Draft Initial Environmental Examination

Project Number: 43253
October 2014

IND: Karnataka Integrated Urban Water Management Investment Program (Tranche 1) – Davangere City Sewerage and Sanitation Scheme

Asian Development Bank

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Tranche 1: Davangere City Sewerage and Sanitation Scheme

Prepared by Karnataka Urban Infrastructure Development and Finance Corporation, Government of Karnataka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 09 October 2014)

Currency unit	–	Indian Rupee (Re/Rs)
Re1.00	=	$ 0.02
$1.00	=	Rs. 61.06

ABBREVIATIONS

ADB	Asian Development Bank
ADB SPS	Asian Development Bank Safeguard Policy Statement
APMC	Agricultural Produce Market Committee
BOD	Bio-Chemical Oxygen Demand
BPL	Below Poverty Line
CAP	Corrective Action Plan
CBO	Community Based Organizations
CC	Complaint Cell
CC Drain	Cement Concrete Drain
CFE	Consent for Establishment
CFO	Consent for Operation
CGWB	Central Ground Water Board
CMC	City Municipal Councils
CPCB	Central Pollution Control Board
dbA	Decibels
DI	Ductile Iron
DPR	Detailed Project Report
DS	Double Suction
EA	Executing Agency
EAC	Expert Appraisal Committee
EC	Environmental Clearance
EIA	Environmental Impact Assessment
ELSR	Elevated Storage Reservoir
EMP	Environmental Management Plan
GDP	Gross Domestic Product
GIL	Grasim Industries Limited
GoI	Government of India
GoK	Government of Karnataka
GLSR	Ground Level Service Reservoir
GRC	Grievance Redress Committee
GSDP	Gross State Domestic Product
ha	Hectares
HDPE	High Density Polyethylene
H&S	Health and Safety
IA	Implementing Agency
IEE	Initial Environmental Examination
IEE	Initial Environmental Examination
IWRM	Integrated Water Resource Management
KIUWMIP	Karnataka Integrated Urban Water Management Investment Program
KMRP	Karnataka Municipal Reforms Project

KSCB	Karnataka Slum Clearance Board
KSPCB	Karnataka State Pollution Control Board
KSRTC	Karnataka State Road Transport Corporation
KTCP	Karnataka Town and Country Planning
KUIDFC	Karnataka Urban Infrastructure Development & Finance Corporation
KUWSDB	Karnataka Urban Water Supply & Drainage Board
M&M	Major and Medium
MFF	MultitrancheFinancing facility
MoEF	Ministry of Environment and Forest
MSL	Mean Sea Level
NEERI	National Environmental Engineering Research Institute
NGO	Non-Government Organisation
NKUSIP	North Karnataka Urban Sector Investment Program
NOx	Nitrogen Oxide
NRW	Non Revenue Water
OCRP	Office of Compliance Review Panel
OHT	Over Head Tank
OSPF	Office of the Special Project Facilitator
O&M	Operations & Maintenance
PC	Program Consultants
PCU	Project Co-ordination Unit
PMU	Program Management Unit
PIU	Program Implementation Unit
PWD	Public Works Department
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RF	Resettlement Framework
RP	Resettlement Plan
RSPM	Residual Suspended Particulate Matter
SC	Scheduled Caste
SEIAA	State Environmental Impact Assessment Authority
SIPMIU	State Investment Program Management and Implementation Unit
SPM	Suspended Particulate Matter
SPS	Sewage Pumping Station
ST	Scheduled Tribe
STP	Sewage Treatment plant
SW	StoneWare
TMC	Town Municipal Council
ToR	Terms of Reference
UGD	Under Ground Drainage
ULB	Urban Local Body
UDWSP	Urban Drinking Water & Sanitation Policy
USD	US Dollars
(U)WSS	(Urban) Water Supply & Sanitation

WEIGHTS AND MEASURES

Kl	kiloliter
km	kilometer
Ha	hectares
HAM	hectares meters
l/hd/dy	liters per head per day
lpcd	liters per capita per day
lps	liters per second
M	million
mbgl	meters below ground level
mcm	million cubic meters
Mg/l	milligram per liter
Mld	million liters per day
m	meter
mm	millimeter

NOTE{S}

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. The Karnataka Integrated Urban Water Management Investment Program (KIUWMIP, the Program) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation (UWSS) while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use.

2. Davangere water supply and sewerage subproject is one of the subprojects proposed in Tranche 1. Sewerage system including a wastewater treatment plant is presently in implementation under the ADB assisted NKUSIP; however this does not cover the entire town. 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 SPS (2009). This Initial Environmental Examination (IEE) addresses components proposed under Tranche 1 which includes sewerage and sanitation components.

3. **Categorization.** Davangere water supply and sewerage subproject is classified as Environmental Category B as per the SPS as no significant impacts are envisioned. Accordingly this Initial Environmental Examination (IEE) has been prepared and assesses the environmental impacts and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

4. **Subproject Scope.** The subproject is formulated under this Investment Program to address gaps in sewerage and sanitation infrastructure in a holistic and integrated manner. Investments under this subproject includes: (i) construction of new sewer network for 204.12 km with 46981 HSC connections in District 1 and 3; (ii) Construction of one 20 MLD STP at Shiva Nagar; (iii) Construction of one 5 MLD STP at Avaragere; and (iv) construction of individual household toilets (3805 Nos) and community toilets (4 Nos of 10 seat each).

5. **Implementation Arrangements.** Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the Executing Agency (EA) responsible for overall technical supervision and execution of all subprojects funded under the Investment Program. Implementation activities will be overseen by a separate Program Management Unit (PMU) in its head office at Bangalore, in coordination with its regional office and 2 divisional offices established to supervise the implementing agencies in each geographical area. A team of senior technical, administrative and financial officials, including safeguards specialists, will assist the PMU in managing and monitoring Program implementation activities. The Implementing Agencies (IA) are ULBs. Project implementation units (PIUs) dedicated exclusively to the project are set up in each town. The PIUs will be staffed by qualified and experienced officers and are responsible for the day-to-day activities of project implementation in the field, and will be under the direct administrative control of the PMU. Consultant teams are responsible for subproject planning and management and assuring technical quality of design and construction; and designing the infrastructure and supervising construction; and safeguards preparation.

6. **Description of the Environment.** Subproject components are located in Davangere urban area or in its immediate surroundings. Major part of the sub project sites are located in existing right of ways (RoWs) and government-owned land, however private land (404.68 m^2) will be required for small portion of the approach road to the STP at Avaragere This land has been donated for the purpose of the project. There are no protected areas, wetlands, mangroves, or estuaries in or near the subproject location. There are no forest areas within or near Davangere. Traffic management will be necessary during pipe laying on busy roads.

7. **Environmental Management.** An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

8. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people, (ii) laying of pipes in RoWs alongside main/access roads, to avoid acquisition of land and impacts on livelihoods specifically in densely populated areas of the city. For the construction of approach road for the 5 MLD STP at Avaragere, 404.68 m^2 private land will required to be and this has donated for the purpose of this project.

9. Potential impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Taking into consideration the future development around the proposed STP site, the following measures have been incorporated; (i) design of a compact, superior treatment process that reduce the likelihood of odor emission; and (ii) sensitive layout design and green buffer zone and no development zone around the facility, and regulation of surrounding land use in strict compliance with Davangere Master Plan.

10. During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of waste soil and disturbance of residents, businesses, and traffic. These are common temporary impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during pipe-laying on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

11. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

12. The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB and KUIDFC websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

13. The citizens of the Davangere City will be the major beneficiaries of this subproject. The sewerage system will cover the presently uncovered areas under NKUSIP and will remove the human waste from those areas served by the network rapidly and treated at the STP, currently

in implementation under NKUSIP, to acceptable standards. With the construction of toilets and targeted awareness program on sanitation proposed, in addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

14. The most noticeable net environmental benefits to the population of the towns will be positive and large as a result of improved: (i) sanitation and environmental health; and (ii) river water quality through the expansion of sewerage networks, treatment capacity and sanitation coverage.

15. **Consultation, Disclosure and Grievance Redress.** Public consultations were done in the preparation of the project and IEE. Ongoing consultations will occur throughout the project implementation period with the assistance of the NGOs. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

16. **Monitoring and Reporting.** The PMU, PIU, and DSC consultants will be responsible for monitoring. The DSC will submit monthly monitoring reports to PMU, and the PMU will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

17. **Conclusions and Recommendations.** Therefore the proposed subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006).

I. INTRODUCTION

Introduction to KIUWRMIP

1. The Karnataka Integrated Urban Water Management Investment Program (KIUWMIP, the Program) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation (UWSS) while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use. The Program focuses on priority investments and institutional strengthening in water supply and sanitation within an IWRM context.

2. The Program will be implemented over a four-year period beginning in 2014, and will be funded by a loan via the Multitranche Financing Facility (MFF) of Asian Development Bank (ADB). The Executing Agency is the Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC) and implementing agencies for the Investment Program will be respective Urban Local Bodies (ULBs). Byadgi, Harihar, Ranebennur and Davangere are the four towns chosen to benefit from the first tranche of the investment.

3. The expected outcome will be improved water resource planning, monitoring and service delivery in 3 towns of the Upper Tunga Bhadra sub basin. Tranche 1 will have 3 outputs;(i) Output 1: Expanded efficient UWSS infrastructure in 4 towns of the Upper Tungabhadra sub basin; (ii) Improved water resource planning, monitoring and service delivery in Karnataka; and (iii) KUIDFC strengthened capacity. The IEE is based on an assessment of these components within the project area.

II. POLICY & LEGAL FRAMEWORK

A. Extent of the IEE Study

4. Indian law and ADB policy require that the environmental impacts of development projects are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and project development and implementation worldwide.

5. This IEE, for the Davangere City Sewerage and Sanitation Subproject, discusses the environmental impacts and mitigation measures relating to the location, design, construction and operation of all physical works proposed under this subproject. IEE relies mainly on secondary sources of information and site reconnaissance surveys including on-site informal discussions with the local people. The IEE follows the process and documentation as per the ADB's Safeguard Policy Statement (SPS, 2009).

B. ADB's Environmental Safeguard Policy

6. ADB's Safeguard Policy Statement, 2009, requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in detail in ADB Environmental Assessment Guidelines, 2003. This states that ADB requires environmental assessment of all project loans, programme loans, sector loans, sector development programme loans, financial intermediary loans and private sector investment operations.

7. The nature of the 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 categories:

(i) Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required.
(ii) Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
(iii) Category C: Projects that are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

8. ADB has classed this subproject as Category B and following normal procedure for MFF loans has determined that one IEE will be conducted for each subproject, with a subproject being the water supply and sewerage infrastructure improvements proposed in a subproject town.

C. Government Law and Policies

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

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

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

12. None of the components of this sewerage and sanitation improvement subproject in Davangere falls under the ambit of the EIA Notification 2006, and, therefore EC is thus not required for the subproject.

13. 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. These are listed in Appendix 2. The specific requirements of this subproject are shown in Table 1

Table 1: Action required to Ensure Subprojects Comply with National Environmental Laws

Component	Applicable Legislation	Compliance	Action required
STP, Sewer Network	EIA Notification	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined 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. Category A projects requires Environmental Clearance from the Ministry of Environment and Forest (MoEF). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	Sub project is not a listed activity in Schedule I of this notification and hence environmental clearance is not required.
STP	Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having the potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain Consent For Establish (CFE) under Section 25 of the Act from Karnataka State Pollution Control Board (KSPCB) before starting implementation and	Based on project review and site inspection KSPCB provides CFE before construction, and stipulate the disposal standards to be met during operation. After completion of construction, CFO is issued confirming compliance with the CFE conditions, if any

Component	Applicable Legislation	Compliance	Action required
		Consent For Operate (CFO) before commissioning. The Water Act also requires the occupier of such projects to take measures for abating the possible pollution of receiving water bodies.	
STP	Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	The projects having potential to emit air pollutants into the atmosphere have to obtain CFE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from KSPCB before starting implementation and CFO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	For the project, the following will require CFE and CFO from KSPCB: (i) diesel generators; (ii) hot mix plants; and (iii) stone crushers, if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CFE and CFO can be found in the KSPCB website (www.kspcb.gov.in). Procure generators only from approved manufacturers/ suppliers, the manufacturer/ supplier shall be registered with the CPCB and shall have valid certificates for “Type Approval” and “Conformity of Production”
STP, Sewer Network	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 notified.	Appendix 7 provides applicable standards for ambient air quality.

Component	Applicable Legislation	Compliance	Action required
STP, Sewer Network	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.	Appendix 8 provides applicable noise standards.
STP, Sewer Network	Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	The Amendment Act designates areas within 100 meters (m) from the "protected property" as "prohibited area" and beyond that up to 200 m as "regulated area" respectively. No "construction" is permitted in the "prohibited area" and any "construction" in the "regulated area" requires 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 and "construction" means the construction of any structure or building.	There are no protected properties near project area in Davangere. However, in case of chance finds, the contractors will be required to follow a protocol as defined in the Environmental Management Plan (EMP).
Components that require tree cutting	Karnataka Preservation of Trees Act, 1976 and Karnataka Preservation of Trees Rules, 1977	This Act has put restriction on felling of trees in the State unless until permitted by the Tree Officer. None of the components of this sub project require cutting of trees, hence this act is not applicable	NA.
STP, Sewer Network	Biodiversity Act of 2002	The Biodiversity Act 2002 primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people.	Not applicable to Davangere Sewerage and sanitation Project as no mentioned activities are involved in the project

Component	Applicable Legislation	Compliance	Action required
STP, Sewer Network	Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	Not applicable to Davangere Sewerage and sanitation Project as no wetlands presents in the project area.
STP, Sewer Network	Wildlife Protection Act, 1972	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable to Davangere Sewerage and sanitation project as none of the project component will have any impact on wildlife or protected areas.
STP, Sewer Network	Forest (Conservation) Act, 1980	The Forest (Conservation) Act prevents the use of forest land for non-forest uses without the clearance from Ministry of Environment and Forests (MoEF), Govt. of India	Not applicable to Davangere Sewerage and Sanitation Project as there is no forest area within or adjacent to the project area.
STP, Sewer Network	Karnataka Forest Act, 1963 and Karnataka Forest Rules, 1969	This Act makes the basis for declaration of Reserved Forests, constitution of village forest committees, management of reserved forests and penalties and procedures.	Not applicable to Davangere Sewerage and Sanitation Project as there is no forest area within or adjacent to the project area.

III. DESCRIPTION OF THE PROJECT

A. Project Need

14. Old Networks (Pre – NKUSIP). Considering the topography, KUWS&DB has divided the entire city into four Districts, viz 1, 1A, 2, and 3. Three Districts sewerage zones drain into Bettur nallah, which flows from south to north along eastern boundary of the city, while the fourth distirct drains into Kundawada lake, located on the west side of the city. KUWS&DB constructed outfall sewers and an STP under the NRCP project. Another 20 MLD STP proposed under UIDSSMT scheme is yet to be constructed at upstream side of the Bathi tank.

15. The old part of Davanagere City Corporation is having underground sewerage facility which was laid long back. It has one Sewage treatment plant of 19.45 MLD capacity constructed under the NRCP scheme. It was designed to cover 2,00,000 population for a sewage flow of 20 MLD. The sewer network covers only about 25% of the CC area and only 195 Km roads. In the remaining areas, individual septic tank and dry latrines provide the disposal system for the human waste. It is intended to provide a lasting solution to the problem of effective handling of sullage and sewage generated by implementing an underground sewerage system in the area duly considering the requirements for the next 30 years.

1. Problems relating to the Existing Sewer Network

(i) There are no drawings of the network.

(ii) Some of the houses are provided with individual septic tanks and there are a few public toilets. Sewage flows into the septic tanks and its supernatant overflows cause's odour nuisance.

(iii) Disposal of Domestic Sewage: In many parts of the city sewage, sullage and storm water are presently discharged into open drains, which are in turn connected to nearby open channel. Similarly, in many parts sewage, sullage and storm water from the residential areas are presently discharged directly into open drains, which in turn join water bodies, ultimately polluting the fresh water bodies available within the corporation limits.

(iv) Individual Latrines: The number of private latrines is not available. All the private latrines are reported to be flush type, connected either to septic tanks or to the underground sewers. Total number of sewer connections is 53,906. The effluent of the septic tanks is discharged into the open drains or spreads in low-lying areas and some latrines are connected to the UGD sewers.

(v) Areas with No Latrines. Many isolated small areas and some places in major areas have no latrine facility and hence people are practicing open defecation.

(vi) Public Latrines: There are 39 public latrines in the city corporation with 176 seats, 13 of these toilets are "Pay and Use" toilets. Most of the latrines have water supply facility made available from either municipal tap or a bore well. Overhead tanks are also provided on the latrine. The disposal is in a septic tank and the effluent flows to the drains or in low-lying areas.

(vii) Inadequate Coverage: Sewers have been laid for a length of 195 km, out of total 795 km long roads. The coverage is thus 25 percent. Other areas do not have access to UGD system.

(viii) Disposal of Domestic Sewage: In the absence of a comprehensive sewerage system and inadequate sanitation facilities, a large amount of the domestic sewage is let into

storm water drains. This is resulting in pollution of the public water bodies such as rivers and nallahs, as the waste runoff leads to these watercourses.

(ix) Secondary Drain Links: Many low lying areas in the city cannot be effectively drained, as there are no proper outlets or secondary drains connecting them to the primary channels.

(x) Unhygienic Condition: The areas where there is no sewerage system are still dependent on the roadside drains for carriage of wastewater. In the absence of well constructed drains, in many areas, wastewater flows along the streets and accumulates in to low lying areas.

(xi) Treatment facilities: At present, there is one Sewage Treatment plant of 19.45 MLD, which has been constructed under NRAP project. One more STP (20 MLD) which is already proposed at upstream side of the bathi tank is yet to be constructed. This treatment facility has been provided only for the existing sewerage system of the old part of the city. For the remaining part of the city, individual septic tanks and dry latrines provide the disposal system for the human waste. Providing sewage treatment plant to take care of year 2044 demand and located at suitable location so that entire sewage can be drained into this plant by gravity is required.

16. **Works under Implementation**. The Government of Karnataka (GoK) through the Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC) has prepared the North Karnataka Urban Sector Investment Programme (NKUSIP) under the Asian Development Bank assistance. Under NKUSIP the total allocation for sewerage component is Rs. 2.30 Crore only. In addition to this the ULB has decided to divert the Rs. 34.63 Crore allocation it has under water supply & urban road components for sewerage sector, making the total funds available to Rs. 36.93 Cr. The total requirement for providing the above explained sewerage system in District 1 has been estimated as Rs.23.455 Crores excluding cost of 20 MLD STP. The works in Davanagere Drainage district has been made into two packages. The components in package one are interception and extending sewerage system by laying new trunk mains, sub-mains & lateral networks in District 1 and in package two is construction of a 20 MLD SBR type STP at Shivanagar. The work shall start in near future.

B. Description of the Subproject

17. Table 2 shows the nature and size of the various components of the subproject. The descriptions shown in Table 2 are based on the proposals at detailed design stage. Locations of subproject components are shown in Figure 1 and 2.

18. Implementation Schedule. As per the suggested schedule, preparation of detailed project report and bids for this subproject will commence in February 2014. Construction activities for this subproject are likely to start in April-2014, and should be completed in 30 months.

Table 2: Proposed Subproject & Component Descriptions

Infrastructure	Function	Description	Location
1. Sewerage			
Sewage Collection System	The sewerage system being implemented is designed as a	Sewer - lying of 204.12 Km new sewer network with 46981 HSCs connections in District-1	Sewers will be laid underground along the roads in the town in currently uncovered areas; However, will cover all parts of

Infrastructure	Function	Description	Location
	separate system of sewage collection (i.e. caters only to wastewater).	and District-3.	the town including high, medium and low dense areas.
Sewage Treatment Plant	Treatment of the waste water	The one new STP has been proposed in the existing STP site (Shiva Nagar) and with provision for development of a buffer zone along the site boundary. New STP will be located in Avaragere.	20 MLD STP in the existing STP site at Shiva Nagar and 5 MLD STP at Avaragere.
Toilets	Individual household toilets and community toilets	Construction of individual household toilets (3805 Nos) and community toilets (4 Nos of 10 seat each)	The sites of public toilets will be identified in consultation with the ULB and community and will be identified in government and vacant lands only.

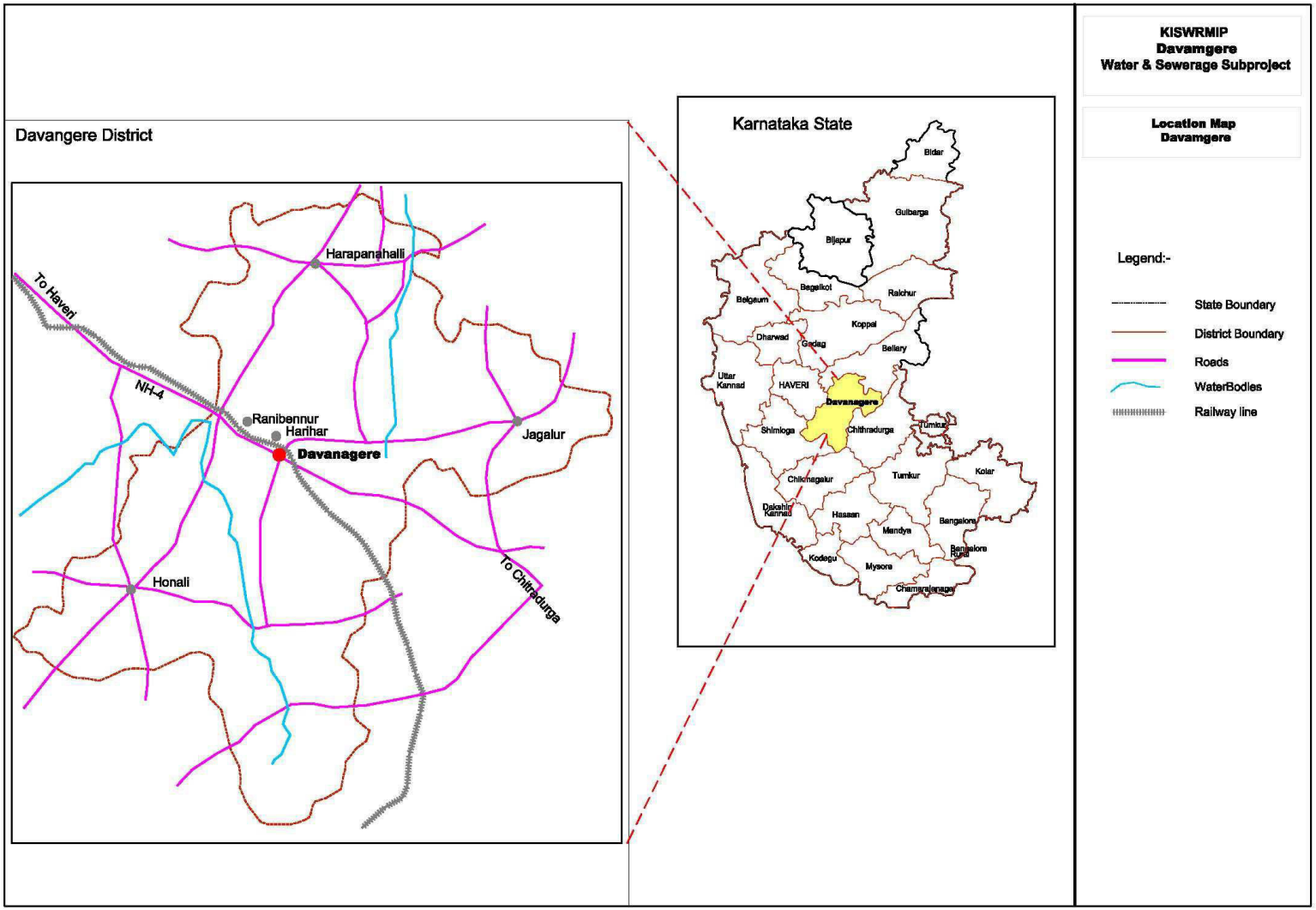


Figure 1: Location of Subproject Town

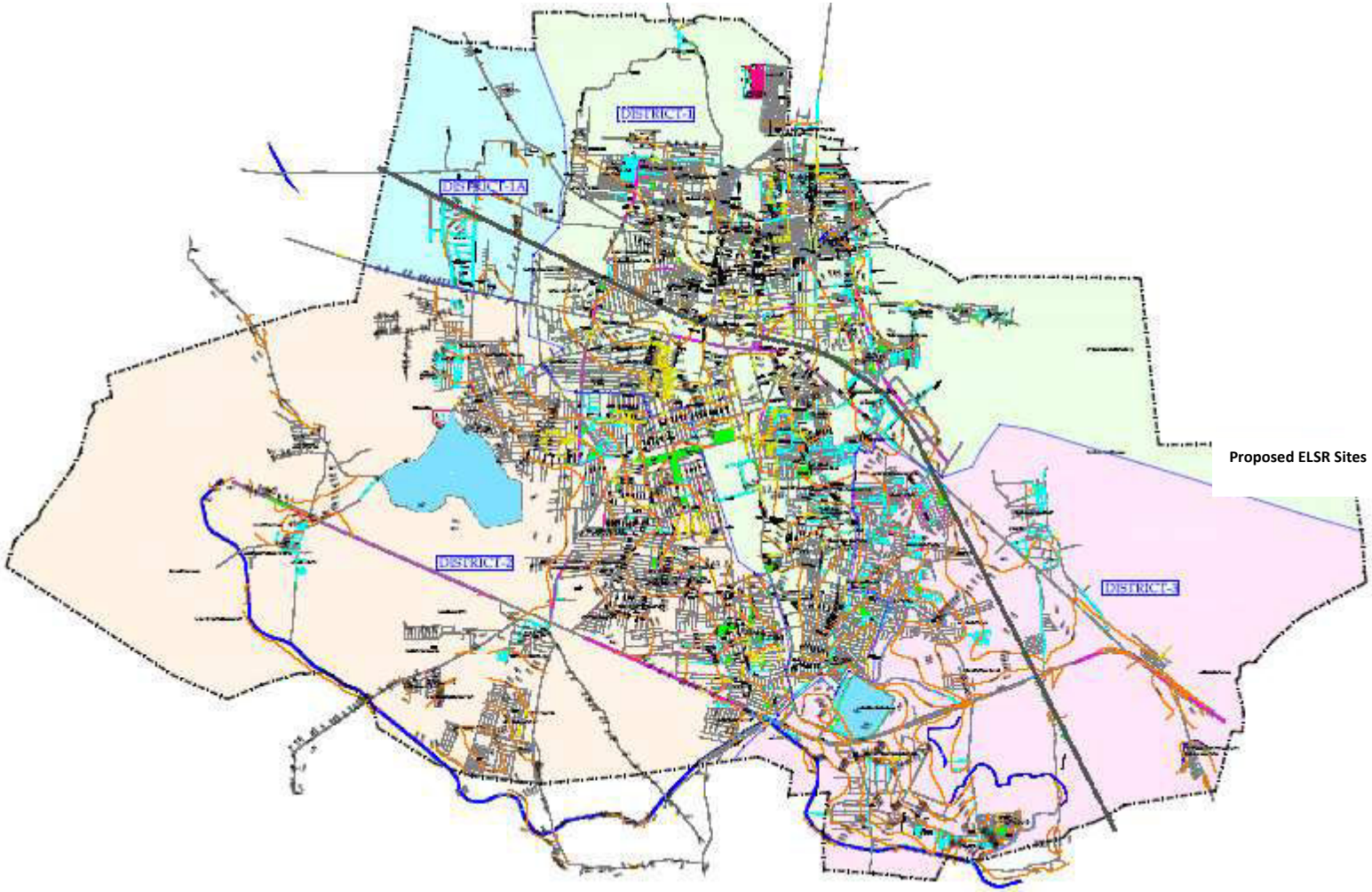


Figure 2: The Comprehensive Plan of Sewerage System in Davengere City.

