Draft Initial Environmental Examination

April 2013

India: Karnataka Integrated Urban Water Management Investment Program
- Ranebennur (Urban Water Supply and Sanitation Subproject)

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

CURRENCY EQUIVALENTS

(as of 8 April 2013)

Currency unit	–	Indian Rupee (Re/Rs)
Re1.00	=	$ .0182832069
$1.00	=	Rs54.695

ABBREVIATIONS

ADB	Asian Development Bank
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
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
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
IWRM	Integrated Water Resource Management
KISWRMP	Karnataka Integrated and Sustainable Water Resource Management Investment Program
KSCB	Karnataka Slum Clearance Board
KSPCB	Karnataka State Pollution Control Board
KTCP	Karnataka Town and Country Planning
KUIDFC	Karnataka Urban Infrastructure Development & Finance Corporation
KUWSDB	Karnataka Urban Water Supply & Drainage Board

LPA	Local Planning Authority
M&M	Major and Medium
MFF	Multitranche Financing Facility
MoEF	Ministry of Environment and Forest
MSL	Mean Sea Level
NGO	Non-Government Organisation
NKUSIP	North Karnataka Urban Sector Investment Programme
NRW	Non Revenue Water
NWKRTC	North-West Karnataka Road Transport Corporation
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
ppm	Parts per million
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
RF	Resettlement Framework
RH	Relative Humidity
RP	Resettlement Plan
SC	Scheduled Caste
SEIAA	State Environmental Impact Assessment Authority
SPS	Sewage Pumping Station
ST	Scheduled Tribe
STP	Sewage Treatment plant
SW	StoneWare
TMC	Town Municipal Council
ToR	Terms of Reference
ULB	Urban Local Body
UDWSP	Urban Drinking Water & Sanitation Policy
USD	US Dollars
(U)WSS	(Urban) Water Supply & Sanitation
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

WEIGHTS AND MEASURES

Kl	kilolitre
km	kilometre
l/hd/dy	litres per head per day
lpcd	litres per capita per day
lps	litres per second
M	million
mcm	million cubic meters
Mg/l	milligram per litre
Mld	million litres per day
m	metre
mm	millimetre

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. Ranebennur water supply and sewerage subproject is one of the subprojects proposed in Tranche-1. Water supply is currently intermittent, unreliable and suffers with huge losses and quality issues. Sewerage system including a wastewater treatment plant is presently in construction under the ADB funded NKUSIP, however this does not cover 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 water supply and sewerage components.

3. **Categorization.** Ranebennur 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 water and sewerage infrastructure in a holistic and integrated manner. The main objective of the Investment Program is to improve water efficiency, security and have an important effect on public health. Investments under this subproject includes: (i) installation of water pumps; (ii) rehabilitation and augmentation of existing WTP; (iii) rehabilitation and restoration of river bank lake reservoir (Doddakere Lake); (iv) construction of service reservoirs; (v) construction of strategic water network and rehabilitation of water distribution network; (vi) installation of water meters; (vii) construction of new sewer network; (viii) construction of household and community toilets, and (ix) sludge treatment at the WWTP.

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 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) 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 Ranebennur urban area or in its immediate surroundings which were converted into agricultural or urban use

many years ago, and there is no natural habitat left at these sites. The subproject sites are located in existing right of ways (RoWs) and government-owned land. Doddakere Lake is an important water body in the town, which is presently in poor condition with low water inflow, sewage entry and decreased water holding capacity. The total area of this lake is 105.12 ha and it is government-owned. At present it is mostly dry with water present in some isolated patches. The lake is situated in the outskirts of the town, and is used for fishing and animal grazing. Open defecation is prevalent in the surrounding area. The lake is covered with shrubs and bushes of local common species and a variety of birds have been spotted near the lake. There are no mangroves, or estuaries in or near the subproject location. Ranebennur Black Buck Sanctuary is the nearest to the project area. This is spread in Ranebennur Taluk, and its boundary is extended to up to 1 km from the CMC boundary in the eastern side. The WWTP, presently under construction in NKUSIP, is in the northern side, about 1 km from the sanctuary boundary. The core area of the park is about 6-8 km inside its boundary. There are no forest areas within or near Ranebennur.

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 all facilities on government-owned land to avoid the need for land acquisition and relocation of people; and (ii) laying of pipes in RoWs alongside main/access roads, to reduce acquisition of land and impacts on livelihoods specifically in densely populated areas of the city. The proposed lake rehabilitation works will be conducted within the lake area, which is mostly dry.

9. Potential impacts were identified in relation to location, design, construction and operation of the improved infrastructure. No notable location specific impacts were noticed. None of the subprojects are located in or adjacent to the boundary of Blackbuck Sanctuary. Subprojects are confined to CMC boundary, and other facilities outside CMC limits (water intake and pumping stations) are situated on the other side of the town (southern). Although no impacts/interference with the sanctuary is envisaged, certain measures to avoid entry of construction workers in to the areas have been suggested. Similarly, considering the natural habitat at the lake, various measures are suggested in the design and construction phases.

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.

11. 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. Construction work is likely to disturb

the lake body and various measures such as limiting the work to dry period, restrict the movement/use of construction equipment within the lake etc are suggested.

12. 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.

13. 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.

14. The citizens of the Ranebennur Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. 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 WWTP, currently under construction, to acceptable standards. The proposed improvement to sludge handling at WWTP will further improve the efficiency. 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 proposed lake rehabilitation works will improve the environmental and social benefits of the lake, including enhancing water security for the town.

15. The most noticeable net environmental benefits to the population of the towns will be positive and large as a result of improved: (i) water efficiency and security through the implementation of NRW reduction programs and expansion and rehabilitation water supply infrastructure respectively; and (ii) river water quality through the expansion of sewerage networks, treatment capacity and sanitation coverage.

16. **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.

17. **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.

18. **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

A. 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 intends to enhance water security and improve river environment through integrated urban water management (IUWM) interventions. KIUWMIP aims to build on water supply and sanitation considerations within an urban settlement by incorporating urban water management within the scope of the entire river basin. IUWM will provide flexible planning amongst water user sectors within the watershed basins. This will allow for optimal sequencing of traditional and new infrastructure with alternative management scenarios to improve water use efficiency. The emerging IWUM approach offers a more diverse and versatile set of options for dealing with larger and more complex urban water challenges.

3. 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.

4. The expected outcome will be improved water resource planning, monitoring and service delivery in 4 towns of the Upper Tunga Bhadra subbasin. Tranche 1 will have 3 outputs; (i) Output 1: Expanded efficient UWSS infrastructure in 4 towns of the Upper Tunga Bhadra subbasin; (ii) Output 2: 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

5. 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.

6. This IEE, for the Ranebennur Water Supply and Sewerage 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

7. 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.

8. 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.

9. 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

10. 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.

11. 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.

12. 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.

13. None of the components of this water supply and sewerage improvement subproject including lake rehabilitation in Ranebennur falls under the ambit of the EIA Notification 2006, and, therefore EC is thus not required for the subproject.

14. 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
Components that require tree cutting (WTP Augmentation)	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. Application for felling of trees shall be submitted and permission to be obtained.	Tree to be cut enumerated and application to be submitted in required format as per the Act. Compensatory plantation as stipulated in the tree cutting permission shall be adhered to.
Modifications to sludge treatment and disposal for Existing (under construction) WWTP	Water (Prevention and Control of Pollution) Act 1974	Revised Consent for Establishment (CFE) from KSPCB	Based on review of proposed changes CFE will be issued
Doddakere Lake Rehabilitation	Government Notification for transferring Doddakere Lake from Minor Irrigation Department to Ranebennur CMC (transferred in 2007)	Lake rehabilitation works have to be planned in consultation with Minor Irrigation Department	Discuss the concept and detailed project report with MI Department

III. DESCRIPTION OF THE PROJECT

A. Project Need

15. **Water Supply**. Currently water supply within Ranebennur is intermittent with consumers typically receiving a supply on alternate days, and in some cases less frequently, for a period of up to 2 hours. The situation is less than desirable in that the amount of water available to consumers is limited and the prolonged periods during which customers have to store water leads to significant deterioration of its quality, exasperated by the warm climate and a lack of customer understanding of the need for hygienic storage facilities. There is an increased risk of contaminated groundwater entering the water network when the mains are de-pressurised; a risk made greater by the accepted poor condition of the network and lack of maintenance.

16. Raw water for Ranebennur is abstracted from the River Tungabhadra at Mudhenur, approximately 20 km from the City. The water is pumped in two stages from Mudhenur intake to

the water treatment plant at Ranebennur. There is a intermediate pumping stations at Magod 12 km from the intake. This river based bulk water scheme was commissioned in 2002 as common scheme for Ranebennur and Byadagi. Capacity of WTP is 11.4 MLD. About 13-14 MLD of water is abstracted from river and treated at WTP and supplied to Ranebennur and Byadagi, It is estimated that about 3MLD of water is lost due to poor condtion of raw water pumping main. Water supplied to Byadagi is in the range of 1-2 MLD.

17. From WTP, water is pumped to service reservoirs (4 overhead and 1 ground level reservoir a top hill) via clear water transmission pipes of 16.5 km length consisting of mild steel and uPVC pipes. From the reservoirs, water is supplied to consumers through gravity distribution network of 78 km length consisting of mostly uPVC pipes.

18. Information provided by the ULB's indicated that all residents have access to a drinking water supply, albeit many of them through use of a public stand post. There are 13,840 consumer connections and 890 stand posts. The current per capita volume made available to customers is assessed at 80litres/capita/day, compared with the norm of 135litres/capita/day. Without metering facilities, the assessed figure can only be taken as indicative, and is an average. Supply periods for individual areas are based on the availability of water from the Ranebennur treatment works and are commenced and ended by the operation of the pumps at the works, storage sites or within the network. There is no formal regulation for the valve operations which can lead to an unfair distribution of water, not helped by the fact that those in the lower areas of the town tend to have a longer supply than those on higher ground.

19. **Sewerage**. The town has an existing sewerage collection system that covers about 30% of the service area and 22.5km of road length. The condition of the existing sewerage system is very poor, as are the records of the network. Reported data on the sewer network is: 2.12 km of trunk sewer which is damaged; 19.38 km of lateral and branch sewers out of which about 12.5 km is in good condition, and 460 numbers of manholes and 3099 house connections. The existing wastewater treatment works is a Waste Stabilisation Pond system. The plant is not operating and in a poor condition, with most of the plant damaged or overgrown with bushes. Raw sewage has been diverted to the nearby fields for irrigation.

20. **Works under Implementation**. A sewerage scheme for the entire town has been prepared, approved under NKUSIP, funded by the ADB, with the intention to provide full sewer coverage within the developed areas. As per the design, Ranebennur has been divided into sewerage District 1 and District 2. The total length of sewers to be laid comprises: Trunk sewers - 8.1km; Outfall sewer - 1.4km; and Secondary sewers - 68.0 km.

21. The work has been divided into two phases. Phase 1, which is under construction and funded under the NKUSIP, consists of 8.1km of trunk sewers; 57km of secondary and lateral sewers and rehabilitation of 2km of sewers, a pumping station (average flow of 7.5MLD), 1.4km outfall sewer and a 7.5WLD wastewater treatment plant, based on facultative aerated lagoon technology (FAL). The WWTP consists of five connected lanes with a serpentine configuration, such that the flow "snakes" around all five lanes before discharging in to the nearby natural drainage channel. Unlike a stabilisation pond, the FAL has aerators (50 no,s) to enhance the treatment efficiency which reduces the land area needed compared with stabilisation ponds. There is no fund available under NKUSIP for Phase 2, which is required in both districts and is for the remaining 11km of secondary sewers. It is therefore proposed to take up this work under the KISWRMIP’s Part C.

22. There are large numbers of toilet-less households in Ranebennur. In the absence of access to individual/shared toilets or functional community toilets, a very large proportion of these households practice open defecation. It is estimated that approximately 3,280 households in Ranebennur do not have access to toilets.

23. Based on the disparity in access to sanitation facilities evident in the four towns, especially amongst the low income households and the need for demand promotion to promote ODF communities, OBA mechanism has been proposed to be used. The OBA mechanism will increase the access of sanitation to primarily low income households in the four towns through (i) construction and connection to the sewer network of new individual household toilets; (ii) construction, connection to the sewer network and operation of community toilets; and (iii) sanitation marketing to increase demand for toilet construction and use and promote open defecation free (ODF) communities.

24. The sewer system under implementation was designed as a separate sewer system that carries only the wastewater including sewage and sullage. The underground gravity sewers will carry sewage from households to the Wastewater Treatment Plant (WWTP). The open drain system that exists in the town will cater to storm runoff.

B. Description of the Subproject

25. Following **Table 2** shows the nature and size of the various components of the subproject. The descriptions shown in **Table 2** are based on the present proposals at this feasibility stage. Certain details may change as development of the subproject progresses, particularly in the detailed design stage. It should also be noted that at this stage the infrastructure has been designed in outline only, to determine overall feasibility and budget costs, so certain aspects (such as size of WTP units) have not yet been finalised. Location of subproject components and conceptual layout plans are shown in Figure 1 to Figure 12.

26. **Implementation Schedule**. As per the suggested schedule, preparation of detailed project report and bids for this subproject will commence in the middle of 2013. The construction is likely to start in April-2014, and should be completed in 24 months.

Table 2: Proposed Subproject & Component Descriptions

Infrastructure	Function	Description	Location
1. Water Supply			
Raw water pumps	Provide for increase quantity of raw water to the WTP (from existing 13-14 MLD to 29 MLD)	*New & Replacement* At intake: • 3 pumps of 195 lps discharge and 85 m head At Intermediate pumping station • 3 pumps of 195 lps discharge and 85 m head	Within in the existing pumping stations at River intake Mudhenur and intermediate pumping station at Magod
Rehabilitation of	Provide treated	Rehabilitation &	Within the existing WTP compound

Infrastructure	Function	Description	Location
augmentation of existing Water Treatment Plant	water to fill the current gap in supply and to cater future demand of supply.	expansion of existing WTP[1] to 18 MLD, including the following: • Additional clariflocculator tank • Double the number of existing rapid gravity sand filters • Upgraded chlorine handling and dosing facilities (improve safety) • Filter backwash arrangements • Sludge dewatering plant & short term on site storage • Site laboratory for drinking water quality monitoring and analysis of samples from supply network as well as the treated wastewater from the WWTP. • New process instrumentation & control system connected to control room	at Sidheshwar Nagar in the town.
Clear water pumps	Pump treated water from WTP to elevated service reservoirs	*New & Replacement* • 3 pumps of 180 lps discharge and 47 m head	Within the existing WTP compound at Sidheswar Nagar
Construction of New Service Reservoirs	To convey treated water under gravity	*New* 2 Nos Elevated Storage Reservoirs of 900 KL each. All proposed ELSRs to have a bottom water level of 12m above ground 1 Ground Level Service Reservoir (GLSR)	ELSRs at Maruti Nagar and Bireshwara Nagar Extension GLSR at Cholamadeswara Hillock
Clear water	Supply clear water	*New*	Pipes will be laid along the roads in

[1] As indicated earlier, the existing WTP supplies water to Byadagi as well. KUWSDB has proposed a separate bulk water system for Byadagi, which is currently in bidding stage. Once this is commissioned, this WTP will be exclusive to Ranebennur.

Infrastructure	Function	Description	Location
rising mains	from WTP to service reservoirs for further supply	65.1 km DI pipe 250-450 mm diameter	the vacant space between the carriage way and building line;
Rrehabilitation of distribution network	Distribute treated water in the currently un-serviced area	*Rehabilitation* 54.6 km 110-300 mm diameter HDPE/DI pipes	Pipes will be laid along the roads in the vacant space between the carriage way and building line; this will cover mostly outer areas of the town
Bulk Water Meters and District Meters	Monitor water flow in the improved network	*New – 50 no, s* Bulk Meters (Dia. varying from 150mm to 400mm) District Meters (Dia. varying from 80mm to 150mm)	WS Strategic Network and Primary mains Distribution Network
Domestic Meters	Monitor and regulate water usage by consumers and improve cost recovery	*New* 37,037 Domestic Meters, 15mm Dia. and 20mm.	Attached to the water delivery pipe at each house
Generator	To provide for backup power during power supply outages	*New* Standby diesel generators at pumping stations and WTP including diesel storage	Generator set will be installed within the existing facility compounds
2. Sewerage			
Sewer network	Collect domestic wastewater from households not covered under ongoing NKUSIP project and convey it to Wastewater treatment plant	30 km 150-250 diameter SW pipes	Sewers will be laid mostly in the outer medium and low density developed areas of the town, where sewers were not laid under NKUSIP; sewers will be laid underground, along the roads in the vacant space between road and building
Toilets	Toilets at individual level and community level to cater to households without toilets	*New* 1,425 - water flush toilets, outlets connected to sewers community toilets (total 120 seats -- water flush toilets, outlets connected to sewers	These are proposed to ensure access to toilets for all households, irrespective of tenure status or economic constraints. Space availability will determine the level of service for a household, i.e., individual or community toilets. Community toilets shall be designed keeping the needs of men, women, elderly, disabled and children in view. Individual toilets are located within the house premises, and community toilets are constructed in the

Infrastructure	Function	Description	Location
			neighbourhood, where space is available
Sludge thickening equipment for WWTP	Improved sludge handling and management reduce the water content	Sludge centrifuge de-watering plant Including belt press, polymer makeup unit and electrical control panel.	The plant to be housed in a small building for weather protection at the existing WWTP, located outside the town. The thickened sludge to be stored outside on concrete hard-standing, including drains. The outdoor sludge store to have a roof but open sides to allow good ventilation, but to prevent heavy rain "re-liquidising" the thickened sludge
Other works			
Rehabilitation of Doddakere Lake	To enhance water security, improve water quality and, improve overall lake environment	Rehabilitation and strengthening of bunds including stone pitching and turfing on slopes Desilting of lake at selective locations Box culvert near railway bridge Interception and diversion unit to divest dry weather flow (sewage)	The Doddakere Lake is located to the north side of Ranebennur Town. The total area of the tank is about 105.12 Ha; this is government-owned.

