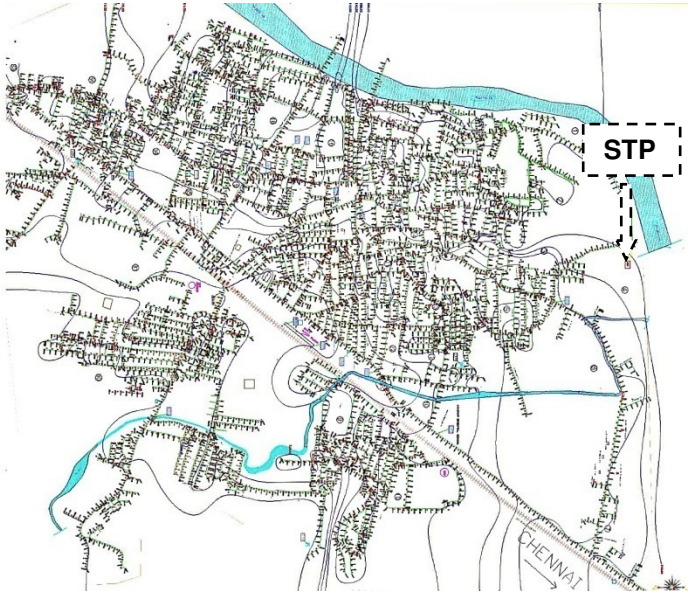
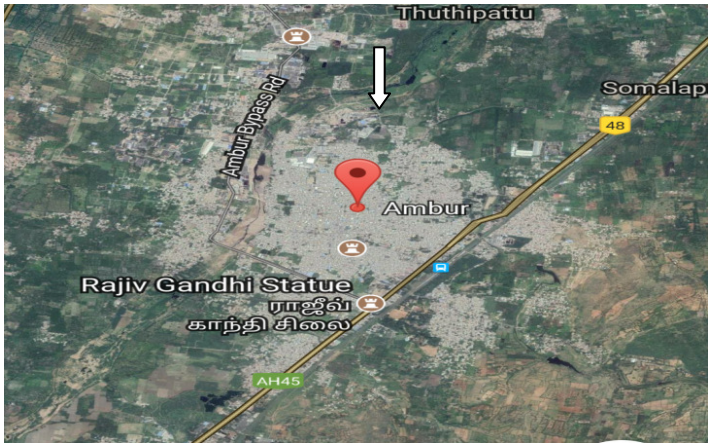


Figure 3: STP site





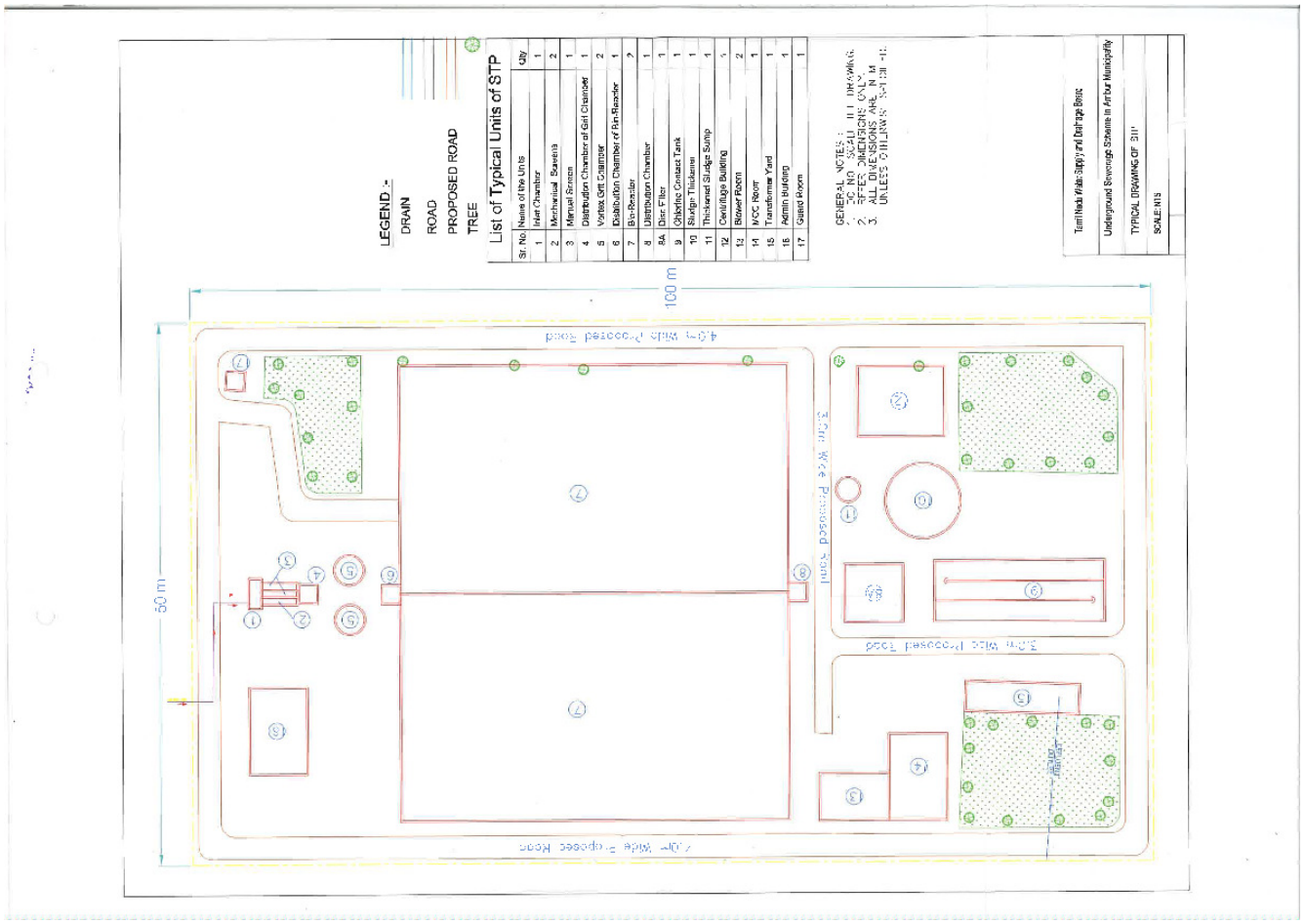
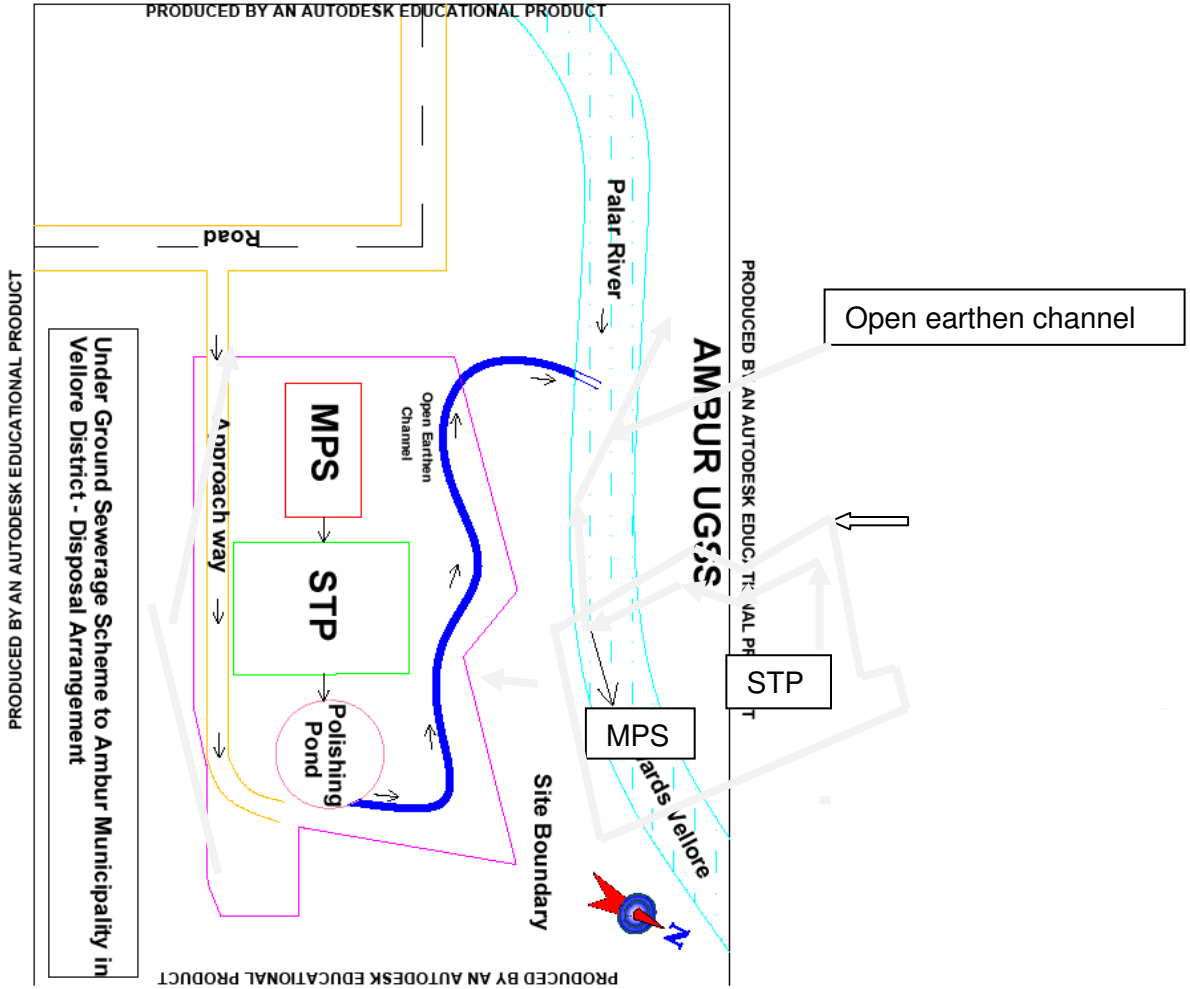


Figure 4: STP Layout

* This is indicative layout; actual layout will be prepared by contractor considering siting measures suggested in IEE

Figure 5: STP and Alignment of Outfall open earthern channel



III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

16. 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.

17. **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.

18. **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.

19. **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

20. **Environmental assessment.**TheGoI 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.

21. Category A projects require EC from the central Ministry of Environment,Forestsand Climate Change (MoEFCC). 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 MoEFCC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

22. 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.

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

24. **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

IV. Law	Description	Requirement
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.	Construction of proposed STPrequires CTE and CTO from TNPCBbefore starting of construction and before commissioning of STP respectively. Application has to be submitted online at http://tnocmms.nic.in/OCMMS/
Environment (Protection) Act, 1986 and CPCB Environmental	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.

IV. Law	Description	Requirement
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.	Generators will require CTE and CTO from TNPCB Generators to comply with applicable emission standards.
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 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.	**Appendix 2**provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.

Table 3:Effluent Disposal Standards of STPs applicable to all modes of disposal[1]

S. No.	Parameter	Standard	
		Location	**Concentration not to exceed**
1	pH.	Anywhere in the country	6.5 - 9.0
2	Bio-Chemical Oxygen Demand (BOD)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir, and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep	20
		Areas/regions other than mentioned above	30
3	Total Suspended Solids (TSS)	Metro Cities*, all State Capitals except in the State of Arunachal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir, and Union territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli Daman and Diu and Lakshadweep	<50
		Areas/regions other than mentioned above	<100
4	Fecal Coliform (FC) (Most Probable Number per 100 milliliter, MPN/100ml	Anywhere in the country	<1000

*Metro Cities are Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Ahmedabad and Pune.

Note :
(i) All values in mg/l except for pH and Fecal Coliform.
(ii) These standards shall be applicable for discharge into water bodies as well as for land disposal/applications.
(iii) The standards for Fecal Coliform shall not apply in respect of use of treated effluent for industrial purposes.
(iv) These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.
(v) In case of discharge of treated effluent into sea, it shall be through proper marine outfall and the existing shore discharge shall be converted to marine outfalls, and in cases where the marine outfall provides a minimum initial dilution of 150 times at the point of discharge and a minimum dilution of 1500 times at a point 100 meters away from discharge point, then, the existing norms shall apply as specified in the general discharge standards.

[1]Environment (Protection) Act, 1986 (29 of 1986), Environment (Protection) Amendment Rules, 2017 dt.13.10.2017 for the discharge standards for Sewage Treatment Plants

(vi) Reuse/Recycling of treated effluent shall be encouraged and in cases where part of the treated effluent is reused and recycled involving possibility of human contact, standards as specified above shall apply.
(vii) Central Pollution Control Board/State Pollution Control Boards/Pollution Control Committees may issue more stringent norms taking account to local condition under section 5 of the Environment (Protection) Act, 1986".

25. **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 4:Clearances and permissions required for Construction

S. No	Construction Activity	Statutory authority	Statute under which Clearance is Required	Implementation	Supervision
1	Construction of new STP	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contractor & PIU	PIU
2	Tree Cutting	Department of Forest and District Collector	Clearances from theauthorities as per the TamilNadu Timber TransitRules,1968 or latest.	PIU	IA and PMU
3	Hot mix plants, Crushers and Batching plants	TNPCB	Consent to establish andconsent to operate under Air Act, 1981	Contractor	PIU
4	Discharges from construction activities	TNPCB	Consent to establish and consent to operate under Water Act, 1974	Contractor	PIU
5	Storage, handling and transport of hazardous materials	TNPCB	Hazardous Wastes(Management and Handling)Rules. 1989Manufacturing, Storage and Import of HazardousChemicals Rules, 1989	Contractor	PIU
6	Sand mining, quarries and borrow	Department of Geology and mining, GoTN	Tamilnadu Minor MineralConcession Rules, 1959(corrected	Contractor	PIU

S. No	Construction Activity	Statutory authority	Statute under which Clearance is Required	Implementation	Supervision
	areas		up to 31.3.2001)		
7	For establishing new quarries and borrow areas	MOEFCC	Environmental clearance under EIA Notification 2006	Contractor	PIU
8	Groundwater extraction	Public Works Department	(Groundwater) Tamilnadu Groundwater Development and Management Act 2000	Contractor	PIU
9	Disposal of bituminous wastes	Tamilnadu State Pollution Control Board	Hazardous Wastes (Management and Handling) Rules. 1989	Contractor	PIU
10	Temporary traffic diversion measures	-	MoRTH 112 SP 55of IRC codes	Contractor	PIU
11	Disposal of treated effluent	Public Works Department		Contractor & PIU	PIU

26. **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 5: WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]		
	Averaging Period	Guideline value in µg/m³
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 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 6:World Bank Group's EHS Noise Level Guidelines

Table 1.7.1- Noise Level Guidelines[54]		
	One Hour L_{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[55]	55	45
Industrial; commercial	70	70

V. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

27. **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.

28. The literature survey broadly covered the following:

(i) Project details, reports, maps, and other documents prepared by TWAD Board.
(ii) Discussions with Ambur Municipality,TNUIFSLand 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.

29. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2018 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project.

B. Physical Resources

1. Location, Areaand Connectivity

30. Ambur Municipality is a Ist grade Municipality in Vellore district of Tamil Nadu lies at a latitude of 12^0 78'N and longitude of 78^0 62'E. Ambur municipal limits are is bound by omalapuram Panchayat in North, Solur Panchayat in South, Naikkeneri Panchayat in East and Palar river in West.

31. The area of the town, as per local body records is 17.97 sq. km.. The total length of the street is about 120 KM . The total area of the town is divided into 36 wards.

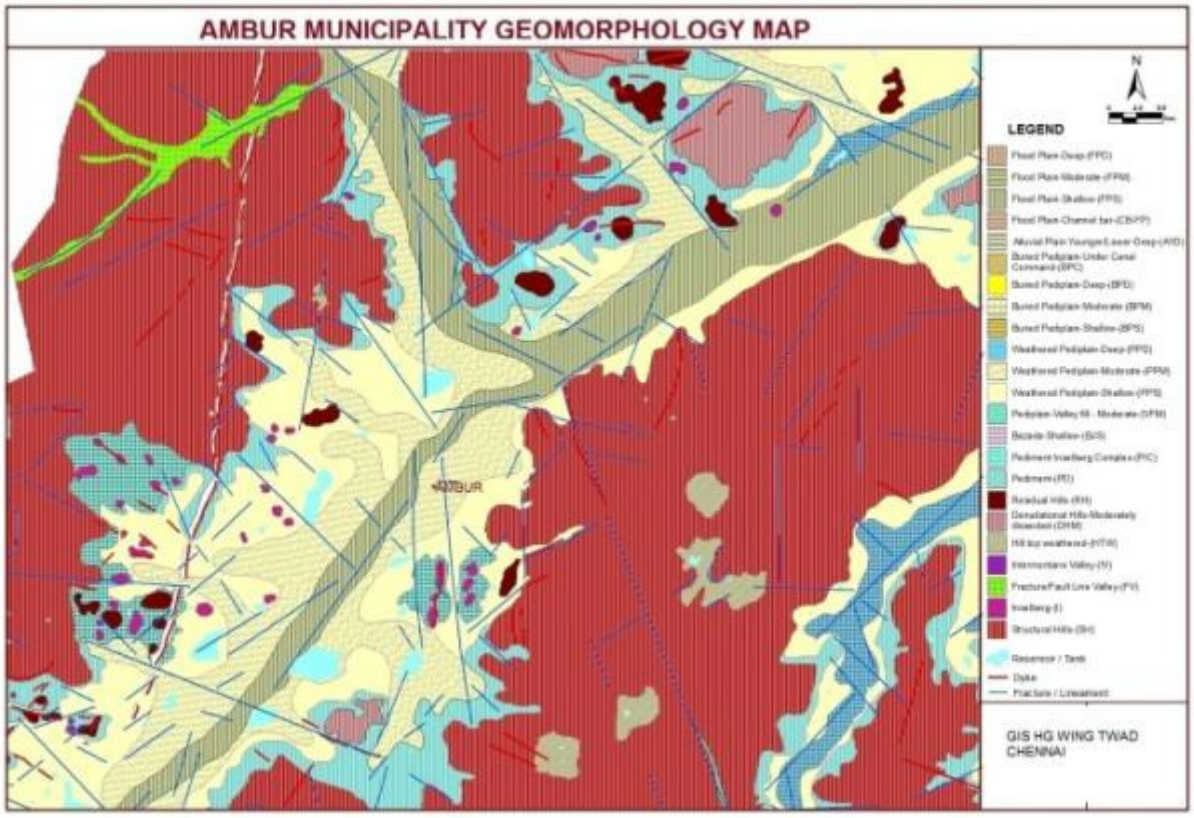
32. Road and rail: Ambur municipality lies on the Chennai–Krishnagiri - Bangalore National Highway NH-4. The town is at a distance of 200 km from Chennai, 180 km from Bengaluru and 52 km from Vellore. The town is well connected by road and rail with the nearby urban centers. Air The closest airport is in Chennai at a distance of 200 km which serves both domestic and International passengers.

