

Initial Environmental Examination

Document Stage: Draft
Project Number: 49107-005
July 2019

IND: Tamil Nadu Urban Flagship Investment Program
(Tranche 2) – Underground Sewerage System of
Municipal Corporation Covering Zones 5 to 9 and
Zones 13 to 17 in Tiruppur City

CURRENCY EQUIVALENTS

(as of 4 July 2019)

Currency Unit	–	Indian rupee (₹)
₹1.00	=	\$0.0145
\$1.00	=	₹68.7685

ABBREVIATIONS

ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
TCMC	–	Tiruppur City Municipal Corporation
CPCB	–	Central Pollution Control Board
CTE	–	consent to establish
CTO	–	consent to operate
DWC	–	double wall corrugated
EAC	–	expert appraisal committee
EHS	–	environmental health and safety
EIA	–	environmental impact assessment
EMP	–	environmental management plan
ESS	–	environmental and social safeguards
GOTN	–	Government of Tamil Nadu
IEE	–	initial environmental examination
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NTADCL	–	New Tiruppur Area Development Corporation Limited
NOC	–	no objection certificate
PIU	–	program implementation unit
PMU	–	program management unit
PPTA	–	project preparatory technical assistance
PWD	–	Public Works Department
REA	–	rapid environmental assessment checklist
ROW	–	right-of-way
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement
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

WEIGHTS AND MEASURES

°C	–	Degree Celsius
km	–	kilometer
lpcd	–	liters per capital per day
m	–	meter
Mgd	–	million gallons per day
MLD	–	million liters per day
mm	–	millimeter
nos	–	numbers
km ²	–	square kilometer

NOTE

In this report, "\$" refers to United States dollars.

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EXECUTIVE SUMMARY

On 28 September 2018, the Asian Development Bank (ADB) approved a multitranche financing facility (MFF) for the Tamil Nadu Urban Flagship Investment Program (the program) for an amount not exceeding \$500 million. The program will develop priority water supply, sewerage, and drainage infrastructure in at least 10 cities in strategic industrial corridors in Tamil Nadu. The Municipal Administration and Water Supply Department (MAWS), acting through Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), is the executing agency. Urban local bodies (ULBs) are the implementing agencies for the subprojects.

The Subproject. The subproject components are proposed in the Tiruppur city, which is located in the region of the Indian state of Tamil Nadu. Tiruppur is the administrative headquarters of Tiruppur district and the fifth largest urban agglomeration in Tamil Nadu. Based on the elevation and terrain, the entire Tiruppur City Municipal Corporation (TCMC) is divided into 17 zones. Out of this, the existing Under Ground Sewerage Scheme (UGSS) covers only 70% area of the old Tiruppur Municipality area (Zone 1 to Zone 4) and for a length of 120 kilometer (km). The scheme was implemented by New Tiruppur Area Development Corporation Limited (NTADCL) under Tiruppur Area Development Project. The existing sewerage system was commissioned in 2008. The existing sewage treatment plant (STP) I with capacity of 15 million liters per day (MLD) located at Sarkarperiyapalayam was operated and maintained by NTADCL, which can be augmented to 30 MLD by construction of additional treatment module. The collection system was handed over to Tiruppur Corporation for maintenance. In the proposed sewage system the project area is divided in to 10 zones (Zones 5 to 9 & Zones 13 to 17) each having a separate pumping station. Total road length in Tiruppur Corporation area is 1,577.6 km, out of which the existing scheme already covers 120 km and proposed scheme will cover 563.67 km of sewer collection system. On considering the lower population density in Zones 10, 11, 12, the proposed UGSS will not cover these zones, which shall be added in future, based on the developments.

Subproject includes the following civil work components:

- (i) sewage collection system (563.67 km length of sewers and 22,260 manholes);
- (ii) six nos. of Sewage Pumping Stations (SPS) and four nos. of Main Pumping Stations (MPS);
- (iii) construction of new STPs at Sarkarperiyapalayam and Chinnandipalayam, augmentation of the existing STP at Sarkarperiyapalayam;
- (iv) (a) Chinnandipalayam STP (Proposed) – treated sewage water will be discharged into overflow channel of Chinnandipalayam Kulam, through pipeline of length 200 m will be laid from outlet of STP, further this overflow channel flows about 800 m and gets connected to Noyyal River;
(b) Sarkarperiyapalayam STP (proposed) treated sewage water will be discharged into the overflow channel of Nanjarayan kulam (where the discharge of existing STP takes place) through, laying of 230 m length pipeline from proposed STP outlet. The overflow channel of Nanjarayan kulam will get connected to Noyal River at a distance of 1.1 km. Both Chinnandipalayam kulam and Nanjarayan kulam outfall channel have adequate capacity to discharge outfall of STPs;
- (v) Construction of pipe carrying bridges – three nos; and
- (vi) 74,293 house service connections for Zones 5 to 9 & Zones 13 to 17.

Project implementation arrangements. The MAWS of GOTN acting through the 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. TCMC is the implementing agency for this project. A Project Implementation Unit (PIU) will be established in TCMC headed by a full-time Project Manager (Executive Engineer or above) and comprising dedicated full-time staff of the TCMC for day-to-day implementation of the subproject. PIU is assisted by NTADCL in implementation. Environmental Specialist of the NTADCL will assist PIU in implementation of safeguards in the subproject in compliance with environmental management plan (EMP) and environmental assessment and review framework (EARF), and will carry out all necessary tasks.

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 Government of India EIA Notification, 2006, this project do not require EIA study or Environmental Clearance. The potential environmental impacts of the project have been assessed using ADB Rapid Environmental Assessment Checklist for Sewerage. The potential negative impacts were identified in relation to pre-construction, construction and operation phases.

Categorization. Based on the environmental assessment and ADB SPS, the subproject is classified as environmental category 'B', i.e., the subproject is unlikely to have significant adverse environmental impacts and accordingly, this Initial Environmental Examination (IEE) is prepared.

Description of the Environment. Tiruppur is a city in the Kongu Nadu region of the Indian state of Tamil Nadu and located at 11.1075°N, 77.3398°E on the banks of the Noyyal River. It has an average elevation of 295 meters (m) (967 feet) and covers an area of 159.6 square kilometer (km²). Tiruppur is the administrative headquarters of Tiruppur District and the fifth largest urban agglomeration in Tamil Nadu. It is situated at the center of the South Indian Peninsula, about 450 km (280 mi) southwest of the state capital Chennai and about 50 km (31 mile [mi]) east of Coimbatore. The climate is tropical with the mean maximum and minimum temperatures varying between 35°C to 22°C (95°F to 72°F). Tiruppur receives rainfall mainly due to northwest and southwest monsoon and it receives an average annual rainfall of 700 millimeter (mm). Major portion of Tiruppur district is constituted by red gravel, clay loamy soils. Tiruppur falls under seismic zone — III (Moderate Damage Risk Zone). The southern part of the Tiruppur district is covered by hill ranges of Western Ghats and the rest of the district consists of undulating plain sloping gradually from West to East. The Noyyal, Amaravati, Palar, Nallar and Chinnar Rivers flow through the district. There are two major dams in the district namely Thirumoorthy dam (across Palar River) and Amaravathi dam (across Amaravathy River). STP and all the pumping station sites are situated on government owned land parcels and sewers will be laid on the public roads. With an exemption to STP, all the other subproject components are located within the TCMC. STP site is located outside the town, surrounded by agricultural and barren lands. Within the project area or in the vicinity of the project area, there are no eco-sensitive areas like forest or protected areas or nationally important / protected monuments.

Potential environmental impacts and mitigation measures. The project is unlikely to cause significant adverse impacts that are irreversible, diverse or unprecedented 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 although careful attention needs to be paid to minimizing disruption to population of urban areas; and (iii) predicted impacts are site-specific and likely to be associated with the construction process.

Sewerage system performs a crucial function of safely collecting, transporting, treating and disposing domestic wastewater, including, human excreta (designed as a separate system).

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 are not expected to be significant.

Sewage pumping stations are likely to generate odor. Although utmost care is taken to locate these away from the residential areas, due to design considerations and land constraints, six pumping station sites namely Angeripalayam Road, AVP Road Santhapettai, Anaipalayam, SR Nagar North, Kattabomman nagar and Pattukottaiyar nagar are located close to the residential areas (6 out of 10 pumping station are close to the households.), for which necessary provisions for odor control measures were given in the EMP and the cost for implementing the same is given in the estimate.

It is proposed to discharge treated water from Sarkarperiyapalayam STP (proposed) into the overflow channel of Nanjarayan Kulam (where the discharge of existing STP takes place) through construction of 230 m pipeline from STP outlet. The overflow channel of Nanjarayan Kulam will get connected to Noyal River at a distance of 1.1 km. Similarly, it is proposed to discharge the treated water from Chinnandipalayam STP into the outfall channel of Chinnandipalayam Kulam through construction of pipeline for a distance of 200 m to the outfall channel, which is connected to the Noyyal River at a distance of 800 m from Chinnadipalayam outfall weir. The Chinnandipalayam outfall channel have adequate capacity to hold the discharge outfall of STP into the Noyyal River.

The Chinnandipalayam Kulam (Pond) has the catchment area of 0.91 square kilometer (km²), which has the water holding capacity of 0.8176 million cubic meter (m cum). The Kulam has a supply channel from the check dam of Noyyal River near Mangalam village for about 3 km. Also, the surplus course is located at the south end side of the Chinnandipalayam kulam (Pond) which is connected to the Noyyal River. The water from Chinnandipalayam kulam is not used for irrigation and drinking purposes, also it is a seasonal pond during summer it will be in dry condition. Thus, there are no adverse impacts likely due to disposal of STP treated wastewater meeting the set quality standards. Sludge Management Plan will be prepared during the detailed design phase for treatment, disposal or safe reuse of sludge. Monitoring of treated wastewater and sludge quality, safe reuse limits are provided in EMP.

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. Mixing of industrial waste in sewage is also identified as one of the risk which could render treatment inadequate. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers, etc., may create nuisance, unhealthy and hazardous conditions.

Sewage pumping stations (which collect sewage from the sewer network and pump to higher level to convey the sewage to STP for safe treatment and disposal) are located within or near residential areas. These facilities may generate odor 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, six pumping station sites (Angeripalayam Road, AVP Road at Santhapettai, Anaipalayam, SR Nagar North, Kattabomman nagar and Pattukottaiyar nagar) are located close to the residential areas (Refer Table 17). For those locations, suitable site planning, green buffer and design related measures are included in

the project to prevent and control odor generation. These include appropriately locating sewage wells within site maintaining maximum distance from the nearby houses; developing tree cover; covered facilities; design and operation measures to prevent odor; and, providing gas collection and treatment facilities at sewage pumping stations. Odor monitoring is also proposed.

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 odor control including: appropriately locating sewage wells within site as far as away from the houses/residential areas; developing tree cover; closed facilities; gas collection and treatment facilities, design and operation measures to prevent odor build up; adopting 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.

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 (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.

Environmental Management Plan. 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 project. 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.

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

Consultation, disclosure and grievance redress mechanism. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB, TCMC 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.

Monitoring and Reporting. Contractor will submit a monthly EMP implementation report to PIU. PIU, with the assistance of NTADCL, will monitor the compliance of Contractor, prepare a Quarterly Environmental Monitoring Report and submit to PMU. The PMU will oversee the implementation and compliance, and will submit semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted on TCMC and TNUIFSL websites. Environmental audit of the existing STP associated with the subproject is carried out and the Corrective Action Plan for Environmental Compliance of existing STP is included in this report.

Conclusions and Recommendations. As per ADB SPS, 2009 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 and Consent to Operate from TNPCB, which shall be obtained for both the new and the proposed rehabilitation of existing STP prior to construction and operation. Disposal of treated sewage water into the outfall channel of Chinnandipalayam and Nanjarayan Kulam (Pond) also require prior permission of Public Works Department (PWD). The existing STP is located at Sarkar Periyapalayam which will require permission to be obtained from PWD to discharge treated sewage into the overflow channel of Najarayan Kulam and as a corrective action plan Tiruppur City Municipal Corporation will obtain the permission within 6 months through NTADCL. This IEE shall be updated by PIU during detailed design phase to reflect final project design and will be reviewed and approved by PMU. The updated IEE will be submitted to ADB for concurrence and disclosure.

I. INTRODUCTION

A. Background

1. On 28 September 2018, the Asian Development Bank (ADB) approved a multitranche financing facility (MFF) for the Tamil Nadu Urban Flagship Investment Program (TNUFIP) for an amount not exceeding \$500 million. The program will develop priority water supply, sewerage, and drainage infrastructure in at least 10 cities in strategic industrial corridors in Tamil Nadu. The Municipal Administration and Water Supply Department (MAWS), acting through Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL), is the executing agency. ULBs are the implementing agencies for the subprojects.

2. **Impact and outcome.** Tranche 2 is aligned with the following impacts of TNUFIP: (i) universal access to basic water and sanitation services achieved; (ii) “world-class” cities and industrial corridors across the state developed; and (iii) water security, reduced vulnerability to climate change in urban areas, achieved. The investment program will have the following outcome: livability and climate resilience in at least five cities in priority industrial corridors enhanced.

3. **Outputs.** Tranche 2 will support the development of water supply and sewerage facilities in five cities (Ambur, Madurai, Tiruchirappalli, Tiruppur and Vellore). There are six subprojects (four sewerage, two water supply) proposed. It will support improvement of urban governance in all project urban local bodies (ULBs) under the MFF. A summary description of the outputs is described below.

4. **Output 1: Climate-resilient sewage collection and treatment, and drainage systems developed in four cities.** Works in Tiruchirappalli, Ambur, Tiruppur, and Vellore include:

- (i) construction of two new sewage treatment plants (STPs) with a combined treatment capacity of 72 million liters per day (MLD);
- (ii) rehabilitation of one STP (15 MLD capacity);
- (iii) reuse of 3,000 cubic meters treated wastewater per day;
- (iv) construction of 1,256 kilometers (km) of new sewage collection pipelines, with 100% households connected (152,580 households);
- (v) construction 28 pump and 44 lift stations; and
- (vi) formation of eight (two in each city) all-female community water and sanitation committees.

5. The breakdown by city is: (i) construction of new sewage collection system in Tiruchirappalli, (ii) construction of new sewage collection system and 16.71 MLD STP in Ambur, (iii) construction of new sewage collection system with new 56 MLD STP and rehabilitation of one 15 MLD STP in Tiruppur, and (iv) construction of new sewage collection system in Vellore.

6. **Output 2: Water supply systems in two cities improved with smart features.** Works in Tiruppur and Madurai include:

- (i) construction of 1,260 km of new distribution pipelines with 100% households connected (188,900 households) in 66 newly established district metered areas (DMAs) with new Supervisory Control and Data Acquisition (SCADA) systems to manage and reduce nonrevenue water (NRW);
- (ii) construction of 66 new storage reservoirs with combined capacity of 92 million liters;
- (iii) construction of three pump stations;

- (iv) construction of 196 km new transmission mains and 230 km of feeder mains;
- (v) construction of three new intakes and three new water treatment plants (WTPs) of combined capacity of 321 MLD; and
- (vi) 80% of technical staff from each implementing agency of two cities trained in NRW reduction including 100% women staff.

7. The breakdown by city is: (i) construction of 1,060 km of distribution pipelines in 29 DMAs, 29 storage reservoirs, 2 pump stations, 46 km of transmission mains and 121 km of feeder mains, and a new intake with 196 MLD WTP in Tiruppur; and (ii) construction of 200 km of distribution pipelines in 37 DMAs, 37 storage reservoirs, 1 pump station, 150 km transmission mains and 109 km feeder mains, and a new intake structure with 125 MLD WTP in Madurai.

8. Output 3: Institutional capacity, public awareness, and urban governance strengthened. Governance improvement and awareness consultants recruited under Tranche 1 will support output 3. This includes a performance-based urban governance improvement program implemented for 10 project cities to:

- (i) achieve targeted household connections for water and sewerage projects,
- (ii) timely completion of projects under the MFF as per the original implementation schedule,
- (iii) actions in fecal sludge management in areas not covered by centralized sewerage system,
- (iv) initiatives on reuse of treated wastewater (in all 10 program cities and in cities outside the program with functioning wastewater treatment systems), and
- (v) implementation of gender action plan.

B. Scope of Project

9. Tiruppur City Municipal Corporation (TCMC) was formed by annexing two municipalities (Nallur and Velampalayam) and eight village panchayats (Andipalayam, Chettipalayam, Mannarai, Murugampalayam, Muthanampalayam, Nerupherichal, Thottipalayam and Veerapandi). The total area of the TCMC is 159.35 square kilometres (km²). The existing underground sewerage system implemented by New Tirupur Area Development Corporation Limited (NTADCL) is having 120 km of sewer collection system and STP of 15 MLD capacity. The extended corporation areas do not have underground sewerage system, Hence, the Tiruppur City Municipal Corporation intends to extend Underground sewerage system to all the uncovered areas of Corporation considering the requirement for the next 30 years. In this subproject, to be implemented under ADB funded TNUFIP, it is proposed to provide Underground sewerage system (UGSS) for Zones 5 to 9 and 13 to 17 of TCMC. Total road length in TCMC is 1,577.6 km, out of which the existing UGSS already covers 120 km and proposed UGSS will cover 563.67 km of sewer collection system. Due to the lower population density the remaining zones 10, 11 and 12 will be added in future, based on the developments. At present, TCMC is using tanker lorries for collecting the septage from households/public toilets of uncovered areas and discharging it to the nearest pumping stations.

10. Subproject includes the following civil work components: (i) sewage collection system (563.67 km length of sewers and 22,260 manholes); (ii) six sub-pumping stations (SPS) and four main pumping stations; (iii) construction of new STPs at Sarkarperiyapalayam and Chinnandipalayam and improvement of the existing STP at Sarkarperiyapalayam; (iv) the discharge of the treated water from Chinnandipalayam STP is into the outfall channel of Chinnandipalayam kulam (Pond), through laying of pipeline for a distance of 200 m, similarly the discharge of treated water from Sarkarperiyapalayam STP is into over flow channel of Najarayan

kulam (where the existing STP discharge takes place); (v) construction of three pipe carrying bridges; and (vi) 74,293 house service connections. The proposed STP will be based on design-build contract and therefore at present, STP design is in preliminary stage.

C. Purpose of this Initial Environmental Examination Report

11. 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 sewerage (Appendix 1). The potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment shows that the project 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.

12. The prepared IEE is based on the detailed project report (DPR) prepared by TCMC. However, the treatment and disposal system (STP) is proposed under design-build type implementation; therefore, at present only preliminary designs are prepared. Detailed design for STP will be prepared by the design-build contractor. Therefore for treatment and disposal system, the environmental assessment is based on preliminary designs, and will be updated during the detailed design. The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractor 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 project implementation. Stakeholder consultation was an integral part of the IEE.

D. Report Structure

13. This report contains the following 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

14. Tiruppur is administered by municipal corporation which was established in 2008 and the total area of the corporation is 159.6 km². The population as per 2011 census is 877,778 and is divided into 60 administrative wards. Based on the elevation and terrain the entire TCMC is divided into 17 zones as shown in Figure 3. Out of this, zones 1 to 4 are already covered with UGSS, zones 5 to 9 and zones 13 to 17 are proposed to cover under the present UGSS proposal.

15. TCMC area is characterized by an undulating terrain with the elevation ranging between 275 m and 358 m above mean sea level (MSL). River Noyyal flowing through the center of the corporation from west to east divides the corporation into northern part and southern part. A number of surface streams that confluence in the River Noyyal flowing through the center of the town, characterize the landscape of the town. The terrain gently slopes from northern and southern boundary of the corporation towards the center i.e., towards the Noyyal River.

16. The existing sewage treatment plant STP I at Sarkarperiyapalayam having capacity of 15 MLD expandable to 30 MLD which now treats the sewage from zones 1 to 4. It is proposed to expand this STP to 30 MLD and utilize this STP to treat the sewage from proposed zones 13, 16, and 17. The STP-III is proposed at Chinnandipalayam (where vacant land is available) to treat the sewage from the proposed Zones 8, 9, 14, and 15. The corporation vacant land available near the existing STP I site at Sarkarpeyalayam which is now proposed to construct the STP II to treat the sewage from Zones 5, 6 and 7. The key location plan of the Tiruppur City and the Corporation area are presented in Figures 1 and 2.

Figure 1: Location of Tiruppur Corporation in Tiruppur District

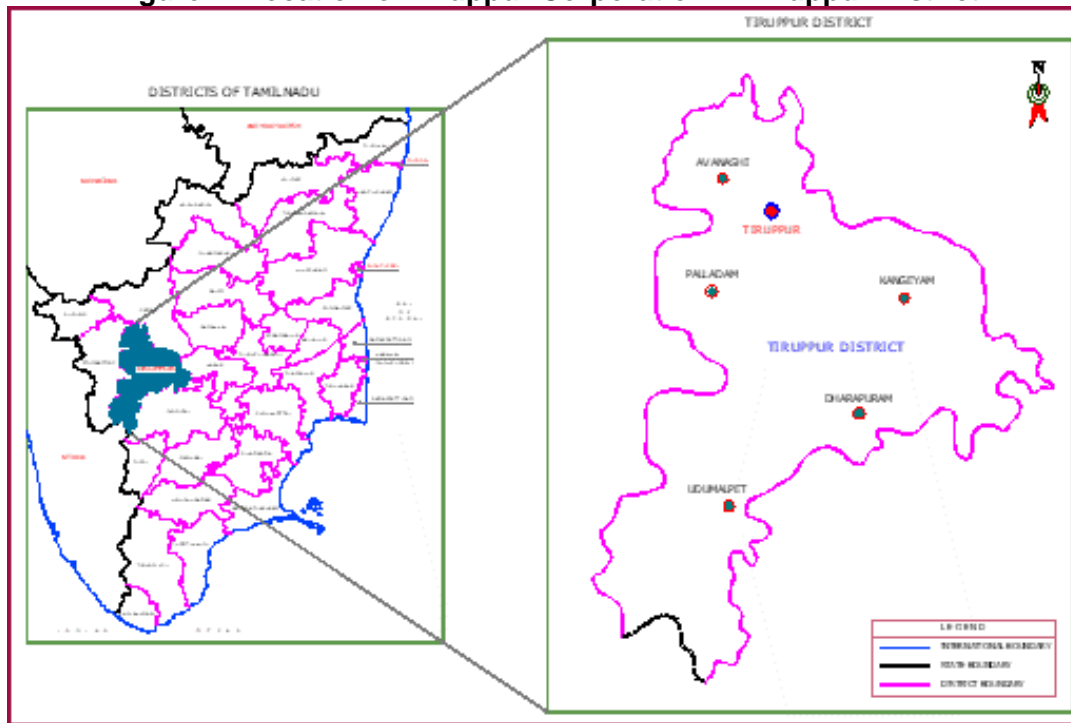
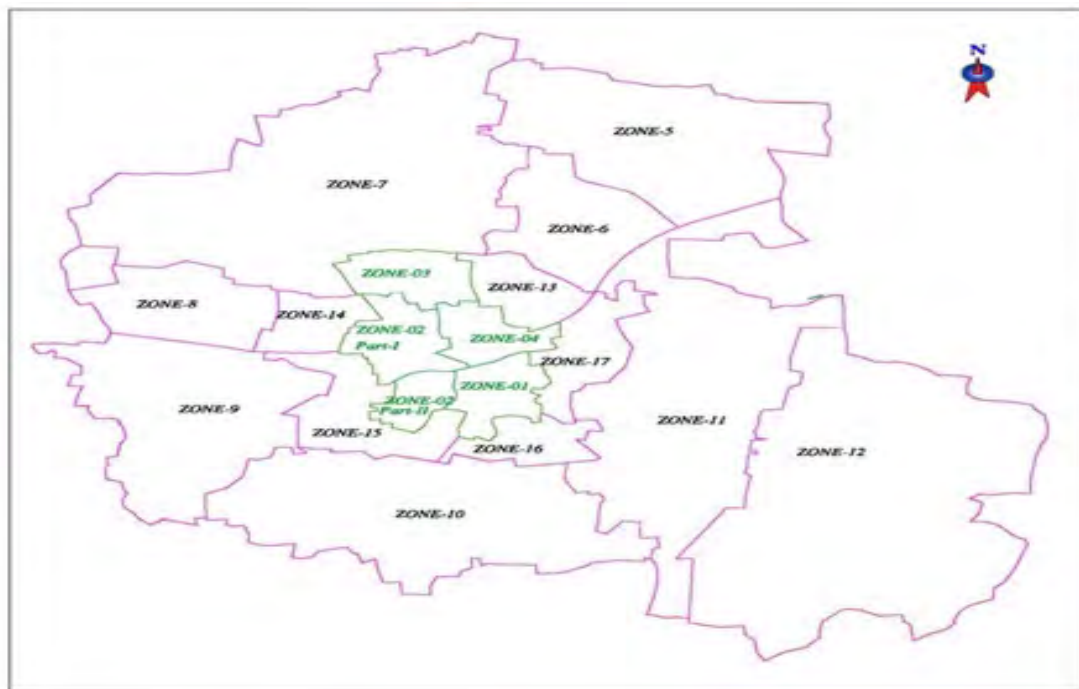


Figure 2: Tiruppur Corporation Map



Figure 3: Zone Map of Tiruppur Corporation



B. Existing Underground Sewerage Scheme

17. The existing UGSS covers only 70% area of the old Tiruppur Municipality area (Zone 1 to Zone 4) and for a length of 120 km. The pumping stations and pumping main are designed to handle peak flow of 60 MLD. STP has been constructed for 15 MLD with provision to expand to 30 MLD by construction of additional aeration tanks, clarifiers, etc. The scheme was implemented by NTADCL under Tiruppur Area Development Project. The sewerage system was commissioned in 2008. The collection system was handed over to Tiruppur Corporation for maintenance. The pumping stations, pumping main and the STP are being operated and maintained by NTADCL. Salient details of the existing sewerage system are given in the Table 1.

Table 1: Design Features of Existing Sewerage Scheme

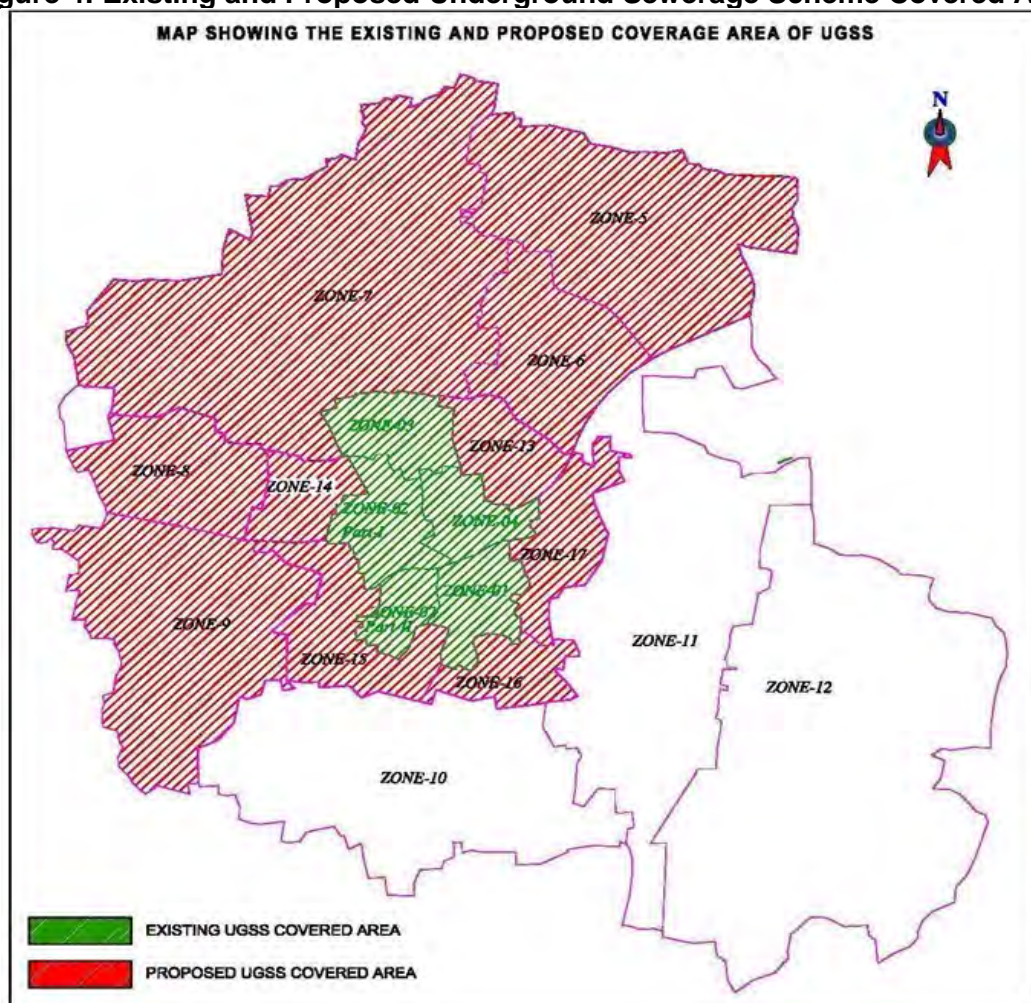
Sl. No	Description	Details
1	Ultimate design period	2038
2	Ultimate Designed population	2.96 Lakh
3	Wards Covered	8 (80%), 9, 10 (50%), 23 (20%), 24, 25, 26, 27, 31, 32 (20%), 42, 43 (20%), 44 (25%), 45, 46 (40%), 47, 48, 49 (80%), 50, 56 (20%).
4	No. of zones	4 (further divided into 8 sub zones)
5	Length of Collection system	Construction completed 119.80 km 150 mm to 800 mm, Stoneware and Concrete pipes
6	No. of pumping stations	4 + 2 Lift Pumping Stations
7	Pumping main length	13.89 km 400 mm to 800 mm –GRP pipes
8	STP Capacity	15 MLD expandable to 30 MLD

km = kilometer, mm = millimeter, MLD = million liters per day, STP = sewage treatment plant.