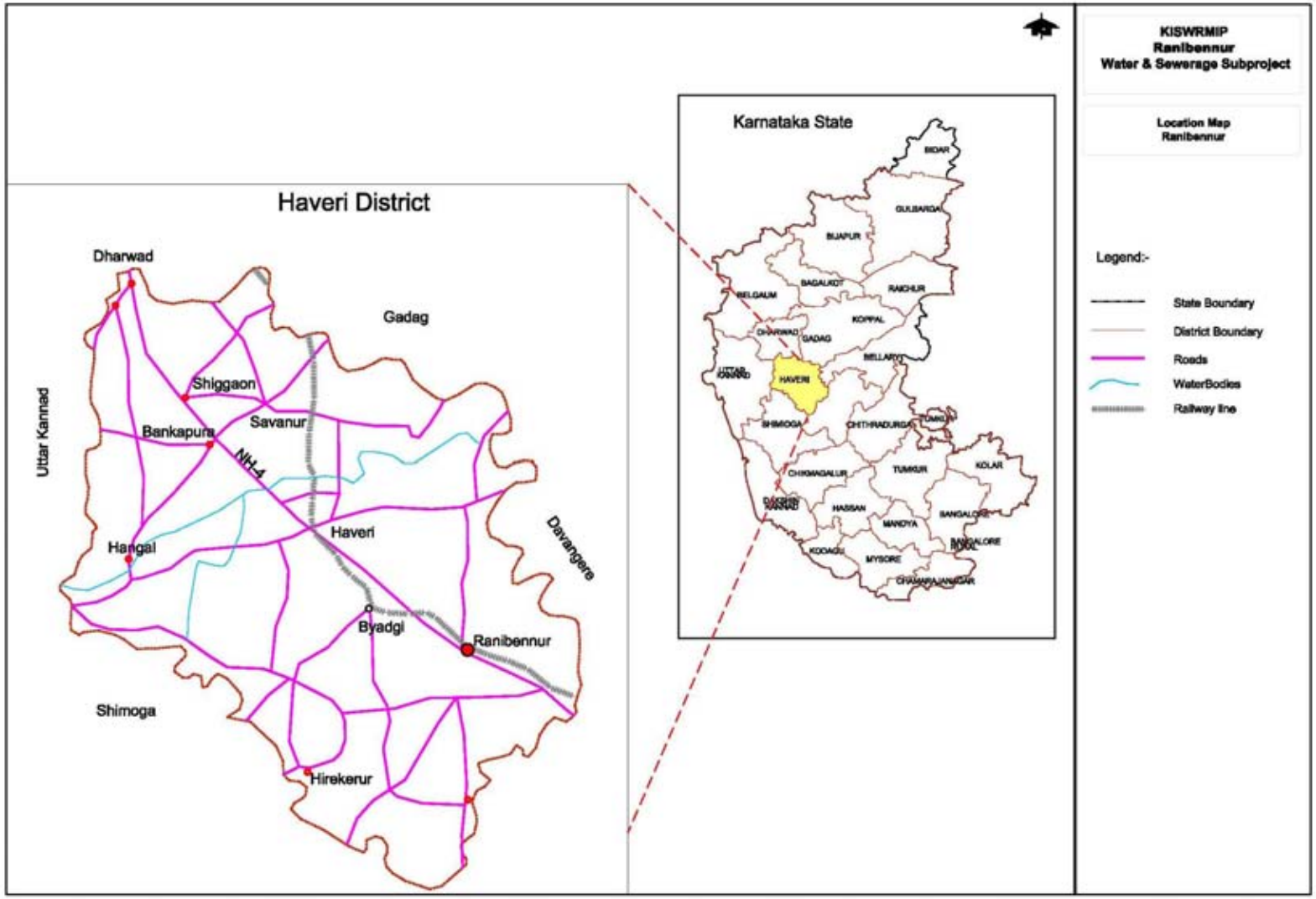


Figure 1: Location of Subproject Town - Ranebennur

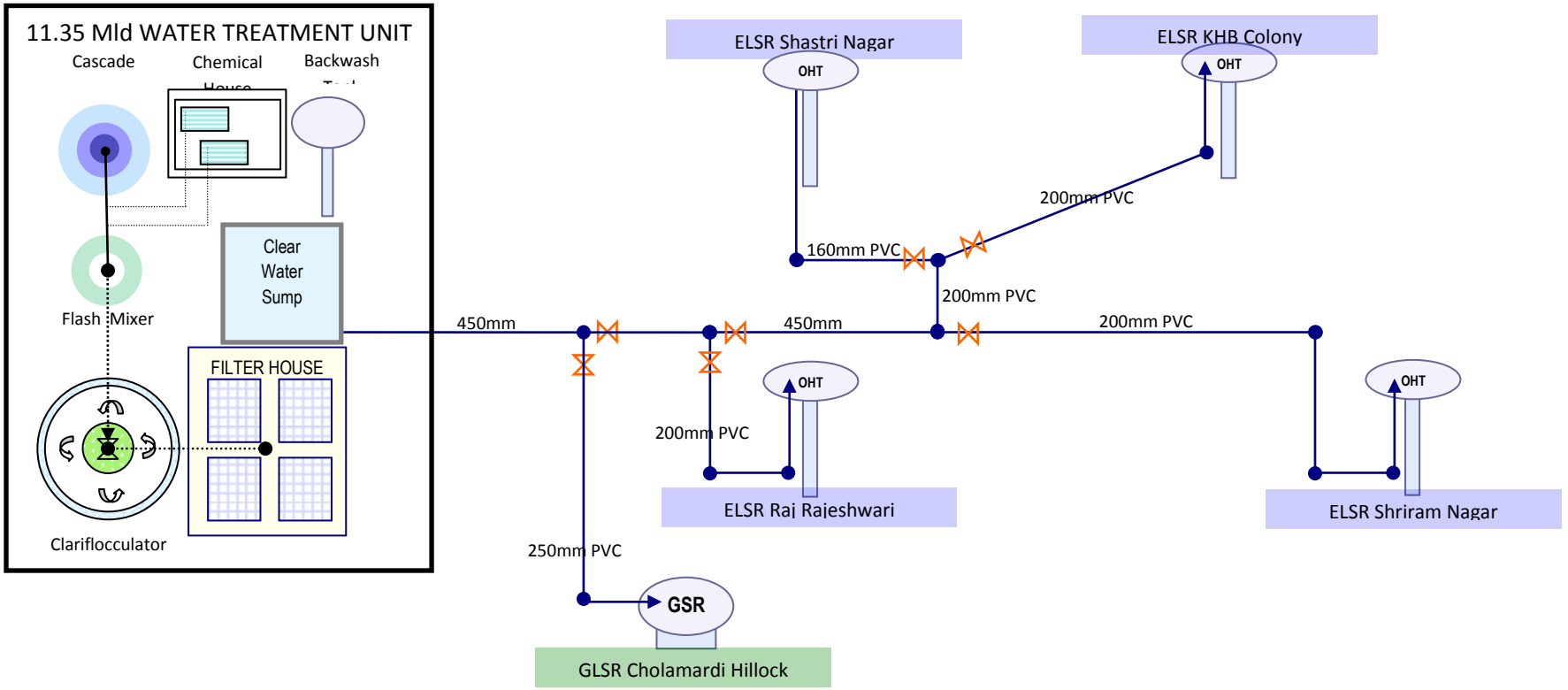


Figure 2: Water Supply system in Ranebennur

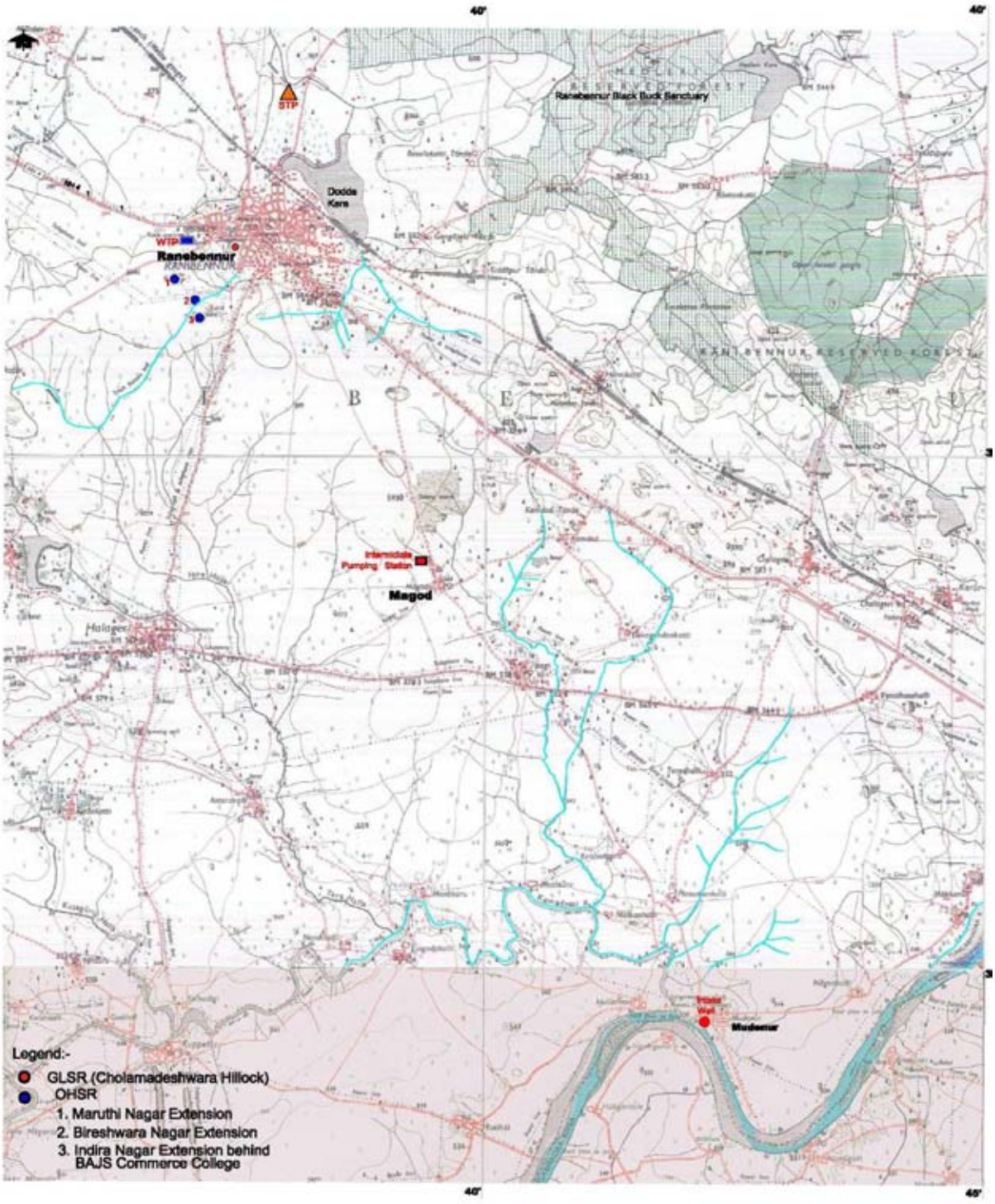


Figure 3: Location of Subproject Components in the Town

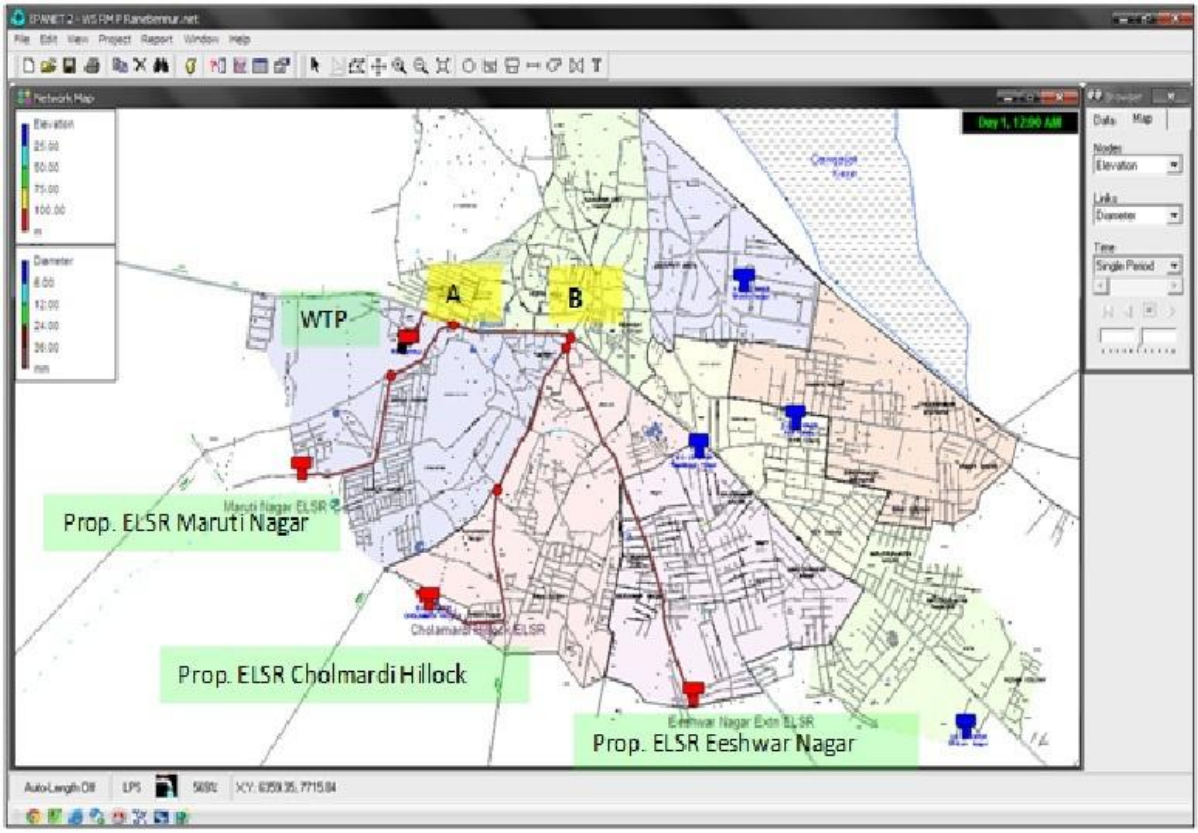


Figure 4: Proposed Strategic Network

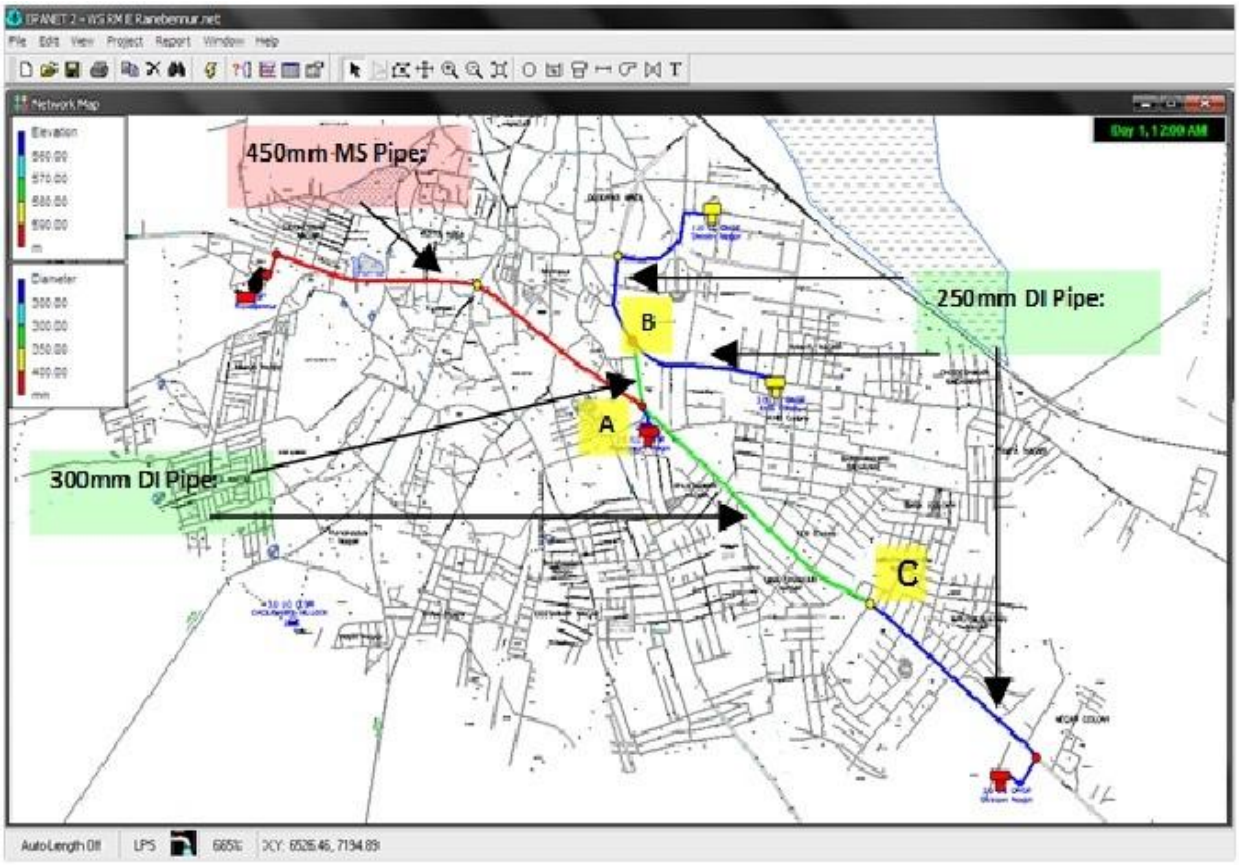


Figure 5: Existing Strategic Network Replacement

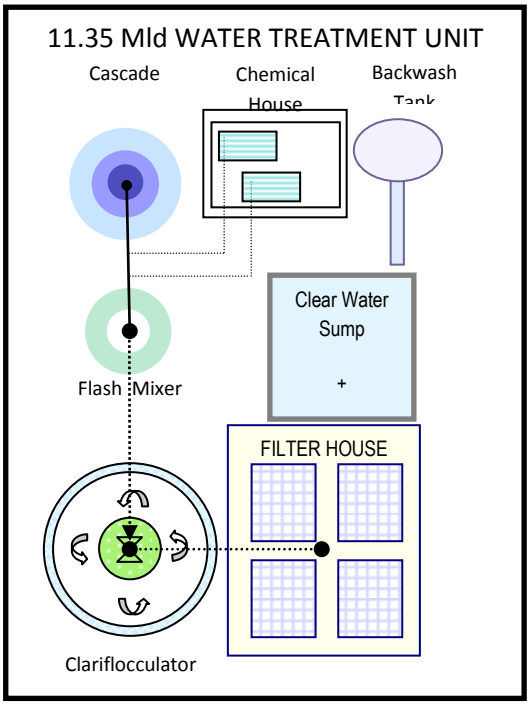


Figure 6: Existing WWTP and Proposed Expansion

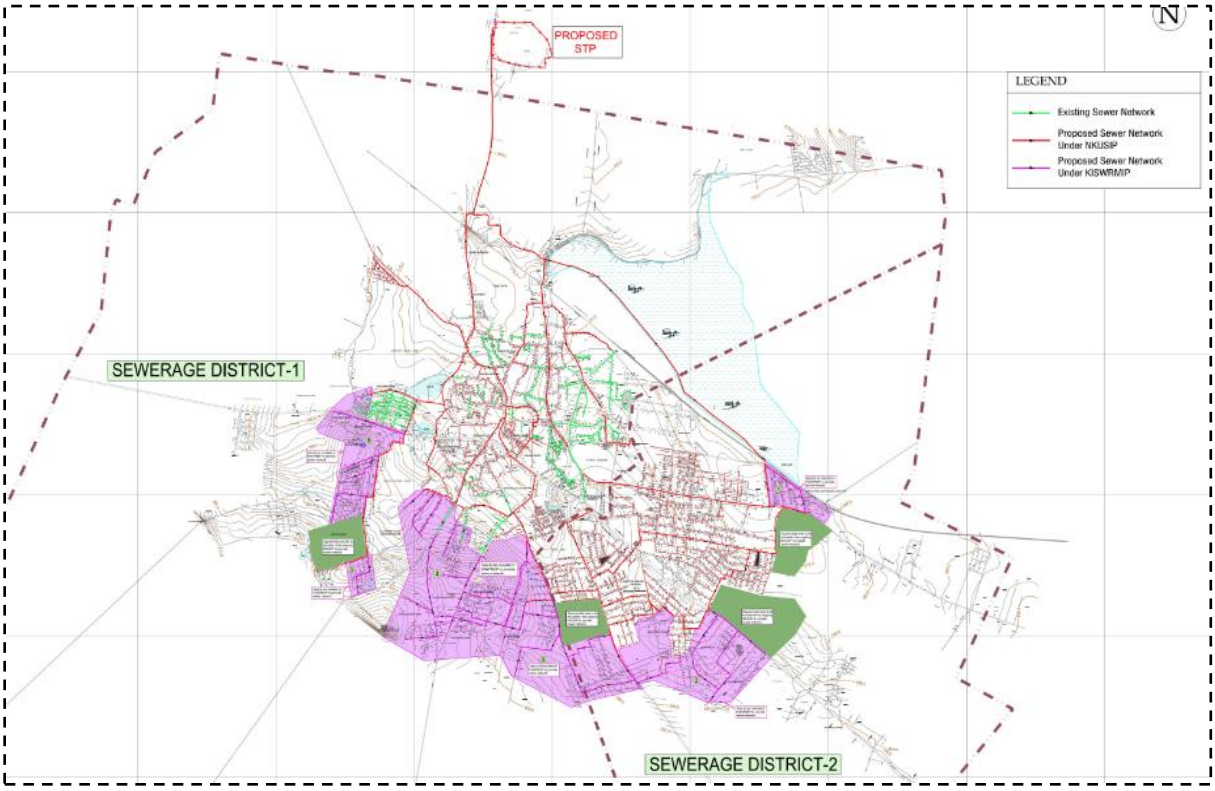


Figure 7: Proposed Sewer Network in Sewerage Districts 1 and 2

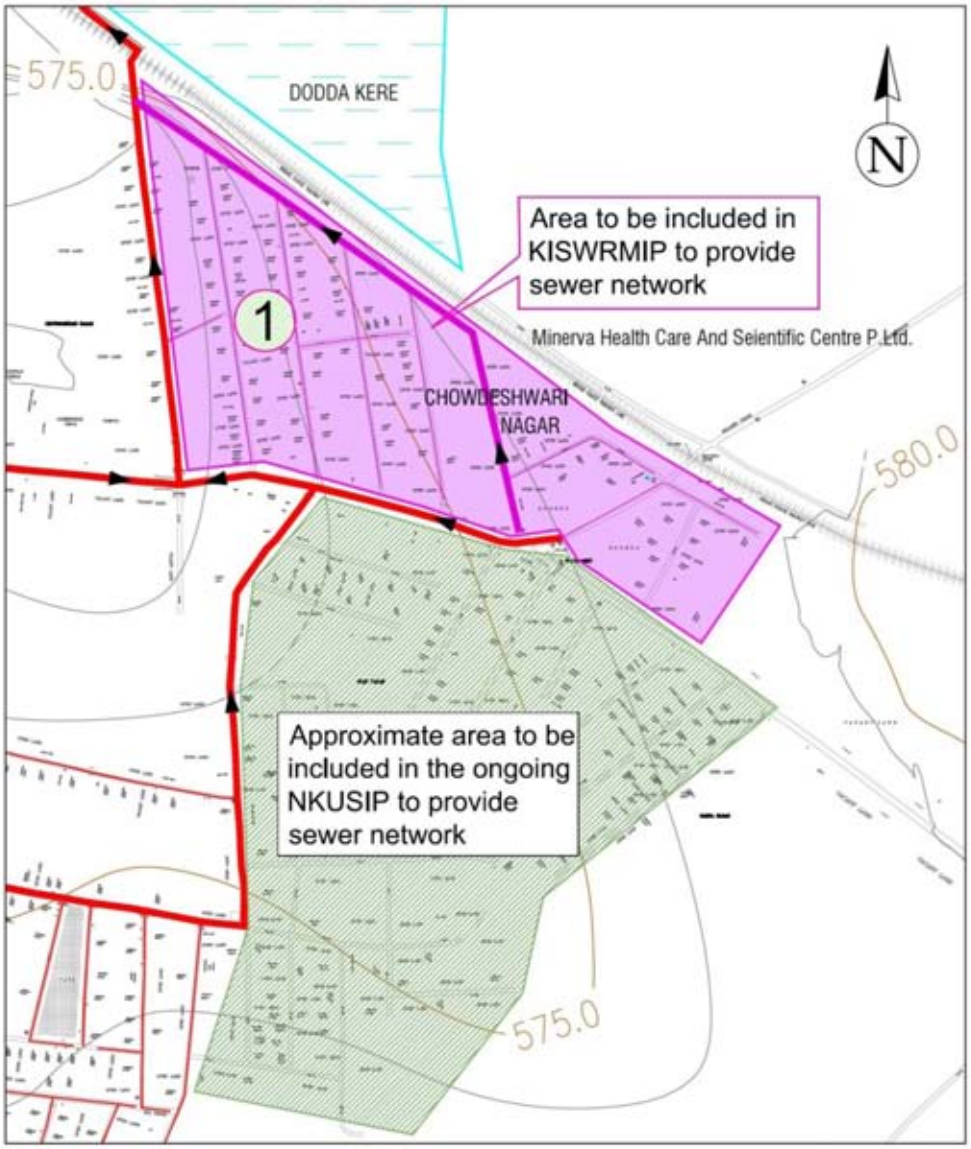


Figure 8: Proposed Sewer Network for Area 1 in Ranebennur

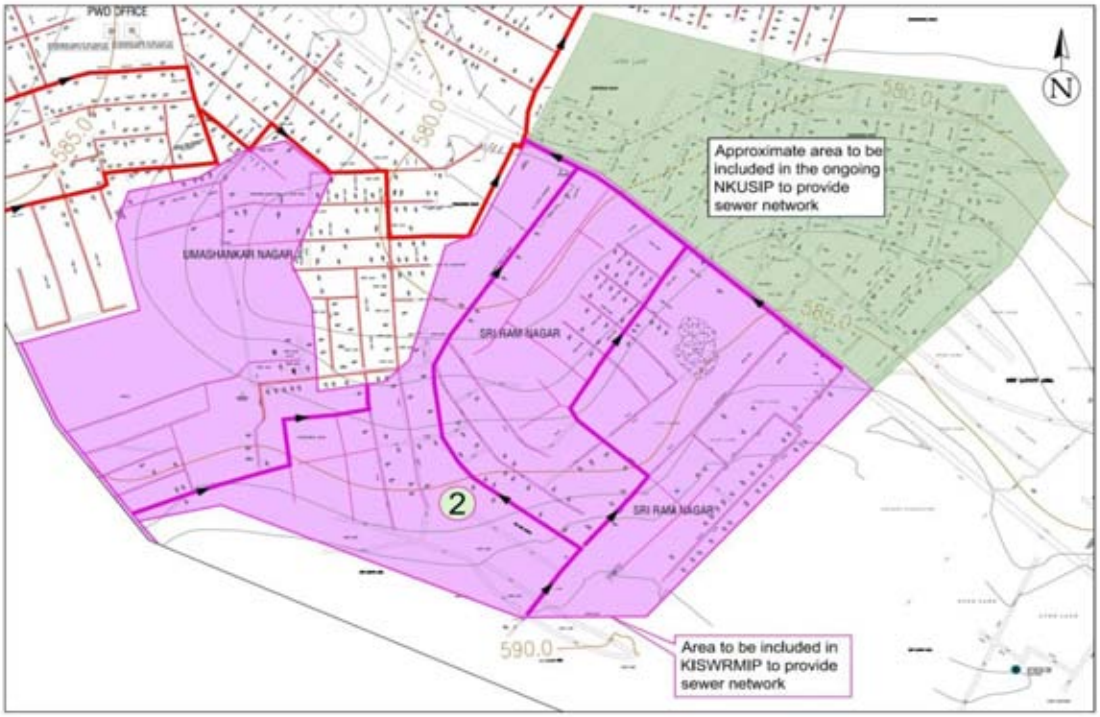


Figure 9: Proposed Sewer Network for Area 2 in Ranebennur

Figure 10: Proposed Sewer Network for Area 3 in Ranebennur

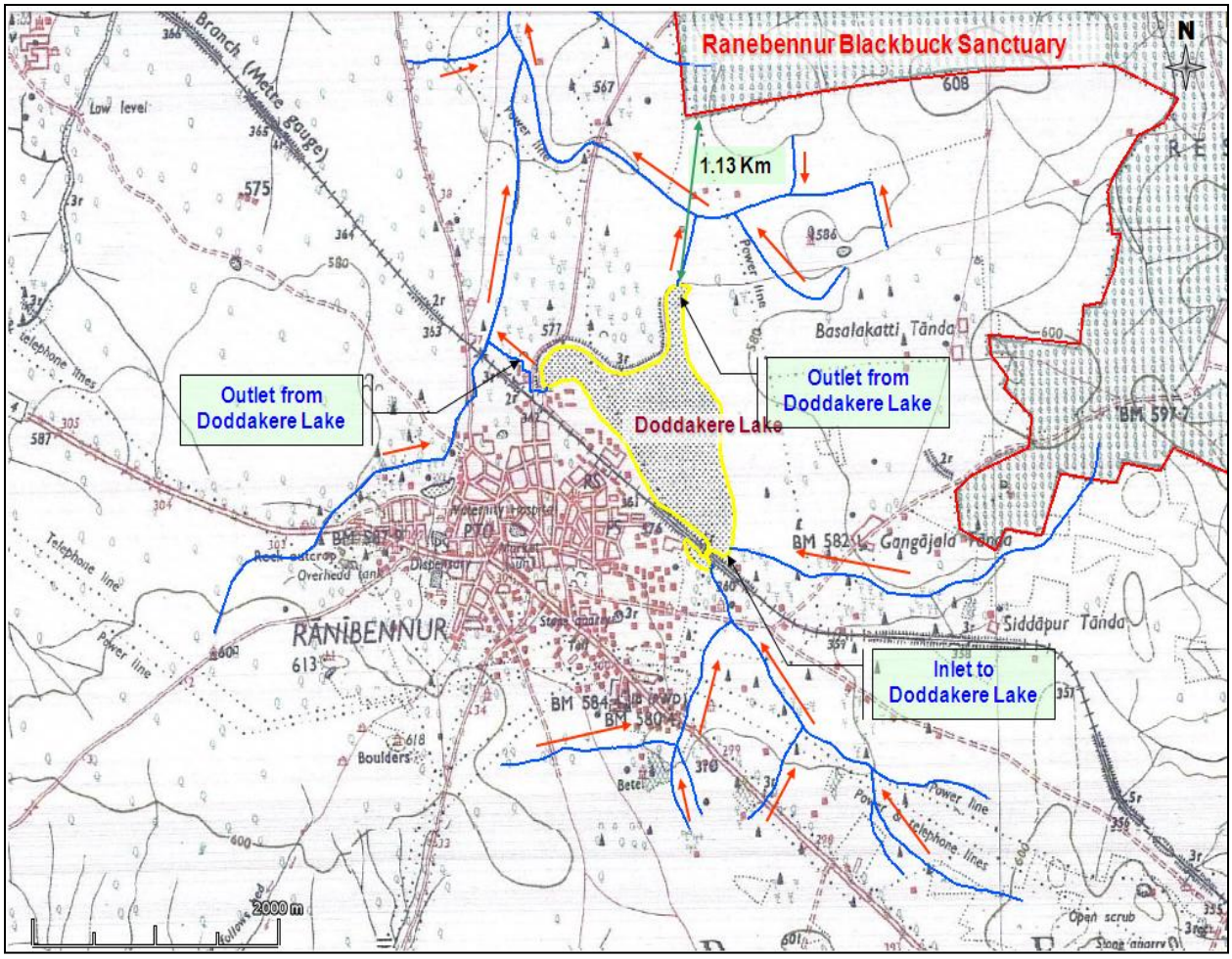


Figure 11: Doddakere Lake, inflow channels and catchment (base map – Survey of India)

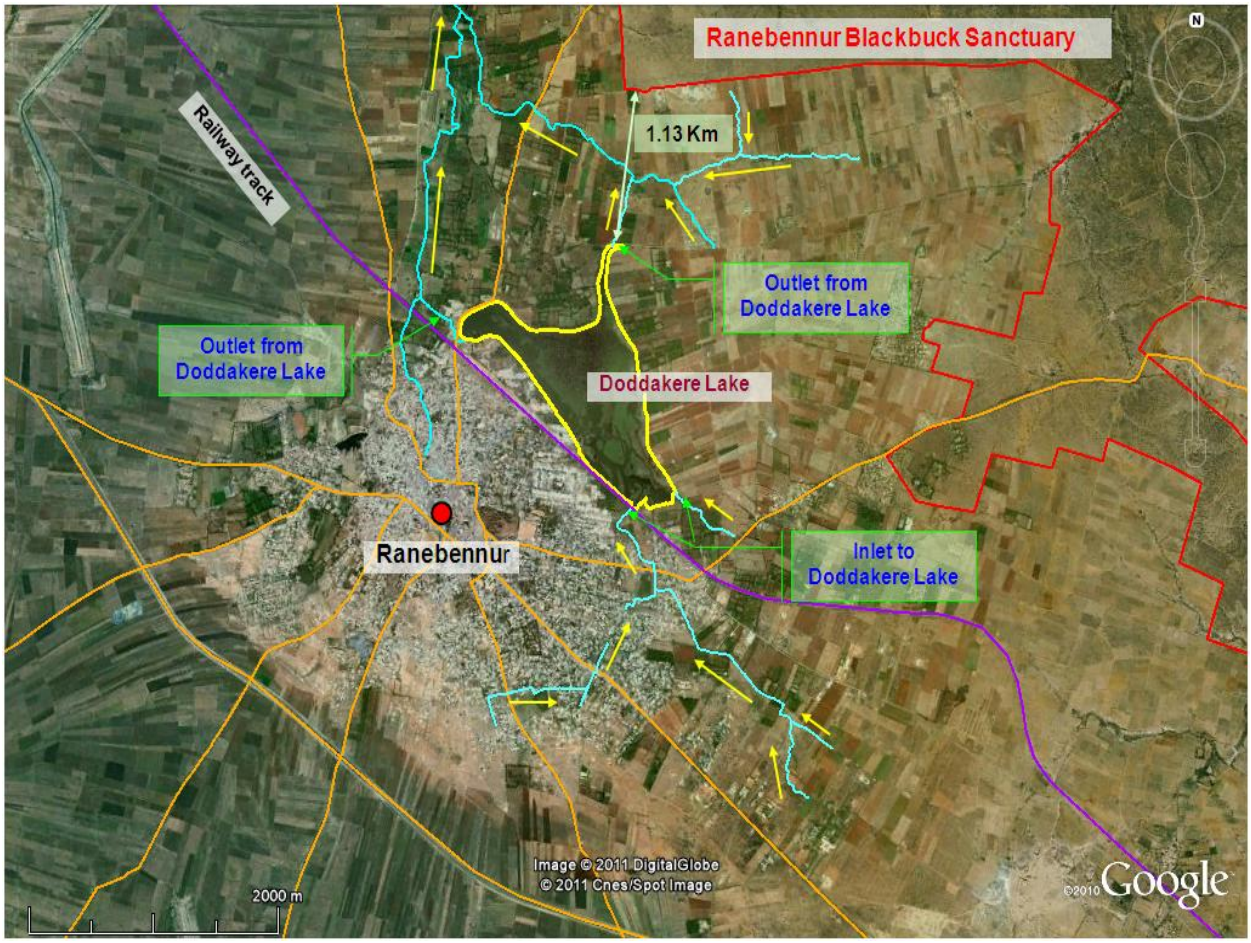


Figure 12: Doddakere Lake, inflow channels and catchment (base map – Google earth)

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location

27. Ranebennur is situated in the central part of Karnataka. Geographically, the town is located at 14.62°N 75.62°E with an average elevation of 605 m. This is the biggest town in Haveri district and is an important trade centre.It is located on the Pune-Bangalore Highway (NH-4) at a distance of 300 km from Bangalore, 35 km from Haveri and 107 km from Hubli and Dharwad. The town extends to an area of 9.98 sq. km and houses population of 114,580 as per Census 2011. The town is well connected by roads with the Bangalore and neighbouring towns – Byadagi, Hirekerur, Hanagal, Savanur and Shiggaon. Tungabhadra Rivers flows along the southern border of Ranebennur Taluka.

2. Topography, Soil & Geology

28. Ranebennur town is situated on a flat terrain, with predominant slope from southeast to northwest. The ground levels vary from the maximum of 605 m near Eraguppi Joisara Halli in Benakan Hunda Area in south to 561 m in north. The predominant soils in the town and surrounding area are red and black cotton soil that supports the cultivations of commercial crops like groundnut and Cotton. In some areas of the town, soils are shallow.

29. As per the seismic zoning map of India, Ranebennur Town 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

30. The town is characterized with hot summer months, cold winters and with low rainfall during monsoon. The temperature varies between 42 °C during summer and 17 °C during winter. Generally, April and May are the hottest months while December to February is cold. The town experiences southwest monsoon from June to September and the period between the months of October and November can be termed as post monsoon months. Rain fall is low and the long term annual average rainfall is 696 mm. The rainfall is mostly confined to southwest monsoon and about 60 percent of the annual rainfall is received during the months of June to September. The maximum rainfall is registered during the month of August. The morning relative humidity (RH) varies from 51 to 87 percent while evening RH varies from16 to 67 percent; and the RH is generally higher during the southwest monsoon months.

31. The region experiences moderate winds; as shown in Figure the wind blows predominantly from west during May to September while during November and December predominant wind direction is from east. Most of the winds occur in the range of 12 – 19 kmph, however during the period of June to August winds of more than 19 kmph also occur.

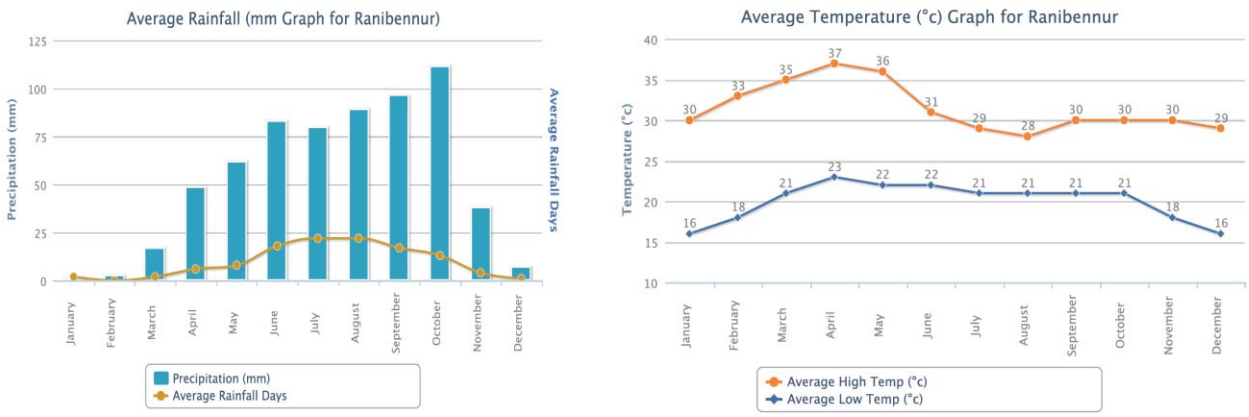


Figure 13: Average Monthly Rainfall & Temperature in Ranebennur

4. Air Quality

32. 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, district headquarters and industrial locations. There is a cement factory and a floor tiles industry in the town besides few agro based industries. Air quality as such should meet the ambient air quality standards except that due to dry weather and poor quality roads, compounded by traffic and construction work along the roads, dust is prevalent.

5. Surface Water

33. Ranebennur is situated in Tungabhadra Basin Doddakere Lake, located to the northeast of Ranebennur City, is an important surface water body. The total area of the lake is about 105.12 ha, and is presently free of encroachments. Constructed in 1931, Doddakere Lake (also known as Ranebennur Lake) is an irrigation tank with a total capacity of 38.05 Mcft (million cubic feet). The lake was owned by Minor Irrigation Department (MID). MID transferred the lake to Ranebennur CMC in 2007. The lake is surrounded by agricultural areas on two sides; a railway line passes along its southern boundary. The catchment area of the lake is about 7 sq. km. The lake is shallow in depth and maximum depth of water is about 3-4 m, when the lake is full. The lake is currently silted, reducing the overall water holding capacity.

34. There are fishes such as Catla (Indian Carp) and Catfish in the lake and there is no aquatic weed growth. Wastewater from the town is entering the lake via a drain that is passing adjacent to Chiwdeshari Temple and carrying domestic wastewater including sewage from the residential areas. This is the main inflow drain and enters the lake from southern side. There is a small temple, of local importance, within the lake.

35. Due to dry weather the inflow into the lake is very limited, except during good monsoon season. The lake is fed by two drains, flowing from south and south east. The major drain to the lake is from southern side, which brings in storm run-off and dry weather flow in the form of sewage/sullage from the Mruthunjaya Nagar, Gowri Shankar Nagar, Banashankarei Nagar, Vageesh Nagar, Vinayaka Badavane and Chowdeshwari Badavane area.