2. Topography, Soils and Geology

33. Topography is moderately sloped undulating with an elevation difference of approximately 20 m from the South to North near Palar River. The Town is located 316.00 m above mean sea level. Ambur has Tropical wet and dry climate, reaching high temperatures during summer and experiences wet winters. The area also experiences light rain fall during South East monsoon. But to its tropical and sub tropical climate Mangoes, Ground Nuts, Coconut and Jasmine are cultivated in and around Town.

34. The topography is moderately sloped from west to east. There are no notable mineral resources. Black loam soil is found in parts of ambur municipality. The other type of soil are chiefly gravelly, stony and sandy of the red variety.

Figure 6: Germorphology of Project Area



3. Seismology

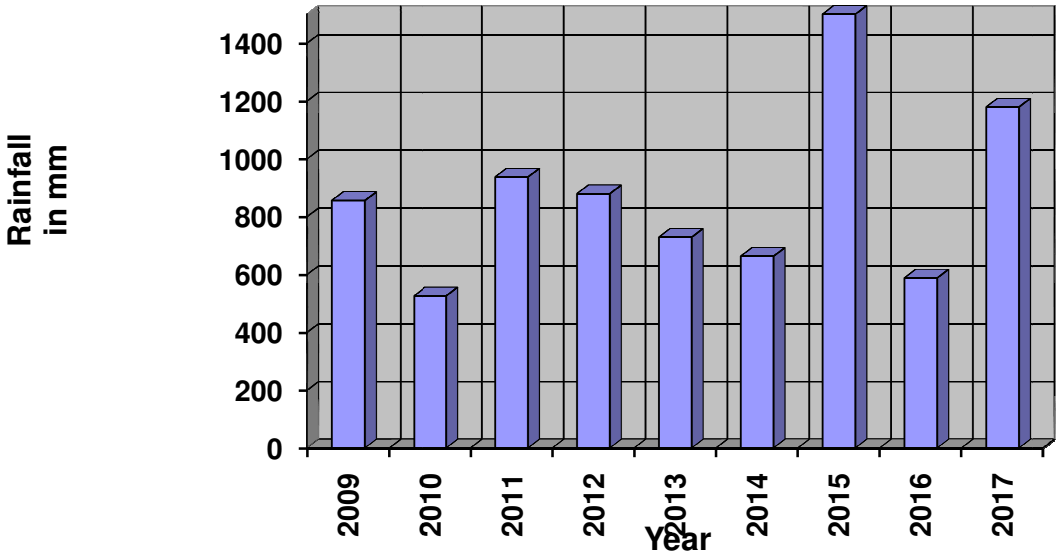
35. As per the seismic zoning map of India, Amburfalls under Zone III, which is the moderate earthquake risk zone in India.

4. Climatic Conditions

36. The Town is located 316.00 m above mean sea level. Ambur has Tropical wet and dry climate, reaching high temperatures during summer and experiences wet winters. The area also experiences light rain fall during South East monsoon. But to its tropical and sub tropical climate Mangoes, Ground Nuts, Coconut and Jasmine are cultivated in and around Town. The mean maximum and minimum temperatures during summer and winter varies between 42℃ and 13℃. Highest temperature ever recorded is 43℃ and lowest is 11 ℃. The humidity ranges are 38% – 61% during summer and 65% – 84% during winter. The maximum rain fall occur during September, October and November through North East mansoon.The area experiences rain fall during the South West mansoon as well. The average annual rain fall is 1000mm. The wind

direction is usually predominate towards South West. During winter it is from North to East, in summer from South to West.

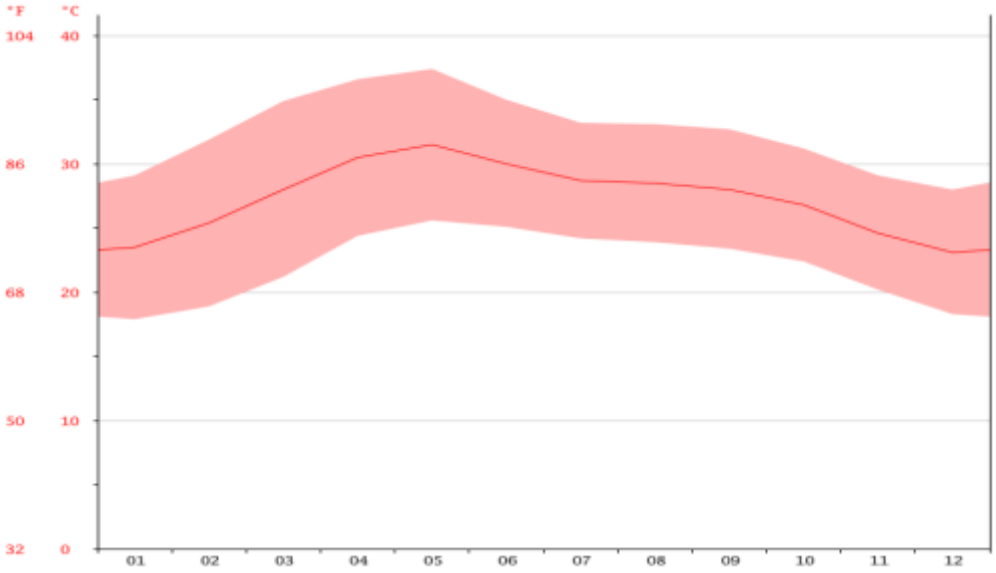
Figure 7: Annual Seasonal Rainfall in Project Area



Monthly Max and Min Average Temperature

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (℃)	23.50	25.40	28.00	30.50	31.50	30.00	28.70	28.50	28.00	26.80	24.60	23.10
Min. Temperature (℃)	17.90	18.90	21.20	24.40	25.60	25.10	24.20	23.90	23.40	22.40	20.20	18.30
Max. Temperature (℃)	29.10	31.90	34.90	36.60	37.40	35.00	33.20	33.10	32.70	31.20	29.10	28.00
Avg. Temperature (℉)	74.30	77.70	82.40	86.90	88.70	86.00	83.70	83.30	82.40	80.20	76.30	73.60
Min. Temperature (℉)	64.20	66.00	70.20	75.90	78.10	77.20	75.60	75.00	74.10	72.30	68.40	64.90
Max. Temperature (℉)	84.40	89.40	94.80	97.90	99.30	95.00	91.80	91.60	90.90	88.20	84.40	82.40
Precipitation / Rainfall (mm)	9.00	2.00	7.00	24.00	74.00	52.00	98.00	103.00	125.00	163.00	97.00	31.00

Figure 8: Monthly Max and Min Average Temperature in project area



5. Surface Water

37. The River Palar is a prominent and historical feature ofAmbur. 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. And distance of intake work 6 km apart from Ambur Municipality limit. Upstream of Palar at Ambur Municipality is Indira Nagar and downstream at AhmediNagar.Palar river where the treated effluent is proposed to be disposedadjacent to STP siteand distance of intake work 6 km apart from disposal point and which is not functioning from last 10 years.Assessment of the quality has been proposed as part of the monitoring plan in the IEE.

6. Groundwater

38. Ground water occurs under phreatic conditions in the weathered zone and under semiconfined conditions in the fractures. The thickness of weathered zone varies from less than a metre to about 15 m in the area depending on the topography. Potential aquifer zones are also developed in these rocks by fractures persisting to depths, particularly along lineaments and their inter sections. The depth of dug wells in crystalline formations varies form 8 – 19.5 m bgl. Fracture zones have been encountered in the well down to a depth of 116 m bgl in the borehole drilled by CGWB. The thickness of alluvium along the course of Palar River ranges from 8 – 12 m.

39. Vellore district is underlain by geological formations ranging in age from Archaean to Recent. In the crystalline formations comprising charnockites, gneisses and granites. In the consolidated formations, primary depositional features such as grain size are the major controlling factors.

40. In Gondwana formations, ground water abstraction is through dug wells and dug cum bore wells. These formations have considerably low yield potentials compared to both 6 hard rock and alluvium. Depth of dug wells in Gondwana sediments varies from 6 – 15 m bgl with extension of bores at the bottom ranging in depth from 15 – 25 m. Dug wells are the most common structures in recent alluvial formations too. The depth of dug wells tapping Palar alluvium ranges from 4 – 18.70 m bgl. These formations have moderate to good yield potential in the district and can sustain pumping for 3-4 hrs even during peak summer months and have yield up to 4.6 lps. Filter points of 10 – 15 m bgl depth are also being used in these formations for tapping ground water for domestic purposes. [2]

41. **Ground Water Quality** Ground water in phreatic aquifers in Vellore district is, in general, colourless, odourless and slightly alkaline in nature. The specific electrical conductance (µS/cm at 25o C) of ground water in the phreatic zone during May 2006 was in the range of 935 to 7920 in the district. Conductance below 750 has been observed only in select pockets of the district. It is observed that the ground water is suitable for drinking and domestic uses in respect of all the constituents except total hardness, Chloride and Nitrate. In about 42% of samples, nitrate concentration is above permissible limits of 100 mg/l. The incidence of high total hardness is attributed to the composition of litho units constituting the aquifers in the district, whereas nitrate pollution is most likely due to the use of fertilizers and other improper waste disposal.

42. Sodium Adsorption Ratio (SAR), values range from 2.4 to 19.6. With regard to irrigation suitability based on specific electrical conductance and SAR it is observed that the ground water in the phreatic zone may cause high to very high salinity hazard and medium to very high alkali hazard when used for irrigation. Proper soil management strategies are to be adopted in the major part of the district while using ground water for irrigation.

43. The pollution from tanneries has caused irrevocable deterioration of quality of ground water and soil in vast areas. There is an urgent need to arrest/prevent further deterioration of ground water and soil quality through a comprehensive plan. Providing common effluent treatment plant (CETP) and adoption of environment friendly technologies for tanning and safe disposal of waster in the area was presently done through CETP two numbers viz., 1 at Kaspa-A near proposed MPS and STP site. 2.@ Periyavarigam for the tanneries in around Ambur town respectively.

Table 7: Groundwater Quality in Ambur

Parameters	Minimum	Maximum	Mean
pH	5.71	7.93	**7.39**
EC (µS)	200	6300	**3100**

[2]District Groundwater Brochure, Vellore District,Jan 2009by CGWB

Total dissolved solids (mg/L)	230	3583	**1732**
Turbitity (NTU)	3.2	7.6	**5.6**
Total Hardness (mg/L)	355	1258	**625**
Chloride (mg/L)	135.60	526.24	**329.06**
Chromium (mg/L)	.0011	.0655	**0.0222**
Sulphate (mg/L)	564	2564	**1825**

Source:International Journal For Technological Research In Engineering,Volume 2, Issue 9, May-2015,assessment of ground water quality analysisinAMBUR. Ajana V. K, J.Sharpudin, Student, M.E. Environmental Engineering, Assistant Professor, C. Abdul Hakeem College of Engineering and Technology, Melvisharam

7. Ambient Air Quality

44. At present there is air quality monitoring station set up by Tamil Nadu Pollution Control Board (TNPCB), and therefore there is no air quality data available for Vellore City. Main source of air pollution in the city are vehicular traffic, road dust, construction and industrial activities.

45. The study areas are tannery industry accumulated places of Vellore district, which include near tannery industrial area atAmbur. Sampling located at these areas only. Due to unregulated population growth, these two towns experiences an exponential growth in the vehicular usage, tanneries activities, other industrial industries and fuel consumption, which results in an increased concentration of particulate matter and other gaseous pollutants in the surrounding air. Sampling Location: Based on the tanneries and industrial pollutions density, were selected in the town.

Table 8: Ambient Air Quality at Traffic Junctions, Ambur, 2016

S.No	Location	Time	PM10	PM2.5	SO2	NO2	CO	NH3	Cr	Pb
1	Tannery location at Ambur town	6.00AM-2.00PM	21.0	15.4	14.89	7.89	0.092	5	BDL(D.L-0.5)	BDL(D.L-0.5)
		2.00PM-10.00PM	20.5	15.1	18.94	10.12	0.083	8	BDL(D.L-0.5)	BDL(D.L-0.5)
		10.00PM-6.00AM	20.6	15.6	19.56	17.89	0.076	3	BDL(D.L-0.5)	BDL(D.L-0.5)
Average pollutant			20.7	15.36	17.79	11.96	0.083	5.33	BDL(D.L-0.5)	BDL(D.L-0.5)
CPCB Standard			100	60	80	80	02	100	BDL(D.L-0.5)	BDL(D.L-0.5)

Source: International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE) ISSN: 0976-1353. Volume 23 Issue 2 –JUNE 2016. (SPECIAL ISSUE)A. Kistan, A. PremKumarand A.ThaminumAnsari,Research& Development Centre, BharathiarUniversity,Coimbatore, India.AssistantPorofessor, Panimalar institute of technology, Chennai ,India. Assistant professor, MuthurangamGovernment Arts and Science College, Vellore, India.

8. Ambient Noise Levels

46. There is noise data available for Vellore from TNPCB. Following table presents the noise level data across Ambur Municipality from a research study conducted in 2016. Study monitored noise levels along different types of roads at nine locations. Noise levels at all location and at all times (day and night) exceeded the ambient noise standards[3]. Further, due to heavy traffic volumes, noise levels alonghighways/expressways and arterial roads were much higher than the noise levels on local streets.

day and night time noise standards for residential areas = 55 dBA and 45 dBAand for commercial areas = 65 dBA and 55dBA

[3]day and night time noise standards for residential areas = 55 dBA and 45 dBAandfor commercial areas = 65 dBA and 55dBA.

Table 9: Ambient Day-time Noise Levels in Ambur

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	Umar street	Lmax	72.13	73.65	75.29	78.32	75.33
		Lmin	63.24	62.58	78.71	68.61	61.78
		Leq	71.65	70.49	69.75	74.08	72.33
	Nethaji Road	Lmax	75.42	74.56	79.72	77.48	79.72
		Lmin	68.22	66.25	70.42	70.53	70.42
		Leq	71.23	71.68	73.89	74.58	73.89
	Peranampattu road	Lmax	75.69	76.55	82.7	82.7	78.73
		Lmin	69.24	71.66	70.16	70.16	65.37
		Leq	73.66	72.66	75.77	75.77	73.84
TYPE II	Bethalegam	Lmax	69.58	68.22	74.81	76.05	74.81
		Lmin	61.25	59.65	64.35	64.94	64.35
		Leq	65.35	64.22	70.43	71.25	70.43
	sanankuppam	Lmax	71.65	70.66	74.81	82.11	79.42
		Lmin	68.47	66.45	64.35	76.73	66.09
		Leq	69.98	68.22	70.43	79.12	75.29
	Somalapuram road	Lmax	68.95	66.75	69.68	82.35	78.71
		Lmin	61.32	61.55	66.98	71.86	69.75
		Leq	64.78	64.78	67.66	76.77	75.42

C. Ecological Resources

47. Ambur is geographically located at 12.78°N 78.7°E with an average elevation of 316 metres (1,037 ft). It lies roughly between Chennai and Bengaluru. Ambur has a tropical wet-and-dry climate, reaching high temperatures during summer and experiences wet winters. The maximum rainfall occurs during October and November, with the northeast monsoon. The area also experiences light rainfall during the southwest monsoon.

48. Planning based on agro-ecological zoning aims at scientific management of regional resources to meet the food, fibre, fodder and fuel wood requirements without adversely affecting the status of natural resources and environment. An attempt has been made to map the agro-ecological units for Vellore district of Tamil Nadu and derive the crop-zone map for the four major crops namely, paddy, sugarcane, groundnut and millets. The basic theory of FAO framework for Land Evaluation was adopted to define the suitability of crops. Land quality details necessary for evaluating the agro-land suitability of crops and for delineating the

agroecological units include the terrain, soil and climatic characteristics. Agro-ecological units map was generated by overlaying the agro-edaphic and agroclimatic map layers in GIS. The agro-land suitability map was generated by matching the crop requirement details with the land qualities. The results of the suitability evaluation, when compared with the current land use statistics of these crops showed that area cultivated is less than the area suitable for these crops

D. Economic Development

9. Land use

49. The Regional Directorate of Town and country planning had conducted the land use survey in 1984 for Ambur town, the area included in the planning area. The town land use is clasified in the following major classifications.

1. Residential.
2. Commercial.
3. Industrial
4. Public and Semi Public
5. Transportation and Communication.
6. Recreational.
7. Public utilities
8. Vacant development.
9. Non-Urban use.

The land use analysis for Ambur town is given below.

Land use Analysis for Ambur town.

Sl.No	Land use	Area in Hectares	Percentage over total developed area	Percentage over total area
(I)	**DEVELOPED AREA**			
1	Residential	577.19	60.00	32.12
2	Commercial	56.74	5.46	3.15
3	Industrial	127.21	13.14	7.08
4	Public & Semi Public	135.16	13.95	7.52
5	Educational	72.15	7.45	4.03
	Total developed area	**968.45**	100.00	100.00
(II)	**UNDEVELOPED AERA**			
1	Agricultural Wet	93.13	11.24	5.18
2	Hillocks and Dry	579.25	69.91	32.23
3	Land under Water	156.17	18.85	8.69
	Total Undeveloped area	**828.55**	100.00	100.00
	Grand total	**1797.00 Hectares**		

10. **Industry** and Agriculture

50. Ambur Municipality is an industrially forward town and directly linked to Vellore by NH48. Major employment in the Municipality is provided by leather industry, agricultural trading and industries located in and around the Municipality .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 Municipality economy.

.

11. Infrastructure

Water Supply:

Existing water supply system

51. The water supply need of the Town by considering 2011 population is 135 lpcd. The Town area proposed to be covered under UGSS is having adequate water supply from the existing main sources (1) Sarangal River (2) Cauvery from Vellore CWSS and (3) Local source

Sources :

At present, the requirement of the water supply to Ambur town is fulfilled by the following schemes.

Head works:

The potable water of 5.00LL per day is daily supplied from the two open wells in Anaimadugu area.

52. An improvement scheme for this municipality has been provided during the year 2003,with sources from Sarangal river and from the unaffected upstream side of Malattar river near Mittapalli. An average of 0.50MLD of potable drinking water is being supplied daily from these sources.

53. Augmentation scheme under Vellore Mega CWSS in Vellore district with river Cauvery as source near Mettur Dam was commenced in 2016 and provides water supply of 9.82 MLD to AmburMunicipality. In addition to the above,6.60 MLD of water is being supplied to this town through other local open well sources and bore wells soures at respective locations like Sarangal(3.40 MLD) 15km from ULB , Aanaimaduku(1.20 MLD) 1 km from ULB, Sanikanavaimedu(0.80 MLD) 200 m from ULB, Nathisilapuram(0.60 MLD) 200 m from ULB and Vannandurai(0.60 MLD) 3 km from the ULB.

Quantity from Vellore Mega CWSS	- 9.82 MLD
Quantity from local sources (0.50+6.60)	- 7.10 MLD
Total	- 16.92 MLD

54. Water supply from Vellore Mega CWSS will be increased to 15.85 MLD (from current supply level of 9.82 MLD) from 2018.After the increase of supply the total water supply from 2018 will be22.95 MLD (7.10 +15.85) and a level of supply at intermediate stage will be more than 135 LPCD.Hence for UGSS design, the pro rata sewage generation is taken as 115 lpcd for the Ambur Town population.