Source: Tiruppur City Municipal Corporation (TCMC).

18. The existing sewage treatment plant is located at Sarkarperiyapalayam village about 9.3 km from terminal pumping station. The designed capacity of the sewage treatment plant is 15 MLD, the capacity can be augmented to 30 MLD by modular expansion of Aeration Tank and Clarifiers, etc. The treated water of the existing STP is in compliance with the discharge standard prescribed by the TNPCB. The treated water from the STP is being discharged into overflow channel of Nanjarayan Kulam (Pond) which gets merged into the Noyyal River.

Figure 4: Existing and Proposed Underground Sewerage Scheme Covered Area



C. Proposed Project

19. The proposed scheme will provide the underground sewerage system to zones 5 to 9 and zones 13 to 17 of Corporation area. The proposed scheme involves construction of 6 sewage pumping stations, 4 main pumping stations, 2 new STPs, and augmentation of existing STP through provision of a new treatment module. In the proposed sewage collection system, totally three numbers of pipe carrying bridges is proposed within the TCMC area to cross Noyyal River. The sewage collected in the zones 13, 16 and 17 will be treated in the existing STP I at Sarkar Periyapalayam while sewage collected in the zones 5, 6, and 7 will be treated in the proposed STP II at Sarkar Periyapalayam. Sewage generated from the zones 8, 9, 14, and 15 will be collected and treated in proposed STP III at Chinnandipalayam. The proposed scheme will provide 74,293 house service connections. The zones 10, 11, and 12 does not have the required population density which in turn results in less sewage generation. These zones will be covered with UGSS system in future when the population density is achieved.

20. Table 2 shows the nature and size of the various components of the project. The UGSS is designed to cater only domestic wastewater; The storm water runoff will be carried by existing open drains and dispose into natural streams/ water bodies. Industrial wastewater will not be disposed into sewers. The UGSS is designed for 110 liters per capital per day, based on sewage

generation rate of 80% of water supply, It is also design with gravity flow as far as possible. However, the topography do not permit a complete gravity system from collection to inlet at the STP and therefore wherever required sewage pumping stations are introduced to optimize the system design.

Table 2: Proposed Underground Sewerage Scheme Project Components

Infrastructure	Function	Description				Location
Collection System	Street sewers have been proposed to collect the sewage from each zone and collected in a ground level sump proposed for each zone.	The total length of collection system proposed is 563.67 km and the length of collection system proposed for each zone is shown below				Sewers will be laid underground in the roads and internal streets in the proposed zones of Tiruppur City Municipal Corporation Area (TCMC).
		Zone No	Length (m)	Manholes (nos.)	Lift Manholes (nos.)	
		5	66810	2629	4	
		6	55912	2273	4	
		7	161901	6478	6	
		8	32216	1254	1	
		9	70284	2829	4	
		13	37498	1447	3	
		14	39240	1493	1	
		15	17417	665	2	
		16	27558	1060	1	
		17	44243	1722	1	
		TOTAL	563079	22260	27	
Sewage Pumping Stations (SPS)	Collect sewage and pump to main pumping stations	Each zone is provided with a sewage pumping station which consists of a <ul style="list-style-type: none"> • Screen well (Dia 2.5 m to 5.5 m, Depth 3.18 m to 7.38 m) • Collection well (Dia 3.0 m to 8.5 m, Depth 4.32 m to 8.65 m) • Suction well (Dia 8.0 m to 4.5 m, Depth 5.25 m to 13.1 m) • Non-clog submersible pump sets 				Sewage pump stations are proposed at following locations: <ol style="list-style-type: none"> 1. SPS 6 - Indra Nagar 2. SPS 17.1 - Karumarampalayam 3. SPS 13 - Kattabomman Nagar 4. SPS 16 - Pattukottaiyar Nagar 5. SPS 7.3 - AVP Road Santhapettai 6. SPS 7.2 - Angeripalayam Road
Main Sewage pumping stations	Collect sewage from SPS	Components of MPS <ul style="list-style-type: none"> • Screen well (Dia 3.0 m to 4.5 m, Depth 4.5 m to 7.0 m) 				Main sewage pump stations are proposed at

Infrastructure	Function	Description	Location
(MPS)	and pump to STP.	<ul style="list-style-type: none"> Grit well (Dia 4.5 m to 7 m, Depth 5.76 to 7.18 m) Suction well (Dia 8m, Depth 8.03m to 10.39 m) Pump room Non-clog submersible pump sets 	<p>following locations:</p> <ol style="list-style-type: none"> MPS 5 - Nanjarayan Nagar MPS 7 - Sakthi Nagar MPS 8 - Anaipalayam MPS 9 - S.R. Nagar (North) <p>The MPS 5 and 7 will pump sewage to Sarkarperiyalam STP's and MPS 8 and 9 will pump sewage to Chinnandipalayam STP.</p>
Sewage Treatment Plant (STP)	Treatment of collected wastewater to comply with disposal standards	<ul style="list-style-type: none"> Augmentation of existing STP at Sarkarperiyapalayam – STP I (15/30 MLD) Construction of New Sewage Treatment Plant at Sarkarperiyapalayam - STP II (36/44 MLD) Construction of New STP at Chinnandipalayam - STP III (20/26 MLD) <p>The proposed STP will be based on DBOT with ten (10) years of O&M. However, on considering the land availability, Construction, Operation & maintenance cost and performance the technology of the proposed STP's will be decided by the TCMC.</p>	<ul style="list-style-type: none"> The existing STP at Sarkarperiyapalayam having capacity of 15 MLD shall be expanded to 30 MLD which now treats the sewage from zones 1 to 4. It is proposed to expand this STP and utilize this STP to treat the sewage from proposed zones 13, 16 and 17 also. About 8.0 acres of corporation vacant land available near the existing STP I site at Sarkarpeyalayam which can be used to construct STP II for Zones 5, 6 and 7. About 7.5 acres of land available at Andipalayam

Infrastructure	Function	Description	Location
			<p>village and this can be used to construct STP III for Zones 8, 9, 14 and 15.</p> <p>Selected site is located ideally away from the residential areas. STP will be constructed inside the compound maintaining adequate distance.</p>
Outfall sewer	Disposal of treated water	<ul style="list-style-type: none"> The treated sewage from existing STP-I at Sarkarperiyapalayam is disposed into overflow channel of Nanjarayan kulam (Pond) which gets merged into Noyyal River at a distance of 1.1 km. The proposed STP-II will be located adjacent to existing STP-I at Sarkarperiyapalayam, treated sewage from the STP-II is disposed into overflow channel of Nanjarayan kulam (Pond) which gets merged into Noyyal River at a distance of 1.2 km. The 230 m length pipe line will be laid from outlet of STP-II till overflow channel of Nanjarayan kulam (Pond). Treated sewage from proposed STP- III located at Chinnandipalayam is disposed into nearby outfall channel of Chinnandipalayam kulam (Pond). The 200 m pipe line will be laid for this purpose from the outlet of the STP till the overflow channel near Chinnandipalayam Kulam. Treated wastewater from the overflow channel flows further into Noyyal River for ultimate disposal. 	The treated effluent will be within the standards set by CPCB/TNPCB.
House service connection (HSC)	Collect sewage from individual houses and convey into network	<ul style="list-style-type: none"> Each manhole will be able to receive sewage from about 6 houses. The size of the HSC is 110 mm dia UPVC pipe for domestic and 160 mm UPVC pipe for non-domestic service connection respectively. Provision has been made for connecting 74,293 nos. (Domestic connection – 59,435 nos, Non-Domestic connection – 14,858 nos.) Apart from this the sewage from commercial establishments like hotels and public toilets can also be connected to the sewer system so as to increase the flow into the SPS's and STP. 	At each household, connected to wastewater outlet drain.

CPCB = Central Pollution Control Board, TNPCB = Tamil Nadu Pollution Control Board.

Figure 5: Schematic Diagram of overall Sewerage Zones, Main Pumping Stations and Sewage Pumping Stations

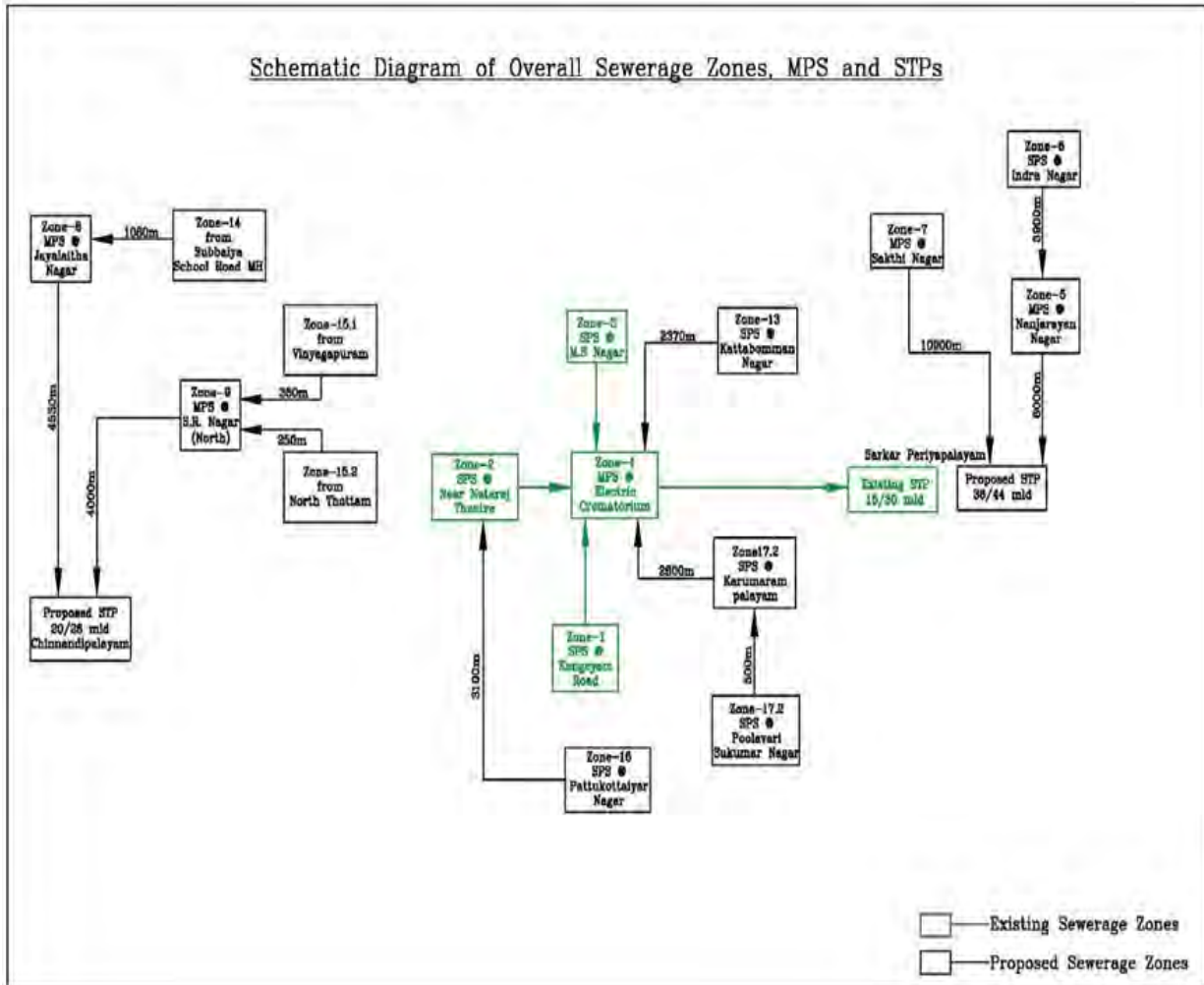


Figure 6: Map showing proposed Main Pumping Stations and Sewage Pumping Stations



Figure 7: Map showing Existing STP- I and Proposed STP-II in Sarkarperiyapalayam



Figure 8: Map showing Proposed STP-III in Chinnandipalayam



D. Implementation Schedule

21. The construction works involving various components have been grouped under different packages as mentioned below for quick execution.

- (i) Package I: Sewer collection system (zones 5, 6, and 7) including SPS and pumping main and House service connection (HSC).
- (ii) Package II: Sewer collection system (zones 8, 13, and 14) including SPS pumping main and HSC. Augmentation of the existing STP 15 MLD to 30 MLD at Sarkarperiyapalayam and rejuvenation of existing SPS & MPS.
- (iii) Package III: Sewer collection system (zones 9, 15, 16, and 17) including SPS, pumping main and HSC.
- (iv) Package IV: Construction of new STPs under design, build, operate and transfer (DBOT) basis as per the process specified to suit the available site at Sarkarperiyapalayam and Chinnadipalayam.
- (v) Package V: Purchase of sullage tankers.

22. Packages I to III and V shall be item rate contract as per bill of quantities. Package IV shall be under design and build basis. The works 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.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

23. 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.

24. **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.** A proposed project is classified as category 'A' if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- (ii) **Category B.** A proposed project is classified as category 'B' if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category 'A' projects. An initial environmental examination is required.
- (iii) **Category C.** A proposed project is classified as category 'C' if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- (iv) **Category FI.** A proposed project is classified as category 'FI' if it involves investment of ADB funds to or through a Financial Intermediary (FI).

25. **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.

26. **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 IEE upon receipt; and
- (iii) environmental monitoring reports submitted by the implementing agency during project implementation upon receipt.

B. National Environmental Laws

27. **Environmental assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that environmental clearance 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.

28. Category 'A' projects require Environmental Clearance from the central Ministry of Environment, Forests and 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 environmental clearance if appropriate.

29. 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 environmental clearance 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.

30. None of the components of this underground sewerage system project falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or environmental clearance is not required for the project.

31. **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 is shown in Table 3.

Table 3: Applicable Environmental Regulations

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.	STP requires CTE and CTO from TNPCB. Application has to be submitted online at http://tnocmms.nic.in/OCMMS/
Ancient Monuments and Archaeological Sites and Remains Acts, 1958, its Rules, 1959 and notification, 1992. Ancient Monuments and Archeological Sites and Remains (Amendment and Validation) Act, 2010.	This Act provides, inter alia, for the preservation of ancient and historical monuments and archaeological sites and remains of national importance - Notifies 100 m around the monument as prohibited area and 100 to 300 m as regulated area for construction works; - No excavation/construction work is allowed within 100 m of boundary of the protected monument; - Requires prior permission of National Monument Authority (NMA) for taking up works within 300 m of the boundary of protected monuments.	There are no protected monuments in areas of Tiruppur City Municipal Corporation.
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards.	To comply with applicable notified standards. Refer Table 4 & Table 5 for Wastewater disposal standards for STPs and sludge composting standards for use as compost/manure.
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.

Law	Description	Requirement
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.

CPCB = Central Pollution Control Board, m = meter, STP = sewage treatment plant, SWM = Solid Waste Management.

Table 4: Effluent Disposal Standards of STPs applicable to all modes of disposal

(Environment (Protection) Act, 1986 (29 of 1986), Environment (Protection) Amendment Rules, 2017 dt.13 October 2017 for the discharge standards for Sewage Treatment Plants)			
S. No.	Parameter	Standard	
		Location	Concentration not to exceed
1	pH	Anywhere in the country	6.5 - 9.0
2	Bio-Chemical Oxygen Demand	Metro Cities, ^a all State Capitals except in the State of Aruna chal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kash mir, 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 Aruna chal Pradesh, Assam, Manipur, Meghalaya Mizoram, Nagaland, Tripura Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kash mir, 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/100 ml)	Anywhere in the country	<1000

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

Notes:

(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 Sewage treatment plants (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.
- (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".

Table 5: Standards for Sludge Reuse as Manure

Standards 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
Moisture, percent by weight, maximum		15.0 – 25.0	25.0
Bulk density (g/cm ³)		<1	Less than 1.6
Total Organic Carbon, % by weight, minimum		12	7.9
Total Nitrogen (as N), % by weight, minimum	percent by weight	0.8	0.4
Total Phosphate (as P ₂ O ₅) percent by weight, minimum	percent by weight	0.4	10.4
Total Potassium (as K ₂ O), percent by weight, minimum	percent by weight	0.4	-
Color			
Odor		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

Standards 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)
Conductivity, not more than	dsm-1	4	8.2

Note: 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.

32. **Clearances / permissions to be obtained by Contractor.** Following Table 6 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 6: Clearances and permissions required for Construction

S. No	Construction Activity	Statutory authority	Statute under which Clearance is Required	Implementation	Supervision
1	STP	TNPCB	Consent to establish and consent to operate under Air Act, 1981 and Water Act, 1974	Contractor	PIU
2	Tree Cutting	Department of Forest and District Collector	Clearances from the authorities as per the Tamil Nadu Timber Transit Rules, 1968 or latest.	PIU	implementing agency and PMU
3	Hot mix plants, Crushers and Batching plants	TNPCB	Consent to establish and consent to operate under Air Act, 1981 and Water Act, 1974	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, 1989 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	Contractor	PIU
6	Sand mining, quarries and borrow areas	Department of Geology and mining, Government of Tamil Nadu (GOTN)	Contractor to obtain material from the existing government licensed mines / quarries; Contractor will require prior approval of PIU for obtaining material from a particular source. PIU to review and approve only existing licensed mines	Contractor	PIU
7	Groundwater extraction	Public Works Department	(Groundwater) Tamil Nadu Groundwater Development and Management Act 2000	Contractor	PIU
8	Disposal of	Tamil Nadu State	Hazardous Wastes (Management and Handling)	Contractor	PIU

S. No	Construction Activity	Statutory authority	Statute under which Clearance is Required	Implementation	Supervision
	bituminous wastes	Pollution Control Board	Rules. 1989		
9	Temporary traffic diversion measures	-	MoRTH 112 SP 55 of IRC codes	Contractor	PIU
10	Disposal of treated effluent	PWD	Refer Table 4 for discharge standards	PIU	PIU

MoRTH = Ministry of Road Transport and Highways, PWD = Public Works Department, PIU = program implementation unit, PMU = program management unit, STP = sewage treatment plant, TNPCB = Tamil Nadu Pollution Control Board.

33. **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, 2009.

Table 7: Applicable Ambient Air Quality Standards for India Projects

Parameter	Location ^a	National Ambient Air Quality Standards ^b	WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$)		Applicable Per ADB SPS ^c ($\mu\text{g}/\text{m}^3$)
			Global Update ^d 2005	Second Edition ^e 2000	
Particulate Matter PM ₁₀ ($\mu\text{g}/\text{m}^3$)	Industrial Residential, Rural and Other Areas	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
	Sensitive Area	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
Particulate Matter PM ₂₅ ($\mu\text{g}/\text{m}^3$)	Industrial Residential, Rural and Other Areas	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)		10 (Annual) 25 (24-hr)
Sulfur Dioxide SO ₂ ($\mu\text{g}/\text{m}^3$)	Industrial Residential, Rural and Other Areas	50 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 800 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
Nitrogen Dioxide NO ₂ ($\mu\text{g}/\text{m}^3$)	Industrial Residential, Rural and Other Areas	40 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	40 (Annual) 80 (24-hr) 200 (1-hr)
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)

Parameter	Location ^a	National Ambient Air Quality Standards ^b	WHO Air Quality Guidelines (µg/m ³)		Applicable Per ADB SPS ^c (µg/m ³)
			Global Update ^d 2005	Second Edition ^e 2000	
Carbon Monoxide CO (µg/m ³)	Industrial Residential, Rural and Other Areas	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
	Sensitive Area	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
Ozone (O ₃) (µg/m ³)	Industrial Residential, Rural and Other Areas	100 (8-hr) 180 (1-hr)	100 (8-hr)	-	100 (8-hr) 180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)	-	100 (8-hr) 180 (1-hr)
Lead (Pb) (µg/m ³)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) 1.0 (24-hr)	-	0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)	-	0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
Ammonia (NH ₃) (µg/m ³)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)	-		100 (Annual) 400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)	-	-	100 (Annual) 400 (24-hr)
Benzene (C ₆ H ₆) (µg/m ³)	Industrial Residential, Rural and Other Areas	5 (Annual)	-	-	5 (Annual)
	Sensitive Area	5 (Annual)	-	-	5 (Annual)
Benzo(o) pyrene (BaP) (ng/m ³)	Industrial Residential, Rural and Other Areas	1 (Annual)	-	-	1 (Annual)
	Sensitive Area	1 (Annual)	-	-	1 (Annual)
Arsenic (As) (ng/m ³)	Industrial Residential, Rural and Other Areas	6 (Annual)	-	-	6 (Annual)
	Sensitive Area	6 (Annual)	-	-	6 (Annual)
Nickel (Ni) (ng/m ³)	Industrial Residential, Rural and Other Areas	20 (Annual)	-	-	20 (Annual)
	Sensitive Area	20 (Annual)	-	-	20 (Annual)

^a Sensitive area refers to such areas notified by the India Central Government.

^b http://cpcb.nic.in/uploads/National_Ambient_Air_Quality_Standards.pdf

^c As per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

^d WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006.

^e Air Quality Guidelines for Europe Second Edition. WHO 2000.

Table 8: Applicable Ambient Noise Level Standards for India Projects

Receptor/ Source	Noise Level Standards ^a (dBA)		WHO Guidelines Value For Noise Levels Measured Out of Doors ^b (One Hour LA _{eq} in dBA)		Applicable Per ADB SPS ^c (dBA)	
	Day	Night	07:00 – 22:00	22:00 – 07:00	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial area	65	55			65	55
Residential Area	55	45	55	45	55	45
Silent Zone	50	40			50	40

^a Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010

(<http://cpcb.nic.in/displaypdf.php?id=Tm9pc2UtU3RhbmRhcmRzL25vaXNlX3J1bGVzXzlwMDAucGRm>)

^b Guidelines for Community Noise. WHO. 1999.

^c As per ADB SPS, the Executing Agency shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

Table 9: Applicable Drinking Water Quality Standards^a for India Projects

Group	National Standards for Drinking Water ^b			WHO Guidelines for Drinking-Water Quality, 4 th Edition, 2011 ^c	Applicable Per ADB SPS ^d
	Parameter	Unit	Max. Concentration Limit		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6.5 – 8.5	none	6.5 – 8.5
	Color	Hazen units	5 (15)	none	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2,000)	-	500 (2,000)
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	none	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Barium	mg/l	0.7	none	0.7
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Anionic detergents	mg/l	0.2 (1.0)	none	0.2 (1.0)
	Phenolic compounds	mg/l	0.001(0.002)	none	0.001(0.002)

	Residual Chlorine	mg/l	0.2	5	0.2
Microbial indicator	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			

^a <http://cgwb.gov.in/Documents/WQ-standards.pdf>

^b Bureau of India Standard 10500: 2012 (Indian Standard, Drinking Water — Specification (Second Revision)).

^c Health-based guideline values.

^d As per ADB SPS, the government shall achieve whichever of the drinking quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

^e Figures in parenthesis are maximum limits allowed in the absence of alternate source.

Table 10: General Standards for Discharge of Environmental Pollutants^a
Part- A: Effluents (SCHEDULE – V)

Sl.no	Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/ coastal areas
1	Suspended solids mg/l, max.	100	600	200	(a) For process waste water (b) For cooling water effluent 10 % above total suspended matter of influent
2	Particle size of suspended solids	shall pass 850 micron IS Sieve	-	-	(a) Floatable solids, solid s max. 3 mm (b) Settleable solids, max 856 microns
3	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	Temperature	shall not exceed 5°C above the receiving water temperature	-	-	shall not exceed 5°C above the receiving water temperature
5	Oil and grease, mg/l max	10	20	10	20
6	Total residual chlorine, mg/l max	1	-	-	1
7	Ammonical nitrogen (N), mg/l, max	50	50	-	50
8	Total kjeldahl nitrogen (N) mg/l, max	100	-	-	100
9	Free ammonia (NH ₃), mg/l, max.	5	-	-	5

Sl.no	Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/ coastal areas
10	Biochemical Oxygen Demand (3 days at 27°C), mg/l, max	30	350	100	100
11	Chemical Oxygen Demand, mg/l, max	250	-	-	250
12	Arsenic (As) mg/l, max.	0.2	0.2	0.2	0.2
13	Mercury (Hg), mg/l, max.	0.01	0.01	-	0.01
14	Lead (Pb) mg/l, max	0.1	1	-	2
15	Cadmium (Cd) mg/l, max	2	1	-	2
16	Hexavalent chromium (Cr ⁶⁺), mg/l, max.	0.1	2	-	1
17	Total Chromium (Cr) mg/l, max.	2	2	-	2
18	Copper (Cu) mg/l, max.	3	3	-	3
19	Zinc (Zn) mg/l, max	5	15	-	15
20	Selenium (Se) mg/l, max	0.05	0.05	-	0.05
21	Nickel (Ni) mg/l, max.	3	3	-	5
22	Cyanide (CN) mg/l, max	0.2	2	0.2	0.2
23	Fluoride (F) mg/l, max.	2	15	-	15
24	Dissolved phosphates (P _i), mg/l, max	5	-	-	-
25	Sulphide (S) mg/l, max.	2	-	-	5
26	Phenolic compounds (C ₆ H ₅ OH) mg/l, max.	1	5	-	5
27	Radioactive materials:				
	(a) Alpha emitters micro curie mg/l, max.	10 ⁻⁷	10 ⁻⁷	10 ⁻⁸	10 ⁻⁷
	(b) Beta emitters micro curie mg/l	10 ⁻⁶	10 ⁻⁶	10 ⁻⁷	10 ⁻⁶
28	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
29	Manganese	2 mg/l	2 mg/l	-	2 mg/l
30	Iron (Fe)	3mg/l	3mg/l	-	3mg/l
31	Vanadium (V)	0.2mg/l	0.2mg/l	-	0.2mg/l
32	Nitrate Nitrogen	10 mg/l	-	-	20 mg/l

^a <http://cpcb.nic.in/industry-effluent-standards/>

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

34. **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 project sites.

35. The literature survey broadly covered the following:

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

B. Physical Resources

1. Location, Area and Connectivity

36. Tiruppur is a city in the region of the Indian state of Tamil Nadu. Tiruppur is located at 11.1075°N, 77.3398°E on the banks of the Noyyal River. It has an average elevation of 295 metres (967 feet) and covers an area of 159.6 km² (61.6 sq mi). Tiruppur is the administrative headquarters of Tiruppur District and the fifth largest urban agglomeration in Tamil Nadu. It has been ruled at different times, by the Early Pandyas, Medieval Cholas, Later Cholas, Vijayanagar Empire, Madurai Nayaks, Mysore Kingdom and the British. It is situated at the center of the South Indian Peninsula, about 450 km (280 mi) southwest of the state capital Chennai and about 50 kilometers (31 mi) east of Coimbatore.

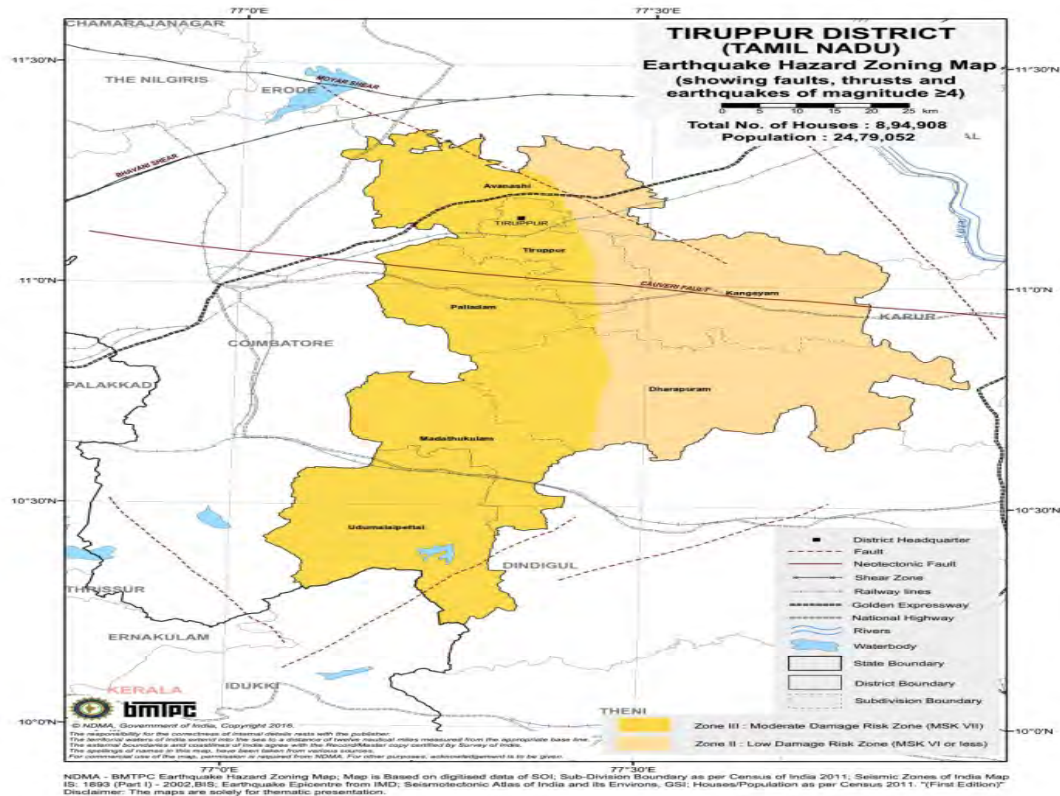
37. The district is well connected by means of road through National and State Highways to many prominent places in and around the district. Three National highways pass through the district including NH-47(Avinashi), NH-67 (Kangeyam-Palladam) and NH-209 (Udumalpet). There are also various State Highways connecting to various urban centers in the district. Tiruppur station is the only major railway station in the district. The other major taluk centres such as Kangeyam, Palladam, Avinashi does not have railway connectivity and depend on Tiruppur railway station for transportation. The nearest airport is Coimbatore, which is 45 km away from the district headquarters. The nearest port is Kochi port with about 235 km distance and Tuticorin port with about 320 km distance. Tuticorin port is used for transportation of majority of the export goods from the district.