36. There is a small stream that originates from the Doddakere Lake (carries lake overflow), and flows in the south-north direction towards River Tungabhadra. The WWTP currently in

construction under ADB funded NKUSIP is adjacent to this stream, and it is proposed that the treated wastewater will be disposed off into this steam. This mostly runs dry except during monsoon and joins Savala Halla / Bandapura Halla that ultimately joins River Tungabhadra about 20 km north.

37. The CMC has been using this to store water from Tungbhadra River, when the river flow is high. The water is pumped from the river into the lake. This lake is mainly used as a percolation tank to recharge the groundwater. Available water quality data shows the presence of BOD (6.2 mg/l), indicating some pollution. Water is polluted mainly due to domestic wastewater entering the lake from residential and other institutional areas in the catchment area. With the ongoing sewerage system construction including WWTP under the NKUSIP, the sewage flow into the lake will be prevented. There are no water polluting industries in the catchment of the lake.

38. Due to various reasons, the lake is in poor condition. Besides water pollution, inflow into lake is reduced due to blockage/encroachment of inflow drains. These drains are filled with solid waste. At present entire lake area is free of any encroachments; however, there is no fencing. Open defecation is prevalent. Lake is heavily silted up decreasing the total water capacity. Lake bunds have been deteriorated. At present the lake is mostly dry and water is confined to few isolated places. Fishing activity has been observed. Desilting activity has also been observed in the lake with backhoe excavators by local farmers. The soil is then used as soil conditioner by the farmers.

Table 3: Doddakere Lake Water Quality (June, 2011)

S. No	Characteristic	Test Result	Tolerance Limit as per IS:2296 (Inland Surface Waters Subject to Pollution)
1	Color, Hazen units	Turbid	300
2	pH value	8.1	6.5-8.5
3	Conductivity, µmhos/cm	1002	Not specified
4	Turbidity, NTU	9	Not specified
5	Total dissolved solids, mg/l	640	1500
6	Hardness, mg/l	288	Not specified
7	Calcium, mg/l	75.2	Not specified
8	Chlorides (as Cl), mg/l	198	600
9	Sulphates (as SO4), mg/l	26	400
10	Fluorides (as F), mg/l	0.4	1.5
11	Nitrates (a NO3), mg/l	0.4	50
12	Alkalinity, mg/l	240	Not specified
13	Iron (as Fe), mg/l	0.66	50
14	Sodium, mg/l	94	Not specified
15	Phosphate, mg/l	Not detected	Not specified
16	Biochemical oxygen demand (3 days at 27o C), mg/l	6.2	3
17	Ammoniacal Nitrogen, mg/l	1.9	Not specified
18	Boron (as B), mg/l	1.14	Not specified
19	Soidium Adsorption Ratio (SAR), Ratio	2.4	Not specified

S. No	Characteristic	Test Result	Tolerance Limit as per IS:2296 (Inland Surface Waters Subject to Pollution)
20	Arsenic (as As), mg/l	Not detected	0.2
21	Lead (as Pb), mg/l	Not detected	0.1
22	Copper (as Cu), mg/l	Not detected	1.5
23	Chromium (as Cr 6+), mg/l	Not detected	0.05
24	Zinc (as Zn), mg/l	Not detected	15

6. Ground Water

39. Depth of ground water table in the town is 10 – 15 m. Groundwater development data from Central Groundwater Board (CGWB) indicates overdevelopment of groundwater in the district with extractions is exceeding the net recharge. Over the years, the groundwater depth is increasing due to over exploitation of resources. The groundwater quality in the district in not meeting the drinking water standards. Electrical conductivity of water is 2000 micromhos/cm. Some parts of the town have high nitrate and chloride content in groundwater (Nitrate content of more than 45 ppm and chloride content of more than 250 ppm). Following Table shows the summary of ground water estimation (source: CGWB) studies in Ranebennur.

Table 4: Groundwater Resource

Particulars		Details
Recharge from rainfall during monsoon season (mcm)		43.52
Recharge from other sources during monsoon season (mcm)		18.83
Recharge from rainfall during non-monsoon season (mcm)		8.15
Recharge from other sources during non-monsoon season (mcm)		7.41
Net annual ground water availability (mcm)		74.06
Ground water draft for drinking and industries (mcm)		4.71
Ground water draft for drinking and industries (mcm)		68.05
Existing gross ground water draft for all uses (mcm)		72.75
Allocation for domestic and industrial use for next 25 years in (mcm)		7.14
Net ground water availability for future irrigation development (mcm)		1.66
Balance ground water irrigation potential available (ha)		197.58
Categorization as on March 2004	Stage of development in %	99.06
	Safe area (%)	-
	Semi critical area (%)	5
	Critical area (%)	31
	O.E. area (%)	64

B. Ecological Resources

40. There are no forest areas and sensitive environmental features within Ranebennur Municipality. Ranebennur Black Buck Sanctuary is the nearest sensitive area, the boundary of is located at about 1 km from the municipal boundary in the western side (See figure 14), and about 1.2 km from Doddakere Lake.None of the project componentsare located in or adjacent to the sanctuary boundary.

41. At present, Doddakere Lake is mostly dry, and there is some water in isolated small patches. Most of the area of the lake is covered with shrubs and bushes mainly of *Prosopis juliflora* and *Ricinus comminis*. Surrounding area is mostly agricultural land. Vegetables, cotton, banana and areca nut are the predominant crops. Lake attracts variety of birds including the following: Great Indian Bustard (*Ardeotis nigriceps*), sirkeer cuckoo (*Phaenicophaeus leschenaultia*), large grey babbler (*Turdoides malcolmi*), baybacked shrike (*Lanius vittatus*), black drongo (*Dicrurus macrocercus*), and Grey Heron (*Ardea cinerea*). Catla (Indian Carp) and Cat Fish are found in the lake.