Sewerage:

Existing Sewerage System:

55. Ambur, a fast growing town, is not having underground sewerage system. The town is provided with open drains in the main area of the town. The open drains are constructed on the

sides of the roads / streets. The waste water generated from the town is collected through the main drain along the roads / street. The waste water discharged into these drains including the sullage water from kitchen and bathroom of the houses. Waste water from all the open drains is discharged into the nearby lake and ponds. Most of the latrines in this town are flush type. Considerable number of latrines is flushed out directly to street drains without any treatment. As the sewage is let into unprotected open ponds the quality of ground water gets contaminated very easily.

56. **Solid Waste Management**.Ambur Municipality is a Selection Grade Municipality that has 17.97 sq.km. consisting of 26302 Households with the Population of 1,14,608 as per the 2011 census. Primary Level Collection, Secondary Level Collection, Re-cycle and Fertilizer Manufacturing processes, going on Under Solid Waste Management through which 45 tons of Garbage is being collected daily.80 Permanent Sanitary Workers and 120 Outsourced Sanitary Workers are engaged in this Project.

Primary Level Collection

- Push Carts : 54 Nos
- Tricycles : 40 Nos
- TATA Ace : 06 Nos

Secondary Level Collection

- Tipper Lorry : 03 Nos
- Dumper Blazer Lorry : 03 Nos
- Dumper Blazer Bins : 42 Nos

Bylaws have been made and enforced as per Solid Waste Management Rule 2016 by which 20 Bulk waste Generators have been identified and given notice for Self- Composting. Out of 20 BWGs, 6 BWGs have started their processes. Municipal Publics and Shop Keepers are instructed through issuance of notice and awareness programs done by 9 animators and 2 Supervisors to segregate wastes as Bio – Degradable and Non – Degradable waste being collected at their places. They are also instructed to providemunicipal sanitation workers Non – degradable wastes on Wednesday and Bio – degradable on daily basis. As of now, source segregation is being done at 44% of wards and processed at 8.17 square kilometer area of municipal compost yard located at 1stTharvazli where fertilizers are manufacturing by Window Composting method. From the collected 45 tons of garbage, 25 tons of garbage is dumped and processed at Compost yards' existing windrow platforms by which 1500 kg (55.5%) of manure is produced so far. Now, additional Windrow platforms are being constructed by the estimated value of 339.72 lakhs. After completion of these works, all the 45 tons of garbage being collected will be processed into manures by using Windrow composting method.

Recently, a proposal of MCC has been submitted for approval to execute in a place at TNHB, ward 11. Under Amrut Scheme, construction of two parks has been completed in which onsite composting Shed work is going on.

Source: Ambur Municipality

Transportation.

Road and rail:

57. Ambur municipality lies on the Chennai- Bangalore National Highway. The town is at a distance of 200 km from Chennai, 180 km from Bengaluru and 50 km from Vellore. The town is well connected by road and rail with the nearby urban centers.

Air

The closest airport is in Chennai at a distance of 200 km which serves both domestic and International passengers.

E. Socio Cultural Resources

1. Demography

58. According to 2011 census, Ambur has a population of 114,608 with a sex-ratio of 1,033 females for every 1,000 males, much above the national average of 929. A total of 13,235 were under the age of six, constituting 6,716 males and 6,519 females. Scheduled Castes and Scheduled Tribes accounted for 16.83% and 0.57% of the population respectively.

59. The average literacy of the city was 76.08%, compared to the national average of 72.99%. The city had a total of 26302 households. There were a total of 40,654 workers, comprising 163 cultivators, 519 main agricultural labourers, 982 in house hold industries, 35,411 other workers, 3,579 marginal workers, 27 marginal cultivators, 174 marginal agricultural labourers, 306 marginal workers in household industries and 3,072 other marginal workers. As per the religious census of 2011, Ambur had 35.0% Hindus, 60.9% Muslims, 3.8% Christians, 0.3% following other religions.

Table 10:Percentage of working population - Ambur

Discription	**Worker** (Among total population)	**Main Worker** (Among workers)	**Marginal Worker** (Among workers)	**Non Worker** (Among total population)
Total	35.5%	32.3%	3.1%	64.5%
Male	55.4%	51.5%	3.8%	44.6%
Female	16.2%	13.8%	2.4%	83.8%

Source:https://indikosh.com/city/680479/ambur

2. History, Culture and Tourism

60. Ambur was in existence from the Pallava period during the 15th and 16th Century, North arcot district was under control of Vijayanagar.In1687 onwards North arcot district was brought under the control of the Nawab's of Karnatic.In1749 NawabAnwaruddin was defeated and killed in Ambur by his rival Chandra Sahib. Haider Ali of Mysore, during his invasion of the Karnatic of 1767 laid seize to Ambur.The the British army resumed the seize of Ambur.During the beginning of 18th Century was brought under the control of British.From the above past incidents, through it is known that Ambur was existence since 15th Century. There are no protected or notified movements at present to reveal the past history and perhaps they might have been runed due to successive held during the past.Ambur is the one of the leather oriented industrial town in Tamilnadu and hence wet and dry processing industrial where predominantly occupy. Other common industries beedi factories are also existing. There are no historical or ASI protected Monuments in the sub-project area in Ambur Municipality.

F. Subproject Site Environmental Features

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

Table 11:Site Environmental Features

Infrastructure	Location and Environmental Features	Site Photograph
Sewage treatment plant	The Sewage treatment plant has been proposed in a private land identified with SF no Ambur Town, Ward-A, block-3, TS no 1/1 in Kaspa A in Ambur Municipality. The extent of land is (2.555 Acre) 10,339.718sqm and the classification of land is Dry land(Punjai).. Site is mostly surrounded by vacant and agricultural lands. And houses are located towards the Municipality, and are located 550m(0.55km) away from the site. In this the proposed STP, an area of 2.555 acres allocated while required is about 1.20 acres. Balance land will be utilized for future expansion of STP and Polishing Pond. .	

Infrastructure	Location and Environmental Features	Site Photograph
MPS	**2. Main pumping station at Kaspa-A** The Main pumping station has been proposed in a private land identified with SF no Ambur Town, Ward-A, block-3, TS no 1/1 in Kaspa A in Ambur Municipality. The extent of land is (0.230 Acre) 930.777 sqm and the classification of land is Dry land (Punjai).. Site is mostly surrounded by vacant and agricultural lands. And houses are located towards the Municipality, and are located 550m(0.55km) away from the site.	
SPS	**3. Sub pumping station at Rafeequenagar** The sub pumping station-I has been proposed in SF no Ambur Town Ward-B, block-5, TS no 1/2 Rafeequenagar in Ambur Municipality. The extent of land is 901 sqm and the classification of land is Road side waste land (Pattaiporambokku).The owner of the land is Revenue department.Land is surroundedby road and private vacant land and after road commercial establishments and residential colonyare 70m apart from SPS site.	
Llift Manhole	**Lift Manhole at Asanampattu road near Forest Range Office** Located in a residential colony, and site isnear the Forest Range Office and land is owned by Municipality. *Lift station is essentially proposed as enlarged manhole (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.*	

Infrastructure	Location and Environmental Features	Site Photograph
Sewer network	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,, divided 2-way roads etc., sewers will be laid along the edge of the road, but mostly within the black top portion. In the outskirts 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. Large diameter pipes will be laid on main roads (400 – 900 mm), while the tertiary sewers of small size (150 mm to 300 mm dia) that collect wastewater from each house will be laid in all streets in the subproject area. There is one NH & Railway crossing for SPS to MPS pumping main which will be made by trenchless technology. Trench size to bury the sewer will be of 0.8 m to 1.5 m wide and 1.2 m to 8 m deep (4.35% of sewer line exceeding 5m depth that also coming near SPS and MPS)	  

Infrastructure	Location and Environmental Features	Site Photograph
Outfall sewer and Disposal point	Treated effluent is proposed to be disposed at about 200 m from STP(Polishing pond) through open earthern channelto disposal point of Palar River. And channel has been designed for ultimate flow and considered rain water at STP site.	

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

62. 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.

63. 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.

64. 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).

65. 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.

66. The ADB Rapid Environmental Assessment Checklist in 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.

67. 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 greatly 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

68. **Design of the Proposed Components**. Technical design of the (i) sewage treatment plants; (ii) sewage pumping and lifting stations; and (iii) 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.

69. **Design of Sewage Treatment Plant**. A 16.71 MLD STP is proposed to be constructed at the identified site to treat the sewage generated from the subproject areas of Ambur municipality.The treated wastewater will be disposed though an though an open earthern channel within the site after polishing pond.in to Palar river that flows is locatedat about 200m from the STP site. Since the treatment and disposal system is proposed under DBOT contract, the STP will be designed by the DBOT contractor. The STP process will be designed to meet the stipulated disposal standards for STP. STP Contractor would carry out monitoring of the Palar river as in the monitoring plan in this IEE. Reuse of treated effluent through supply to tanneries is also being examined by Ambur Municipality. Upon finalization, this re-use of treated water will be managed by Municipality/CETP owners in future and balance treated effluent will be disposed into the Palar river through open earthen channel.

(i) One of the critical aspects in STP operation is, change in raw sewage characteristics at inlet of STP may affect the process and output quality. The system is designed for municipal wastewater, which does not include industrial effluent. Existing tannery units have own CETPs and effluent is not to be mixed with domestic sewage.

.Following measures are suggested to safeguard sewerage system efficiency.

(ii) No industrial wastewater shall be allowed to dispose into municipal sewers

(iii) No domestic wastewater from industrial units shall be allowed into municipal sewers

(iv) Ensure that there is no illegal discharge through manholes or inspection chambers

(v) Conduct public awareness programs; in coordination with TNPCB
Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the standards.

71. An area of 2.555 acres is allocated for the proposed STP, while the land requirement is about 1.2 acres. And the balance land is to be used for ultimate stage expansion and polishing pond. This land is located in the northen periphery of Ambur Municipality, surrounded by tanneries,burialground,Palar river and agricultural lands. Predominant wind direction in Ambur is southwest. Besides operating the plant as per the standard operating procedures, which will further minimize the odour potential, the following measuresare also included in the site planning and design:

I. Site layout design of STP within allocated 2.555acre land in Kaspa-A near Palar river.

II. Providing a green buffer zone of 15-20 m wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater will be used for land scaping and some quantity of treated water is requested by tannery units. This re-use of treated

water will be managed by Municipality/CETP owners in future. Balance treated effluent will be disposed into the Palar river through open earthen channel.

72. **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. 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. The dried sludge may be disposed in the waste disposal site in Tharuvazhi at a distance of around 4 km from theSTP site, in consultation with Ambur Municipality. Sludge shall be periodically tested for presence of heavy metals. Proper sludge handling methods should be employed. Personal Protection Equipment should be provided to the workers.

73. Dried and properly composted sludge can be used as soil conditioner. In case of reuse of sludge, periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests will be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016have been adopted here. Rules stipulate that “In order to ensure safe application of compost, the following specifications for compost quality shall be met”:

Table 12:Standards for Sludge Reuse as Manure

S**tandards for Composting** . As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards “In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:-

Parameters	Units	Organic Compost (FCO 2009)	Phosphate Rich Organic Manure (FCO 2013)
Arsenic	mg/kg	10	10
Cadmium	mg/kg	5	5
Chromium		50	50
Copper		300	300
Lead		100	100
Mercury		0.15	0.15
Nickel		50	50
Zinc		1000	1000
C/N ratio		<20	<20:1
PH		6.5 – 7.5	(1:5 solution) maximum 6.7

S**tandards for Composting** . As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards "In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:-

Parameters	**Units**	**Organic Compost (FCO 2009)**	**Phosphate Rich Organic Manure (FCO 2013)**
Moisture, percent by weight, maximum		15.0 – 25.0	25.0
Bulk density (g/cm3)		<1	Less than 1.6
Total Organic Carbon, per cent by weight, minimum		12	7.9
Total Nitrogen (as N), per cent by weight, minimum	percent by weight	0.8	0.4
Total Phosphate (as P205) percent by weight, minimum	percent by weight	0.4	10.4
Total Potassium (as K20), percent by weight, minimum	percent by weight	0.4	-
Colour			
Odour		Absence of foul Odor	
Particle size		minimum 90% material should pass through 4.0 mm is sieve	minimum 90% material should pass through 4.0 mm is sieve
Conductivity, not more Than	dsm-1	4	**8.2**

* compost (final product) exceeding the above stated concentration limits shall not be used for food crops. however, it may be utilized for purposes other than growing food crops.

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 surfaceroad 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, Municipality 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 1 m, 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. **Sewage Pumping stations and lift stations**. It is proposed to construct 1 sewage lift station, and 2 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. Attempts to eliminate lift stations by examining the feasibility of providing rider mains are assessed to be uneconomical. Therefore, in such situations, the feasible and practical solution was to opt for a low capacity lift station with submersible pumps to lift and convey the collected sewage from peripheral areas to the downstream system through a bell-mouth chamber.

77. 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 consists of a sewage sump or suction well of dia 2.30 m and 8.37 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.

78. **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:

- Screen well
- Grit well Suction well
- DG set platform
- Pump room

79. At the 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.

80. **Odour from pump and lift station**In the suction wells, the sewage emits gases, which accumulated in the air above water surface. The gas may include odourous 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 odourous gas compounds. H_2S is the most dominant odour causing compound, and therefore can cause nuisance to nearby households.When sewage becomes stagnant, H2S is generated in the anaerobic conditions. The quantum of H2S generation depend 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 H2S generation. Designconsiderations 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.

81. Given that lifting stations and 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/lifting station. Given the very limited land availability in urban areas like the project area, that tooofgovernment owned lands, locating the pumping stations ideally about 50-100 m away from the houses is not practical.inAmbur, 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 and mostly in sparsely populated areas. Sites which are located close have been selected only in cases where there are no other alternative lands available.

82. 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 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.

(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) Provision of odor control / mitigation system as per site conditions / requirements.Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to control odor. Size of GAC (including material size) should be selected based on the vent diameter and expelled air flow rate expected.

(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.

(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.

(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 electriMunicipality supply interruption.

(x) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations

(xi) Provide training to the staff in SOPs and emergency procedures

(xii) Periodic monitoring of H2S levels at sewage pumping and lifting stations using handheld H2S meters

Provision of odour treatment system: Besides the above measures, following odor control and mitigation measures are consideredat all sewage pumping and lifting stations, for facilities located very close to the houses/properties.

(i) Provide closed wells fitted with necessary ventilation wherever required
(ii) Provide greenbelt (tree cover) around the lift stations, wherever possible
(iii) a suitable arrangement such 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 / lifting stations

83. **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 Municipality, 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[4].
(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

84. **Energy Efficiency**. Project area is moderately 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 Municipality. 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.

85. To optimize the power consumption, the hydraulic design shall follow optimal approach, and the following alsoconsidered in design and selection of pumping systems. According to Manual for the Development of Municipal Energy Efficiency Projects in India (jointly developed

[4]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.

by Beaurau of Energy Efficiency (BEE) and International Finance 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)

86. **Tree cutting at selected project sites**. As presented in the baseline profile of subproject sites, there are no notable tree cover in the SPS and MPS project sites, However the available trees in theSTP site will be indentified and cut according to the requirement of component of STP.Permission required for cutting the trees will be obtained from the competent authorities.Sewers are proposed within the roads, and therefore no tree cutting envisaged. 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 STP and pumping stations
(ii) Obtain prior permission for tree cutting
(iii) Plant and maintain 10 trees for each tree that is removed

87. **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 lands except MPS and STP sitesand there are no notable existing utilities. MPS and STP sites are private owned land and land to be acquired by ULB and consent letter has been obtained from land owner. 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 due to relocation of the utilities, the contractor, in collaboration with the Municipality 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

88. **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.

89. **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 DepartmentofGeology and Mining. Contractor should, to the maximum extent possible, procure material from existing quarries, and creation of new quarry areas should be avoid 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 Miningand local revenue administration, as required.

90. **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. There are no archeologically or historically recognized sites or places close to project sites or within the project area. Therefore it is not likely that the project sites contains any archaeological or historical remains, and risk of uncovering them is very low. Nevertheless, Municipality will follow chance find protocol to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved:

(i) Construction contractors to follow these measures in conducting any excavation work
(ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work
(iii) Stop work immediately to allow further investigation if any finds are suspected;
(iv) Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

B. Construction Impacts

91. 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.

92. Technical components of the STP comprise a variety of pre-fabricated elements, which are installed on site as ready-made individual units. These will be directly brought from the manufacturers place to the sites lifted into position by crane, affixed to plinths or other installation points, and connected up to pipework and theelectricalsupply.

93. Since these works are confined to the boundary of identified sites, 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.

94. Subproject also include linear works (laying of 112.5 km sewers along the roads). This covers almost entire project area of AmburMunicipality, 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.

95. 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). The diameter of sewer ranges from 150 mm to 900 mm, of which nearly 93% of the sewers are of size between 150 mm and 250 mm. According to the design the sewers will be laid at a depth of 1 to 8 m. The width of the trench excavation along the roads will vary from 0.8 m to 1.4 m, and the depth varies from a minimum of 1 m to 8 m. Nearly 95% length of sewers will be laid in trench of depth 5 m of less, and there are very few sewers that will be laid in a trench of more than 5m deep (4.35% sewers only).The design is optimized to minimize the sewer depth to the extent possible with an optimal combination of sewer depth and pumping requirements. Details of sewer construction are provided in the following Table.

Type of Pipe	Length	
uPVC		
200 mm	91452	m
DWC		
200 mm	7,913	m
250 mm	1,316	m
300 mm	810	m
CI LA CLASS S/S PIPE		
250 mm	1,522	m
300 mm	1,145	m
350 mm	680	m
400 mm	822	m
450 mm	480	m
500 mm	1,968	m
600mm	2,750	m
700 mm	1,645	m

Table 13:Sewer construction

96. 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 backhouse excavators. As trenches are deep (up to 6-7 m), there is risk of collapse of trenchesand/ordamage 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 2.0 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 1,36,013.58 m3, of which nearly 95% will be reused, and the remaining 6,800.679 m3 of excess soil needs to be disposed safely.

97. Although sewer laying work involves quite simple techniques of civil work, the invasive nature of excavation in the urban areawhere 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.

98. Sewers will extend to all residential and developed areas, while large diameter sewers will be laidmostlyalong the proposed trunk mains alignment in each zone..

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

100. Sources of Materials. Significant amount of sand andcoarse 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 approvedlicensed quarries only, to ensure these controls are in place. In Ambur, construction sand is normally obtained from Pernampattu (about 30 km), and gravel and aggregate is available locally in Minnur and just 5 km away from Ambur.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

101. **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. Over 1,36,013.58m3 of earthwork is anticipated from the subproject, and 95% of which 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 STP, pumping stations etc., 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 Municipality, 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:

For all construction works

(i) Provide a dust screen around the construction sites of pumping and lifting stations and STP
(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 devises, which are operating correctly, and have a valid pollution under control (PUC) certificate

For sewerworks

(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 500m minimum 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 and

restoration of UGD cutting portion can be done immediately after work is completed.