Figure 3: Location of Sewer Network Crossing NH and Railway

(Attached separately)

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

19. Geographically, Davangere Town is located at a latitude of 14°28′ N and longitude of 75°59′E, at an average altitude of 602.5 m above the mean sea level (MSL). It is the headquarter town of Davangere District, and is located at about 260 km from Bangalore. Davangere is primarily an educational and commercial centre for the vast hinterland. It is located on the main trade route that connects northern part of the country to the southern peninsula. Extending to an area of 66.08 sq km, the town's population is 435,128. National Highway No. 4 (NH 4) connecting Bangalore – Pune/ Mumbai passes through the City.

2. Topography, Soil & Geology

20. Situated in the Deccan Plateau and close to River Tungabadhra (15 km), the topography of the town is almost flat and slopes gently towards north and west. The north eastern and south eastern part of the city drains towards north, to Bettur Halla, whereas the western and south western part drains towards west to Bathi Tank. Red and black cotton soils are predominant in the region, which favours the growth of cotton, paddy and oil seeds. Red Sandy soil comprises of red loams, red sandy, sandy loams and medium black soils.

21. Predominant geological formation in the region consists of Granites, Gneiss & Schist. As per the seismic zoning map of India, Davangere City falls under Zone II, which is the lowest earth quake risk zone in India. This zone is termed as "low damage risk zone".

3. Climate

22. Davangere enjoys semi arid climate, dryness in the major part of the year and hot summer. In general, southwest monsoon contributes 58% of total rainfall and northeast monsoon contributes 22% rainfall. The remaining 20% rainfall is received as sporadic rains in summer months. It receives low to moderate rainfall. The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Davangere are increasing temperature from March to May, usually maximum in May month and minimum temperature that is coldest month during month of December.

23. The normal annual rainfall is 680 mm. However in the last decade (1996-2005) the average rainfall was just 589 mm much below the long term average. Year 2003 was the worst rainfall year, receiving just 388.6 mm.

24. The temperature varies between 35^{O}C to 38^{O}C during summer and 16^{O}C to 20^{O}C during winter. The hot summer season starts in early March and last till the beginning of June when the district comes under the influence of southwest monsoon.

Figure 4: Average Monthly Rainfall and Temperature in Davangere

4. Air Quality

25. The major sources of sound pollution in the city are from the vehicles. Karnataka State Pollution Control Board (KSPCB) monitors air and noise pollution in the State in line with Air (Prevention and Control of Pollution) Act, 1981. KSPCB have monitoring stations located at various places across the state; however covers major cities, and industrial locations. There are no regular monitoring stations in Davangere.

26. Dust pollution in the city appears to be high, especially in areas such as Azad Nagar and Mandakki Bhatti due to presence of puffed rice factories and movement heavy goods vehicles and traffic. Poor quality roads and dry weather is compounding the dust problem in the city. As per a report of KSPCB (2005-06), suspended particulate matter (SPM) and respirable suspended particulate matter (RSPM) in the ambient air is well above the permissible (SPM value of 280 µg/m3 along the main corridor of the tow – PB Road, against the National Ambient Air Quality Standard of 140 µg/m3). Nantional Ambient Air Quality Standard is given in Appendix 7.

5. Surface Water

27. There are no notable rivers and streams in and around the town. Tungabhadra River flows at a distance of 15 km from the town. Kunduwada Kere (lake) situated in the south western part of the town is an important water body in the town. This is one of the water supply sources to the town besides River Tungabhadra. Bathi Tank is a small lake in the western part. Located on the downstream side of Kunduwada Lake, this tank receives outflow from Kunduwada, and the sewage/wastewater from western part of the town. Presently, a wastewater treatment plant is under construction near Bathi Tank to treat the sewage from eastern parts of the town.

28. Besides these, there are irrigation channels outside the town, originating from a reservoir at Budhihal, about 15 km southwest of the town.

6. Ground Water

29. In Davangere fractured granitic-gneisses, gneisses and hornblende-schists are the main water bearing formations. Ground water occurs within the weathered and fractured rocks under water-table conditions and semi-confined conditions. Aquifers are encountered between the depths of 8.46 and 32 m below ground level (bgl). Bore wells are drilled from a minimum depth

of 35 to a maximum of 200 m bgl. Depth of weathered zone ranges from 5.5 mbgl to 30 mbgl. Yield ranges from 1.5 to 4.0 lps. Transmissivity ranges from 5.27 to 110.67 m2/day. Specific capacity ranges from 4.54 to 36.0 lpm/m draw down. The main source of ground water occurring in the district is through precipitation and return flow from applied irrigation. During May 2006 (pre-monsoon season) the minimum and maximum depth to water level was 4.28 mbgl and 7.65 m bgl respectively. During November 2006 (post-monsoon) water level ranged from 5.30 m bgl to 10.20 m bgl. Although overall groundwater development in DavangereTaluk is 61%, major parts including Davangere City fall under over exploited category (Central Ground Water Board, 2008).

Table 3: Groundwater Development in DavangereTaluk

Particulars	Details (in hectare meter)
Net annual ground water availability	10576.79
Existing gross ground water draft for all uses	6439.13
Allocation for domestic and industrial use for next 25 years	1032.85
Net ground water availability for future irrigation development	4827.88
Balance ground water irrigation potential available (ha)	5905.66

30. The Ground Water Quality in the district is generally potable and suitable for irrigation and domestic purposes. Electrical conductivity of ground water in general ranges from 584 to 2720 micro mhos /cm at 25 °C. Fluoride ranges from 0.2mg/l to 2.41 mg/l. Nitrate ranges from 10 to 352 mg/l.

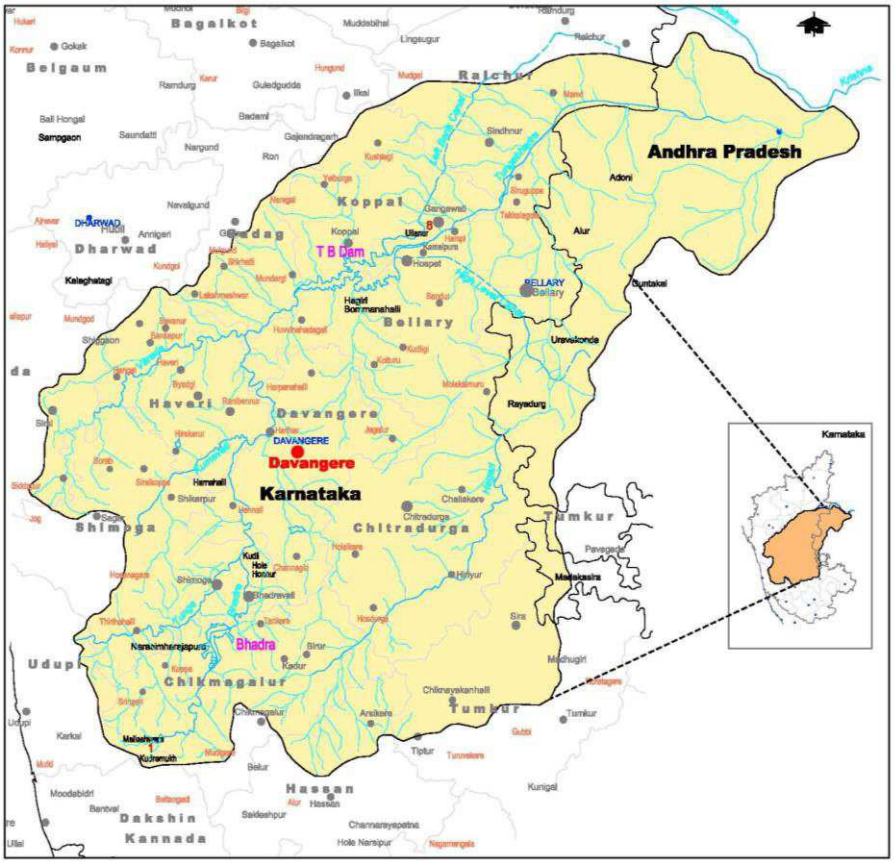


Figure 5: Location of Town in Tungabhadra Basin

B. Ecological Resources

31. Davangere is an urban area surrounded by land that was converted for agricultural use many years ago. There are no forest areas within or near Davangere. Owing to fertile lands and availability of irrigation facilities, the land around the town is extensively cultivated. The outer areas within the CMC limits also under cultivation.

C. Economic Development

1. Land Use

32. Davangere / Harihar Urban Development Authority (DHUDA) has formulated a development plan for Davangere outlining the land-use pattern up to the year 2021. The area usage under the suggested Land Use pattern in the City is presented below.

Table 4: Proposed Land Use for Davangere

Land-Use Pattern	Area (Km2)	Percentage Use
Residential	27.80	45.08%
Commercial	2.90	4.70%
Industrial	6.37	10.33%
Public & Semi-Public	4.18	6.78%
Parks, Play-ground and Open Space	5.34	8.66%
Public Utilities	0.46	0.74%
Transport and Communication	12.95	21.04%
Water Shed	1.65	2.68%
Total	61.65	

2. Industry & Agriculture

33. Until recently the city was known as the "Manchester of Karnataka" because of its many cotton mills and supporting trades and businesses. Although these mills contributed to the industrial and commercial development of the city many of them were closed in the 1990's. Currently, the major agro-industrial activity in Davangere revolves around rice and sugarcane, with a number of rice mills and sugar mills in and around the city. There are vast agriculturally rich lands around the town, cultivated by Tungabhadra water. Sugar cane, paddy, jowar and cotton are the major crops grown in and around Davangere.

34. There is an industrial estate in Davangere developed by Karnataka Small Scale Industries Development Corporation (KSSIDC) and spread over an area of 19.35 acres. 14 units are working in this area and are mostly engineering fabrication units. There is another industrial area on Lokikere road, developed by Karnataka Industrial Area Development Board (KIADB), spread over 93.08 acres with 52 working units at present. The industrial mix is mainly engineering, fabrication and garment making.

35. Besides these there are few rice, sugar industries and distilleries in and around the town.

36. Davangere has a large Agriculture Produce Marketing Committee (APMC) yard that caters to the surrounding towns and villages which mainly deals with cotton, paddy and oil seeds. Due to good connectivity by roads and railway line with other parts of the region, it has become a focal point for trade and commerce

3. Infrastructure

37. **Water Supply**. Currently water supply within Davangere is intermittent and varies across the town. The reported duration and frequency is 1-2 hours every 3 days. The current per capita volume made available to customers is assessed at 86litres/head/day, compared with the norm of 135litres/head/day. Tungabhadra River and Kunduwada Lake are the main sources of water supply to the town.

38. **Sewerage and Sanitation**. Davangere is partially covered with underground sewerage – this old system covers about 25% of the city in the central part. The sewerage system in Davangere is divided into three major districts 1, 2 & 3 and a smaller sub-district 1A. This existing sewerage system is mostly in District1 and District 2, coverage in District 3 is very limited. Under NKUSIP, it is proposed to improve the sewerage system in District 1 including the treatment works. However, due to lack of adequate funds, the project will not cover entire District 1. The capacity of the existing wastewater treatment plant (WWTP) is 19.45 MLD (stabilization pond based).

39. **Storm Water Drainage**.In the absence of a properly functioning sewerage system, the open drains are mostly catering to wastewater except during monsoon which carries both wastewater and surface runoff. These open drains dispose waste into Bathi Tank in the west, Bettur Nala in the east and Avaregere Lake in the southeast.

40. **Transportation**. The National Highway No. 4 connecting Bangalore and Pune/Mumbai is the major regional road running in the midst of the city. The city has direct rail connectivity with a broad gauge line connecting Bangalore – Hubli/Mumbai. This railway line contributes a major share in passenger and goods transportation. With a total length of over 1000 km, internal road network in the city is well developed, however are not in good in condition. Most of the roads in the central part are congested.

41. **Power Supply**. Hydal power is the main source of energy in Karnataka, with 61% of total installed capacity. Remaining is mostly from thermal power stations. Contribution of wind and solar energy, although increasing, is negligible. Government run Karnataka Power Corporation Limited (KPCL) is responsible for power generation while Karnataka Power Transmission Corporation Limited (KPTCL) is responsible for power transmission. The distribution to users in Davangere is provided by regional company – Bangalore Electricity Supply Company Limited. Power is supplied from the central grid by overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. The power supply in Davangere is poor; there are frequent outages in warmer months, and fluctuations in voltage.

D. Socio Cultural Resources

1. Demography

42. During the last decade the population of Davangere City had increased from 363,780 in 2001 to 435,128 in 2011 indicating a decadal growth rate of 19.6 percent. This growth is much less than the last decadal growth rate of 26.6%

Table 5: Population Growth of Davangere City

Year	Population	Decadal Growth Rate
	Nos.	%
1991	287,233	-
2001	363,780	26.6
2011	435,128	19.6

43. **Sex Ratio**. The sex ratio (female population per 1,000 of male population) in Davangere City, as per 2001 census, is 939, which is lower than the district and state urban average figures of 951 and 940 respectively.

44. **Literacy**. The literacy rate of the city is 84.89 percent (2011 census).

45. Largest proportion of population comprises Hindus followed by Muslims and then Christians. Almost all speak in Kannada followed by Hindi.

2. History, Culture & Tourism

46. Davangere was originally a small village, forming one of the suburbs of Bettur. Sultan Haider Ali gave it as jagir to a Maratha chief named Apoji Ram, who encouraged merchants to settle there. While Apoji Ram died without heirs, the place continued to grow, favoured by Tipu Sultan. After the fall of Tipu Sultan's regime, a European firm stepped in and started a cotton mill. These mills flourished as cotton was grown in plenty, in and around Davangere, as well as the adjacent town of Harihar. Climatic conditions and the nature of the soil (black gypsum) favoured its growth. Davangere Cotton Mills is a well-known name in the region.

47. Town has some locally important religious places. Durgambika Temple, said to be around 200 years old, attracts good number of devotees throughout the year. Subramanya Temple is another important temple in the City. Kundavada Lake, Sulakere Lake and Bath Gudda (hill) are the local tourist spots.

V. ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

A. Overview

48. 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.

49. As a general practice, an IEE should evaluate impacts due to the location, design, construction and operation of the project. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. In assessing the effects of these processes therefore, all potential impacts of the project should be identified, and mitigation is devised for any negative impacts. Following sections evaluate impacts of the proposed water supply and sewerage project in Davangere.

B. Location Impact

50. **Location.** These Impacts are associated with planning particularly on the site selection. They include impacts due to encroaching on sensitive areas and impacts on the people who might lose their homes or livelihoods due to the development of the proposed site.

51. In case of sewerage components, no significant impacts are anticipated since the laying of sewer line will be along the already built up area. All the sewer lines as a part of this sub project is passing through the government lands (Appendix 13 a) and along the roads only.. The new 20 MLD STP has been proposed in the existing STP site with provision for development of a green buffer zone of 10-15 meter along the site boundary. Site for 5 MLD STP at Aavaragere is located in Government land, the private land (404.68 m^2) required for the construction of approach road for the STP at Avaragere, As per the documents availed from the Davanagere City corporation, it was confirmed that the land has already been donated by the land owner (Appendix 13 b). 100 meter around the the periphery of both the STP plants will be declared as 'no-development zones' and no construction or residential buildings will be allowed there. No serious impacts on existing environment or surrounding are anticipated due to these project components.

52. Proposed subproject sites are carefully selected to avoid encroachment into sensitive areas and minimise the impacts on people livelihoods and homestead.

53. All the sewer pipes will be laid within the municipal boundary. The sewer pipes will be along the roads. Larger diameter pipes will mostly be laid along wider roads where there is enough space between the road carriageway and the buildings.

54. Since lot of people will be using the public toilets, there will be significant nuisance to the nearest habitats and commercial places, if the site selection is not proper. Therefore the location of the public toilets will be selected strategically in such a way that people can access it but won't cause nuisance to the houses and commercial places. The sites of public toilets will be identified in consultation with the ULB and community and will be identified in government and vacant lands only. An updated IEE report shall be prepared after finalising the land.

55. If the individual household toilets are located in the upstream of water bodies, there is a chance for contamination of the water bodies, so the individual toilets should not be constructed at the upstream of any water body.

56. The PIU/ULB has to obtain necessary clearances before starting the work. The applicable clearances are given as appendix 11. The proposed sewer network is crossing the railway lines at 3 locations (in District 3) and crossing the national highway at 3 locations. The crossing locations are given in Figure 4.

57.**Utilities.** During the construction stage of underground sewer lines, traffic and human activities like Telephone lines, electric poles and wires, water lines within the proposed sub project locations may require to be shifted in few cases which will be temporarily interfered due to the operation of construction machineries. Traffic management plan with proper sign board, stocking of construction materials away from the densely built up have been suggested. To mitigate the adverse impacts due to relocation of the utilities, IA will:

(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase;
(ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance; and
(iii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. In case of disruption of water supply, alternative supply, through tankers, shall be provided.

58. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas**. Priority is to locate these near the subproject locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up 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 the forest, water bodies, swamps, or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings. Construction work camps shall be located at least 200 m from residential areas. Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains. The subproject is likely to generate soil from excavations, which needs to be disposed safely. The following measures should be considered for disposal of surplus/waste soil:

(a) The excavated soil should be removed from construction area at the earliest for beneficial reuse such as land raising / filling of excavated areas.
(b) Soil should be covered with tarpaulin sheets during the transportation.
(c) Soil transportation should not be done during the peak hours and should be avoid narrow and heavy traffic routes and important religious or tourist sites.

59. Location for disposing the surplus soil / waste / debris to be identified in barren / unused public lands under the ULBs. Contractor need to identify these locations before starting the work at each site and include in the Construction Management plan.

60. **Setting up labour camps**. Labour camp include accommodation for workers / labourers along with other basic amenities such as kitchen, potable water supply, sanitation (toilets, bathrooms, washing areas and water supply for such needs), first aid room as well as garbage collection and disposal facility. The roof height of the worker's and labour camp shall not be less than 3mt. from floor level to the lowest part of the roof. The camps shall be floored with concrete, shall be kept clean, and with proper cross ventilation, and the space provided shall be on the basis of one sq.mt per head or as per the relevant regulation, which ever is higher. Fire and electrical safety pre-cautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately. The Contractor will maintain necessary living accommodation and ancillary facilities (including provision of clean fuel to prevent damage to forests and to prevent fuel wood cutting and burning by labour) in functional and hygienic manner. The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire so as to prevent the trespassing of humans and animals.

61. **Site selection of 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. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be sites already permitted by Mines and Geology Department. If other sites are necessary, these would to be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities.

62. For Davangere subproject, the quarry material required will be sand and stone aggregate, and the nearest quarries are near Harihar and Medleri (sand quarries along River Tungabhadra) and Chatra at Motebennur and Hunasikatte in Ranebennur Taluka for stone aggregate. These are existing quarries and are licensed by Mines and Geology Department. The material from the existing quarries will be adequate for the subproject construction, and therefore no new quarry sites will be developed for the purpose

C. Design Impact

63. These impacts arise from the design of the subproject including the technology used, scale of operation/throughput, waste production, discharge specification, pollution sources, and ancillary services.

64. **Sewer system – collection & conveyance.** The sewerage system being implemented under NKUSIP for Davangere is designed as a separate system of sewage collection (i.e. caters only to wastewater). There is considerable length of existing surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to the STP. The expansion proposed under this subproject will also be designed as a separate system. To maximize the benefits as intended, Davangere CMC should 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.

65. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc are some of the issues

that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability. Another critical aspect is change in raw sewage characteristics at inlet of STP may affect the process and output quality.

66. Measures such as the following shall be 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, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided)
(v) For shallower sewers, use small inspection chambers in lieu of manholes;
(vi) Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry
(vii) Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulfide generation
(viii) Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas
(ix) Establish routine 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

(x) Conduct repairs prioritized 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);
(xi) 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;
(xii) 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.

(xiii) 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

(xiv) Develop an Emergency Response System (ERS) for the sewerage system leaks, burst and overflows, etc. A Template for ERS is provided in Appendix 5.

67. **Sewage Treatment Plant**. The nuisance due to mosquito breeding and bad odour from the STP. To mitigate this impact, development of physical separation and visual screen around the facility is recommended. A green buffer zone in the form of landscaping and earth work shall be created around the STP. The banks of the ponds shall be kept clear of grasses and bushes etc. No development zone will be declared around the STP sites.

68. The SBR treatment (for the STP) process consists of the following stages:

- Inlet works with mechanical screens, grit removal, flow measurement & flow splitter box
- Four square batch reactors with individual inlet flow control & a fully automated process
- Mechanical sludge dewatering
- Short term (14 days) sludge holding area

69. The SBR based STP will require uninterrupted power supply for operation of all the activities from STP inlet to treatment (SBR operation) and to sludge dewatering and drying. Disruption in power supply will lead to process upset, may affect the efficiency of treatment, and result in treated effluent quality not meeting the disposal standards. In the context of urban local bodies in India, SBR is a recent and an advanced technology. Technical know-how is very limited or even nil with the local bodies. Although the system will be designed for automated operation with minimum human interference, it is necessary that the Davangere CMC has basic understanding of technical features (design and operation) and regular maintenance.

70. The above issues need to be considered in design and operation of STP. Appropriate measures, such as the following, shall be integrated into planning and design of the STP.

(i) Continuous uninterrupted power supply should be provided for the facility

(ii) Back-up facility (such as generator) shall be provided and adequate fuel supplies shall be ensured for running of generator when required;

(iii) Provide an operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility; this should include guidance on the follow up actions in case of process disruptions, inferior quality of treated water; etc. Necessary training (hands-on and class room / exposure visits) shall be provided to the ULB staff dealing with STP.

(iv) The scope of work of facility contractor should include extended operation period (at least five years) to ensure smooth operation, training to the ULB staff and gradual transfer of facility to the Davangere CMC.

(v) Design should include online monitoring for at the minimum BOD, pH and Ammonia at the inlet and outlet of the plant.

(vi) Design should include provision for automated shutdown in the incidence of high BOD (above design capacity) entering the plant.

(vii) 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

71. The SBR being an aerobic process and conducted in a compacted and a closed system with automated operation, the odour nuisance will be minimal. However, bad odours may be generated from wet well, primary treatment units and sludge treatment. Besides operating the plant as per the standard operating procedures, the following measure should be included in the designs:

- Provide a green buffer zone of 10-15 m wide around the STP; this should be planted with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance.
- Further 100 meter around the STP site should be declared as 'no development zone'.

72. **Sludge Management**. 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. However, there are no industries with problematic wastewater discharges in the catchment area of the proposed wastewater treatment plant. Most importantly, as provided above, no industrial discharges are allowed into municipal sewer system.

73. The sludge from SBR basins will be collected into sludge sump and conveyed to centrifuge unit for dewatering the same. The necessary centrifuge feed pumps & centrifuge will be provided. The sludge in the form of a wet cake will be further air-dried in the sludge drying beds and disposed off.

74. 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 (days) shall be ensured. The drying period, which will be varying depending on the season, shall be determined during detailed design.

75. A sludge management plan shall be developed by the STP facility designer. Sludge shall be periodically tested for presence of heavy metals.

76. Proper sludge handling methods should be employed to mitigate pollution due to improper sludge disposal methods. Personal Protection Equipment should be provided to the workers. A sludge management plan should be prepared.

(i) Dried sludge will be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests will be conduct 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 Municipal Solid Waste Management & Handling Rules, 2000 have been adopted here. The MSWMH Rules stipulate that "In order to ensure safe application of compost, the following specifications for compost quality shall be met, -Table 6;

Table 6: Dried Sludge for Use as Soil Conditioner

Parameters	Concentration not to exceed (mg/kg dry basis, except pH value and C/N ratio)
Arsenic	10.00
Cadmium	5.00
Chromium	50.00
Copper	300.00
Lead	100.00
Mercury	0.15
Nickel	50.00
Zinc	1000.00
C/N ratio	20-40
PH	5.5-8.5
Arsenic	10.00

*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.

Source: Municipal Solid Waste (Management & Handling) Rules, 2000, Government of India

77. **Sanitation**. Since lot of people will be using the public toilet, there will be nuisance and health risk due to improper design, site selection and due to unhygienic conditions in the public toilets. Therefore, the toilets shall be designed properly to maintain hygienic conditions and aesthetics.

78. Additionally, there should be proper drain system from the toilet connecting to the main network, failure of which would create health issues to the local public.

D. Construction Impacts

1. Construction Method

79. The project involves construction of the following: i) laying of sewer network. ii) Sewage Treatment Plan iii) individual toilets and iv) public toilets. Following table 7 shows the details of construction activities involved in the subproject.

Table 7: Construction Activities for the Subproject

Component	Construction method	Likely waste generated
Sewer lines	Trench excavation along the identified main roads of about 0.4-1 m wide and 1.5- 4 m deep Trench will be excavated using backhoe and where not feasible will be done manually. Excavated soil will be placed along the trench. A bed of sand of 100 mm	~3,00,909 m^3 of excavated soil; 93% will be utilized for refill; remaining soil (~21,000 m^3)

Component	Construction method	Likely waste generated
	thick will be prepared at the bottom and pipes will be placed and joined. Excavated soil will be replaced and compacted. Where the pipes are laid in the roadway, handheld pneumatic drill will be used to break the road surface. Construction activity will be conducted along the roads in the town and will cover most part of the town excluding the dense core city areas where currently sewerage system is being implemented under NKUSIP. The work will be conducted by a team of 5 workers at each site	need to be disposed off
Sewerage Treatment plant	This will include construction and fixing of Inlet works with mechanical screens, grit removal, flow measurement & flow splitter box; four square batch reactors with individual inlet flow control & a fully automated process; installation of mechanical sludge dewatering (centrifuge), and developing sludge drying beds. The SBR tank will be of RCC structure, and mostly at above-ground facility. The overflow from outlet weir shall be collected by a leading channel that discharges in to Primary Drain. The work involves excavation using backhoe excavator; concreting mixing on site, fixing scaffolding and pouring concrete to form concrete structures; fixing mechanical and electrical equipment; installation of centrifuge and development of sludge drying beds. Construction activity will be confined to a site located in the city outskirts	This activity will not generate any excess/ surplus soil that need to be disposed; the excavated soil will be used to raise the ground level of the site
Community Toilets	No major excavations, trenching required	The waste to be generated is insignificant.

80. As detailed above, except linear components like pipes and sewers, construction activities of all other components are minor and will be confined to selected isolated sites (already in use or new). However, the material and waste transport to and from the site will use public roads.

81. Although construction of the of the pipelines and sewers involve quite simple techniques of civil work, the invasive nature of excavation and the subproject locations in the built-up areas of Davangere Town, where there are a variety of human activities, will result to 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. Physical impacts will be reduced by the method of working and scheduling of work, whereby the project components will be (i) constructed by small teams working at a time; (ii) any excavation done near sensitive area like school, religious places and house will be protected as per standard construction practices. These are discussed in detail in the following sections.

82. While trenching at densely populated areas like market place or layouts, roads with heavy traffics additional care has to be taken. Hard barricade should be mandatorily provided along with caution board and traffic diversion boards. Some of the densely populated area identified at Davangere are Vinobha Nagar, Ashok Nagar, KTG Nagar, Ashraya Layout etc. and major road with heavy traffic are AVK College Road, Bappuji Hospital Road, Hadadi Road, Chigeteri General Hospital Road, P.J.Extension Road etc.

83. Prior to starting of work, the contractor should prepare Construction Management Plan. The Construction Management Plan should be site specific and has to submit every month before starting the work. The Construction Management Plan will include the method statement for construction works, Utility Management and Contingency Plan, Traffic Management Plan, Work camp and Labour Camp details, Safety measures taken for the workers and the public. etc.