2. Topography, Soils and Geology

38. Major portion of Tiruppur district is constituted by red gravel, clay loamy soils. The fine soil being of loamy variety requires only little irrigation and this type of soil is found in Udumalaipettai taluk and it is fit for cotton cultivation. There are five major types of soil found in the district. Red loam is mainly found in Avinashi, Palladam, Tiruppur and Udumalaipettai blocks. Laterite soil is mainly found in Kangeyam and Dharapuram blocks. Black soil is mainly found in Dharapuram, Avinashi, Palladam, Tiruppur and Udumalaipettai Blocks. Sandy coastal alluvium is mainly found in Palladam Block. Red Sandy Soil is mainly found in Dharapuram and Avinashi Blocks. Calcareous soil is mainly found in Avinashi, Palladam and Tiruppur blocks.

39. Tiruppur is underlain by a wide range of high-grade metamorphic rocks of peninsular gneissic complex. These rocks are extensively weathered and overlain by recent valley fills and alluvium at places. The most common rock type of the area are gneiss, charnockite, granite, quartzite, laterite and alluvium.

Figure 9: The Seismic map of Tiruppur District



3. Seismology

40. According to Bureau of Indian Standards (BIS) [IS 1983 (Part I):2002], Tiruppur City Municipal Corporation falls under Zone III and on the macro seismic intensity scale the project area falls under MSK VII (Moderate Damage Risk Zone). Structural design of infrastructure elements will be done with due consideration to relevant codes. The Seismic map of Tiruppur District is shown in the Figure 9.

4. Climatic Conditions

41. The climate in Tiruppur is tropical with the mean maximum and minimum temperatures varying between 35°C to 22°C (95°F to 72°F). The summer season starts from the month of March, April and May during this period the weather remains hot and dry. The maximum temperature during the summer months will be around 35°C (95°F) and the minimum temperature will be around 29°C (84°F). The monsoon season starts from the month of June, July and August. During the monsoon season, mild showers and a reduced temperature is observed. The post monsoon or winter months are from September to January. The winter season generally have a

cool climate and temperatures rarely rise beyond a maximum of around 29°C (84°F). The minimum temperature during this season will be around 24°C (75°F).

42. Due to the presence of the Palghat gap, the city receives rainfall from the South-west monsoon (June to August). After a humid September, the North-east monsoon brings rains, which starts from October and lasts till early November. The average annual rainfall is around 700 mm (28 in) with the North East and the South West monsoons contributing to 47% and 28% respectively to the total rainfall. Major portion of Tiruppur district is constituted by red gravel, clay loamy soils.

5. Physiography

43. The southern part of the Tiruppur District is covered by hill ranges of Western Ghats (Anamalai, Sirumugamalai, Nilgiri, Boluvampatti, Janakal and Velligiri) and the rest of the district consists of undulating plain sloping gradually from West to East. The major rivers flowing through the district are Noyyal and Amaravathi, which come under the Cauvery basin. Chinnar and Tenar Rivers are the main tributary of Amravati River, which is the main source of irrigation in the district. Nallar and Palar River are covered under the Parambikulam-Aliyar basin. Both Amaravathi dam and Thirumurthy dam are the prime source of irrigation in the district, whereas Uppaar dam is another dam which receives water from seasonal rains.

6. Surface Water Sources

44. The Noyyal, Amaravati, Palar, Nallar and Chinnar Rivers flow through the district. There are two major dams in the district namely Thirumoorthy dam (across Palar River) and Amaravathi dam (across Amaravathy River). Other minor dams include Upparu dam, Nallathangal dam and Vattamalaikarai Odai dam for irrigation purpose. The sources of drinking water supply for the Tiruppur City Municipal Corporation are from Bhavani River at Mettupalayam and Cauvery River at Bhavani

7. Surface Water and Groundwater Quality

45. Baseline water quality (surface and groundwater) will be determined by contractors as per pre-works condition documentation. Results will be included in the Updated/Final IEE and/or semi-annual environmental monitoring report.

9. Air Quality

46. Based on the secondary information,¹ the ambient air quality in the subproject area is observed to be within the permissible limits stipulated by CPCB–NAAQ standards. The particulate matter (PM₁₀) was in the range between 50 to 70 µg/m³, the oxides of sulphate (SO_x) was in the range between 13 and 27 µg/m³, the oxides of nitrogen (NO_x) was in the range of 25 and 30 µg/m³. Thus, the air quality index of the subproject area is found to be satisfactory. The given information on the air quality is obtained from the CPCB “Ambient air quality and Noise levels” published in the year 2017, state wise for whole India. Hence, the data for Tamil Nadu (which represents Tiruppur) has been taken for discussion. Being a consolidated report, specific information pertaining to the date and sampling stations are not available.

¹Source: <http://cpcb.nic.in/openpdf.php?id=UmVwb3J0RmlsZXNmNjE1XzE1MTczOTcyNjBfbWVkaWFwaG90bzE2MzkxLnBkZg==>

47. Baseline air quality will be determined by contractors per pre-works conditions documentation. Results will be included in the Updated/Final IEE and/or semi-annual environmental monitoring report.

10. Ecological Features

48. Common flora found in the Tiruppur City Municipal Corporation are *Adhatoda zeylanica*, *Agave sisalana* Perinne, *Ailanthus akeli* Roxb., *Aloe vera*, *Cocos nucifera* L., *Indigofera soo*, *Moringa olifera* Lam., *Pongamia pinnata* L., *Artocarpus integrifolia*, *Borassus flabellifer*, *Cocos nucifera*, *Mangifera indica*, *Moringa oleifera*, *Phoenix sps.* *Oryza sativa*, *Lycopersicum esculentum*, *Sorghum bicolor*, *Piper betle*, etc.

49. Common fauna found in the Tiruppur City Municipal Corporation are Common crow Grass yellow, Dragon fly, Grasshopper, Common Indian Toad, Common Garden lizard, Pond Heron, Small Egret, Spotted Dove, Rose Ringed Parakeet, Pied Crested Cuckoo, House Sparrow, Indian Palm squirrel, Indian pipistrella. Based on the assessment, there are no Vulnerable, Endangered, Critically endangered species available in the subproject area. Also, there is no eco-sensitive areas (Forest areas, Bio reserves, National parks, Sanctuaries, Wetland or nationally important/protected monuments) found in the subproject area. Source: (<https://www.iucn.org/regions/washington-dc-office/our-work/ibat-business>). The nearest monument as per Archaeological Survey of India (ASI) is Prehistoric site (known as Pandava graves) present in kanyampudi, Coimbatore at a distance of 5.69 km from Tiruppur.

C. Socio-Economic Characteristic

1. Demography

50. As per Census 2011, Tiruppur district has a population of 24.8 lakh persons – 3.44% of the state population. Majority of the population (40%) is concentrated in Tiruppur taluk. The district's literacy rate is 78.7%, which is marginally lower than the state average of 80.1%, but higher than all-India average of 74%. Male literacy at 85.5% is higher than female literacy rate at 71.8%. The Taluks in the district include Tiruppur North, Tiruppur south, Palladam, Udumalai Pettai, Madathu Kuam, Kangeyam, Dharapuram, Avinashi and Uthukuli. The population of Tiruppur City Municipal Corporation as per 2011 census is 877,778 and is divided into 60 administrative wards.

51. The workforce participation rate of the district (51%) is one among the highest in the state and significantly more than the state average of 46%. The industrialization of the district is reflected by the workforce rate. Majority of the population is classified under other workers (67%) which include occupation such as government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, construction, political or social work, priests, entertainment artists, etc.

52. As per the religious census of 2011, Tiruppur (Municipal Corporation) had 86.05% Hindus, 10.36% Muslims, 3.33% Christians, 0.03% Sikhs, 0.01% Buddhists, 0.07% Jains, 0.14% following other religions and 0.01% following no religion or did not indicate any religious preference.

Table 13: Tiruppur Corporation Area and Population Details

Sl. No	Name of Urban local bodies	Area km ²	Population				Persons/ km ² 2011
			1981	1991	2001	2011	
1	Andipalayam	9.00	3590	5563	11350	25095	2788
2	Chettipalayam	9.49	5652	9254	20184	34309	3615
3	Mannarai	5.74	2340	3039	8496	17267	3008
4	Murugampalayam	9.20	4694	6800	14440	26739	2906
5	Muthanampalayam	20.67	4738	6166	9548	24765	1198
6	Nallur	24.87	6872	13421	29495	70025	2816
7	Nerupherichal	19.67	6031	10902	16372	55822	2838
8	Thottipalayam	5.79	3695	8383	26818	41063	7092
9	Tirupur	28.25	165223	235661	344543	444543	15736
10	Veerapandi	11.81	6112	8515	21848	50968	4316
11	Velampalayam	14.86	16571	26248	45679	87182	5867
	Total	159.35	225518	333952	548773	877778	

Source: Census 2011.

2. Industry and Agriculture

53. **Agriculture.** Tiruppur, though an industrial district, plays important role in agriculture. In Tiruppur, more than 80% of farmers belong to small and marginal category and they play a key role in overall development in agriculture. The total area of cultivation is around 228,556 hectare comprising primarily food and commercial crops. The chief food crops are paddy, millets and pulses. The non-food or commercial crops in the district are cotton, oil seeds and coconut. Depending on the rainfall and assured irrigation, the total cultivable area may exceed the cultivable area benchmark by up to 150% of the aforementioned.

54. **Industry.** Tiruppur is a major textile and knit wear hub contributing to 90% of total cotton knit wear exports from India. The textile industry provides employment to over six lakh people and contributed to exports worth 200 billion (US\$3.1 billion) in 2014–2015. Tirupur is known for cluster activity development. Each activity of garment making is outsourced on a cluster basis to knitting units, dyeing & bleaching units, fabric printing, garmenting, embroidery, compacting and calendaring and other ancillary units.

55. As of 2010-2011, Tiruppur district had the seventh largest Gross District Domestic Product (GDDP) in Tamil Nadu at Rs18,202 crore (4.5% of the Gross State Domestic Product at constant prices). In terms of per capita income though, it ranked 2nd amongst all the districts at Rs. 83,776 when compared with the State average of Rs 59,967. The district economy is pre-dominantly service based with service sector's share in GDDP at 51% in 2010–2011. This is followed by secondary sector at 42% and primary sector at 7%.

Table 14: Industrial Area in Tiruppur District

Area	Land acquired (In hectare)	Land developed (In hectare)	No of allotted plots	No. of Units in Production
Ganapathipalayam	7	7	53	77
Gudimangalam	3	3	1	31
Tiruppur	4	4	5	45

SIDCO Industrial Estate, Rasathi Valasu, Kangeyam	21	21	51	N/A
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Source: Micro, Small and Medium Enterprises (MSME).

56. **School.** Education is an important component in the process of human development. The state has policy objectives of universal elementary education through the enrollment and retention of all children in the age group of 6-14 years. The district administration taking all effort to enroll all children who completed 5 years in the network of schools across the district.

- (i) No. of elementary school: 86 nos.
- (ii) No. of middle school: 77 nos.
- (iii) Government high school: 3 nos.
- (iv) Government Higher. sec school: 7 nos.
- (v) Municipal High school: 4 nos.
- (vi) Municipal Higher Sec. School: 4 nos.

3. Health Profile

57. Tiruppur district having 10 government hospital with total bed strength of 1238 at Taluk level, around 51 Primary health center in rural and urban areas. The indicators contained within this health profile will support Tiruppur City Municipal Corporation to focus on and prioritise health improvement initiatives, particularly among young children and vulnerable adults. In 2017, the number of peoples affected by vector borne diseases (Dengue, Malaria) is 254; however none were affected by water borne diseases and the morbidity rate was 0.032.

4. History, Culture and Tourism

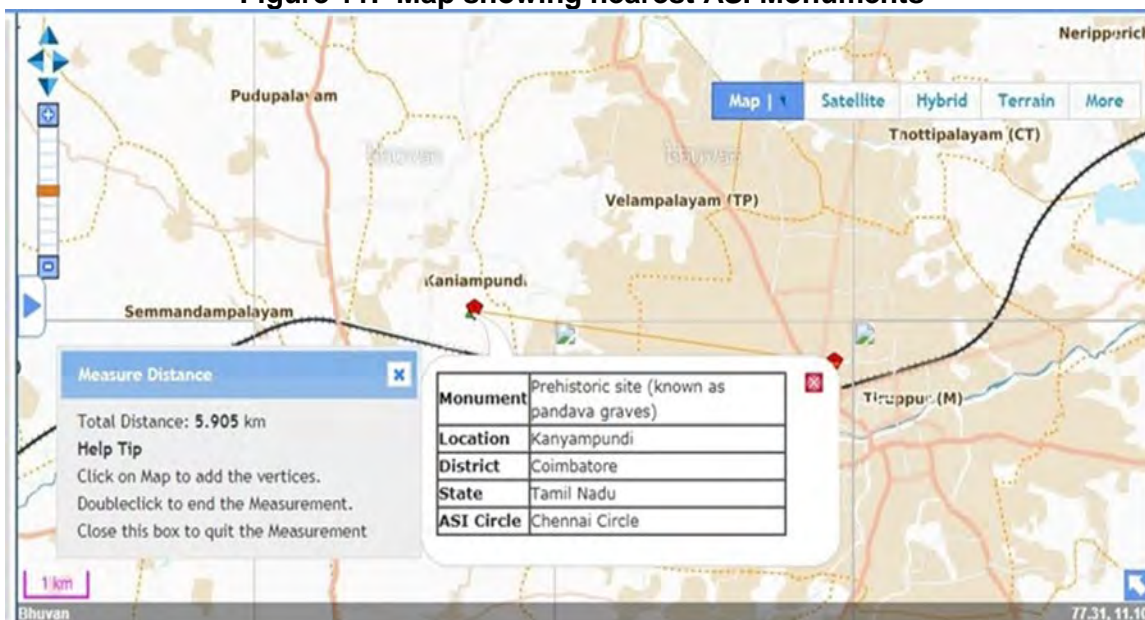
58. Tiruppur formed a part of the Kongu Nadu region ruled by the Cheras during Sangam period. The region was part of a prominent Roman trade route that connected east and west coasts of India. The medieval Cholas conquered the Kongu Nadu in the 10th century CE and Chola stone carvings mention *Kanchi Maanadhi* (Noyyal River) and the fertile sand that it deposited on its banks.

59. The region came under the rule of the Vijayanagara Empire by the 15th century and later Palayakkarars, the chieftains of Madurai Nayaks ruled the region. In the later part of the 18th century, the region came under the Kingdom of Mysore, following a series of wars with the Madurai Nayak Dynasty. After the defeat of Tippu Sultan in the Anglo-Mysore Wars, the British East India Company annexed the region into the Madras Presidency in 1799.

60. Major temples in Tiruppur were built during the reign Cholas and Pandyas. Sukreeswarar Temple is a 10th-century temple situated at the outskirts of Tiruppur is considered one of the four 'SirpaSthalangal' in Kongu region. An epigraphic study conducted studies at the temple reported that though the temple was built by Pandyas, different inscriptions state that the place was used by tribal to offer poojas to 'Shivalingam' as early as 5th century. The Town Hall, new railway over-bridge, Tiruppur Kumaran memorial, corporation memorial pillar are some of the landmarks in the Tiruppur city. Some of the common tourist locations outside the city are Sivanmalai, Nanjarayan Tank, Koolipalayam wetlands, Konganagiri hill hock temple, Andipalayam lake, Thirumuruganpoondi, Tiruppur Tirupathi temple, Avinashiappar temple and Vazhai Thottathu Ayyankovil.

61. Within the project area there are no sensitive areas like forest or protected areas or nationally important / protected monuments. No eco-sensitive areas are located in the subproject area. The nearest Monument as per Archaeological Survey of India (ASI) is Prehistoric Site (known as pandava graves) present in Kanyampundi, Coimbatore at a distance of 5.69 km from the project area.


Figure 11: Map showing nearest ASI Monuments








D. Project Site Features

62. Features of the selected project sites are presented in the following table.

Table 15: Site Environmental Features



Infrastructure	Location and Environmental Features	Site Photograph
<p>Main Pumping Station (MPS)</p> <p>MPS-5 – Nacharayan nagar (11° 8'20.46"N, 77°22'57.87"E)</p>	<p>0.5 acres of vacant land belonging to corporation (S.F.No.179 (Neruperichel) in Nacharayan nagar is proposed for constructing MPS.</p> <p>The site is covered partly with shrubs and buses. The site is located away from the commercial and residential area. Also, the nearest receptor i.e., residential place lies at a distance of 160 m from the project site. The site is large and MPS will be located within the site maintaining maximum buffer all around. The green belt will be developed on the boundary of the site. It is located in zone 5 and components of MPS are Screen well (dia – 4.5 m & depth -5.85 m), Grit well (dia – 7 m & depth – 7.18 m) and Wet well (dia-8 m & depth-10.39 m).</p>	


Infrastructure	Location and Environmental Features	Site Photograph
<p>Sewage Pumping Station (SPS)</p> <p>SPS-6 Indra nagar (11° 7'59.82"N, 77°21'53.03"E)</p>	<p>The proposed Sewage pumping station was located at Indra nagar in the corporation land extend of 0.5 acre comprise S.F.No. 433 (Mannarai). The site is covered with Shrubs and bushes. Residential area is far away from vicinity of the site. The Rathna Nagar one of the residential area lies at 285 m from the project site. The green buffer will be proposed in the site to mitigate the odour.</p> <p>The components of SPS are Screen well (dia - 4 m & depth -4.68 m), Grit well (dia – 6 m & depth - 5.97 m) and Wet well (dia-8 m & depth-8.42 m) and located in Zone 6.</p>	
<p>MPS</p> <p>MPS-7 Sakthi nagar (11° 8'30.63"N, 77°21'1.61"E)</p>	<p>The proposed main pumping station was located at Sakthi nagar in the Government Purambok land extend of 0.5 acre comprise S.F. No. 270 (Thottipalayam). Site is vacant and covered with shrubs and bushes. Site is not low-lying or flood prone. The industrial sheds are surrounded on the North, East, Western side at a distance of 17.0 m and in Southern side, the Nallaru River lies adjacent to project site. The nearest receptor i.e., residential area lies at a distance of 320 m from the project site. Other measures – design and operation, green buffer etc., will be required to prevent odour issues. The Components of MPS are Screen well (dia – 5.5 m & depth -7.38), Grit well (dia – 8.5 m & depth – 8.65 m) and Wet well (dia-8 m & depth-13.1 m) and located in Zone 7.</p>	
<p>Sewage pumping station</p> <p>SPS 7.2 Angeripalayam Road (11°9'8.26"N, 77°20'0.86"E)</p>	<p>The proposed Sewage pumping station was located at Angeripalayam road in the Corporation land extend of 0.1 acre. Site is vacant and surrounded by vacant lands and road. The residential areas 25 m away from the project site. However, the site is large and SPS will be located within the site. The odor controlling device is proposed in the site to mitigate the odor problems/ issues. The components of SPS are Screen well (dia – 2.0 m & depth -3.88), Grit well (dia – 2.5 m & depth – 4.97 m) and</p>	


Infrastructure	Location and Environmental Features	Site Photograph
	Wet well (dia-8.0 m & depth-5.79 m) and located in Zone 7.	
<p>Sewage pumping station</p> <p>SPS-7.3 AVP Road Santhapettai (11°8'27.41"N, 77°19'19.70"E)</p>	<p>The proposed Sewage pumping station was located at AVP Road, Santhapettai in the Corporation land extend of 0.25 acre comprise S.F. No. 423 (Velampalayam). Site is located within a developed neighborhood with residential and commercial buildings. The nearest residential unit lies at 15 m from the project site. However, the site is large and SPS will be located within the site maintaining maximum buffer with residential buildings. However, the odour controlling device will be installed in site.</p> <p>The Components of SPS are Screen well (dia – 4.5 m & depth -5.22), Grit well (dia – 6.5 m & depth – 6.5 m) and Wet well (dia-8 m & depth-9.26 m) and located in Zone 7.</p>	
<p>Main Pumping Station.</p> <p>MPS-8 Anaipalayam (11° 6'29.54"N, 77°18'47.43"E)</p>	<p>0.5 acres of Government Purambok land of TS. No. 5 available in Anaipalayam will be used to construct Main Pumping Station. The site is vacant with shrubs and bushes, surrounded by the few trees and located far away from the residential areas.</p> <p>However, the odor controlling device will be installed in site. The residential areas lies at the Eastern and Western side of the project site at the distance of 15 m.</p> <p>It is located in zone 8 and Components of MPS are Screen well (dia – 4.0 m & depth – 4.67 m), Grit well (dia – 5.5 m & depth – 5.93 m) and Wet well (dia-8 m & depth- 7.99 m)</p>	



Infrastructure	Location and Environmental Features	Site Photograph
<p>Main Pumping Station</p> <p>MPS-9 SR Nagar North (11° 6'5.77"N, 77°19'28.02"E)</p>	<p>0.5 acres of Corporation land of S.F.No.43/1 (Andipalayam) available in SR Nagar North will be used to construct Main Pumping Station. At present the site is vacant and surrounded by vacant land. The nearest residential house lies at 25.0 m from the project site on the Southern side of project boundary.</p> <p>It is proposed to construct Compound wall for the entire site. Green buffer is proposed to mitigate the Odour problems. Also Odour control device will be installed in site.</p> <p>It is located in zone 9 and components of MPS are Screen well (dia – 4.0 m & depth – 4.62 m), Grit well (dia – 6.0 m & depth – 5.76 m) and Wet well (dia-8 m & depth- 8.03 m)</p>	
<p>Sewage pumping station</p> <p>SPS -13</p> <p>Kattabomman Nagar – (11°11'85.57"N, 77°36'08.18"E)</p>	<p>The Proposed Sewage pumping station was located at Kattabomman nagar. The land extend of 0.2 acre comprises S.No 351/2 (Mannarai Village) was identified and to be purchased by the Corporation. At present, maize and cattle feed are grown in the land. The residential houses are lies adjacent to project site on Eastern and Northern side of project boundary.</p> <p>It is proposed to locate the SPS within the site, maintaining maximum buffer to roads all round with high odour potential units such as wet well. It will also be separated by a green buffer. However, the odour controlling device will be installed in site.</p> <p>The Components of SPS are Screen well (dia – 3.0 m & depth -7.38), Grit well (dia – 4.5 m & depth – 8.53 m) and Wet well (dia-8.0 m & depth-10.03 m) and located in Zone 13.</p>	

Infrastructure	Location and Environmental Features	Site Photograph
<p>Sewage Pumping Station</p> <p>SPS – 16 Pattukottaiyar nagar (11°5'25.53"N, 77°21'6.03"E)</p>	<p>0.2 acres of Government Porromboke land comprises TS No. 200 ward – N Block-13 available in Pattukottaiyar nagar will be used to construct Sewage Pumping Station.</p> <p>The proposed site is located near Sangilipallam odai bank and surrounded by residential area and commercial development on three sides and vacant land present on otherside. The nearest residential and commercial are lies at a distance of 15.0 m from the project site. The compound wall and maximum green buffer is proposed to mitigate the odour problems.</p> <p>However, the odor controlling device will be installed in site. It is located in zone 16 and Components of SPS are Screen well (dia – 3.0 m & depth – 3.0 m), Grit well (dia – 3.5 m & depth – 4.27 m) and Wet well (dia-8 m & depth- 5.37 m)</p>	
<p>Sewage Pumping Station</p> <p>Karumaram palayam SPS 17.1 (11°6'44.57"N, 77°22'14.13"E)</p>	<p>0.3 acres of Government Porromboke land comprises S.F. No. 474 (Mannarai) available in Karumarampalayam will be used to construct Sewage Pumping Station.</p> <p>The proposed site is vacant & covered with shrubs and bushes, it is located near bank of Noyyal River and far away from the residential area and industries. The residential settlement of Karumarampalayam village lies at distance of 290.0m from the project site. The site has ample space and green buffer will be developed all around the site.</p> <p>It is located in zone 17 and The Components of SPS are Screen well (dia – 2.5 m & depth – 3.18 m), Grit well (dia – 3.0 m & depth – 4.32 m) and Wet well (dia- 8.0 m & depth- 5.25 m)</p>	

Infrastructure	Location and Environmental Features	Site Photograph
<p>Sewage Treatment Plant- Existing</p> <p>Sarkarperiya palayam STP-I (11° 7'56.21"N, 77°24'59.50"E)</p>	<p>The existing STP treatment process is extended aeration process. The existing sewage treatment plant STP I at Sarkarperiya palayam having capacity of 15 MLD expandable to 30 MLD which now treats the sewage from zones 1 to 4. It is proposed to expand this STP to 30 MLD and utilize this STP to treat the sewage from proposed zones 13, 16 and 17. The snap shot shows the location for disposal of treated sewage by gravity in closed conduit into nearby overflow channel of Nanjarayan kulam (Pond). From STP, this channel flows and gets merge into the Noyyal River at a distance of 1.2 Km from the STP-I</p>	
<p>Sewage Treatment Plant-Proposed</p> <p>STP II (36/44 MLD) Sarkarperiya palayam (11° 7'56.21"N, 77°24'59.50"E)</p>	<p>About 8.0 acres (S.F. No. 199, 200, 205) of Corporation vacant land available near the existing STP site at Sarkarperiya palayam will be used to construct new STP-II. This site is vacant with shrubs and bushes, site is far away from the residential and commercial development. This new STP-II is proposed to treat the sewage from Zones 5, 6 and 7. The residential settlements are far away from the proposed STP (740m). The green belt will be developed on the boundary of the site.</p> <p>The Sewage treated water will be disposed into overflow channel of Nanjarayan Kulam (Pond) where existing STP I discharge takes place. A pipeline of length 230 m will be constructed from the outlet of proposed STP II upto the channel. Further, overflow channel gets connected into Noyyal River at a distance of 1.1 km.</p>	

Infrastructure	Location and Environmental Features	Site Photograph
<p>Sewage Treatment Plant-Proposed</p> <p>STP III (20/26 MLD) Chinnadipalayam village (11° 6'2.10"N, 77°17'37.13"E)</p>	<p>7.5 acres (S.F. No. 188) of land available at chinnadipalayam village will be used to construct new STP-III. The peripheral of the site consist of few trees and also site is covered with shrubs and bushes. State Highways 169 Tiruppur – Somanur road traverses adjacent to site, there are few industries that are located surrounding the site but are not close enough. The residential area is far away from the vicinity of the site (130 m). A pond named chinnadipalayam kulam (Pond) is located near to the site in north east direction and is separated by a major road along the East-West direction and a parallel storm drain between the site and the major road.</p> <p>The green belt will be developed on the boundary of the site.</p> <p>Proposed STP-III at Chinnandipalayam will utilize to treat the sewage from the Zones 8, 9, 14 and 15.</p> <p>The Sewage treated water then discharged through a closed conduit by gravity to a nearby outlet channel of Chinnandipalayam kulam (Pond) located in north direction at a distance of 200 meter from STP-III. The outlet channel of the Chinnandipalayam kulam gets discharged into Noyyal River at a distance of 800 meter.</p>	
<p>Outfall from STP in Sarkarperiya palayam</p>	<p>It is proposed to discharge the treated water from Sarkarperiyapalayam STP (existing and proposed STPs) into the overflow channel of Nanjarayan kulam (Pond) through pipeline for length about 230 m. The overflow channel of Nanjarayan kulam (Pond) confluence with Noyal River at a distance of 1.2 Km.As per PWD data, average width and depth of the channel is 5 m and 0.9 m respectively. The slope of the channel is 1:1000.</p> <p>The capacity of STPs at Sarkarperiyapalayam are STP I (15/30 MLD) and STP II (36/44 MLD). The maximum daily discharge in the ultimate period from the STPs into the overflow channel of Nanjarayan kulam (Pond) is 0.856 Cu.m/s. The maximum discharge capacity of the channel is 3.9 Cum/s. The maximum discharge in the channel during monsoon season is 1.83 Cum/s. Thus, the outflow channel of Nanjarayan kulam (Pond)has the adequate capacity to take the treated water from STP (existing and proposed) during</p>	

Infrastructure	Location and Environmental Features	Site Photograph
	monsoon and non-monsoon periods. Also, the overflow channel of Nanjarayan kulam (Pond) does not have residential units and encroachments in the downstream.	
		
Outfall Arrangements from STP in Chinnandipalayam	<p>It is proposed to discharge the treated water from Chinnandipalayam STP into the outfall channel of Chinnandipalayam Kulam (Pond) through the proposed pipeline for a distance of 200m from the STP. The outfall channel is connected to the Noyyal River at distance of 800m. The rainfall in the region varies from 53.68 mm to 63.8 mm. As per PWD data, width and depth of the outfall channel of Chinnandipalayam kulam (Pond) is 7m and 1.2m respectively. The slope of the channel is 1:1000.</p> <p>The capacity of STP at Chinnandipalayam is 26 MLD. The maximum daily discharge from the STP into the channel in the ultimate year is 0.301 Cu.m/s. The maximum discharge capacity of the channel is 5.88 Cum/s. The maximum discharge in the channel during monsoon season is 3.7 Cum/s.</p> <p>Thus, the channel has the adequate capacity to take the treated water from STP during monsoon and non-monsoon periods. Also, the channel does not have encroachments and household in the downstream.</p>	

Infrastructure	Location and Environmental Features	Site Photograph
		
Collection system	<p>Sewer lines will be laid in the centre of road by cutting black top, within the road right of way. In wider roads, like SH, NH, divided 2-way roads etc., sewers will be laid 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.</p>	
<p>Construction of new Sewage Treatment Plants under Design and Build basis as per the process specified to suit the available site at Sarkarperiyapalayam and Chinnadipalayam</p>		

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

63. 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.

64. Screening of potential environmental impacts are categorized into four categories considering project 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; and
- (iv) **Operation and maintenance 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.

65. 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).

66. 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.

67. 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.

68. In the case of this project (i) most of the individual elements involve straightforward construction and operation, so impacts will be mainly localized and not significant; (ii) negative impacts associated with sewage facilities such as odour are already considered in the design and siting, (iii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iv) being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impacts – Design and Location

69. **Design of the Proposed Components.** Technical design of the (i) STP; (ii) SPS; 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.