(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.

102. **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.

(i) 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 and this shall be avoided.

103. **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/rivers.Project area receives rainfall in southwest and northeast monsoon seasons, between June/July to November/December. 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).

104. **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

105. **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. In Total earthwork excavation, nearly 95% of soilwill be reused, and the remaining of 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 disposedoff 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

106. **Noise and Vibration Levels**. While pumping and lifting station sites are located predominantly urban and suburban areas, MPS and STP is located at theboundary of Municipality near Palar river.Sewer lines are spread over entire project area. Except STP, all these sites are located close to habitation areas, where there are houses, schools and hospitals, religiousplacesand businesses. The sensitive receptors arethe 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 negativeshort-term, and reversible by mitigation measures. The construction contractor will be required to:

a. 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;
b. 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
c. Maintain maximum sound levels not exceeding 70 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s..Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
d. Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
e. 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.

107. **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). Sewers are proposed along:

- NH48 (Chennai-Bangalore Highway)
- SH130A (Ambur-Pernampattu Bypass-Road)

108. National highway and state highways carry considerable traffic.Sewers will also be laid along the internal main roads that provide connectivity within the Municipality. These roads also carry considerable flow of traffic and are centres of commercial activities. Internal roads in the project area are narrow, except in the newly developing residential layout which comparatively have wide roads.

109. 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.

110. Works related to all the remaining components (lifting/pumping stations and STP) will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility.

111. 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:

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 meter 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) 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
(viii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
(ix) Inform the affected local population 1-week in advance about the work schedule
(x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
(xi) Keep the site free from all unnecessary obstructions;
(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
(xiii) At work site, public information/caution boards shall be provided including contact for public complaints

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.

112. **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.

113. **Socio-Economic – Employment**. Manpower will be required during the 36-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

114. **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 (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&S Training[5] 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[6].
(iii) Ensure that qualified first-aidis 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
(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

115. **Community Health and Safety**. Sewers worksanddeep 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:

[5] 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.

[6] http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES

(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 (20-30 kmph) for plying on unpaved roads, construction tracks
(ix) Provide temporary traffic control (e.g. flagmen) and signs where necessary to improve safety and smooth traffic flow
(x) Where traffic is diverted around crossings, traffic control or careful selection of the exit from the working areas will be provided with the aim of ensuring that vehicles join the road in a safe manner.
(xi) At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighbourhood awareness meetings
(xii) All drivers and equipment operators will undergo safety training
(xiii) Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

116. **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 Municipality
(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) Camp 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

117. Operation and Maintenance of the sewerage system will be carried out by AmburMunicipality.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 into Palarriver through 200m open earthern channel from polishing pond. STP is proposed under DBOT modality, and the contractor will prepare detailed designs for STP including the outfall sewer and disposal arrangements. At present, treatment and disposal system is designed in outline only (preliminary design); and during the detailed design phase, the assessment will be updated accordingly.During its operation phase, STPwill treat 16.71 million liters ofwastewater every day. As discussed in the pre-construction stage impacts, various measures, following measures are suggested for detailed design to avoid, mitigate any impacts on the environment due to operation of STP.

(i) Process design to meet the stringent inland water disposal standards

(ii) Develop a sludge management plan : Sludge management to collect, treat and dispose the accumulated sludge safely; sludge will be treated in a mechanical centrifuge which will thicken the sludge by separating the liquid, thicken sludge will be further dried, and dried sludge will be used as a soil conditioner in fields; Sludge will be tested periodically for heavy metal concentration.

(iii) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage in sewer system, including STP

(iv) Using low-noise and energy efficient pumping systems

(v) Installing the noise-producing pumps and motors etc., in enclosed buildings with noise reducing walls, and also maintaining adequate buffer to the nearby

inhabited areas

(vi) Provision of appropriate personal protection equipment to the workers and staff

118. **Treatment and Disposal**.Sewage treatment facilitywould be designed to meet the disposal standards notified by CPCB for disposal of treated wastewater for STPs.The treated sewage effluent would be disposed into Palar river through 200m open earthern channel from polishing pond(STP).Any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and may further pollute Palar river. It is therefore critical that STP treats the sewage as designed. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency.

119. **STP operation**. It must be ensured that the facility is operated with standard operating procedures and only by trained staff. Ensuring uninterrupted power supply with back-up facility is a must.Standard operating procedures and operation manual shall be prepared by the contractor. Besides routine operation, this will cover all necessary items such as preventive maintenance, periodic maintenance and emergency maintenance, replacement of pumps, motors, and other electro-mechanical parts as per the design life to optimize energy use and system efficiency etc., Manual shall also include safety awareness and mock drills for worker safety.

120. **Quality of Raw Sewage**. As discussed previously, one of the critical aspects in STP operation is, change in raw sewage characteristics at inlet of STP may affect the process and output quality. The system is designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP, and will upset process and affect the efficiency.Therefore, no wastewater from industries is to be allowed into the sewer network and to be strictly monitored and enforced.

121. **Sewage sludge**. Sewage sludge contains harmful substances such as bacteria and pathogens, and nutrients like nitrogen, phosphates. Improper handling and disposal of the sludge will have adverse impacts on health and environment. STP will have proper facilities for handling, treatment and disposal of sludge safely with implementation of sludge management plan. Therefore no adverse impacts envisaged. 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.The reuse of sludge should be preceded by rigorous bacteriological tests to confirm that the treatment methods render all dried sludge and effluent free from enteric bacteria and pathogens, so that it is safe to humans, animals and crops.Sludge shall also need to be periodically tested for presence of heavy metals, to check if it meets the compost standards specified the Solid Waste Management and Handling Rules, 2016.

122. Following measures are to be implemented during the operation phase:

(i) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility
(ii) Ensure continuous uninterrupted power supply
(iii) Operate and maintain the facility following standard operating procedures of operational manual
(iv) Undertake preventive and periodic maintenance activities as required
(v) Maintain the mechanical / electrical parts as per the maintenance plan to avoid

any hazards

(vi) Conduct periodic training to workers

(vii) Ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations

(viii) Implement sludge management plan at the STP

(ix) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers

(x) Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with TNPCB

(vii) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards

(viii) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming to the applicable standards to use as compost.

123. **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 periodic H2S monitoring at pumping and lifting stations using handheld H2S meters[7]

124. **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,

[7]There are no any standards notified by Government of India or Government of Tamil Nadu. However, Central Pollution Control Board (CPCB) has stipulated Guidelines on Odor Pollution and its Control. These guidelines deal only 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 H2S cannot be avoided in the process involving anaerobic decomposition whereas release of H2S will almost be nil in case of aerobic treatment. PIU and design engineers have not specified any odor standards adopted elsewhere in the preliminary designas 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.

and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

125. 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, sewer line ruptures, 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.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

126. 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.

127. 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, TNUIFSL, Government of Tamil Nadu and the ADB.

B. Public Consultation

128. 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

129. The subproject proposal is formulated by Ambur Municipalityin consultation with the public representatives bodies in the project area to suit their requirements.

130. Focus-group discussions with other stakeholders were conductedduring project preparation, and information on likely issues and the proposed mitigation and monitoring measures provided, 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 was conducted in Amburon 27.01.2018 with the public representatives and prominent citizens, NGOs and women participants. Another consultation was held with stakeholders near project site for proposed STP was conducted on 02.06.2018.

131. 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 nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place for sewerage system for its best functioning and to have the maximum health and aesthetic benefits. Issue of bad odours from lifting and pumping stations located close to

the houses is also raised. 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

132. 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 workas required. 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, television, 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

133. Executive summary of the IEE will be translated in Tamiland made available at the offices of PMU, PIU, and Amburand 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 Tamilwill be placed in the official website of the TNUIFSL and Ambur after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

134. 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.

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

VIII. GRIEVANCE REDRESS MECHANISM

136. 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.

137. 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.

138. 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 experts 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.

139. 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).

140. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the experts 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.

141. 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-failing which the grievance will be addressed by the state-level Steering Committee (SC). The SC will resolve escalated/unresolved grievances received.

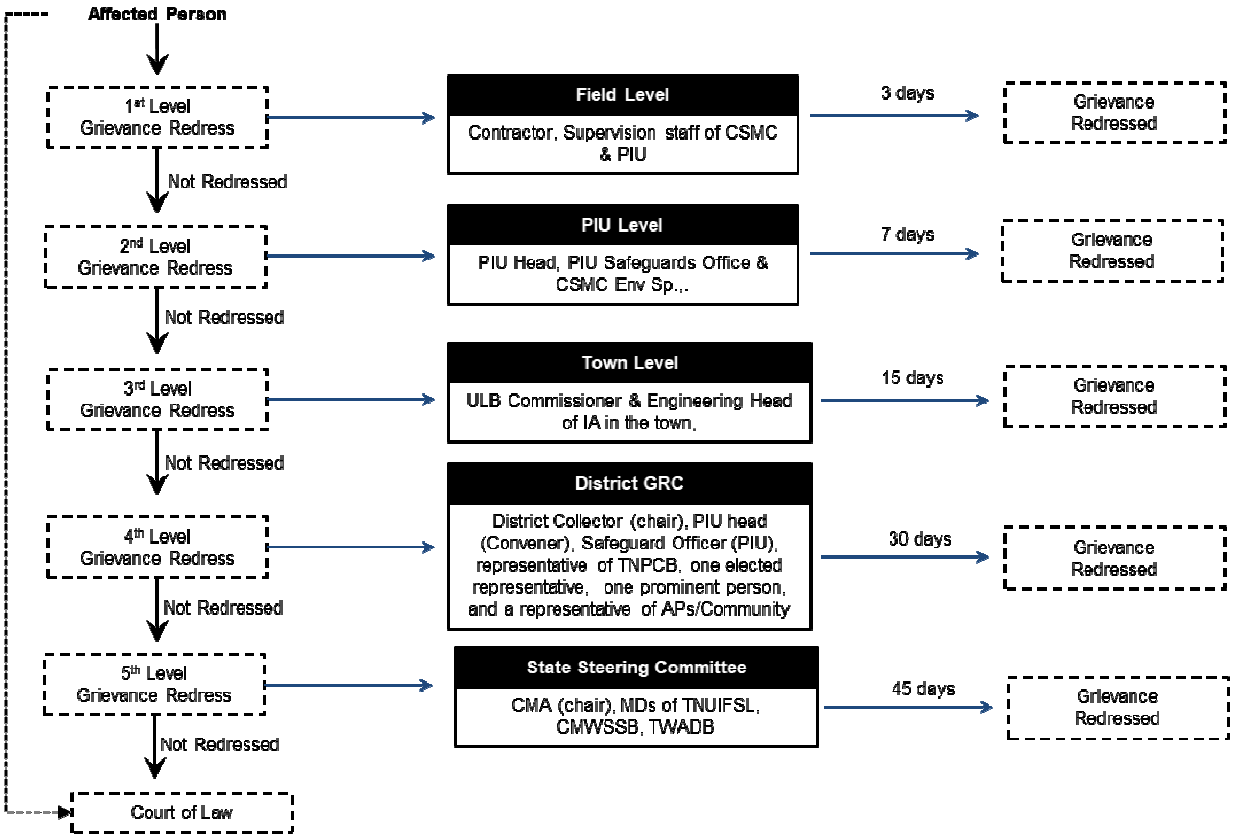
142. **Composition of GRC**. GRC will be headed by the District Collector, and members include: PIU head, Safeguards Officer of PIU, representative of TNPCB, one elected representative / prominent citizen from the area, and a representative of affected community. GRC must have a women member.

143. **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.

144. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collectorwill 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).

145. The multi-tier GRM for the project is outlined below (Figure 11), 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 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 9: Proposed TNUFIP Grievance Redress Mechanism



146. **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 andAmbur Municipality submitted to PMU.

147. **Information dissemination methods of the GRM**. The PIU, assisted by experted 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.

148. **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.

149. **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.

150. **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.

151. **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.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

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

153. 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.

154. 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.

155. 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 to ensure compliance to the conditions set out in this document.

156. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in theapprovedSEMP; 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.

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

Table 14:Design Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Design of STP	Deficient treatment due to substandard operation / system malfunction	(i) Design process to meet the CPCB disposal standards of inland water disposal (i) Ensuring continuous uninterrupted power supply, including a back-up facility (such as generator) (ii) Providing operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility (iii) Necessary training to ULB staff dealing with STP. (iv) Extended contractor period for O AND M, proper transfer of facility to ULB with adequate technical know-how on O AND M and hands-on training to ULB staff (v) Provision for online monitoring of crucial wastewater quality parameters at the inlet and outlet of the plant (BOD, pH, ammonia etc.,)	DBOT Contractor and TWADB	Project cost - DB Contractor
	Odour nuisance	(i) Site layout design of STP within allocated 9.57 acre land. (ii) Providing a green buffer zone of 15-20 m wide all around the STP with trees in multi-rows and land scaping. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater will be used for land scaping	DBOT Contractor and TWADB	Project cost - DB Contractor
	Sludge disposal	(i) Prepare sludge management plan to ensure safe collection, adequate treatment prior to reuse / disposal (ii) Conduct periodic testing of sludge to check its quality according to set standards for reuse as manure/soil conditioner (iii) Provide training on safe handling of sludge, along with proper apparatus and personnel protection equipment (PPEs) to workers	DBOT Contractor and TWADB	Project cost - DB Contractor
Sewer network	Nuisance due to leaks, overflows,	(i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains	PIU/Ambur Municipality	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
	contamination of water supplies, occupation health and safety of workers, etc.	(at least 1 m, 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		
Sewage pumping stations	Odour nuisance	**Measures specific (additional) to New Pumping Station near household area** (i) Maintain maximum buffer distance from the nearest residences to the pumping station wells; (ii) Locate pumping station as far as away from the road (iii) Develop green buffer zone around the facility 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 **Design measures** (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.	TWADB/Ambur Municipality	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		(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. (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. Provision of odor control / mitigation system as per site conditions / requirements • Suitable granular activated carbon filter with bird-screen fitted at the vent outlet to control odor. Size of GAC (including material size) should be selected based on the vent diameter and expelled air flow rate expected. (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. (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. (ix) Diesel Generators shall be provided for all pump stations and in cases of lift stations with space for control room. In		

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		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 electriMunicipality supply interruption. (x) Develop standard operating procedures / operational manual for operation and maintenance of lifting and pump stations; this shall include measures for emerge situations (xi) Provide training to the staff in SOPs and emergency procedures (xii) Periodically monitorodour generation at pumping stations		
	Sewage pumping and lifting stations located close to houses	(i) For Sub pumping station and lift station which are located adjacent to houses with a buffer distance of less than 20 m from the sewage wells to nearest house/property boundary, a suitable arrangement such 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 is less than 10 m.		
	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. At site boundary noise shall be within the prescribed limits for residensial areas. (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	PIU/Ambur Municipality	

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		(v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors (vi) Provide ear plugs to workers		
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/Ambur Municipality	Project 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/Ambur Municipality	Project Costs

Table 15:Pre Construction Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
Submission of updated EMP / SEP; EMP implementation and reporting	Unsatisfactory compliance to EMP	(i) Appoint EHS Supervisor to ensure EMP implementation (ii) Submission of updated EMP/ SEP (ii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs	Contractor	Contractor cost
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.	Contractorincoordination with PIU	Project cost-
Construction work camps, stockpile areas, storage	Conflicts with local community; disruption to	(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	Contractor to finalize locations in consultation and approval of PIU	Project cost-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
areas, and disposal areas.	traffic flow and sensitive receptors	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.		
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(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	Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	Contractor cos

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
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.	Construction Contractor and PIU	Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU.
Chance finds	Damage / disturbance to artifacts	(i) Construction contractors to follow these measures in conducting any excavation work (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ.	Construction Contractor and PIU	Contractor cost

Table 16:Construction Stage Environmental Impacts and Mitigation Measures

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	Contractor cost
Air Quality	Dust, emissions from construction vehicles, 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.	**For all construction works** (i) Provide a dust screen around the construction sites of pumping and lifting stations and STP (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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		prior to leaving construction site (x) Ensure that all the construction equipment, machinery are fitted with pollution control devises, which are operating correctly, and have a valid pollution under control (PUC) certificate **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		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately. (ix) 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.		
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality. Ponding of water in the pits / foundation excavations	(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; (viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).	Contractor	Contractor cost
	Water	(i) As far as possible control the entry of runoff from	Contractor	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	accumulation in trenches/pits	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		cost
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 minimise sound impact to surrounding sensitive receptor; and (iii) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. at sensitive locations like schools and hospitals noise shall not exceed 50 dBA. (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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		cultural festivals.		
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.	(i) Prepare and implement a Construction Waste Management Plan (refer 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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		to issuing of construction completion certificate		
Accessibility and traffic disruptions	Traffic problems and conflicts near project locations and haul road	**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; prepare traffic management plans for each section (refer sample in Appendix 6) (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 meter 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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		narrow roads and deeper sewers; if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period (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 (viii) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access. (ix) Inform the affected local population 1-week in advance about the work schedule (x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (xi) Keep the site free from all unnecessary obstructions; (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 (xiii) At work site, public information/caution boards shall be provided including contact for public complaints **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		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		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.		
Socio-Economic Loss of access to houses and business	Loss of income	(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;	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(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.		
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force as far as possible (iii) Comply with labor laws	Contractor	Contractor cost
Occupational Health and Safety	Occupational hazards which can arise during work	(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 (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[8]. (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	Contractor	Contractor cost

[8]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
		(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 (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		
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste	(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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	transportation	Municipality (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) Camp 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		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		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		
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(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) (ii) Avoid tree cutting for setting up camp facilities (iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around (iv) Camp site shall not be located near (100 m) water bodies, flood plains flood prone/low lying areas, or any ecologically, socially, archeologically sensitive areas (v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit (vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers;	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; (vii) Consult PIU before locating project offices, sheds, and construction plants; (viii) Minimize removal of vegetation and disallow cutting of trees (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 (x) Camp shall be provided with proper drainage, there shall not be any water accumulation (xi) Provide drinking water, water for other uses, and sanitation facilities for employees (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) (xiii) Train employees in the storage and handling of materials which can potentially cause soil contamination (xiv) Recover used oil and lubricants and reuse or remove from the site (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 /		

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

Table 17:Operation Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
STP operation – malfunction and effect on efficiency	Public health, safety and environmental impacts	(i) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility (ii) Ensure continuous uninterrupted power supply (iii) Operate and maintain the facility following standard operating procedures of operational manual (iv) Undertake preventive and periodic maintenance activities as required (v) Maintain the mechanical / electrical parts as per the maintenance plan to avoid any hazards (vi) Conduct periodic training to workers (vii) Ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations (viii) Implement sludge management plan at the STP. sludge management to collect, treat and dispose the accumulated sludge safely; sludge will be tested periodically for heavy metal concentration. (ix) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers	DBOT Contractor and PIU /Ambur Municipality	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(x) Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with TNPCB (vii) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the standards (viii) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming stipulated concentrations to use as compost		
Operation of sewage lifting and pumping stations	Odour nuisance	(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_2S monitoring periodically	PIU and Ambur Municipality	Operating costs
Operation and maintenance of sewerage system	Blocks, overflows, system malfunction, occupational health and safety	(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	PIU and Ambur Municipality	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		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); (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		