84. The method statement for construction works. The method statement for pipeline and sewer works should be simple and explain the contractor's work process that is actually conducted on site, with safety and safeguard concerns. Method Statement is very important, particularly for pipeline/sewer works along the roads. Method Statement can be prepared for each stretch (say 1 km) /specific site based on the project area. Method Statement should be in a Table format with appended site layout map and cover the following:

- Work description
- No. Of workers (skilled & unskilled)
- Details of Plant, equipment & machinery, vehicles
- Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing)
- PPE (helmet, gloves, boots, etc) details for each type of work
- Details of materials at each site (type & quantity)
- Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure etc)
- Construction waste/debris generated (details & quantity)
- Detail the sequence of work process (step-by-step) including specific details of each work
- Contractor's supervision & management arrangements for the work
- Emergency: Designate (i) responsible person on site, and (ii) first aider
- Typical site layout plan including pipe trenching, placement of material, excavated earth, barricading etc
- The pipeline/sewers are to be laid along the roads, Roads are provided with side drains to carry rain water. The excavated soil, placed along the trench may get disturbed due to wind, rain water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc, and also into nearby open drains. The following should be included in the site layout plan:

- Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone
- Location of temporary stockpiles and provision of bunds
- Separation of stockpiles areas with workers/vehicle movement paths to avoid disturbing the stockpiled soil
- Wetting of soil to arrest dust generation by sprinkling water

- Waste/surplus soil and concrete debris utilization and disposal plan – indicate expected duration of temporary stockpiling along the trench at each site and identify final surplus soil utilization/disposal site in consultation with PIU

4. Impact on Physical Resources

85. **Topography, Soils & Geology**. Subproject activities are not large enough to affect these features; so there will be no impacts.

86. **Sources of Materials**. Significant amount of gravel, sand and aggregate, will be required for this subproject. The construction contractor will be required to:

(i) Use quarry sites and sources permitted by Mines & Geology Department only
(ii) No new quarry sites shall be developed for the subproject
(iii) Verify suitability of all material sources and obtain approval of implementing agency
(iv) Submit on a monthly basis documentation of sources of materials.

87. **Air Quality**. It is most certain that work will be conducted during the dry season, so there is potential for creating dust from the excavation of dry soil, backfilling, transportation to disposal, and from the import and storage of sand/gravel for bedding. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will also induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, Sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
(iii) Bring materials (aggregates, sand, etc gravel) as and when required;
(iv) Use tarpaulins to cover sand and other loose material when transported by vehicles;
(v) Clean wheels and undercarriage of vehicles prior to leaving construction site
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity

88. **Noise Levels.** The soils are deep in the subproject area and therefore activities like rock cutting/blasting that generate high noise are not anticipated. In isolated areas where a hard stratum is encountered (especially for deep sewers in some locations going more than 3 m deep) requiring using of pneumatic drills, there will be high noise during the activity. Also, where the pipelines are required to be laid in the roadway, pneumatic drills will be used to break open

the road surface. Pneumatic drills typically generate a equitant noise of 82-98 dBA, at 1 m distance from the activity. The sensitive receptors are the general population and socio-cultural institutions in the area. Noise will be for a short term (about 2-3 days at each location) thus impact is minimal and short-term. The construction contractor will be required to:

(i) Plan activities in consultation with the 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) Construction work shall be limited to day light hours (6 AM to 6 PM)
(iii) Provide prior information to the local public about the work schedule;
(iv) Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling;
(v) Minimize noise from construction equipment/pneumatic drills by using silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and
(vi) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s.

89. **Surface Water Quality.** Davangere topography is primarily plain; the town receives moderate rainfall. The South – West Monsoon winds brings rainfall from June to September while the North – East monsoon winds delivers further rainfall from October to December. Due to these reasons and also that excavation will not certainly be conducted during rains, there is no impact on drainage and surface water quality is envisaged. In unavoidable case of excavation during monsoons, there may be temporary impacts like flooding of construction sites, mixing of construction waste and material within the runoff, etc. This may lead to silting and blockage of drains and water bodies. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

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

90. **Groundwater**. Subproject activities do not interfere with groundwater regime, no groundwater abstraction proposed nor do the activities affect groundwater quality.

91. **Landscape and Aesthetics**. The construction work is likely to generate considerable quantities of waste soil. The pipe laying work will generate surplus soil; as small diameter pipes/sewers are proposed it will generate only 5-10% as surplus as most of the soil will be used for refilling after the pipe is laid in trench. Indiscriminate disposal of the soil and waste may affect the local environment at the disposal location. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly
(ii) Avoid stockpiling of excess excavated soils as far as possible
(iii) Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers;
(iv) Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas;

5. Impact on Ecological Resources

92. Subproject sites are located within the town area. There is no natural habitat left in these sites, and therefore no impacts on ecological resources envisaged.

6. Impact on Economic Development

93. **Land Use.** Subproject activities will not affect the land use. All subproject activities are being conducted in the vacant space along the road ways; and other facilities are being developed on government-owned vacant lands. Therefore, there is no land acquisition required for this sub project.

94. **Accessibility**. Transport infrastructure will be affected by the pipe/sewer laying work, as in the narrower streets there is not enough space for excavated soil to be piled off the road. The road itself may also be excavated in places where there is no available land to locate pipes alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road may need to be closed for short periods. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan pipeline work in consultation with the traffic police
(ii) Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time;
(iii) Provide for immediate consolidation of backfilling material to desired compaction – this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement;
(iv) Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line;
(v) In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions;
(vi) At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.
(vii) Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4. The Traffic Management Plan should be part of the Construction Management Plan.
(viii) The list of roads where the road will be closed partially or completely during the construction time is given as Appendix 4B.

7. Impact on Socio Cultural Resources

95. **Impacts on social sensitive areas.** Since the work is being conducted in an urban area, sensitive areas like schools, hospitals and religious centre, the excavation of trenches and pipe/sewer laying activity will create nuisance and health hazard to children and people with ailments. The measures suggested under various heads in this section will minimize the impact in general in all areas, however, special attention is necessary at these locations. Following measures shall be implemented in 250 m around the sensitive locations (schools, hospitals, and religious centres:

(i) No material should be stocked in this area; material shall be brought to the site as and when required
(ii) Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles
(iii) No work should be conducted near the religious places during religious congregations
(iv) Material transport to the site should be arranged considering school timings; material should be in place before school starts;
(v) Notify concerned schools, hospitals etc 2 weeks prior to the work; conduct a 30 minute awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts
(vi) Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.

96. **Socio-Economic – Income.** Excavation of trenches and pipe/sewer laying work in the town will obstruct access to residences/commercial buildings adjacent to the pipeline. Disruption of access to commercial establishments may affect livelihood. Since many of the roads are narrow, construction activities may also obstruct traffic. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Leave space for access between mounds of excavated soil
(ii) Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required
(iii) Consult affected businesspeople to inform them in advance when work will occur
(iv) Address livelihood issues, if any; implement the Resettlement Plan (RP) to address these issues
(v) Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and
(vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.

97. **Socio-Economic – Employment**. Manpower will be required during the 30-months construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

(i) Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available; and
(ii) Secure construction materials from local market.

98. **Occupational Health and Safety**. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training[1] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(ii) All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures
(iii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(iv) Provide medical insurance coverage for workers;
(v) Secure all installations from unauthorized intrusion and accident risks;
(vi) Provide supplies of potable drinking water;
(vii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances
(viii) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(ix) 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;
(x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xi) Ensure moving equipment is outfitted with audible back-up alarms;
(xii) 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
(xiii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
(xiv) Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2Boccupational%2Bhealth%2Band%2Bsafety.pdf?MOD=AJPERES)

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

99. **Community Health and Safety**. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites are along the road ways, hence safety risk to community is to be considered. The sewer line work may require deep trenches including in narrow streets; unprotected trench excavation may endanger the stability of nearby buildings/structures. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Provide wooden bracing for all deep excavations that may require especially for sewer lines (> 2m); identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work
(ii) Plan material and waste routes to avoid times of peak-pedestrian activities
(iii) Liaise with IA/Davangere CMC in identifying risk areas on route cards/maps
(iv) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure
(v) Provide road signs and flag persons to warn of dangerous conditions, for all work sites along the roads
(vi) Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2Bcommunity%2Bhealth%2Band%2Bsafety.pdf?MOD=AJPERES)

100. **Work Camps**. Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. Provision of proper living facilities and basic amenities (water, sanitation, fire safety, health and safety, etc) shall be ensured.

101. The construction contractor will be required to comply with the following. Overall, the contract should follow the IFC EHS guidelines specific to workers accommodation (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation).

(i) Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located within reasonable distance of work site
(ii) Minimize removal of vegetation and disallow cutting of trees
(iii) Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge
(iv) The camp site should be adequately drained to avoid the accumulation of stagnant water
(v) Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination
(vi) Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons
(vii) Train employees in the storage and handling of materials which can potentially cause soil contamination;

(viii) Recover used oil and lubricants and reuse or remove from the site;
(ix) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(x) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(xi) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

102. **Social and Cultural Resources – Chance Finds**. Subproject area is not a potential archaeological area and therefore no impacts envisaged.

E.. Operation and Maintenance Impact

103. **Sewer System**. The new sewerage system will need regular maintenance during operation; with a few simple precautions this can also be conducted without major environmental impacts.

104. The main requirement for maintenance of the new infrastructure will be for the detection and repair of leaks. The generally flat topography and the usage of good quality HDPE / GSW / Concrete pipes should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes.

105. The new sewerage system provided under the Investment Program will collect domestic wastewater and sewage produced by majority of the town population. The proposed treatment plants under implementation will treat the sewage collected from the town. The discharge after treatment will comply with Indian wastewater standards.

106. The sewer pipes will not function without maintenance, as silt inevitably collects in areas of low flow over time. The project will therefore provide equipment for cleaning the sewers, including buckets and winches to remove silt via the inspection manholes, diesel-fuelled pumps to remove blockages, etc. Piped sewers are not 100% watertight and leaks can occur at joints. The measures suggested for consideration during the design of sewer network will help in proper functioning of the system. Any repairs will be conducted by sealing off the affected sewer and pumping the contents into tankers, after which the faulty section will be exposed and repaired following the same basic procedure as when the sewer was built. Trenches will be dug around the faulty section and the leaking joint will be re-sealed, or the pipe will be removed and replaced.

107. **Operation of STP**. STP operation will be mostly automated with less human intervention in the process, so scope for human error and its effect on efficiency is very limited. Design also includes provision for automated shutdown in the incidence of high BOD (above design capacity) entering the plant. However, 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.

108. Potential health hazards due to improper sludge disposal methods. Sludge will be regularly accumulated in the SBR basins during each process batch. 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. Personal Protection Equipments shall be provided.

109. Chances for Ground water contamination due to proximity to STP site and health risk due to abstraction of polluted ground water through bore wells by the people residing near the STP sites. The proposed STP will completely lined on its wall and floor. So the infiltration of water will be negligible.

110. The impact due to odour nuisance may be considered as medium since the proposed STP unit will be provided with aerators which will ease the biodegradation process and thereby reduce odour problems and also the proposed buffer zone around the site will reduce the impact on nearest habitations. Buffer zone in the form of landscaping and earthwork shall be created and well maintained around the site. O & M of STP will be conducted regularly to reduce odour problems to the neighbours.

111. However, STP operation It is suggested to develop an Emergency Response Plan (ERP) in case of release of bad odours from the facility. A Template for ERP is provided in Appendix 5. Sensitize and train staff in implementation of ERP.

112. **Sanitation**. There will be significant nuisance and public health risk due to unhygienic conditions in community toilets, if not maintained properly. Therefore, the community toilets shall be regularly cleaned to maintain hygienic conditions.

113. The proposed community toilets will not function without regular cleaning and maintenance. Therefore, there is a need to develop and implement Operation and Maintenance (O & M) plans for community toilets with participation from community. A memorandum of understanding (MoU) between Davangere City Corporation and community will be reached prior to any construction and operation of community toilets. As a minimum, the O & M plan should specify i) cleaning procedures and frequency ii) responsible personnel iii) maintenance and repairs schedule iv) emergency contact numbers. The ULB and community group will jointly handover O&M to a service provider and will periodically monitor the implementation of the O&M plan

114. An O&M plan for the individual toilets will be prepared and submitted at the time of application for OBA grant by the household owner. The household owner may seek the assistance of the NGO to prepare this plan. The NGO and loan consultant will jointly review the implementation of the O&M plan after 6 month of construction completion prior to releasing the final stage of funding as stipulated in the OBA Toilet Program Guidelines.

General.

115. **Surface Water Quality:** Adequate capacity sewerage facility is already under construction, hence this sub project won't cause any impairment of downstream water quality due to release of untreated or raw sewerage. The ULB will be required to restrict any discharge of raw sewer to the drains prior to commissioning of the sewer network

116.**Occupational Health and Safety**: There are no source of hazardous material that will discharge hazardous materials into the sewers, resulting in damage to sewer system and danger to workers. Waste water, other than municipal (i.e., industrial) entering the sewerage system shall meet the stipulated standards.

117. The Implementing Agency/Davangere CMC needs to prepare Operation and Maintenance (O&M) Manual and operate and maintain the system as per the manual. Preparation of O&M Manual may be included in the scope of DPR consultants (for item rate contracts) or Construction Contractor (for design-build or turnkey contracts). Measures to minimize the disturbance to general public/ business and dust control, as followed during the construction, is to be implemented during maintenance as well. Operation of sewage pumping station will be simple, but requires skilled workforce.

118. The provision of an improved sewerage system is expected to have indirect economic benefits from the expected improvement in the health, environment and economic well-being.

119. The citizens of the Davangere Town will be the major beneficiaries of this subproject. The sewerage system will remove the human waste from those areas served by the network rapidly and treated to an acceptable standard. With the construction of toilets and targeted awareness program on sanitation propose, in addition to improved environmental conditions, the sub project will improve the overall health conditions of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

VI. INSTITUTIONAL ARRANGEMENTS

A. Implementation Arrangements

120. **Executing Agency (EA)**: Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the executing agency (EA) responsible for implementing the Investment Program. Investment Program implementation activities will be monitored by KUIDFC through a separate Investment Program Management Unit (PMU) for the IWRM Project, which will be set-up within KUIDFC. The Task Manager, KUIDFC will head the PMU and will be assisted by an Executive Director at the Regional office of KUIDFC at Dharwad to oversee the Investment Program progress. A team of senior technical, administrative and financial officials will assist the Executive Director in controlling and monitoring Investment Program implementation activities.

121. The Executive Director will be supported by a new Divisional Office established at Davangere. A Consultant Team will be appointed by EA and the team will work under the Divisional Programme Director (DPD) and will be involved in project planning, preparation of subproject and cost estimates, co-ordination, technical guidance and supervision, financial control, training and overall subproject management

122. All Investment Program decisions will be made by the Executive Director who shall operate from the PMU, Dharwad; only interactions with GoK, GoI and ADB shall be conducted through the KUIDFC office at Bangalore.

123. **Implementing Agency (IA):** The ultimate implementation responsibility lies with respective ULBs (in this case Davangere City Municipal Council). A Programme Implementation Unit (PIU) will be established in each ULB.

124. Other than the above institutional setup, District Level Programme Steering Committee will be set up in each district to monitor implementation of subprojects and institutional reforms. The District Level Programme Steering Committee shall consist of Deputy Commissioner of District, Divisional Program Director from concerned divisional office, Municipal Commissioners' / Chief Officers of Investment programme ULB and President / Chair of investment programme ULB. The District Level Programme Steering Committee will report to the PMU Executive Director: Dharwad.

125. At the Executing Agency (i.e. KUIDFC), environmental issues will be coordinated centrally by an Environmental Specialist at manager level (designated as Assistant Executive Engineer – Environment), reporting to the Task Manager, Assistant Executive Engineer – Environment will ensure that all subprojects comply with environmental safeguards. The IEE / EIA reports prepared by the Consultant Team, and will be reviewd by the Assistant Executive Engineer – Environment as per the ADB's Environmental Guidelines and forwarded to ADB for review and approval. In case of IEE reports, the ADB could delegate approval of IEE reports fully to the PMU after reviewing the first two reports. However, all the EIA reports shall be sent to ADB for approval. The Assistant Executive Engineer – Environment will be assisted by an Environmental Experts, who will be appointed by by EA in divisional office at Davangere.

126. The responsibility fulfilling environmental requirements of GoI/GoK and conducting required level of environmental assessment as per ADB guidelines lies with the EA and IA. The Consultant Team will assist EA and IA in this regard.

127. The mitigation measures identified through IEE/EIA are incorporated into the Investment Program. Mitigation measures, which are to be implemented by the Contractor, shall form part of the Contract Documents. The other mitigation measures are undertaken by the IA (itself or in assistance with the Consultant Team) as specified in the IEE. During the construction phase, environmental specialist of Consultant Team will monitor the implementation of the EMP and report to the PMU. The Implementation of EMP and other environmental related measures and the results of environmental monitoring conducted during implementation will be reported to ADB through semi annual Environmental Monitoring Reports. These will also be made available on executing agency (KUIDFC) website for wider public access.

128. **Consultants**: Each Divisional Program Director is being assisted by a consultant team in project planning, preparation of project and cost estimates, coordination, technical guidance and supervision, financial control, training and overall project management. The consultant team includes an environmental specialist to supervise the implementation of environmental safeguards at the divisional level. The consultant team also includes a Construction Supervision Specialist (CSS) at each ULB/CMC responsible for the supervision of project implantation including environmental safeguards at eh ULB/CMC level.

129. **Contractor:** The contractor shall appoint one supervisor who will be responsible on a day-today basis for i) ensuring implementation of EMP ii) Coordinating the CSS and environment specialists (all levels) iii) community liaison, consultation with interested / affected parties and grievance redressal and iv) reporting.

130. KUIDFC will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities, on (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste, and on (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.

131. The following figure and table summarizes the institutional responsibility of environmental safeguards at all stages of the project.

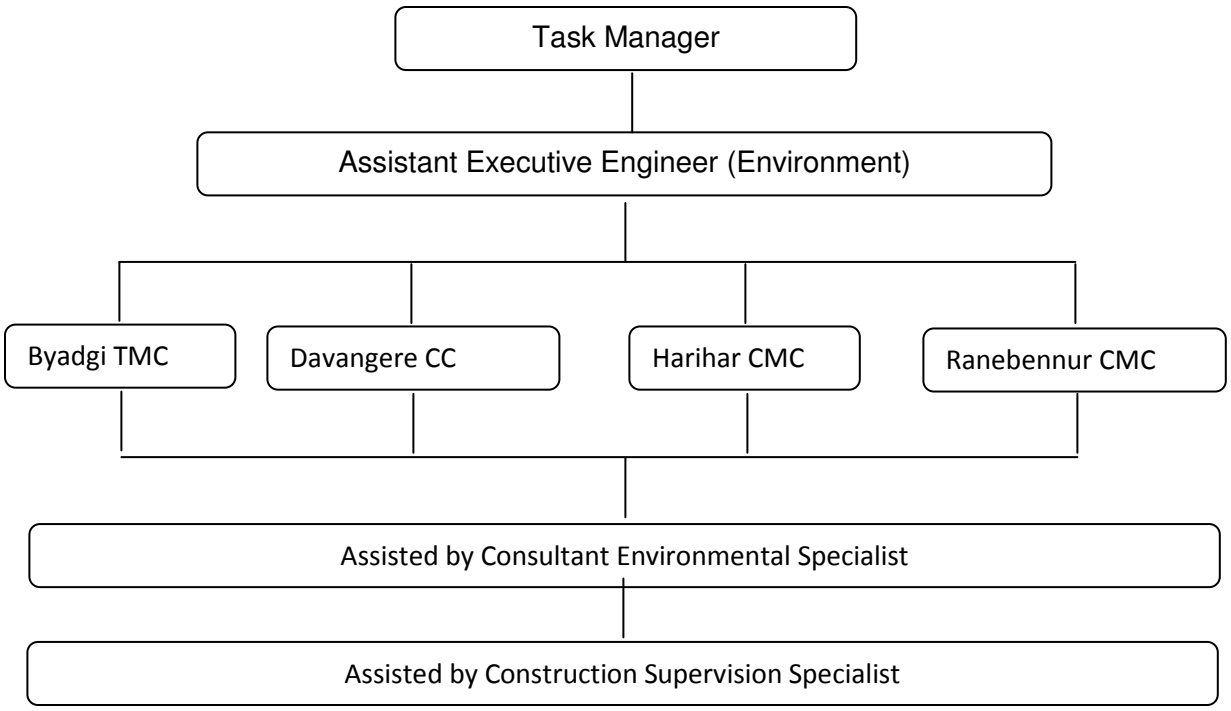


Figure 6: Environment Safeguard Implementation Arrangement

Table 8: Institutional Roles and Responsibilities

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
Task Manager	(i) Review REA checklists and assign categorization based on ADB SPS (ii) Review and approve EIA/IEE (iii) Submit EIA/IEE to ADB for approval and disclosure in ADB website (iv) Ensure approved IEEs are disclosed in KUIDFC website and summary posted in public areas accessible and understandable by local people. (v) Ensure environmental management plans (EMPs) are included in the bid documents and contracts (vi) Organize an	(i) Task Manager is responsible for over-all environmental safeguards compliance of the project (ii) Prepare and submit to ADB semi-annual monitoring reports (iii) Review and submit Corrective Action Plans to ADB (iv) Organize capacity building programs on environmental safeguards (iv) Coordinate with national and state level government agencies (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	orientation workshop for	manner as per the IEEs	
Assistant Executive Engineer (Environment)	PMU, ULBs/CMCs, and all staff involved in the project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH&S, (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (vii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (viii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (x) Assist PMU, PIUs, and project NGOs to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE. (xi) Assist in the review of	(i) Review quarterly monitoring report. Prepare Quarterly Monitoring report. (ii) Assist in the preparation of semi-annual monitoring reports (iii) Monitor and ensure compliance of EMPs as well as any other environmental provisions and conditions. (iv) If necessary prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts; (v) Organize capacity building programs on environmental safeguards at regional / divisional level (vi) Coordinate with regional level government agencies (vii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (viii) Assist in overseeing implementation of the EMP during construction including environmental, health and safety monitoring of contractors; (ix) Coordinate with the General Manager, environmental Experts, ULBs/CMCs, NGOs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	the contractors' implementation plans to ensure compliance with the IEE.		
ULB/CMC	(i) Conduct initial environmental assessment for proposed project using REA checklists and submit to PMU (ii) Prepare EIA/IEE based on categorization and submit to PMU for approval (iii) Ensure IEE is included in bid documents and contract agreements. Ensure cost of EMP implementation is provided. (iv) Disclose approved EIAs/IEEs. (v) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions. (vi) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. (vii) Ensure contractors undergo EMP implementation orientation prior to start of civil works	(i) Ensure EMP implementation is included in measuring works carried out by the contractors and certifying payments. (ii) Ensure Corrective Action Plan is implemented. (ii) Conduct public awareness campaigns and participation programs (iii) Prepare monthly reports. (vi) Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.
Consultant Environment Specialist at ULB/CMC level Construction Consultant Specialist at ULB/CMC level	(i) Assist ULBs/CMCs in preparation of REA checklists and EIAs/IEEs (ii) Assist ULBs/CMCs in obtaining all necessary clearances, permits, consents, NOCs, etc. Ensure provisions and conditions are incorporated in the IEE and detailed design documents. (iii) Assist in ensuring IEE is included in bid documents and contract agreements. Assist in determining adequacy of	(i) Monitor EMP implementation (ii) Recommend corrective action measures for non-compliance by contractors (iii) Assist in the review of monitoring reports submitted by contractors (iv) Assist in the preparation of monthly reports (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs	(i) Assist in the inspection and verification of contractor's post-construction activities.

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	cost for EMP implementation. (iv) Assist in addressing any concern related to IEE and EMP. (v) Assist in summarizing IEE and translating to language understood by local people.		
Contractors	(i) Ensure EMP implementation cost is included in the methodology. (ii) Undergo EMP implementation orientation prior to award of contract (iii) Provide EMP implementation orientation to all workers prior to deployment to worksites (iv) Seek approval for camp sites and sources of materials. (v) Ensure copy of IEE is available at worksites. Summary of IEE is translated to language understood by workers and posted at visible places at all times.	(i) Implement EMP. (ii) Implement corrective actions if necessary. (iii) Prepare and submit monitoring reports including pictures to ULB/CMC (iv) Comply with all applicable legislation, is conversant with the requirements of the EMP; (v) Brief his staff, employees, and laborer about the requirements of the EMP and provide environmental awareness training to staff, employees, and laborers; (vi) Ensure any sub-contractors/ suppliers who are utilized within the context of the contract comply with all requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf; (vii) Bear the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions; (viii) Ensure that ULBs/CMCs and CSS are timely informed of any foreseeable activities related to EMP implementation. (vi) Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from ULBs/CMCs

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Summary Environmental Impact & Mitigation Measures

132. The purpose of the Environmental Management Plan (EMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

133. A copy of the EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

134. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

135. Table 9 to Table 17 shows the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and estimated cost of implementation. This EMP will be included in the bid documents and will be further reviewed and updated during implementation.

Table 9: Summary of Environmental Impacts & Mitigation Measures- Sewer Network – Pre-Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Utilities: Disturbance/damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; • Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance, and • Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. In case of disruption of water supply, alternative supply, through tankers, shall be provided.	PIU and Design Consultant	Part of project cost
Design: Drinking water supply lines may be contaminated due to leakage from sewers	• Limit the sewer depth where possible. • Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); • 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) • In unavoidable, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided) • For shallower sewers, use small inspection chambers in lieu of manholes; • Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry • Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulphide generation • Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service	PIU and Design Consultant	Part of project cost

	interruptions. Consider redundant pump capacity in critical areas • Establish routine 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 prioritized 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); • 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; • 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. • 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		
Emergencies such as leaks, overflows, bursts	• Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5	PIU and CMC	Part of project cost

Table 10: Summary of Environmental Impacts & Mitigation Measures – Sewer Network– Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Impacts due to excess excavated earth, excess construction materials, solid waste etc. Occupational hazards which can occur to workers and public during work.	Prepare and submit a Construction Management Plan, every month, before starting the work. The method statement for the construction works should be part of the Construction Management Plan. The method statement for pipeline and sewer works will be in a Table format with appended site layout map and cover the following: • Work description; No. Of workers (skilled & unskilled); Details of Plant, equipment & machinery, vehicles • Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing) • PPE (helmet, gloves, boots, etc) details for each type of work • Details of materials at each site (type & quantity) • Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure etc) • Construction waste/debris generated (details & quantity) • Detail the sequence of work process (step-by-step) including specific details of each work • Contractor's supervision & management arrangements for the work • Emergency: Designate (i) responsible person on site, and (ii) first aider • Typical site layout plan including pipe trenching, placement of material, excavated earth, barricading etc • The pipeline/sewers are to be laid along the roads, The excavated soil, placed along the trench may get disturbed due to wind, rain water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc, and also into nearby open drains. The following should be included in the site layout plan: ✓ Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone ✓ Location of temporary stockpiles and provision of bunds ✓ Separation of stockpiles areas with workers/vehicle	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	movement paths to avoid disturbing the stockpiled soil ✓ Wetting of soil to arrest dust generation by sprinkling water ✓ Waste/surplus soil utilization and disposal plan – indicate expected duration of temporary stockpiling along the trench at each site and identify final surplus soil utilization/disposal site in consultation with PIU		
Disturbance/ damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase	PIU	Part of project cost
	• Prepare a contingency plan to include actions to be done in case of unintentional interruption of services. The contingency plan should be included in the Construction Management plan. • A micro planning on utilities need to be included in the Construction Management Plan and to be submit before the start of the construction works. The micro planning should cover the possible disturbance to the utilities and suggested precautions / restoration plan. • Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance; • In case of disruption of water supply, alternative supply, through tankers, shall be provided; water may be made available by the Davangere CMC, but it will the responsibility of contractor to supply to affected people	Construction Contractor	
Construction work camps, stockpile areas, storage areas, and disposal areas (disruption to traffic flow and sensitive areas and receptors)	• Prioritize areas within or nearest possible vacant space in the subproject location; • Construction work camps shall be located at least 200 m from residential areas • Do not consider residential areas for stockpiling the waste/surplus soil • Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains. • The details of the work camps should be included in the Construction Management Plan.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Extraction of materials can disrupt natural land contours	• Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue	Construction Contractor	Good construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution	Department. • Verify suitability of all material sources and obtain approval of implementing agency • No new quarry sites shall be developed for the subproject purpose • Submit a monthly statement of construction material procured indicating material type, source and quantity.		practice to be followed by contractor – no additional costs
Dust and emissions from construction activity may degrade the air quality	• Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials; • Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; • Bring materials (aggregates, sand, etc gravel) as and when required; • Use tarpaulins to cover sand and other loose material when transported by vehicles; • Clean wheels and undercarriage of vehicles prior to leaving construction site • Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
High noisy construction activities may have adverse impacts on sensitive receptors and structures	• Plan activities in consultation with the PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; • Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town;. • Provide prior information to the local public about the work schedule; • Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling; • Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and • Maintain maximum sound levels not exceeding 80 decibels (db)	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	when measured at a distance of 10 m or more from the vehicle/s		
Impacts on surface drainage and water quality due to contaminated runoff from construction areas in monsoon	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose any wastes generated by construction activities in designated sites	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Impacts on landscape and aesthetics due to construction activity	• Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly. The Waste Management Plan will be part of the Construction Management Plan. • Avoid stockpiling of excess excavated soils as far as possible • Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; • Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Damage to protected structures due to construction along the areas near to protected monuments	All necessary and adequate care should be taken to minimize the impact on protected properties. If articles such as fabrics, coins, artifacts, structures or other geologically or archeologically important materials are discovered, the excavation should be stopped and the Archaeological Department should be intimated at the earliest and all the articles received during the sewer laning should be handed over to ASI DCC should include the above instruction in the contract document.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Hindrance to traffic movement	• Plan pipeline (sewer lines) work in consultation with the traffic police • Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum	Construction Contractor	Good construction practice to be followed by

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	possible time; • Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement; • Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line; • In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions; • At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints. • Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4A. The site specific Traffic Management Plan should be part of the Construction Management Plan. • The list of roads where partial or full closure of road is necessary is given as Appendix 4B.		contractor – no additional costs
Schools, hospitals and religious places	• No material should be stocked in this area; material shall be brought to the site as and when required • Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles • No work should be conducted near the religious places during religious congregations • Material transport to the site should be arranged considering school timings; material should be in place before school starts; • Notify concerned schools, hospitals etc 2 weeks prior to the work; conduct a 30 minutes awareness program at on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts • Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Socio- Economic: Livelihood			

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Impediment of access to houses and business	• Leave space for access between mounds of excavated soil • Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required • Consult affected businesspeople; inform them in advance when work will occur • Address livelihood issues; implement the Resettlement Plan (RP) to address these issues • Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and • Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Socio-Economic: Employment Employment generation	• Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available • Secure construction materials from local market.	Construction Contractor	NA
Impact on construction workers during sewer laning along the existing sewer / abandoned network with AC pipes. AC pipes can be carcinogenic if inhaled as dust particles	• Train all construction personnel in dangers of AC pipes and how to recognise them in situ. • Develop and apply protocol if AC pipes are encountered.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Workers occupational health & safety	• Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures • Ensure that qualified first-aid can be provided at all times.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances • Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • 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; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • 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; • Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES). • The measures adopted for ensuring the workers safety should be part of the Construction Management Plan.		