70. **Design of Sewage Treatment Plant.** The existing STP I at Sarkarperiyapalayam is has capacity of 15 MLD (expandable to 30 MLD) which is used for treating the sewage generated from zones 1 to 4. Under this subproject, the existing STP is proposed to expand to 30 MLD for treating the sewage generated from proposed zones 13, 16 and 17. The new STP-II proposed at Sarkarperiyapalayam will be used to treat sewage generated from the Zones 5, 6 and 7 and another new STP-III proposed at Chinnandipalayam village will be used to treat sewage generated from the Zones 8, 9, 14 and 15. Since the treatment and disposal system is proposed under DBOT contract, the STP will be designed by the DBOT Contractor. The STP will be designed to meet the stipulated disposal standards of CPCB/TNPCB. The assimilative capacity study and downstream users are identified and included as part of the detailed design of the STP.

71. The treated sewage water from the existing STP-I and proposed STP-II located at Sarkarperiyapalayam will be discharged through a closed conduit by gravity to a nearby overflow channel of Nanjarayan Kulam (Pond), further this channel flows about 1.1 km and gets connected to Noyal River. The treated sewage from STP-III located at Chinnandipalayam will be discharged through a closed conduit by gravity to a nearby outfall channel of Chinnandipalayam kulam (Pond), further this channel flows about 800m and gets connected to Noyyal River. The Nanjarayan Kulam and Chinnadipalyam kulam outfall channel are having adequate capacity to hold treated sewage water from all the STP's.

72. From Tirupur, the Noyyal River flows to the Orathupalayam Dam located at a distance of 14 km (app.) from the STPs located at Sarkarperiyapalayam, then it will merge into the Cavery River at Noyyal hamlet in Karur district. The treated sewage will be within the standards set by CPCB/TNPCB.

73. The existing STP is an associated facility as per the ADB SPS, 2009. Associated facilities need to be in compliance with ADB safeguard policy, which requires conduct of environmental audit of associated facilities. Accordingly, environmental audit of the existing Sewage Treatment Plant in Sarkarperiyapalayam, Tiruppur has been conducted during the IEE preparation to assess the compliance with environmental legislation and current environmental performance. Environmental Audit report is presented in Appendix 10.

74. The proposed actions to ensure compliance are indicated in the following Table 16.

Table 16: Corrective Action Plan for Environmental Compliance of Existing Sewage Treatment Plant

Item	Compliance	Action Required / Proposed for compliance	Timeline	Responsible Agency and funding source
Occupational health and safety	-	Provide proper training in safe operation of STP including sludge management to STP staff;	31 January 2019	O&M Contractor - NTADCL

Item	Compliance	Action Required / Proposed for compliance	Timeline	Responsible Agency and funding source
		provide proper personal protection equipment		
Sludge disposal	The sludge treatment is done by gravity thickener followed by sludge drying bed. There is no Sludge management plan.	Prepare and implement sludge management plan for safe collection, treatment and disposal of sludge, including periodic monitoring and safe reuse application	31 January 2019	O&M Contractor-NTADCL
PWD permission for disposal of treated sewage	Non Compliance: <u>The treated sewage is being disposed through pipeline into the Overflow channel of Nanjarayan kulam (Pond) which gets mixed with Noyyal River without PWD permission</u>	Permission will be obtained from PWD.	31 March 2019	O&M Contractor-NTADCL

NTADCL = New Tirupur Area Development Corporation Limited, O&M = operations and maintenance, PWD = Public Works Department, STP = sewage treatment plant.

75. 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. Although legally the disposal of effluent meeting certain standards is allowed into municipal sewers the monitoring of the same is not-practical. Although there are no significant presence of industries with problematic water discharges in the project area of Tiruppur City Municipal Corporation, following measures are suggested to safeguard sewerage system efficiency:

- (i) No industrial wastewater shall be allowed to dispose into municipal sewers;
- (ii) No domestic wastewater from industrial units shall be allowed into municipal sewers;
- (iii) Ensure that there is no illegal discharge through manholes or inspection chambers;
- (iv) Conduct public awareness programs in coordination with TNPCB;
- (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the standards; and
- (vi) Providing a green buffer zone of 15-20 m wide all around the STP with trees in multi-rows and landscaping. This will act as a visual screen around the facility and will improve the aesthetic appearance.

76. **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 thickener 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 for the existing STP and the proposed STP's. 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. Sludge will be stored in a separate place within the plant and will be disposed off periodically in the area identified by the Tiruppur City Municipal Corporation at a maximum distance of 30 km from the STP site.

77. 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 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, 2016 (Schedule II A, Standards for Composting) have been adopted here. MSW Rules stipulate that "In order to ensure safe application of compost, the specifications for compost quality shall be met":

78. **Sewer system – collection and conveyance.** The sewerage system is designed as a separate system of sewage collection (i.e., caters only to wastewater). Existing surface roadside 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 pumping station, from where the sewage is pumped to the STP. To maximize the benefits as intended, Tiruppur City Municipal Corporation will ensure that all existing septic tanks are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system.

79. Accumulation of silt in sewers in low areas 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; and
- (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope in gravity mains to prevent build-up of solids and hydrogen sulfide generation.

80. **Sewage Pumping Stations/ Main Pumping Stations.** The sewage will be collected from the houses via sewer network and conveyed by gravity to the SPS. From the Sewage pumping station, collected sewage will be pumped into MPS and subsequently from MPS accumulated sewage will be pumped into the designated STP. The sewage and main pumping stations cater to much larger area or sewage flow, and will also have several components, and occupy comparatively larger area. Components of SPS and MPS include:

- (i) Screen well,
- (ii) Grit well,
- (iii) Suction well,
- (iv) DG set platform, and
- (v) Pump Room.

Table 17: Proposed Sewage pumping stations/Main pumping stations details

SI No	Zone	Screen Well		Grit Well		Suction / Wet Well	
		Dia	Depth	Dia	Depth	Dia	Depth
1	5	4.50	5.85	7.00	7.18	8.00	10.39
2	6	4.00	4.68	6.00	5.97	8.00	8.42
3	7	3.00	6.10	4.50	7.24	8.00	8.73
4	7.2	4.50	5.22	6.50	6.50	8.00	9.26
5	7.3	5.50	7.38	8.50	8.65	8.00	13.10
6	8	4.00	4.67	5.50	5.93	8.00	7.99
7	9	4.00	4.62	6.00	5.76	8.00	8.03
8	13	3.00	7.38	4.50	8.53	8.00	10.03
9	16	3.00	3.00	3.50	4.27	8.00	5.37
10	17.1	2.50	3.81	3.00	5.14	8.00	6.05

81. At these pumping 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.

82. **Odor from Sewage pumping stations/Main pumping stations.** In the suction wells, the sewage emits gases, which accumulated in the air above water surface. The gas may include odorous compounds like hydrogen sulfide (H_2S), amines, fatty acids, aldehydes, ketones and other volatile organic compounds (VOCs). As the water level rises before the pumping cycle, it physically displaces the air, along with the odorous gas compounds. H_2S is the most dominant odor causing compound, and therefore can cause nuisance to nearby households. When sewage becomes stagnant, H_2S is generated in the anaerobic conditions. The quantum of H_2S generation 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 H_2S generation. Design considerations are included to minimize the both as much as possible. Pumping stations cater to large area and will have high capacity of suction wells and pump sets. 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.

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

potential of odor 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. There are no standards notified by Government of India or Government of Tamil Nadu for odor. However, Central Pollution Control Board (CPCB) has stipulated Guidelines on Odor Pollution and its Control which deal with the basics of odor pollution, its sources and measurement, technologies for its control etc., but do not specify any threshold limits for odor-causing pollutants. Therefore, as part of mitigation, provision for odor control measures has been made in the sewage pumping stations for all UGSS subprojects. However, in case of STPs, the odor-causing processing units will be located far off to the extent possible within the premises so as to mitigate the odor nuisance. Further, the technology for treating sewage plays a vital role since release of gases like H_2S cannot be avoided in the process involving anaerobic decomposition whereas release of H_2S will almost be nil in case of aerobic treatment. PIU and design engineers have not specified any odor standards adopted elsewhere in the preliminary design as not to limit the technology that can be considered by the bidders in the treatment of domestic sewage. Sufficient mitigation measures have been taken for all sewage pumping stations and will be taken for all STPs when finalizing/revising the IEEs based on the detailed engineering design.

1. 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 odor and also act as visual shield, and improve aesthetical appearance; and
- (iii) Provision of high compound wall.

2. Design related measures to prevent and control odor from SPS and MPS operations

- (i) Proposed wells to be closed using reinforced cement concrete (RCC) slabs. Design of RCC slab to consider both superimposed loads (human and equipment loads) and severe corrosion risk from sewer gas from within wells;
- (ii) RCC Slab to be designed and fixed in a modular manner such that access to pumps / appurtenances and other equipment can be provided for maintenance / replacement / renewal purposes;
- (iii) Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metallised grating / grill work shall be provided over the sections (or full cross section if required) where workers will stand / work for inspection and repair /O&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 with space for control room. In cases of lift manholes (road-side or road-center type structures with only provision of kerb-side kiosk), an electrical cut-out provision shall be made for connecting an Emergency Mobile / Skid Mounted Diesel Generator for pumping out during long period of electricity supply interruption;
- (x) Develop standard operating procedures / operational manual for operation and maintenance of pump stations; this shall include measures for emerge situations;
- (xi) Provide training to the staff in SOPs and emergency procedures; and
- (xii) Periodic monitoring of H₂S levels at sewage pumping stations using handheld H₂S meters.

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

- (i) Provide closed wells fitted with necessary ventilation wherever required;
- (ii) Provide 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

84. Noise from pumping operations. Operation of pumps and motors and diesel generators is a major source of noise. As the pumping stations are located in the residential areas, with few located very close to the houses, noise generated from pump stations can have continuous negative impacts on the surrounding population. Although STP is located adequately away from residential areas, 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 1 m from these pump sources typically will be in the range of 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 1m.²

² 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.

- (ii) Use appropriate building materials and construction techniques for SPS which can absorb sound rather than reflect noise.
- (iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors and continuous running critical equipment such as aeration blowers in STP.
- (iv) Procure only CPCB approved generators³ to meet air emission and noise level requirements.
- (v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors
- (vi) Provide ear plugs designated for noise reduction to workers. Those working in enclosed areas or adjacent to continuous running equipment should be provided with proper noise attenuating equipment.

85. **Energy Efficiency.** Project area is mostly plain and gently sloping ground, it is therefore not technically feasible or economical to design a completely gravity system to collect sewage from individual houses and transfer the same the STP on the outskirts of the city. It necessitated provision of 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 pumping station. From the Sewage pumping station, collected sewage will be pumped into Main Pumping station and subsequently from main pumping station accumulated sewage will be pumped into the designated sewage treatment plant. This optimized the energy consumption.

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

- (i) Using low-noise and energy efficient pumping systems;
- (ii) Efficient Pumping system operation;
- (iii) Installation of Variable Frequency Drives (VFDs); and
- (iv) Ensuring maintenance of high power factor through use of Capacitor Banks.

87. **Tree cutting at selected project sites.** As presented in the baseline profile of project sites, there are no notable tree cover in the project sites. STP sites (Sarkar periyapalayam and Chinnandipalayam) are having few small trees (local species) on the peripheral of the site. Similarly some pumping station sites (Indra Nagar, Nacharayan Nagar, Kattaboman Nagar, Karumarampalayam) are also having few small trees. Sewers are proposed within the roads, and therefore no tree cutting is envisaged. However, the following measures need to be implemented to minimize and/or compensate for the loss of tree cover.

³ CPCB has published Genset notifications, which includes specification for emission limits for new Diesel Engines (up to 800KW) and Noise limits for Generator sets which runs with Diesel as fuel type

Emission limits for DG's

POWER RANGE	HC+ NO _x	CO	PM	SMOKE
	g/kWh			m ⁻¹
Up to 19 kW	7.5	3.5	0.3	0.7
>19 kW	4.7	3.5	0.3	0.7
Up to 75 kW				
>75 kW	4.0	3.5	0.2	0.7
Up to 800 kW				

Noise limit shall not exceed 75 dB (A) at 1 m distance.

The generators that are in line with the specifications shall be procured. The requirement for the same is specified in the BoQ that are to be monitored to ensure that generation of noise and potential deterioration of ambient air quality will be avoided.

- (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.

88. **Greenbelt development plan.** Totally 700 trees were proposed to be planted in the subproject area and the cost of plantation with maintenance is included in EMP Budget. It is proposed to plant 150 trees in Chinnandipalayam STP site, 150 trees in Sarkarperiyapalayam STP site, about 6-10 trees in each pumping stations to the extent possible and remaining trees are proposed to be planted along the alignment of sewage collection system within available ROW. The tree plantation will be proposed within the ROW along the alignment (based on the space availability), soil condition and topography. However the maximum number of tree plantation will be achieved along the proposed sewer alignment. It is suggested that the components are designed in such a way to provide planting of trees at least for a width of 15 m along the boundary of the STP site in multi-rows. Trees shall be interspaced at a distance of 7 m and in between the rows, shrubs may be planted in between two trees. It is also recommended that tree plantation in the project site will be completed within commissioning stage of project. Adequate protection for the plants, necessary care and monitoring should be carried out to ensure their growth. Table 18 below presents a list of some of the tree species that are suitable for plantation at the project sites.

Table 18: List of Trees suggested for Plantation

S.No	Common Names	Botanical Names
1	Jamun tree	<i>Syzygium cumini</i>
2	Big Jamun tree	<i>Syzygium jambolana</i>
3	Pongamaram	<i>Pongamia pinnata</i>
4	Mahogany	<i>Swietenia mahogany</i>
5	Alexandrian Laurel	<i>Calophyllum inophyllum</i>
6	India Kino Tree	<i>Pterocarpus marsupium</i>
7	Puvarasumaram	<i>Thespesia populnea</i>
8	Neem Tree	<i>Azadirachta indica</i>
9	Almond tree	<i>Terminalia catapa</i>
10	Vagai	<i>Albizia lebbek</i>
11	Kadamba Tree	<i>Neolamarkia cadamba</i>
12	Pink Trumpet Tree	<i>Tabebuia rosea</i>
13	Yellow Flame Tree	<i>Peltophorum pterocarpum</i>
14	Rain tree	<i>Samanea saman</i>
15	Arjun tree	<i>Terminalia-arjun</i>

89. Monitoring of survival of the plants shall be done once every three months and the dead plants shall be replaced with new plants. Records would be maintained for the status of greenbelt. The proposed green belt in STPs site will be maintained by O&M Contractor and in remaining sites will be maintained by TCMC.

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

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

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

91. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location but at least 100 m from groundwater wells and surface water bodies. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution 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.

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

B. Construction Impacts

93. Main civil works in the project include construction of STP and SPS 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 project 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.

94. 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 pipe work and the electricity supply.

95. 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.

96. Subproject also include linear works i.e., sewage collection system (563.67 km length of sewers and 22,260 manholes). This covers almost entire project area (zones 5 to 9, and 13 to 17) 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. In cases where there are specific crossing such as Canal/ River, laying may be performed through adoption of suitable trenchless technology methods.

Table 19: List of Water Ways Crossing in the subproject alignment

S. No	Location	Type of structure	Proposed Span length in meter	Water Bodies	Type of water body
1	Corporation - Noyyal River Crossing at College Road Anaipalayam to Mangalam Road	Pipe Carrying bridge	Length – 72.00 m – 600mm dia MS Pipe	River	Perennial
2	Corporation- Noyyal Crossing at North Thottom to Vinayagapuram	Pipe Carrying bridge	Length – 64.00 m – 350mm dia DI Pipe	River	Perennial
3	Corporation- Noyyal Crossing at Poolavari Sukumaran Nagar to Karumarampalayam Burial Ground	Pipe Carrying bridge	Length – 68.00 m – 250mm dia DI Pipe	River	Perennial

97. 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. The pipes that shall be used for the gravity up to 200 mm sewers shall be uPVC pipes for depth up to 2.50 m. Pipes having diameter between 250 mm and 350 mm and up to any depth, Double Wall Corrugated (DWC) Structured Wall Polyethylene pipes (SN 8 class) with online / offline coupler and elastomeric sealing ring conforming to IS: 16,098 (Part-2) type B shall be used. For depths greater than 3.0m or dia. Greater than 300 mm, For 400mm and above size and for all depths CI pipes (LA class) as per IS 1536 / 2001 and CI Specials are conforming to IS 1538 / 1993 shall be adopted. However the pipe materials to be adopted depends on the soil condition, easy availability etc. The materials for pipelines has been selected as per the guidelines and pipe policy issued by TWAD Board or by any other approving agencies and in consultation with the corporation officials.

98. Earthwork 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 (e.g., very narrow streets) for the backhouse excavators. As trenches are deep (up to 6-10 m), there is risk of collapse of trenches and/ or damage to surrounding buildings, safety risk to pedestrians and traffic. Necessary precautions such as bracing / shoring in the trench will be provided for trenches of more than 1.2 m deep. The normal working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. Excavated soil will be used for refilling the trench after placing the sewer and therefore residual soil after pipe laying and refilling is not significant. Total earthwork excavation will be over 443,557 m³, of which nearly 95% will be reused, and the remaining 22,178 m³ of excess soil shall be disposed safely in Mudhalipalayam or Velliyangadu dumping ground.

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

100. While selecting alternate routes care shall be taken to minimize congestion and consideration of sensitive receptor areas such as schools and hospitals. For minimizing traffic congestion in busy/narrow stretches, alternate routes for diversion of traffic shall be considered and planned in consultation with and permission of traffic authority and highways (SH/NH). Prior intimation shall be provided to authorities and necessary measures (e.g. Provision of adequate signs, displays for movement, lights, flags) shall be undertaken to minimize disturbance to traffic movement.

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

102. **Sources of Materials.** Approximately, 1810 m³ of sand, 3230 m³ of gravel, and 1480 m³ of aggregated will be required for this project, which will be sourced from quarries. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or levelling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation. It will therefore be important to ensure that construction materials for this project are obtained from government approved licensed quarries only, to ensure these controls are in place (licensed stone quarries are located at 63-Velapalayam with lead of 17 km and sand quarry at karur with lead of 77 km). Contractor should not create/use any new borrow pits / quarries. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:

- (i) Obtain construction materials only from government approved quarries with prior approval 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); and
- (iv) Avoid creation of new borrow areas, quarries etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance prior to approval by PIU.

103. **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 project, spread all over the project area. Over 443,557 m³ of earthwork is anticipated from the project, and 95% of the earthwork excavated 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 stations are located within residential neighborhood, STP is located outside the city, away from habitation area. Dust generation will be significant during sewer laying along the roads. Increase in dust/ particulate matter in ambient air is detrimental, and may have adverse impacts on people and environment. To mitigate the impacts, construction contractors will be required to:

104. For all construction works

- (i) Provide a dust screen (6 m high) around the construction sites of pumping stations and STP; provide 2 m high barricades for the sewer works;
- (ii) Damp down the soil and any stockpiled material on site by water sprinkling; (3-4 times a day - before the start of work, 1-2 times in between, and at the end of the day); when working in the roads there should permanently be one person responsible for directing when water sprinkling needs to take place to stop the dust moving;
- (iii) Reduce the need to sprinkle water by stabilizing surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition;
- (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 and surround by dust screens;
- (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; minimize the drop height when moving the excavated soil;
- (ix) Clean wheels and undercarriage of haul trucks prior to leaving construction site;
- (x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate; and
- (xi) No vehicles or plant to be left idling at site, generators to be at placed maximum distance from properties.

105. 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; and
- (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.

106. **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 be 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.

107. 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.

108. **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 monsoon. River flows only during monsoon, rest of the time it carries mostly wastewater from the surrounding areas. Project area mostly drains into Noyyal River. It is important that runoff from the construction areas, which may contain silt and chemical traces do not enter these water bodies. Impact will be temporary, and but needs to be mitigated. Construction contractor will be required to:

- (i) All earthworks be conducted during the dry season to prevent the problem of soil/silt run-off during rains;
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; do not stock earth/material close to water bodies;
- (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; these should be at least 100 m away from water bodies and groundwater wells;
- (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).

109. **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; and
- (iii) Consider safety aspects related to pit collapse due to accumulation of water.

110. **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. The 95% excavated earth will be reused, and the remaining excess soil needs to be disposed safely. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- (i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in Appendix 3);
- (ii) Whenever 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 of 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 (with impermeable bottom and sides) 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 via licensed (by TNPCB) third parties;
- (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 recycle waste materials where possible; and
- (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.

111. **Noise and Vibration Levels.** While pumping station sites are located predominantly urban and suburban areas, STP I & II at Sarkarperiyapalayam and STP III at Chinnandipalayam are located about 8 km and 5 km respectively away from the city. 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, religious places and businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for laying of sewers, operation of construction equipment, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearby buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; especially near schools and other sensitive receptors;
- (ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor;
- (iii) Maintain maximum sound levels not exceeding 75 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s;
- (iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- (v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; and
- (vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

112. 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. Three National highways pass through the district including NH-47 (Avinashi), NH-67 (Kangayam-Palladam) and NH-209 (Udumalpet). National highway and state highways carry considerable traffic, followed by MDRs and ODRs. Sewers will also be laid along the internal main roads that provide connectivity within the city. These include Nacharayan Nagar, Indra Nagar, Sakthi Nagar, etc., These roads also carry considerable flow of traffic and are centers of commercial activities.

113. Internal roads in the project area are narrow, except in the newly developing residential layout which comparatively have wide roads. The areas with narrow roads include Santhapettai, Kattabomman Nagar, Angeripalayam Road, etc., have wide internal roads, and less traffic. 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.

114. Works related to all the remaining components (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.

115. 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:

116. Sewer works

- (i) Prepare a sewer work implementation plan in each zone separately and undertake the work accordingly; ensure that for each road where the work is being

- undertaken there is an alternative road for the traffic diversion; take up the work in sequential way so that public inconvenience is minimal;
- (ii) Plan the sewer work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with general public;
 - (iii) Avoiding conducting work in all roads in a colony at one go; it will render all roads unusable due to excavations at the same time, creating large scale inconvenience
 - (iv) Undertake the work section wise: a 500 m section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different zones;
 - (v) Confine work areas in the road carriageway to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required;
 - (vi) Limit the width of trench excavation as much as possible by adopting best construction practices; adopt vertical cutting approach with proper shoring and bracing; this is especially to be practiced in narrow roads and deeper sewers; if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period;
 - (vii) 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; and
 - (xiii) At work site, public information/caution boards shall be provided including contact for public complaints.

117. 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; and
- (v) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

118. Socio-Economic – Income. Sites for all subprojects components are carefully selected in government owned vacant lands and therefore there is no requirement for land acquisition or any resettlement issues. 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 project.

- (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.

119. **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 Employ local labour force as far as possible

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

- (i) Follow all national, state and local labour laws (indicative list is in Appendix 2);
- (ii) Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) excluding public from the work sites; and (d) documentation of work-related accidents; follow international Standards such as the World Bank Group's Environment, Health and Safety Guidelines.⁴
- (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

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

- (v) Provide OHS orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- (vi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- (vii) Ensure the visibility of workers through their use of high visibility vests and other PPE when working in or walking through heavy equipment operating areas;
- (viii) Ensure moving equipment is outfitted with audible back-up alarms;
- (ix) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate;
- (x) 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; and
- (xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances.

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

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

- (xiii) Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

122. **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 TCMC;
- (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

123. Operation and Maintenance of the sewerage system including STP will be carried out by DBOT contractor for first 6 month of time period. After six month O&M of sewerage collection

system except STP will be maintained by the TCMC and O&M of STP will be carried out by DBOT Contractor. Sewage Collection system operation will involve collection and conveyance of wastewater from houses to nearest pumping stations; operation of pumping stations to pump accumulated sewage to 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 sewage into inland surface water. The existing STP at Sarkar Periyapalayam with Activated Sludge Process has the capacity of 15 MLD which will be augmented up to 30 MLD will be utilized for the under this scheme. 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.

124. Treated wastewater disposal from STP. The quantity of sewage generated from the project area is expected to be about 88 MLD and 115.82 MLD for the year 2035 and 2050 respectively. During its operation phase, the sewage generated from the project area will be treated in the STP. (Existing STP I - 15/30 MLD, proposed STP II - 36/44 MLD, proposed STP III - 20/26 MLD). Additional STP is proposed in the Sarkar Periyapalayam to accommodate the additional flow during ultimate stage and for the treatment of sewage generated in zones 10, 11 and 12. 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 thickener 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 or within acoustic enclosures, and also maintaining adequate buffer to the nearby inhabited areas; and
- (vi) Provision of appropriate personal protection equipment to the workers and staff

125. Treatment and Disposal. Sewage treatment facility would be designed so as to meet the disposal standards of treated wastewater for STPs as notified by CPCB/TNPCB. The treated sewage from the existing STP-I located at Sarkarperiyapalayam and from proposed STP-II located adjacent to STP-I will be disposed to a nearby overflow channel of Nanjarayan kulam (Pond) through a closed conduit by gravity. Also, the treated sewage from STP-III located at Chinnandipalayam is disposed through a closed conduit by gravity to a nearby outfall channel of Chinnandipalayam kulam. The Over flow channel of Nanjarayan Kulam and Chinnandipalayam kulam further flows and it merges into the Noyyal River. From Tirupur, the Noyyal flows to the Orathupalayam dam located at a distance of 14 km (approx.) from the STPs at Sarkarperiyapalayam, then it merges into the Cauvery River at Noyyal hamlet in Karur district

126. Treatment efficiency and Compliance with Disposal Standards. Sewage treatment facility will be designed to meet the STP disposal standards notified by MOEFCC. The Proposed STP will be designed at 90% to 95% treatment efficiency (in terms of BOD removal). The sewage will be treated to meets the standards prescribed by TNPCB/CPCB and will be disposed as

discussed above. The quality of treated sewage from the existing STP will be complying with the TNPCB/CPCB prescribed disposal standards. Operation and maintenance of STP and change in incoming sewage quality will have an impact on the treatment efficiency. Hence, the treatment plant will be equipped with inbuilt lab facilities and the raw and treated sewage quality parameters are analyzed daily in this laboratory to ensure the treatment efficiencies.

127. **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.

128. **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. The industries located within the Tiruppur City Municipal Corporation are having their own CETP's to treat the effluents. however, it is important that no wastewater from industries is allowed into the sewer network with strict monitoring and enforcement.

129. **Sewage sludge.** No estimate of sludge generation from STP is available at this stage. 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. Sludge regularly accumulates in the treatment units during the process. STP will have proper facilities for handling, treatment and disposal of sludge safely with implementation of Sludge Management Plan. Therefore no adverse impacts envisaged. This sludge from basins will be collected into sludge sump and conveyed to centrifuge unit for dewatering and thickening. 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. 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 in the Solid Waste Management Rules, 2016.

130. STP is proposed under design-build contract modality, following measures needs to be considered and included in the detailed design of the STP:

- (i) Process design to meet the discharge standards;
- (ii) Regular monitoring to ensure that treated wastewater always meets the design disposal standards;
- (iii) Review the feasibility studies and finalize detailed design of treatment and disposal system;
- (iv) 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;
- (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimizing the overall energy usage in sewer system, including STP;
- (vi) Using low-noise and energy efficient pumping systems;
- (vii) 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; and
- (viii) Provision of appropriate personal protection equipment to the workers and staff.

131. Following measures are to be implemented during the operation phase, and should be appropriately included in the project design phase itself:

- (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;
- (xi) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards; and
- (xii) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops.

132. **Odor and Noise from Sewage pumping stations.** Various measures are included in the design of these facilities giving utmost importance to odor and noise. Therefore it is anticipated there will not be any significant generation of odor 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 pump stations
- (ii) Ensure that operating staff is properly trained, and have clear understanding of odor 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 stations using handheld H₂S meters

(as per the WHO guidance notes on H₂S)

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

134. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal 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; and
- (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 sulfide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

135. 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 projects 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.

136. 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 project are: residents, shopkeepers and businesspeople who live and work near sites where facilities will be built (sewer network, pumping 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, TNUISL, Government of Tamil Nadu and the ADB.

B. Public Consultation

137. 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

138. The project proposal is formulated by Tiruppur Corporation in consultation with the public representatives bodies in the project area to suit their requirements.

139. Focus-group discussions with other stakeholders were conducted during 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 on 24 January 2018 in Tiruppur with the public representatives and prominent citizens, NGOs etc. During the public consultation women have actively participated.

140. 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 odor from pumping stations located close to the houses is also

raised. Project team explained proposed EMP to manage the negative impacts, including odor prevention and control measures included in the design and operation.

2. Consultation during construction

141. Prior to start of construction, PIU will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism (GRM). 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, 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

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

143. 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.

144. 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.

VII. GRIEVANCE REDRESS MECHANISM

145. 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 PMU and concerned PIU will ensure that their grievances are addressed.

146. 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.

147. 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 NTADCL 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.

148. 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).

149. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel of the NTADCL 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 TCMC level. In the event that certain grievances cannot be resolved even at TCMC 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.

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

151. **Composition of Grievance Redress Committee.** 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.