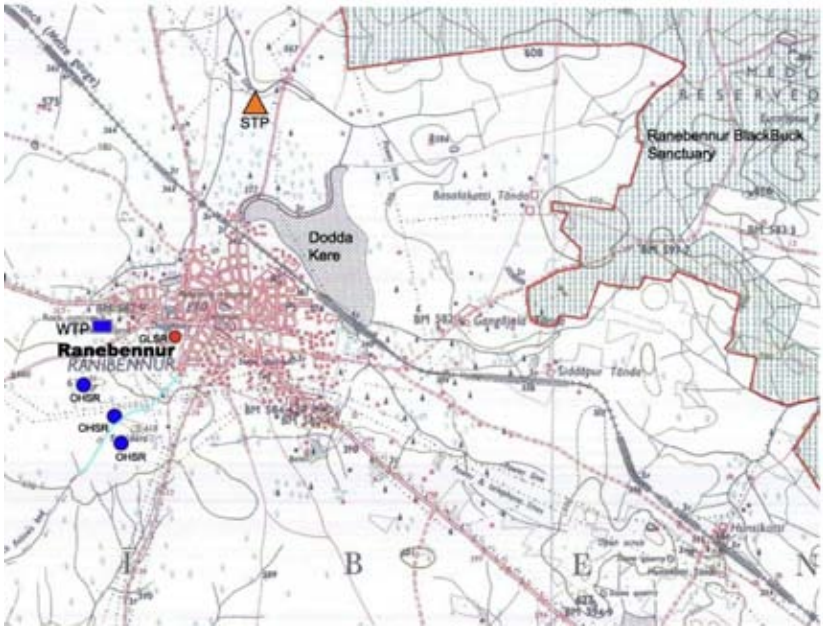


Figure 14: Location of Black Buck Sanctuary

C. Economic Development

1. Land Use

42. The Ranebennur Local Planning Area covers an area of 196.34 sq. km, which includes Ranebennur and its surrounding villages. In local planning area, the Ranebennur CMC occupies 9.98 sq. km of developed land. According to the land use of 1999, the residential sector occupied 43.68 percent of the total developed area. The core area of Ranebennur town is over-crowded and very congested as a result new extension areas are forming in the peripheral areas of the town. Commercial activities are predominant along M.G. Road, Station Road, Medleri Road, and NH 4.

43. According to Ranebennur Development Plan 2021, the Local Planning Authority (LPA) proposes to develop 17.27 sq. km of land. To meet the future demand (2021) for houses, the LPA proposes to develop 8.51 sq. km of area under residences, which constitutes around 50 percent of the total proposed area for development. As the town has great potential for agricultural products, 1.03 sq. km of land is kept reserved for industrial use. The LPA proposes to develop more parks and playgrounds in the town.

Table 5: Existing Land Use for Ranebennur

Land Use	Existing Land Use (1999)	
	Area in Sq.km	Percent
Residential	4.12	43.68
Commercial	0.54	5.71
Industrial	0.78	8.32
Public Utilities	0.43	4.51
Circulation	2.81	29.81
Public & Semi Public	0.75	7.97
Total	9.43	100
Vacant land	1.28	
Grand Total	**10.73**	

2. Industry & Agriculture

44. Although located strategically in an agricultural hinterland and good connectivity with a National Highway (NH4) and a number of State Highways (SH57, SH26, SH76) passing through it, the industrial development in the town is limited, and there is still a vast potential. Some important industries in the town include: Ramco Industries (cement), Mahyco (seeds), Suraj Seeds Private limited (seeds), Chirag Seeds Corporation, South India tiles etc. Ranebennur has been developed as a centre for production of hybrid seeds in the country. Crops like chilly, maize, onion and cotton, horticulture crops like mango, banana, papaya and a variety of vegetables are cultivated in the hinterland.

3. Infrastructure

45. **Water Supply**. Ranebennur CMC is responsible agency to provide safe drinking water to the people of the town. Currently water supply within Ranebennur is intermittent and varies across the town, a 2 hours supply is provided every alternate day. Water supply is provided at a rate of 80 lpcd. System suffers with huge losses as high as 39%.

46. **Sewerage and Sanitation**. The town has an existing sewerage collection system that covers about 30% of the service area and 22.5km of road length. Individual houses have septic tanks which discharge into open roadside storm water drains. From these drains municipal waste water eventually flows into natural drainage channels and is used for cultivation of crops. Under the ongoing ADB assisted North Urban Sector Development Investment Program (NKUSIP), sewerage system is being developed, and is presently under construction.

47. **Transportation**. The total length of the road network in the town is about 247 km. Most of the roads in the town are narrow and congested with traffic, pedestrian and activities. In the outer and newly developed areas, the roads are comparatively wider and less used. The condition of roads in most of the town is no good. The Pune-Bangalore (PB) Road forms the spinal cord of entire road network in the town with other arterials including Bus Stand road and Halgeri Road branching off from the same. Other major roads are MG Road, Station Road, Medleri Road, Ashoka Circle Road, Kurubageri Road and Guttal Road. Auto rikshwas are the main transport system in the town. The North West Karnataka Road Transport Corporation (NWKRTC) operates to various towns and villages.

48. **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 Ranebennur is provided by regional company – Hubli 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 Ranebennur is poor; there are frequent outages in warmer months, and fluctuations in voltage.

D. Socio Cultural Resources

1. Demography

49. Ranebennur population has grown from 89,554 in 2001 to 106,365 in 2011 with a growth rate of 18.72 percent, much less than the previous decade's 32.85 percent. The decadal growth rates never showed a steady growth over the past ten decades. The negative growth rate of 47.93 percent was observed during 1901-11 and the highest was recorded the following decade i.e., 1911-1921 with a figure of 72.70 percent. The decadal growth is shown in Table 6. Growth in the last few decades is also attributed to the extension of city boundaries and merger of adjoining villages with the city.

Table 6: Population Growth of Ranebennur Town

Year	Population	Decadal Growth Rate	CAGR
	Nos.	%	%
1901	14,851	-	-
1911	7,733	-47.93	-6.32
1921	13,355	72.70	5.62
1931	16,411	22.88	2.08
1941	16,994	3.55	0.35
1951	25,282	48.77	4.05
1961	31,304	23.82	2.16
1971	40,749	30.17	2.67

Year	Population	Decadal Growth Rate	CAGR
	Nos.	%	%
1981	58,118	42.62	3.61
1991	67,442	16.04	1.50
2001	89,594	32.85	2.88
2011	106,365	18.72	1.73

50. **Sex Ratio**. The current sex ratio (female population per 1,000 male population) in Ranebennur is 948, which is higher than the district and state urban average figures of 945 and 940 respectively.

51. **SC/ST Population**. The Scheduled Caste (SC) population comprise of 5.5 percent of total population which is lower than the district population at 12.2 percent. The Scheduled Tribe (ST) population is 3 percent of the total population which is lower than the district level ST population of 8.8 percent. The scheduled tribes in the town are part of main stream.

52. **Household Size**. The total number of households in Ranebennur as per Census 2001 is 16041 which accounts for household size of 5.6.

53. **Slums**. In Ranebennur, there are eight notified slums with a population 5,199 and one non-notified slum (population 250). Slums occupy about 2.62 Ha of area, which is 0.59 percent of the total municipal area.

54. **Literacy**. In 2001, the literacy rate (percentage of literate population to the total population above six years of age) in the town was 79.94 percent. The literacy rate in Ranebennur is higher than that of Haveri District (68.09 percent) but lower than the State urban average (81.40 percent). The male and female literacy rate was 86.60 percent and 72.92 percent, respectively.

55. **Area and Population Density**. The Pune-Bangalore National Highway bisects the town into two. The northern part of the highway is the old part whereas the southern part is the new part of the town. The Pune-Bangalore railway line restricts the development in the northern part and the area between the railway line and the highway consequently became denser making the old part congested. The CMC limit has increased from 3.36 sq. km in 1981 to 9.98 sq. km in 2001, which indicates that the CMC is developing new extension areas for reducing the decongesting in the core old part of the town.

2. History, Culture & Tourism

56. The history of Ranebennur goes back to ancient times. The name “Ranebennur” is in scripted on stones belonging to 859 A.D. In 1550 A.D, and the town was ruled by Sadashiva of Vijayanagara Kingdom. Popularly known as the "Gateway to North Karnataka", the name of the city is derived from the term Rani-bennuru, (meaning Queen's resting place). From the late 17th century onwards, the city was a part of the Regency of Bombay until the independence of India in 1947, when Bombay merged into the Republic of India. An Islamic Saint Harat Jambshaha of Ajmer visited and resided in Ranebennur in 1785. The famous tomb attracts large devotees from the surrounding areas during the holy Ramzan month.

57. There are various temples in the town: .Aduvi Hanumappa Temple, Choudeshwari Temple, Adishakti Temple, Siddeshwara Temple (Siddapana Gudi), Basavanna Temple, Shri Sumathinath Jain Swetambara Jain Temple, Marulasiddeshwara Temple and Ayyappa Swamy Temple. These are of local importance.

58. Majority of people in Ranebennur are Hindus and the remainder are mainly Muslims and Jains. Kannada is the native language. A good proportion can speak Hindi and a few can converse in English.

V. ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

A. Overview

59. 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 Ranebennur.

B. Location Impact

60. **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.

61. Proposed subproject sites are carefully selected to avoid encroachment into sensitive areas and minimise the impacts on people livelihoods and homestead. All the subproject activities are proposed on government-owned unused vacant lands. Most of the works are proposed within the existing facilities. The proposed improvements to sludge handling and treatment will be carried out at the Sewage Treatment Plant (STP), which at present is under construction. The nearest environmental sensitive area is Ranebennur Black Buck Sanctuary. Extending in the in the north and eastern side of municipal area, the closest point of Sanctuary boundary is in the eastern side at about 800-1000 m from municipal boundary, while the core area is about 6-8 km inside the boundary. None of the subproject components are located in or adjacent to the sanctuary boundary, nor anyway interfere with the sanctuary area. The WWTP, which is under construction at present, is situated in the northern side of the town, outside the municipal boundary. The sanctuary boundary is about 1 km from the WWTP site.

62. The proposed lake rehabilitation works will be conducted within the lake area. Rehabilitation works will be taken up during the dry season when there is no or little water. Currently water in the lake in confined only to three isolated low lying areas. The other area is mostly dry, and devoid of much vegetation. For the bund strengthening work, bushes and shrubs needs to be cleared at some places. These are common flora of the areas, and therefore no impact envisaged. The desilting work will be mostly conducted in the dry area devoid of much vegetation. As works will be conducted during the dry season, and desilting is to be conducted only at select places (where there is accumulation of silt), the low lying areas within the lake where there will be some water during the dry season will not be disturbed. Although there are important bird species within the subproject area, the proposed lake rehabilitation works will not have any impact. Due to construction work, and movement of people and

machinery may disturb/prevent the birds visiting the lake, however, this will be temporary, and there are few other lakes in the nearby area, where the birds normally frequent. Due to its location near the town and also due to various activities like fishing, animal grazing, and using the area for open defecation, the lake area at present is frequented by people, Access will be restricted during construction in areas where works will be conducted.

63. There is a small temple (Thukkamma Devasthana) within the lake, situated on high ground in the north western part. Enquires with the local people indicate that this is an old temple of local importance and managed by local community. Although the lake land is under the government, the temple is community controlled. Visitors walk through the lake to enter the temple, and when the lake is full, the entry to temple is restricted. However from many years, this has not been the case due to low water level in the lake. As the temple is located on highland, the proposed improvement works will not inundate the temple.

64. All the sewer and water pipes will be laid within the municipal boundary, 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. Replacement and augmentation of pumps will be undertaken within the existing pumping stations at Mudhenur intake and at Magod intermediate pumping station, both of which are located in the southern side, far away from municipal boundary.

65. Proposed rehabilitation and capacity augmentation of the water treatment plant (WTP) will be carried out within the existing WTP site. Adequate land is available for the expansion. This area is presently covered with trees of local species. There are about 20 trees of girth size in the range of 200-300 mm. Most of these trees will be required to cut off for the proposed augmentation. The following measures shall be implemented to minimize the impact:

(i) Develop a site layout plan for WTP augmentation in such a way that it reduces the need to cut trees
(ii) Obtain permission from the Tree Officer for felling of trees
(iii) Plant two tree per each tree felled in the WTP compound

66. **Utilities.** Water supply pipelines, Telephone lines, electric poles, and wires within the proposed subproject locations may require to be shifted in few cases 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;
(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.

67. **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:

68. The Ranebennur Blackbuck Sanctuary boundary is located far at about 1 km (core zone is still far at 6-8 km) from the WWTP site. At present WWTP is in construction at this site under the ADB funded NKUSIP and this includes construction of fencing. However, the following measures shall be followed during development of sludge thickening facility to ensure that there is no interference within the sanctuary area:

(i) No worker camp shall be set up in north/western outskirts of the town, which are located close to sanctuary
(ii) 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 violations by workers.
(iii) 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.

69. **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.

70. For Ranebennur subproject, the quarry material required will be sand and stone aggregate, and the nearest quarries are at Chikka Kuruvatti, Harihar and Medleri (sand quarries along River Tunga Bhadra) 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

71. 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.

72. As per the proposed project design, the Tungabhadra River is continued to be the source of water supply to Ranebennur. To meet the future demand, it is proposed to increase the water abstraction from the river from the present 12-14 MLD to 29 MLD. Necessary

augmentation of raw water pumping systems and treatment facility is proposed under the study. However, no improvement to the raw water main is proposed in this subproject.

73. **Water availability in the river**. River Tungabhadra is a perennial and an important river of Karnataka. This is formed north of Shimoga Town, by the union of two rivers, the Tunga and the Bhadra, which rise in the Western Ghats at an elevation of about 1 200 metres. The Tunga River emerges from the hills surrounding Varaha Parvata, at a place called Ganga Mula. The river flows through seven districts in Karnataka - Chikmagalur, Shimoga, Davanagere, Haveri, Chitradurga, Bellary and Raichur. The river has a dam built across it at Gajanur. After traversing a distance of 147 km long merges with the Bhadra River at Koodli at about 610 m above MSL, a small town in Shimoga District. There is a dam across river Bhadra, 15 km upstream of Bhadravathi Town. Tungabhadra Dam was built across the Tungabhadra River after it traverses 265 km from the origin in western ghats. Then the river merges with the Krishna River in Andhra Pradesh state. It has a drainage area of 71 417 km2 out of which 57 671 km2 lies in Karnataka State, and the length of river in the state is 293 km.

74. River flow fluctuates between very high during monsoon months to very low during summers. Almost all the towns and villages in the basin depend on the river for water supplies. Water for Ranebennur is abstracted from the river at Muddenur. This intake site was selected appropriately with a natural gorge portion in the river course, so that there is adequate depth of water available throughout the year to pump from the intake, and this gorge also acts as a sort of storage.

75. As the subproject proposes to increase water abstraction from the river, there may be likely impacts. If the increased abstraction reduces the downstream flow, that could affect the downstream users and the river ecosystem. The "sister" TA[2] to that which has produced this Feasibility Study and IEE has within its scope the preparation of a river water balance to ensure the adequacy of raw water for public water supply. For this feasibility study/IEE of Ranebennur, it has been assumed that adequate supplies will be made available by, if necessary, a reduction in water permitted for agriculture, by the construction of barriers etc. or by any other means as deemed necessary by the TA. Therefore impacts of increased water abstraction from the river are not considered in this report. It is also assumed that the water balance will take into consideration the minimum flow required downstream to sustain the ecosystem. However, it is necessary, to ensure subproject sustainability, that:

(i) Adequate water availability is established and necessary provision is made for Ranebennur water supply through government statutes as required before the start of detailed design.

76. **River water quality**. There are no major pollution sources like industries in the upstream side of the intake at Mudhenur. Most of the villages and towns, however, along the river discharge domestic wastewater into the river without any treatment, although there is no such disposal point in the proximity of intake. The river water quality meets the "Category C quality that make is appropriate as "Drinking water source after conventional treatment and disinfection". A grab sample was collected from the intake and tested for pesticides residues. The results indicated that there are no pesticide residues in the raw water. The subproject

[2] Overall water resource balance in Tungabhadra River Basin and measures for assurance of water availability within the Tungabhadra River for public water supply and other uses will be proposed within KISWRMP Water Resource PPTA. Government of India policy is for priority to be given to public water supply and it is therefore assumed that adequate water resources will be available without effecting current downstream uses.

includes capacity augmentation of existing water treatment plant, so the raw water will be treated to drinking water standards and supplied to the consumers.

77. **WTP Rehabilitation & Augmentation**. The pipeline from the Intermediate Pumping station will branch off, to a new cascade aerator, from where the water will be conveyed through the raw water channel to the flash mixer and then to the Plate / Tube Settler. No additional structures are required to house chemical treatment processes as the existing chemical house will be utilised for chemical dosing in both the existing and upgraded plant. Provision for re-cycling of filter back wash water will be incorporated to reduce the water losses from filter back wash water from existing and proposed filter houses and sludge from clariflocculator and tube / plate settlers.

78. Environmental audit of the existing Water Treatment Plant has been conducting during the IEE preparation to assess the compliance with environmental legislation and current environmental performance. This audit identified improvements required for the WTP, which are appropriately included in the subproject. This will improve the compliance and environmental performance. Environmental Audit report is presented in **Appendix 7**.

79. There is invariably a safety risk when considerable quantities of chlorine are handled at the WTP. (Chlorine cylinders will be brought by trucks to the site, installed and operated to disinfect the water supplies). Since facilities are located in the urban area, precautions will thus be needed to ensure the safety of both workers and citizens.

80. The average dose of chlorine for pre-chlorination will be about 4mg/l and that for post-chlorination will be about 2 mg/l. With the present water supply 11 MLD, about 66 kg of chlorine is consumed daily. This which will increase to 174 kg per day with the augmented capacity of 29 MLD. Chlorine cylinders (called tonners, with capacity about 900 kg) will be procured from nearest manufacturing unit and stored at the site. Tonners sufficient for a month will be stored in the storage; this will be about 7 tonners (1 - working + 6 - in storage).

81. To avoid any risk to workers and public, the chlorination facility at the WTP should be designed developed with all appropriate safety features and equipment to meet with any accidental eventuality, which may include

(i) Chlorine neutralization pit with a lime slurry feeder
(ii) Proper ventilation, lighting, entry and exit facilities
(iii) Facility for isolation in the event of major chlorine leakage
(iv) Personal protection and safety equipment for the operators in the chlorine plant
(v) Visible and audible alarm facilities to alert chlorine gas leak
(vi) Laboratory facility shall not be housed within the chlorination facility
(vii) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier
(viii) Develop an emergency response system for events like chlorine leakage – an ERS template is provided at Appendix 5.
(ix) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Kannada Languages

82. Owing to higher elevation of the town to that of intake at Muddenur, the energy intensive pumping could not be avoided. The raw water from the intake will be pumped to WTP, and from the WTP treated water will be pumped to elevated service reservoirs (ELSR). From ELSRs,

water is supplied by gravity to the consumers. To optimize the power consumption, the following needs to be considered in design and selection of pumping systems:

- Design pumping equipment with maximum efficiency to optimize the energy consumption
- Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds.
- Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps. For instance, as per American Standard for DS Centrifugal Pumps issued by Hydraulic Institute, New Jersey, the specific speed for Pumps should be in the range of 2000 to 3000 for attaining optimum efficiency. The pumps should be designed accordingly.
- Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 percent for pumps and 94 percent for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency.
- The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class 3 of IS: 9137-1978 Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Flow Pumps.

83. **Sludge treatment and disposal**. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. Following are included in the subproject design to dispose the sludge and back wash:

(i) Provision of recirculation system for backwash water – backwash water from filter beds will be re circulated to WTP inlet and mixed with raw water; this arrangement will minimize wastage of water, which otherwise would have disposed to open drains, and also avoids the pollution of receiving water body

(ii) Provision of sludge drying - accumulated sludge from clariflocculator will be flushed to sludge drying beds, for natural drying.

(iii) 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, namely;

Table 7: 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

Parameters	Concentration not to exceed (mg/kg dry basis, except pH value and C/N ratio)*
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

84. 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, as industries are very limited and also the industrial effluent is not allowed into sewers, it is most unlikely that sludge contains metals. A WWTP is under construction at present as part of NKUSIP. This is based on facultative aerated lagoon technology (FAL). It is proposed, under this Investment Program, to provide sludge thickening equipment in addition to the current NKUSIP works to produce a sludge cake suitable for use in agriculture. The sludge in the form of a wet cake will be further air-dried in the sludge drying beds and disposed off.

85. 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.

86. Sludge shall be periodically tested for presence of heavy metals. The standards indicated for compost quality as per the MSWMH Rules, 2000 (**Table 7**, above) will apply here.

87. **Sewer system – collection & conveyance.** The sewerage system in construction in Ranebennur (under the ADB funded NKUSIP) has been designed as a separate system of sewage collection (i.e. caters only 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 WWTP. This system will be expanded to the new areas with the same principle. Ranebennur CMC should ensure that all existing septic tanks in the areas where sewers are being provided under the KIWRMIP are phased out by bypassing the inlet and connecting the toilet discharge from each house directly to sewerage system

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

89. Lake rehabilitation works are primarily designed to enhance water security for the town and improve water quality of the lake. Works will be conducted within the existing footprint. It is designed that desilting activity will be conducted only at select locations with high silt accumulation, and will not disturb the low-lying water areas. Bunds will be constructed considering the historic high flood level with all protection measures. There is a temple within the lake – situated on a high ground and will be left untouched. Therefore no design related impacts envisaged.

D. Construction Impacts

1. Construction Method

90. The project involves construction of the following: (i) Rehabilitation of existing WTP including capacity augmentation from the present 11.4 MLD to 29 MLD; (ii) Construction of three Elevated-level Service Reservoirs (ELSR) and a Ground Level Service Reservoir (GLSR); (iii) Laying/replacement of water pipes (clear water rising mains, distribution network); (iv) installation of house connections, bulk water meters and consumer meters; (v) installation of pumps; (vi) laying of sewer network; and (vii) installation of sludge thickener (belt press). Following table shows the details of construction activities involved in the subproject.