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Community health & safety Danger due to deep excavations, hindrance to traffic and chances of accident.	• Provide wooden bracing for all deep excavations (> 2m); identify buildings at risk prior to start of excavation work and take necessary precautions for safe work • Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with Davangere CMC in identifying risk areas on route cards/maps; identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work • Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure • Provide road signs and flag persons to warn of dangerous conditions, for all the sites along the roads • Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Temporary worker camps	• The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: • Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located within reasonable distance of work site • Minimize removal of vegetation and disallow cutting of trees • Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge • The camp site should be adequately drained to avoid the accumulation of stagnant water • Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	cleaned regularly and covered properly to avoid any contamination • Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons • Train employees in the storage and handling of materials which can potentially cause soil contamination; • Recover used oil and lubricants and reuse or remove from the site; • Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; • Remove all rubbish, or temporary structures which are no longer required • Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		

Table 11: Summary of Environmental Impacts & Mitigation Measures – Sewer Network - Operation

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
General maintenance and repair of sewer system Nuisance and disturbance to people, disruption services etc	• Follow standard procedures as prescribed by O&M Manual • Ensure that all necessary equipment and tools are available for regular maintenance, especially for sewer network • Ensure there is no overflow of sewers due to blockages or leaks; in case of occurrence, attend to these at the earliest • Implement all necessary mitigation measures suggested during construction (to avoid disturbance and inconvenience to people, business and traffic) • Treat/dispose/utilize the sludge as per the sludge management plan. Ensure operation and maintenance of sewer network as per the standard operating procedures to avoid, over flows,	DCC	Part of project O&M cost

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	blockages, etc and immediately conducting the maintenance work in case of such occurrences • Implement Emergency Response Plan (ERP template is provided in Appendix 5 for reference) for events such as burst/leaks/overflows of sewers etc)		
Damage to sewer and health risk to sewer cleaning and STP workers, negative impact on performance of STP and pollution in water bodies receiving treated effluent	• The rules and regulations will be strictly implemented to avoid discharge of hazardous chemicals into sewers.	KSPCB and DCC	Part of O & M Cost.
Odour nuisance due to STP	• Green Buffer zone in the form of landscaping and earthwork shall be created and well maintained around the site. • 100 meter around the STP site will be declared as 'no development zone' • This impact may be considered as negligible due to location of plant site and proposed buffer zone and no development zone provision.	DCC	Part of project O&M cost

Table 12: Summary of Environmental Impacts & Mitigation Measures – STP – Pre Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Disturbance/damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within identified sites for these treatment plants)	• Identify the operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; • Discuss with the respective agencies during the construction phase before ground clearance, and	PIU and Design Consultant	Part of project cost
Design Nuisance due to location of the site in a developing	• Select a treatment process that is compact, aesthetically good, and generates no or fewer odours.	PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
area	• Provide a green buffer zone of 10-15 m wide around the STP; this should be planted with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. • Regulate the surrounding land use in strict compliance with Davangere Master Plan. And declared no developmet zone around the STP sites. • Design the layout plan of the facility such that potential odour generating units – inlet and primary treatment units and sludge thickener, are located away as far as possible from the nearest development, and be provided with green buffer zone. • Provide backup power facilities for continuous and uninterrupted operation		
Nuisance due to mosquito breeding and bad odour from STP	• Development of physical separation and visual screen around the facility. • A buffer zone in the form of landscaping and earth work shall be created around the STP. • 100 meter around the STP site will be no development zone. • To avoid / reduce mosquito breeding the banks of ponds shall be kept clear of grasses bushes etc.	DCC	Part of Design cost
Contamination of groundwater resources due to leaching of waste water from STP	• This may not be significant as the ground water table is deep as 40-50 feet. As a precautionary measure, the bottom of the STP plants should be lined with concrete.	DCC / Head Contractor	Part of project cost
Design and development of Treatment plans as per disposal standards set by CPCB (Pollution of surface water, groundwater and land resources)	• The Treatment Plants should be designed for following treated water disposal standards (for more details refer Appendix 3): ✓ BOD of 30 mg/l ✓ Suspended solids level of 100 mg/l ✓ Faecal coliform less than 1000/100 ml • Continuous uninterrupted power supply should be provided for the facility; back-up facility (such as generator) shall be provided and adequate fuel supplies shall be ensured for running of generator when required • Provide energy efficient design; this should be one of the main criteria for evaluation of different bidders • Provide an operating manual with all standard operating	PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	procedures (SOPs) for operation and maintenance of facility; this should include guidance on the follow up actions in case of process disruptions, inferior quality of treated water; etc. Necessary training (hands-on and class room / exposure visits) shall be provided to the ULB staff dealing with Treatment Plants. • Develop a Sludge Management Plan • The scope of work of facility contractor should include extended operation period (at least five years) to ensure smooth operation, training to the ULB staff and gradual transfer of facility to Davangere CMC • Conduct regular wastewater quality monitoring (at inlet and at outlet) to ensure that the treated effluent quality complies with the standards • Provide a green buffer zone of 10-15 m wide around the STP; this should be planted with trees in multi-rows. • 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 • Utilize treated water for irrigation use in the surrounding fields		
Emergencies Events like release of bad odours	• • Develop an emergency response system for events like release of bad odours – an ERS template is provided at Appendix 5.	PIU and CMC	Part of project cost

Table 13: Summary of Environmental Impacts & Mitigation Measures – STP – Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Impacts due to excess excavated earth, excess construction materials, solid waste etc. Occupational hazards which can occur to	Prepare and submit a Construction Management Plan. The method statement for the construction works should be part of the Construction Management Plan. Method Statement for the Treatment plant works will be in a Table format with appended site layout map and cover the following: • Work description; No. Of workers (skilled & unskilled); Details of Plant, equipment & machinery, vehicles	Construction Contractor	Good construction practice to be followed by contractor – no

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
workers and public during work.	• Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing) • PPE (helmet, gloves, boots, etc) details for each type of work • Details of materials at each site (type & quantity) • Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure etc) • Construction waste/debris generated (details & quantity) • Detail the sequence of work process (step-by-step) including specific details of each work • Contractor's supervision & management arrangements for the work • Emergency: Designate (i) responsible person on site, and (ii) first aider • The excavated soil, may get disturbed due to wind, rain water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc, and also into nearby open drains. The following should be included in the site layout plan: ✓ Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone ✓ Location of temporary stockpiles and provision of bunds ✓ Separation of stockpiles areas with workers/vehicle movement paths to avoid disturbing the stockpiled soil ✓ Wetting of soil to arrest dust generation by sprinkling water ✓ Waste/surplus soil utilization and disposal plan – indicate expected duration of temporary stockpiling along the trench at each site and identify final surplus soil utilization/disposal site in consultation with PIU		additional costs
Disturbance/ damage to existing utilities in the treatment plant site (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase	PIU	Part of project cost
	• Discuss with the respective agencies during the construction phase before ground clearance; • Prepare a contingency plan to be done in case of unintentional interruption of utility service during the construction of the plant or	Construction Contractor	

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	transportation of the materials. This contingency plan should be part of the Construction Management Plan.		
Construction work camps, stockpile areas, storage areas, and disposal areas (disruption to traffic flow and sensitive areas and receptors)	• Prioritize areas within or nearest possible vacant space in the subproject location; • Construction work camps shall be located at least 200 m from residential areas • Do not consider residential areas for stockpiling the waste/surplus soil • Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains. • The details of work camps should be included in the Construction Management Plan.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
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	• Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue Department. • Verify suitability of all material sources and obtain approval of implementing agency • No new quarry sites shall be developed for the subproject purpose • Submit a monthly statement of construction material procured indicating material type, source and quantity.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Dust and emissions from construction activity may degrade the air quality	• Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials; • Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; • Bring materials (aggregates, sand, etc gravel) as and when required; • Use tarpaulins to cover sand and other loose material when transported by vehicles; • Clean wheels and undercarriage of vehicles prior to leaving construction site • Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
High noisy construction	• Plan activities in consultation with the PIU so that activities with the	Construction	Good

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
activities may have adverse impacts on sensitive receptors and structures	greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; • Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town;. • Provide prior information to the local public about the work schedule; • Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling; • Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and • Maintain maximum sound levels not exceeding 80 decibels (db) when measured at a distance of 10 m or more from the vehicle/s	Contractor	construction practice to be followed by contractor – no additional costs
Impacts on surface drainage and water quality due to contaminated runoff from construction areas in monsoon	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose any wastes generated by construction activities in designated sites	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Impacts on landscape and aesthetics due to construction activity	• Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly • Avoid stockpiling of excess excavated soils as far as possible • Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; • Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Socio-Economic: Employment: Employment generation	• Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available • Secure construction materials from local market.	Construction Contractor	NA
Workers occupational health & safety	• Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances • Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • 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; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • 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; • Disallow worker exposure to noise level greater than 85 dBA for a	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES) • The measures adopted for ensuring the workers safety should be part of the Construction Management Plan.		
Community health & safety Danger due to deep excavations, hindrance to traffic and chances of accident.	• Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with Davangere CMC in identifying risk areas on route cards/maps; identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work • Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure • Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Temporary worker camps	• The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: • Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located within reasonable distance of work site • Minimize removal of vegetation and disallow cutting of trees • Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge • The camp site should be adequately drained to avoid the	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	accumulation of stagnant water • Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination • Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons • Train employees in the storage and handling of materials which can potentially cause soil contamination; • Recover used oil and lubricants and reuse or remove from the site; • Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; • Remove all rubbish, or temporary structures which are no longer required • Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.		

Table 14: Summary of Environmental Impacts & Mitigation Measures – STP – Operation

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Odour nuisance from the treatment plants	• Buffer zone in the form of landscaping and earthwork shall be created and well maintained around the site. • No development zone will be declared around the STP premises. • This impact may be considered as negligible due to location of plant site and proposed buffer provision.	DCC	Part of project O&M cost
Pollution and health hazards due to improper sludge disposal methods Contaminated work area may cause health hazards	• Safe sludge handling methods shall be employed. PPE shall be provided. Sludge shall be dried in drying beds before disposal. • Sludge Management Plan shall be implemented	DCC	Part of project O&M cost

Table 15: Summary of Environmental Impacts & Mitigation Measures – Sanitation – Pre-Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Disturbance/damage to existing utilities on the sites (Telephone lines, electric poles and wires, water lines within proposed project sites)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; • Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance, and • Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. In case of disruption of water supply, alternative supply, through tankers, shall be provided	PIU and Design Consultant	Part of project cost
Community Toilets – Operation and Maintenance impacts	• Develop and implement operation and maintenance (O & M) plans for community toilets with participation of community • A memorandum of understanding (MoU) will be reached prior to any construction and operation of community toilets. • As a minimum, the O & M plan should specify i) cleaning procedure and frequency ii) responsible personnel iii) maintenance and repair schedule iv) emergency contact numbers	PIU and CMC	Part of project cost
Contamination to water bodies due to individual toilets	• The toilet site selected should not be upstream of any water body	Design consultant	NA

Table 16: Summary of Environmental Impacts & Mitigation Measures – Sanitation – Construction

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Impacts due to excess excavated earth, excess construction materials, solid waste etc. Occupational hazards which	Prepare and submit a Construction Management Plan. The method statement for the construction works should be part of the Construction Management Plan. The method statement for pipeline and sewer works will be in a a Method Statement for the toilets works in a Table format with appended site layout map and cover the following:	Construction Contractor	Good construction practice to be followed by contractor –

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
can occur to workers and public during work.	• Work description; No. Of workers (skilled & unskilled); Details of Plant, equipment & machinery, vehicles • Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing) • PPE (helmet, gloves, boots, etc) details for each type of work • Details of materials at each site (type & quantity) • Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure etc) • Detail the sequence of work process (step-by-step) including specific details of each work • Contractor's supervision & management arrangements for the work • Emergency: Designate (i) responsible person on site, and (ii) first aider • Typical site layout plan including pipe trenching, placement of material, excavated earth, barricading etc • The excavated soil, placed may get disturbed due to wind, rain water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc, and also into nearby open drains. The following should be included in the site layout plan: ✓ Provide barricading/ personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone ✓ Location of temporary stockpiles and provision of bunds ✓ Separation of stockpiles areas with workers/vehicle movement paths to avoid disturbing the stockpiled soil ✓ Wetting of soil to arrest dust generation by sprinkling water ✓ Waste/surplus soil utilization and disposal plan – indicate expected duration of temporary stockpiling along the trench at each site and identify final surplus soil utilization/disposal site in consultation with PIU		no additional costs
Disturbance/ damage to existing utilities on the sites (Telephone lines, electric	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase	PIU	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
poles and wires, water lines within proposed project sites)	• Prepare a contingency plan to include actions to be done in case of unintentional interruption of services. The contingency plan should be part of the Construction Management Plan. • Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance;	Construction Contractor	
Construction work camps, stockpile areas, storage areas, and disposal areas (disruption to traffic flow and sensitive areas and receptors)	• Prioritize areas within or nearest possible vacant space in the subproject location; • Construction work camps shall be located at least 200 m from residential areas • Do not consider residential areas for stockpiling the waste/surplus soil • Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains • The details of the work camps should be included in the Construction Management Plan.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
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	• Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue Department. • Verify suitability of all material sources and obtain approval of implementing agency • No new quarry sites shall be developed for the subproject purpose • Submit a monthly statement of construction material procured indicating material type, source and quantity.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Impacts on surface drainage and water quality due to contaminated runoff from construction areas in monsoon	• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose any wastes generated by construction activities in	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	designated sites		
Impacts on landscape and aesthetics due to construction activity	• Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly • Avoid stockpiling of excess excavated soils as far as possible • Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; • Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Hindrance to traffic movement	• Plan construction works in consultation with the traffic police • Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement; • Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line; • In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions; • At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints. • Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4. This Traffic Management Plan should be part of the Construction Management Plan.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Socio- Economic: Livelihood Impediment of access to houses and business	• Leave space for access between mounds of excavated soil • Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required • Consult affected businesspeople; inform them in advance when work will occur • Provide sign/caution/warning boards at work site indicating work	Construction Contractor	Good construction practice to be followed by contractor – no additional

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	schedule and traffic information; prevent public entry into work sites through barricading and security; and • Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.		costs
Socio-Economic: Employment Employment generation	• Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available • Secure construction materials from local market.	Construction Contractor	NA
Workers occupational health & safety	• Develop and implement site-specific Health and Safety (H and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances • Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • 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; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	• Ensure moving equipment is outfitted with audible back-up alarms; • 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; • Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)		
Community health & safety: Danger due to deep excavations, hindrance to traffic and chances of accident.	• Provide wooden bracing for all deep excavations (> 2m); identify buildings at risk prior to start of excavation work and take necessary precautions for safe work • Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with Davangere CMC in identifying risk areas on route cards/maps; identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work • Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure • Provide road signs and flag persons to warn of dangerous conditions, for all the sites along the roads • Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
	pdf?MOD=AJPERES		
Temporary worker camps	• The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: • Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located within reasonable distance of work site • Minimize removal of vegetation and disallow cutting of trees • Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge • The camp site should be adequately drained to avoid the accumulation of stagnant water • Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination • Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons • Train employees in the storage and handling of materials which can potentially cause soil contamination; • Recover used oil and lubricants and reuse or remove from the site; • Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; • Remove all rubbish, or temporary structures which are no longer required • Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Table 17: Summary of Environmental Impacts & Mitigation Measures – Sanitation – Operation

Anticipated Impact	Mitigation Measures	Responsible for Implementation	Cost and Source of Fund
Unhygienic condition due to lack of proper maintenance in public toilets generates health risk to public.	• Implement operation and maintenance (O & M) plans for community toilets with participation of community. • Clean and maintain the toilets regularly and maintain hygienic condition. • Regular check to the connections to the main lain for the leaks.	DCC	Part of project O&M cost

B. Environmental Monitoring Plan

136. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation measures by construction contractors will be conducted by the PIU with Consultant Team's support. Periodic monitoring and overseeing of implementation of mitigation measures will be PMU. Monitoring during operation stage will be conducted by the Operating Agency, Davangere.

137. Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. Sampling and quality monitoring of water supplied will be conducted regularly.

138. Prior to commencement of the work, the contractor will submit a compliance report to ULB/CMC ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. ULB/CMC with the assistance of the consultant environment specialist will review the report and thereafter PMU will allow commencement of works.

139. During construction, results from internal monitoring by the contractor will be reflected in their weekly EMP implementation reports to the Construction Supervision Specialist. These weekly report will be retained in DSC office for reference. Construction Supervision Specialist will review and advise contractors for corrective actions if necessary. Monthly report summarizing compliance and corrective measures taken will be prepared by Construction Supervision Specialist to be reviewed and endorsed by ULB/CMC to PMU.

140. Based on monthly reports and measurements, PMU will draft, review, and submit to ADB, 6-monthly (twice a year) EMP implementation progress report (Appendix 12). Once concurrence from the ADB is received the report will be disclosed in the Project website.

141. ADB will review project performance against the KUIDFC's commitments as agreed in the legal documents. 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

142. Following Table shows the proposed Environmental Monitoring Plan for this subproject, which specifies the various monitoring activities to be conducted during different phases of the project. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring).

Table 18: Environmental Monitoring Plan

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Pre-Construction						
All mitigation measures related to project site, location and design	-	PIU / Design Consultant	DPR Review	As needed	PMU	
• Select a treatment process that is compact, aesthetically good, and generates no or fewer odours. • Provide a green buffer zone of 10-15 m wide around the STP; this should be planted with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. • Design the layout plan of the facility such that potential odour generating units – inlet and primary treatment units and sludge thickener, are located away as far as possible from the nearest development, and be provided with green buffer zone. • Provide backup power facilities for continuous and uninterrupted operation	-	PIU	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU	Civil Work Contract
• Provision of sludge drying – accumulated sludge from clariflocculator shall be flushed to sludge drying beds, for natural drying. • Dried sludge shall be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it is suitable for use	-	PIU	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU	Civil Work Contract
• Identify and include locations and operators of the utilities in the detailed design documents	-	PIU / Consultant Team	Review & check the inclusion/ provision in	Once before DPR approval	PMU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
			DPR, as appropriate			
• Require construction contractors to prepare a contingency plan and make it part of the Construction Management plan	-	Contractor	Review the contingency plan	Once prior to the relocation of utilities	PIU	Civil Work Contract
• Limit the sewer depth where possible. • Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); • 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) • In unavoidable, where sewers are to be laid close to storm water drains or canals or natural streams, appropriate pipe material shall be selected (stoneware pipes shall be avoided)		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	Civil Work Contract
• For shallower sewers, use small inspection chambers in lieu of manholes; • Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry • Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulfide generation • Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
pump capacity in critical areas • Establish routine maintenance program, including: o 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. o 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 o Monitoring of sewer flow to identify potential inflows and outflows • Conduct repairs prioritized 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);						
• 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; • 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		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
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. • 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 • Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5						
Develop and implement operation and maintenance (O&M) plans for community toilets with participation from the community. A memorandum of understanding (MoU) between Ranebennur CMC and community will be reached prior to any construction and operation of community toilets. • As a minimum, the O&M plan should specify (i) cleaning procedures and frequency; (ii) responsible personnel; (iii) maintenance and repairs schedule; (iv) emergency contact numbers etc.		Davangere CMC, PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR /O&M Manual approval	PMU /PMC	NA
Construction						
Prepare and submit a Method Statement for pipeline and sewers works in a Table format with appended site layout map • Method Statement can be prepared for each stretch (say 1 km) /specific site based on the project area.	At each work site	Contractor	• Review and approve method statement Site observations during	Approve statement before start of work Weekly during construction	PIU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
			construction			
• Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance;	-	Contractor	Check contractor records Random checks on site, drawings and interactions with respective agencies	Once prior to the start of ground clearance for construction	PIU	Civil Work Contract
• Prepare a contingency plan to include actions to be done in case of unintentional interruption of services.	-	Contractor	Review the plan	Once prior to start of construction	PIU	Civil Work Contract
• In case of disruption of water supply, alternative supply, through tankers, shall be provided; water may be made available by the Davangere, but it will the responsibility of contractor to supply to affected people	Utility relocation site	Contractor	Site observations Informal public consultations	Weekly Once	PIU	Civil Work Contract
Prioritize areas within or nearest possible vacant space in the subproject location Construction work camps shall be located at least 200 m from residential areas • Do not consider residential areas for stockpiling the waste/surplus soil; • No worker camp shall be set up in north/western outskirts of the town, which are located close to sanctuary • The Contractor shall take all necessary precautions to prevent his workers from entering into sanctuary/forest area; removing, disturbing and damaging any trees/vegetation for fire wood and/or hunting animals; the contractor will be severely penalized if there are any	Sites for worker camp, material store	Contractor	Site observations	Before &after such establishment	PIU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
violations by workers. • Appropriate signage/caution/warning boards have to be installed on the site indicating the proximity of the sanctuary and prohibitory orders on entering sanctuary area and also on collecting the fuel-wood. This signs should be in Kannada, Hindi and English.						
• Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains	Stockpile sites	Contractor	Site observations	Weekly	PIU	Civil Work Contract
• Contractor should obtain material from existing mines approved/licensed by Mines and Geology Department/ Revenue Department. • Verify suitability of all material sources and obtain approval of implementing agency • No new quarry sites shall be developed for the subproject purpose	-	Contractor	Check sources & approvals	Prior to approval of quarry for material	PIU	Civil Work Contract
• Submit a monthly statement of construction material procured indicating material type, source and quantity.	-	Contractor	Record check	Monthly	PIU	Civil Work Contract
• Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;	Stockpile site	Contractor	Site check & approval	Prior to approval	PIU	Civil Work Contract
• Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather • Bring materials (aggregates, sand, etc gravel) as and when required • Use tarpaulins to cover sand and other loose material when transported by vehicles; • Clean wheels and undercarriage of	Work site	Contractor	Site observations Informal public consultations	Weekly	PIU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
vehicles prior to leaving construction site						
• Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity	Work site	Contractor	Check valid PUC	Prior to start and quarterly there after	PIU	NA
• Plan activities in consultation with the PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; • Construction work shall be limited to day light hours (6 AM to 6 PM) for all the works located within the town; for facilities outside the town/habitation (i.e. STP) the timings may be relaxed with the permission of Davangere CMC and PIU, however no work should be conducted between 10 PM – 6 AM at any site. • Provide prior information to the local public about the work schedule;	Work site	Contractor	Check work schedule of contractor; public consultation records	Prior to start of work	PIU	NA
• Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiselling;	Work site	Contractor	Site observations	Weekly	PIU	NA
• Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and	Work site	Contractor	Site observations	Weekly	PIU	NA
• Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more	Work site	Contractor	Noise monitoring	Quarterly	Contractor	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
from the vehicle/s						
• Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets • Stockpiles shall be provided with temporary bunds • Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas • Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies • Place storage areas for fuels and lubricants away from any drainage leading to water bodies • Dispose wastes generated by construction activities in designated sites	Work site	Contractor	Site observations	Weekly	PIU	NA
• Avoid stockpiling of excess excavated soils as far as possible • Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers; • Coordinate with PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas • Prepare and implement Waste Management Plan – it should present how the surplus waste generated will temporarily stocked at the site, transported and disposed properly	-	Contractor	Waste Management Plan review & approval	Once prior to start of construction	PIU	NA
• Plan pipeline work in consultation with the traffic police • Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a	Work site	Contractor	Work program review Site observations	Once prior to start of construction Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
minimum possible time; • Provide for immediate consolidation of backfilling material to desired compaction - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement • Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line • In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions; • Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with Davangere CMC in identifying risk areas on route cards/maps			Informal public consultation	during work		
• At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.	Work site	Contractor	Site observations	Once prior to start of construction	PIU	NA
• Prepare a Traffic Management Plan – a template is provided for reference at Appendix 4.	Work site	Contractor	Review, approval and on-site implementation of TMP	Once prior to start of construction; weekly during work	PIU	NA
• No material should be stocked in this area; material shall be brought to the site as and when required • Conduct work manually with small group of workers and less noise; minimize use	Work near sensitive areas	Contractor	Work program review Site observations Informal public	Once prior to start of construction Weekly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
of equipment and vehicles • No work should be conducted near the religious places during religious congregations • Material transport to the site should be arranged considering school timings; material should be in place before school starts; • Notify concerned schools, hospitals etc 1 week prior to the work; conduct a 30-m awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts • Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.			consultation			
• Leave space for access between mounds of excavated soil • Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required • Consult affected businesspeople to inform them in advance when work will occur • Address livelihood issues, if any; implement the Resettlement Plan (RP) to address these issues • Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security; and	Work site	Contractor	Site observations Informal public consultation	Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
• Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.						
• Employ at least 50% of the labour force, or to the maximum extent, local persons if manpower is available • Secure construction materials from local market.	Work site	Contractor	Review records Worker consultation	Weekly	PIU	NA
• Develop and implement site-specific Environment, Health and Safety (EHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H and S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • All trenches deeper than 2 m shall be protected with wooden bracing to avoid safety risks to workers, public and nearby buildings/structures • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide clean eating areas where workers are not exposed to hazardous or noxious substances	Work site	Contractor	Review and on-site implementation of EHS Plan	Once prior to start of construction; weekly during work	PIU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
• Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; • 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; • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; • Ensure moving equipment is outfitted with audible back-up alarms; • 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; • Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. • Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2						

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)						
• Provide road signs and flag persons to warn of dangerous conditions, in case of location near the road • Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)	Work site	Contractor	Review and on-site implementation of EHS Plan	Once prior to start of construction; weekly during work	PIU	Civil Work Contract
• The contractor should establish and operate the temporary worker camps in compliance with IFC EHS Guidelines specific to workers accommodation ((this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/publications/publications_gpn_workersaccommodation), including the following: • Consult with PIU/Davangere CMC before locating workers camps/sheds, and construction plants; ; as far as possible located within reasonable distance of work site • Minimize removal of vegetation and disallow cutting of trees • Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge • The camp site should be adequately drained to avoid the accumulation of stagnant water	Workers camp site	Contractor	Site observations and facilities	Once prior to start of construction; monthly during work	PIU	Civil Work Contract

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
• Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination • Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons • Train employees in the storage and handling of materials which can potentially cause soil contamination; • Recover used oil and lubricants and reuse or remove from the site; • Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; • Remove all wreckage, rubbish, or temporary structures which are no longer required • Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.						