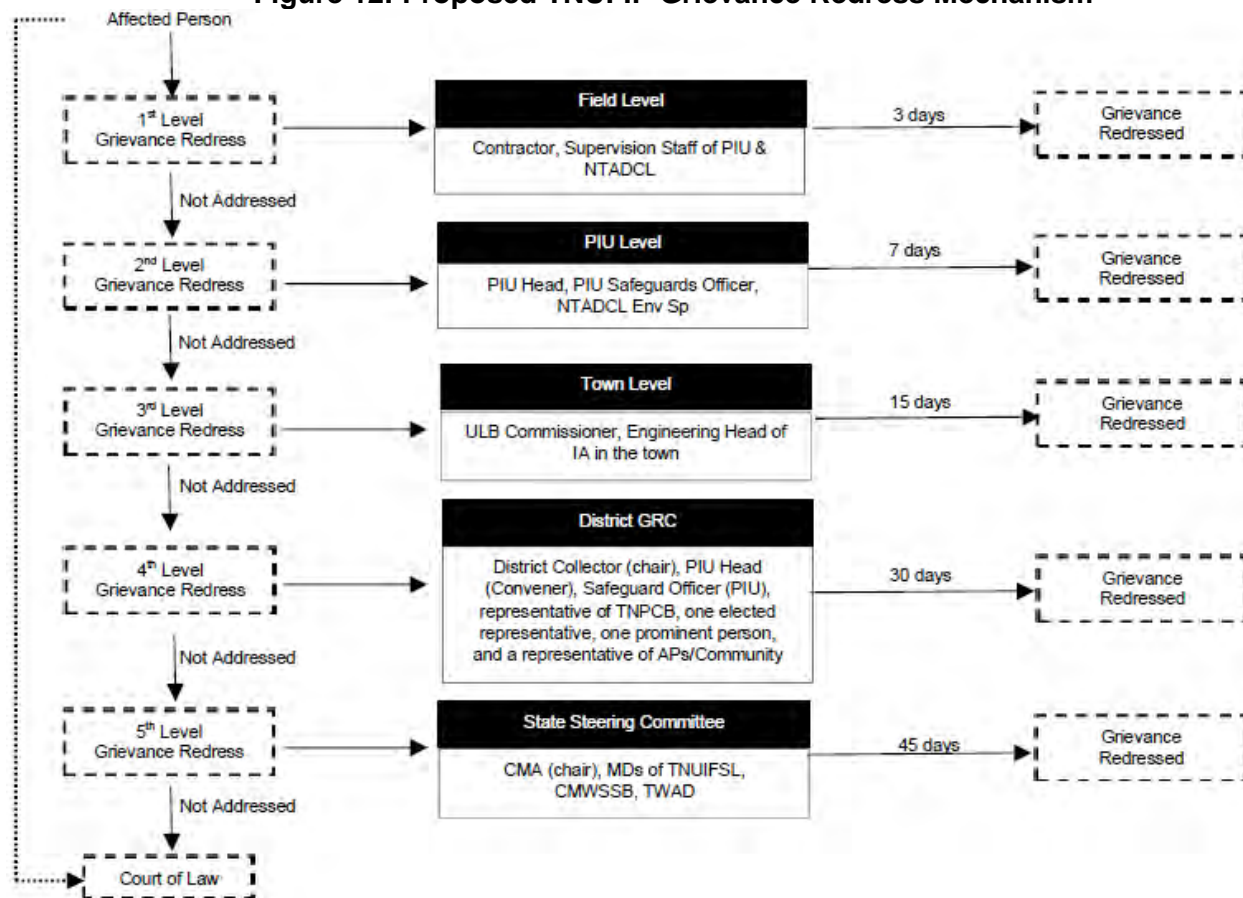
152. **State level steering committee** will include Commissioner of Municipal Administration as chair, member include managing directors of TNUFSL, CMWSSB, TWAD Board and others as necessary.

153. **Areas of Jurisdiction.** The areas of jurisdiction of the GRC, headed by the District Collector will be (i) all locations or sites within the district where project facilities are proposed, or (ii) their areas of influence within the District. The Steering Committee will have jurisdictional

authority across the state (i.e., areas of influence of project facilities beyond district boundaries, if any).

154. The multi-tier GRM for the project is outlined below (Figure 12), each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration. The implementing agencies/ULBs shall issue notifications to establish the respective PIU level grievance redress cells, with details of composition, process of grievance redress to be followed, and time limit for grievance redress at each level.

Figure 12: Proposed TNUFIP Grievance Redress Mechanism



155. **Recordkeeping.** Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU (with the support of NTADCL) and submitted to PMU.

156. **Information dissemination methods of the GRM.** The PIU, assisted by NTADCL 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.

157. **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.

158. **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.

159. **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.

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

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

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

162. The EMP will guide the environmentally-sound construction of the project and ensure efficient lines of communication between TNUIFSL (PMU), TCMC (PIU), NTADCL 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 project; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the project; 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.

163. 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.

164. 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.

165. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved EMP; 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, EMP and SEMP. The contractor shall allocate budget for compliance with these IEE, EMP, SEMP measures, requirements and actions.

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

Table 20: 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	<ul style="list-style-type: none"> (i) Design the treatment process to meet the applicable discharge standards (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 Tiruppur City Municipal Corporation staff dealing with STP. (iv) Extended contractor period for O&M, proper transfer of facility to TCMC with adequate technical know-how on O&M and hands-on training to Tiruppur City Municipal Corporation 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 PIU (TCMC)	Project cost - DB Contractor
STP treatment efficiency	Change of inlet sewage parameters and deficient treatment quality	<ul style="list-style-type: none"> (i) No industrial wastewater shall be allowed to dispose into municipal sewers (ii) No domestic wastewater from industrial units shall be allowed into municipal sewers (iii) Ensure that there is no illegal discharge through manholes or inspection chambers (iv) Conduct public awareness programs; in coordination with TNPCB (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the applicable standards 	PIU (TCMC)	PIU Costs
Discharge of treated wastewater into outfall channel of Chinnandipalayam Kulam (Pond) from proposed Chinnandipalayam STP and Discharge of treated	Impacts on receiving water body	<ul style="list-style-type: none"> (i) Review the feasibility studies and finalize detailed design of treatment and disposal system, including reuse and/or safe disposal into downstream water tanks; review the tank stability of bunds to continuously hold water and along with its overflow arrangement and interconnection with 	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
wastewater into overflow channel of Nanjarayan Kulam (Pond) from Sarkar Periyapalayam.		<p>other lakes shall be checked for safety and proper disposal of surplus water without any inundation</p> <p>(ii) Obtain PWD and TNPCB consent for disposal of treated wastewater into out fall channel of Chinnandipalayam Kulam</p> <p>(iii) Conduct detailed water quality assessment of Chinnandipalayam Kulam during pre and post monsoon seasons.</p>		
	Odor Nuisance due to STP operation	(i) Develop a green buffer zone of 15-20 m wide all around the STP with trees in multi-rows and landscaping. This will act as a visual screen around the facility and will improve the aesthetic appearance.	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor
	Sludge disposal	(i) Prepare Sludge Management Plan (collection, treatment, drying, disposal and periodic testing) and integrate into design, construction and operation	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor
	Noise	<p>(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</p> <p>(ii) Use appropriate building materials and construction techniques for sewage pumping stations which can absorb sound rather than reflect noise</p> <p>(iii) Use acoustic enclosures – manufacturer specified, for all pumps, motors</p> <p>(iv) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures</p> <p>(v) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors</p> <p>(vi) Provide ear plugs to workers</p>	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor
STP operation	Energy consumption	<p>(i) Using low-noise and energy efficient pumping systems</p> <p>(ii) Efficient Pumping system operation</p> <p>(iii) Installation of Variable Frequency Drives (VFDs)</p>	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
Construction of subproject components	Tree cutting	<ul style="list-style-type: none"> (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 	DBOT Contractor and PIU (TCMC)	Project cost - DB Contractor
Sewer network	Nuisance due to leaks, overflows, contamination of water supplies, occupation health and safety of workers, etc.	<ul style="list-style-type: none"> (i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m); if not possible, sewer lines shall be laid below the water lines (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 (that has no or least infiltration risk) 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 	PIU (TCMC)	PIU costs
Sewage pumping stations	Odor nuisance	<p>Site layout planning</p> <ul style="list-style-type: none"> (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 odor and also act as visual shield, and improve aesthetical appearance 	PIU (TCMC)	PIU costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		<p>(iii) Provision of high compound wall</p> <p>Design measures</p> <p>(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.</p> <p>(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.</p> <p>(iii) Since human intervention is involved and safety shall be primary and critical consideration, additional protection by way of a metaled 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&M purposes.</p> <p>(iv) Provision of passive gas ventilation arrangement by providing a take-off vent from top of well by positioning vent in such a way that cover slab fitment / movement / drawl if required for maintenance purposes is not compromised.</p> <p>(v) Height of vent to be provided appropriately and a minimum 2 m above the lintel level (top level) of window(s) / passageways / doors in the nearby adjoining buildings.</p> <p>(vi) Submersible sewage pumps of suitable rating, minimum submergence requirements, open impeller with cutting-tearing arrangement and high strength-corrosion resistant heavy duty construction shall be proposed.</p> <p>(vii) In locations/cases where sewage flow in the present to intermediate design stage is envisaged to be low, position of the submersible pumps and</p>		

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		<p>design of the collection well floor by providing necessary side benching / sloped flooring to allow for higher submergence during low flow shall be made to ensure regular pump operation and avoid sewage stagnation beyond the permissible limit.</p> <p>(viii) Diesel Generators shall be provided for all pump stations with space for control room. In cases of lift manholes (road-side or road-center type structures with only provision of kerb-side kiosk), an electrical cut-out provision shall be made for connecting an Emergency Mobile / Skid Mounted Diesel Generator for pumping out during long period of electricity supply interruption.</p> <p>(ix) Develop standard operating procedures / operational manual for operation and maintenance of pump stations; this shall include measures for emerge situations</p> <p>(x) Provide training to the staff in SOPs and emergency procedures</p> <p>(xi) Periodically monitor odor generation.</p> <p>(xii) Periodic monitoring of H₂S levels at sewage/main pumping stations using handheld H₂S meters</p>		
	Nuisance from sewage pumping stations operation close to houses	(i) Provide a suitable arrangement 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	PIU (TCMC)	PIU costs
	Noise	<p>(i) Use appropriate building materials and construction techniques for sewage pumping stations which can absorb sound rather than reflect noise</p> <p>(ii) Use acoustic enclosures – manufacturer specified, for all pumps, motors</p> <p>(iii) Procure only CPCB approved generators to meet air emission and noise level requirements</p>	PIU (TCMC)	PIU costs

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Cost and Source of Funds
		(iv) Provide sound mufflers for ventilators in the plant rooms; and sound proof doors (v) Provide ear plugs designated for noise reduction 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 (TCMC)	PIU costs
	Tree cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design/alignment (ii) Obtain prior permission for tree cutting (iii) Plant and maintain 10 trees for each tree that is removed	PIU (TCMC)	PIU costs

CPCB = Central Pollution Control Board; DBOT = design, build, operate and transfer; O&M = operations and maintenance; PWD = Public Works Department; RCC = reinforced cement concrete; SOP = standard operating procedures; STP = sewage treatment plants; TCMC = Tiruppur City Municipal Corporation; VFD = Variable Frequency Drives.

Table 21: 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/ SEMP (ii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs	Contractor	Contractor costs
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services.	Contractor in coordination with PIU	PIU costs
Construction work camps, stockpile areas, storage	Conflicts with local community; disruption to traffic	(i) Prioritize areas within or nearest possible vacant space in the project location;	Contractor to finalize locations in consultation	Contractor costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
areas, and disposal areas.	flow and sensitive receptors	(ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.	and approval of PIU	
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 the existing 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) No new borrow areas, quarries etc., shall be developed for the project;	Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	PIU costs
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc.	CC and PIU	PIU costs for project approvals Contract cost for construction approvals
Chance finds	Damage/disturbance to artifacts	(i) Construction contractors to follow these measures in conducting any excavation work <ul style="list-style-type: none"> Create awareness among the workers, supervisors and engineers about the chance finds during excavation work 	CC and PIU	Contractor Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Funds
		<ul style="list-style-type: none"> Stop work immediately to allow further investigation if any finds are suspected; Inform State Archaeological Department if a find is suspected, and taking any action they require to ensure its removal or protection in situ. 		

EHS = environmental Health and Safety, EMP = environmental management plan, m = meter, NOC = no objection certificate, PIU = program implementation unit.

Table 22: 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 (OHS), 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 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	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>(x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have a valid pollution under control (PUC) certificate</p> <p>For sewer works</p> <p>(i) Barricade the construction area using hard barricades (of 2 m height) on both sides</p> <p>(ii) Initiate site clearance and excavation work only after barricading of the site is done</p> <p>(iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.), to the barricaded area</p> <p>(iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area</p> <p>(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</p> <p>(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.</p> <p>(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.</p> <p>(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.</p> <p>(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</p>		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		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	<p>Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality.</p> <p>Ponding of water in the pits / foundation excavations</p>	<ul style="list-style-type: none"> (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 accumulation in trenches/pits	<ul style="list-style-type: none"> (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 	Contractor	Contractor cost
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment,	<ul style="list-style-type: none"> (i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimize sound impact to surrounding sensitive receptor; and 	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
	materials, and people	(iii) Maintain maximum sound levels not exceeding 75 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; (v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.		
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 be 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 of 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.	Contractor	Contractor cost

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

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

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<p>materials and machinery, and providing footbridges so that people can crossover open trenches</p> <p>(iii) Barricade the construction area and regulate movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around</p> <p>(iv) Control dust generation</p> <p>(v) Immediately consolidate the backfilled soil and restore the road surface; this will also avoid any business loss due to dust and access inconvenience of construction work.</p> <p>(vi) Employee best construction practices, speed up construction work with better equipment, increase workforce, etc., in the areas with predominantly commercial, and with sensitive features like hospitals, and schools;</p> <p>(vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and</p> <p>(viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p>		
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	<p>(i) Employ local labor force as far as possible</p> <p>(iii) Comply with labor laws</p>	Contractor	Contractor cost
Occupational Health and Safety	Occupational hazards which can arise during work	<p>(i) Follow all national, state and local labor laws (indicative list is in Appendix 2);</p> <p>(ii) Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training for all site personnel, (d) excluding public from the work sites; and (e) documentation of work-related accidents; Follow International Standards such as the World Bank Group's Environment, Health and Safety Guidelines.^a</p>	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<ul style="list-style-type: none"> (iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the sites; (iv) Secure all installations from unauthorized intrusion and accident risks (v) Provide OHS orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (vi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (vii) Ensure the visibility of workers through their use of high visibility vests 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 transportation	<ul style="list-style-type: none"> (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 Tiruppur City Municipal Corporation (iii) Avoid tree cutting for setting up camp facilities 	Contractor	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		<ul style="list-style-type: none"> (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 		

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(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	<p>Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants</p> <p>Unsanitary and poor living conditions for workers</p>	<p>(i) As far as possible the work camp should be located within the construction sites (STP or large pumping stations); if any of the work camp has to be located outside the construction sites (due to lack of space), then the location should be identified away from the nearby residential areas (at least 100 m buffer shall be maintained)".</p> <p>(ii) Avoid tree cutting for setting up camp facilities</p> <p>(iii) Ensure that a proper compound wall is provided, and erect a wind/dust screen around</p> <p>(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</p> <p>(v) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit</p> <p>(vi) Provide proper temporary accommodation with proper materials, adequate lighting and ventilation, appropriate facilities for winters and summers; ensure conditions of livability at work camps are maintained at the highest standards possible at all times;</p> <p>(vii) Consult PIU before locating project offices, sheds, and construction plants;</p> <p>(viii) Minimize removal of vegetation and disallow cutting of trees</p> <p>(ix) Ensure conditions of livability 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</p> <p>(x) Camp shall be provided with proper drainage, there shall not be any water accumulation</p>	Contractor	Contractor cost

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

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	<ul style="list-style-type: none"> (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 re-vegetation 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

dBA = decibels, EMP = environmental management plan, m = meter, OHS = occupational health and safety, PIU= Program Implementation Unit , PUC = pollution under control, SOP = Standard operating procedures.

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

Table 23: 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	<ul style="list-style-type: none"> (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 (x) Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with TNPCB (xi) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with the standards (xii) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming stipulated concentrations to use as compost 	PIU /TCMC	Operating costs
Operation of sewage and Main pumping stations	Odor nuisance	<ul style="list-style-type: none"> (i) Strictly follow standard operating procedures / operational manual for operation and maintenance of pump stations (ii) Ensure that operating staff is properly trained, and have clear understanding of odor issues vis-à-vis its related with operational practices 	PIU	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(iii) Ensure that pumping cycles are properly followed; and there is no buildup of sewage beyond design volume in the wells (iv) Conduct H ₂ S monitoring periodically		
Operation and maintenance of sewerage system	Blocks, overflows, system malfunction, occupational health and safety	(i) Establish regular maintenance program, including: <ul style="list-style-type: none"> 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.	PIU	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost and Source of Funds
		(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 sulfide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use.		

H₂S = hydrogen sulfide; PIU = Program Implementation; STP = sewage treatment plants; TNPCB = Tamil Nadu Pollution Control Board.

Table 24: Pre-Construction and Construction Stage Environmental Monitoring Plan

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Baseline water quality monitoring at treated water discharge locations (Chinnandipalayam Kulam and Noyyal River, Nanjarayan kulam and Noyyal River)	4 points	pH, TDS, TSS, DO, BOD, COD, E-coli, Total coliform, Nitrate, Total Phosphates, Oil & grease, Total hardness, Sulphate, Fluoride, Chloride, Ammonia, Aluminum, Manganese, Iron, Zinc, Nickel, Magnesium, Phenolic compounds, Chromium, Arsenic, Mercury, Cadmium, Lead, Pesticides	Twice during detailed design phase (Pre monsoon and post monsoon during design phase)	DBOT Contractor	Cost for implementation of monitoring measures responsibility of DB contractor (8 samples x 8000 per sample = 64,000)
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

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Ambient air quality	6 location (2 STP and 4 monitoring locations 50 m downwind direction near sewer and pumping station work sites in the town)	PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , CO	Once before start of construction. Three season in a year for 2 years during construction (except monsoon period)	DBOT Contractor & Construction Contractor	Cost for implementation of monitoring measures responsibility of DB contractor (42 samples x 4000 per sample = 168,000)
Ambient noise	6 location (2 STP and 4 monitoring locations 50 m downwind direction near sewer and pumping station work sites in the town)	<ul style="list-style-type: none"> Day time and night time noise levels 	Once before start of construction. Three season in a year for 2 years during construction (except monsoon period)	DBOT Contractor & Construction Contractor	Cost for implementation of monitoring measures responsibility of DB contractor (42 samples x 1500 per sample = 63,000)
Surface water quality	4 sampling locations (Chinnandipalayam Kulam and Noyyal River, Overflow channel of Nanjarayan Kulam and Noyyal River)	<ul style="list-style-type: none"> pH, Oil and grease, Cl, F, NO₃, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity 	Once before start of construction Half yearly during construction (2 year construction period)	DBOT Contractor	Cost for implementation of monitoring measures responsibility of DB contractor (12 samples x 4000 per sample = 80,000)

DBOT = design, build, operate and transfer; EMP = Environmental Management Plan, m = meter.

Table 25: Operation Stage Environmental Monitoring Plan

Monitoring Field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
Monitoring of treated wastewater quality from STPs	Inlet and outlet of STPs, and within the treatment process	Parameters as specified by TNPCB in the consent. Concentration of various parameters in treated wastewater shall be within the	Monthly	Operator/ TCMC	Operating Cost

Monitoring Field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost and Source of Funds
		specific limits as per the discharge standards for STP .			
Water quality of receiving water body	2 points at Chinnandipalyam STP (1 at outfall discharge point into outfall channel of Chinnandipalayam Kulam;1 in Noyyal River) 2 points at Sarkarperiyapalayam STP (1 at outfall discharge point into outfall channel of Nanjarayan kulam Kulam;1 in Noyyal River)	pH, Cl, F, NO ₃ , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity, coliform heavy metals and pesticides	Monthly once during operation Yearly twice (pre & post monsoon)	Operator/ TCMC	O&M costs (water quality will be tested at the internal laboratory part of STPs)
Odor monitoring at STPs	3 points (boundary of the STP's in downwind direction)	Hydrogen sulphide (H ₂ S)	One baseline prior to start of operation Monthly once	Operator/ TCMC	O&M Costs
Ambient noise	3 points (boundary of the STP's in downwind direction)	Day time and night time noise levels	One baseline prior to start of operation Monthly once	Operator/ TCMC	O&M Costs
Sludge quality and suitability as manure	STP	Analysis for concentration of heavy metals and confirm that value are within the limits specified in the SWM rules.	Start of operation and Yearly once	Operator/ TCMC	O&M costs (testing to be done at an accredited external laboratory)
Odor 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 sulfide (H ₂ S)	Half yearly (yearly twice) and as and when based on public complaints (throughout the operation phase)	Operator/ TCMC	O&M Costs

H₂S = Hydrogen sulfide, O&M = operations and maintenance, STP = sewage treatment plants, TCMC = Tiruppur City Municipal Corporation TNPCB = Tamil Nadu Pollution Control Board.

B. Implementation Arrangements

167. 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.

168. The implementing agency for this project is Tiruppur City Municipal Corporation (TCMC). A Project Implementation Unit (PIU) will be established in TCMC headed by full-time a Project Manager (a senior official of TCMC) and comprising dedicated full-time staff from engineering and other departments of TCMC. PIU under the TCMC will be responsible for planning, implementation, monitoring and supervision, and coordination of all activities of project. New Tirupur Area Development Corporation Limited (NTADCL) will assist PIU in day-to-day implementation of the project.

169. **Safeguards Compliance Responsibilities.** Environmental and Social Safeguards (ESS) managers in the PMU, TNUIFSL will have overall responsibility of safeguard compliance with ADB SPS, 2009. ESS Managers report to Vice President in the Projects Wing. At PIU level, the safeguard measures will be handled/ managed by the Environmental Specialist from NTADCL, and the role of Safeguard Officer will be to coordinate the safeguard tasks at PIU, oversee the implementation of safeguard tasks, grievance redressal and reporting.

170. **PMU Safeguard Responsibilities.** Key tasks and responsibilities of the PMU for this project include the following:

171. **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; and
- (vi) Prior to invitation of bids and prior to award of contract ensure that all clearance/permissions as required for implementation of project are in place, to the extent possible.

172. **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 projects and ensure EMPs are implemented by PIUs and contractors;
- (ii) Oversee and provide guidance to the PIU to properly carry out the environmental monitoring as per the EMP;

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

173. **Operation stage.** 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.

174. **PIU Safeguard Responsibilities.** Key tasks and responsibilities of the PIU assisted by NTADCL for this project include the following:

175. **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 EMO 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, ethnicity, 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 project, including consent to establish (CTE) from TNPCB for STP and permission from PWD for disposal of treated effluent prior to invitation of bids and/or prior to award of contract / prior to construction as appropriate

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

177. Operation stage:

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

178. Contractor's Responsibilities:

1. Bidding stage:

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

179. 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 plan (sample is Appendix 6); and
- (vi) Implement the mitigation measures as per the EMP including CWM and Traffic management 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 NTADCL; and
- (xiii) Comply with applicable government rules and regulations.

C. Training Needs

180. Table 26 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 26: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Tamil Nadu applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc. - Incorporation 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
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 project At PIU	To be conducted by CSMC 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.	Contractors' EHS officer to conduct program, with guidance of NTADCL

Description	Target Participants and Venue	Cost and Source of Funds
	Daily briefing on safety prior to start of work	
	All workers (including unskilled laborers)	

ADB = Asian Development Bank, EHS = environmental Health and Safety, EMP = environmental management plan, OHS = occupational health and safety, PMU = program management unit, PIU = program implementation unit, SOP = standard operating procedures.

D. Monitoring and Reporting

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

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

183. Based on PIU Quarterly Environmental Monitoring Reports and oversight visits to project work sites, PMU will submit semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed on TNUFSL, PMU and TCMC websites.

184. ADB will review project performance against the TNUFIP commitments as agreed in the legal documents (loan and project agreements). 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

185. 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 27: Cost Estimates to Implement the EMP

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Costs Covered By
A.	Implementation Staff						

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Costs Covered By
	EHS Supervisor	Construction	Per Month	72	35,000	2,520,000	Civil works contract
	Subtotal (A)					2,520,000	
B.	Mitigation Measures						
1	Tree Plantation with maintenance	Construction	Per tree	700	1000	700,000	Provisional sums of contract (PIU)
2	Safety Barricading, Dust Suppression	Construction	Lump Sum	-	-	3,000,000	Civil works contract
3	Preparation of plans traffic management plan, waste (spoils) management plan etc.,), Traffic management at (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump Sum	-	-	300,000	Civil works contract
4	Providing gas capture and treatment system at selected pumping stations	Design	nos.	6	-	2,000,000	Provisional sums of contract (PIU)
5	Measures related to make the STP complaint with TNPCB consent	Design/ Construction	-	-	-	-	TCMC
	Subtotal (B)					6,000,000	
C.	Monitoring Measures						
I	During Construction Phase						
1	Baseline Surface water quality monitoring	Design/ Pre construction	Per sample	8	8000	64,000	Civil works contract
2	Air quality monitoring - Three season in a year for 2 years	Construction	Per sample	42	4,000	1,68,000	Civil works contract
3	Noise levels monitoring - Three season in a year for 2 years	Construction	Per sample	42	1500	63,000	Civil works contract
4	Surface water monitoring – Two season in a year for 2 years	Construction	Per sample	20	4000	80,000	Civil works contract
	Subtotal (C)					375,000	
D.	Capacity Building						
1	Training on EMP implementation	Construction				-	Part of PIU and PMU , consultant tasks

	Particulars	Stages	Unit	Total Number	Rate (₹)	Cost (₹)	Costs Covered By
2	Contractors orientation to Workers on EMP implementation	Prior to dispatch to worksite				-	Civil works contract
	Subtotal (D)					-	
	Total (A+B+C+D)				₹	8,895,000	

EHS = environmental Health and Safety, PIU = program implementation unit, PMU = = program management unit , STP = sewage treatment plant, TCMC = Tiruppur City Municipal Corporation TNPCB = Tamil Nadu Pollution Control Board.

IX. CONCLUSION AND RECOMMENDATIONS

186. The process described in this document has assessed the environmental impacts of all elements of the proposed underground sewerage project in TCMC. 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 UGSS designs. 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, rehabilitation of existing STP to ensure proper treatment and sludge management, dour 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.

187. The site selected for STP's are located far away from the residential settlements and located outside the TCMC. Considering the current and future development around the facility, various measures are included in the project design, including design of a compact, superior process with low odor 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 pumping station sites are situated on government owned vacant land parcels, and sewers will be laid on the public roads. Therefore project do not involve any private land acquisition. The treated sewage from the STP (Chinnandipalayam) will be discharge into the outfall channel of Chinnandipalayam Kulam (pond) and treated sewage from the STP (Sarkarperiyapalayam) will be discharged into the overflow channel of Nanjarayan kulam (pond). Thus, there are no adverse impacts like due to discharge of STP treated wastewater meeting the set quality standards. Given the proposed disposal standards, the disposal will improve the existing water quality, and will raise the water level

188. STP and all the pumping station sites are situated on government owned vacant land parcels, and sewers will be laid on the public roads. Therefore subproject do not involve any private land acquisition. All the subproject components are located within urban environment. STP

site is located outside the town, surrounded by agricultural and barren lands. There are no ecologically sensitive or protected wildlife or archeological areas in or close to subproject area.

189. Sewage 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 odor 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, six pumping station sites namely Angeripalayam Road, AVP Road Santhapettai, Anaipalayam, SR Nagar North, Kattabomman nagar and Pattukottaiyar nagar are identified close to the residential areas. 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 odor; and, providing gas collection and treatment facilities. Periodical odor monitoring is proposed at pumping stations.

190. 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 will be designed by the DBOT contractor to meet the disposal standards and to discharge the treated wastewater into Noyyal River. Required measures to ensure that sewage system is operated and maintained with designed efficiency are to be included in the design and operation by the Contractor. Proper sludge management system to collect, treat and dispose safely will be followed. Periodic monitoring of dried sludge to check suitability as a manure is suggested.

191. 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, project 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.

192. 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&M manual and standard operating procedures to be developed for all the activities.

193. 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 odor. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

194. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU, TCMC 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.

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

196. The citizens of the TCMC will be the major beneficiaries of this project. 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 project will improve the over-all public health in the project area. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

197. Therefore, as per ADB SPS, 2009, 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 establish (CTE) and consent to operate (CTO) from Tamil Nadu Pollution Control Board. This IEE shall be updated by the PIU during the implementation phase to reflect any changes, amendments and will be reviewed and approved by PMU.

RAPID ENVIRONMENTAL ASSESSMENT 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 Sustainable Development and Climate Change 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: Underground Sewerage System for Tiruppur City Municipal Corporation
Areas (Zones 5 to 9 & Zones 13 to 17)

Sector Division: Urban Development

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area...			
• Densely populated?	✓		Subproject activities are located in the outer areas of Ambur Municipality, which were originally municipalities. Old habitation 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?	✓		All the project towns are developing towns; urban expansion is considerable.
Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	✓		In Vellore and Tiruchirappalli, sewer alignments will pass thru regulated areas of the protected monuments of the Archaeological Society of India (ASI). Potential impacts from civil works will be avoided by (i) consulting with and obtaining permission from ASI, and (ii) appointing an archaeological expert to assess impacts and supervise construction. No impacts anticipated during operation phase.
• Protected Area		✓	In Tamil Nadu State, there are 5 national parks, 15 wildlife sanctuaries (including four tiger reserves), 15 bird sanctuaries, and two conservation reserves. The ADB Mission team confirmed during pre- and fact-finding missions that Tranche 2 locations are not in these protected areas.
• Wetland		✓	
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	There are 3 biosphere reserves in Tamil Nadu.