Table 8: Construction Activities for the Subproject

Component	Construction method	Likely waste generated
Rehabilitation of existing WTP and capacity augmentation	These works will be conducted at the existing WTP site at Sidheswar Nagar. The rehabilitation works will be within the existing structure. The additional units for capacity augmentation will be constructed on the site adjacent to the existing WTP. The WTP will be constructed in reinforced concrete structure and fixed with mechanical parts imported in ready-to-fix state. Most of the structure will be developed above ground except the clear water storage facility which will be constructed below the ground. Work will involve excavation for foundations, concreting, fixing of mechanical elements, finishing and fixing of electrical instrumentation items. Excavated soil will be used in the site for levelling and excess soil will be transported to disposal site. Material (sand, aggregate) will be procured from local quarries, and brought to the site on trucks and stored temporarily. Concrete will be mixed using a mixer at the site, and concrete will be transported by manual labour. The work will be conducted by a team of 50-60 workers and works will be confined to WTP facility compound.	excavated soil will be utilized in the site
ELSR/GLSR	The cavity for the foundations for the overhead service reservoirs (OHSR) will be excavated by backhoe, with soil being loaded onto trucks for disposal. Aggregate and concrete will be tipped into each void to create the foundations and floor, after which metal reinforcing rods will be added to create the outline of the walls of the reservoir and the vertical supporting pillars. Sections of reinforcing will then be encased in wooden shuttering and concrete will be poured in, and this process will be repeated to gradually create each structure from RCC, including the tank of the reservoirs. Surfaces will be smoothed and finished where necessary by hand. The work will be conducted by a team of 10-15 workers at each site	500 m3 of excavated soil
Water supply pipelines	Trench excavation along the identified main roads of about 0.5-0.7 m wide and 1.5 m deep	~75,000 m3 of excavated soil; 97% will be utilized for

Component	Construction method	Likely waste generated
	Trench will be excavated using backhoe and where not feasible will be done manually. Excavated soil will be placed along the trench, and pipes will be placed and joined, and the 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; most of the roads in the centre of the town are congested with traffic, pedestrians and activities; roads outside are comparatively wide and less traffic. The work will be conducted by a team of 5 workers at each site	refill; remaining soil (~2,250 m3) need to be disposed off
Fixing of water meters	Minor civil work – conducted manually	Negligible
Sewer lines	Trench excavation along the identified main roads of about 0.4-1 m wide and 1.5- 3 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 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 mostly in the outer areas which are not covered under NKUSIP project; these are comparatively wide and less traffic. The work will be conducted by a team of 5 workers at each site	~23,000 m3 of excavated soil; 92-93% will be utilized for refill; remaining soil (1,700 m3) need to be disposed off
Sludge thickener	A centrifuge will be procured from market and installed at the site. This will be houses in concrete room of adequate size. Works will be conducted within the site with a small team of workers and equipment.	Excavated soil from foundations – negligible quantity
Rehabilitation of lake	Desilting activity will be conducted using backhoe excavators supplemented by manual excavation. Excavated material will mostly be utilized for bund construction and/or provided to local farmers to use in their fields as soil conditioner. Lake bund will be strengthened using earth/gravel brought from the nearest borrow areas; if suitable, the material from desilting and trench excavation from pipeline works will be utilized. The construction material will be stored outside the lake, and mostly in dry areas where there is no vegetation. Other works such as box culvert are of typical of cement concrete construction work.	Desilting activity is likely to generate high quantities of soil (no estimate available at this stage), however this will be mostly utilized for bund construction and/or in the nearby agricultural fields

91. As detailed above, except linear components like pipes and sewers, construction activities of all other components 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.

92. Although construction of the of the pipelines and sewers involves quite simple techniques of civil work, the invasive nature of excavation and the subproject locations in the built-up areas of Ranebennur 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.

93. Prior to starting of work, the contractor should prepare a method statement for pipeline and sewer works. This 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 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

2. Impact on Physical Resources

94. **Topography, Soils & Geology**. Subproject activities are not large enough to affect these features; so there will be no impacts. However movement of heavy construction vehicles in the lake body may disturb and consolidate the soil, which will negatively affect soil environment. The following measures will be required:

(i) Prepare a plan for use and movement of construction vehicles within the area based on the nature of soil;
(ii) Vehicles/equipment movement shall be confined to dry areas with hardened soil; no vehicle/equipment shall enter the damp areas, water areas, vegetative areas and areas with soft soil in the lake
(iii) No material shall be stored in the lake.

95. **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.

96. **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, sulfur 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

97. **Noise Levels.** The soils are shallow in some parts of the subproject area, and therefore activities like rock cutting for trenching will be required in those areas. This requires using of pneumatic drills and 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) for all the works located within the town; for facilities outside the town and habitations, the timings may be relaxed with the permission of Ranebennur CMC and PIU, however no work should be conducted between 10 PM – 6 AM at any site.
(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.

98. No significant noise generating activities are envisaged in the lake rehabilitation works, however, working of backhoe excavator and vehicle will generate noise. Drivers shall be trained to avoid use of horns and conduct the work with less noise.

99. **Surface Water Quality.** Ranebennur topography is primarily plain; the town receives moderate rainfall. Most of the rainfall occurs during southwest monsoon between July and September. 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 rains, 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

100. The lake rehabilitation works are primarily designed to enhance water security and improve the water quality of the lake, and as such will have positive impacts. The construction work will mostly be confined to dry areas and therefore no impact on lake water envisaged. The following measures are suggested to avoid any pollution of lake:

(i) Works shall be conducted during the dry season and shall be completed before onset of monsoon
(ii) No construction material shall be stored in the lake
(iii) No labour camp shall be established in the lake
(iv) All construction material and waste shall be cleared from the lake after the construction

101. **Groundwater**. Subproject activities do not interfere with groundwater regime, no groundwater abstraction proposed nor do the activities affect groundwater quality. The proposed lake improvement works will enhance the groundwater recharge and will have positive impacts.

102. **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 5-7% as surplus as most of the soil will be used for refilling after the pipe is laid in trench. The surplus soil needs to be disposed safely. 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

3. Impact on Ecological Resources

103. Subproject sites are located within the town area and in the areas converted for agriculture. There is no natural habitat left in these sites, and therefore no impacts on ecological resources envisaged. Doddakere Lake although bare and patchy with shrubs and bushes is known to, attract birds The lake rehabilitation work is likely to disturb the environment temporarily, therefore the following measures are suggested:

(i) Avoid clearance of vegetation/trees in the lake; no vegetation shall be disturbed outside the actual construction area
(ii) Birds visiting the lake/nearby area shall not be distributed, hunting and poaching of birds/animal strictly prohibited
(iii) Vehicles/equipment movement shall be confined to dry areas with hardened soil; no vehicle/equipment shall enter the damp areas, water areas, vegetative areas and areas with soft soil in the lake
(iv) No material shall be stored in the lake.

(v) Do not conduct any major noise generating activities; Construction equipment/vehicle drivers shall be trained to avoid use of horns and conduct the work with less noise
(vi) Works shall be conducted during the dry season and shall be completed before onset of monsoon
(vii) No construction material shall be stored in the lake
(viii) No labour camp shall be established in the lake
(ix) All construction material and waste shall be cleared from the lake after the construction

104. The nearest and only sensitive area – Ranebennur Black Buck Sanctuary is situated about 1 km from Ranebennur CMC boundary. None of the subproject components are located in or adjacent to the sanctuary, nor anyway interfere with the sanctuary area. The core area of the sanctuary is at about 6-8 km inside the boundary. The WWTP, which is under construction at present, is situated in the northern side of the town, outside the municipal boundary. The sanctuary boundary is about 1 km from the WWTP site. The works at this WWTP will be limited installation of sludge thickening equipment including construction of a RCC building. The following measures as suggested earlier shall be followed to ensure that there is no interference within the sanctuary area:

(i) No worker camp shall be set up in north/western outskirts of the town which are located close sanctuary
(ii) The Contractor shall take all necessary precautions to prevent his workmen 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 violations by workers.
(iii) 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.

4. Impact on Economic Development

105. **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.

106. **Accessibility.** Transport infrastructure will be affected by the pipe 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.

5. Impact on Socio Cultural Resources

107. **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.

108. **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 and pedestrian movement. 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.

109. **Socio-Economic – Employment**. Manpower will be required during the 24-months construction period. 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.

110. **Socio-Economic – General.** The benefits of implementing 24 x 7 water supply surpasses the temporary construction impacts. Typical benefits are[3]:

(i) 24x7 supply delivers better quality water for public health - High levels of bacterial contamination are experienced in the first 10 minutes of repressurization of an intermittent system, in some cases persisting for up to 20 minutes. Maintaining full pressure removes that risk.
(ii) 24x7 supply gives significantly better service to all consumers - Access to clean water with improved quantity, timing, and pressure, including effective service to supply pipe „tail ends'.
(iii) 24x7 supply revolutionizes service to the poor - Consumers can access more water for improved health and hygiene while saving time in queuing and carrying, and gainfully using the time thus saved for employment opportunities.
(iv) 24x7 supply converts household coping costs into resources for the service provider - Coping costs that consumers need to incur are reduced; they pay for a better service.
(v) 24x7 supply reduces the burden on water resources - Continuous supply reduces water wastage arising from overflowing storage systems and open taps. It saves on stored household water that is discarded when new supply comes in. Because the network is renewed where needed, it also reduces losses arising from leaks in the old pipes.
(vi) 24x7 supply delivers effective „supply management' and „demand management' - Continuous supply makes possible the effective management of leakage through pressure management and flow measurement. Water conservation is also encouraged through metering and price signals via a volumetric tariff to consumers.
(vii) 24x7 supply enables improved efficiency of service provision - Operational efficiencies are achieved because of a reduced need for valvemen, and a conversion of these jobs into more efficient ones of meter reading and customer care. It also makes possible the management of illegal connections.

111. **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

[3] Water and Sanitation Program, *The Karnataka Urban Water Sector Improvement Project*, Field Note, 2010, Available Online URL: http://www.wsp.org/sites/wsp.org/files/publications/WSP_Karnataka-water-supply.pdf

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[4] 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) There may be poisonous snakes or other reptiles in the lake; the clearance of bushes/shrubs in the lake may pose risk to workers; all workers shall be briefed on the possibility of such accident and all necessary measures shall be put in place

(v) Provide medical insurance coverage for workers;

(vi) Secure all installations from unauthorized intrusion and accident risks;

(vii) Provide supplies of potable drinking water;

(viii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances

(ix) 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;

(x) 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;

(xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;

(xii) Ensure moving equipment is outfitted with audible back-up alarms;

(xiii) 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

(xiv) 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.

(xv) Overall, the contractor should comply with IFS EHS Guidelines on Occupational Health and Safety (this can be downloaded fromhttp://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)

[4] 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.

112. **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/Ranebennur TMC 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 the work sites along the roads
(vi) Overall, the contractor should comply with IFS EHS Guidelines Community Health and Safety (this can be downloaded fromhttp://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES)

113. **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.

114. 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.

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

E. Operational & Maintenance Impacts

116. The improved water supply system should operate without the need for major repair and maintenance. Although the new sewerage system will need regular maintenance during operation; with a few simple precautions this can also be conducted without major environmental impacts.

117. 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 DI/HDPE pipes should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes. The repair of household connections and the provision of new connections to increase the number of people supplied should greatly reduce the incidence of illegal connections, which are often a major source of leaks.

118. The bulk meters will allow monitoring of amounts of water flowing through individual parts of the network, which will pinpoint areas where there are leaks. A small Leak Detection Team will then visit these areas with audio devices to locate individual leaks, which will then be repaired in essentially the same way that the pipes were installed. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

119. The sewerage system provided under the subproject will collect and treat domestic wastewater and sewage from the areas that are not covered under the ongoing NKUSIP. Combining with this subproject, the entire town will have the sewerage system, except the low density fringe areas. The wastewater treatment plant, now under construction in NKUSIP, has adequate capacity to treat the wastewater collected from the entire town. It is designed to treat the sewage to Indian wastewater disposal standards; the Ranebennur TMC has obtained the mandatory Consent for Establishment (CFE) from Karnataka State Pollution Control Board (KSPCB) for construction of WWTP. The discharge after treatment will comply with Indian wastewater standards. This WWTP is based on facultative aerated lagoon technology (FAL). It is proposed, under this Investment Program, to provide sludge thickening equipment in addition to the current NKUSIP works at WWTP to produce a sludge cake suitable for use in agriculture. The sludge in the form of a wet cake will be further air-dried in the sludge drying beds and disposed off.

120. 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.

121. It is suggested to develop an Emergency Response System (ERS) for the sewerage system leaks, burst and overflows, etc. A Template for ERS is provided in Appendix 5. Sensitize and train staff in implementation of ERS.

122. 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 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.

123. **General**. The work will follow the same procedures during the construction stage. The Implementing Agency/Ranebennur TMC 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 sludge thickening (belt press) will be simple, but requires skilled workforce. It will be ensured that the centrifuge will be operated by trained staff, and a back-up power facility will be provided to ensure uninterrupted operation.

124. The issues related to quantity of water available from source (i.e. source sustainability) and water quality are being looked into in detail by the "sister" TA[5] to this TA. The "sister" TA has within its scope the preparation of a river water balance to ensure the adequacy of raw water for public water supply. Therefore impacts of increased water abstraction from the river are not considered in this report. It is assumed that the measures suggested by the said TA through the IWRM will make sure that adequate quantity of water will be made available for Ranebennur water supply without affecting the downstream users and the river ecosystem.

125. **Operation of Water Treatment Plant (WTP)**. This involves various processes: pre-chlorination, alum dosing, flash mixing, flocculation, clarification, filtration, post-chlorination, wash water re-circulation and sludge disposal systems prechlorination, aeration, alum-mixing, flocculation, clarification, filtration, and disinfection. Chemicals such as Alum and chlorine will be used in the treatment processes.

126. The safety risk due to handling of large quantities of chlorine at the WTP should be negligible if all the suggested safety features and equipment to meet with any accidental eventuality are included in the design and development of the facility. During the operation phase, it is necessary that:

[5] Overall water resource balance in Tungabhadra River Basin and measures for assurance of water availability within the Tungbhadra River for public water supply and other uses will be proposed within KISWRMP Water Resource PPTA. Government of India policy is for priority to be given to public water supply and it is therefore assumed that adequate water resources will be available without effecting current downstream uses.

(i) chlorinator facility is operated only by trained staff and as per the standard operating procedures
(ii) In case of any accident and/or maintenance activity, the staff should follow documented procedures only
(iii) It is suggested to develop an Emergency Response System (ERS) for chlorine leakage. A Template for ERS is provided in Appendix 5. Sensitize and train staff in implementation of ERS.

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

128. The citizens of the Ranebennur Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. 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.

129. The proposed lake rehabilitation works will further improve the overall environment of Ranebennur Town. Restoring water holding capacity, and improved water quality will enhance the lake environment and the ecosystem. This will also provide the town people with an invaluable recreational resource. There will be positive benefits on the groundwater regime from improved recharge. The rehabilitation works including bund formation, repairs to inflow and outflow arrangements will be as per the historical design flood, and therefore there is no likelihood of flooding.

VI. INSTITUTIONAL ARRANGEMENTS

A. Implementation Arrangements

130. **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 Managing Director, 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.

131. 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

132. 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.

133. **Implementing Agency (IA):** The ultimate implementation responsibility lies with respective ULBs (in this case Ranebennur City Municipal Council). A Programme Implementation Unit (PIU) will be established in each ULB unless the ULBs decide to form a single PIU.

134. 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 ULB and President / Chair of investment programme ULB. The District Level Programme Steering Committee will report to the PMU Executive Director: Dharwad.

135. At the Executing Agency (i.e. KUIDFC), environmental issues will be coordinated centrally by an environmental specialist at manager-level (designated as Manager-Environment), reporting to the General Manager (Technical). Manager – Environment (supported by an Environmental Expert (Assistant Manager Rank) will ensure that all subprojects comply with environmental safeguards. The IEE/EIA reports will be prepared by the Consultant Team, and will be reviewed by the Manager-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 Manager-Environment will be assisted by an Environmental Specialist, who will be appointed by EA in divisional office at Davangere.

136. The responsibility fulfilling environmental requirements of GoI/GoK and conducting required level of environmental assessment as per ADB guidelines lies with the implementing agency, i.e. Ranebennur CMC. The Consultant Team will assist the CMC in this regard.

137. The mitigation measures identified through IEE/EIA are incorporated into the Investment Program cycle. 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.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Summary Environmental Impact & Mitigation Measures

138. Tables 9 to 11 show 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 Environmental Impacts & Mitigation Measures – Pre-Construction

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
Tree cutting for WTP augmentation	• Develop a site layout plan for WTP augmentation in such a way that it reduces the need to cut trees • Obtain permission from the Tree Officer for felling of trees • Plant two tree per each tree felled in the WTP compound	Contractor in coordination with PIU	Part of project cost
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.	PIU and Design Consultant	Part of project cost
Source sustainability	• Establish adequate water availability and ensure that necessary provision is made for Ranebennur water supply through government statutes as required before the start of detailed design.	PIU	NA
Risk due to handling and application of chlorine	Design and develop chlorination facility with all safety features and equipment to meet with any accidental eventuality, which may include • Chlorine neutralization pit with a lime slurry feeder • Proper ventilation, lighting, entry and exit facilities • Facility for isolation in the event of major chlorine leakage • Personal protection and safety equipment for the operators in the chlorine plant • Visible and audible alarm facilities to alert chlorine gas leak • Laboratory facility shall not be housed within the chlorination facility • Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier • Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Kannada Languages • Develop an emergency response system for events like chlorine leakage – an ERS template is provided at Appendix 5. • During operation, it shall be ensured that chlorinator facility is operated only by trained staff and as per the standard operating procedures	PIU/IA	Part of project cost
Design of pumps	• Design pumping equipment with maximum efficiency to optimize the	PIU and Design	Part of project

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
(design and procure pumps with higher efficiency to optimize the power consumption)	power consumption • Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds. • Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps. As per American Standard for DS Centrifugal Pumps issued by Hydraulic Institute, New Jersey, the specific speed for Pumps should be in the range of 2000 to 3000 for attaining optimum efficiency. The pumps should be designed accordingly. • Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 percent for pumps and 94 percent for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency. • The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class 3 of IS: 9137-1978 Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Flow Pumps.	Consultant	cost
Sewer network	• 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 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.	PIU and Design Consultant	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	Consider redundant 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 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 • Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5		
Community toilets – operation & maintenance impacts	• 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.	Ranebennur CMC, PIU and Design Consultant	Part of project cost
Lake rehabilitation works	• Design rehabilitation works including bund design as per the historic flood and with appropriate outflow discharge arrangements	Ranebennur CMC,	Part of project cost

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	• Schedule works during the dry season and shall be completed before the onset of monsoon • The temple within the lake shall not be disturbed; ensure that there is no risk to the temple due to increase in lake water level/holding capacity, and if required, the high ground on which temple is located shall be strengthened with stone pitching to avoid erosion • Consult community during the detailed design and incorporate suggestions and feeb back into the design • No new pathway shall be constructed to temple and status quo shall be maintained – visitors will enter the temple through lake when it is dry; if it is necessary a facility such as a boat shall be initiated with the community participation	PIU and Design Consultant	

Table 10: Summary Environmental Impacts & Mitigation Measures – Construction

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
Construction impacts	Prepare and submit a Method Statement for pipeline and sewer works 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	Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	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		
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. • 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 Ranebennur 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	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Temporary worker camps	• 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	Construction Contractor	Good construction practice to

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	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 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.		be followed by contractor – no additional costs
Source of construction 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)	• . 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
Air quality (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 greatest potential to generate noise are conducted during periods of the day which will result in least	Construction Contractor	Good construction

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
activities may have adverse impacts on sensitive receptors and structures	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. WWTP) the timings may be relaxed with the permission of Ranebennur 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; • 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 (dbA) when measured at a distance of 10 m or more from the vehicle/s		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
Disturbance/ damage to sanctuary area	• No worker camp shall be set up in north/western outskirts of the town which are located close 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	Contractor	Good construction practice to be followed by

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	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.		contractor – no additional costs
Tree cutting for WTP augmentation	• Develop a site layout plan for WTP augmentation in such a way that it reduces the need to cut trees • Obtain permission from the Tree Officer for felling of trees • Plant two tree per each tree felled in the WTP compound	Contractor in coordination with PIU	Good construction practice to be followed by contractor – no additional costs
Hindrance to traffic movement	• Plan pipeline (water & 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 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 4.	Construction Contractor	Good construction practice to be followed by contractor – no additional costs
Nuisance/ disturbance to sensitive areas (schools, hospitals and religious places) due construction work in the	• 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	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
proximity (within 250 m of such place)	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.		
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 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 • 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
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[6] 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	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

[6] 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.

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	• 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)		
Community health & safety	• Provide wooden bracing for all deep excavations (> 2m); identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work • Plan material and waste routes to avoid times of peak-pedestrian activities • Liaise with IA/Ranebennur TMC 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 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	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+su	Construction Contractor	Good construction practice to

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	stainability/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 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.		be followed by contractor – no additional costs
Lake rehabilitation works	• Prepare a plan for use and movement of construction vehicles within the area based on the nature of soil; • Vehicles/equipment movement shall be confined to dry areas with hardened soil; no vehicle/equipment shall enter the damp areas, water areas, vegetative areas and areas with soft soil in the lake • No construction material/waste shall be stored in the lake. • No noise generating activities shall be conducted • Drivers shall be trained to avoid use of horns and conduct work with less noise • Works shall be conducted during the dry season and shall be completed before onset of monsoon • No construction material shall be stored in the lake • No labour camp shall be established in the lake • All construction material and waste shall be cleared from the lake after the construction • Avoid clearance of vegetation/trees in the lake; no vegetation shall be disturbed outside the actual construction area • Birds visiting the lake/nearby area shall not be distributed, hunting and poaching of	Construction Contractor	Good construction practice to be followed by contractor – no additional costs

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
	birds/animal strictly prohibited • Works shall be conducted during the dry season and shall be completed before onset of monsoon • All construction material and waste shall be cleared from the lake after the construction • Conduct awareness programs to workers on the risks poisonous snakes when clearing bushes/shrubs		

Table 11: Summary Environmental Impacts & Mitigation Measures – Operation

Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Cost of mitigation
General maintenance and repair work of water supply and 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 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) • Ensured that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, the staff should follow documented procedures only • Ensure operation and maintenance of sewer network as per the standard operating procedures to avoid, over flows, blockages, etc and immediately conducting the maintenance work in case of such occurrences • Implement Emergency Response System (ERS template is provided in Appendix 5 for reference) for events such as chlorine leak,and burst/leaks/overflows of sewers etc) • Implement operation and maintenance (O&M) plans for community toilets with participation of the community.	Ranebennur CMC	Part of project O&M cost

B. Environmental Monitoring Plan

139. 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' support. Periodic monitoring and overseeing of implementation of mitigation measures will be conducted by PMU with Consultant Team' support. Monitoring during operation stage will be conducted by the Operating Agency, Ranebennur CMC, and regulatory compliance monitoring will be conducted by Karnataka State Pollution Control Board (in case of WWTP) as per their normal procedures.