Table 19 : Environmental Quality Monitoring

Sample	Sites	Responsibility	Parameter	Frequency	Agency
Construction					
Ambient air quality and noise	points shall be selected during detailed design stage	-	• SPM, RSPM, SOx, NOx • Day and night time noise (dBA) • Monitoring method as prescribed by CPCB	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor
Noise Level	points shall be selected during construction	Contractor	• Noise level	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor
Operation					
Monitoring of treated wastewater	outlet of STP,	Operator	Concentration of various parameters shall be within the specific limits by KSPCB	Quarterly	Davangere CMC through accredited lab/
	Inlet	operator	Analysis of Wastewater characteristics including heavy metals such as Mercury (as Hg), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Zinc (as Zn) and Nickel (as Ni) Concentration of various parameters shall be within the specific limits by KSPCB	Yearly twice	Davangere CMC
Sludge quality and suitability as manure	Sludge drying beds	Operator	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) • Arsenic - 10.00; • Cadmium - 5.00 • Chromium - 50.00 • Copper - 300.00 • Lead - 100.00 • Mercury - 0.15 • Nickel - 50.00 • Zinc - 1000.00 • PH - 5.5-8.5	Yearly once	Davangere CMC through accredited lab

C. Environmental Management & Monitoring Costs

143. Most of the mitigation measures require the Contractors to adopt good site practices, which are part of their normal procedures, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of ULBs/CMCs will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacity building program is included as part of the project. The EMP cost includes the cost for providing water supply and sanitation facilities for the workers and hard barricades at the construction sties. In addition to this, hard barricades need to be provided at the work sites to prevent any entry of the public or animals into the worksite and to prevent any possible accidents. Costs required for environmental quality monitoring is indicated in Tables 20 to 25.

Table 20: Environmental Monitoring Cost

Sample	Site/s	Responsibility	Parameter to monitor	Frequency	Who	Cost (INR)
Construction						
Ambient air quality and noise	3 locations. Monitoring points shall be selected during construction	Contractor	• SPM, RSPM, SOx, NOx • Day and night time noise (dBA) • Monitoring method as prescribed by CPCB	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	Rs. 4000 per sample – sum Rs. 120000.00 for 30 samples
Noise Level	3 locations. Monitoring points shall be selected during construction	Contractor	• Noise level	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	Rs. 2000.00 per sample Rs. 60000.00 for 30 samples
Operation						
Monitoring of treated wastewater quality from STP	Inlet and outlet of STP,	Operator	Concentration of various parameters shall be within the specific limits by KSPCB	Quarterly	Davangere CMC through accredited lab/ KSPCB	Part of laboratory O&M Costs
	Inlet	operator	Analysis of Wastewater characteristics including heavy metals such as Mercury (as Hg), Lead (as Pb), Cadmium (as Cd), Chromium (as Cr), Zinc (as Zn) and Nickel (as Ni) Concentration of various parameters shall be within the specific limits by KSPCB	Yearly twice	Davangere CMC	Part of O&M costs
Sludge quality and suitability as manure	Sludge drying beds	Operator	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) • Arsenic- 10.00 Cadmium - 5.00 Chromium- 50.00 Copper - 300.00 Lead - 100.00 Mercury - 0.15 Nickel- 50.00 Zinc - 1000.00 PH - 5.5-8.5	Yearly once	Davangere CMC through accredited lab	Part O&M costs

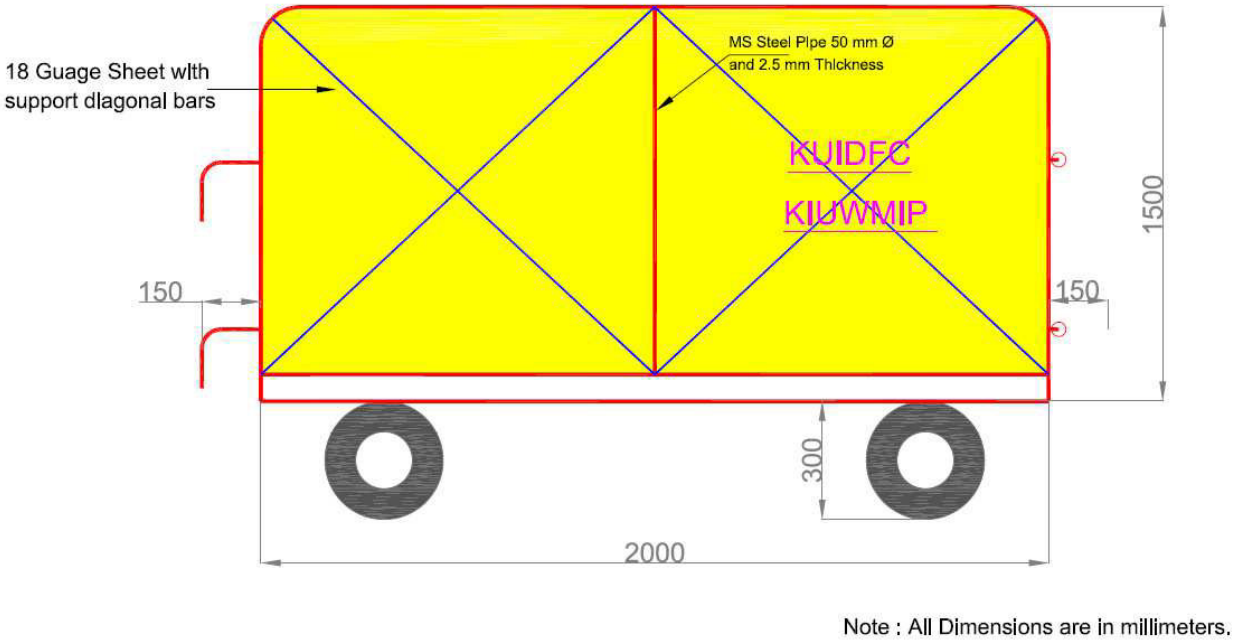


Figure 7: Diagram for the Hard Barricade at construction site

Table 21: Cost Estimate for Tree planting at STP Area

No	Particulars	Qty	Rate	Amount (Rs)
1	Putting in Hard Laterite Roack with 20 % iron ore 1m x 1m x 1m size pits. As per KUWS&SB	2500 pits (2500 m^3)	648 /m^3	16,20,000
2	Cost of Tall Seedling raised in Bigger Bags (14" x 20" PBs)	2500 Plants	45 / each	1,12,500
3	Cost of Planting, staking, watering and watch and ward	2500 Plant	As per Forest Department SSR	12,70,000
4	Cost of 1st year Maintenance	2500 Plant	As per Forest Department SSR	2,00,000
5	Cost of 2nd year Maintenance	2500 Plant	As per Forest Department SSR	2,00,000
6	Cost of 3rd year Maintanance	2500 Plant	As per Forest Departmetn SSR	2,00,000
Total				36,02,500

Table 22: Cost Estimate for Hard Barricade

Sl.No	Description	No	L (m)	B (m)	D (m)	QTY	Unit	Rate		Amount (Rs)
1	MS Steel Pipe 50mm dia and 3.65 mm th.k	1	10.5			53.55	kg	48	Kg	2570
2	MS Angles (25 x 25 x 3 mm)	1	10			11	Kg	48	Kg	528
3	MS Sheet 18G and 1.25mm th.k	1	2	1.5		29.4	Kg	48	Kg	1411
4	Wastage	50% of Material weight				46.975	Kg	48	Kg	2255
5	Fabrication Charge	40Rs/Kg								5637
6	Steel Wheel	4				4	LS			1500
Total Cost for Barricade										**13901**
										99
Round off										**14000**

Table 23: Cost Estimates to Implement the EMP – Sewer Network

No	Particulars	Stages	Unit	Number	Rate	Cost (INR)	Costs Covered By
A.	**Monitoring Measures**						
1	Air quality monitoring	Construction	Per location	30	4000	1,20,000	Civil works contract
2	Noise levels monitoring	Construction	Per location	30	2000	60,000	Civil works contract
	Sub Total					**1,80,000**	
B	**Capacity Building**						
1	Introduction and sensitization to environment issues	Pre-construction	lump sum			75,000	PMU
2	EMP implementation	Construction	lump sum			225,000	PMU
3	Plans and Protocols	Construction	lump sum			225,000	PMU
			lump sum			75,000	Civil works contract
4	Experiences and best practices sharing	Construction/ Post-Construction	lump sum			75,000	PMU
5	Contractors Orientation to Workers	Prior to dispatch to	Lump sum			40,000	Civil works

	on EMP implementation	worksite					contract
	Subtotal (B)					**715,000**	
C	Civil Works						
1	Construction of shelters for workers. (Should include basic amenities, shall not mbe less than 3 meter from floor, floored concrete and space provided shall be on the basis of one sq.mt per head or relevant regulation)	Construction	Lump sum			12,00,000	Civil works contract
2	Providing Water Supply Facility for the workers	Construction	Lump sum			5,00,000	Civil works contract
3	Providing Sanitation Facility for the workers.	Construction	Lump sum			4,00,000	Civil works contract
4	Barricades at the worksite (MS sheet 18G and 1.25 mm thickness supported with MS Sheet pipes 50 mm dia and 3.65 mm thickness at the outer frame and MS Angles (25x25x3 mm))	Construction	Per unit	450	14000	64,00,000	Civil works contract
5	Retro reflectorized Traffic Signs as per IRC:67, M 15 grade, 80 x 60 mm rectangular; fixed over Aluminum sheeting supported on MS angle iron. As per Schedule of Rate 2013-14)	Construction	Per unit	12	4000	48000	Civil works contract
6	Retro reflectorized Traffic Signs as per IRC:67, M 15 grade, 60 x 60 mm square; fixed over Aluminum sheeting supported on MS angle iron. As per Schedule of Rate 2013-14)	Construction	Per unit	6	3500	21000	Civil works contract
	Sub Total (C)					**85,69,000**	
	Total (A+B+C)					**94,64,000**	

Total cost for implementing EMP for Sewer Networks.

PMU Cost - Rs. 6,00,000.00

Contractor Cost - Rs. 88,64,000.00

TOTAL - Rs. 94,64,000.00

Table 24: Cost Estimates to Implement the EMP- Sanitation

No	Particulars	Stages	Unit	Number	Rate	Cost (INR)	Costs Covered By
A	**Capacity Building**						
1	Introduction and sensitization to environment issues	Pre-construction	lump sum			75,000	PMU
2	EMP implementation	Construction	lump sum			225,000	PMU
3	Plans and Protocols	Construction	lump sum			225,000	PMU
			lump sum			75,000	Civil works contract
4	Experiences and best practices sharing	Construction/ Post-Construction	lump sum			75,000	PMU
5	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			40,000	Civil works contract
	Subtotal (A)					**715,000**	
B	Civil Works						
1	Construction of shelters for workers. (Should include basic amenities, shall not be less than 3 meter from floor, floored concrete and space provided shall be on the basis of one sq.mt per head or relevant regulation)	Construction	Lump sum			5,00,000	Civil works contract
2	Providing Water Supply Facility for the workers	Construction	Lump sum			1,00,000	Civil works contract
3	Providing Sanitation Facility for the workers	Construction	Lump sum			1,00,000	Civil works contract
	Sub Total (B)					**7,00,000**	
	Total (A+B+C)					**14,15,000**	

Total cost for EMP implementation for Sanitation works

PMU Cost - Rs. 6,00,000.00

Contractor Cost - Rs. 8,15,000.00

TOTAL - Rs. 14,15,000.00

Table 25: Cost Estimates to Implement the EMP- STP

No	Particulars	Stages	Unit	Number	Rate	Cost (INR)	Costs Covered By
A.	**Monitoring Measures**						
1	Air quality monitoring	Construction	Per location	10	4000	40,000	Civil works contract
2	Noise levels monitoring	Construction	Per location	10	2000	20,000	Civil works contract
	Sub Total					**60,000**	
B	**Capacity Building**						
1	Introduction and sensitization to environment issues	Pre-construction	lump sum			75,000	PMU
2	EMP implementation	Construction	lump sum			225,000	PMU
3	Plans and Protocols	Construction	lump sum			225,000	PMU
			lump sum			75,000	Civil works contract
4	Experiences and best practices sharing	Construction/ Post-Construction	lump sum			75,000	PMU
5	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			40,000	Civil works contract
	Subtotal (B)					**715,000**	
C	Civil Works						
1	Construction of shelters for workers. (Should include basic amenities, shall not mbe less than 3 meter from floor, floored concrete and space provided shall be on the basis of one sq.mt per head or relevant regulation)	Construction	Lump sum			7,00,000	Civil works contract

2	Providing Water Supply Facility for the workers	Construction	Lump sum			5,00,000	Civil works contract
3	Providing Sanitation Facility for the workers	Construction	Lump sum			2,00,000	Civil works contract
4	Barricades at the worksite (MS sheet 18G and 1.25 mm thickness supported with MS Sheet pipes 50 mm dia and 3.65 mm thickness at the outer frame and MS Angles (25x25x3 mm)).	Construction	Per unit	20	14,000	2,80,000	Civil works contract
	Cost of plantation of trees and maintenance for three years	Construction	2500 plants			36,02,500	
	Sub Total (C)					**52,82,500**	
	Total (A+B+C)					**60,57,500**	

Total Cost for EMP implementation for Treatment Plants

PMU Cost - Rs. 6,00,000.00

Contractor Cost - Rs. 54,57,500.00

TOTAL - Rs. 60,57,500.00

D. Grievance Redress Mechanism

144. A project specific grievance redress mechanism (GRM) will be established to receive, evaluate and facilitate concerns of, complaints and grievances of the DPs in relation to project's social and environmental performances. The main objective of the GRM will be to provide time bound action and transparent mechanism to resolve social and environment concerns.

145. A project GRM will cover the project's towns for all kinds of grievances and will be regarded as an accessible and trusted platform for receiving and facilitating project related complaints and grievances. The multi-tier GRM for the program will have realistic time schedules to address grievances and specific responsible persons identified to address grievances and whom the DPs have access to interact easily.

146. Awareness on grievance redress procedures will be created through Public Awareness Campaign with the help of print and electronic media and radio. The resettlement NGO will ensure that vulnerable households are also made aware of the GRM and assured of their grievances to be redressed adequately and in a timely manner.

147. There will be multiple means of registering grievances and complaints by dropping grievance forms in complaint/ suggestion boxes at accessible locations, or through telephone hotlines, email, post or writing in a complaint registrar book in ULB's project office. There will be

complaint registrar book and complaint boxes at construction site office to enable quick response of grievances/ complaints for urgent matters. The name, address and contact details of the persons with details of the complaint / grievance, location of problem area, date of receipt of complaint will be documented. The RPMU's Social development / Resettlement Officer will be responsible at the project level for timely resolution of the environmental and social safeguards issues and registration of grievances, and communication with the aggrieved persons. Annex 1 is the draft PID to be distributed to all affected communities and DPs which include the contact numbers of the respective ULB officer(s) responsible for the KISWRMIP.

E. Grievance Redress Process

148. There will be several tiers for grievance redress process. Simple grievances for immediate redress will first be resolved at site by Contractor.. If unaddressed for up to 7 days the complainants may go to PIU officer in ULB responsible for resettlement/social issues. Project engineer and the resettlement NGO will assist in resolving the issues. Name, designation and contact number of personnel responsible for grievance redress at ULB and RPMU, will be posted at Contractor's and PMDSC's site office in full visibility of public. NGO will be involved in community mobilization and awareness campaign among the communities. Grievances of immediate nature should be resolved at site/ within ULB/PIU level within 15 days of registration of grievances.

149. All grievances that cannot be resolved by ULB/PIU within 15 days will be forwarded to RPMU's Social safeguards/R&R Officer and PMDSC specialist who will review and resolve within 15 working days of grievance registration with the assistance of the Resettlement NGO and concerned PIU/ULB personnel, if required.

150. The grievances of critical nature and those cannot be resolved at RPMU level should be referred to Grievance Redress Committee(GRC)/Steering Committee (ST) set up at district level to be settled within 30 days. All documents related to grievances, follow up action taken to resolve along with explanatory note on nature, seriousness and time taken for grievance redress shall be prepared by RPMU Social safeguard / R&R Officer and circulated to GRC/SC members at least a week prior to scheduled meeting. The decision taken at the GRC/SC level will be communicated to the DPs by RPMU Social safeguards/R&R officer through ULB/PIU and resettlement NGO.

151. For any issues that remain unresolved by the GRC or SC or the decision taken at such meetings are not acceptable, the complainants /DPs can approach the Court of Law as per Govt. of Karnataka legal procedure.

F. GRC / SC composition and selection of members

152. The GRC/SC for the project will be headed by Dy. Commissioner (DC) of the district with members as followed: (1) ULB Commissioners of project towns,(2) Revenue Department (Registrar) official, (3) RPMU Social safeguard/ R&R Officer of KIUWMIP, (4) ULB officer who will convene the periodic meeting of GRC and will shoulder responsibility of keeping records of grievances/ complaints in details with help from resettlement NGO. Other members, such as, NGO/CBO representatives, wards council representatives, DPs' representatives will be selected by the ULB Commissioner to represent in the GRC/SC meeting. NGO should also deploy one person in the team who will be responsible for coordinating with all GRC members and the DPs for grievance redress.

153. In the event when the established GRM is not in a position to resolve the issue, Affected Person also can use the ADB Accountability Mechanism (AM) through directly contact (in writing) to the Complain Receiving Officer (CRO) at ADB headquarters or to ADB Indian Resident Mission (INRM). The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will included in the PID to be distributed to the affected communities, as part of the project GRM. A Grievance Redress Mechanism is shown in the Figure 12.

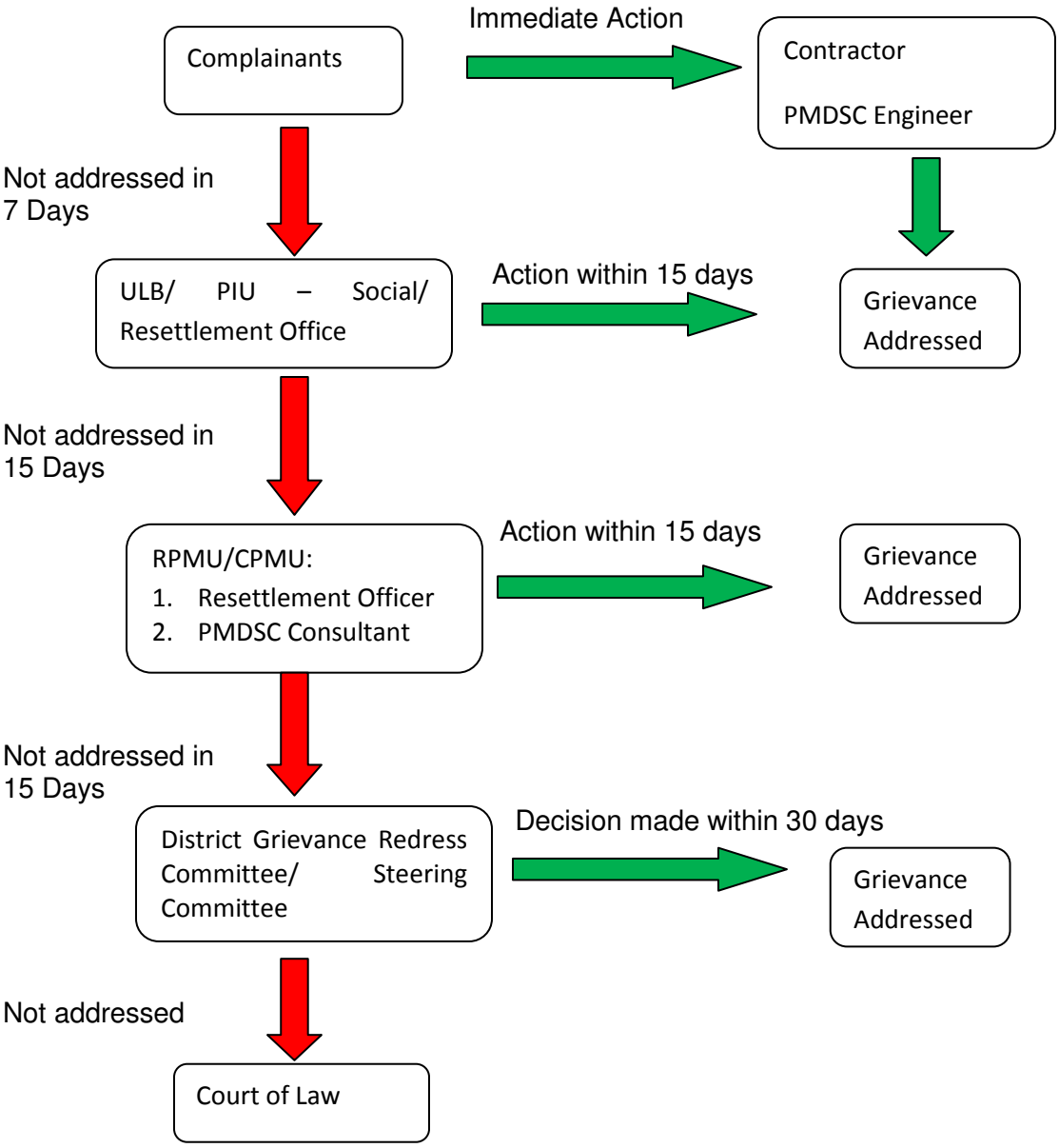


Figure 8: Grievance Redress Process

VIII. PUBLIC CONSULTATION & INFORMATION DISCLOSURE

A. Project Stakeholders

154. 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 are:

(i) Residents, shopkeepers and businesspeople near the work sites;
(ii) Public representatives and prominent citizens of the town
(iii) Davangere City Municipal Council
(iv) KUIDFC, GoK

155. Secondary stakeholders are:

(i) Other concerned government institutions (utilities, regulators, etc)
(ii) NGOs and CBOs working in the affected communities;
(iii) Other community representatives (prominent citizens, religious leaders, elders, women's groups);
(iv) The beneficiary community in general; and
(v) ADB as the funding agency

B. Consultation & Disclosure Till Date

156. A series of public consultation meetings were conducted during the project preparation. Various forms of public consultations (consultation through ad hoc discussions on site) have been used to discuss the project and involve the community in planning the project and mitigation measures.

157. Besides, a public consultation workshop was conducted on October 3, 2012 at Davangere for all the four project towns to discuss the proposed project and likely environmental issues and mitigation measures. Key stakeholders – public representatives, officials from various agencies, district level officers, from each project town, including Davangere, were participated in the workshop. Minutes of this consultation meeting is appended at Appendix 6.

158.Project information dissemination was conducted on 17th November 2013. Project components were appraised to the public and the project affected person. The people were in general supportive to the development initiatives. The public expressed their concern regarding the interruption to the traffic during the laying of sewer network.They also asked for advance information before the starting of trenching work. Some people demanded that the operation and maintenance of the proposed STP should be carried out regularly in order to avoid any inconvenience from bad odour or any health issues from the effluents. They also demanded including the local people unskilled or semi-skilled works during the construction time.

C. Future Consultation & Disclosure

159. EA and IA shall extend and expand the consultation and disclosure process significantly during implementation of the Investment Program.

(i) Consultation during detailed design:

- Focus-group discussions with affected persons and other stakeholders (including women's groups, NGOs and CBOs) to hear their views and concerns, so that these can be addressed in subproject design where necessary; and
- Structured consultation meetings with the institutional stakeholders (government bodies and NGOs) to discuss and approve key aspects of the project.

(ii) Consultation during construction:

- Public meetings with affected communities (if any) to discuss and plan work programmes and allow issues to be raised and addressed once construction has started; and
- Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation;

(iii) Project disclosure:

- Public information campaigns (via newspaper, TV and radio) to explain the project to the wider town population and prepare them for disruption they may experience once the construction programme is underway;
- Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Kannada; and
- Formal disclosure of completed project reports by making copies available at convenient locations in the study towns, informing the public of their availability, and providing a mechanism through which comments can be made.

160. Based on ADB requirements, the following will be posted on ADB website: (i) this IEE, upon finalization and approval of ADB; (ii) a new or updated IEE, if prepared, reflecting significant changes in the Project during design or implementation; (iii) corrective action plan prepared during Project implementation to address unanticipated environmental impacts and to rectify non-compliance to EMP provisions; and (iv) environmental monitoring reports. Documents will also be available on the websites of KUIDFC and Davangere CMC.

IX. RECOMMENDATION & CONCLUSION

A. Recommendation

161. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Davangere Sewerage and Sanitation Sub project. Potential negative impacts were identified in relation to design, construction and operation of the improved infrastructure. Mitigation measures have been developed in generic way to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the outline designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design. Various design related measures suggested for: uninterrupted power supply provision; standard operating procedures for operation and maintenance; extended operation by turnkey contractor and imparting necessary training for ULB staff; providing necessary safety and personal protection equipment for workers engaged in sewer cleaning (protection against oxygen deficiency, harmful gaseous emissions) and sludge handling, and development of green buffer zone and no development zone around the sewage treatment plant.

162. The site selected for the STP was earmarked for the sewage treatment facility in Davangere Master Plan. This site is located in the south-eastern outskirts of the city, and surrounded by agricultural fields and upcoming residential areas. Considering the future development various measures are included in the subproject design, including: design of a compact, superior process with few odours; sensitive layout design and green buffer zone around the facility, declaration of no development zone around the STP plant, and regulation of surrounding land use in strict compliance with Davangere Master Plan.

163. During the construction phase, impacts mainly arise from the need to dispose waste soil; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Since the sewer work are conducted along the roads, there is potential to create disturbance. To minimize this, the contractor should develop a Method Statement, which should be approved by the PIU prior to start of work, and should conduct the work strictly in line with the Method Statement.

164. There were limited opportunities to provide environmental enhancements, but certain measures were included. For example it is proposed that the project will employ in the workforce people who live in the vicinity of construction sites to provide them with a short-term economic gain; and ensure that people employed in the longer term to maintain and operate the new facilities are residents of nearby communities.

165. Once the system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Necessary safety precautions are suggested for proper functioning and operation of sewer network. The operation and maintenance will comply with the standard operating procedures. SOPs / O&M Manual will be developed during the construction stage, and the staff will be provided with necessary training.

166. The citizens of the Davangere City will be the major beneficiaries of this subproject. The sewerage system will remove the human waste from those areas served by the network rapidly

and treated to an acceptable standard. With the construction of toilets and targeted awareness program on sanitation proposed, in addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. Diseases of poor sanitation, such as diarrhoea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health. The sewerage system proposed in this subproject, combined with the system under implementation in NKUSIP, will collect wastewater including sewage from entire town and treat Indian standards. Adequate capacity of STP is included in the proposed two STPs along with the one under implementation under NKUSIP and other projects under implementation.

167. 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 PIU/PMU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population. There will also be regular and periodic monitoring surveys for quality of water (at intake, reservoirs and at consumer end).

168. Finally, stakeholders were involved in developing the IEE through face-to-face discussions and on site meetings, after which views expressed were incorporated into the IEE and the planning and development of the project. A city level consultation workshop was conducted for larger public participation in the project. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

B. Conclusion

169. The Davangere Sewerage and Sanitation subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

170. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further special study or detailed EIA needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006). If necessary, tree cutting permission should be obtained from the designated Tree Officer of Davangere.