Screening Questions	Yes	No	Remarks
			Biosphere reserves have vast areas and may cover urban and developing areas. The ADB Mission team confirmed during pre- and fact-finding missions that Tranche 2 locations are components are/will be in the biosphere core zones.
• Special area for protecting biodiversity		✓	
• Bay		✓	
B. Potential Environmental Impacts Will the Project cause...			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	Not anticipated. The Mission team confirmed during pre- and fact-finding missions that Tranche 2 locations are not within nor adjacent to any protected historical/cultural monuments/areas.
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	✓		Anticipated during operations but can be avoided and mitigated. STP, sewage lifting, and pump stations are in urban areas and odor may create nuisance to communities. Appropriate odor standards will be applied, and necessary odor control measures are included in the designs and EMPs.
▪ dislocation or involuntary resettlement of people?	✓		Anticipated but can be managed. Any involuntary resettlement impact is addressed in the resettlement plan prepared per ADB SPS.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	Not anticipated. The contractor will be encouraged to hire workers from the local labor force.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		✓	Not anticipated. Sewage will be treated in the proposed STPs. The designs and operation of the STPs will consider on assimilative capacity of receiving body of water and effluents will comply with discharge standards.
▪ overflows and flooding of neighboring properties with raw sewage?		✓	Not anticipated. Risks, climate change factors, and 30 years population projects have been considered in identifying the capacity and design of the sewerage systems. The design engineers confirmed no risk of overflow.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?		✓	Not anticipated. STP designs will include sludge collection, treatment and disposal process. The sewerage collection systems will only allow flow domestic sewage by direct connections to households. The designs ensure no industrial effluent will be allowed into the sewer network.
▪ noise and vibration due to blasting and other civil works?	✓		Anticipated but temporary, site-specific and can be mitigated. No blasting activities envisaged. Nuisance/disturbance due to elevated noise may be experienced by sensitive receptors during construction. Noise will be minimized with mitigation measures specified in the EMPs. During operations, noise may be

Screening Questions	Yes	No	Remarks
			experienced by sensitive receptors due to STP operations. This will be avoided by including noise barriers and enclosure of noise-producing components to meet IFC EHS' WHO guideline values and/or national standards, whichever is more stringent.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	✓		Anticipated but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors' Health and Safety (H&S) plan. The contractors' H&S plans will be reviewed and cleared by PIUs prior to commencement of works.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		✓	Not anticipated. The sewerage collection systems are designed to only allow flow of domestic sewage by direct connections to households. The designs ensure no industrial effluent will be allowed into the sewer network.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		✓	Note anticipated. STP, pump and lifting stations will include buffer zones as required and condition in the Consent to Establish by the Tamil Nadu State Pollution Control Board.
▪ road blocking and temporary flooding due to land excavation during the rainy season?	✓		Anticipated during construction but temporary, site-specific and can be mitigated. Complete road blocks are not envisaged. In narrow roads, traffic may be diverted but access will be ensured for pedestrians. Works will be conducted during dry season. Contractors are required to submit traffic management plan as part of site-specific EMP.
▪ noise and dust from construction activities?	✓		Anticipated during construction but temporary, site-specific and can be mitigated. No major noise-generating activities like rock blasting is anticipated. As the sewers will be laid on the road surface, cutting open of road surface using pneumatic drills will produce noise and dust. Temporary nuisance/disturbance due to noise and dust may be experienced by sensitive receptors. These impacts will be minimized with mitigation measures specified in the EMPs. During operations, noise may be experienced by sensitive receptors due to STP operations. This impact will be avoided by including noise barriers and enclosure of noise-producing components.
▪ traffic disturbances due to construction material transport and wastes?	✓		Anticipated during construction but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors' Traffic Management Plan which will be reviewed and cleared by PIUs prior to commencement of works.
▪ temporary silt runoff due to construction?	✓		Anticipated during construction but temporary, site-specific and can be mitigated. EMPs and contract provisions include requirement for contractors to provide silt control

Screening Questions	Yes	No	Remarks
			measures.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		✓	Not anticipated. O&M Manuals will be developed as part of the contracts. Necessary equipment and training to workers will be provided under TNUIFP. The ULBs will be trained on standard operating procedures and maintenance to ensure facilities are functioning according to the designs.
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		✓	Not anticipated. The STP designs include sludge handling and treatment facilities. Necessary equipment and training to ULBs/workers on sludge handling and effluent monitoring will be provided under TNUIFP.
▪ contamination of surface and ground waters due to sludge disposal on land?		✓	Not anticipated. The STP designs include sludge handling and treatment facilities. O&M Manual will include testing procedures, parameters and restriction on re-use of treated sludge. Only if it meets the Government of India standards for soil conditioner and fertilizer then will be allowed for re-use and strictly for non-food crops only.
▪ Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?	✓		Anticipated during operation but temporary, site-specific and can be mitigated. Workers may be exposed during cleaning of blockages in sewerage network. However, O&M Manuals will include standard operating procedures. All necessary health and safety training and personal protection equipment will be given to workers and staff during operation of sewerage system. Implementation of contractors' H&S will be strictly enforced by the PIUs.
▪ Large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		✓	Not anticipated.
▪ Social conflicts between construction workers from other areas and community workers?		✓	Not anticipated. The contractor will be encouraged to hire workers from the local labor force.
▪ 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?	✓		Anticipated but can be mitigated. Construction will not involve use of explosives and chemicals. During operations, chemicals such as pH adjusters, flocculants, or coagulants may be used. The complete list of chemicals, quantities, and requirements for safe use and storage will be included in the Updated/Final IEE for the STPs (these are design-build-operate packages). The EMPs in the current IEEs already include measures and monitoring requirements conforming with IFC EHS Guidelines. O&M Manuals will include health and safety requirements for managing chemicals.
▪ Community safety risks due to both accidental and natural hazards,		✓	Not anticipated. Work area will be clearly demarcated. STPs will have compound walls

Screening Questions	Yes	No	Remarks
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?			and security personnel. Pump houses and lifting stations will be secured and locked. Only workers and project-concerned members will be allowed to enter the sites. PIUs, in coordination with water and sanitation committees, will disseminate information on community health and safety.

CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING

Screening Questions		Score	Remarks ^a
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	Some project locations may experience flooding during heavy rains. No components will be sited in river flood plains, drainage channels, etc. Locations may however be in low-lying areas. Adequate measures will be included in the designs to safeguard facilities from extreme events.
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	1	Intakes and other structures (e.g., pumping stations, STPs) located in or close to rivers/water bodies, low lying flat lands, etc., to be designed with proper hydro-meteorological parameters
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No significant effect
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No significant effect
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	No significant effect

^a If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium Risk

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 at 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 Labor (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.

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.

Public Information Notice Template**Public Announcement
Providing Underground Sewerage System Tiruppur City
Municipal Corporation**

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

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.

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:	

SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for TMP around the Water Pipes 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 A6.1 illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

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

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

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

Figure A6.1: Policy Steps for the TMP

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

D. Public awareness and notifications

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

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the

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

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

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

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

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

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

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

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

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

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

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

12. Figure A6.2 to Figure A6.6 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:

- (i) Work on shoulder or parking lane
- (ii) Shoulder or parking lane closed on divided road
- (iii) Work in Travel lane
- (iv) Lane closure on road with low volume
- (v) Street closure with detour

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

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

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

Figure A6.2 and A6.3: Work on shoulder or parking lane and Shoulder or parking lane closed on divided road

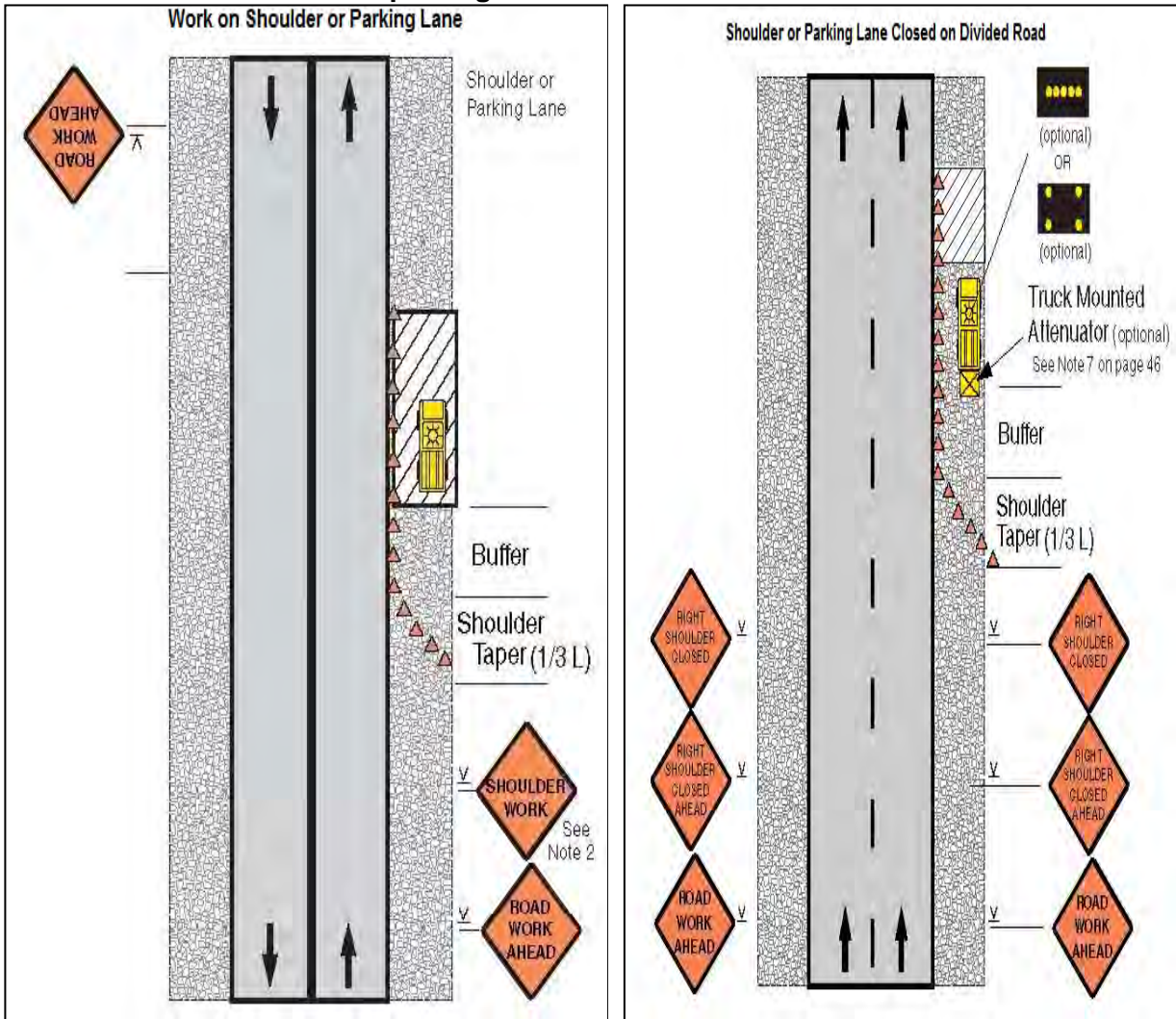


Figure A6.4 and A6.5: Work in Travel lane and Lane closure on road with low volume

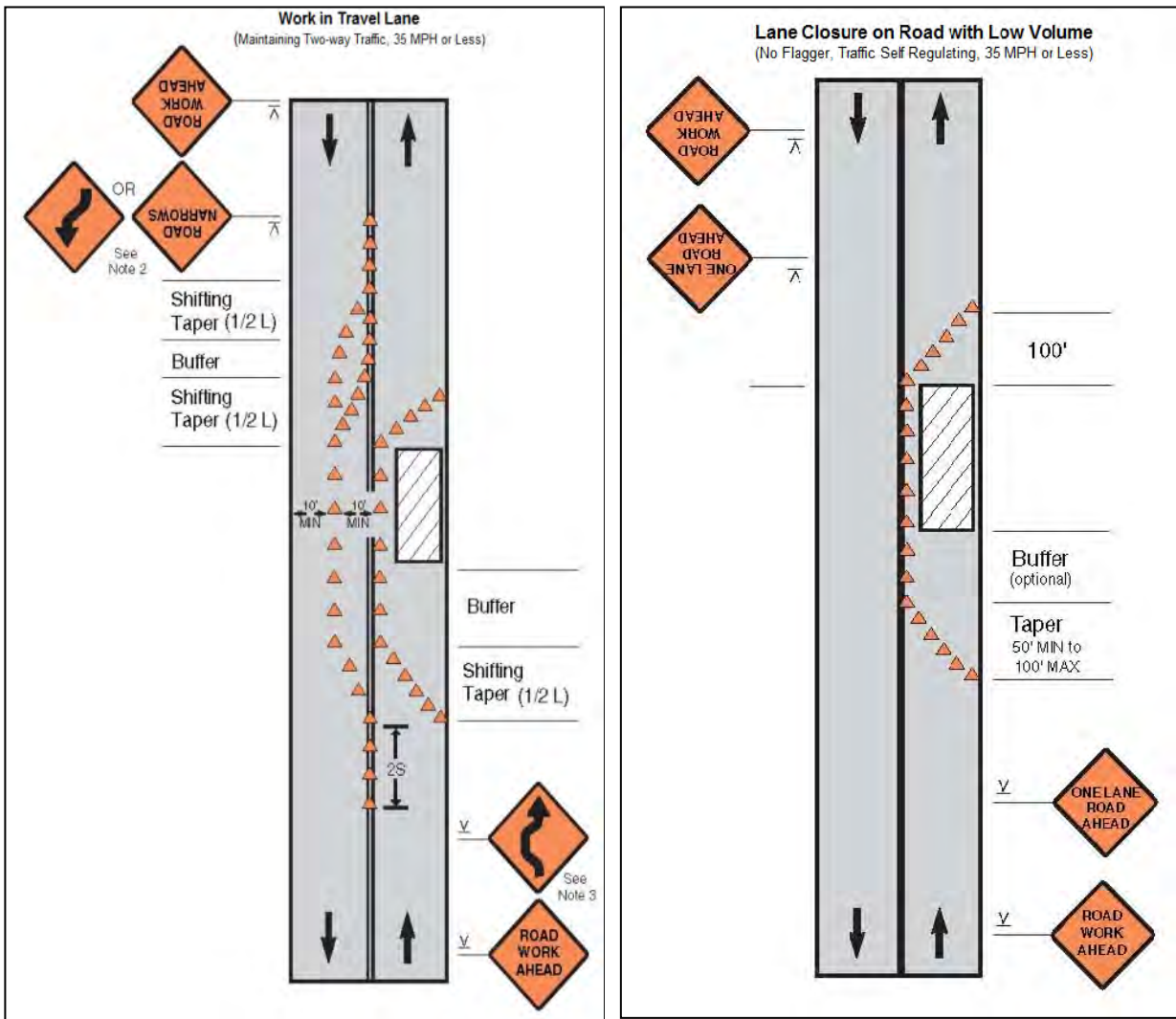
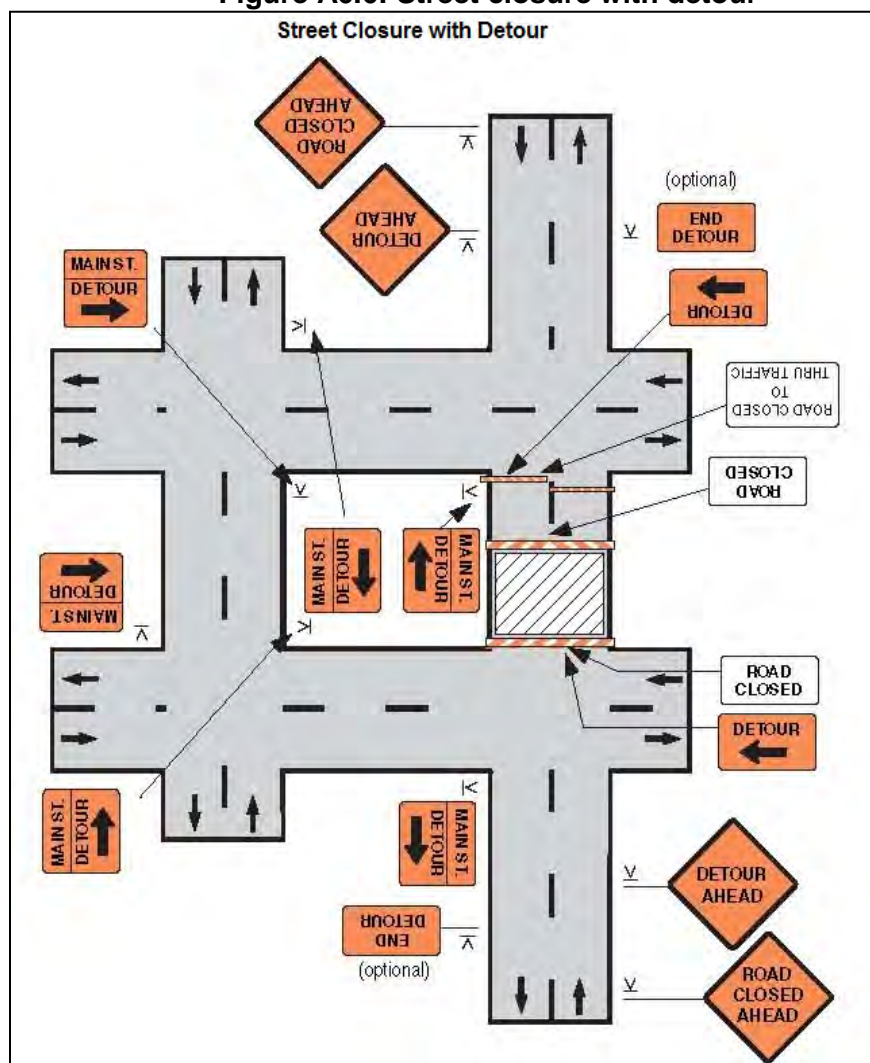


Figure A6.6: Street closure with detour



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
Position

Name
Position

SAMPLE SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

I. Introduction

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

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

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

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

^a If on-going construction, include %physical progress and expected date of completion

II. Compliance status with National/State/Local statutory environmental requirements^a

Package No.	Subproject Name	Statutory Environmental Requirements ^b	Status of Compliance ^c	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish ^d

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

^b Specify (environmental clearance? Permit/consent to establish? Forest clearance? etc.)

^c Specify if obtained, submitted and awaiting approval, application not yet submitted

^d Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

III. Compliance Status with Environmental Loan Covenants

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

IV. Compliance status with the environmental management Plan (Refer to EMP Tables In Approved IEE/s)

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

Package-wise Implementation Status

[illegible]

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

Summary of Environmental Monitoring Activities (for the Reporting Period)^a

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						

^a Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/ EMP

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

- V. Approach and methodology for environmental monitoring of the project
- Brief description on the approach and methodology used for environmental monitoring of each sub-project
- VI. 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/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

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 $\mu\text{S/cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

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

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

VIII. APPENDIXES

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

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name _____
 Contract Number _____

NAME: _____ DATE: _____
 TITLE: _____ DMA: _____
 LOCATION: _____ GROUP: _____

WEATHER CONDITION: _____

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____ Resolved _____
 _____ Unresolved _____

INCIDENT:

Nature of incident: _____

Intervention Steps: _____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes ☐ No ☐

Signature _____

Sign off

Name _____
 Position _____

Name _____
 Position _____

DETAILS OF PUBLIC CONSULTATIONS

Minutes of the Public Consultation Conducted on 24 January 2018 at Tiruppur City Municipal Corporation, Zone 2, Thottipalayam&Tiruppur Corporation Central Office, Tiruppurfor The Proposed Underground Sewerage Scheme (UGSS) by Tiruppur City Municipal Corporation

The Public Consultation commenced at 11.00 AM with officials from Tiruppur City Municipal Corporation (TCMC).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 copy of Attendance register is attached herewith.

Officials of TCMC welcomed the gathering and outlined the procedure for Public Consultation. They described that the TCMC have proposed to develop the Water Supply Scheme (WSS) and Underground Sewerage Scheme (UGSS) for Tiruppur Corporation. 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 existing UGSS) covers only 70% area of the old Tiruppur Municipality area (Zone 1 to Zone 4) and for a length of 120 Km.Under the AMRUT Scheme, the proposed UGSS will cover 10 zones of Tiruppur Corporation area (Zones 5 to 9 & Zones 13 to 17) each having a separate pumping station. The proposed scheme contains provisions for sewer laying for a total length of 563.672 km and construction of 22,260 manholes. The Construction of New Sewerage Treatment Plants at Sarkarperiyapalayam, Chinnandipalayam and improvement of the existing Sewage treatment plant at Sarkarperiyapalayam will also covered under this project.

The quantity of sewage generated from the above mentioned10 zones is expected to be about 50.02 MLD, 68.57 MLD and 87.79 MLD for the year 2020, 2035 and 2050, respectively. The pumping main of length of 563.672 Km with diameter varies from 200 mm to 800 mm. The scheme will be implemented at the project cost of Rs. 579 Crores.

Following this, the TCMC 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 / stake holders	Clarification given by the Officials of TCMC
1.	Why the Proposed Underground Sewerage Scheme didn't not cover all Tiruppur Corporation area	The scheme will be implemented based on the population density which indirectly meant for generation of sewage. Thus, zones which consist of low population density are not covered under this scheme.

S. No.	The views and questions of the public / stake holders	Clarification given by the Officials of TCMC
2.	What is the usage of treated sewage from STP	The treated water will be disposed into Noyyal river, also planned to use for irrigation.
3.	Any Changes in Existing Underground Sewerage Scheme	The existing scheme covered only 4 zones namely (Zone 1 to Zone 4). The scheme is functioning well and same will be maintained. There is no changes in the existing scheme only addition of new zones.
4.	About Sewage Treatment Plant	The existing sewage treatment plant at Sarkarperiyapalayam having capacity of 15 MLD expandable to 30 MLD will be retained. Also, a new STP is proposed within the same STP site. In addition another new STP is proposed at Chinnandipalayam. The selected sites for STP's are far away from the residential zones.
5.	Water supply line gets broken and mixed with sewer lines. This proposal will replace this problem.	This scheme will resolve this issue. The existing old pipes will be replaced and new pipes with good quality will be provided for water supply scheme. Also, there is a proposal for Under Ground sewerage system.
6.	Time period of the project i.e., start and end time of the project	The project will be started after the tender process i.e., about six months from today. The project will be implemented in 3 years of time period.
7.	About the durability of the pipes to be laid. Kindly ensure that there should not be any frequent maintenance for which excavation is carried out.	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 until the year 2050. Also, the pipes will be used based on the IS standard thus there will not be any frequent maintenance.

The officials of TCMC concluded the Public Consultation with vote of thanks.

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

Brief Summary of the project details circulated to the stakeholders / Public

திருப்பூர் மாநகராட்சி பகுதியில் வார்டு எண்.12 (ப),13,14 (ப), 22(ப), 23(ப), 24(ப), 27(ப),32(ப),43(ப),44(ப),46,49(ப),50,51,56,58,59 மற்றும் 60 பகுதிகளில் பாதாள

சாக்கடை திட்டம்

திருப்பூர் பழைய மாநகராட்சி பகுதியில் பாதாள சாக்கடை திட்டம் செயல்பாட்டில் உள்ளது. வார்டு எண். 12 (ப),13,14 (ப), 22(ப), 23(ப), 24(ப), 27(ப),32(ப),43(ப), (ப),46, 49(ப), 50, 51, 56, 58,59 மற்றும் 60 ஆகிய பகுதிகளில் ரூ. 250.00 கோடியில் பாதாள சாக்கடை திட்டம் 2017-20 அம்சுத் திட்டத்தின் கீழ் செயல்படுத்தப்பட உள்ளது. இத்திட்டத்தில் மத்திய அரசின் பங்கு 50 சதவீதம் மான்யமாகவும், 20 சதவீதம் மாநில அரசின் பங்கு மான்யமாகவும், மீதம் உள்ள 30 சதவீதம் ஆசியன் வங்கி நிதியுதவி மற்றும் கடனுதவியாகும்.

மேற்குறிப்பிட்ட வார்டு பகுதிகளில் பாதாள சாக்கடை திட்டம் அமைய உள்ள பகுதிகளில் 2020, 2035, 2050 ஆம் ஆண்டுகளில் எதிர்பார்க்கப்படும் மக்கள் தொகை முறையே 2,20,091, 3,01,566 மற்றும் 3,99,435 ஆகும்.இம்மக்கள் தொகையின் படி அடிப்படை கால கழிவு நீர் அளவு தினசரி 24.19 மில்லியன் லிட்டர் எனவும், இடைக்கால கழிவு நீர் அளவு தினசரி 33.17 மில்லியன் லிட்டர் எனவும் உச்சகால கழிவு நீர் அளவு தினசரி 43.93 மில்லியன் லிட்டர் எனவும் கணக்கிடப்பட்டுள்ளது.

திருப்பூர் மாநகராட்சி பகுதியின் நில அமைப்பின் படி 17 கழிவு நீர் சேகரிப்பு மண்டலங்களாக பிரிக்கப்பட்டுள்ளது. இதில் 4 மண்டலங்களில் ஏற்கனவே பாதாள சாக்கடை திட்டம் செயல்பாட்டில் உள்ளது. தற்போது 7 மண்டலங்களில் (வார்டு பகுதிகள் 12 (ப),13,14 (ப), 22(ப), 23(ப), 24(ப), 27(ப), 32(ப),43(ப),44(ப), 46,49(ப),50,51,56, 58,59 and 60) அம்சுத் திட்டத்தின் வழிகாட்டுதலின் படி பாதாள சாக்கடை திட்டம் அமைக்க மக்கள் தொகை பெருக்கம் உள்ளதால் புதிய பாதாள சாக்கடை திட்டம் செயல்படுத்தப்பட உள்ளது.

இத்திட்டத்தில் 200 மி.மீ லிட்டம் முதல் 800 மி.மீ லிட்டம் உடைய கழிவு நீர் சேகரிப்பு குழாய்கள் மொத்தம் 274,041 கி.மீ தூரம் 10882 ஆள் இறங்கு குழிளுடன் அமைக்கப்பட உள்ளன. இத்திட்டத்தின் மூலம் 33651 வீட்டு இணைப்பு வழங்கப்பட உள்ளது. இத்திட்டத்தின் பெரிய சர்க்கார் பாளையத்தில் 15 எம்.எல்.டி சுத்திகரிப்பு நிலையமும், ஆண்டிபாளையத்தில் 19 எம்.எல்.டி சுத்திகரிப்பு நிலையமும் அமைக்கப்பட உள்ளது.

இத்திட்டத்தின் செயலாக்க காலம் 24 மாதங்கள் சோதனை ஓட்ட காலம் 6 மாதங்கள். சோதனை ஓட்டம் முடிந்தவுடன் ஒப்பந்ததாரரின் பராமரிப்பு காலம் 3 ஆண்டுகள் ஆகும். இத்திட்டம் முடிவடைந்த பின்னர்ப்பாட்டிற்கு வரும் பட்சத்தில் மேற்கண்ட வார்டு பகுதிகள் சுகாதாரமான தூய்மையான பகுதியாக உருப்பெரும் என்பதில் அய்யமில்லை. இதனால் பயன்பெருவோர் எண்ணிக்கை 2,20,091 ஆகும்.

ஆணையாளர்,
திருப்பூர் மாநகராட்சி.

Attendance of Public Hearing

Tiruppur City Municipal Corporation.
Water Supply Scheme &
Underground Sewerage Scheme.