140. 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. Laboratory facilities are included in the subproject.

141. 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 12: Environmental Monitoring Plan

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Pre-Construction						
Confirm availability of water (through the PPTA for water resources under IWRM Project) to meet the subproject demand and downstream needs before the start of detailed design. Ensure that necessary provision is made for Ranebennur water supply through government statutes as required before the start of detailed design	-	PIU	Review of study recommendations; confirmation on water availability for Ranebennur CMC; and government's acceptance of recommendations and water allocation to Ranebennur	Once before start of detailed design	PMU	NA
Design and develop chlorination facility with all safety features and equipment to meet with any accidental eventuality, which may include • Chlorine neutralization pit with a lime slurry feeder • Proper ventilation, lighting, entry and exit facilities • Facility for isolation in the event of major chlorine leakage • Personal protection and safety equipment for the operators in the chlorine plant • Visible and audible alarm facilities to alert chlorine gas leak • Laboratory facility shall not be housed within the chlorination facility • Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier • Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and	-	PIU	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
repairs; preferably these shall be provided both in English and Kannada Languages Develop an emergency response system for events like chlorine leakage – an ERS template is provided at Appendix 5.						
Identify and include locations and operators of the utilities in the detailed design documents	-	PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU	NA
Require construction contractors to prepare a contingency plan	-	Contractor	Review the contingency plan	Once prior to the relocation of utilities	PIU	NA
Design pumping equipment with maximum efficiency to optimize the power consumption		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Various combinations of number of pumps, stages, motor speed should be considered to select the best pump with ideal specific speeds.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Specific speeds of the pumps should be selected to achieve maximum efficiency of pumps.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Attainable efficiency for procuring the pumps and motors should be considered as 88 to 92 % for pumps and 94 % for motors. It is proposed that during the procurement, the evaluation of bid shall also be in terms of efficiency.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
The pumps shall conform to IS 1710 – 1989 Specification for Pump and IS 5120–1992 Technical Requirements for Roto-dynamic Special Purpose Pumps and tested to class 3 of IS: 9137-1978 Code for Acceptance Tests for		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Centrifugal, Mixed Flow and Axial Flow Pumps.						
Limit the sewer depth where possible.		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
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)		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
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	NA
For shallower sewers, use small inspection chambers in lieu of manholes;		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent build up of solids and hydrogen sulfide generation		PIU / Consultant Team	Review & check the inclusion/ provision in DPR, as appropriate	Once before DPR approval	PMU /PMC	NA
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		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

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
problem areas. • Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. 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		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
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;		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
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		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
Develop Emergency Response Plan for all emergencies such as leaks, overflows, bursts; a template of ERP is provided at Appendix 5.		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
Provide necessary health & safety training to the staff sewer cleaning & maintenance; WTP operation; sludge handling		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

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Provide all necessary personnel protection equipment		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
For personnel cleaning underground sewers there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, carbon monoxide, methane, etc); the design should consider these risks and provide for adequate equipment (including oxygen masks) for emergency use		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
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.		Ranebennur 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
Lake rehabilitation works Design rehabilitation works including bund design as per the historic flood and with appropriate outflow discharge arrangements Schedule works during the dry season and shall be completed before the onset of monsoon The temple within the lake shall not be disturbed; ensure that there is no risk to the temple due to increase in lake water level/holding capacity, and if required, the high ground on which temple is located shall be strengthened with stone pitching to avoid erosion	Doddakere Lake	Ranebennur CMC, PIU / Consultant Team	Review & check the inclusion/ provision in DPR/O&M manual as appropriate	Once before DPR approval	PMU /PMC	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Consult community during the detailed design and incorporate suggestions and feedback into the design No new pathway shall be constructed to temple and status quo shall be maintained – visitors will enter the temple through lake when it is dry; if it is necessary a facility such as a boat shall be initiated with the community participation						
Construction						
• Tree cutting permission & compensatory plantation	WTP Site	PIU	• Permission letter from Tree Officer • Site observations	As needed	PMU	NA
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 construction	Approve statement before start of work Weekly during construction	PIU	NA
• 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	NA
• 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	NA
• In case of disruption of water supply, alternative supply, through tankers, shall be provided; water may be made available by the	Utility relocation site	Contractor	Site observations • Informal public consultations	Weekly Once	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Ranebennur CMC, but it will the responsibility of contractor to supply to affected people						
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 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.	Sites for worker camp, material store	Contractor	• Site observations	Before & after such establishment	PIU	NA
• 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	NA
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	NA
• Submit a monthly statement of construction	-	Contractor	• Record check	Monthly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
material procured indicating material type, source and quantity.						
• 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	NA
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	Work site	Contractor	Site observations • Informal public consultations	Weekly	PIU	NA
• 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. WWTP) the timings may be relaxed with the permission of Ranebennur 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	Work site	Contractor	• Site observations	Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
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	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 from the vehicle/s	Work site	Contractor	• Noise monitoring	Quarterly	Contractor	NA
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,	-	Contractor	• Waste Management Plan review & approval	Once prior to start of construction	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
transported and disposed properly						
Obtain permission from the Tree Officer for felling of trees Plant two tree per each tree felled in the WTP compound	WTP site	Contractor	Check permission for tree cutting; site observation	Prior to tree cutting & after re plantation	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 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 Ranebennur CMC in identifying risk areas on route cards/maps	Work site	Contractor	Work program review Site observations • Informal public consultation	Once prior to start of construction Weekly during work	PIU	NA
• 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	Work site	Contractor	• Review, approval and	Once prior to start of	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
4.			on-site implementation of TMP	construction; weekly during work		
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 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.	Work near sensitive areas	Contractor	Work program review Site observations • Informal public consultation	Once prior to start of construction Weekly during work	PIU	NA
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;	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
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.						
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 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	Work site	Contractor	• Review and on-site implementation of EHS Plan	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
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)						
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	Work site	Contractor	• Review and on-site implementation of EHS Plan	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
(this can be downloaded from http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2BCommunity%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES						
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/Ranebennur 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 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	Workers camp site	Contractor	• Site observations and facilities	Once prior to start of construction; monthly during work	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
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.						
Prepare a plan for use and movement of construction vehicles within the area based on the nature of soil; Vehicles/equipment movement shall be confined to dry areas with hardened soil; no vehicle/equipment shall enter the damp areas, water areas, vegetative areas and areas with soft soil in the lake No construction material/waste shall be stored in the lake. No noise generating activities shall be conducted Drivers shall be trained to avoid use of horns and conduct work with less noise Works shall be conducted during the dry season and shall be completed before onset of monsoon No construction material shall be stored in the lake No labour camp shall be established in the lake All construction material and waste shall be cleared from the lake after the construction Avoid clearance of vegetation/trees in the lake; no vegetation shall be disturbed outside the actual construction area	Work site	Contractor	• Review records • Site observations • Worker consultation	Weekly	PIU	NA

Mitigation measures	Location	Responsible for Mitigation	Monitoring Method & Parameters	Monitoring Frequency	Responsible for monitoring	Cost of monitoring
Birds visiting the lake/nearby area shall not be distributed, hunting and poaching of birds/animal strictly prohibited Works shall be conducted during the dry season and shall be completed before onset of monsoon All construction material and waste shall be cleared from the lake after the construction Conduct awareness programs to workers on the risks poisonous snakes when clearing bushes/shrubs						

Environmental Quality Monitoring						
Construction						
Mitigation measures	**Location**	**Responsible for Mitigation**	**Monitoring Method & Parameters**	**Monitoring Frequency**	**Responsible for monitoring**	**Cost of monitoring**
Ambient air quality	2 sampling location in the town	Co	• SPM, RSPM • Monitoring method as prescribed by CPCB	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	$ 100 per sample – sum $ 1,800
Lake water quality	3 sampling locations in the lake		• pH, TC, FC, Turbidity BOD, DO, NO3, P, oil & grease	Once before start of construction and monthly during construction	Contractor	$ 50 per sample – sum $ 1,050
Operation						
Raw water quality at Intake	Intake at Mudhenur		• pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalnity	Monthly once	Ranebennur CMC	Part of laboratory O&M Costs

Lake water quality	Doddakere lake		• pH, NO3, P, TC, FC, Hardness, Turbidity BOD, COD, DO,	Yearly twice	Ranebennur CMC	Part of laboratory O&M Costs
Monitoring of quality of water supplied to consumers	All Service reservoirs		pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity, Total coliform and E-coliform	Monthly once	Ranebennur CMC	Part of laboratory O&M Costs
	Consumer end-random sampling in all zones		pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity, Total coliform and E-coliform	Yearly once	Ranebennur CMC	Part of laboratory O&M Costs
Sludge quality and suitability as manure	Sludge drying beds WTP & WWTP	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	Ranebennur CMC through accredited lab	Part O&M costs

C. Environmental Management & Monitoring Costs

142. 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. These costs of mitigation by the contractors are included in the budgets for the civil works. Mitigation and monitoring provided by the PIU/PMU or their consultants will be part of incremental administration costs. Costs required for environmental quality monitoring is indicated in Table 13.

Table 13: Environmental Management and Monitoring Costs

Item	Responsible Agency	Quantity/Details	Total Cost (US$)	Source of funds
Air quality monitoring	Contractor	18 samples	1,800	Included in the project cost as BOQ item
Lake water quality monitoring	Contractor	21 sample	1,050	Included in the project cost as BOQ item
Tree cutting/ compensatory plantation	PIU	Lump sum (plantation & maintenance for 3 years)	1,000	Included in the project cost as BOQ item
Monitoring of implementation of mitigation measures	PIU / PMU / Consultants	As required	Part of incremental admin costs	Project funds
Water quality monitoring	Operating agency/ Ranebennur CMC	As required	Part of O&M costs of operator	O&M funds
Sludge water quality	Operating agency/ Ranebennur TMC	As required	Part of O&M costs of operator	O&M funds
Total costs			**$ 3,850**	

D. Grievance Redress Mechanism

143. 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.

144. 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.

145. 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.

146. 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

147. 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.

148. 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.

149. 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.

150. 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.

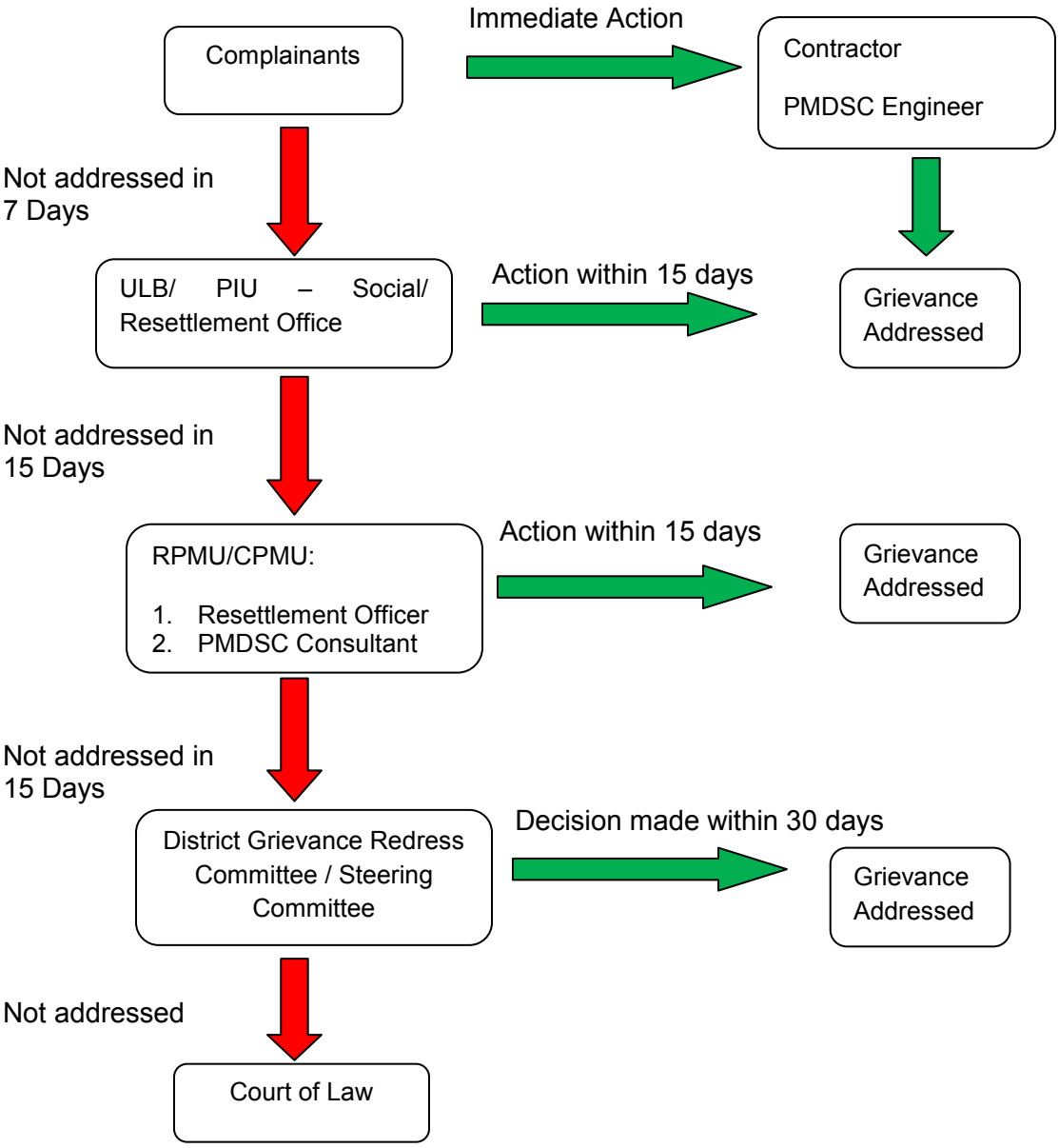
F. GRC / SC composition and selection of members

151. 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.

152. 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 be included in the PID to be distributed to the affected communities, as part of the project GRM. A Grievance Redress Mechanism is shown in Figure 15.

Figure 15: Grievance Redress Process



VIII. PUBLIC CONSULTATION & INFORMATION DISCLOSURE

A. Project Stakeholders

153. 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) Ranebennur City Municipal Council
(iv) KUIDFC, GoK

154. 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

155. 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.

156. 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 Ranebennur, were participated in the workshop. Minutes of this consultation meeting is appended at Appendix 6.

C. Future Consultation & Disclosure

157. 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.

158. 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 Ranebennur CMC.

IX. RECOMMENDATION & CONCLUSION

A. Recommendation

159. The process described in this document has assessed the environmental impacts of all elements of the infrastructure proposed under the Ranebennur Water Supply and Sewerage Subproject. Potential negative impacts were identified in relation to design, location, 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.

160. All the subproject sites are either situated on government owned vacant land parcels or along the public roads (for pipelines and sewers). Subproject has been designed to continue the usage of existing surface water source (Tungabhadra River) with increased abstraction from 11 MLD to 29 MLD to meet the designed water demand of Ranebennur. The source sustainability issue including the downstream impacts are in the scope of another parallel ADB TA preparing for IWRM's Water Resources component. This "sister" TA has within its scope the preparation of a river water balance to ensure the adequacy of raw water for public water supply from Tungabhadra River. For this feasibility study of Ranebennur, it has been assumed that adequate supplies will be made available by, if necessary, a reduction in water permitted for agriculture, by the construction of barriers etc. or by any other means deemed necessary by the TA. Therefore impacts of increased water abstraction from the river are not considered in this

report. It is also assumed that the water balance will take into consideration the minimum flow required downstream to sustain the ecosystem. However it is necessary to establish adequate water availability and ensuring that necessary provision is made for Ranebennur water supply through government statutes as required before the start of detailed design. This will ensure subproject sustainability.

161. No significant negative impacts envisaged from the proposed rehabilitation works of Doddakere Lake. Necessary measures are suggested for design and construction phase to avoid negative impacts. These include design as per historic high flood including outflow; schedule of works during the dry season; no distrubance to temple within the lake and maintaining status quo on entry to temple; community consultation during the detailed design. It is envisaged that there will be numerous positive benefits of this rehabilitation work – both to natural environment and as well to the local community.

162. Ranebennur Black Buck Sanctuary is spread in the Ranebennur Taluk, and its boundary is extended to up to 1 km from the CMC boundary in the eastern side. No impacts are anticipated as subprojects are confined to CMC boundary, and other facilities outside CMC limits (water intake and pumping stations) are situated on the other side of the town (southern). The WWTP, presently under construction in NKUSIP, is in the northern side, about 1 km from the sanctuary boundary. Although no impacts/interference with the sanctuary is envisaged, certain measures to avoid entry of construction workers in to the areas have been suggested.

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 water pipeline and sewer work are conducted along the roads, this great 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. Since the lake rehabilitation works are conducted in the lake body, which still has natural habitat, construction work need to be conducted with minimum disturbance. Various measures suggested including confining vehicle/equipment movement to dry areas with hardened soil; no storage of material/waste in the soil; no noise generating activities; conduct of work during dry season and completion before monsoon; avoid clearance of vegetation/trees in the lake; no vegetation shall be disturbed outside the actual construction area and prevention of disturbance, hunting and poaching of birds/animals

165. 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.

166. Once the system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Necessary safety precautions are suggested for safe handling and application of chlorine to disinfect water supplies. As far the sewer network is concerned, the operation and maintenance will comply with the standard operating procedures. SOPs / O&M Manual will be developed during the detailed design stage, and the staff will be provided with necessary training.

167. The citizens of the Ranebennur Town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, piped into their homes. In addition to improved environmental conditions, the subproject will improve the over-all health condition of the town. With the construction of toilets and targeted awareness program on sanitation proposed, 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 construction in ADB funded NKUSIP, will collect wastewater including sewage from entire town (except few density fringe areas) and treat Indian standards. Adequate capacity of WWTP is already under construction in NKUSIP. Certain improvements to sludge treatment proposed in this subproject will further improve the efficiency of WWTP.

168. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be regular and periodic monitoring surveys for quality of water (at reservoirs and at consumer end) and sludge quality to check the suitability as manure.

169. 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

170. The subproject is unlikely to cause significant adverse impacts. The potential adverse 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.

171. 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). With the changes in sludge handling and treatment proposed for the under construction WWTP, a revised Consent for Establishment (CFE) should be obtained from the Karnataka State Pollution Control Board. Tree cutting permission should be obtained from the designated Tree Officer of Ranebennur.

172. This IEE needs to be updated as the subproject preparation progresses to detailed design to reflect the latest subproject design.

Site Photographs

Photo 1: View of clariflocculator needs to be rehabilitated

Photo 4: View of filter beds that are to be rehabilitated

Photo 2: Proposed New WTP site

Photo 5: Proposed ELSR behind BAJS arts college

Photo3:Proposed service reservoir at Cholamardeswara Hillock

Photo 6: Proposed ELSR at Maruti Nagar

Photo 7: Vacant Area at STP for Sludge Thickner

Photo 10: View of a narrow street in Ranebennur

Photo 8: View of Ongoing STP at Devagudda road

Photo 11: View of street in Ranebennur

Photo 9: View of Ranebennur Main Road

Photo 12: View of narrow street in Ranebennur

Photo 13: View of Doddakere Lake

Photo 16: Thukkamma Temple in the Lake

Photo 14: View of Doddakere Lake

Photo 17: Birds at the lake

Photo 15: Thukkamma Temple in the Lake

Photo 18: Desilting of lake by local farmers

Appendix 1: REA Checklist

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST
Ranebennur Water Supply and Sewerage Subproject

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?	**x**		Subproject activities extend to the entire city including the densely populated areas. There are no major negative impacts envisaged, because water supply/ sewer network will be located in unused government lands 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 measures like best activity scheduling/ traffic management, alternative routes prior information to road users, houses and shops will minimize the impact to acceptable levels.
▪ Heavy with development activities?	**x**		Ranebennur is a developing town; urban expansion is considerable.
▪ Adjacent to or within any environmentally sensitive areas?			Ranebennur Black Buck Sanctuary is extended up to 1 km of town boundary on the northern and eastern sides. However, none of subproject components are located adjacent or within the sanctuary boundary. The core area of the sanctuary is about 608 km deep inside the boundary.
▪ Cultural heritage site		**x**	
▪ Protected Area		**x**	
▪ Wetland		**x**	
▪ Mangrove		**x**	
▪ Estuarine		**x**	
▪ Buffer zone of protected area		**x**	

Screening Questions	Yes	No	Remarks
▪ Special area for protecting biodiversity		x	
▪ Bay		x	
Water Supply			
B. Potential Environmental Impacts Will the Project cause…			
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		x	Subproject will utilize existing intake.
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		x	There is no historical / cultural monument in the project location.
▪ hazard of land subsidence caused by excessive ground water pumping?		x	No ground water source will be used for this project.
▪ social conflicts arising from displacement of communities ?		x	The subproject does not involve land acquisition or displacement.
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		x	Not anticipated. Overall water resource balance in Tungabhadra River Basin and measures for assurance of water availability within the Tungabhadra River for public water supply and other uses will be proposed within the proposed ADB funded Karnataka Integrated Sustainable Water Resource Management project (KISWRMP). Government policy is for priority to be given to public water supply and it is therefore assumed that adequate water resources will be available without effecting current downstream uses.
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		x	Raw water quality is satisfactory. Water will be treated to drinking water standards before delivery.
▪ delivery of unsafe water to distribution system?		x	Subproject involves distribution of treated water supplies
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		x	Existing water intake is located ideally. There are no sources in the vicinity that may cause water pollution. Nevertheless, the proposed KISWRMP will look into both water quantity and quality issues.
▪ over pumping of ground water, leading to salinization and ground subsidence?		x	No ground water is proposed to be abstracted.