Site Photographs

Photo 1: A view of damaged trunk main discharging sewage to storm water

Photo 2: A view of sewage discharging to storm water drain

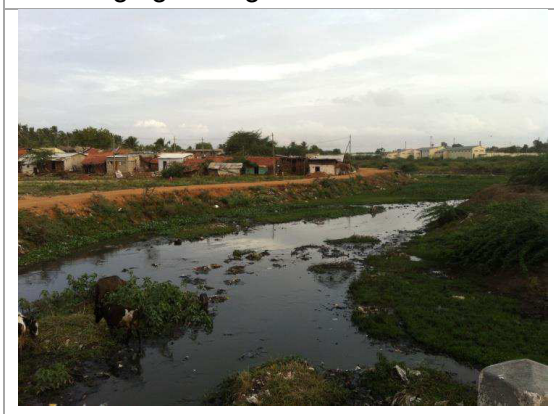


Photo 3: Basapura Halla carrying sewage

Photo 4: Consultation with local people

Appendix 1: REA Checklist

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST
Davangere Sewerage Subproject

A. Screening Questions for Impact Categorization

Check the appropriate box (e.g. ☒ by double-clicking the box and selecting 'checked' in default value)

Screening Questions	Yes/No	Remarks
A. Project Siting Is the project area…		
• Densely populated?	☒Yes ☐No	Subproject activities extend to the entire City including the densely populated areas. There are no major negative impacts envisaged, because sewer lines will be alongside the existing roads and can be constructed without causing disturbance to, houses, and commercial establishments. In narrow streets, disruption to road users is likely, and measure like best activity scheduling, alternative routes, prior information to road users, houses and shops will minimize the impact to acceptable levels.
• Heavy with development activities?	☒Yes ☐No	Davangere is a developing town; urban expansion is considerable
• Adjacent to or within any environmentally sensitive areas?	☐Yes ☒No	None
• Cultural heritage site	☐Yes ☒No	None
• Protected Area	☐Yes ☒No	None
• Wetland	☐Yes ☒No	None
• Mangrove	☐Yes ☒No	None
• Estuarine	☐Yes ☒No	None
• Buffer zone of protected area	☐Yes ☒No	
• Special area for protecting biodiversity	☐Yes ☒No	None
• Bay	☐Yes ☒No	None
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐ Yes ☒ No	There are no such areas near the subproject sites
▪ interference with other utilities and blocking of access to buildings; nuisance to neighbouring areas due to noise, smell, and influx of insects,	☐ Yes ☒ No	No blocking/interference with other utilities expected; subproject include sewer network and STP; necessary measures are included for smooth operation and maintenance

rodents, etc.?		
▪ dislocation or involuntary resettlement of people?	☐ Yes ☒ No	There may also be temporary disturbance to business and squatters/vendors during construction. Private land required for the construction of approach road for the STP at Avaregere,. The city corporation has confirmed that the land has already been donated for the construction of the STP.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	☐ Yes ☒ No	No such possibilities; Sewerage system will cover entire population including urban poor; In fact, it will have positive health impact due to improved sanitation condition.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	☐ Yes ☒ No	Adequate sewage treatment capacity facility is being development under this subproject;
▪ overflows and flooding of neighbouring properties with raw sewage?	☐ Yes ☒ No	Sewerage system has been designed considering the population growth. It has been designed to accommodate sewage until year 2028. Design considers standard peak factors and therefore no such impact envisaged.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	☐ Yes ☒ No	Proper treatment facilities are provided and safe guard measures are recommended.
▪ noise and vibration due to blasting and other civil works?	☐ Yes ☒ No	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	☐ Yes ☒ No	In appropriate handling of sludge may have occupational health hazard. All necessary safety precautions will be taken to avoid any risk.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐ Yes ☒ No	There are no sources of hazardous material that will find its way into the sewers. Wastewater other than municipal, i.e. industrial, entering the sewerage system must meet the stipulated standards, and therefore it is unlikely that problematic waste will be discharged into the sewers.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	☐ Yes ☒ No	No pumping stations/treatment plants proposed
▪ Social conflicts between construction workers from other areas and community workers	☐ Yes ☒ No	Provision added to employ at least 50% or maximum extent of people from the local project area.
▪ road blocking and temporary flooding due to land excavation during the rainy season?	☐ Yes ☒ No	All necessary precautions will be taken to prevent flooding during construction; flooding is unlikely as work will be mostly be conducted during dry season.

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

Rapid Environmental Assessment (REA) Checklist

Davangere Sanitation Subproject

A. Screening Questions for Impact Categorization

Check the appropriate box (e.g. ☒ by double-clicking the box and selecting 'checked' in default vale)

SCREENING QUESTIONS	Yes/No	REMARKS
A. Project Siting Is the project area…		
▪ Densely populated?	☒Yes ☐No	Subproject activities extend to the entire City including the densely populated areas. There are no major negative impacts envisaged, because public toilets will be located in unused government lands and can be constructed without causing disturbance to, houses, and commercial establishments. In narrow streets, disruption to road users is likely, and measure like best activity scheduling, alternative routes, prior information to road users, houses and shops will minimize the impact to acceptable levels.
▪ Heavy with development activities?	☒Yes ☐No	Davangere is a developing town; urban expansion is considerable
▪ Adjacent to or within any environmentally sensitive areas?	☐ Yes ☒ No	None
• Cultural heritage site	☐ Yes ☒ No	None
• Protected Area	☐ Yes ☒ No	None
• Wetland	☐ Yes ☒ No	None
• Mangrove	☐ Yes ☒ No	None
• Estuarine	☐ Yes ☒ No	None
• Buffer zone of protected area	☐ Yes ☒ No	None
• Special area for protecting biodiversity	☐ Yes ☒ No	None
• Bay	☐ Yes ☒ No	None
B. Potential Environmental Impacts Will the Project cause…		

SCREENING QUESTIONS	Yes/No	REMARKS
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	☐ Yes ☒ No	This subproject component is part of the overall sanitation and waste disposal systems of the project area and no impact on the present system.
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?	☐ Yes ☒ No	This subproject will not lead for any rapid urban population growth, commercial and industrial activity and waste generation
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?	☐ Yes ☒ No	No wetlands, wild lands, or forest in the project sub component area
▪ dislocation or involuntary resettlement of people	☐ Yes ☒ No	All community toilets will be in government lands. No resettlement or land acquire required.
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?	☐ Yes ☒ No	No cultural property in the project component area and no threat to tourism revenues
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollute industries?	☐ Yes ☒ No	There is no polluting industries or health hazards components as a part of this sub project
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?	☐ Yes ☒ No	The proposed system is designed in such way that, it won't cause any pollution to the water bodies or deteriorate the water qualities. No direct discharge into water bodies.
▪ air pollution due to urban emissions?	☐ Yes ☒ No	No air pollution expected due to the sub component.
▪ social conflicts between construction workers from other areas and local workers?	☐ Yes ☒ No	Not anticipated, local workers shall be encourage for engaging for different construction activities
▪ road blocking and temporary flooding due to land excavation during rainy season?	☐ Yes ☒ No	All necessary precautions will be taken to prevent flooding during construction, flooding is unlikely as work will be mostly be conducted during dry season.
▪ noise and dust from construction activities?	☐ Yes ☒ No	No major noise generating activities like rock blasting is envisaged. Dust will be temporary and will be controlled with proper measures.
▪ traffic disturbances due to construction material transport and wastes?	☐ Yes ☒ No	Proper planning, such as selection of routes and scheduling to avoid peak traffic hours, will be carried out in consultation with concerned authorities.
▪ temporary silt runoff due to construction?	☐ Yes ☒ No	The topography is plain and the rainfall is low to moderate, so no runoff impacts envisaged

SCREENING QUESTIONS	Yes/No	REMARKS
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?	☐ Yes ☒ No	There is less chance of failure; proper design and standard operating procedures will be followed in O & M, necessary equipment and training to workers will be provided.
▪ water depletion and/or degradation?	☐ Yes ☒ No	This sub component is not affecting the water bodies and hence no depletion or degradation.
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?	☐ Yes ☒ No	Not applicable as no ground water extraction is required for the construction and operation & maintenance phases
▪ contamination of surface and ground waters due to improper waste disposal?	☐ Yes ☒ No	Any contamination of water bodies are avoided by proper design of the system and drain network.
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?	☐ Yes ☒ N	There will be no discharge of untreated effluents into the water bodies.

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

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

Assessment on the Categorization and Planning Requirement for this subproject

☐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.

☒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.

☐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.

Appendix 2: Environmental Related Legislations in India

i. The Water (Prevention and Control of Pollution) Act, 1974, amended 1988
   - The Water (Prevention and Control of Pollution) Rules, 1975
   - The Water (Prevention and Control of Pollution) Cess Rules, 1971

ii. The Air (Prevention and Control of Pollution) Act 1981, amended 1987
   - The Air (Prevention and Control of Pollution) Rules, 1982

iii. The Environment (Protection) Act, 1986, amended in 1991 and including the following Rules/Notification issued under this Act
   - The Environment (Protection) Rules, 1986, including amendments
   - The Municipal Solid Wastes (Management and Handling) Rules, 2000
   - The Hazardous Wastes (Management and Handling) Rules, 1989
   - The Bio-Medical Waste (Management and Handling) Rules, 1998
   - Noise Pollution (Regulation and Control) Rules, 2000,
   - Wild Life (Protection) Amendment Act, 2002
   - Environmental Impact Assessment Notification, 2006
   - Environmental Standards of Central Pollution Control Board (CPCB)

iv. The Indian Wildlife (Protection) Act, 1972, amended 1993
   - The Wildlife (Protection) Rules, 1995

v. The Indian Forest Act, 1927

vi. Forest (Conservation) Act, 1980, amended 1988
   - Forest (Conservation) Rules, 1981 amended 1992 and 2003
   - Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980

vii. Ancient Monuments and Archaeological Sites and Remains Act 1958
   - Ancient Monuments and Archaeological Sites and Remains Rules 1959
   - Government of India Notification of 1992 under the above-stated Rules

Appendix 3: Environmental Disposal Standards

1. General Standards for Discharge of Environmental Pollutants Part - A: Effluents

Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
Suspended solids mg/l, max.	100	600	200	(a) For process waste water (b) For cooling water effluent 10 per cent above total suspended matter of influent.
Particle size of suspended solids	shall pass 850 micron IS Sieve	-	-	(a) Floatable solids, solidsmax. 3 mm (b) Settleable solids, max 856 microns
pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
Temperature	shall not exceed 5oC above the receiving water temperature			shall not exceed 5oCabove the receiving water temperature
Oil and grease, mg/l max,	10	20	10	20
Total residual chlorine, mg/l max	1.0	-	-	1.0
Ammonical nitrogen (as N),mg/l, max.	50	50	-	50
Total kjeldahl nitrogen (as N);mg/l, max. mg/l, max.	100	-	-	100
Free ammonia (as NH3), mg/l,max.	5.0	-	-	5.0
Biochemical oxygen demand (3 days at 27oC), mg/l, max.	30	350	100	100
Chemical oxygen demand, mg/l, max.	250	-	-	250
Arsenic(as As).	0.2	0.2	0.2	0.2
Mercury (As Hg), mg/l, max.	0.01	0.01	-	0.01
Lead (as Pb) mg/l, max	0.1	1.0	-	2.0
Cadmium (as Cd) mg/l, max	2.0	1.0	-	2.0
Hexavalent chro-mium (as Cr + 6),mg/l, max.	0.1	2.0	-	1.0
Total chromium (as Cr) mg/l, max.	2.0	2.0	-	2.0
Copper (as Cu)mg/l, max.	3.0	3.0	-	3.0
Zinc (as Zn) mg/l, max.	5.0	15	-	15
Selenium (as Se)	0.05	0.05	-	0.05
Nickel (as Ni) mg/l, max.	3.0	3.0	-	5.0
Cyanide (as CN) mg/l, max.	0.2	2.0	0.2	0.2
Fluoride (as F) mg/l,	2.0	15	-	15

Parameter	Inland surface water	Public sewers	Land for irrigation	Marine/coastal areas
max.				
Dissolved phosphates (as P),mg/l, max.	5.0	-	-	-
Sulphide (as S) mg/l, max.	2.0	-	-	5.0
Phenolic compounds (as C6H50H)mg/l, max.	1.0	5.0	-	5.0
Radioactive materials: (a) Alpha emitters micro curie mg/l, max. (b)Beta emittersmicro curie mg/l	10^{-7} 10^{-6}	10^{-7} 10^{-6}	10^{-8} 10^{-7}	10^{-7} 10^{-6}
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
Manganese	2 mg/l	2 mg/l	-	2 mg/l
Iron (as Fe)	3mg/l	3mg/l	-	3mg/l
Vanadium (as V)	0.2mg/l	0.2mg/l	-	0.2mg/l
Nitrate Nitrogen	10 mg/l	-	-	20 mg/l

These standards shall be applicable for industries, operations or processes other than those industries, operations or process for which standards have been specified in Schedule of the Environment Protection Rules, 1989.

Standards for Diesel Generator Sets: Stack Height

The minimum height of stack to be provided with each generator set can be worked out using the following formula:
H = h+0.2x ÖKVA
H = Total height of stack in metre
h = Height of the building in metres where the generator set is installed
KVA = Total generator capacity of the set in KVA
Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	**Total Height of stack in metre**
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

PART-E Noise Standards

Noise limits for domestic appliances and construction equipments at the manufacturing stage in dB(A).

Window air conditioners of 1 -1.5 tonne	68
Air coolers	60
Refrigerators	46
Diesel generator for domestic purposes	85
Compactors (rollers), front loaders, concentrate mixers, cranes (movable), vibrators and saws	75

Appendix 4: Traffic Management Plan (TMP)

A. Principles for TMP around the Water Pipes Sewer 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 every project from planning through design, construction, and maintenance.
(ii) Inhibit traffic movement as little as possible.
(iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
(iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
(v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
(vi) Train all persons that select, place, and maintain temporary traffic control devices.
(vii) Keep the public well informed.
(viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

3. **Figure A2 to Figure A12**illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

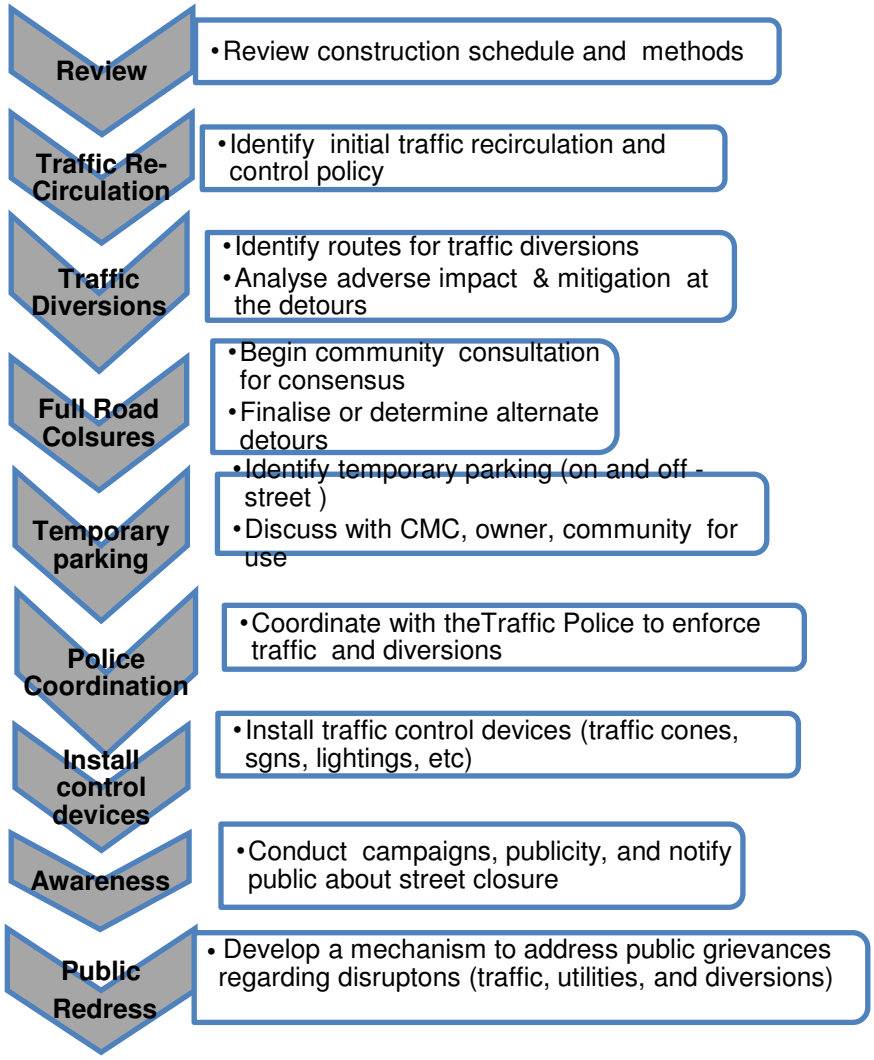
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the Davangere City Corporation / 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 A1: Policy Steps for the TMP



D. Public awareness and notifications

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

7. 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.

8. 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.

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

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

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

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

11. 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

12. 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”).

13**.** **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Lane closure on a four lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

14. 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.

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

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

Figure A2 & A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road)

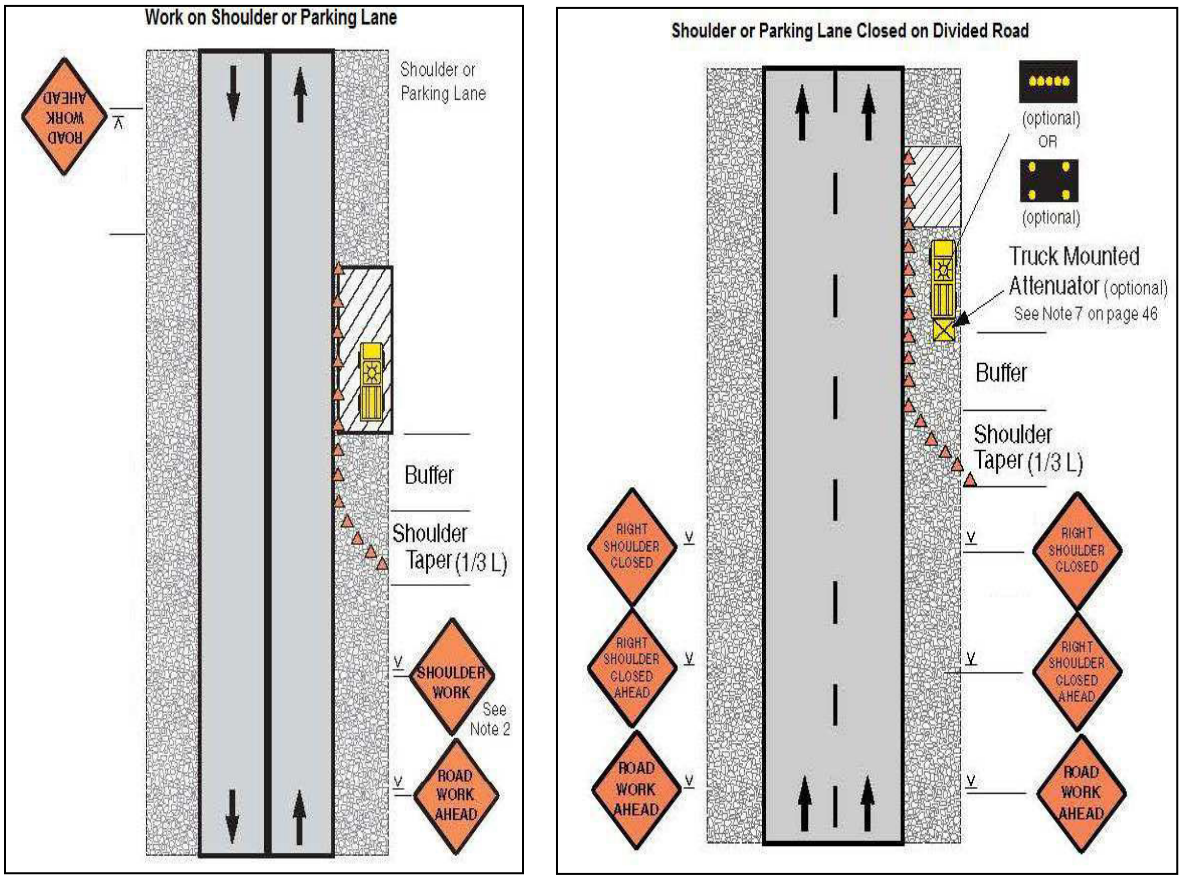
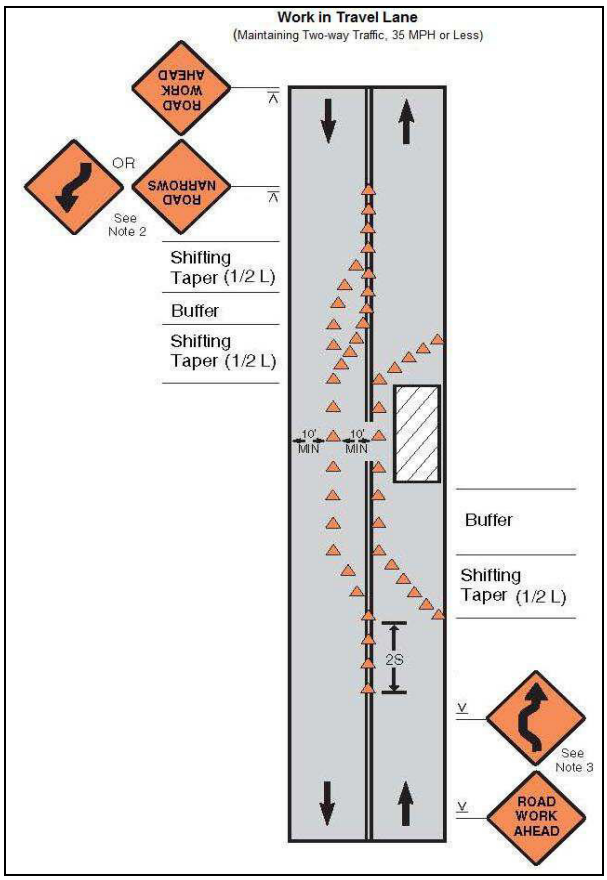


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume



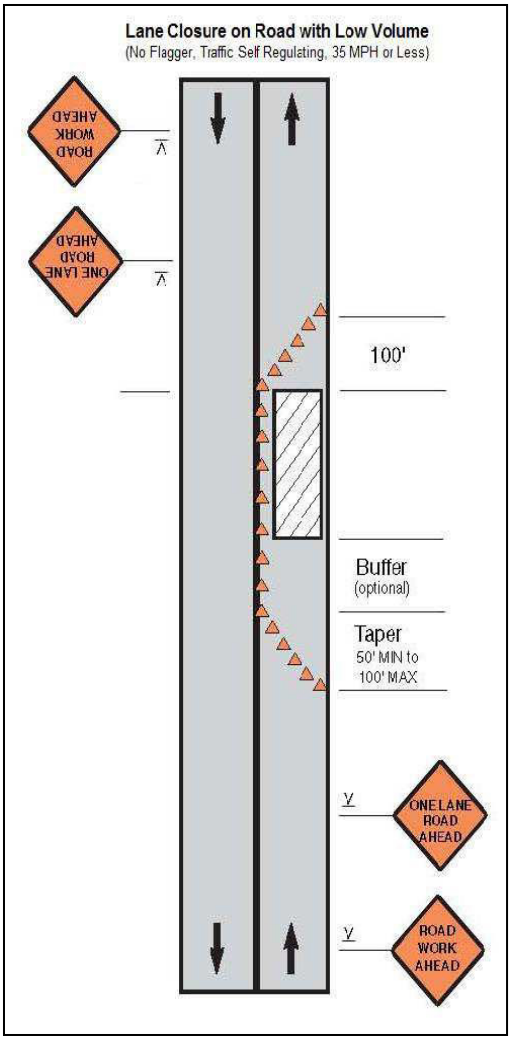
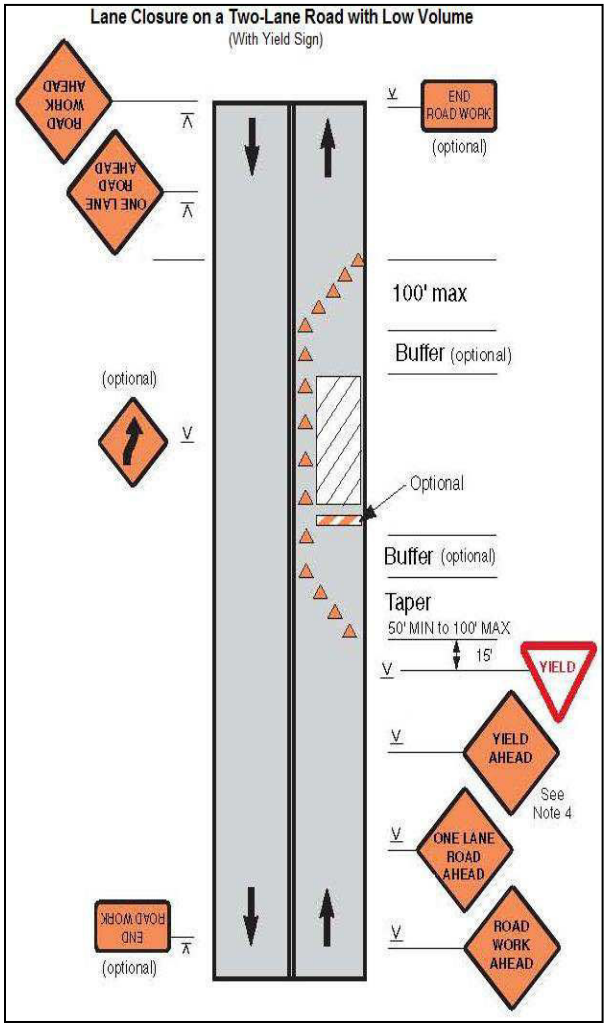


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



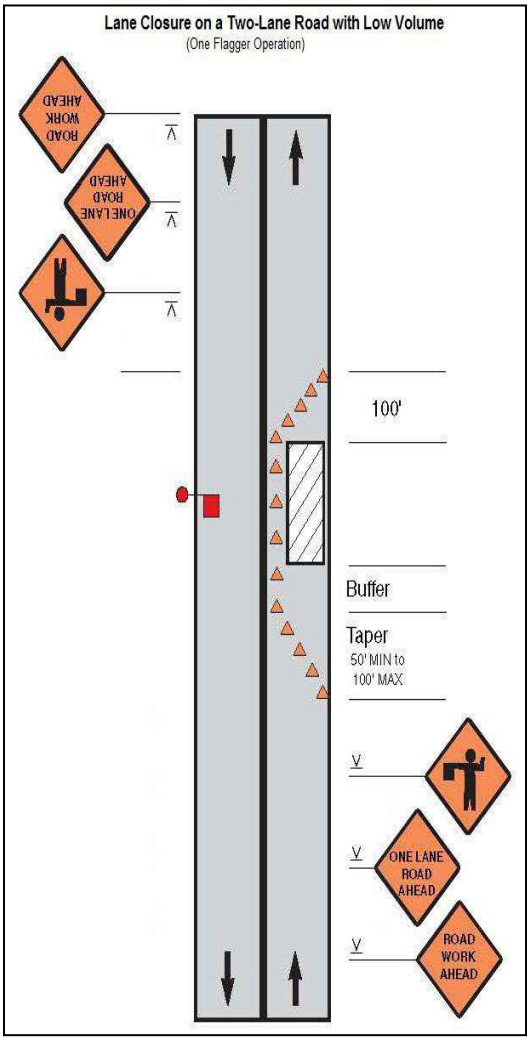
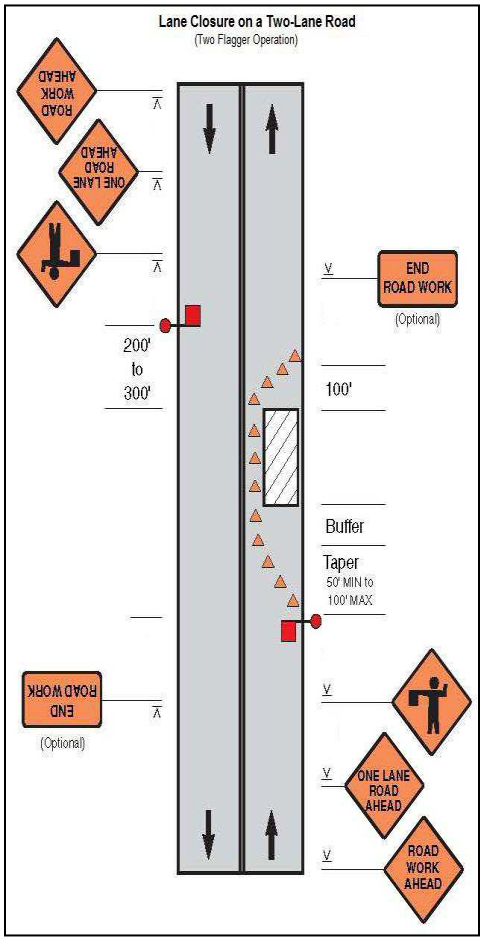