Table 18:Construction Stage Environmental Monitoring Plan

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 **Appendix 7**	Weekly during construction	Supervising staff and safeguards specialists of PIU	Staff and consultant costs are part of incremental administration costs
Ambient air quality	5 locations (STP and4 monitoring locations 50 m downwind direction near sewer and pumping station work sites in the Municipality);	• PM10, PM2.5 NO2, SO2, CO	Once before start of construction Quarterly (yearly 4-times) during construction (3year period considered)	ConstructionContractor	Cost for implementation of monitoring measures responsibility of contractor (65 samples x 5000 per sample = 325,000)
Ambient noise	5 locations (STP in Kaspa-A and 4 monitoring locations near sewer and pumping station work sites in the Municipality);	• Day time and night time noise levels	Once before start of construction Quarterly (yearly 4-times) during construction (3year period	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor (65 samples x 1500 per sample =

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
			considered)		97,500)
Surface water quality	2 locations (Kaspa-A)	• pH, Oil and grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalnity • heavy metals and pesticides	Once before start of construction Half yearly during construction (3year construction period considered)	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor (14 samples x 4000 per sample = 56,000)

Table 19:Operation Stage Environmental Monitoring Plan

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of treated wastewater quality from STP	Inlet and outlet of STP	Parameters as specified by TNPCB in the consent/ disposal standards notified for STPs. •	Monthly Once	Ambur Municipality	AMBUR MUNICIPALITY Operating Cost
Water quality at disposal point	Kaspa-A / Palar river disposal point	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity, Heavy metals and pesticides	Baseline monitoring prior to start of commissioning Monthly once during operation Yearly twice during operation (pre and post monsoon)	Ambur Municipality	O and M costs (water quality will be tested at the internal laboratory part of STP)
Odour monitoring at STP	3 points (at boundary in the downwind direction and at nearest house, and including other units within the STP)	Hydrogen sulphide (H2S) •	Periodical (throughout the operation phase)	Ambur Municipality	Handheld H2S meters to be procured as part of the project and operated by operating staff
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 (H2S)	Periodical (throughout the operation phase)	Ambur Municipality	Handheld H2S meters to be procured as part of the project and operated by operating staff
Odour	2 points (downwind	Hydrogen sulphide	Periodical	Ambur	Handheld H2S meters

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
monitoring at lifting stations	direction) at all lifting stations: near suction well and at nearest house	(H2S) in ambient air •	(throughout the operation phase)	Municipality	to be procured as part of the project and operated by operating staff
Sludge quality and suitability as manure	STP	Analysis for concentration of heavy metals and confirm that value are within the limits for use as compost	Start of operation and Yearly once	Ambur Municipality	O and M costs (testing to be done at an accredited external laboratory)

B. ImplementationArrangements

158. 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.

159. The implementing agency for this subproject is TWAD Board. A project implementation unit(PIU) will be established in TWAD headed by a full-time Project Manager (Executive Engineer or above) and comprising dedicated full-time staff of the TWADfor day-to-day implementation of the project. PIUunder the TWAD Board will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of subproject.

160. **Safeguards Compliance Responsibilities**. Environmental and Social Safeguards (ESS) Managers in PMU/TNUIFSL will have overall responsibility of safeguard compliance with EMP and EARF. ULB Safeguards Officer will coordinate monitoring and implementation of safeguards. Environmental expert from TWAD Board will assist PIU in implementation of project in compliance with EMP and EARF, and will carry out all necessary tasks.

161. **PMU Safeguard Responsibilities**. Key tasks and responsibilities of the PMU for this subprojectinclude 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 labor laws and core labor 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.
(vii)

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 quarterlyenvironmental 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

162. **PIU Safeguard Responsibilities**. Key tasks and responsibilities of the PIU assisted by experts 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 labor laws and core labor standards including:

a. Labour welfare measures and provision of amenities
b. prohibition of child labor as defined in national legislation for construction and maintenance activities;
c. equal pay for equal work of equal value regardless of gender, ethniMunicipality, or caste;
d. elimination of forced labor;
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 STPand permission from PWD for disposal of treated effluent prior to invitation of bids and/or prior to award of contract / prior to constructionasappropriate

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

(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) Superviseambientenvironmental monitoring by contractors
(x) Take corrective actions when necessary to ensure no environmental impacts
(xi) Submit quarterlyenvironmental monitoring reports to PMU
(xii) Conduct continuous public consultation and awareness
(xiii) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP
(xiv) 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;
(xv) Implement corrective or preventative actions in case of non-compliance or new/unanticipated impacts;
(xvi) 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
(xvii) 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;
(xviii) Review and approve monthly progress reports submitted by Contractor on EMP compliance,
(xix) Prepare quarterly environmental monitoring reports and submit to PMU /TNUIFSL
(xx) 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

163. **Contractor'sResponsibilities:**

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 Ambur Municipality
(xiii) Comply with applicable government rules and regulations

C. Training Needs

164. The following **Table 20**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 20:Pre Outline Capacity Building Program on EMP Implementaiton

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Tamil Naduapplicable safeguard laws, regulations and policies including but not limited to core labor standards, OH and S, etc. - In of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project At PMU (combined program for all PIU)	-	Included in the overall program cost

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
2. EMP implementation (1/2 day) - EMP mitigation and monitoring measures -Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up and restoration	All PIU staff, contractor staff and consultants involved in the subproject At PIU	-	To be conducted by PIU at the PIU office; part of project implementation cost
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 PIU

D. Monitoring and Reporting

165. 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. 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.

166. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. PIU will monitor, review and advise contractors for corrective actions if necessary. Quarterly eport summarizing compliance and corrective measures, if any, taken will be prepared by PIU 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 anannualreport.

167. Based on PIU Quarterly monitoringreports 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 Ambur Municipality websites.

168. ADB will review project performance against the TNUFIPcommitments 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

169. 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 21:Cost Estimates to Implement the EMP

	Particulars	**Stages**	**Unit**	**Total Number**	**Rate (INR)**	**Cost (INR)**	**Costs Covered By**
A.	**Implementation staff**						
1	EHS Supervisor	Construction	per month	36x2	35,000	25,20,000	Civil work contract
	Subtotal (A)					**25,20,000**	
B.	**Mitigation Measures**						
1	Providing odour control system sewage pumping & lifting stations (gas capturing & treatment at required stations) and handheld H2S meters for monitoring	Design	Lump sum provision	-	-	15,00,000	Provisional sums of contract (PIU)
2	Consent for establishments and consent for operation from TNPCB	Pre construction	Lump sum			200,000	Project costs (PIU)
3	Provision for tree cutting and compensatory plantation measures (1: 5 ratio replantation)	Construction	Per tree	100	1,000	100,000	Project costs (PIU)
4	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
5	Safety barricading	Construction	Lump sum	Lumsum		2,000,000	Civil works contract
	Subtotal (B)					**40,50,000**	
C.	**Monitoring Measures**						
1	Air quality monitoring	Construction	per	65	5,000	325,000	

	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
			sample				
2	Noise levels monitoring	Construction	Per sample	65	1,500	97,500	
3	Surface water monitoring	Construction	Per sample	12	4,000	48,000	
	Subtotal (C)					**470,500**	
D.	**Capacity Building**						
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
	Subtotal (D)						
	Total (A+B+C+D)				**INR**	**70,40,500**	

Contractor Cost - 47,70,000
PIU Cost - 22,70,500

X. CONCLUSION AND RECOMMENDATIONS

170. The process described in this document has assessed the environmental impacts of all elements of the proposed underground sewerage subproject in area of AmburMunicipality. 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: STP treatment process design to meet disposal standards, ensuring efficient treatment, and sludge management,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) and sludge handling, and development of green buffer zone around the sewage treatment plant.

171. The site selected for STP is located within a vast parcel of land. Considering the current and future development around the facility, various measures are included in the subproject design, including: design of a compact, superior process with lowodour potential; sensitive layout design by maintaining adequate distance from the boundary, so that STP is deep inside the campus with tree cover around, etc.,. All the lifting and pumping station sites are situated on vacant land parcels, and sewers will be laid on the public roads.

172. 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, some of the 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. Periodical odour monitoring is proposed at pumping and lifting stations.

173. STP malfunction or decrease in treatment efficiency will have adverse impacts.This will result in release of untreated or partially treated wastewater that will pollute environment and cause public health issues. STP would be designed by the DBOT contractor to meet the disposal standards and disposal is proposed into Palar river through 200m open earthern channel from Polishing pond(STP). Required measures to ensure that sewage system is operated and maintained with designed efficiencyare to be included in the design and operation by the contractor. . Proper sludge management system to collect, treat and dispose safety will be followed. Periodic monitoring of dried sludge to check suitability as a manure is suggested.

174. 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.

175. 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 O and M manual and standard operating procedures to be developed for all the activities.

176. 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 treatment efficiency of STP (raw and treated sewage quality), sludge and odour. 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 aMunicipality level consultation workshop, whichwas 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, Ambur Municipality and ADB websites. The consultation process will be continued during project implementation, as necessary, to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation.

181. 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.

182. 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/ SEP 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 to ensure compliance to the conditions set out in this document.

183. The citizens of the AmburMunicipality 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 theproject area. Diseases of poor sanitation, such as diarrhoea 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.

184. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STPrequiresconsenttoestablishment (CTE) and consent to operate (CTO) from Tamil NaduPollution Control Board. CTE shall be obtained prior to construction.

185. This IEE shall be updatedby 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 for Ambur Municipality.

Sector Division: Urban Development

Screening Questions	Yes/No	Remarks
A. Project Siting **Is the project area…**		
• Densely populated?	☒Yes ☐No	Subproject activities are located in the outer areas of AmburMunicipality, which were originally municipalities. Old habilitation areas within these municipalities have density residential pockets, with narrow and congested roads. Newly developing residential areas have low density and well planned layouts. Agriculture is still practiced in the outer areas.
• Heavy with development activities?	☒Yes ☐No	It is a developing area; urban expansion is considerable
• Adjacent to or within any environmentally sensitive areas?	☐Yes ☒No	-
• Cultural heritage site	☐Yes ☒No	-
• Protected Area	☐Yes ☒No	-
• Wetland	☐Yes ☒No	-
• Mangrove	☐Yes ☒No	-
• Estuarine	☐Yes ☒No	-
• Buffer zone of protected area	☒Yes ☐No	-
• Special area for protecting biodiversity	☐Yes ☒No	-

• Bay	☐Yes ☒No	-
B. Potential Environmental Impacts **Will the Project cause…**		
Sewerage		
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐ Yes ☒ No	No historical or cultural sites in the subproject area
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	☒ Yes ☐ No	Few sewage lifting and pump stations are located close to the house, and odour may create nuisance. Necessary measures are included to prevent and control odour; no net negative impacts envisaged
▪ dislocation or involuntary resettlement of people?	☐ Yes ☒ No	Do not involve land acquisition or resettlement
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	☐ Yes ☒ 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.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	☐ Yes ☒ No	Adequate capacity sewage treatment facility is being development under this subproject;
▪ overflows and flooding of neighboring properties with raw sewage?	☐ Yes ☒ 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 impact envisaged.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	☐ Yes ☒ 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
▪ noise and vibration due to blasting and other civil works?	☐ Yes ☒ No	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical,and biological hazards during project construction and operation?	☐ Yes ☒ No	In appropriate handling of sludge may have occupational health hazard. All necessary safety precautions will be taken to avoid any risk.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐ Yes ☒ 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.
▪ inadequate buffer zone around	☒ Yes	Due to technical constraints and land

pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	☐ No	availability, some pumping stations are located close to houses, however, necessary measures are included in site planning, design and operation. No net negative impacts envisaged
▪ road blocking and temporary flooding due to land excavation during the rainy season?	☐ Yes ☒ No	Complete road block 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.
▪ noise and dust from construction activities?	☒ Yes ☐ 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 measures.
▪ traffic disturbances due to construction material transport and wastes?	☐ Yes ☒ 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?	☐ Yes ☒ 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?	☐ Yes ☒ 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?	☐ Yes ☒ No	The STP design would include adequate sludge treatment facilities
▪ contamination of surface and ground waters due to sludge disposal on land?	☐ Yes ☒ No	The STP design would 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 maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?	☐ Yes ☒ 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	☐ Yes ☒ No	No such impact anticipated; local communities in the vicinity of the project would be employed as much as possible.

sanitation system)?		
▪ Social conflicts between construction workers from other areas and community workers?	☐ Yes ☒ 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?	☐ Yes ☒ 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?	☐ Yes ☒ 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. .

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
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
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)?		√	No
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)?		√	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 to Ambur Municipality

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

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)

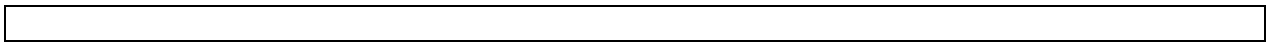
The _____Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

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 in 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

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 Municipality 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 Municipality areas are wide but in old Municipality 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. Flagggers/ 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

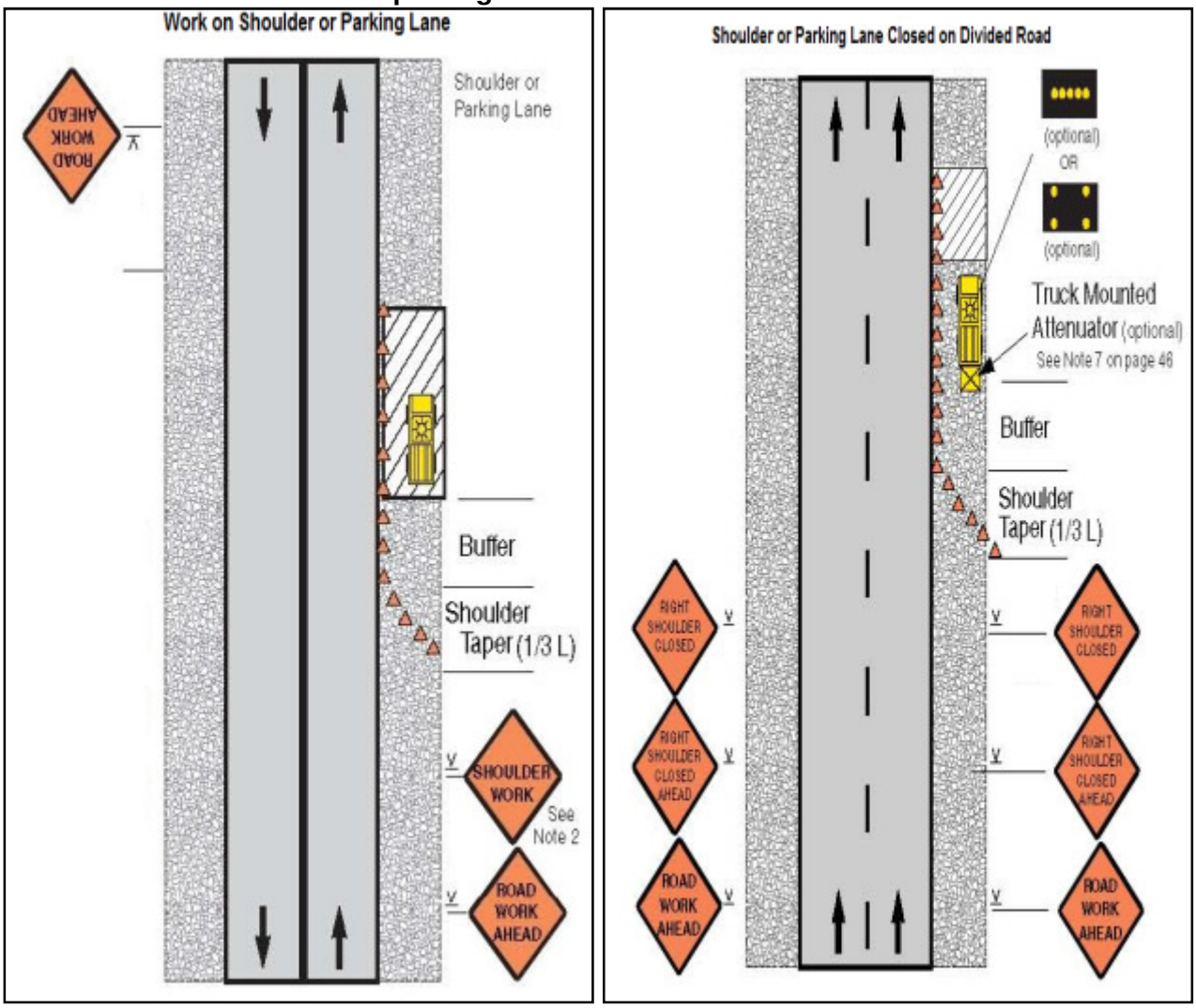


Figure A11.4 and A11.5: Work in Travel lane and Lane closure on road with low volume