Screening Questions	Yes	No	Remarks
▪ excessive algal growth in storage reservoir?		x	Regular cleaning of storage reservoir shall be ensured to avoid algal growth in the reservoir.
▪ increase in production of sewage beyond capabilities of community facilities?		x	Sewerage system is currently being constructed under ADB assisted NKUISP. Uncovered areas in NKUISP will be covered under this sub project. The WWTP being constructed has been designed to accommodate capacity for proposed expansion under this subproject.
▪ inadequate disposal of sludge from water treatment plants?		x	The subproject proposes improvement to sludge collection, treatment and management.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		x	Not anticipated. No new pumping stations or treatment plants proposed. Installation of new pumps will be within the existing WTP.
▪ impairments associated with transmission lines and access roads?	x		Anticipated during construction activities. However impacts are temporary and short in duration. The EMP includes measure to mitigate impacts.
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		x	Necessary safety measures have been taken into consideration in the design and included in the EMP.
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		x	Necessary safety measures have been taken into consideration during O&M and included in the EMP.
▪ dislocation or involuntary resettlement of people?	x		The subproject does not involve land acquisition and displacement. There may be temporary disturbance to business and squatters/vendors during construction. A resettlement plan has been prepared to mitigate/compensate these impacts.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	Not applicable.

Screening Questions	Yes	No	Remarks
▪ noise and dust from construction activities?	x		Short term impact on air quality due to dust generation during construction activities is anticipated. Appropriate dust suppression measures will be taken to minimize dust generation due to construction activities at site. No significant increase in noise level is anticipated due to construction. All equipment and machineries will conform to the Statutory norms.
▪ increased road traffic due to interference of construction activities?	x		Proper traffic management and planning will be ensured during construction.
▪ continuing soil erosion/silt runoff from construction operations?	x		Construction activities (pipe laying, etc.) on hill slopes may increase the chance of land slide and soil erosion. Careful stacking of excavated materials will be ensured to avoid slippage and erosion especially on hill slopes. Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		x	Trained and skilled staff will be deployed for O&M. Also, quality of treated water will be regularly monitored through water sample testing to ensure delivery of safe water to consumers.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		x	uPVC pipes will be used for distribution system and are non corrosive in nature.
▪ accidental leakage of chlorine gas?		x	Necessary safety measures have been taken into consideration during design and O&M and included in the EMP.

Screening Questions	Yes	No	Remarks
▪ excessive abstraction of water affecting downstream water users?		x	Not anticipated. Overall water resource balance in Tungabhadra River Basin and measures for assurance of water availability within the Tungabhadra River for public water supply and other uses will be proposed within the proposed ADB funded Karnataka Integrated Sustainable Water Resource Management project (KISWRMP). Government policy is for priority to be given to public water supply and it is therefore assumed that adequate water resources will be available without effecting current downstream uses.
▪ competing uses of water?		x	Not applicable.
▪ increased sewage flow due to increased water supply	x		Sewerage system is currently being constructed under ADB assisted NKUSIP. Uncovered areas in NKUSIP will be covered under this sub project. The WWTP being constructed has been designed to accommodate capacity for proposed expansion under this subproject.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	x		Sewerage system is currently being constructed under ADB assisted NKUSIP. Uncovered areas in NKUSIP will be covered under this sub project. The WWTP being constructed has been designed to accommodate capacity for proposed expansion under this subproject.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		x	No such impact anticipated as the import of workforce will be limited to skilled workers; local communities in the vicinity of the project would be employed as much as possible.
▪ social conflicts if workers from other regions or countries are hired?		x	Not anticipated as local communities within the project vicinity will 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 operation and construction?		x	Not applicable. Construction will not involve use of explosives and chemicals.

Screening Questions	Yes	No	Remarks
▪ 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?		x	Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites.
Sewerage			
C. Potential Environmental Impacts Will the Project cause…			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		x	There are no such areas near the subproject sites
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?		x	No blocking/interference with other utilities expected.
▪ dislocation or involuntary resettlement of people?		x	The subproject does not involve land acquisition or displacement.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	Not applicable. Sewerage system will cover entire population (both poor and non-poor) and will have positive health impacts due to improved sanitation conditions.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		x	Treatment process being constructed is designed to meet the inland water disposal standards set by the Central Pollution Control Board (CPCB).
▪ overflows and flooding of neighboring properties with raw sewage?		x	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?		x	Sludge thickening equipment is proposed under this subproject to improve the efficiency of WWTP under construction. No industrial waste is allowed into sewers.
▪ noise and vibration due to blasting and other civil works?		x	No blasting activities envisaged. Temporary nuisance/disturbance due to construction activities will be minimized with appropriate mitigation measures.

Screening Questions	Yes	No	Remarks
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?		x	Not anticipated. The EMP ensures occupational health and safety measures are implemented.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		x	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?		x	No sewerage pumping station proposed under this subproject.
▪ road blocking and temporary flooding due to land excavation during the rainy season?		x	Flooding is unlikely as work will be mostly conducted during dry season.
▪ noise and dust from construction activities?	x		No major noise generating activities like rock blasting is envisaged. Dust will be temporary and will be controlled with proper dust suppression measures.
▪ traffic disturbances due to construction material transport and wastes?	x		Proper traffic management and planning will be ensured during construction.
▪ temporary silt runoff due to construction?	x		Construction activities (pipe laying, etc.) on hill slopes may increase the chance of land slide and soil erosion. Careful stacking of excavated materials will be ensured to avoid slippage and erosion especially on hill slopes. Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?		x	Not anticipated. The system is designed to accommodate adequate capacity. Staff and workers will be trained in O&M.
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?		x	Not anticipated.
▪ contamination of surface and ground waters due to sludge disposal on land?		x	Improvements to sludge treatment and management proposed.

Screening Questions	Yes	No	Remarks
▪ health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge?		**x**	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)?		**x**	No such impact anticipated as the import of workforce will be limited to skilled workers; 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?		**x**	Not anticipated as local communities within the project vicinity will 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?		**x**	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?		**x**	Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the construction sites. During operation, entry into WWTP will be restricted.

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 1)?		**x**	There is a low risk of natural hazards in the project areas. All towns are land locked and expansively cultivated. The general topography of the towns is plains with isolated hills fringing some of the towns. The towns are located in an area of low seismological intensity. The towns are generally dry throughout the year except during the monsoon from June to September. Davanegere and Rannebenur receive the lowest rainfall (annual average rainfall between 300 – 600mm). Whereas Byadgi and Harihar receive higher rainfall (annual average rainfall between 700 – 1000 mm).
▪ 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)?	**x**		Low precipitation and increased temperatures could result in disruption to water supply and security. The project proposes improved water security through the rehabilitation and restoration of river bank reservoirs in selected vulnerable towns.
▪ 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)?		**x**	The project will improve the socio-economic conditions of both the poor and non-poor populations of the towns.
▪ 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)?		**x**	Not applicable.

* Hazards are potentially damaging physical events.

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.	10^{-7}	10^{-7}	10^{-8}	10^{-7}
(b)Beta emittersmicro curie mg/l	10^{-6}	10^{-6}	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 ÔKVA

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 Planning (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

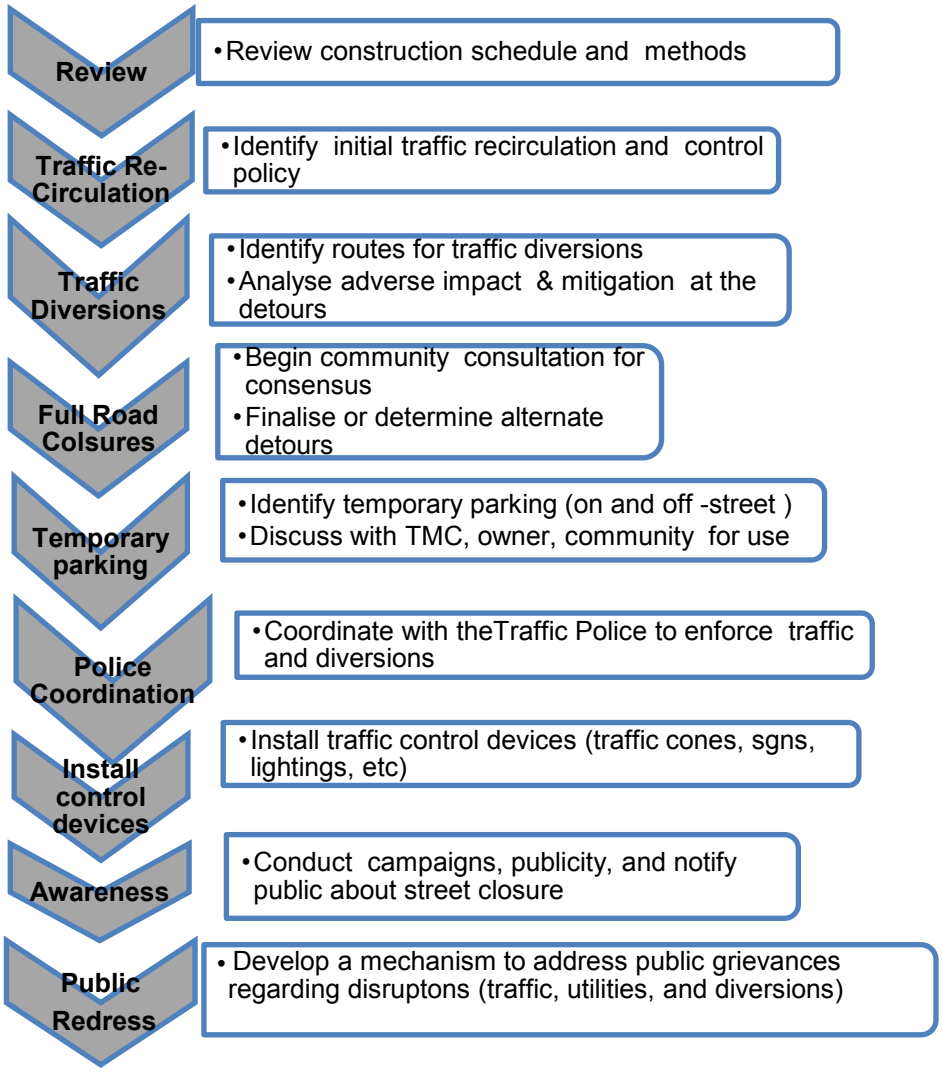
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the Ranebennur CMC / 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

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

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

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

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

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

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

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

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

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

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

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

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads are narrow but carry very less traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. **Figure 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

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

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

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

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

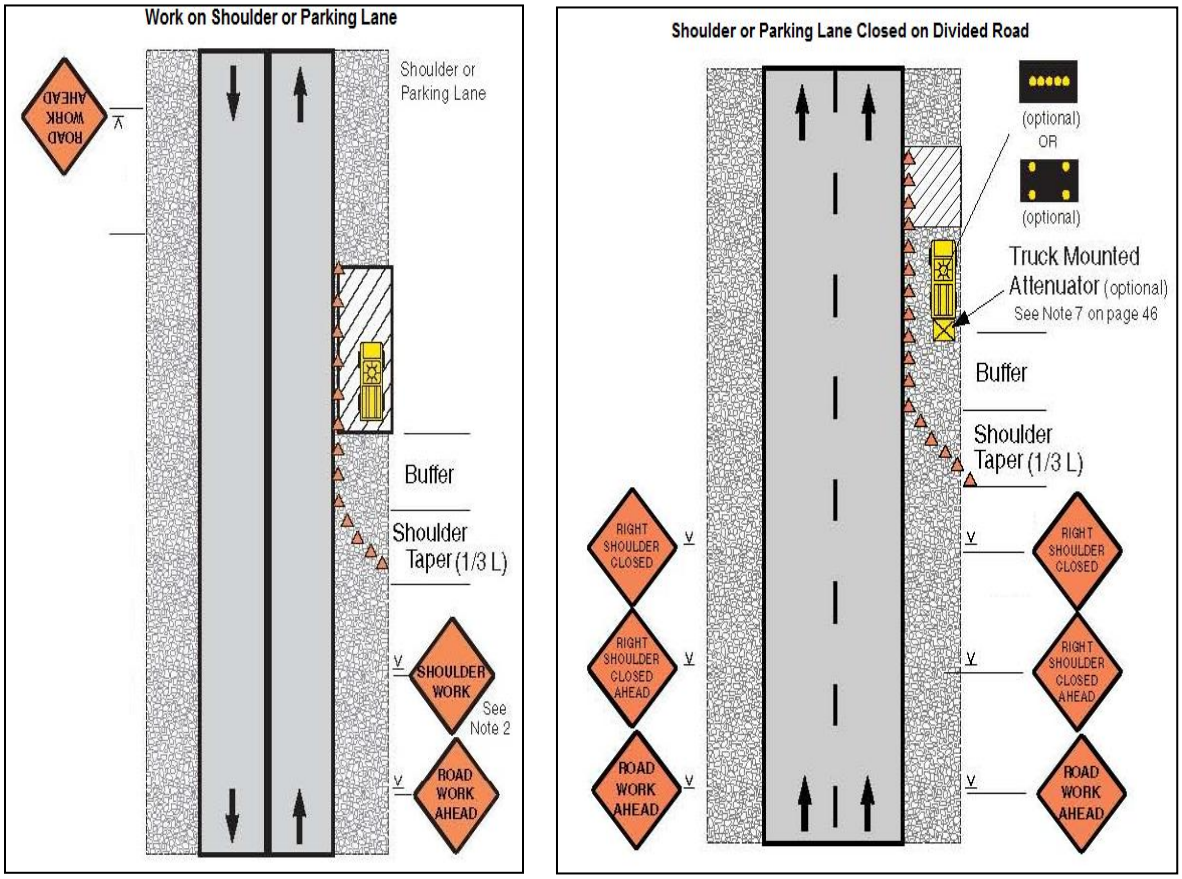
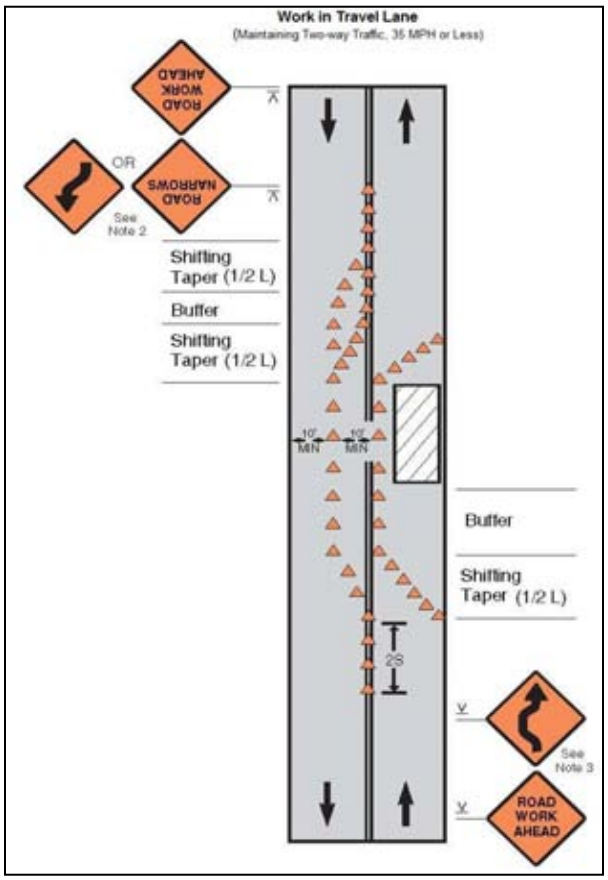


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume



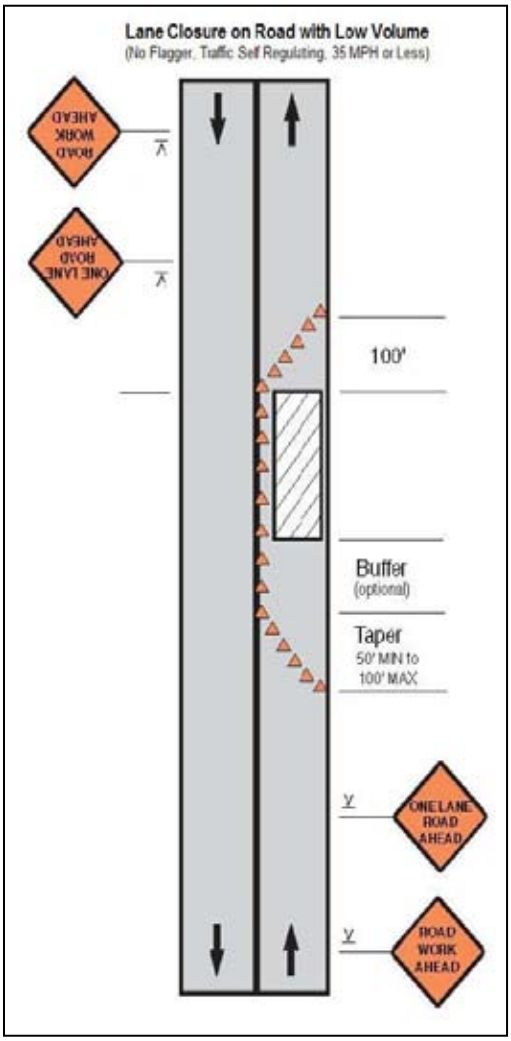
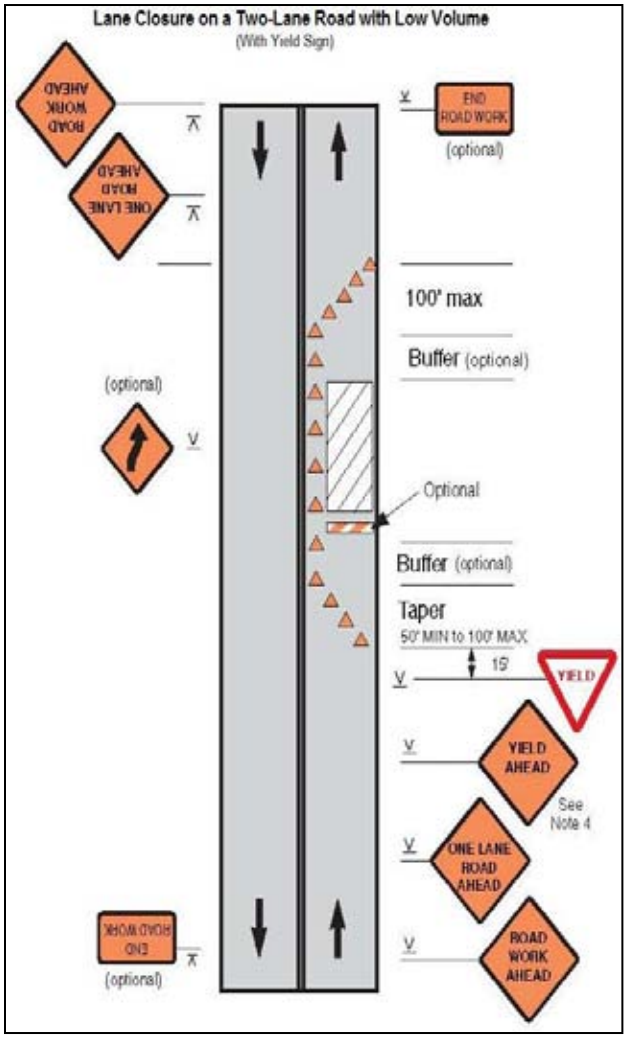


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



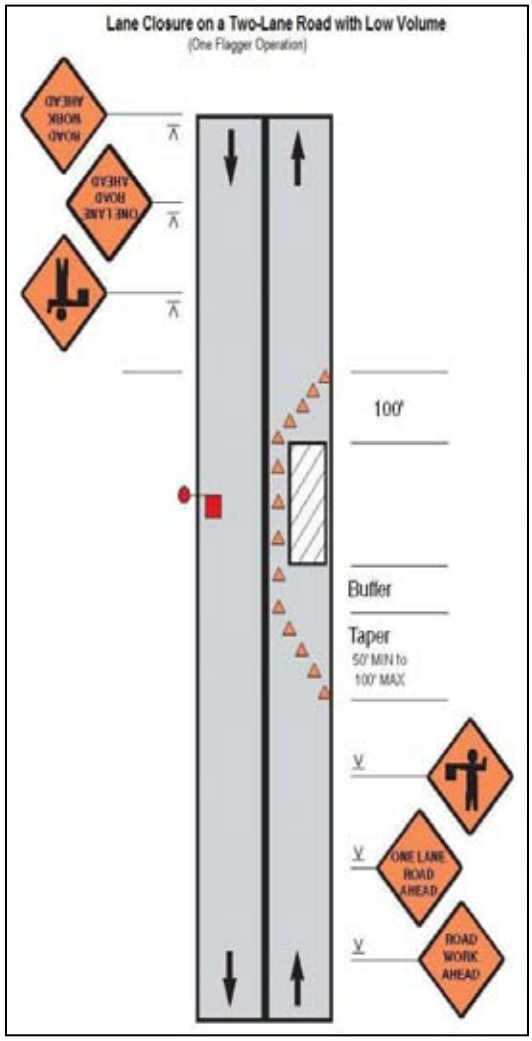
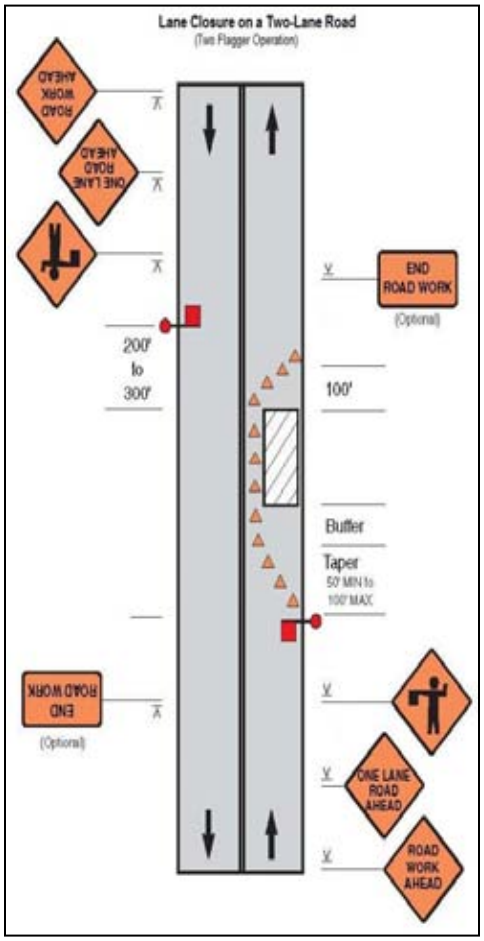