Figure A8 & A9: Lane closure on a two lane road (two flagger operation) & Lane closure on a four lane undivided Road



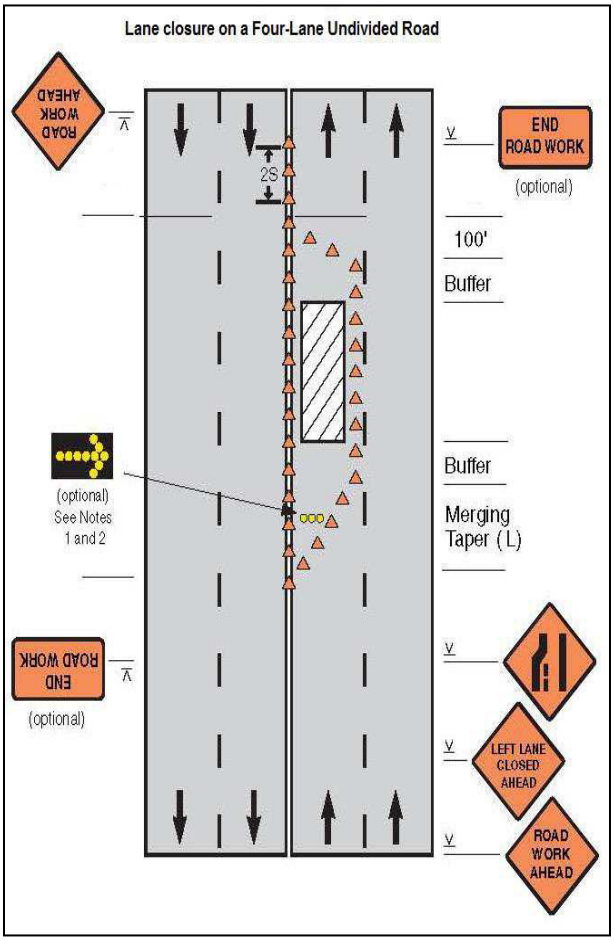
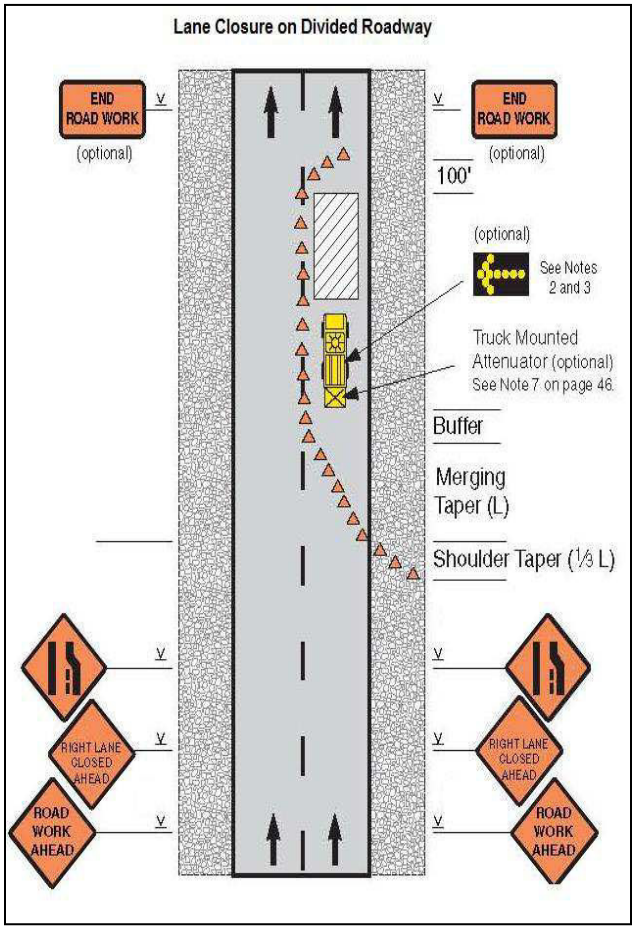


Figure A10 & A11: Lane closure on divided roadway &Half road closure on multi-lane roadway



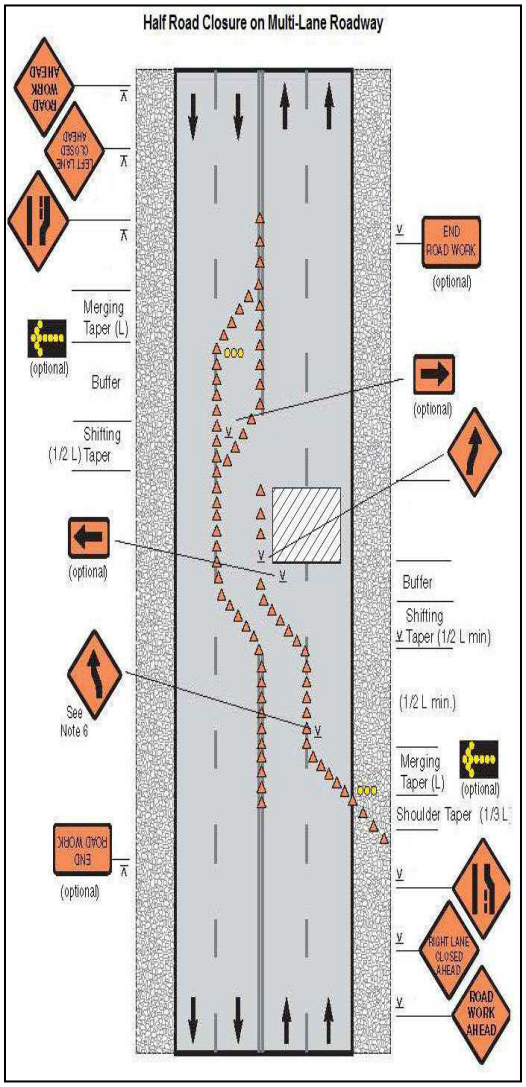
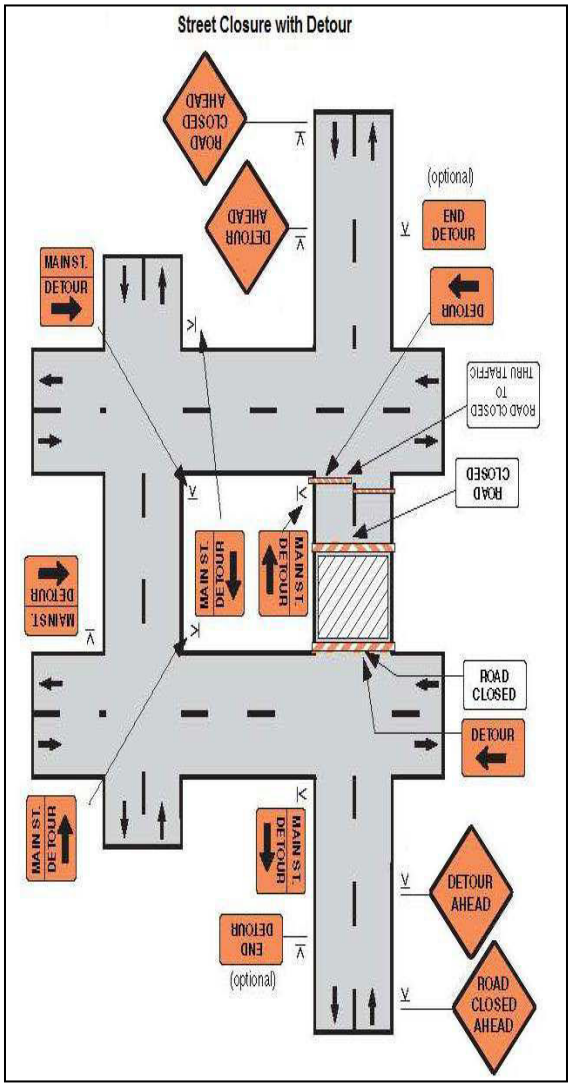


Figure A12: Street closure with detour



Appendix 4B. List of Roads

The following table gives the list of roads that will be closed completely during the construction phase of the sewer network.

SI. NO	STREET NAMES	SI. NO	STREET NAMES
1	60 FEET ROAD	5	ANEKONDA ROAD
2	ABINAIYA BHARATI SCHOOL ROAD	6	ANJANAYA LAYOUT ROAD
3	ADADI ROAD	7	ANJANEYA TEMPLE ROAD
4	ANEKODPET ROAD	8	ATHAOI COLONY ROAD

SI. NO	STREET NAMES	SI. NO	STREET NAMES
9	AUARGALA ROAD	55	DHYAPYAR GALLI ROAD
10	AVARAGERE ROAD	56	DODDA BUDIHAL ROAD
11	AVK COLLEGE ROAD	57	DODDA PET ROAD
12	AVRAGERE	58	DURGAMBIKA TEMPLE ROAD
13	BANASHAKRI LAYOUT	59	ELE BETUR ROAD
14	BAPUJI CO-OP ROAD	60	ELIGARSHIVAPPA ROAD
15	BAPUJI ENGG. COLLEGE ROAD	61	ESAR CIRCLE ROAD
16	BASAPUR ROAD	62	ESI HOSPITAL ROAD
17	BASAVARAJ PET	63	EWS COLONY ROAD
18	BASAVERHWARA TEMPLE ROAD	64	GANDHI CIRCLE ROAD
19	BASAVESHWAR NAGAR ROAD	65	GANDHINAGAR MAIN ROAD
20	BASHA NAGAR MAIN ROAD	66	GARMENT INDUSTRI ROAD
21	BATHUR ROAD	67	GM. INSTI. OF TECHNOLOGY ROAD
22	BEAUTY PARLOUR ROAD	68	HABEAH MANZIL ROAD
23	BELLUDI GALLI	69	HADADI ROAD
24	BENTAGE MAHARANI ROAD	70	HAGEDESHA CIRCLE
25	BESIDE BHADRAVATHI CHANNEL	71	HAGEDIBBA CIRCLE ROAD
26	BHADHARAVATI CHANNEL	72	HALESHAPPA ROAD
27	BHARATH COLONY MAIN ROAD	73	HARAPANAHALLI ROAD
28	BHASHPOOR ROAD	74	HARIHARA ROAD
29	BIET ROAD	75	HAVARAGERI
30	BODA CROSS MOORTHI NAGAR	76	HONDA CIRCLE
31	BOMMALINGAIAHNA HALLI	77	HONDADESA ROAD
32	BRALLUR	78	HONDAPA CIRCLE ROAD
33	BRINDOUALL ROAD	79	HONDJI ROAD
34	BUDHAL ROAD	80	HUBLICHOWDAPPAN HALLI ROAD
35	BUDSCHOOL ROAD	81	HUNU ROAD
36	BUTHAL ROAD	82	IMR ROAD
37	BYE PASS ROAD	83	INDIAN POST ROAD
38	C' BLOCK CHAWDESHWARI NAGAR	84	ISLAMPET ROAD
39	C.C ROAD	85	ITTUVATTI ROAD
40	CHAMARAJPETE MAIN ROAD	86	IZARDHAR HALLI
41	CHAMUNDIESWARY NAGAR ROAD	87	J.H.PATEL BADAVANE
42	CHAWDESHWARI TEMPLE ROAD	88	K R MARKET ROAD
43	CHAWKIPET ROAD	89	K.B. EXTENSION I MAIN
44	CHENNAGIRI ROAD	90	K.R ROAD
45	CHENURAJPET CIRCLE	91	KADLE BAALU ROAD
46	CHIGTELI HALLI ROAD	92	KALIKADEVI ROAD
47	CHIKKABUDIHAL ROAD	93	KALPANALLY ROAD
48	CHOWDAMPIKA TEMPLE ROAD	94	KAYAPET ROAD
49	CHURCH ROAD	95	KEB ROAD
50	DAVANGERE ROAD	96	KIRWADI LAYOUT
51	DC OFFICE ROAD	97	KOADAJJI ROAD
52	DCM TOWNSHIP OFFICE ROAD	98	KSRTC ROAD
53	DEVARA BELAKERE ROAD	99	KTJ NAGAR
54	DEVARAJ URS LAYOUT ROAD	100	KUNDAVADA ROAD

SI. NO	STREET NAMES
101	LAKSHMI LAYOUT MAIN ROAD
102	M.G ROAD
103	MAALIPET ROAD
104	MAHARAJ PET MAIN ROAD
105	MAHATHMA GANDHI STATUE ROAD
106	MALEEBENNU ROAD
107	MANIKANTHA CIRCLE ROAD
108	MANJUNATHA TEMPLE ROAD
109	MATTIKALLU ROAD
110	MYSORE CLINIC ROAD
111	NANJAPPAND HALLI ROAD
112	NAREANI MAIJID ROAD
113	NINCHANA PUBLIC SCHOOL ROAD
114	NITTIVALI MAIN ROAD
115	NITUVALLI EXTENSION ROAD
116	OLD P.B. ROAD
117	OLD S.S.V HOSTEL ROAD
118	P.BASAVANA GOWDA ROAD
119	P.J EXTENSION
120	P.S.EXTN.
121	PARVATHAMMA NAGAR ROAD
122	PAVILLION ROAD
123	PIRALER HALLI ROAD
124	PODU PATTA CROSS
125	POLICE STATION ROAD
126	PRINNI COMPANY ROAD
127	R.M.C RING ROAD
128	RAJAWILLA MUSTAG NAGAR ROAD
129	RAJEEV GANDHI BADAVANE ROAD
130	RAMA TEMPLE ROAD
131	RAMAN NAGAR ROAD
132	RING ROAD
133	RLY STATION ROAD
134	RMC LINK ROAD
135	ROAD TOWARDS HOSAKUNDWAD
136	RTO OFFICE ROAD
137	S M KRISHNA NAGAAR ROAD
138	S S LAY OUT BLOCK ROAD
139	SAPTHAGIRI SCHOOL ROAD
140	SARASWATHI NAGAR ROAD
141	SEETAMATHA BADAVANE ROAD
142	SHANTI NAGAR MAIN ROAD
143	SHEKHARAPPA NAGAR MAIN ROAD
144	SHIVAPPIAH CIRCLE ROAD
145	SIDHA RAMESHWARA ROAD
146	SIDVEERAPPA BADAVANE
147	SIVALI ROAD
148	SKP ROAD
149	SOG COLLEGE
150	SPS NAGAR ROAD
151	SRI VEERABHADRESHWAR INDUSTRIES ROAD
152	SRIRAMANAHALLI ROAD
153	SWAMI VIVEKANAD BADAVANE
154	TALUK OFFICE ROAD
155	THARALABALU NAGAR 1ST CROSS
156	THE INSTITUTION OF ENGINEERING
157	THEISHUL TALKIES ROAD
158	TO BALAJI BAZAR
159	TO BANGALORE
160	TO BARLANE ROAD
161	TO BASAVARAJ PET
162	TO BASAVESHWARA NAGAR ROAD
163	TO CHIGTELI HALLI
164	TO ITTUVATTI ROAD
165	TO LAXMI LAYOUT
166	TO NEW LAYOUT
167	TO R.M.C RING ROAD
168	TO SRI MUTHU MARI TEMPLE
169	TOWARDS BASAPURA ROAD
170	TOWARDS HARIHARA ROAD
171	TOWARDS PRIVATE BUS STOP
172	TOWARDS RING ROAD
173	TOWARDS SHANTHI NAGAR
174	TOWARDS SHIVA NAGAR
175	TOWRDS HALEKUNDWAD ROAD
176	TRISHUL THEATRE COMPLEX ROAD
177	VANDA CIRCLE ROAD
178	VASANTHA ROAD
179	VIJAYA LEXMI ROAD
180	VIJAYA NAGAR BADAWANE ROAD
181	VINAYAKA NAGAR
182	VISHWARADYA CANCER HOSPITAL
183	VONI HONDA SHOWROOM
184	YARAGUUTE ROAD
185	YELLAMMA NAGAR MAIN ROAD

During the construction of sewer network, partial or one line traffic can be allowed through the roads listed below:

SI. NO	STREET NAMES
1	ABETHKAR CIRCLE
2	APMC CHECK POST ROAD
3	APMC COMPLEX ROAD
4	APMC MARKET
5	APMC ROAD
6	ASHOKA ROAD
7	BAMBOO BAZZAR ROAD
8	BATHEN MAIN ROAD
9	BEAUTY PARLOUR ROAD
10	C.G HOSPITAL ROAD
11	CHANNA GIRI ROAD
12	CHITRADURGA ROAD
13	COLLEGE ROAD
14	DC OFFICE ROAD
15	EERUTTI MARKET ROAD
16	EX.MUNICIPAL OFFICE ROAD
17	GMB ONION TRADERS ROAD
18	HALLE KUNDWAD KERE ROAD
19	J.H PATEL LAYOUT
20	KIDS CAMPUS SCHOOL
21	KTJ NAGAR 11TH CROSS
22	L. I. C NAGAR
23	LAWER ROAD
24	LOKIKERE ROAD
25	M.C.C 'B' BLOCK
26	MAGANAHALLI ROAD
27	MAHILA SAMAJ ROAD
28	MANJUNATHA TEMPLE ROAD
29	MEDICAL HOSTEL ROAD, I MAIN
30	NAGIKANGAPPA LAYOUT ROAD
31	NAREANI MAIJID ROAD
32	NEAR BAPUJI INSTITUTE OF ENGINEERING AND TECHNOLOGY
33	NH -4
34	NIZALINGAPPA LAYOUT ROAD
35	OLD BETHUR ROAD
36	P B ROAD
37	P.B ROAD BYPASS
38	PAMENAHALLI ROAD
39	POST OFFICE ROAD
40	RADHASWAMY SATHRANGA ROAD

SI. NO	STREET NAMES
41	RESTORENT ROAD-GARDEN
42	RMC LINK ROAD
43	RMC ROAD
44	ROAD TO S.S.M 'B' BLOCK
45	SAMNUR ROAD
46	SHAMANUR ROAD
47	SHAMANUR VILLAGE
48	SHEKARAPPA BADAVAIN
49	SREE VEERESHWARA ASHRAMA ROAD
50	SRI JAYADEVA CIRCLE
51	SS LAY OUT ROAD
52	TEACHERS COLONY
53	THE CAMPCO LTD, ROAD
54	TO BYE PASS ROAD
55	TO GANDHI CIRCLE
56	TO GANESH LAYOUT
57	TO LAKSHMI CIRCLE
58	TO MOTI THETERE
59	TO NITUVALLI CIRCLE
60	TO RAILWAY STATION
61	TO YARAGUNTE AND KARUR ROAD
62	TOWARDS BADA ROAD
63	TOWARDS CHENAGERI ROAD
64	TOWRDS HALEKUNDWAD ROAD
65	V.M.G LAYOUT
66	VIDYANAGAR ROAD
67	VIJAYA LEXMI ROAD
68	VINAYAKA BADANANE
69	VINOBHA ROAD

Appendix 5: Emergency Response Plan Template - Sewerage

Section 1.
System Information
Keep this basic information easily accessible to authorized staff for emergency responders, repair people, and the news media.
System information

System Name and Address	Davangere City Sewerage System, City Municipal Council (CMC), Davangere	
Directions to the System	Towards North from Halladakeri, Pumping Station to STP	
Basic Description and Location of System Facilities	72.16 km of sewer pipeline 150-700 mm diameter, and procurement of Jetting Machine, Construction of four Sewage Lift station at Keshavanagar park, Amravathi colony, Guttur & APMC Yard Construction of 18 MLD capacity STP with FAL	
Population Served and Service Connections	156,725 people – Intermediate Year 2031	7500 Connections
System Owner	Commissioner, Davangere CMC	
Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Emergency Plan	Shri B H Narayanappa Commissioner, CMC Davangere.	08192 232008 Phone 944733799 Mobile

Section2.
Chain of Command – Lines of Authority

The first response step in any emergency is to inform the person at the top of this list, who is responsible for managing the emergency and making key decisions.
Chain of command – lines of authority

Name and Title (as required)	**Examples of Responsibilities During an Emergency**	**Contact Numbers**
Mr Naranappa Commissioner, CMC Davangere.	Responsible for overall management and decision making for the water & wastewater system. The Wastewater System Manager is the lead for managing the emergency, providing information to regulatory agencies, the public and news media. All communications to external parties are to be approved by the manager.	08192 232008 Phone

Name and Title (as required)	Examples of Responsibilities During an Emergency	Contact Numbers
Shri K M Manjunath, Water Supply & UGD Asst. Executive Engineer (Sewerage Manager)	In charge of operating the wastewater systems, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the system manager.	9611904100 Mobile
Mr. N.T Kodi Bhimarao Sewer Inspector (Sewerage System Operator)	In charge of running treatment plants and chlorine handling system, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the system manager.	08192 244266 Phone 8050122080 Mobile
Shri G M Ravindra, Deputy Commissioner, City Corporation (Office Administrator)	Responsible for administrative functions in the office including receiving phone calls and keeping a log of events. This person will provide a standard carefully pre-scripted message to those who call with general questions. Additional information will be released through the Sewer system manager.	9611955422 Mobile
Field Staff (crew) Post not generated	Delivers door hangers, posts notices, and supports Sewer system operator.	

Section 3 .
Events that Cause Emergencies

The events listed below may cause Sewerage system emergencies. They are arranged from highest to lowest probable risk.
Events that cause emergencies

Type of Event	Probability or Risk (High-Med-Low)	Comments
Burst of sewer line	High	Alert the whole system
Leak of sewer line	Medium	Alert the O & M Team
Overflow of sewer line	Low	Alert the O & M Team

Section 4 .
Emergency Notification
Notification call-up lists - Use these lists to notify first responders of an emergency.
Emergency Notification List

Organization / Department	Name & Position	Telephone	Night or Cell Phone

Davangere, CMC	Santhosh Kumar .A Sewer System Inspector	08192 244266 Phone	8095138657 Mobile
Davangere, CMC	Mahesh Kodbal Environment Engineer	08192 244266 Phone	9482733562 Mobile
Davangere, CMC	K.H Chandrashekar Asst. Exe. Engineer	08192 244266 Phone	9448494912 Mobile

Priority Customers				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Domestic customers	7500 Nos.	As per Data Base		

Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Police	Shri Thimmappa (City Dy S P)		9480803220	sdpocitydvg@ksp.gov.in
Regulatory Agency : Karnataka State Pollution Control Board	Regional Officer	08192-252895	93412-38714	davangere@kspcb.gov.in
Natural Disasters Department, DC Office,Davanagere	Shri S T Anjankumar		7259700555	deo.davanagere@gmail.com

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Bescom Electricity Supply Company	Shri Gyanappa (Ex- engineer)		9448279012	eedvgdvn.work@gmail.com
Electrician	Post not Generated			
Sewerage System operator/manager	Post not Generated			
Telephone Department	Shri B P Kulkarni (Assistant General		9449858884	sdopdvg.15172@gmail.com

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
	Manager)			
Water Connections	Shri Manjappa (Work Inspector)		9480608251	itstaff_ulb_davanagere@yahoo.com
Plumber				
Pump Supplier	Yet To Procure			
"Call Before You Dig"	CMC Emergency	08192 242030		
Rental Equipment Supplier	To be Identified			
Pipe Supplier	To be identified			

Notification procedures

Notify Sewerage Network system customers

Who is Responsible:	Field Staff (crew)
Procedures:	Inform both verbal (through telephone) & in writing.

Alert local law enforcement, or regulatory officials, and local health agencies

Who is Responsible:	Shri B H Narayanappa, Commissioner, CMC Davangere.
Procedures:	Inform both verbal (through telephone) & in writing.

Contact service and repair contractors

Who is Responsible:	Shri K M Manjunath, Asst. Executive Engineer
Procedures:	Prequalified contractors shall be invited through standard official procedures

Procedures for issuing a health advisory

Who is Responsible:	Sanitary Inspector, CMC, Davangere
Procedures:	Through Public Address System through announcement, through media.

Other procedures, as necessary

Who is Responsible:	Shri K M Manjunath, Asst. Executive Engineer
Procedures:	Inform both verbal (through telephone) & in writing.

Section 5 .
Effective Communication

Designated public spokesperson
Designate a spokesperson (and alternate) and contact regulatory agency for delivering messages to the news media and the public.
Designate a spokesperson and alternates

Spokesperson	Alternate
Shri B H Narayanappa, Commissioner, CMC Davangere	Shri K M Manjunath, Asst. Executive Engineer

Section 6 .
The Vulnerability Assessment
This is an evaluation of each Sewerage system component to identify weaknesses or deficiencies that may make them susceptible to damage or failure during an emergency. It also assesses facilities for security enhancements that may guard against unauthorized entry, vandalism, or terrorism.
Facility vulnerability assessment and improvements identification

System Component	Description and Condition	Vulnerability	Improvements or Mitigating Actions	Security Improvements
Collection System	Tampering Manhole	Manhole covers	Heavy Duty Covers provisioned	
Sewage Pumping	Disconnect power supply	Power supply	Alternate DG Set provisioned	Pump operator
Other Considerations				

Section 7.
Response Actions for Specific Events

In any event there are a series of general steps to take:
1. Analyze the type and severity of the emergency;
2. Take immediate actions to save lives;
3. Take action to reduce injuries and system damage;
4. Make repairs based on priority demand; and
5. Return the system to normal operation.