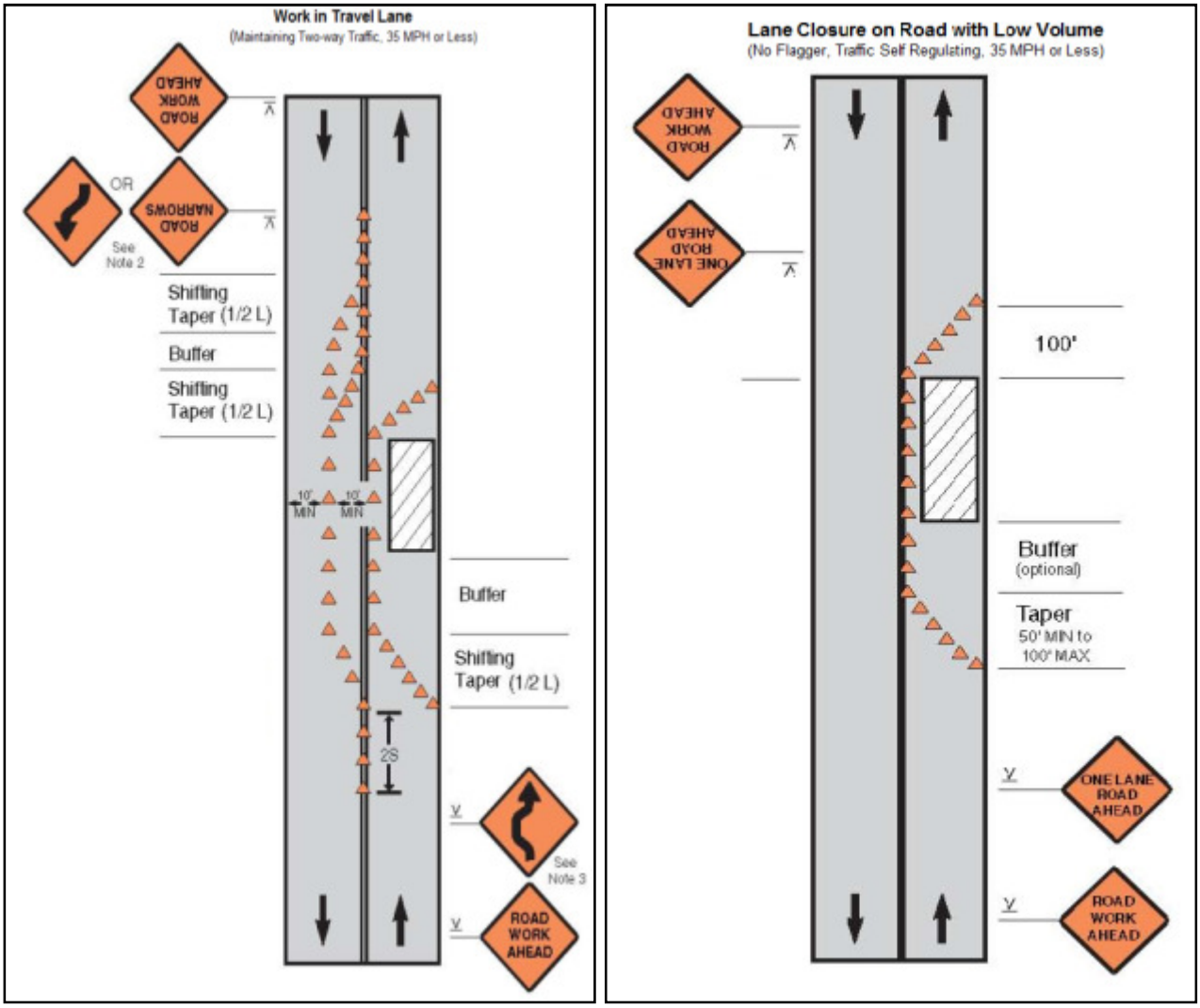
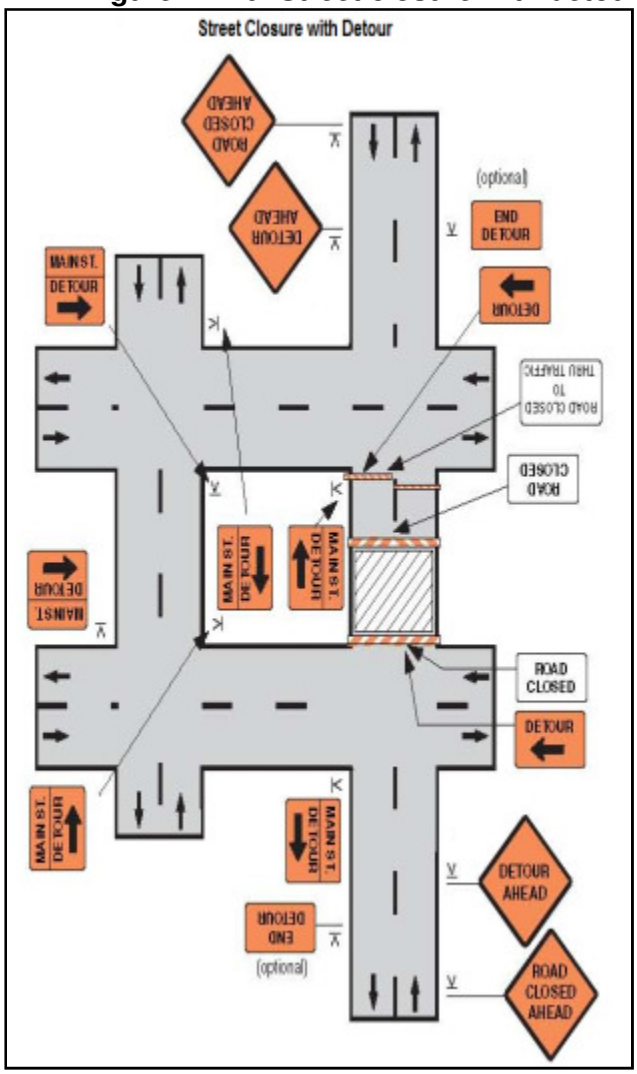


Figure A11.6: Street closure with detour



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
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
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 **Name**
Position **Position**

APPENDIX 8: QUARTERLY REPORTING FORMAT FOR AMBUR MUNICIPALITY/PIU

1. Introduction

- Description of sub-project implemented by PIU
- Environmental category of the sub-project
- Details of site personnel and/or consultants responsible for environmental monitoring
- Sub-project status

No.	Sub-Project Name	Subproject status	List of Works	Progress of Works
		Design☐ Pre-Construction☐ Construction☐ Operational Phase☐		

2. Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

3. Compliance status with environmental loan covenants, if any

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

4. Compliance status with the environmental management and monitoring plan

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
    - What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;

- If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
- adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Are their designated areas for concrete works, and refuelling;
- Are their spill kits on site and if there are site procedure for handling emergencies;
- Is there any chemical stored on site and what is the storage condition?
- Is there any dewatering activities if yes, where is the water being discharged;
- How are the stockpiles being managed;
- How is solid and liquid waste being handled on site;
- Review of the complaint management system;
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

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

Overall Compliance with EMP

No.	Sub-Project Name	EMP Part of Contract Documents (Y/N)	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 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/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 µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (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.

8. Appendixes

- Photos
- Summary of consultations conducted, if any
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

Appendix 9: Details of Public consultations

Minutes of the Public Consultation Conducted on 27.01.2018 at Ambur Municipality Office, Ambur for The Proposed Underground Sewerage Scheme (UGSS by Tamil Nadu Water Supply and Drainage Board and AmburMunicipality

The Public Consultation commenced at 11.00 AM with officials from TWAD Board and Ambur Municipality.The public/residents of the area and the residential association members were present at the meeting based on prior public notice given in newspapers about the details of the public consultation. The list of participants and residents participated in public opinion hearing meeting is as entered in the attendance register. The copy of Attendance register is attached herewith as Annexure - I for your reference.

Officials of TWAD &Ambur Municipality welcomed the gathering and outlined the procedure for Public Consultation. They described that the TWAD Board &Ambur Municipality have proposed to develop the Under Ground Sewerage Scheme for AmburMunicipality. They requested the gathered public to express their views and opinions. This was followed by description of the project in detail. The summary of the project details was also circulated to the gathering.

The following details regarding the scheme were shared with the public:
The proposed UGSS will consist of 1Main pumping stations, 1 Sub Pumping station , 1 lifting station and a STP at Sollur village.The project area is divided into 4 Zones for better implementation. The sewer network will cover all the streets in the Municipality areas of 36-wards.The proposed project will collect the sewage from residential, commercial and institutional areas. The sewage will be pumped to Sewage Treatment Plant at Kaspa-A for treatment and disposal. Also, the entire sewage collected in Ambur Municipality will be directly pumped to STP at Sollur village.The STPwill beexecuted on DBOOT (design, build, own, operate and transfer) basis and the process will provide the treated waste water in line with the discharge standards prescribed by Tamil Nadu Pollution Control Board (TNPCB). The proposal will prevent pollution of the natural water bodies present in the area, due to discharge of sewage.

Following this, the TWAD and Ambur Municipality Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.

The views and questions of the public/residents and clarifications given by the Officials are detailed below:

S. No.	The views and questions of the public	Clarification given by the Officials of TWAD / Ambur Municipality
1.	The proposed location of the pumping stations and STP.	SPS-Rafeeque Nagar MPS-Kaspa-A STP - Sollur village
2.	Time period of the project i.e., start and end time of the project	The project will be started after the tender process. Execution period 36 months.
3.	Questioned about whether there will be any impact to the surrounding peoples in the Rafeeque Nagar because of proposed Sub pumping station.	The Sub Pumping station will be placed beyond the residential units and the proper green belt will be provided in the pumping station so that there will not be any impact to peoples in this locality.
4.	About the project cost and the implementation of project whether increase in the taxes of the households in the project area.	The individual households will have to pay taxes for the sewerage connection as like that of water connection. Also, the tax payment will be calculated based on the type and built-up area of houses.
5.	About the sizes of the pipes used and durability of the pipes.	The sizes of pipes are calculated based on the ultimate period population calculated for 2050. Thus there will not be any resizing of pipes required untilthe year 2050.
6.	About the implementation schedule of the project proposal	The construction and trial run for the project proposal will be about 3 years and 6 months for collection system.
7.	During implementation whether the connections to the household will be given based on type of houses i.e., only for R.C. houses or on what basis.	The connections will be given to all households in the proposed project area. Only the amounttaxed will vary based on the type or built-up area of the house.
8.	Whether the public fund is included in the design and construction phase of project cost.	The project cost is about Rs. 165.55 Crores. Out of which 50% will be granted by Government of India, 20 % will be granted by Government of Tamil Nadu and 10% will be provided by Urban Local Body(own), 20% will be provided by Urban Local Body(fund under ADB)i.e., Ambur Municipality. Taxes will be

		collected from public/residents only during the operation phase.
9.	Whether Under Ground Sewerage Scheme and Storm Water drain are the same.	UGSS will collect only sewage and the storm water will be collected in separate open drain that will be connected to the water bodies.
10.	Whether the proposal will collect grey water and black water	The scheme will collect both the grey and black water from the residential, commercial and institutional areas in the project area
11.	Proposed pumping station will have any odour problems in the vicinity of the area.	There will not be any odour problem as the pumping stations are proposed with development of greenbelt around the periphery. In addition the pumping stations will be fitted with odour control devices.
12.	There is no provision of sewage network in Ward No. 26.	As said earlier, the present project proposal will cover entire Municipality areas of Ambur Municipality.
13.	Implementation of project schedule.	The current proposal of UGSS will be available to the public within 3 years of time.
14.	If any discontinuity in the project proposal which will contribute disturbances to the public where should we contact. Kindly give the authorized person's name, designation and address.	The concerned authority for this project proposal is the Ambur Municipality and it is requested to contact Ambur Municipality officials in their locality directly if there are any disturbances to the public/residents. If no action taken then they can contact the Ambur Municipality.
15.	Need clarification about any deposit needed for sewerage connection or taxes to be paid.	The deposit and the taxes will be calculated based on type and built-up area of the project. Also, the deposit and taxes will be based on the bye-law passed by Government of Tamil Nadu.
16.	On What basis chambers will be laid and Distance between the chambers	The chambers will be laid at 30 m interval for easy inspection purpose.
17.	Pipe quality and diameter of the pipes	The pipes will be laid based on IS standard so that the durability of pipes will be ensured. The diameter will be vary based on the quantity calculated.
18.	Whether household connections will be given on any priority	The household connections will be given to all the housesin Municipality areas of Ambur

		Municipality.
19.	At present there are no sewer and storm water drain facilities in our locality (Ward No. 12) and we are facing many problems. The proposed sewer network will come into operation only after 2 years. What will happen for this 3 years.	We will provide temporary facilities for collection of sewage so that there will not be any problems in your locality.
20.	There are many vacant sites in our locality and this proposal will work if the sites are constructed with residential units.	The sizes of pipes are calculated based on the ultimate period population projected for 2050. This will take into account any increase in residents in the project area.
21.	The proposal is for the Ambur Municipality. The information about the public consultation has not reached the peoples in the locality. Giving advertisement in News Paper alone is not sufficient. Thus, the public consultation should be postponed and conducted again after informing all the peoples.	All the regulations for conducting the public hearing have been followed. Kindly give your opinions for the proposal.
22.	Whether there will be any impact on ground water by proposing the STP in Sollur village.	There will not be any impact in ground water since all the sewage generated are collected through sewer network and treated in STP tanks which are above ground. Also, the treated sewage will match the discharge standards prescribed by TNPCB.

The officials of TWAD and Ambur Municipality concluded the Public Consultation with vote of thanks.

Copy of the photographs and copy of the News Paper advertisementof the entire proceedings are enclosed.

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Ambur on 27.01.2018for proposed UGSS in Ambur Municipality

News items related to Ambur Municipality in Tamil Newspaper

27–இல் பாதாள சாக்கடைத் திட்ட கருத்துக் கேட்பு, கலந்தாய்வுக் கூட்டம்

ஆம்பூர், ஜன. 25: ஆம்பூரில் பாதாள சாக்கடைத் திட்டம் செயல்படுத்தப்பட உள்ள தால் பொதுமக்கள் கருத்துக் கேட்பு மற்றும் கலந்தாய்வுக் கூட்டம் ஜனவரி 27–ஆம் தேதி நடைபெற உள்ளது.

இதுகுறித்து ஆம்பூர் நகராட்சி ஆணையர் (பொறுப்பு) எல். குமார் வெளியிட்டுள்ள செய்திக் குறிப்பு:

ஆம்பூர் நகராட்சியில் அம்ருத் திட்டத்தின் கீழ் ரூ.165.55 கோடி மதிப்பீட்டில் பாதாள சாக்கடைத் திட்டம் செயல் படுத்தப்பட உள்ளது. இது குறித்து பொதுமக்களிடம் கருத்துக் கேட்பு மற்றும் கலந் தாய்வுக் கூட்டம் நகராட்சி அலுவலகத்தில் ஜனவரி 27–ஆம் தேதி (சனிக்கிழமை) காலை 10.30 மணிக்கு நடை பெற உள்ளது.

இதில், நகராட்சி ஆணை யர், தமிழ்நாடு குடிநீர் வடி கால் வாரிய அலுவலர்கள் கலந்து கொள்கின்றனர்.

பொது மக்கள் கூட்டத்தில் பங்கேற்று கருத்துகளைத் தெரிவிக்கலாம் என தெரி விக்கப்பட்டுள்ளது.

...ணவகங்கள்!

பெங்களூருவில் அறிமுகம்!!

...ளூருவில் ஜன.28– திரா காந்தி பெயரில் இந் டும் உணவகங்கள் அறிமு கம் செய்யப்பட்டன. இதன் மூலம் ரூ.5–க்கு சிற்றுண்டியும், ரூ.10–க்கு மதிய உணவும் வழங்கப்ப டுகிறது.

இந்த வகை உணவகங் களை குடியரச தினத்தையொட்டி நடை பெற்ற நிகழ்ச்சியில் கர்நா டகமுதல்வர்சித்தராமையா தொடங்கி வைத்தார். பசி யில்லாத கர்நாடக மாநிலம் என்ற இலக்கை அடையும் நோக்கில் இந்த உணவகங் கள் தொடங்கப்பட்டுள்ள தாக சித்தராமையா தெரி வித்தார். முன்னாள் பிரதமர் இந்திரா காந்தியின் பெய ரில் இந்த உணவகங்கள் தொடங்கப்பட்டுள்ளன.

ஆம்பூரில்

பாதாள சாக்கடை திட்டம்!

ஆம்பூர், ஜன. 28– ஆம்பூர் நகராட்சியில் மொத்தம் 36 வார்டுகள் உள் ளது. இங்கு 1 லட்சத்து 25 ஆயிரத்திற்கும் மேற்பட்ட மக்கள் வசிக்கின்றனர். கழிவு நீர் பாலாற்றில் கலப் பதால் ஆறு மாசடைகிறது. இந்நிலையை போக்க அம் ருத் திட்டத்தின் கீழ் சுமார் ...165.55 கோடி மதிப்பீட் டில் அனைத்து பகுதிகளுக் கும் அமைக்கப்படவுள்ள பாதாள சாக்கடை திட்டத்திற்கு மக்களி டையே கருத்து கேட்கும் கூட்டம் ஆம்பூர் நகராட்சி யில் ஆணையாளர் பொறுப்பு குமார் தலைமை யில் நடந்தது.

நிகழ்ச்சியில் நாகர்வோர் சங்க நிர்வாகிகள் விஜய ராஜ், குணசீலன், முன்னாள் நகர மன்ற உறுப்பினர் கராத்தே மணி உட்பட பொதுமக்கள் ஏராளமா னோர் கலந்து கொண்டு தங் களின் சந்தேகங்களையும் கருத்துகளையும் கேட்ட னர். பொதுமக்களின் சந்தே கங்களுக்கு தமிழ்நாடு குடி நீர் வடிகால் வாரிய உதவி செயற்பொறியாளர் சண்மு கம் பதிலளித்தார். கூட்டத் தில் துப்புரவு அலுவலர் பாஸ்கர் மற்றும் பலர் கலந்து கொண்டனர்.

ஆம்பூரில்

பாதாள சாக்கடை திட்டப்பணி தொடங்கினால் விரைந்து முடிக்க வேண்டும்

ஆலோசனை கூட்டத்தில் பொதுமக்கள் கோரிக்கை

ஆம்பூர், ஜூன்.28–

ஆம்பூர் நகராட்சியில் அம்ருத் திட்டத்தின் மூலம் ரூ.165½ கோடி மதிப்பீட்டில் பாதாள சாக்கடை திட்டப்பணிகளை மேற்கொள்ள அரசு அனுமதி வழங்கியுள்ளது. இதையொட்டி பொதுமக்களிடம் கருத்துகேட்பு கூட்டம் நகராட்சி அலுவலகத்தில் நேற்று நடந்தது. ஆணையாளர் எல்.குமார் தலைமை தாங்கினார். துப்புரவு அலுவலர் பாஸ்கர் வரவேற்றார். தமிழ்நாடு குடிநீர் வடிகால் வாரிய உதவி செயற்பொறியாளர் சண்முகம் திட்டப்பணிகள் குறித்து பேசினார்.

கூட்டத்தில் பாதாள சாக்கடை திட்டப்பணிகள் தொடங்கப்பட்டால் நிர்ணயிக்கப்பட்ட காலத்திற்குள் பணியை விரைந்து முடித்து, சாலையை சீரமைக்க வேண்டும். மேலும் ஒரு குறிப்பிட்ட பகுதியில் பணியை தொடங்கி அங்கு முடித்தபின்னர் அடுத்த பகுதிக்கு செல்ல வேண்டும் என பொதுமக்கள் தெரிவித்தனர். கூட்டத்தில் நகர்வோர் பாதுகாப்பு மன்ற தலைவர் குணசீலன், செயலாளர் விஜயராஜ் உள்பட பலர் கலந்து கொண்டனர்.

ஆம்பூர் நகராட்சியில் பாதாள சாக்கடை அமைப்பதற்காக மக்களிடையே கருத்து கேட்பு கூட்டம் ஆணையாளர் குமார் தலைமையில் நடந்தது. படத்தில் குடிநீர் வடிகால் வாரிய உதவி செயற்பொறியாளர் சண்முகம், துப்புரவு அலுவலர் பாஸ்கர் ஆகியோர் உள்ளனர்.