S.No.	Name, Address & Phone No.	Signature	
1.	சாந்தியம்மா 5/1400, பாரதியார் வீடு பெரியபாளையம் திருப்பூர் மொ: 8489235809	சாந்தியம்மா	F
2.	மயலா 3/8, வ. ஜெய் நகர் 4 ^{வது} திருப்பூர் தொழில்நுட்ப நகர் திருப்பூர் மொ: - 9868974960	Bhuvan	F
3.	சீமா 3/2A வ. ஜெய் நகர் 4 ^{வது} தொழில்நுட்ப நகர் திருப்பூர் மொ: - 8870826796	சீமா	F
4.	சாந்தியம்மா 3/1B வ. ஜெய் நகர் பெரியபாளையம் 4 ^{வது} திருப்பூர் மொ: - 9698961996	சாந்தியம்மா	F
5.	ச. பிரியா பாரதியார் வீடு 5/499 பெரியபாளையம் 4 ^{வது} திருப்பூர் மொ: - 9049608673	S. Priya	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME A
UNDERGROUND SEWERAGE SCHEME

4

S.NO	NAME & ADDRESS & PHONE NO	SIGNATURE	S.NO
6	பாண்டி சந்திரன் 5/950 மீதம்பாளையம் ஹவுஸ் கீருங்குடி மொல் - 8489220351	K. Pandi Sani	F
7	தேவி 5/485 லட்சுமி நகர் மீதம்பாளையம் ஹவுஸ் கீருங்குடி மொல் - 96 59 240 840	T. Deva	F
8	கவிதா 5/487 ஜி.என். வீதி மீதம்பாளையம் ஹவுஸ் கீருங்குடி மொல் - 8489537644	Kavitha	F
9	பாண்டி 5/485/2A லட்சுமி நகர் மீதம்பாளையம் ஹவுஸ் கீருங்குடி மொல் - 7871082744	Paandi	F
10	ரஞ்சனா 5/498 மீதம்பாளையம் ஹவுஸ் கீருங்குடி மொல் - 9994968726	Ranjana	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME A
UNDERGROUND SEWERAGE SCHEME

5

S.NO	NAME + ADDRESS + PHONE NO	SIGNATURE
11	சுலக்ஷ்மா 5/752 வித்யாபாண்டியம் ஹஸ் பிளாக் மொ - 8148538281	சுலக்ஷ்மா F
12	சாந்தி 5/777 ராஜா நகர் 2. வீடு வித்யாபாண்டியம் ஹஸ் பிளாக் மொ - 94489873235	சாந்தி F
	அனா 5/156 லட்சுமி நகர் வித்யாபாண்டியம் ஹஸ் பிளாக்	அனா F
13	லட்சுமி 5/640 இந்திரா நகர் வித்யாபாண்டியம் ஹஸ் பிளாக் - 8870067186	லட்சுமி F
14	ரவிமலா தேவி 20/150 வித்யாபாண்டியம் ஹஸ் பிளாக் P.V. மொ - 9942077387	R.Vimaladevi F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
6 UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE NO	SIGNATURE	S
15.	S. Manimekalan Prabu Nagar Vigayapuram Post. Nallur. 9442120788.	S. Manimekalan	M
16	S. Sanguetha 8/390 Uppilpalayam Arulapuram Thaneerpandal Tirupur - 5 9786440871x	S. Sanguetha	F
17	S. Dhandapani 33. Bridge way colony EXT. Tirupur 7 9698421414	S. Dhandapani	M
18	R. Raja 5/290 Granesh Nagar. Pichampalayam Tirupur - 9524724498	P. Raja	M
19.	S. Anandhokumar 28-B Tiruvallur nagar 2 Street Tirupur 9159422115	S. Anandhokumar	M
20	S. Natarajan 21/10. Monty nagar TIRUPUR 691601 9505071441.	S. Natarajan	M
21.	K. SHANMUGAM 12/90 APPALUWAGU 12th Street Post 9942604909	K. Shanmugam	M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
UNDERGROUND SEWERAGE SCHEME 7

S.NO	NAME, ADDRESS + PHONE NO	SIGNATURE	
22	G. Radhakrishnan Bhogavathi Street 74 P. V. Road - 2	G. Radhakrishnan 9488323223	M
23	R. Karthi 7/4 Kamaraj Nagar 2nd P.V. Road Tiruppur	R. Karthi 948862087	F
24	சுப்பிரமணியம் 25/ சிவசுந்தரி தெருவில் கார்ப்பொருள்கள் பெருநகரத்தின் 40ம் பகுதி வீதி திருப்பூர்	சுப்பிரமணியம்	F
25	L. Karthi 5/592 Pitchampalayam Road Tiruppur	L. Karthi 9543698813	F
26	K. Mohan. Yashwanth 8/2623 T. S. Road 3rd Pantiyampalayam Tiruppur	K. Mohan. Yashwanth	M
27	M. Velamangal Chakr. Palayam 7/1 Nagar	M. Velamangal	M
28	N. Sankar No. 559, 1st Main Road	N. Sankar	M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
8 UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS	A PHONE NO	SIGNATURE	S
29	R. Karthik 28/10/15, 2nd Floor, 2nd Street, 2nd Cross, 2nd Lane, 2nd Block, 2nd Phase, 2nd Stage, 2nd Area, 2nd Zone, 2nd District, 2nd Division, 2nd Sub-Division, 2nd Ward, 2nd Polling Station, 2nd Constituency, 2nd Assembly Constituency, 2nd Lok Sabha Constituency, 2nd Parliamentary Constituency, 2nd Electoral District, 2nd Legislative Assembly, 2nd State, 2nd Union Territory, 2nd Country, 2nd World. Tirup. 9950246094		R. Karthik	M
30	சிவசுந்தரன் பிள்ளை 51, பாலையாறு தெருவில் 4th Floor, 4th Cross, 4th Lane, 4th Block, 4th Phase, 4th Stage, 4th Area, 4th Zone, 4th District, 4th Division, 4th Sub-Division, 4th Ward, 4th Polling Station, 4th Constituency, 4th Assembly Constituency, 4th Lok Sabha Constituency, 4th Parliamentary Constituency, 4th Electoral District, 4th Legislative Assembly, 4th State, 4th Union Territory, 4th Country, 4th World. Tirup. 8870893207		சிவசுந்தரன் பிள்ளை	M
31	K. Jaganathan 55, கந்திபுரம் தெருவில் பந்திபுரம் தெருவில் 4th Floor (PO) திருச்சி. தொ: 9994584329		K. Jaganathan	M
32	T. Kavitha Gurusamyarappan 7/9th Pappanna Nagar. Selvany Thandir East Tirupur. 9891928590		G. L. S.	F
33	Gowthami DNo. 1371, Palanisamy Nagar Tirupur. Ph: 9506823127		Gowthami	F
34	D. Vichay 4/24th, Sri Nagar, kumarasamy Nagar East Sairi Tiruppur ph: 9843347589		D. Vichay	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
UNDERGROUND SEWERAGE SCHEME

S.No	NAME, ADDRESS & PHONE NO	SIGNATURE
	T. சாஸ்திரி 1888 ஸாஸ்திரி ரோடு. சுபாமிநியா சாஸ்திரி ரோடு சாஸ்திரி ரோடு 7708842532	T. Sanyam
	M. V. D. சாஸ்திரி சாஸ்திரி ரோடு, சாஸ்திரி ரோடு 94430-24042	myori. M
	சாஸ்திரி சாஸ்திரி ரோடு, சாஸ்திரி ரோடு 9443353435	9 M
	R. சாஸ்திரி சாஸ்திரி ரோடு, சாஸ்திரி ரோடு சாஸ்திரி ரோடு, சாஸ்திரி ரோடு 9429109266	R. Sanyam M
	சாஸ்திரி சாஸ்திரி ரோடு (சாஸ்திரி) சாஸ்திரி - 2, சாஸ்திரி ரோடு 9150292573	சாஸ்திரி M
	B. சாஸ்திரி சாஸ்திரி ரோடு (சாஸ்திரி) சாஸ்திரி - 2, TMC 9444628864	B. Sanyam M
	சாஸ்திரி சாஸ்திரி ரோடு, சாஸ்திரி ரோடு சாஸ்திரி - 2 9150292573	சாஸ்திரி M
	M. சாஸ்திரி சாஸ்திரி ரோடு 7467095120	M. Sanyam M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
12 UNDERGROUND SEWERAGE SCHEME

S.No.	NAME, ADDRESS	PHONE NO	SIGNATURE	S.
1	P. Karthiga, Pongalur 2/41, N.N. pur Pongalur, Palladam (Th) Tiruppur.	9942092950	P. Karthiga	F
2	M. Hemalatha 67, Marikandan Nagar, K. Chettipalayam, Tiruppur.	9003951922	M. Hemalatha	F
3	Vidhya. V 52, M.G.R Nagar, Samundipuram, Tiruppur	9597791242	V. Vidhya	F
4	K. Mona Sanganu Vengateshwara Nagar Kangayam Main Road Tiruppur.	8925457008	K. Mona	F
5	B. Keerthika 128, NP Nagar, 3 rd street Serangadu East Tirupur.	7305439720	B. Keerthika	F
6	P. Sankar. S/o. P. Perumal. 14/2, Sanganu The Param 7 th street Mangalam road Tel - 641604	9894336865	P. Sankar	M
7	R. Krishnan. S/o, Ramalingam. K. Chettipalayam mamandi nagar Tiruppur Dharmaram nagar - 12	9500919671	R. Krishnan	M

TIRUPPUR CITY MUNICIPAL CORPORATION

WATER SUPPLY SCHEME 4.

UNDERGROUND SEWERAGE

SCHEME
13

S.NO	NAME, ADDRESS + PHONE NO	SIGNATURE	
8.	R. Sivakumar 1/1260 Ambalambur Nagar 6. Chettipalayam Tiruppur 9585176095	R. Sivakumar	M
9.	10. V. Nagesh Kumar 66/97 Samudra Nagar Kumar Nagar Tiruppur 9942728466	V. Nagesh Kumar	M
10.	T. CHANDRASEKHARAN 49, Madhavaram Kovil Street Tiruppur - 641003 8056992467	T. Chandrasekharan	M
11.	Murugesan Amc Tiruppur	Murugesan	M
12.	K. THIRUPATHI SURESH BABU 3/204 Manikam Vm Garden Vandipalayam 9043799999	K. Thirupathi Suresh Babu	M
13.	P. MASILAMANI 14 L.R.G. Lfo Karupalay 9578846456	P. Masilamani	M
14.	P. Sivakumar 46/1, Mangalams Rd. Sre. 8124688252	P. Sivakumar	M
15.	G. Sathyanathan	G. Sathyanathan	F
16.	S. Saravanan 6/1 K.V.R. Sd. Ist 9894013176	S. Saravanan	M

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME +
14 UNDERGROUND SEWERAGE SCHEME

S.NO	NAME, ADDRESS & PHONE No	SIGNATURE	Sex
17	J. G. Senthil Kumar 36 TMC Colony Loyamudi Colony Road - 4 9003245662	<i>[Signature]</i>	M
18	P. Rajagopal Kumar 65, 4th Street Nagayyankuppam Colony 67-6 Chennai 9942352257	<i>[Signature]</i>	M
19	P. Senthil Kumar 29 K. Nagar Loyamudi Colony Chennai - 4 9500373250	<i>[Signature]</i>	M
20	M. Senthil Kumar 10th Street, Nagayyankuppam Colony Nagayyankuppam Colony (Chennai) Chennai - 641652 9843349146	<i>[Signature]</i>	M
21	M. Senthil Kumar 2/139, Nagayyankuppam Colony & Chennai Chennai - 641605 9843716106	<i>[Signature]</i> 24/01/18	M
22	S. Senthil Kumar T.M.C., Chennai, Chennai	<i>[Signature]</i>	F
23	M. Senthil Kumar A.M.C. Chennai	<i>[Signature]</i>	F
24	S. Senthil Kumar A.M.C. Chennai	<i>[Signature]</i>	F

TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4
UNDERGROUND SEWERAGE SCHEME 15

S.No	NAME, ADDRESS & PHONE NO	SIGNATURE	
25	ABIRAMI S AMC Tiruppur NA	[Signature]	F
26	NATHAYA M AMC Tiruppur	M. N. [Signature]	F
27	Panjanka B. AMC Tiruppur	[Signature] B.	F
28	K. Bhwaneshwari AMC Tiruppur	K. [Signature]	F
29	S. I. Shrutti TMC Tiruppur	[Signature]	M
30	V. [Signature] [Signature] P. N. [Signature] [Signature] 7305043486	[Signature]	M
31	V. [Signature] 16/4 [Signature] P. N. [Signature] [Signature] 9095770683	[Signature]	M
32	K. Mohanambal No 35 K.M. Nagar 8th Street, Tiruppur mobile no 9994630998	[Signature]	M

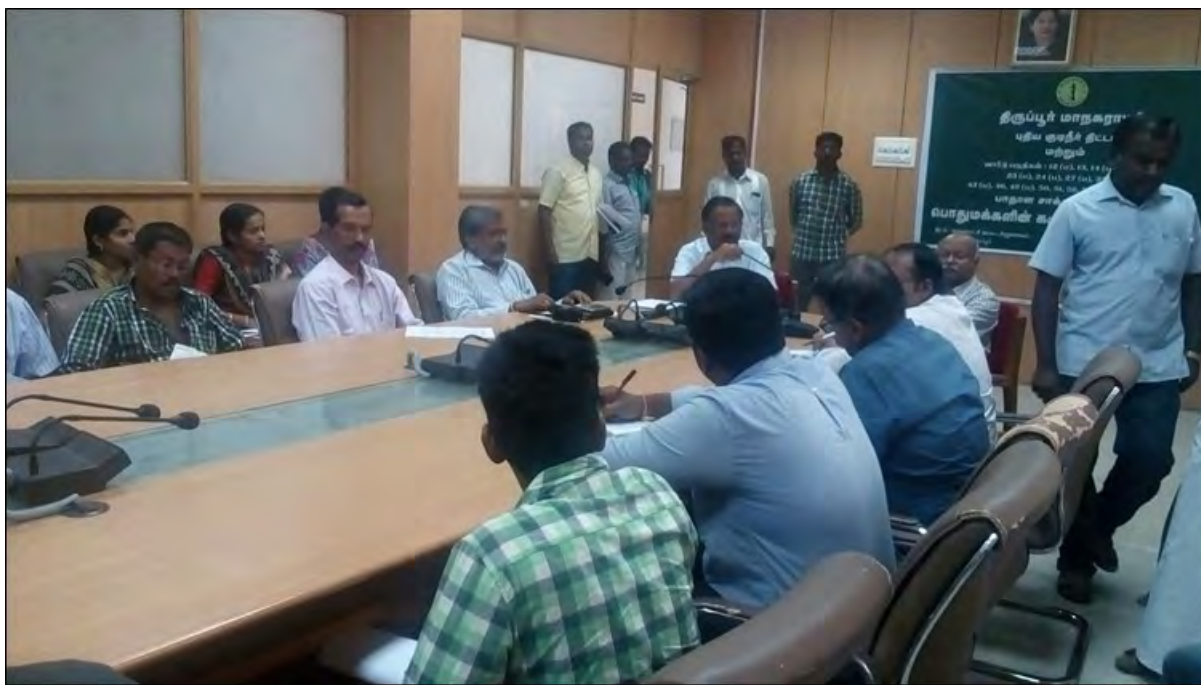
TIRUPPUR CITY MUNICIPAL CORPORATION
WATER SUPPLY SCHEME 4.
16 UNDERGROUND SEWERAGE SCHEME

S.No	NAME, ADDRESS & PHONE NO	SIGNATURE	
	P. R. [Signature] AMC 9443427156	[Signature]	M
	66. [Signature] [Signature] [Signature] 641603		

Photos of Public Hearing









தினமணி
24 JAN 2018

**குடிநீர், பாதாள சாக்கடைத் திட்டம் குறித்து
பொதுமக்களிடம் இன்று கருத்துக் கேட்பு**

திருப்பூர், ஜன. 23: மாநகராட்சி பகுதியில் பாதாள சாக்கடைத் திட்டம் மற்றும் புதிய குடிநீர் திட்டம் செயல்படுத்துவது தொடர்பாக பொதுமக்களிடம் புதுச்சேரி (ஜனவரி 24) அன்று கேட்கப்படுகிறது.

இதன்கீழ் மாநகராட்சி ஆணையர் மா.அ.செகரன் கூறி வதாவது:

திருப்பூர் பழைய மாநகராட்சி பகுதியில் பாதாள சாக்கடைத் திட்டம் செயல்பாட்டில் உள்ளது. அதேபோல், மாநகராட்சி 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 45, 49, 50, 57, 56, 58, 59 மற்றும் 60-வது வார்டு பகுதிகளில் ரூ.300 கோடியில் இத் திட்டம் செயல்படுத்தப்பட உள்ளது.

மேலும், பெரியளிக்கார்பாளையம் அறிநீர் பாய்வை வளர்த்துக் கொடுக்க கருத்துக் கத்திகொடுப்பவர்களும், ஆண்டிபாணையத் தில் புதிய கத்திகொடுப்பவர்களும் கூட்ட முடிவு செயல்பட்டுள்ளது. இதனொட்டி பணம் எவ்வளவு அருத்துக்களைக் கேட்கும்

கலந்தாலங்கம் கூட்டம் தொடர் பணியும் 2-ஆம் மண்டலம் அலுவலகத்தில், ஜனவரி 24-ஆம் தேதி காலை 11 மணிக்கும், மாநகராட்சி எம்மடி அலுவலகத்தில் பகல் 12 மணிக்கும் தொடங்குகிறது. இக் கூட்டத்தில் பொதுமக்கள் கருத்துகளைத் தெரிவிக்கலாம்.

அதோடு திருப்பூர் மாநகராட்சி பகுதியில் மூன்று குடிநீர் திட்டங்கள் செயல்பாட்டில் உள்ளது. ஆகும் 2017-18 திட்டத்தில் கிட்டி ரூ.34 கோடியில் புதிய குடிநீர் திட்டம் செயல்படுத்தப்பட உள்ளது. இத் திட்டத்தில் புதிய மேம்பாடுகள் தீர்த்தெடுத்த தொடர்புடன் கூட்டுதல் குடிநீர் திட்டத்துக்கு ஜூன் 1-ல் பதித்தல் மற்றும் குடிநீர் விநியோகம் ஜூன் 1-ல் பதித்தல் பொன்ற பணிகள் மேற்கொள்ளப்பட உள்ளன. இதுதொடர்பாகவும் அறிக்கை தயார் செய்யப்பட உள்ளது என்பது.

Summary: Information on Proposed Project in Tiruppur



தினமலர்
24. JAN 2018

**பாதாள சாக்கடை திட்டம்
இன்று கருத்து கேட்பு**

திருப்பூர் - ஜன. 24-
புதுச்சேரி நகராட்சி நிர்வாகப் பொதுத் திட்டம் உள்ள, கனம்மாறு குடிநீர் திட்டம் மற்றும் பாதாள சாக்கடை திட்டம் தொடர்பாக, பொதுமக்கள் கருத்துக் கேட்பு கூட்டம், இன்று நடைபெறுவதாகும்.

திருப்பூர் மாநகராட்சி, 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 46, 49, 50, 51, 56, 58, 59 மற்றும், 60வது வார்டுகளில், பாதாள சாக்கடை திட்டம் செயல்படுத்தப்பட உள்ளது. இந்தத் திட்டம் தொடர்பான கருத்துக் கேட்பு கூட்டம், தலைமையில் அலுவலகத்தில், இன்று (24ம் தேதி) மாலை, 12:00 மணிக்கு நடைபெறுவதாகும். பொதுமக்கள் இதில் பங்கேற்று, கருத்துக்களை தெரிவிக்கலாம்.

மாநகராட்சியில், ஒன்று குடிநீர் திட்டங்கள் செயல்பட்டதாக உள்ளன. ஆம்னாடி 2017-18ம் ஆண்டு திட்டத்தில், 334 கோடி ரூபாயில், புதிய குடிநீர் திட்டம் செயல்படுத்தப்பட உள்ளது. இதில், புதிய மேல்நிலை தொட்டிகள் கட்டுதல், குடிநீர் நேற்று குழாய் மற்றும் குடிநீர் விநியோக துறர்கள் பதிக்கும் மணி மேற்கொள்ளப்பட உள்ளது. சர்க்கார் பெரியபாளையம் கழிவுநீர் பாங்கு அளாகத்தில், கருதல் சுத்திதர்ப்பு மையம், ஆண்டிபாஸளையத்தில் புதிய சுத்திகரிப்பு மையம் கட்டப்பட உள்ளது.

இது தொடர்பான பொதுமக்கள் கருத்துக் கேட்பு கூட்டம், தொடர்புபாளையம் மண்டல அலுவலகத்தில், இன்று (24ம் தேதி) காலை, 11:00 மணிக்கு மாநகராட்சி அலுவலகத்தில், மாலை, 12:00 மணிக்கு நடக்கிறது. பொதுமக்கள் பங்கேற்று, இந்தத் திட்டம் குறித்தும் கருத்து தெரிவிக்கலாம் என, மாநகராட்சி நிர்வாகம் அனுமதிப்புகிறது.

24/1/18

Summary: Information on Proposed Project in Tiruppur

தினமணி

25 JAN 2018

குடிநீர், புதை சாக்கடைத் திட்டங்கள்: பொது மக்களிடம் கருத்துக் கேட்பு

திருப்பூர், ஜன. 24: திருப்பூர் மாநகராட்சிப் பகுதியில் புதிதாக குடிநீர் திட்டம், புதை சாக்கடைத் திட்டம் ஆகியவற்றை செயல்படுத்துவது தொடர்பாக பொது மக்களிடம் புதன்கிழமை கருத்துக் கேட்கப்பட்டது.

திருப்பூர் மாநகராட்சி பகுதியில் மூன்று குடிநீர் திட்டங்கள் செயல்பாட்டில் உள்ளன. இந்நிலையில், அம்ருத் 2017-18ஆம் திட்டத்தின் கீழ் ரூ. 834 கோடியில் புதிய குடிநீர் திட்டம்

செயல்படுத்தப்பட உள்ளது. வார்டு எண் 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 46, 49, 50, 51, 56, 58, 59 மற்றும் 60 ஆகிய பகுதிகளில் ரூ. 300 கோடியில் புதை சாக்கடைத் திட்டம் செயல்படுத்தப்பட உள்ளது. பெரிய சர்க்கார்பாளையம் அறிவுநீர் பள்ளை வளாகத்தில் கூடுதல் சுத்திகரிப்பு மையமும், ஆண்டிபாளையத்தில் புதிதாக சுத்திகரிப்பு மையமும் கூட்ட முடிவு செய்யப்பட்டுள்ளது. இது தொடர்பாக பொது மக்க

ளிடம் கருத்துகளைக் கேட்கும் கலந்தாய்வுக் கூட்டம், திருப்பூர், மாநகராட்சி அலுவலகத்தில் புதன்கிழமை நடைபெற்றது. இதில், மாநகராட்சி செயற்பொறியாளர் தமிழ்செல்வன், கலந்துகொண்டு இந்த இரு திட்டங்கள் குறித்தும் விளக்கினார். தொடர்ந்து பொதுமக்கள் கேட்ட சந்தேகங்களுக்கு பதில் கூறினார். இதில் அதிகாரிகள் மற்றும் பொதுமக்கள் பங்கேற்றனர்.

Summary: Information on Proposed Project in Tiruppur

Public Hearing - Newspaper Clippings

தினகரன்
25 JAN 2018

திருப்பூர் மாநகராட்சியில்

பாதாள சாக்கடை திட்டம் குறித்து
பொதுமக்களிடம் கருத்து கேட்பு



திருப்பூர் மாநகராட்சி சார்பில் பாதாள சாக்கடை மற்றும் கலையுண்டிய குடிநீர் திட்டம் குறித்து பொதுமக்களிடம் கருத்து கேட்கும் நிகழ்வு மாநகராட்சி கூட்டறையில் நேற்று நடைபெற்றது.

திருப்பூர், ஜன.25: திருப்பூர் மாநகராட்சி பகுதியில் புதிய குடிநீர் திட்டம் மற்றும் பாதாள சாக்கடை திட்டம் செயல்படுத்துவது தொடர்பாக பொதுமக்களிடம் நேற்று கருத்து கேட்கப்பட்டது.

திருப்பூர் மாநகராட்சி பகுதியில் ஒன்று குடிநீர் திட்டங்கள் செயல்பாட்டில் உள்ளது. அம்மாதிரி திட்டத்தின் கீழ் குடிநீர் கோடியில் புதிய குடிநீர் திட்டம் செயல்படுத்தப்பட உள்ளது. இத்திட்டத்தில் புதிய மேல்நிலை நீர்த்தேக்க தொட்டிகள்

கட்டும், குடிநீர் திரைந்து குழாய்கள் பதிக்கும்மற்றும் குடிநீர் விரிவாக குழாய்கள் பதிக்கப்போவதுமற்றும் மேற்கொள்ளப்பட உள்ளது. இது தொடர்பாகவும், வாராண்டு எண். 12, 13, 14, 22, 23, 24, 27, 32, 43, 44, 45, 49, 59, 61, 66, 68, 69 மற்றும் 69 ஆகிய பகுதிகளில் 300 கோடியில் பாதாள சாக்கடை திட்டம் செயல்படுத்தப்பட உள்ளது.

பெரிய சரக்கார பாண்டலம் கழிவு நீர் பண்ணை வளாகத்தில் கட்டுதல் கத்திரியடிமையூம், துண்டியுபாண்டலம்

இல் புதிய கத்திரியடிமையூம் கட்டும் முடிவு செய்யப்பட்டுள்ளது. இது தொடர்பாகவும் வளாக வளிக் கருத்துக்களை கேட்கும் கலந்தாய்வும் கட்டம் திருப்பூர் மாநகராட்சி அலுவலகத்தில் நேற்று நடந்தது. இதில் மாநகராட்சி செயலாளர் தாழிசெல்வன், கலந்துகொண்டு இந்த இரண்டு திட்டங்கள் குறித்தும் வினாக்கள் கவனமாக தொடர்ந்து பொதுமக்கள் கேட்ட சந்தேகங்களுக்கு பதிலளித்தார். இதில், அதிவாரியின் மற்றும் பொதுமக்கள் பங்கேற்றனர்.

Summary: Information on Proposed Project in Tiruppur

25 JAN 2018

திருப்பூரில் ரூ. 834 கோடியில் புதிய குடிநீர்த் திட்டம்

திருப்பூர் துறை 24 திருப்பூர் மாநகர டிராப்ட்ஸ்மேன் குழித் தொலைவு பூங்காவில் ரூ. 834 கோடி மதிப்பீட்டில் புதியதான குழித் திட்டம் செயல்படுத்தப்பட உள்ளது.

திருநெல்வேலியில் இருந்து வந்த பாதாளக் கடத்தல் குழு பிப்ரவரி 20-ம் திகதி சென்னை ஸ்டீட்ஸ்-வாழ்விடங்களில் இருந்து கிட்டாய் பாதாளக் கடத்தல் குழு, சென்னை-பாண்டிச்சேரி இடைவழி மீட்டை அடுத்து கிழக்குப் புதியதில் கைப்பற்றித் திருநெல்வேலி, சென்னை, செலிபென் ஸ்டீட்ஸ்-வாழ்விடங்களில் கைப்பற்றித்

இந்தியக் கல்வித் துறைக்குப் பரிந்துரைக்கப்பட்டிருக்கிற கல்வித் திட்டம் மிகவும் அறிவுறுத்தல் திட்டம் எனப்படும். அப்படித் திட்டம் அறிவுறுத்தல் திட்டம்.

மார்ச் 2017-ஆம் ஆண்டு மக்கள் தொடர்பு வாரியத்திற்குப் புகார் திருப்பூர் மக்கள் தொடர்பு 8 வட்டத்தில் ஆயிரத்து 778 ஆகும். 2020-ஆம் ஆண்டு கணிதம் மக்கள் தொடர்பு 10 வட்டத்தில் 89 ஆயிரமாக இதை நுகர்வாய்ப்பு மையப்படுத்தித் தள்ளுபடி செய்யப்பட்டுள்ளது. அதே நேரத்தில் இதுவரை மக்கள் தொடர்பு 138 மாவட்டம் ஆகத் தென்பட்டது. இவ்விடங்களில் மக்கள் தொடர்பு மையம் செயல்படுத்தி வருகிறது. இதுவரை திருப்பூர் மாவட்டம் இதுவரை 4 ஆயிரம் 600-ஐ அப்படி மையப்படுத்தியதாக 30 மாவட்டம் ஆகத் தென்பட்டது.

பொது சுகாதார விநியோக உள்
கட்டமைப்பு வசதி இல்லாததால் 2
புறம் 3 டிரைவர் இலு, வெளியில்

[illegible]

மேட்டியாண்டைப் பாலாதி ஆற்றில் இருந்து நல்லூர் சென்று வரப்படுகிறது. அங்கு கத்திரிக் கட்டைப் பூக்கியேற்றும் செப்டம்பர் 22-23 கிரேஸ் பீட்டர் தொழிலாளர் செயல்துறாவின் அமைச்சர்கள் 176 மைலங்கு தூரத்தி் கத்திரிக் பூவைக் கட்டி அமைச்சர்கள் கையேற்றுவதற்காகக் கட்டடம் 3 மடங்கு கட்டி ரூபாய் 20 லட்சம் வீதம் செலவைச் செலவிட்டது. 28 திசம்பரில் செலவுகள் அமைச்சர்கள் மாநில முதலில் 850 கிரேஸ் பீட்டர் பூக்கியேற்றுவதற்காக அமைச்சர்கள் 1 லட்சத்தி் ரூபாயில் கட்டிடத்தி் தூறாவை அமைச்சர்கள் கட்டி விட்டுப் போனது. இந்தக் கட்டிடத்தைப் பணி அதிகம் ஒன்று மாற்றுவதில் செலவுகள் மாற்றாட்சி மூலம் நேரடியாகக் கட்டினால் பணி மேற்கொள்ளப்படுகிறது. இவ்வாறு ஆண்டுவாரியல் பணி நிறைவடைவு கால அளவு நேரமாகிவிட்டிருப்பதால்

இந்தியா-ஓசூர் நகரவாசிகள்

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தினமணி

25 JAN 2018

திருப்பூர் மாநகரில் 17 வார்டுகளில் ரூ. 250 கோடியில் புதை சாக்கடைத் திட்டம் விரிவாக்கம்

திருப்பூர் ஐ.என். 84 திருப்பூர் மாநகரில் 17 வார்டுகளில் புதை சாக்கடைத் திட்டத்தை ரூ. 250 கோடி மதிப்பில் விரிவாக்கம் செய்வ முயற்சி எடுக்கப்பட்டுள்ளது.

இது குறித்து மாநகராட்சியில் புறங்கொள்கைகள் அலுவலரோடு சேர்ந்து கூட்டம் நடைபெற்றது. இத்திட்டம் குறித்து சென்னை மாநகராட்சியின் அலுவலர் கூறியதாவது:

திருப்பூர் மாநகரில் ஏற்கனவே புதை சாக்கடைத் திட்டம் நடைமுறையில் உள்ளது. விரிவாக்கத் திட்டப்பகுதிகளில்

புதை சாக்கடைத் திட்டம் இதுவரை செயல்படுத்தப்படவில்லை. எனவே, தற்போது 12 (பகுதி), 13, 14 (பகுதி), 22 (பகுதி), 23 (பகுதி), 24 (பகுதி), 27 (பகுதி), 32 (பகுதி), 43 (பகுதி), 46, 49 (பகுதி), 50, 51, 56, 58, 59 மற்றும் 60 ஆகிய 17 வார்டுகளில் தற்போது புதை சாக்கடைத் திட்டத்தை அங்கு 2017 - 18 திட்டத்தின்படி ரூ. 250 கோடியில் செயல்படுத்தப்பட முயற்சி எடுக்கப்பட்டுள்ளது. இத்திட்டத்தின் கீழ் 17 வார்டுகளில் பல்

குத் தொகை 50 சதவீதம் என்ற அடிப்படையில் ரூ. 125 கோடி, பல்மாநில அரசு மானியம் 20 சதவீதம் என்ற

அடிப்படையில் ரூ. 50 கோடியும் வழங்கப்படும். மேலும் 20 சதவீத பங்குத் தொகையான ரூ. 75 கோடி ஆகிய வளர்ச்சி வங்கி மூலம் பெறப்படுகிறது. இந்த ரூ. 75 கோடியில் 25 சதவீதம் அதாவது ரூ. 18.75 கோடி நிதியுதவி அரசு வழங்கப்படுகிறது. இதில் 75 சதவீதம் அதாவது 56.25 கோடி கடன் தொகை ஆகும்.

மேற்கண்ட 17 வார்டுகளில் 2020 ஆம் ஆண்டுவரை தொகை உத்தேச மதிப்பீட்டின்படி 2 லட்சத்து 20 ஆயிரத்து 91 செ.அடிகள்.

இப்பகுதிகளில் தினமும் 24.19 எம்எல்டி ஆயிரத்திற்கும் இடைக்கால ஆயிரத்திற்கும் 33.17 எம்எல்டி காகும், உச்சகால ஆயிரத்திற்கும் 43.83 எம்எல்டி காகும் களங்கிப்பட்டுள்ளது.