The following tables identify the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

A. Power outage

Assessment	Monitor the pumps for non functional
Immediate Actions	Operate the DG sets
Notifications	Enter in the log book , the time out and time in Inform Electrician at 9448482224 Inform the Head of the organization on status of power supply
Follow-up Actions	Initiate actions to procure the utilized fuel and store always in advance

B. Collection system blockage or line break

Assessment	Information received are assessed /verified by quick visit to site
Immediate Actions	Inform and organize the suction cum jetting machine to the spot to remove blockages
Notifications	Inform - Sewer System Inspector Inform the details to Head for urgent actions to mobilize the resources
Follow-up Actions	Verify the job is done and its performance

C. Collection system pumping facilities failure

Assessment	Through sensors and with auto starters and monitored by the Pump operator
Immediate Actions	Pump operator shall operate the Standby pump (100% capacity provisioned)
Notifications	Inform Sewerage System Operator Inform for repairs/replacement to the Head
Follow-up Actions	Immediate repair works and monitor the rectification work performance

D. Vandalism or terrorist attack

Assessment	Inspect the sewer line and other infrastructures for any leak/cracks
Immediate Actions	Rectify the stretches with the available material and indent for new materials for fast track supply
Notifications	Inform the loss of infrastructure with photographs to the Head for lodging a complaint with police department
Follow-up Actions	Monitor the rectification work performances

E. Flood

Assessment	Inspect the sewer line and other infrastructures for any leak/cracks
Immediate Actions	Rectify the stretches with the available material and indent for new materials for fast track supply
Notifications	Inform the loss of infrastructure with photographs to the Head for actions Inform Shri S T Anjankumar, Natural Disasters Department, DC Office, Davanagere , Contact No. : 7259700555
Follow-up Actions	Monitor the rectification work performances

F. Earthquake

Assessment	Inspect the sewer line and other infrastructures for any leak/cracks
Immediate Actions	Rectify the stretches with the available material and indent for new materials for fast track supply
Notifications	Inform the loss of infrastructure with photographs to the Head for actions Inform Shri S T Anjankumar, Natural Disasters Department, DC Office, Davanagere , Contact No. : : 7259700555
Follow-up Actions	Monitor the rectification work performances

G. Hazardous materials spill into collection system

Assessment	Regular laboratory assessment of quality of influent sewage
Immediate Actions	Based on type of materials suitable technology shall be adopted to restore the system
Notifications	To quantify the spill and inform in writing to the Head for urgent action Inform Shri S T Anjankumar, Natural Disasters Department, DC Office, Davanagere , Contact No. : : 7259700555
Follow-up Actions	Inform the respective Head to inform/takeup action with concerned Agency responsible for Spill and get compensation to restore to original condition

H. Electronic equipment failure

Assessment	Shall be monitored on regular basis by Pump operator
Immediate Actions	Shall call the supplier during warranty period/AMC person for fast track rectification
Notifications	Shall notify to the head of the organization
Follow-up Actions	Immediate repair/replacement

I. Other

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

Section 8 .
Returning to Normal Operation

Returning to normal operations

Action	Description and Actions
Monitor regularly	Frequency of monitoring, feed backs etc

Plan approval
This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	**Signature**	**Date**

Section 10.
Certificate of Completion

I certify to the Government of Karnataka that this wastewater system has completed an Emergency Response Plan (ERP).
I certify that this document was prepared under my direction or supervision.
Wastewater Systems: _____

System Name: _____

Address: _____

Print Name of Person Authorized to Sign this Certification on behalf of the System:

_____ **Title:** _____

Signature: _____

Phone: _____ **Fax:** _____ **Email:** _____

Completion of the following:
☐ Security Vulnerability Assessment
☐ Emergency Response Plan
Source: www.rcap.org (modified)

Appendix 6: Minutes of the Stakeholder Consultation Meeting

(October 3, 2012, Davangere)

The meeting was attended by key stakeholders from four project towns of Byadgi, Ranebennur, Harihar and Davangere including public/elected representatives from each town, ULB officials, officials from other line departments and executing agency KUIDFC, and NGOs/CBOs. The meeting was chaired by Davangere District Deputy Commissioner,

The PPTA consultants made detailed presentations – in Kannada and English on overall program, pilot towns, technical studies, poverty social development aspects, and environmental and social safeguard issues related to proposed subprojects in respective towns.

DavangereTown Meeting Session

- Davanagere ULB commissioner Mr.Bhemappa offered help to resolve issues and to finalise the proposals to improve water and wastewater systems. He made following comments.
- O&M of the water supply and wastewater system is a major problem in the ULB without adequate staff.
- Expressed concern about WWTP not being used properly because of the shortage of staff in the ULB.
- Promised support and coordination during project implementation.
- Deputy Mayor of Davanagere, expressed concern about quality of work.

KUIDFC

- The Task Manager (NKUSIP) stated that, the Draft Feasibility Studies (DFSs) are subject to change to address stakeholder comments and concerns.
- The Task Manager (NKUSIP) suggested to use Ashraya Scheme Government Order(GO) for land acquisition in Byadgi and other ULB, if required. (GO states that, compensation for land acquisition can be paid at 3 times to the guidance value of the land)

Other discussions

- Provision for Sewer Connections – include connection cost as a separate item. Check with project staff of KMRP/NKUSIP.
- Surrounding areas of ULBs and gaps in the existing sewerage system of the town – Check whether the villages and settlements are within the ULB's jurisdiction/ boundary and also population densities.
- Demarcate the roads where larger diameter sewers and WS mains are proposed in all ULBs, to carryout sample surveys and to check impacts during construction. Identify streets where complete road closure is required?

- Wastewater treatment scenario in Davanagere without considering 19.45 MLD existing Waste Stabilisation Ponds – Review and check whether an additional treatment plant is required?
- Maps or drawings to be prepared to show proposals/ options for both water supply and wastewater system.
- Refine the cost estimates to show following items separately: Laying of sewer network: Road restoration cost; Construction of collection chambers and connections from individual properties to collection chambers; Land cost for WWTPs and Pumping Stations; Construction cost of WWTP
- Identify industrial demand and location for recycling treated wastewater
- Preparation of comparison table for the selection of pipe material for sewerage and water supply system
- Plan awareness program for the sanitation in each ULB

Appendix 7: National Ambient Air Quality Standards

Sl No:	Pollutants	Time weighted average	Concentration in ambient air		Method of measurement
			Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas	
1	Sulphur Dioxide (SO_2) $\mu g/m^3$	Annual 24 hours	50 80	20 80	Improved West and Geake-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2) $\mu g/m^3$	Annual 24 hours	40 80	30 80	Modified Jacob & Hochheiser (Na-Arsenite) Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM_{10} $\mu g/m^3$	Annual 24 hours	60 100	60 100	Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$ $\mu g/m^3$	Annual 24 hours	40 60	40 60	Gravimetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO) mg/m^3	8 hours 1 hours	02 04	02 04	Non Dispersive Infra Red (NDIR) Spectroscopy

Appendix 8: Applicable Noise Standards

Area code	Category of area/zone	Limit in dB (A)	
		Day time	Night time
1	Industrial area	75	70
2	Commercial area	65	55
3	Residential area	55	45
4	Silence zone	50	40

Appendix 9: Salient Features of Major Labour Laws

Including Amendments Issued From Time To Time Applicable To Establishments Engaged In Construction Of Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

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

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

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

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

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

Appendix 10: Operation and Maintenance Guidelines

1. Sewer Network

Quality maintenance shall be the most important step in smooth functioning of the proposed sewers. This includes the optimum use of labour, equipment and material to keep the system in good condition. The following sessions deals with methods of sewer cleaning, staff pattern, organisational set-up for proposed sewerage system and the duties, powers and responsibilities of the staff dealing with proposed system for the town. The following recommendations are made for the smooth maintenance of the sewerage system in the town.

General

Quality maintenance of sewerage system consists of the optimum use of labour, equipment and materials to keep the system in good condition, so that it can accomplish efficiently its intended purpose of collection and transportation of wastewater to the treatment plant.

Types of Maintenance

There are two types of maintenance of a sewerage system - preventive and emergency. It is necessary that preventive or routine maintenance are to be carried out to prevent any breakdown of the system and to avoid emergency situations like clogged sewer lines, over flowing manholes or backing up of sewage into a house or structural failure of the system. Preventive maintenance is more economical and provides for reliability in operations of the sewer facilities. Emergency repairs, which would be rare if proper maintenance is carried out. Proper inspection and preventive maintenance is a necessity.

The primary effort of the staff is to maintain sewers free flowing and unobstructed. The sewer system with its components properly designed and installed is handed over to the person in charge of maintenance who assumes the responsibility to make it function satisfactorily for the benefit of the community. One should have sufficient experience of the system to enable him to perform his task efficiently with an understanding and appreciation of the problems that may arise during maintenance. One has not only to be a technical man but has also to deal with human relations in order to be successful in his work. Service training shall be imparted to the maintenance personnel to improve upon the methods adopted based on the latest trends. Failure to develop a better understanding of human relations and also lack of development of the concept of service to the community generally results in the maintenance part becoming unpopular. The general public is also to be made aware of do's and don'ts to help in keeping the sewers free flowing and unobstructed. Steps to be taken for operation and maintenance of the sewerage network detailed in this section are aimed at:

- Regular maintenance of the system for proper functioning
- Preventing any breakdown of the system
- Emergency operations to deal with clogged sewer lines or overflowing manholes
- Preventing backflow of sewage into residences and
- Preventing structural failure of the system.

Institutional Structure

A separate Operations and Maintenance Wing is proposed for an effective maintenance of sewerage system. A sewer maintenance crew comprising of a gang leader and four workers shall be set up in each sector comprising 20 km of sewer network for regular cleaning and maintenance of the sewer lines. There will be three such crews under one sewer inspectors. The supervisors report to the Junior Engineer who in turn reports to Assistant Executive Engineer. The Junior Engineer, Sewerage Inspectors and the crew can look after the sewerage, drainage and other solid waste management activities in the town. The Crew works as per the instructions of the supervisors. The supervisors hold the charge of the particular sectors or districts under their jurisdiction and will follow up the works like cleaning of sewers. They shall be

assigned the work to take care of the sewerage network and the sewage treatment plant proposed. Care should however be taken to ensure that the debris, brickbats, mortar, etc. is removed immediately after the repair work. A record of daily works done by the sewer maintenance team has to be maintained in a logbook in order to identify the chronic trouble spots, take extra care of these spots and necessary remedial action.

Man power and cost for the maintenance of sewer network

Position	No. of Staff / units	Per month Salary / Cost (Rs)	Total (Rs)
Driver for sewer cleaning vehicle	8	8,000	64,000
Cleaner for sewer cleaning vehicle	24	5,000	1,20,000
Sewer Workers	20	6,000	1,20,000
Sanitary Inspector	2	15,000	30,000
Maintenance of sewer cleaning vehicle (lump sum)	4	25,000	1,00,000
Operating cost of STP	1	50,000	5,00,000
Total (per month)			9,34,000
Total (per year)			11,208,000

The following list gives the duties that are to be performed for proper sewer maintenance:

• Inspection of sewers, sewer appurtenances etc.
• Cleaning of sewers and sewer appurtenances.
• Checking manhole conditions for deposition of silt etc.
• Replacing broken manhole covers.
• Raising the manhole cover for the construction of culverts, resurfacing etc.
• Approval of sewer connection applications and executing connections
• Maintaining records of sewers including:
    - Permanent construction
    - Daily operation and maintenance report
    - Complaints register
    - Stock of equipment
• Disposal of silt, garbage removed after cleaning sewer, manholes and treatment plants.
• Removal of debris, brickbats etc. after any repair work.
• Identifying locations where regular maintenance is needed (problem areas) in sewers.
• Ensuring work is carried out correctly and safely with due regards to health and safety regulations.
• Adopting preventive maintenance within the sub division as a whole,
    - Conducting periodic staff meeting and record of the proceedings.

Sewer Cleaning Equipment and Procedures

General Practice

In addition to the routine sewer cleaning equipments such as pick-axes, manhole guards, tripod stands, danger flags, lanterns, batteries, safety lamps, lead acetate paper, silt drums, ropes, iron hooks, handcarts, plunger rods, observation rods, shovels, etc., a Pull through Disc with Rope, Jetting Machine (Velocity Cleaners) and Hand Operated Winching Machine are also recommended for effective maintenance.

• For small diameters (150 to 400 mm dia), Jetting machines are used.

• For larger diameters (400 to 1100 mm dia), bucket cleaning equipment is used.

• For larger diameters (Above 1100 mm dia), manual de-silting of sewers is practiced.

Manual Cleaning

In manual cleaning method, the silt is collected manually from manholes and large sewers where man-entry is possible. This is however a very slow and risky operation. Proper artificial ventilation and adequate safety precautions are required before the men enter the sewers. The depth of most of the sewers, are considerable in some cases; the velocity can also be expected to be low leading to generation of gases. All personnel entering the manhole should have proper safety equipment. There should be forced ventilation by using air blowers on manholes upstream of the concerned length. All such personnel should use safety harness fastened at the other end and another crew member should monitor crew who has entered the manhole.

Passing Rope Knots and Discs

In this method of sewer cleaning, solid split bamboos are passed through sewers from one manhole to the other to create a link. Ropes are attached to this link and a rope link is created between two manholes. A wooden disc with rubber gasket ring or a series of knots of rope are formed and pulled through the sewer to and fro. The inside of the sewer (sewer fabric) gets scrubbed due to this procedure and dislocates the encrusted silt. The freed silt flows away downstream and in this way the sewer can be cleaned from upstream to downstream. This method is labor intensive and hence expensive. Further such vigorous scrubbing sometimes breaks the joints and damages the sewer fabric. This method is therefore no longer adopted in modern sewer maintenance practices.

Bucket Cleaning Equipment

In the method of utilizing the bucket cleaning equipment, two winches are installed on two manholes. A rope link is established. A bucket is attached to the rope and pulled from one end to the other. The silt deposited in the sewer is collected in the bucket and is taken out from a manhole. This method can cause damage to manholes and sewer fabric due to heavy pulling if not done properly.

Jetting & Suction Equipment

Jetting and suction equipment is mounted on a truck chassis. Water is stored in a tank (usually 6000 lit capacity) mounted on the truck. This water is jetted in the sewer line using a high-pressure pump and a nozzle system. Fine jets with high velocity are generated. On the forward and the backward pass of the jet, the deposited silt is loosened and gets washed down and is collected in the downstream manhole. From this manhole, it is sucked out in a slurry form to a silt tank mounted on the chassis. Various sizes of jets and suction can be used to clean various diameter sewers. The Indian equipment available is usually effective for sewer up to 300mm diameter and can be used up to 450 mm diameter with some modifications. For larger diameter sewers, imported heavy-duty suction and jetting machines can be used. In the latest sewer maintenance programs, these machines are preferred by all and could be conveniently used.

Hand Operated Winch Machine

This is used to clean sewer pipes larger than 300 mm. diameter which are blocked to a significant extent.

Safety & Precautions

Adequate safety measures and precautions are most important while maintaining the sewer

systems. These precautions should necessarily comprise of:

• Ventilating sewer line by opening two or three manholes on both sides of working sewer line for about one hour

• Using gas masks while entering the sewer line

• Placing at least two helpers at the top and sending signals at every few minutes to the person in the manhole

• Testing manhole rungs or steps for structural safety before using

• Lowering all the tools to the workman in bucket and ensuring that no tools are located near the manhole edge that could fall in to the manhole and injure the workman

• Using lighting equipment that are explosion and fire proof

• Adequate and easily readable warning signs to the traffic well ahead of the work area

• Posting flagman at the two ends of the working sewer line to avoid traffic jams

• Avoiding infections by using rubber gloves, gum boots, separate cloths while working and

• By keeping records of injury with description of accident, corrective actions taken and the accident analysis.

In addition to the above, an up-to-date record of maps and profiles have to be maintained duly incorporating any changes made, if any, during construction and repair works. This will help in proper maintenance of the system.

C. Sewerage Treatment Plants

The following sessions covers the routine operation and maintenance plans for the STP. The exact method and nature of operation may vary / differ with respect to the model and specification of the machinery and equipment. Therefore, manufacture's manual and hand book should be referred before finalizing these operation and maintenance plans. The operator shall carry out preventive, routing maintenance and break down maintenance operations for proper upkeep of plant in accordance with good operating practices.

1. Daily

A. Sewage Pumping station & Sewage Treatment Plant

i. Operate the centrifuge for sludge drying and treat incoming sewage at prescribed standards through optimal dosing

ii. Carrying out daily cleaning of grit channels and removal of screenings and disposal of floating matter in grit dewatered sludge out of premises.

iii. Cleaning of the overflow weirs and weekly scarping of the floor and walls of the lauder.

iv. Carrying out continuous flow measurements of treated & untreated sewage and recording the same.

v. Checking the operation, correcting defects related to calibration and setting, minor repairs and proper up keeping such as cleaning for Screens/ Grit Channels, Moving parts of screens and grit removal equipment, Blowers /Agitators / Pumps/ Agitators /Return Sludge pumps/ Chemical mixer/Centrifuge/Decanter, Stuffing box, Bearings, Balancing on Decanter, Chemical dosing and mixing, Motor contact tightness, Cable insulation near the lugs, Panel breaker and starter, contacts of relay and circuit breaker, Setting of over current relay, no-volt coil and tripping mechanism, transformer sub-station, Ground Operated dis-connectors, radiators and earth pit.

vi. Providing security for facilities and system at all times

vii. Ensure continuous power supply, provide necessary power back up.

viii. Ensure the smooth flow into the treatment plant.

B. Daily Reports

i. Daily summary of Operations at Pumping Stations: A daily report providing information at each pumping station, on the hours of pumping quantity of sewage pumped and energy consumed during the day

ii. Daily summary of Operations at Sewage Treatment Plant – A daily report of operation of the diffuses, agitators, decanter and other equipment at the sewage treatment plants providing information on the quantity of sewage treated, hours of operation of equipment, energy consumed and use of chemicals.

2. Monthly

A. Pumping Machinery and Treatment Plant Equipment

i. Checking for damaged pipes, fittings and valves for suction and delivery pipes and replacing / repairing them as required.

ii. Checking pump impellers, body, bearings shafts column pipes and repairing / replacing them if required.

iii. Checking of motors, starters, circuit breakers, capacitors, vanes and/or gears of agitators, transformers, blowers, decanters, diffusers, chlorinator, chemical dosing equipment and centrifuge, and repairing / replacing as required

iv. Calibration, minor repairs and up keeping of Sewerage level indicators in wet well, manholes, wet well interiors and Lighting arrestors.

v. Checking the operation, correcting defects attending to calibration and setting, minor repairs and proper up keeping such as Screen and Grit channels, Chain in mechanically operated components, screen performance, transformer, Oil in transformer, relay alarm circuit, load and voltage

3. Quarterly

A. Pumping Station Complex

i. Checking the pipes and repair /replacing damaged pipes, fittings and valves as required.

ii. Checking the level indicator, lighting conductor etc and replacing / repairing if required.

B. Pumping Machinery and Treatment Plant Equipment

i. Cleaning and maintaining all rising mains/sewers in the plant area.

ii. Checking the operation, correcting defects attending to calibration and setting, minor repairs and proper up keeping such as transformer bushing and dehydrating breathers.

iii. Collecting samples of influent and effluent and analyzing them daily to determine the quality of sewage and performance of the treatment plant

iv. Checking of the walkways for corrosion

v. Conducting Safety audit on routine basis.

C. Quarterly Reports

i. Sewage Quality Monitoring – A quarterly report monitoring the quality of raw and treated sewage through the analysis of samples (Inlet and outlet water quality for BOD/COD/TSS/TKN / TN, TP, Colour etc,)

ii. Testing of the Parameters like testing for MLSS etc. on quarterly basis. .

4. Half Yearly

A. Pumping Station Complex

i. De-silting of wet well and disposing silt.

ii. Pumping Machinery and Treatment Plant Equipment

iii. Dewatering and de-silting of sludge sump, chlorination tank, chemical dosing tanks and disposal of silt.

B. Pumping Station Complex, Wet well, Buildings and other Civil Structures

i. Checking the roof and walls for water proofing.

ii. Checking the operation, correcting defects attending to calibration and setting, minor repairs and proper up keeping such as pumps, blowers, agitators, compressor, decanters, centrifuge, gland of stuffing box, gland bolts, gland packing, alignment of pump aerator and drive, oil lubricating bearings, tripping elements for motor protection, contact points and fuse ratings.

5. Annual

A. Pumping Station and Treatment Complex

i. Checking the ladders and repairs / replacing as required.

ii. Checking for Leakages in structures, ladders, railings, structural damages to the wet and dry well and overflow drain.

iii. Checking the operation, correcting defects attending to calibration and setting, minor repairs and proper up keeping such as paint screens, grit removal mechanism, scrapers, motor pipes, valves, fittings agitators, inlet / outlet weirs.

iv. Carry out routine maintenance and minor repairs including cleaning, repair to plaster doors, windows and painting.

6. Contingency

The contractor need to prepare contingency plans in respect of responses to natural disasters, periods of power failure, storm water inflow into sewers during monsoon, de-silting of units of treatment plants, constraint operations or other similar emergencies to maintain the quality of treated sewage.

7. Energy Audit

The Operator shall take all necessary measures to minimize the power consumption in carrying out its operations. The energy audit operations shall include, but not be limited to the following.

i) Reducing electricity consumption by regulating pumping through suitable modifications to the operating schedules.

ii) Installing more efficient pumping equipment and following better maintenance practices for electrical installation.

Appendix 11. List of clearance required

No	Permission	Sewer Network	STP	Sanitation
1	KSPCB	NA	CFE and CFO	NA
2	National Highways / PWD	Clearance Required	NA	NA
3	Railway	Clearance Required	NA	NA
4	Utilities (BESCOM, BSNL)	Clearance Required	NA	NA
5	Labour License	License Required	License Required	License Required
6	Forest	NA	NA	NA

Appendix 12. Monitoring and Reporting Formats

SAMPLE MONTHLY REPORTING FORMAT FOR CONSTRUCTION SUPERVISION SPECIALIST

1. Introduction

- Overall project description and objectives
- Description of sub Projects
- Environmental Category of the sub projects.
- Details of site personnel and / or consultants responsible for environmental monitoring
- Overall project and sub project progress and status.

No.	Sub Project Name	Status of the Sub Project			List of works	Progress of works
		Pre- Construction	Construction	Operational Phase		

2. Compliance Status with National / State / Local Statutory Environmental Requirements

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

3. Compliance Status with Environmental Loan Covenants

No (List schedule and Paragraph Number of Loan Agreement)	Covenant	Status of Compliance	Action Required

4. Compliance Status with the Environmental Management and Monitoring Plan

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi –annual report send to ADB. Visual assessment and review of relevant site documentation during the routine site inspection needs to note and record the following

✓ What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries.

✓ If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads

✓ Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain.

✓ Are their designated areas for concrete works and refuelling

✓ Are their spill kits on site and if there are site procedure for handing emergencies

✓ Is there any chemical stored on site and what is the storage condition?

✓ Is there any dewatering activities, if yes, where is the water being discharged ?

✓ How are the stockpiles being managed ?

✓ How is solid and liquid waste being handled on site

✓ Review of the complaint management system

✓ Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

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

Overall Compliance with CEMP/ EMP

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

5. Approach and methodology for environmental monitoring of the project

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

6. Monitoring of environmental Impacts on project surroundings (ambient air, water quality and noise levels)

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

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

Air Quality Results

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

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time
Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

7. Summary of key issues and remedial actions

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

8. Appendices

- 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

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

Signature _____
Name Name

Position Position

SAMPLE CHECKLIST FOR CONSTRUCTION SAFETY

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
1	Appointment of qualified construction safety officers						
2	Approval for construction safety management plan by the SC						
3	Approval for traffic management/control plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the contractor.						
5	Provision of temporary traffic barriers/barricades/caution tapes in construction zones						
6	Provision of traffic signboards						
7	Provision for flags and warning lights						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work, and access (ladders with handrail) for works at a height of more than 3 m						
11	Provision of adequate shoring / bracing/barricading/lighting for all deep excavations of more than 3 m depth.						
12	Demarcations (fencing, guarding, and watching) at construction sites						
13	Provision for sufficient lighting, especially for						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	night time work						
14	Arrangements for controlled access and entry to construction zones						
15	Safety arrangements for road users/pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular inspection of work zone traffic control devices by authorized contractor personnel						
18	Construction workers' safety - Provision of personnel protective equipment						
19	A. Helmets						
	B. Safety shoes						
	C. Dust masks						
	D. Hand gloves						
	E. Safety belts						
	F. Reflective jackets						
	G. Earplugs for labour						
20	Workers employed on bituminous works, stone crushers, concrete batching plants, etc. provided with protective goggles, gloves, gumboots, etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders, and other safety devices shall be maintained in safe and sound						

Sl. No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
	condition.						
24	Regular health check up for labor/ contractor's personnel						
25	Ensuring sanitary conditions and all waste disposal procedures and methods in the camps.						
26	The contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers, and flag persons for traffic control						
27	Provision of insurance coverage for the contractor's personnel						

Contractor

Consultant

Appendix 13. Letter from the Commissioner, Davangere

13 (a). About no private land in the proposed Sewer line network alignments

ದಾವಣಗೆರೆ - 577 002

DAVANAGERE - 577 002

Phone: 08192 - 232008, Fax: 252899, ಮೇಯರ್: 255174, ಉಪಮೇಯರ್: 235309

Commissioner/CCD/KIUWMIP/2013-2014/609 28.02.2014

To
Task Manager
KIUWMIP, KUIDFC
Bangalore.

Madam,

Subject: - Sewer line alignment pertains to underground drainage network of Davanagere City-Reg.

It has been confirmed after the joint site inspection by the ULB Engineers and Consultants that all the project sewer alignment is passing through government land and roads within the City Corporation limit.

Yours faithfully,

Commissioner
City Corporation of Davanagere.

13 (b) About the private land donated for the approach road of STP at Avaragere

ಮಹಾನಗರಪಾಲಿಕೆ ಕಾರ್ಯಾಲಯ,
ದಾವಣಗೆರೆ-577 002.

CITY CORPORATION,
DAVANGERE - 577 002.

ದಾಮನಪಾ/ಕಂಶಾ/ಎಲ್ಎನ್ಡಿ/ಸಿಆರ್/ /2013-14 ದಿನಾಂಕ: 07-08-2014

ಗೆ,
ಸಹಾಯಕ ಕಾರ್ಯಪಾಲಕ ಅಭಿಯಂತರರು,
ಎನ್.ಕೆ.ಯು.ಐ.ಎಸ್.ಎಫ್
ದಾವಣಗೆರೆ.

ಮಾನ್ಯರೇ,

ವಿಷಯ : ದಾವಣಗೆರೆ ತಾಲ್ಲೂಕ್ ಅವರಗೆರೆ ಗ್ರಾಮ ಸರ್ವೇ ನಂ.371 ರಲ್ಲಿ 2 ಎಕರೆ ಪ್ರದೇಶದಲ್ಲಿ ಮಳೆನ ನೀರು ಶುದ್ದಿಕರಣ ಘಟಕಕ್ಕೆ ರಸ್ತೆ ಜಾಗವನ್ನು ದಾನಪತ್ರದ ಮೂಲಕ ನೊಂದಾಯಿಸಿಕೊಂಡಿರುವ ಬಗ್ಗೆ.

****

ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ದಾವಣಗೆರೆ ತಾಲ್ಲೂಕ್ ಅವರಗೆರೆ ಗ್ರಾಮ ಸರ್ವೇ ನಂ.371 ರಲ್ಲಿ 2 ಎಕರೆ ಪ್ರದೇಶದಲ್ಲಿ ಮಳೆನ ನೀರು ಶುದ್ದಿಕರಣ ಘಟಕದ ಪ್ರದೇಶಕ್ಕೆ ಹಾದು ಹೋಗಲು ರಸ್ತೆಯ ಜಾಗವನ್ನು ಶ್ರೀ ನಾಗರಾಜಪ್ಪ ಬಿನ್ ತುರಿಯಪ್ಪ ರಿ.ಸ.ನಂ.372/3ರಲ್ಲಿ 13 ಗುಂಟೆ ಪೈಕಿ 4 ಗುಂಟೆ ಜಮೀನನ್ನು ಮತ್ತು ರಿ.ಸ.ನಂ. 372/1ರಲ್ಲಿ 1 ಎಕರೆ ಪೈಕಿ 6 ಗುಂಟೆ ಒಟ್ಟು 10 ಗುಂಟೆ ಜಮೀನನ್ನು ರಸ್ತೆಗಾಗಿ ದಾನಪತ್ರದ ಮೂಲಕ ದಿನಾಂಕ : 05-08-2014 ರಂದು ಕರ್ನಾಟಕ ರಾಜ್ಯಪಾಲರ ಪರವಾಗಿ ಆಯುಕ್ತರು ಮಹಾನಗರಪಾಲಿಕೆ ದಾವಣಗೆರೆ ಇವರು ನೊಂದಾಯಿಸಿಕೊಟ್ಟಿರುತ್ತಾರೆ. ಸದರಿ ದಾನಪತ್ರದ ನಕಲುಗಳನ್ನು ಈ ಪತ್ರದೊಂದಿಗೆ ಲಗತ್ತಿಸಿ ಮುಂದಿನ ಕ್ರಮಕ್ಕಾಗಿ ಕಳುಹಿಸಿದೆ.

ತಮ್ಮ ವಿಶ್ವಾಸಿ

ಆಯುಕ್ತರು,
ಮಹಾನಗರಪಾಲಿಕೆ, ದಾವಣಗೆರೆ.