Edited and Published by S.N.Selvam on behalf of M/s. Chennai Murasu Pvt.Ltd., Printed by

ஆம்பூர் நகராட்சியில்

பாதாள சாக்கடை திட்டம் செயல்படுத்துவது குறித்த ஆலோசனைக்கூட்டம்

நாளை நடக்கிறது

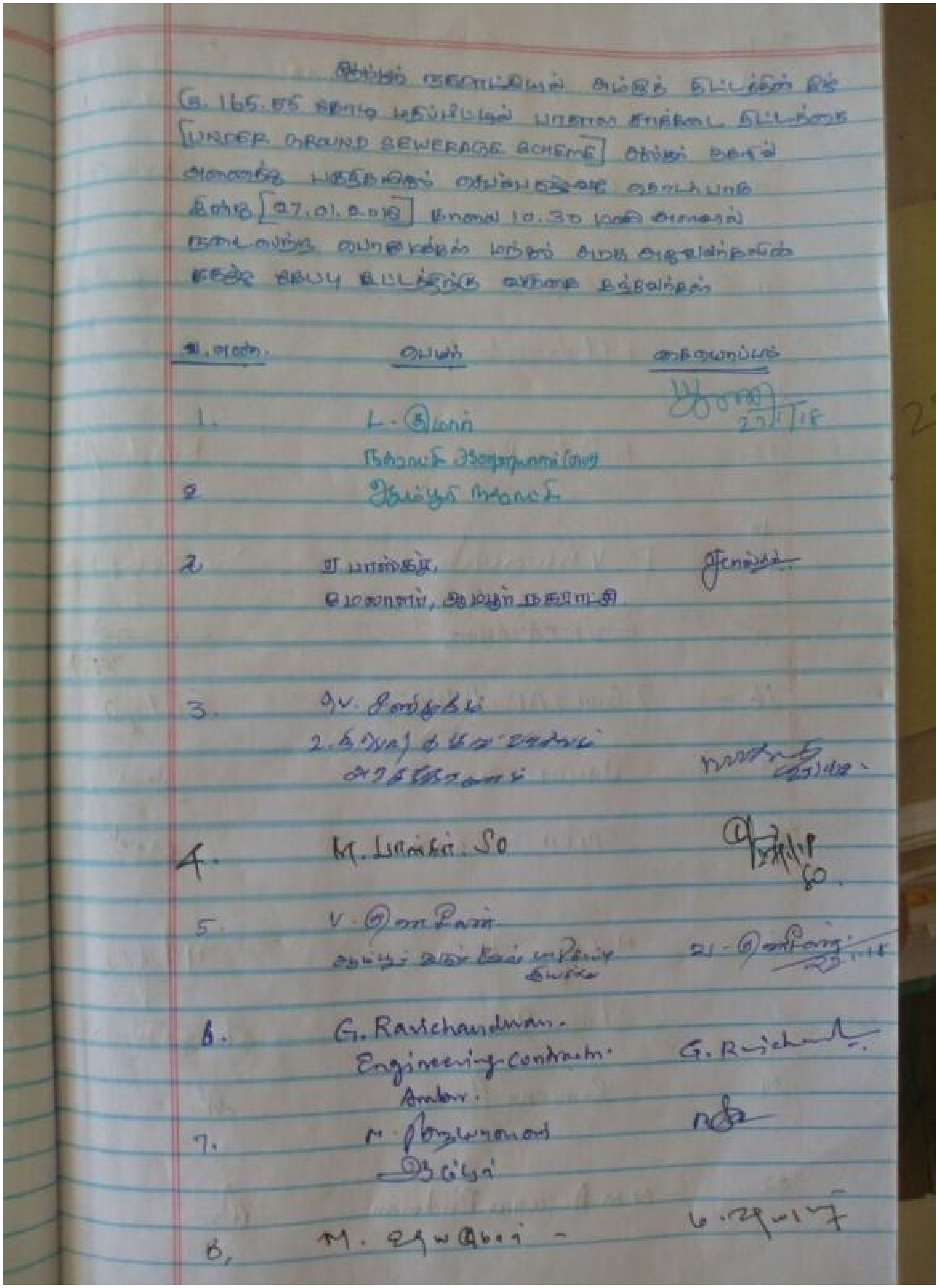
ஆம்பூர், ஜன.26–

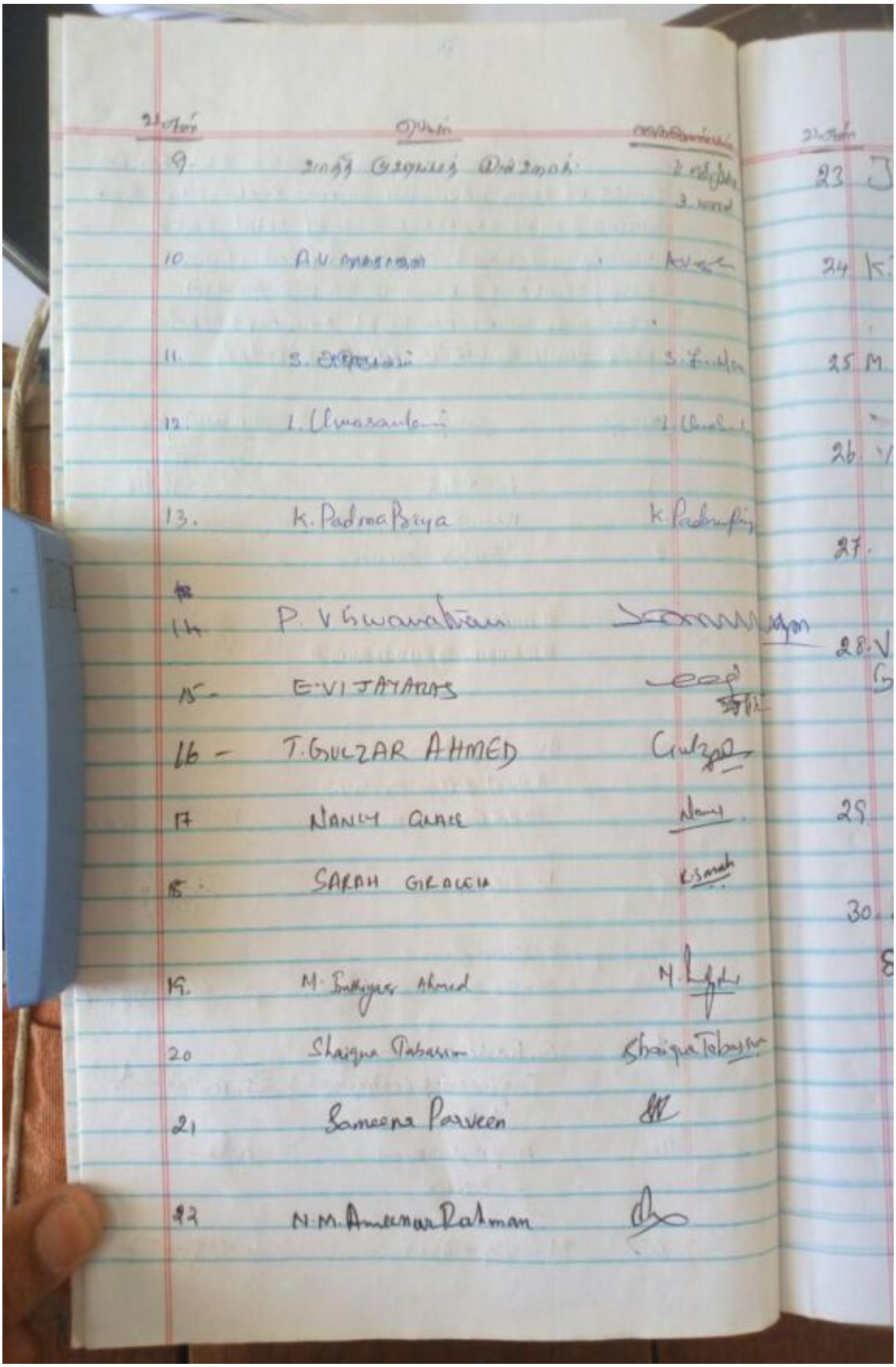
ஆம்பூர் நகராட்சியில் அம்ருத் திட்டத்தின் கீழ் ரூ.165½ கோடி மதிப்பீட்டில் பாதாள சாக்கடை திட்டம் அமல்படுத்தப்பட உள்ளது. ஆம்பூர் நகரில் உள்ள அனைத்து பகுதிகளிலும் இந்த திட்டம் செயல்படுத்துவது குறித்து ஆம்பூர் நகராட்சியில் நாளை (சனிக்கிழமை) காலை 10.30 மணிக்கு பொதுமக்கள் கருத்து கேட்பு ஆலோசனை கூட்டம் நடைபெற உள்ளது.

இக்கூட்டத்தில் நகராட்சி ஆணையாளர், தமிழ்நாடு குடிநீர் வடிகால் வாரிய அலுவலர்கள் கலந்து கொண்டு பொதுமக்களிடம் இருந்து ஆலோசனைகளை பெற உள்ளனர். எனவே கூட்டத்தில் பொதுமக்கள், அரசுதுறை அலுவலர்கள் தவறாமல் பங்கேற்று ஆலோசனைகளை தெரிவிக்கும்மாறு கேட்டுக் கொள்ளப்படுகிறது.

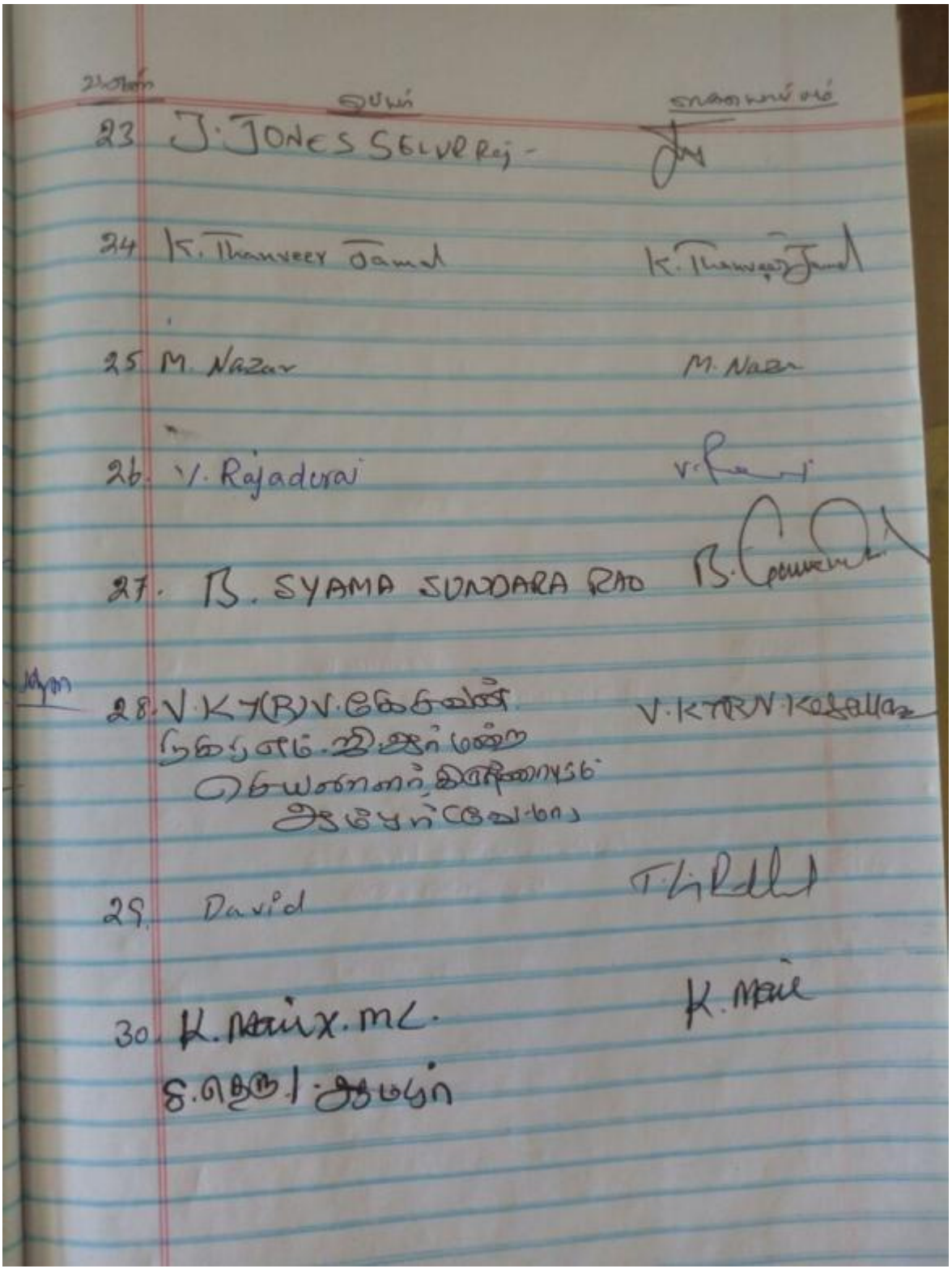
மேற்கண்ட தகவலை நகராட்சி ஆணையாளர் (பொறுப்பு) எல்.குமார் தெரிவித்துள்ளார்.

Attendance of participants for public consultation on 27.01.2018





9.	[illegible]	[illegible]	
10.	A.V. [illegible]	A.V.	
11.	S. [illegible]	S. [illegible]	
12.	I. Umasankari	I. Umasankari	
13.	K. Padmapriya	K. Padmapriya	
14.	P. Viswanathan	[illegible]	
15.	E. VIJAYARAS	[illegible]	
16.	T. GULZAR AHMED	Gulzar	
17.	NANCY GRACE	Nancy	
18.	SARAH GRACE	R. Sarah	
19.	M. Sathiyar Ahmed	M. Sathiyar	
20.	Shaiqua Tabassum	Shaiqua Tabassum	
21.	Sameena Parveen	[illegible]	
22.	N.M. Ameenar Rahman	[illegible]	



Minutes of the Public Consultation Conducted on 02.06.2018 at Ambur Municipality Office, Ambur for The Proposed Underground Sewerage Scheme (UGSS by Tamil Nadu Water Supply and Drainage Board and AmburMunicipality

The Public Consultation commenced at 11.00 AM with officials from TWAD Board and Ambur Municipality.The public/residents of the area and the residential association members were present at the meeting based on prior public notice given in newspapers about the details of the public consultation. The list of participants and residents participated in public opinion hearing meeting is as entered in the attendance register. The copy of Attendance register is attached herewith as Annexure - I for your reference.

Officials of TWAD &Ambur Municipality welcomed the gathering and outlined the procedure for Public Consultation. They described that the TWAD Board &Ambur Municipality have proposed to develop the Under Ground Sewerage Scheme for Ambur Municipality. They requested the gathered public to express their views and opinions. This was followed by description of the project in detail. The summary of the project details was also circulated to the gathering.

The following details regarding the scheme were shared with the public:
The proposed UGSS will consist of 1Main pumping station, 1 Sub Pumping station , 1 lifting station and a STP at Kaspa-A instead of Sollur village. The project area is divided into 4 Zones for better implementation. The sewer network will cover all the streets in the Municipality areas of 36-wards.The proposed project will collect the sewage from residential, commercial and institutional areas. The sewage will be pumped to Sewage Treatment Plant at Kaspa-A for treatment and disposal. Also, the entire sewage collected in Ambur Municipality from 4 Zones (Z1,Z1A,Z2,Z2A) will be directly pumped to STP at Kaspa-A. The STP will be executed on DBOOT (design, build, own, operate and transfer) basis and the process will provide the treated waste water in line with the discharge standards prescribed by CPCB. The proposal will prevent pollution of the natural water bodies present in the area, due to discharge of sewage.

Following this, the TWAD and Ambur Municipality Officials invited the public/residents to express their views, concerns and queries. Also, they requested the public/residents to introduce themselves before expressing their views and raising questions.

The views and questions of the public/residents and clarifications given by the Officials are detailed below:

S. No.	The views and questions of the public	Clarification given by the Officials of TWAD / Ambur Municipality
1.	Why have been changed STP site.?	For reducing the project cost and Annual Maintenance cost.
2.	Neccessity of project..?	To provide safe disposal and hygienic environment to the living areas, public of the Municipal town.
3.	Wheather all the streets are covered or not?	Yes. All the streets were covered except NH road where septage management will be carried out.
4.	How the treatment process will be done and where..?	Typical STP layout plan for serwerage scheme has been shown and explained the treatment process.
5.	While excavating the roads and streets, what precautionary measures taken to stream line the traffic and other safety measures.	Proper barricading will be provided during excavation of the trenches and sign boards will be provided at the both ends of streets and roads to regulate the traffic and two&four wheelers and pedestrians.
6.	Wheather concrete roads and BT roads will be laid after laying of the sewers	Yes. Damaged portion will be rectified and put in to the benificial use as quick as possible.
7.	What cost will be paid for getting HSC.?	It will be decided by municipality after completionof the scheme and HSC cost will be fixed by the municipality and the same will be intimated/notified to the public.

The officials of TWAD and Ambur Municipality concluded the Public Consultation with vote of thanks.

Copy of the photographs and copy of the News Paper advertisementof the entire proceedings are enclosed.