திருப்பூர் மாநகர திரு அலுவலர் கூறியது: 17 ஆயிரத்திற்கும் மேல் மானியம் மிகவும்

பட்டுள்ளது. மேற்படி 17 வார்டுகளில் உள்மடக்கிய 7 மண்டலங்களில் ஆயிரத்திற்கும் 802 ஆயிரத்திற்கும் மேல் (மேல்) அளவாகப்படும் இத்திட்டத்தின் மூலம் 33 ஆயிரத்து 657 வீட்டு இணைப்புகள் வழங்கப்படும். இத்திட்டத்தின் கீழ் சர்க்கார் பாணியத்தில் 75 எம்எல்டி, சந்திரிப்பு நிலையமும், ஆண்டி பாணியத்தில் 79 எம்எல்டி, சந்திரிப்பு நிலையமும் அமைக்கப்படும்.

இத்திட்டப்பணியை 24 மாதங்களில் நிறைவேற்றி, 6 மாதங்கள் சொதனை ஒட்டம் செய்து, ஒப்பந்ததாரரின் பராமரிப்புக்கு 3 ஆண்டுகள் வழங்கப்படும். இத்திட்டம் நிறைவேடத்தால் 2 லட்சத்து 20 ஆயிரத்து 91 வீடுகள் புதை சாக்கடை இணைப்பு வசதி பெற்று பயனடைவார்கள் என்றார்.

Summary: Information on Proposed Project in Tiruppur

தீக்கதிரி

25 - JAN 2018

திருப்பூர் மாநகரில் 17 வார்டுகளில் ரூ.250 கோடியில் பாதாளச் சாக்கடைத் திட்டம்

திருப்பூர், ஜன.24 - ஆகும்.

திருப்பூர் மாநகரில் 17 வார்டுகளில் பாதாளச் சாக்கடைத் திட்டத்தை ரூ.250 கோடி மதிப்பில் விரைக்கப் செய்வ முடிவு செய்யப்பட்டுள்ளது.

இதுகுறித்து மாநகராட்சியில் புதன் கிழமை மக்கள் கவனத்தையோசனைக் கூட்டம் நடைபெற்றது. இதில் செயல்பொறி வாரன் எம்.வி.டி. தமிழ்ச்செல்வன் வினக் கியதாவது: திருப்பூர் மாநகரில் இருக்கையே பழைய மாநகராட்சியில் பாதாளச் சாக்கடைத் திட்டம் நடைமுறையில் உள்ளது. விரிவுபடுத்தப்பட்ட பகுதிகளில் பாதாளச் சாக்கடை இதுவரை இல்லை. எனவே தற்போது 12 (பகுதி), 13, 14 (பகுதி), 22 (பகுதி), 23 (பகுதி), 24 (பகுதி), 27 (பகுதி), 32 (பகுதி), 43 (பகுதி), 46, 49 (பகுதி), 50, 51, 56, 58, 59 மற்றும் 60 ஆகிய 17 வார்டுகளில் தற்போது பாதாளச் சாக்கடைத் திட்டம் அமரத் 2017-18 திட்டத்திற்கு ரூ.250 கோடியில் செயல்படுத்தப்பட உள்ளது. இத்திட்டத்தில் மத்திய அரசின் மானியப் பங்குத் தொகை 50 சதவிகிதம் என்ற அடிப்படையில் ரூ.125 கோடியும், மாநில அரசு மானியம் 20 சதவிகிதம் என்ற அடிப்படையில் ரூ.50 கோடியும் வழங்கப்படும். மீதமுள்ள 30 சதவிகித பங்குத் தொகையான ரூ.75 கோடி ஆசிய வளர்ச்சி வங்கி மூலம் பெறப்படுகிறது. இந்த ரூ.75 கோடியில் 25 சதவிகிதம் அநாவது ரூ.18.75 கோடி நிதிநலவியாக வழங்கப்படுகிறது. ஆகிய 75 சதவிகிதம் அநாவது 56.25 கோடி கடன் தொகை

மேற்கண்ட 17 வார்டு பகுதிகளில் 2020ஆம் ஆண்டு மக்கள்தொகை உத்தேச மதிப்பீட்டின்படி 2 லட்சத்து 20 ஆயிரத்து 91 பேர் ஆகும். இப்பகுதிகளில் தினமும் 24.19 எம்எஸ்டி சுழிவுதர் வரும். இலடக்கால சுழிவுதர் அளவு 33.17 எம்எஸ்டியாகவும், உச்சகால சுழிவுதர் 43.50 எம்எஸ்டியாகவும் கணக்கிடப்பட்டுள்ளது.

திருப்பூர் மாநகர திட அமைப்பின்படி 17 சுழிவுதர் கோரிப்பு அண்டலங்களைப் பிரிக்கப்பட்டுள்ளன. மேற்படி 17 வார்டு களை உண்டாக்கிய 7 மண்டலங்களில் சுழிவுதர் கோரிப்புக்கு 200 மீட்டர் முதல் 800 மீட்டர் விட்டமுள்ள குழாய்கள் 274 கீமேரிட்டர் தூரத்துக்கு அமைக்கப்படுகிறது. இதில் 10 ஆயிரத்து 882 ஆள் இறக்கு குழியாகும் (மேன்மேலாம்) அமைக்கப்படும். இத்திட்டத்தின் மூலம் 33 ஆயிரத்து 851 வீட்டு இணைப்புகள் வறங்கப்பட உள்ளது. இத்திட்டத்தில் பெரிய அக்களப்பாணையத்தில் 15 எம்எஸ்டி சுத்திகரிப்பு திறவறம், ஆண்டபாணையத்தில் 19 எம்எஸ்டி சுத்திகரிப்பு திறவறம் அமைக்கப்படும்.

இத்திட்டப் பணியை 24 வாரங்களில் நிறைவேற்றி, 6 வாரங்கள் சோதனை ஓட்டம் செய்து, முடிந்தததாரின் பராமரிப்புக்கு 3 ஆண்டுகள் வழங்கப்படும். இத்திட்டம் நிறைவடைந்தால் 2 லட்சத்து 20 ஆயிரத்து 91 வீடுகள் பாதாளச் சாக்கடை வசதி பெற்று பயனடையும். இவ்வாறு தமிழ்ச்செல்வன் தெரிவித்தார்.

Summary: Information on Proposed Project in Tiruppur

ENVIRONMENTAL AUDIT OF EXISTING SEWAGE TREATMENT PLANT IN SARKARPERIYAPALYAM, TIRUPPUR

I. Introduction

1. Under the ADB funded Tamil Nadu Urban Flagship Investment Program (TNUFIP), it is proposed to develop sewer system (sewer collection and conveyance infrastructure) in Tiruppur City Municipal Corporation. The existing STP plant located in Sarkarperiyapalayam of capacity 15 MLD is proposed to get augmented with capacity 30 MLD by addition of new aeration tanks. Also it is proposed to construct New Sewerage Treatment Plants at Sarkarperiyapalayam & Chinnandipalayam under DBOT basis.

Therefore the existing STP is an associated facility as per the ADB Safeguard Policy Statement 2009. Compliance with the environmental safeguards will ensure the subproject sustainability, and therefore, ADB SPS requires conduct of environmental audit of associated facilities.

2. The objectives of this environmental audit are to (i) assess the compliance of the existing sewage treatment plant (STP) with country's environmental regulatory framework; (ii) improve environmental performance, as required, through monitoring the effectiveness of the management system; and (iii) increase the TCMC's knowledge of its activities, thus increasing its ability to continually improve and minimize future potential liabilities.

2. The environmental audit was carried out during IEE report preparation in 2018. The methodology adopted for this audit was to initially review existing plans and technical information and list various activities being carried out in the STP. Due diligence was carried out to physically check whether environmental performance, health and safety, etc. were in compliance with national and state prescribed standards and guidelines. Team visited the STP and observed operations. Meetings and discussions with key personnel were held during the audit. Various documentations regarding the operational aspects were also checked.

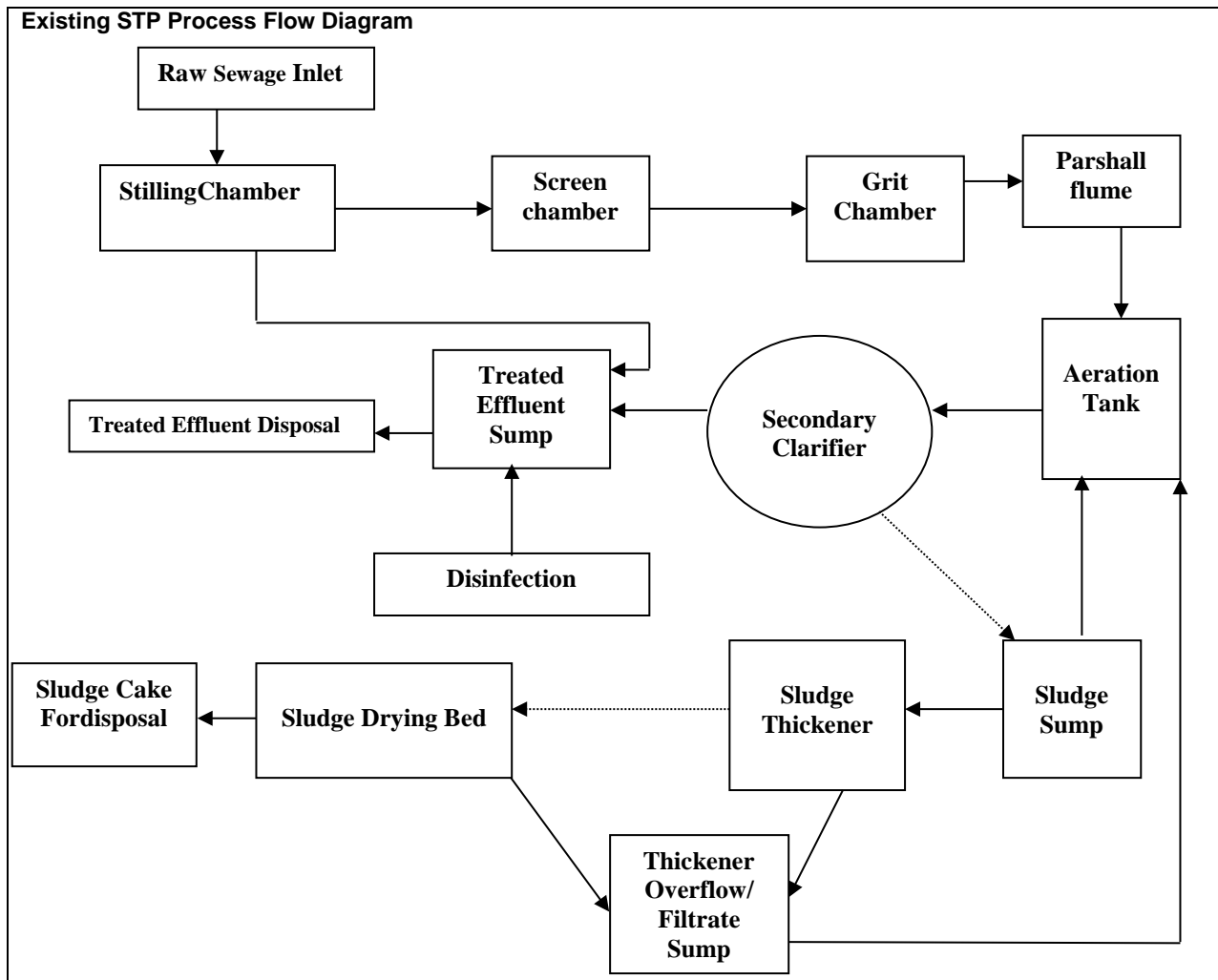
3. A more detailed environmental audit and risk assessment shall be carried out by competent and independent third party auditors during detailed design stage.

II. Description of the STP

iii. Description of the STP

Location	Sarkarperiyapalayam, Tiruppur City Latitude: 11° 7'54.04"N Longitude: 77°25'2.50"E															
Start of operation (year)	2009															
Owned by	Tirunelveli City Municipal Corporation															
Operation & Maintenance	Tech Mahendra															
Contact person and designation	Chief Engineer, TCMC															
Capacity	30 million liters per day (MLD)															
Sewage treatment process	The Sewage treatment process is Extended aeration process. Facility has the following components: (i) Stilling Chamber, (ii) Screening, (iii) Detritor, (iv) Aeration Tank, (v) Secondary Clarifier, and (vi) Treated Effluent Sump. (vii) Sludge Treatment. Technical details of STP units are as follows:															
	<table><tr><th rowspan="2">Component</th><th colspan="3">Size in meters</th><th rowspan="2">Detention Period</th><th rowspan="2">No of Units</th></tr><tr><th>Length</th><th>Breadth</th><th>Depth</th></tr><tr><td>Stilling Chamber</td><td>5.0</td><td>1.10</td><td>1.4</td><td>15 seconds</td><td>1</td></tr></table>	Component	Size in meters			Detention Period	No of Units	Length	Breadth	Depth	Stilling Chamber	5.0	1.10	1.4	15 seconds	1
Component	Size in meters			Detention Period	No of Units											
	Length	Breadth	Depth													
Stilling Chamber	5.0	1.10	1.4	15 seconds	1											

	Screen Chamber	Two racks of 10mm thick mild steel flats(1 no. is equipped with mechanical cleaning system)			30 Seconds	2
	Detritor (Grit Chamber)	6.0	6.0	1.2	30 seconds	2
	Aeration Tank with surface type Aerators (4 nos. in each tank)	84.0	21.0	4.5	24 Hours	2
	Secondary Clarifier	-	23.5 dia	3.0	2.5 hours	2
	Treated Effluent Sump	17.5	8.0	2.0	-	1
	Sludge Sump	13	6.	3.0	-	1
	Sludge Thickener	-	12.0 dia	3.3	-	1
	Sludge Drying Beds	21.4	10.0		-	16
	Thickener Overflow/Filtrate Sump	6.2	6.2	2.0	-	1
	Disinfection of treated sewage from secondary clarifier is done with sodium hypochlorite solution in treated effluent sump. For this purpose, two numbers sintex tank each designed for 12hrs operation are provided for sodium hypo chlorite solution preparation and dosing. The dosing is done by gravity using constant head dosing box. Commercially available sodium hypochlorite solution is brought to the plant by tanker and stored in HDPE tanks. Two numbers sodium hypochlorite transfer pumps are provided to transfer the solution from tankers to storage tank and from storage tank to dosing tanks.					
	Treatment Process at STP (Sarkarperiyapalayam): The sewage treatment plant is located at Sarkarperiyapalayam village about 9.3 Km from terminal pumping station. The designed capacity of the sewage treatment plant is 15 MLD with preliminary units like screens, grit chamber constructed for 30 MLD. The capacity can be augmented to 30 MLD by modular expansion of Aeration Tank and Clarifiers etc. The treatment process is extended aeration process. The sewage after treatment will flows through a closed conduit by gravity to a nearby overflow channel of Nanjarayan channel, then this will flow and gets merge into the Noyyal river at distance of 1.2 km from existing STP.					





View of Existing STP

Treatment efficiency

Normally about 75% treatment efficiency (BOD removal) is expected in aeration tanks. Also disinfection is done to maintain the fecal coliform. So the overall efficiency of treatment can be expected from extended aeration process at a minimum of 85%. However, in Tiruppur, the inlet and outlet effluent quality data from the STP indicate that treatment efficiency is about 90 – 95 %, which is satisfactory. The treated sewage BOD is in the range of 8-20 mg/l. The existing operation is satisfactory. Laboratory reports are as follows.

STP Parameters in mg/L		1/Jan /17	1/Feb /17	1/Mar /17	1/Apr /17	1/May /17	1/Jun /17	1/Jul y/17	1/Aug /17	1/Sep /17	1/Oct /17	1/Nov /17	1/Dec /17
Inlet	BOD	156	172	159	155	175	171	222	201	249	208	222	225
Outlet	BOD	8	13	12	9	10	9	10	14	20	14	19	11
Inlet	COD	410	429	421	427	487	450	503	509	570	526	531	574
Outlet	COD	29	37	52	38	37	31	35	43	99	57	73	43
Inlet	TSS	159	177	214	192	227	196	229	216	244	230	226	186
Outlet	TSS	10	18	18	10	11	11	12	15	29	16	30	12
Inlet	PH	7.23	7.21	7.25	7.12	7.30	7.30	7.32	7.34	7.17	7.21	7.23	7.26
Outlet	PH	7.62	7.57	7.54	7.55	7.57	7.56	7.59	7.57	7.30	7.43	7.50	7.50

Sludge management

Excess sludge from the clarifiers is collected in a sludge sump and a portion of sludge is recycled to the aeration tank using return sludge pumps for maintaining the required MLSS concentration. The remaining sludge is pumped to Gravity Thickener for increasing the sludge consistency. The sludge sump is provided for uniform solids loading to the thickener. Agitators are provided in the sludge sump to maintain the solids in suspension. Two numbers thickener feed pumps (1W +1S) are provided for feeding the sludge to the thickener. The sludge thickener is designed for ultimate peak flow conditions. The thickeners feed pumps are housed in sludge pump house. The thickened sludge of about 2.5-3 % consistency is sent to the sludge drying beds for further dewatering. The filtrate from the sludge drying beds and overflow from the thickener is collected in Thickener overflow/filtrate sump which is designed

	for ultimate peak flow conditions. Thickener overflow and filtrate is re-circulated to aeration tank with thickener overflow transfer pumps. The dried sludge cake from the drying beds is collected in the sludge storage yard and disposed off.
Treated wastewater (effluent disposal)	According to the consent order (CTO) of TNPCB for STP operation, STP have to install UV treatment system for the disinfection of the treated sewage as per the proposal, till then the STP shall carryout the present post disinfection process for the treated sewage before it is disposed into overflow channel of Nanjarayan kulam, then overflow channel will flow and gets merge into the Noyyal river at distance of 1.2 km from the existing STP. The treated sewage water will be within the standards set by CPCB/TNPCB.

III. Compliance with Applicable National and State Laws, Rules, and Regulations

Law, Rules, and Regulations	Description and Requirement	STP at Sarkarperiyapalayam, Tiruppur
		Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant ^a N/A = not applicable (state justification)
EIA Notification	The EIA Notification of 2006 states that environmental clearance is required for certain defined activities/projects.	N/A Environmental clearance is not required as STPs are not listed in the EIA Notification's "Schedule of Projects Requiring Prior Environmental Clearance"
Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	Storage of chlorine (threshold quantity greater than 10 tons but less than 25 tons) in STPs will require clearance from Tamil Nadu Pollution Control Board (TNPCB).	N/A The chlorine stored at any point of time will be less than 10 tons.
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Consent to operate from TNPCB	Consent to Operate was obtained from TNPCB during 2008 prior to start of operation and corresponding renewals were obtained during 2018 which is valid up to March 31, 2021 vide Proceedings No.T1/TNPCB/F.0556TPN/RL/TPN/A & W/2018, Dated: 14.02.2018 TCMC has complied with the government rules and regulation.
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	Consent to operate from TNPCB	no source of air emissions
Environment (Protection) Act, 1986 and CPCB Environmental Standards	Emissions and discharges from the facilities to be created, refurbished, or augmented shall comply with the notified standards. a. Wastewater disposal standards	As per the CTO issued by TNPCB, STP treated sewage shall achieve the revised standards as follows: pH: 6.5 – 9.0, BOD: <30 mg/l, TSS: < 100 mg/l and Fecal Coliform <1000 MPN/100ml before 12.10.20 Available laboratory reports indicate that STP effluent is not meeting the stipulated disposal standards.
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010	Applicable ambient noise standards with respect to noise for different areas/zones	No source of noise
National Institute of Occupational Safety and Health (NIOSH) Publication No. 2002-149	Compliance with NIOSH Guidance for Controlling Potential Risks to Workers Exposed to Class B Biosolids	Training and proper PPEs are required
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the central government.	N/A

Law, Rules, and Regulations	Description and Requirement	STP at Sarkarperiyapalayam, Tiruppur
		Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant ^a N/A = not applicable (state justification)
Ancient Monuments and Archaeological Sites and Remains Rules of 1959	No development activity is permitted in the "protected area," and all development activities likely to damage the protected property are not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.	N/A
The Child Labor (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule are present.	The Operation and Maintenance (O & M) of the STP is leased out to New Tiruppur Area Development Corporation Limited (NTADCL) for the period of 30 years. No children are engaged.

^a Compliant = There is sufficient and appropriate evidence to demonstrate that the particular regulatory requirement has been complied with; non-compliant = clear evidence has been collected to demonstrate the particular regulatory requirement has not been complied with.

IV. Institutional Arrangement

Parameter	STP
Operations	Continuous operation; involves no mechanical or electrical operation; Except manual operation for removal of debris from the screen, and removal of collected grit from grit chamber, no interference is required in operation of STP.
Manager on-site	Personnel at STP are available on-site
Sewerage/public health engineer on-site	
Estimated number of technical employees on-site per shift	The operation and maintenance (O & M) of the STP has been granted by TCMC for New Tiruppur Area Development Corporation Limited (NTADCL) for the period of 30 years (From 2009 to 2039). However, the compliance of the approvals and status of O & M are monitored by TCMC. The City Engineer, TCMC and Executive Engineer, TCMC will monitor the O & M.
Estimated number of laborers on-site per shift	
Estimated number of employees in charge of environmental management and monitoring	Nil
Frequency of waste water quality monitoring (raw)	Monthly
Frequency of wastewater quality monitoring (treated)	Monthly
Frequency of sludge quality monitoring	not conducted
In-house laboratory for water quality analyses (Yes/None). If none, provide name of third-party laboratory.	In-house laboratory is available at the STP; apparatus to conduct pH, BOD, COD and TSS available Laboratory of TNPCB is located in Tiruppur (North)

TNPCCB Consent order of Existing STP – I located in Sarkarperiyapalayam, Tiruppur**TAMILNADU POLLUTION CONTROL BOARD**

CONSENT ORDER NO. 180827092642 DATED: 14/02/2018.

PROCEEDINGS NO. T1/TNPCCB/F.0556TPN/RL/TPN/A/2018 DATED: 14/02/2018

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT - M/s. NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED, S.F.No. 199,200,202,205, AGRAHARA PERIAPALAYAM village, Uthukkuli Taluk and Tiruppur District - Renewal of Consent for the operation of the plant and discharge of emissions under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) -Issued- Reg.

REF: 1. Proc.No. F.0556TPN/RM/DDE/TNPCCB/TPN/W&A/2015 Dt: 17/11/2015
2. IR.No : F.0556TPN/RL/AEE/TPN/2018 dated 29/01/2018

RENEWAL OF CONSENT is hereby granted under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 (Central Act 14 of 1981) (hereinafter referred to as "The Act") and the rules and orders made there under to

The General Manager
M/s. NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED,
S.F.No. 199,200,202,205,
AGRAHARA PERIAPALAYAM village,
Uthukkuli Taluk,
Tiruppur District.

Authorizing the occupier to operate the industrial plant in the Air Pollution Control Area as notified by the Government and to make discharge of emission from the stacks/chimneys.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending March 31, 2021

R. KANNAN

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KANNAN
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For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai



TAMILNADU POLLUTION CONTROL BOARD

1. This renewal of consent is valid for operating the facility for the manufacture of products (Col. 2) at the rate (Col. 3) mentioned below. Any change in the products and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Treated Sewage	30	MLD

2. This renewal of consent is valid for operating the facility with the below mentioned emission/noise sources along with the control measures and/or stack. Any change in the emission source/control measures/change in stack height has to be brought to the notice of the Board and fresh consent/Amendment has to be obtained.

I Point source emission with stack :				
Stack No.	Point Emission Source	Air pollution Control measures	Stack height from Ground Level in m	Gaseous Discharge in Nm ³ /hr
1	Diesel Generator 625KVA	Acoustic enclosures with stack	30	20
II Fugitive/Noise emission :				
Sl. No.	Fugitive or Noise Emission sources	Type of emission	Control measures	



TAMILNADU POLLUTION CONTROL BOARD

Additional Conditions:

1. The NTADCL shall maintain the stack and acoustic enclosure provided for DG set and ensure that the emission let out from the DG set shall satisfy the Emission/ANL standards prescribed by the Board.
2. In the case of revision of consent fee by the Government, the NTADCL shall remit the difference in amount within one month from the date of notification. Failing to remit the consent fee, this consent order will be withdrawn without any notice and further action will be initiated against the unit as per law.

R. KANNAN

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Date: 2018.07.15 15:58:58
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For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To
The General Manager,
M/s. NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED,
SF NO 199,200,202,205 Agrahara Periapalayam village, Uthukuli Taluk, Tirupur District.
Pin: 641607

Copy to:-

1. The Commissioner, UTHUKULI-Panchayat Union, Uthukuli Taluk, Tiruppur District.
2. The District Environmental Engineer, Tamil Nadu Pollution Control Board, TIRUPPUR NORTH.
3. The JCEE-Monitoring, Tamil Nadu Pollution Control Board, Coimbatore.
4. File



TAMILNADU POLLUTION CONTROL BOARD

CONSENT ORDER NO. 180817002642 DATED: 14/02/2018.

PROCEEDINGS NO. TI/TNPCB/F.0556TPN/RL/TPN/W/2018 DATED: 14/02/2018

SUB: Tamil Nadu Pollution Control Board - RENEWAL OF CONSENT - M/s. NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED, S.F.No. 199,200,202,205, AGRATHARA PERIAPALAYAM village, Uthukkuli Taluk and Tiruppur District - Renewal of Consent for the operation of the plant and discharge of sewage and/or trade effluent under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act 6 of 1974) - Issued- Reg.

REF: 1. Proc.No. F.0556TPN/RM/DEE/TNPCB/TPN/W&A/2015 Dt.: 17/11/2015
2. IR.No : F.0556TPN/RL/AEE/TPN/2018 dated 29/01/2018

RENEWAL OF CONSENT is hereby granted under Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 as amended in 1988 (Central Act, 6 of 1974) (hereinafter referred to as "The Act") and the rules and orders made there under to

The General Manager
M/s. NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED,
S.F.No. 199,200,202,205,
AGRATHARA PERIAPALAYAM Village,
Uthukkuli Taluk,
Tiruppur District.

Authorising the occupier to make discharge of sewage and /or trade effluent.

This is subject to the provisions of the Act, the rules and the orders made there under and the terms and conditions incorporated under the Special and General conditions stipulated in the Consent Order issued earlier and subject to the special conditions annexed.

This RENEWAL OF CONSENT is valid for the period ending March 31, 2021

R. KANNAN

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

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TAMILNADU POLLUTION CONTROL BOARD

1. This renewal of consent is valid for operating the facility for the manufacture of products/byproducts (Col. 2) at the rate (Col 3) mentioned below. Any change in the product/byproduct and its quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Sl. No.	Description	Quantity	Unit
Product Details			
1.	Treated Sewage	30	MLD

2. This renewal of consent is valid for operating the facility with the below mentioned outlets for the discharge of sewage/trade effluent. Any change in the outlets and the quantity has to be brought to the notice of the Board and fresh consent has to be obtained.

Outlet No.	Description of Outlet	Maximum daily discharge in KLD	Point of disposal
Effluent Type : Sewage			
1.	Sewage	30000.0	Inland surface Water
Effluent Type : Trade Effluent			



TAMILNADU POLLUTION CONTROL BOARD

Additional Conditions:

- The NTADCL shall operate and maintain the Sewage Treatment Plant efficiently and continuously and to upgrade and carry out necessary modification so as to comply with the standards if any, imposed by CPCB in future.
- The NTADCL shall achieve the revised standards for sewage treatment plants prescribed by MoEFCC through Notification dated 13.10.2017 (pH: 6.5 to 9.0; B.O.D: 30 mg/L, T.S.S: <100 mg/L, and Fecal Coliform (FC): <1000 MPN/100ml) before 12.10.2022.
- The NTADCL shall analyse the treated sewage periodically and furnish ROA to the Board.
- The NTADCL shall ensure that the treated sewage is disposed into Nallur Odai after satisfying the standards prescribed by the Board and ensure that no untreated sewage gain access to the Nallur Odai under any circumstance.
- The unit shall maintain the new ultrasonic flow meter installed at STP inlet and the V-Notch provided for measuring the flow at the outlet of the STP and record the flow and furnish the same at the time of inspection.
- The NTADCL shall install safety measures in the chlorine handling area as per the norms of Directorate of Explosives.
- The STP shall install UV treatment system for the disinfection of the treated sewage as per the proposal submitted; till then the STP shall carryout the present post disinfection process for the treated sewage before it is disposed into Nallur Odai.
- The NTADCL shall not clean the STP tanks manually and it shall be carried out only by mechanical system with prior intimation to the DEE/TPN.
- Necessary safety equipments, Testing kits, goggles, aprons, gloves, masks, gas detectors etc., should be made available in STP premises and the same shall be used properly while carrying out the cleaning operation.
- The NTADCL shall collect and properly dispose the screening waste collected from the fine screen and grit removal.
- The bio degradable solid waste, non bio degradable solid waste, STP sludge, etc generated from the process activity shall be properly collected, segregated and disposed as per the provisions of Solid waste(Management and Handling) Rules, 2016.
- The NTADCL shall continue to develop adequate green belt within and along the periphery of the unit premises.
- The operation of STP shall not attract any public complaints.
- All precautionary measures shall be taken to avoid foul odour and fly nuisance.
- In the case of revision of consent fee by the Government, the NTADCL shall remit the difference in amount within one month from the date of notification. Failing to remit the consent fee, this consent order will be withdrawn without any notice and further action will be initiated against the unit owner.

R. KANNAN

For Member Secretary,
Tamil Nadu Pollution Control Board,
Chennai

To
The General Manager,
MSA NEW TIRUPUR AREA DEVELOPMENT CORPORATION LIMITED,
SP NO 199,200,202,205 Agraham Periapalayam village, Uthukuli Taluk, Tiruppur District,
Pin: 641607

Copy to:

- The Commissioner, UTHUKULI-Panchayat Union, Uthukuli Taluk, Tiruppur District.
- The District Environmental Engineer, Tamil Nadu Pollution Control Board, TIRUPPUR NORTH.
- The ICES-Monitoring, Tamil Nadu Pollution Control Board, Coimbatore.
- File