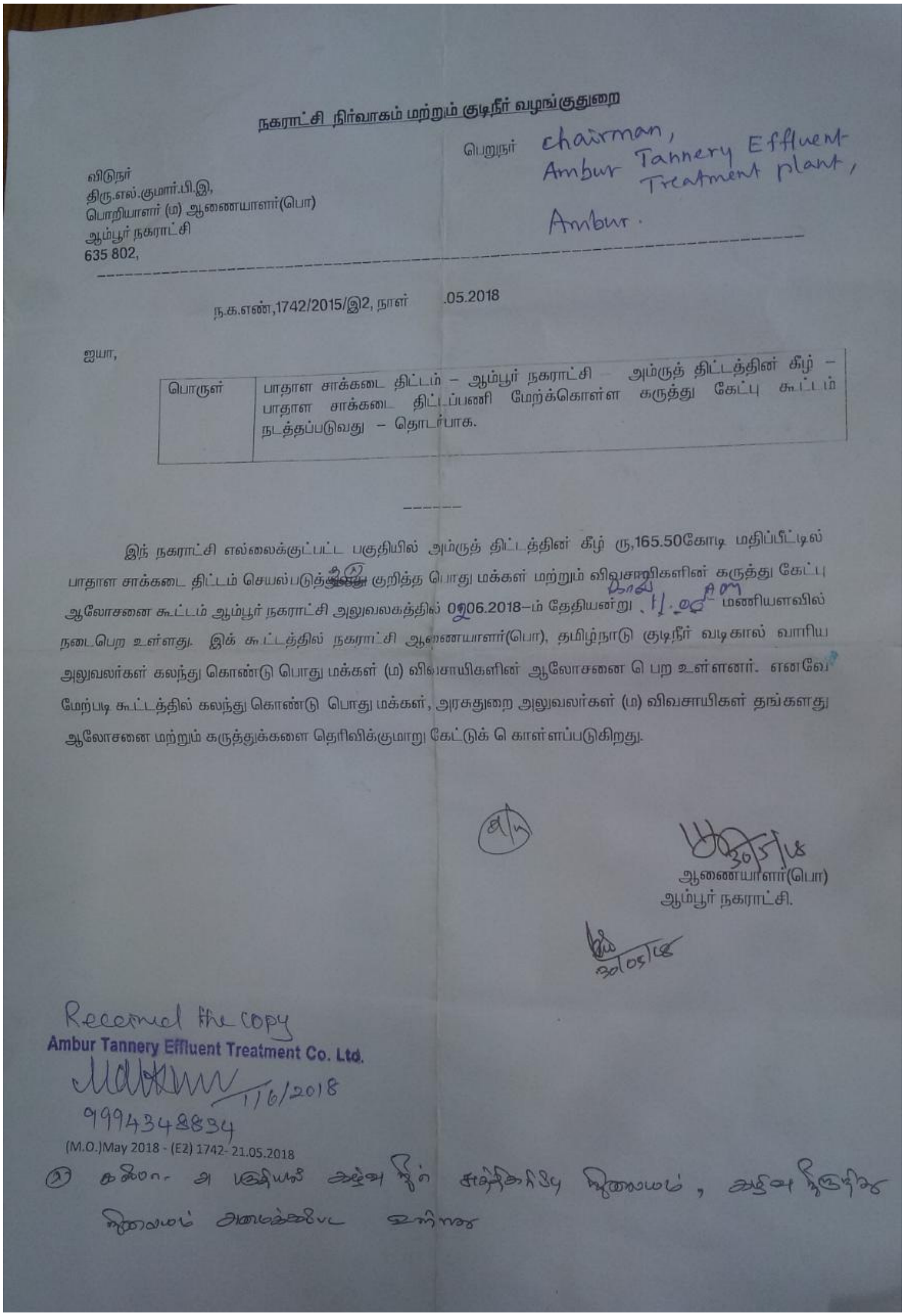
Photographs of Public Consultation in Amburon 02.06.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Amburon 02.06.2018for proposed UGSS in Ambur Municipality

Photographs of Public Consultation in Amburon 02.06.2018for proposed UGSS in Ambur Municipality

Photographs of notice distribution for Public Consultation in Ambur on 02.06.2018for proposed UGSS in Ambur Municipality

Notice for Public Consultation in Ambur on 02.06.2018for proposed UGSS in Ambur Municipality



நகராட்சி நிர்வாகம் மற்றும் குடிநீர் வழங்குதுறை

விடுநர்
திரு.எல்.குமார்.பி.இ,
பொறியாளர் (ம) ஆணையாளர்(பொ)
ஆம்பூர் நகராட்சி
635 802,

பெறுநர் chairman,
Ambur Tannery Effluent Treatment plant,
Ambur.

ந.க.எண்,1742/2015/இ2, நாள் .05.2018

ஐயா,

பொருள்	பாதாள சாக்கடை திட்டம் – ஆம்பூர் நகராட்சி அம்ருத் திட்டத்தின் கீழ் – பாதாள சாக்கடை திட்டப்பணி மேற்க்கொள்ள கருத்து கேட்பு கூட்டம் நடத்தப்படுவது – தொடர்பாக.

இந் நகராட்சி எல்லைக்குட்பட்ட பகுதியில் அம்ருத் திட்டத்தின் கீழ் ரு,165.50கோடி மதிப்பீட்டில் பாதாள சாக்கடை திட்டம் செயல்படுத்துவது குறித்த பொது மக்கள் மற்றும் விவசாயிகளின் கருத்து கேட்பு ஆலோசனை கூட்டம் ஆம்பூர் நகராட்சி அலுவலகத்தில் 02.06.2018–ம் தேதியன்று காலை 11.00 AM மணியளவில் நடைபெற உள்ளது. இக் கூட்டத்தில் நகராட்சி ஆணையாளர்(பொ), தமிழ்நாடு குடிநீர் வடிகால் வாரிய அலுவலர்கள் கலந்து கொண்டு பொது மக்கள் (ம) விவசாயிகளின் ஆலோசனை பெற உள்ளனர். எனவே மேற்படி கூட்டத்தில் கலந்து கொண்டு பொது மக்கள், அரசுதுறை அலுவலர்கள் (ம) விவசாயிகள் தங்களது ஆலோசனை மற்றும் கருத்துக்களை தெரிவிக்குமாறு கேட்டுக் கொள்ளப்படுகிறது.

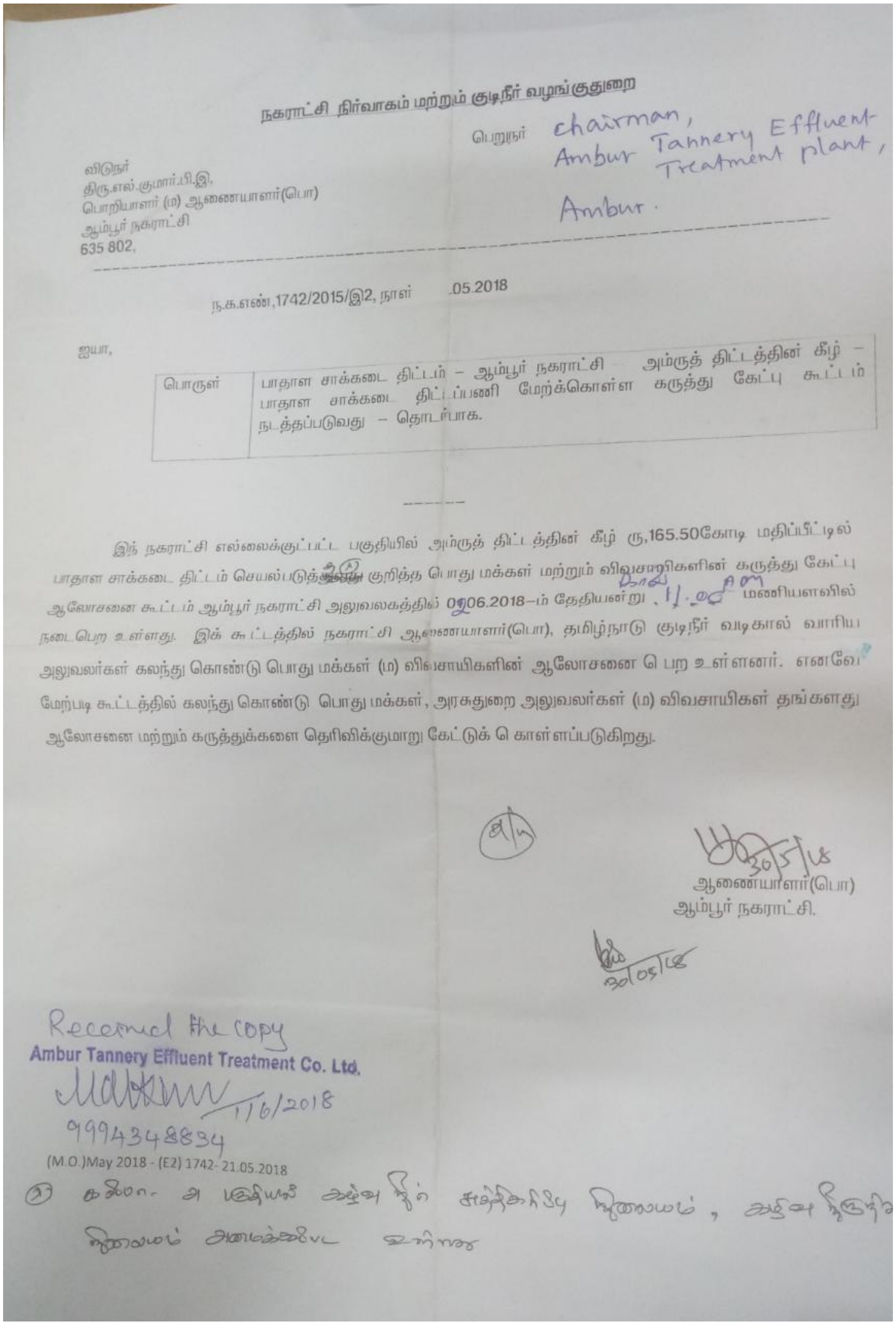
30/5/18
ஆணையாளர்(பொ)
ஆம்பூர் நகராட்சி.

30/05/18

Received the copy
Ambur Tannery Effluent Treatment Co. Ltd.
1/6/2018
9994348834

(M.O.)May 2018 - (E2) 1742- 21.05.2018

Notice for Public Consultation in Ambur on 02.06.2018for proposed UGSS in Ambur Municipality



நகராட்சி நிர்வாகம் மற்றும் குடிநீர் வழங்குதுறை

பெறுநர் Chairman, Ambur Tannery Effluent Treatment plant, Ambur.

அனுப்புநர்
திரு.எல்.குமார்.பி.இ.
பொறியாளர் (ம) ஆணையாளர்(பொ)
ஆம்பூர் நகராட்சி
635 802.

ந.க.எண்.1742/2015/இ2, நாள் .05.2018

ஐயா,

பொருள்	பாதாள சாக்கடை திட்டம் – ஆம்பூர் நகராட்சி அம்ருத் திட்டத்தின் கீழ் – பாதாள சாக்கடை திட்டப்பணி மேற்க்கொள்ள கருத்து கேட்பு கூட்டம் நடத்தப்படுவது – தொடர்பாக.

இந் நகராட்சி எல்லைக்குட்பட்ட பகுதியில் அம்ருத் திட்டத்தின் கீழ் ரு,165.50கோடி மதிப்பீட்டில் பாதாள சாக்கடை திட்டம் செயல்படுத்துவது குறித்த பொது மக்கள் மற்றும் விவசாயிகளின் கருத்து கேட்பு ஆலோசனை கூட்டம் ஆம்பூர் நகராட்சி அலுவலகத்தில் 02.06.2018–ம் தேதியன்று காலை 11.00 AM மணியளவில் நடைபெற உள்ளது. இக் கூட்டத்தில் நகராட்சி ஆணையாளர்(பொ), தமிழ்நாடு குடிநீர் வடிகால் வாரிய அலுவலர்கள் கலந்து கொண்டு பொது மக்கள் (ம) விவசாயிகளின் ஆலோசனை பெற உள்ளனர். எனவே மேற்படி கூட்டத்தில் கலந்து கொண்டு பொது மக்கள், அரசுதுறை அலுவலர்கள் (ம) விவசாயிகள் தங்களது ஆலோசனை மற்றும் கருத்துக்களை தெரிவிக்குமாறு கேட்டுக் கொள்ளப்படுகிறது.

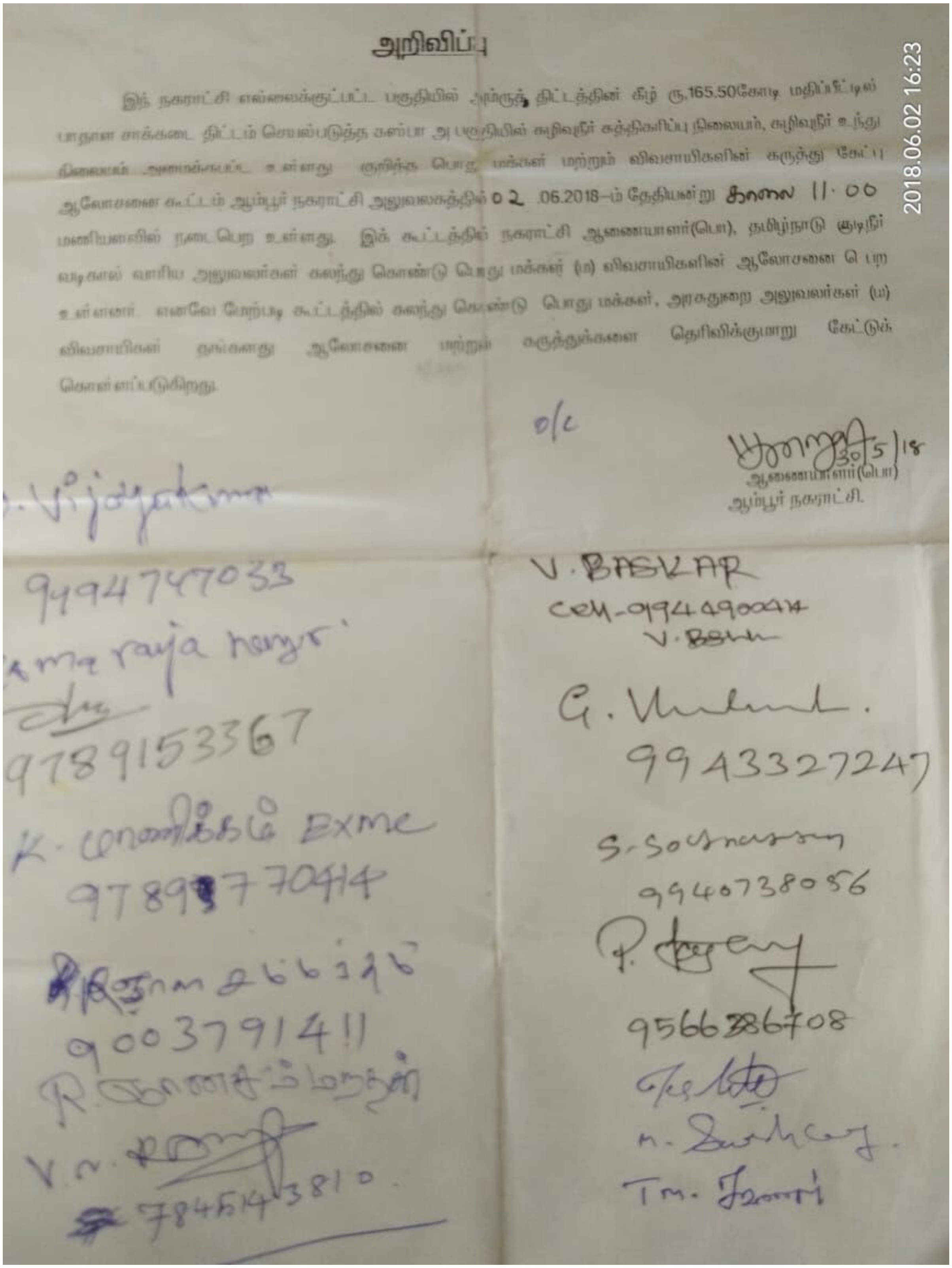
30/5/18
ஆணையாளர்(பொ)
ஆம்பூர் நகராட்சி.

30/05/18

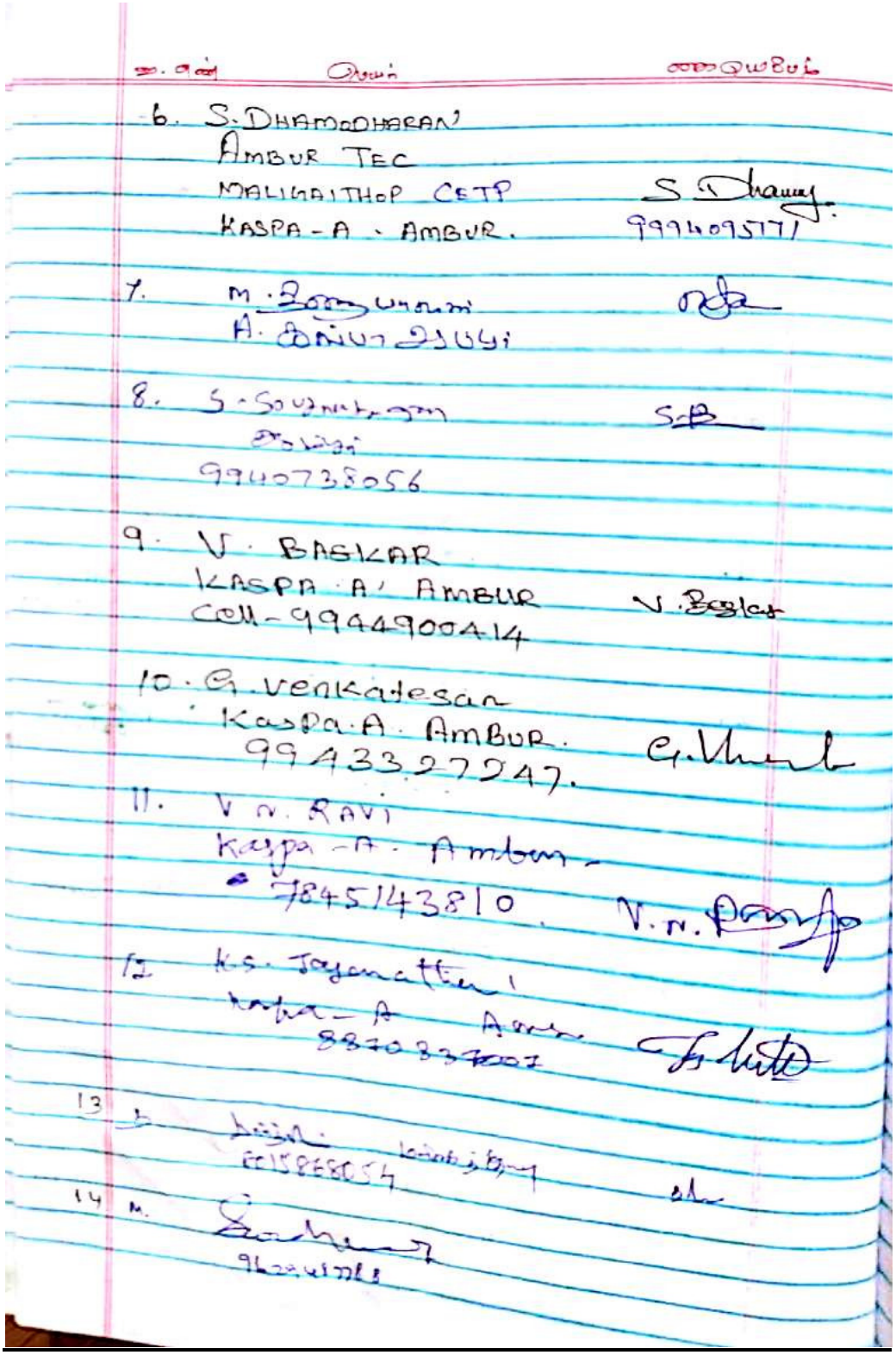
Received the copy
Ambur Tannery Effluent Treatment Co. Ltd.
1/6/2018
9994348834

(M.O.)May 2018 - (E2) 1742- 21.05.2018

Notice for Public Consultation in Ambur on 02.06.2018for proposed UGSS in Ambur Municipality



Attendance of participants for public consultation on 02.06.2018



6. S. DHAMODHARAN
AMBUR TEC
MALIGAITHOP CETP
KASPA-A . AMBUR.
9994095771

7. M.
A.

8. S.

9944738056

9. V. BASKAR
KASPA A/ AMBUR
Cell-9944900414

10. G. Venkatesan
Kaspa-A. Ambur.
9943327247.

11. V. N. RAVI
Kaspa -A. Ambur
7845143810

12 K.S.

13

14 M.

வ.எண்	பெயர்	கையொப்பம்
15	T.M [illegible] 9566663821	T.M. [illegible]
16	M. மதியழகன். அம்பேத்கர் [illegible] [illegible]	[illegible]
17	K. [illegible] EX.MC	K. [illegible]
18	[illegible] K. [illegible] EX.MC.	

-36-