Figure A8 & A9: Lane closure on a two lane road (two flagger operation) & Lane closure on a four lane undivided Road



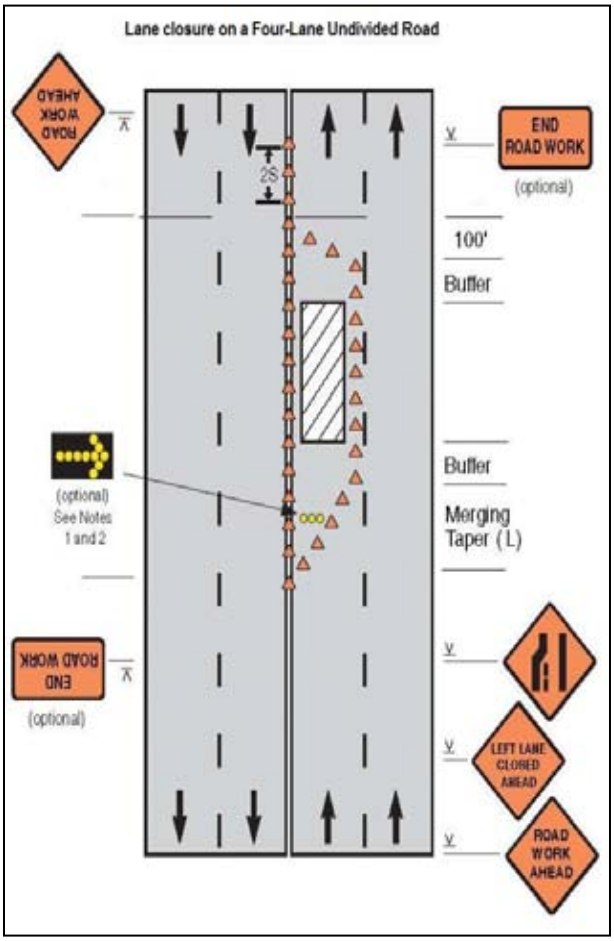
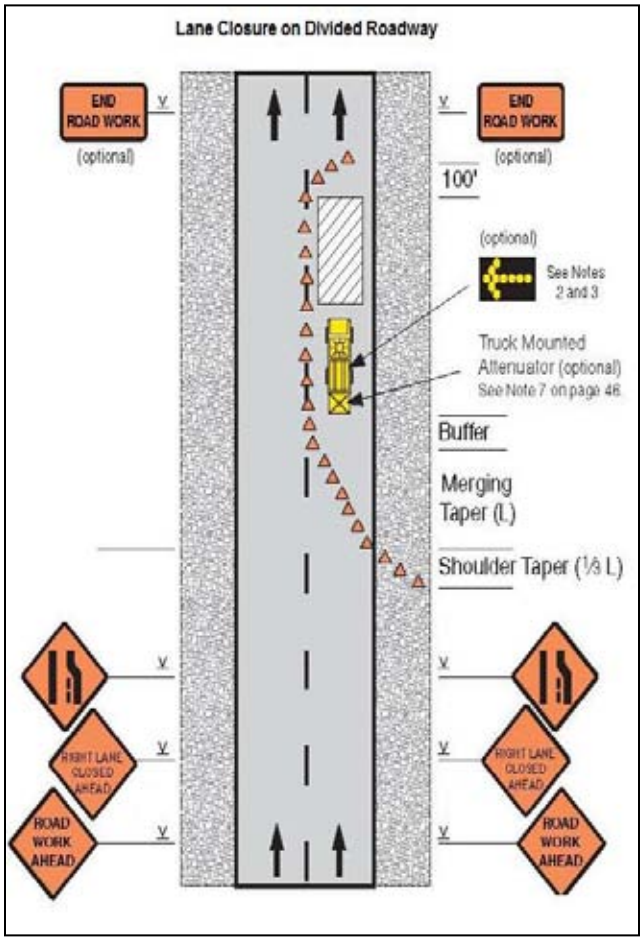


Figure A10 & A11: Lane closure on divided roadway & Half road closure on multi-lane roadway



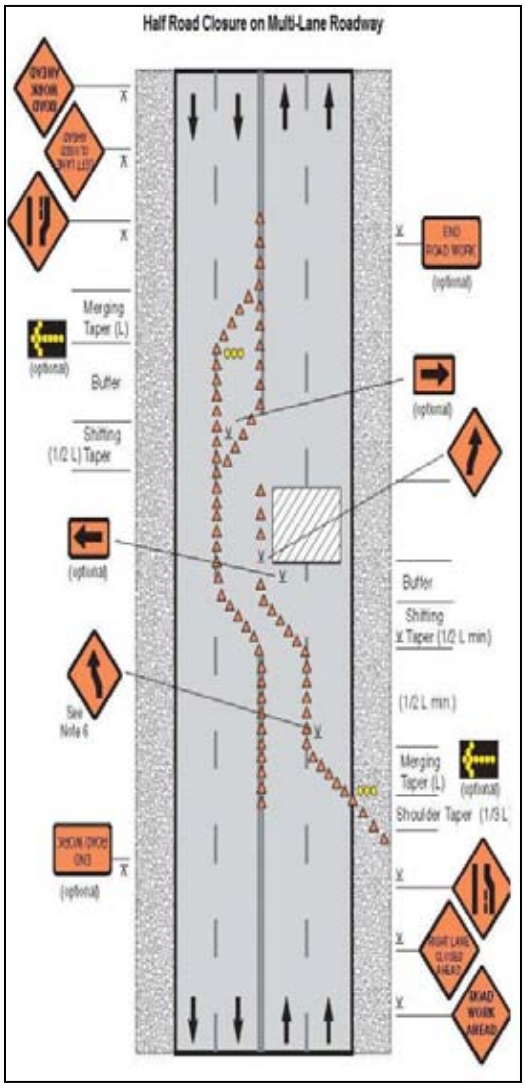
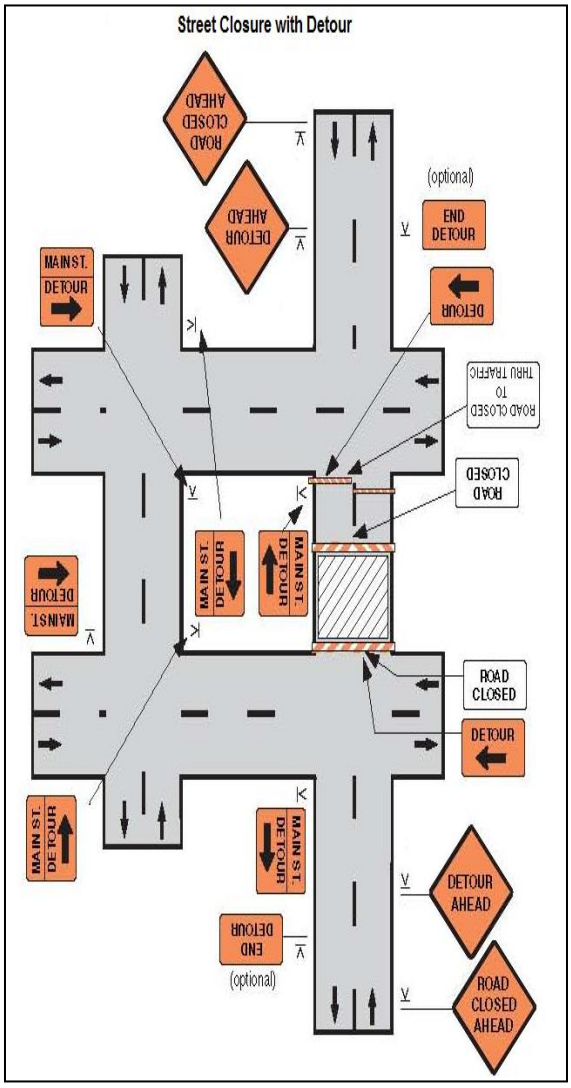


Figure A12: Street closure with detour



Appendix 5: Emergency Response Plan Template – (Chlorine Leakage, Sewer Network Operation, etc)

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		
Directions to the System		
Basic Description and Location of System Facilities		
Population Served and Service Connections	_____ people	_____ connections
System Owner		
Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Emergency Plan		_____ Phone _____ Mobile

Section 2. 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/Ms……. Water & Wastewater System Manager(s)	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	Phone: Mobile:

Name and Title (as required)	Examples of Responsibilities During an Emergency	Contact Numbers
	communications to external parties are to be approved by the manager.	
Mr/Ms …….. Water & Wastewater System Operator(s)	In charge of operating the water supply & wastewater systems, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the system manager.	Phone: Mobile:
Mr/Ms Water & Wastewater Treatment Plant Operator(s)	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.	Phone: Mobile:
Mr/Ms…….. 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 wastewater system manager.	Phone: Mobile:
Mr/Ms…… Field Staff	Delivers door hangers, posts notices, and supports wastewater system operator.	Phone: Mobile:

Section 3.
Events that Cause Emergencies

The events listed below may cause wastewater 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
Chlorine leakage at WTP		
Burst of sewer line		
Leak of sewer line		
Overflow of sewer line		

Section 4.
Emergency Notification

Notification call-up lists - Use these lists to notify first responders of an emergency.

Emergency Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Cell Phone**	**Email**
Urban Local Body				
Wastewater Operator (if contractor)				
Primacy Agency Contact				
Wastewater Systems Manager Contact				

Priority Customers				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Hospitals or Clinic(s)				
Public or Private Schools				
Public Water System				

Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Police				
Regulatory Agency				
Authorized Testing Laboratory				

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Bangalore Electricity Supply Company				
Electrician				
Water Testing Lab.				
Wastewater systems operator/manager				
Plumber				
Pump Supplier				
“Call Before You				

Service / Repair Notifications				
Organization or Department	**Name & Position**	**Telephone**	**Night or Mobile Phone**	**Email**
Dig"				
Rental Equipment Supplier				
Pipe Supplier				

Notification procedures

Notify wastewater system customers

Who is Responsible:	
Procedures:	

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

Who is Responsible:	
Procedures:	

Contact service and repair contractors

Who is Responsible:	
Procedures:	

Procedures for issuing a health advisory

Who is Responsible:	
Procedures:	

Other procedures, as necessary

Who is Responsible:	
Procedures:	

Section 5.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of emergency response.

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

Section 6.
The Vulnerability Assessment

This is an evaluation of each wastewater 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				
Sewage Pumping				
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	
Immediate Actions	
Notifications	
Follow-up Actions	

B. Collection system blockage or line break

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

C. Collection system pumping facilities failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

D. Vandalism or terrorist attack

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

E. Flood

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

F. Earthquake

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

G. Hazardous materials spill into collection system

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

H. Electronic equipment failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

I. Other

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

Section 8.
Returning to Normal Operation

Returning to normal operations

Action	Description and Actions

Section 9.
Plan Approval

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 Nepal 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.

Ranebennur Town Meeting Session

- Chief Officer of Ranebennur CMC requested the PPTA Team to recheck the flows (demand calculations, losses and projections) shown in the reports/ presentations.
- Suggested to recheck the total length of sewer network proposed for the town.
- CO expressed concerns about delays in road restoration and back filling trenches. He stated that, the excavated soils are not stored properly and entering into the storm water drains.
- Workshop to be conducted in each town to appraise councilors of respective ULBs.

KUIDFC

- Mr.Arifullah Sharief stated that, the Draft Feasibility Studies (DFSs) are subject to change to address stakeholder comments and concerns.
- Mr.Arifullah Sharief 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?
- 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 STPs and Pumping Stations; Construction cost of STP
- 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
- Assess existing sewerage system (about 22 km) in Ranebennur to identify need for the sewer renovation or replacement.
- Plan awareness program for the sanitation in each ULB

Appendix 7: Environmental Audit of the Existing Water Treatment Plant in Ranebennur

I. Introduction

1. The objectives of this environmental audit are to (i) assess the compliance of the existing water treatment plant (WTP) to be rehabilitated/augmented during the implementation of KISWRMIP with environmental legislation; (ii) improve environmental performance through monitoring the effectiveness of the management system; and (iii) increase the Ranebennur CMC's knowledge of itself and its activities, thus increasing its ability to continually improve and minimize future potential liabilities.

2. The environmental audit was carried out by the PPTA consultants during IEE report preparation from May 2012 to December 2012. The methodology adopted for this audit was to initially review existing plans and technical information and list various activities being carried out in the WTP. Due diligence was carried out to physically check whether environmental performance, health and safety, etc. were in compliance with national and state prescribed standards and guidelines. Team visited the WTP was and observed operations. Meetings and discussions with key personnel were held in the various stages of the audit.

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

II. Description of Existing Water Treatment Plant at Ranebennur

Location	Ranebennur Town Latitude: 14° 62' N Longitude: 75°62' E
Start of operation (year)	2002
Owned by	CMC Ranebennur
Contact person and designation	Mr Suresh Chaluvadi Junior Engineer +91 9845728012
Capacity	11.4 million liters per day (MLD)
Water supply source	Tungabhadra River (intake at Mudenur 20 km from Ranebennur
Water treatment process	Technology: The treatment process is conventional, and has following units: Cascade Aerator, Raw Water Channel with Parshall Flume for continuous flow measurement, Coagulant & Flocculent chemical makeup tanks, Flash Mixing tank, Clarifier including a flocculation zone in the centre, Four sand filters, Chlorine gas storage cylinders and dosing unit, back wash water storage for filters Materials: All civil structures are made of reinforced cement concrete, and mechanical units like the clariflocculator bridge, etc. are of mild steel. Process: the water from raw water pumping main enters into the inlet, and the first unit is cascade

	aerator. After aeration water passes through parshall flume, where flow is measured. Coagulant and flocculent chemicals (alum and polymer) are added to the water, and mixed in the flash mixer tank, and then flows into clariflocculator. Clarified water flows into sand filters (4 no,s) for filtration and the filtered water is disinfected with chlorine, and allowed to flow into clear water tank from where water pumped into service reservoirs for distribution .
Backwash water and sludge management	-filter backwash water is let into open drains as there is no recycling of backwash into inlet - the settled sludge from the bottom of the clarifier tank is periodically flushed into the drains. -This practice of discharge of backwash and sludge directly into the drains, wastes water, pollutes and silts receiving water bodies.
Chlorination system	Chlorine dosage system is not proper; there are no safety precautions in place. Chlorine cylinders (900 kg tonners) are placed haphazardly at the facility; the dosage system is not properly functional; no safety systems like leak detection or emergency alarm or lime slurry pit available in the facility. Operators are not aware of safety measures or actions to be performed during any emergency.

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

Law, Rules, and Regulations	Description and Requirement	Details
		Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant[1] N/A = not applicable (state justification)
EIA Notification	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994) states that environmental clearance is required for certain defined activities/projects.	N/A Environmental clearance is not required as WTPs are not listed in the EIA Notification's "Schedule of Projects Requiring Prior Environmental Clearance"
Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	Storage of chlorine (threshold quantity greater than 10 tons but less than 25 tons) in WTPs will require clearance from Karnataka Pollution Control Board (WBPCB).	N/A Normally 1 or 2 tonners (of capacity 900 kg) are stored at the site
Water (Prevention and Control	Consent to operate from KSPCB	N/A

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

		Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant[1] N/A = not applicable (state justification)
of Pollution) Act of 1974, Rules of 1975, and amendments		In Karnataka, WTPs do not require consent from KSPCB
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	Consent to operate from WBPCB	no source of air emissions (e.g., standby power generators)
Environment (Protection) Act, 1986 and CPCB Environmental Standards	Emissions and discharges from the facilities to be created, refurbished, or augmented shall comply with the notified standards.	
	a. Air emissions	no monitoring conducted
	b. Effluent	no monitoring conducted
CPHEEO Drinking Water Quality Standards	Applicable standards for drinking water at the consumer end	N – No regular monitoring Is conducted; no laboratory is available within the WTP Although period monitoring is said to be conducted with the help of outside laboratories no results are readily available
Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010	Applicable ambient noise standards with respect to noise for different areas/zones	no monitoring conducted
National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	Applicable noise exposure levels and duration that no worker exposure shall equal or exceed	no monitoring conducted
Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes shall seek approval of the central government.	N/A WTPs are not located in notified forest lands.
Ancient Monuments and Archaeological Sites and Remains Rules of 1959	No development activity is permitted in the "protected area," and all development activities likely to damage the protected property are not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI). Protected property includes the site, remains, and monuments protected by ASI or the State Department of Archaeology.	N/A
The Child Labor (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop	No children between the ages of 14 and 18 will engage in hazardous work.

		Y = compliant (if applicable, specify expiration date of permit/clearance) N = non-compliant[1] N/A = not applicable (state justification)
	wherein any of the processes set forth in Part B of the Schedule are present.	

IV. Institutional Arrangement

Parameter	Details
Operations	7 days a week 24 hours a day 3 working shifts per day
Manager per shift	1 junior engineer
Water supply engineer on-site	
Estimated number of technical employees on-site per shift	2-3 staff
Estimated number of laborers on-site per shift	-
Estimated number of employees in charge of environmental management and monitoring	-
Frequency of water quality monitoring (raw water)	-
Frequency of water quality monitoring (treated water for distribution)	-
Frequency of water quality monitoring (sludge supernatant)	not conducted
Frequency of water quality monitoring (WTP effluents)	not conducted
In-house laboratory for water quality analyses (Yes/None). If none, provide name of third-party laboratory.	No in house laboratory

V. Corrective Action Plan

	Gaps	Corrective Action	Time Frame	Responsible Person	Indicator for CMC/ KUIDFC	Indicator for ADB	Budget
A. Compliance With National, State, and Local Laws and Rules							
1	Monitoring of raw and treated water as per CPHEEO Drinking Water Quality Standards	Conduct regular monitoring of water (frequency, parameters and methodology as per CPHEEO Manual requirements for drinking water supply.	O & M phase	Ranebennur CMC (during O&M phase)	Provision of laboratory as part of the subproject and budget Inclusion in the Environ-mental Monitoring Program	ADB to approve IEE with EMP prior to bidding	Included in CMC cost (during O&M phase)

	Gaps	Corrective Action	Time Frame	Responsible Person	Indicator for CMC/ KUIDFC	Indicator for ADB	Budget
2	Monitoring of air emissions and effluent not being conducted	EMP to include air emissions and effluent monitoring	Construction phase O&M phase	Contractors (during construction phase) Ranebennur CMC (during O&M phase)	EMP implement-tation to include monitoring of air emissions and effluent.	ADB to approve IEE with EMP prior to bidding	Included in contractors cost (during construction phase) Included in CMC cost (during O&M phase)
3	Monitoring of ambient noise levels not being conducted	EMP to include noise level monitoring	Construction phase O&M phase	Contractors (during construction phase) Ranebennur CMC (during O&M phase)	EMP implement-tation to include monitoring of ambient noise levels.	ADB to approve IEE with EMP prior to bidding	Included in contractors cost (during construction phase) Included in CMC cost (during O&M phase)
4	Monitoring of workers' noise exposure levels and duration not being conducted	EMP to include worker noise exposure level and duration monitoring	Construction phase O&M phase	Contractors (during construction phase) CMC (during O&M phase)	EMP implement-tation to include monitoring of workers noise exposure levels and duration.	ADB to approve IEE with EMP prior to bidding	Included in contractors cost (during construction phase) Included in CMC cost (during O&M phase)
B. Institutional Arrangement							
1	Unidentified employees responsible for environmental management and monitoring	PMU to designate environmental coordinators for EMP implementation	During program implement-tation	CMC	PMU Environ-mental Coordinators to work closely with WTP staff. IEE with EMP to specify TOR of PMU Environ-mental Coordinators	Institutional arrangement for EMP implementation clearly defined in the IEE. ADB to approve IEE with EMP prior to bidding.	Included in CMC cost
2	No information on capacity of WTP engineers to conduct environmental quality monitoring	Build capacity of CMC, PMU Environmental Coordinators, and WTP operators	During program implementa-tion	PIU/ consultant Team	Number of trainings conducted	Semi-annual report to include documentation of trainings conducted	Included in DSC cost
C. Others							

	Gaps	Corrective Action	Time Frame	Responsible Person	Indicator for CMC/ KUIDFC	Indicator for ADB	Budget
1	No documentation of complaints/ grievances from people regarding noise/odor	Public consultation to include stakeholders from communities adjacent to the WTP	During program implementation	DSC, Contractors, and CMC	GRM documentation and reporting all throughout the program implementtation	Semi-annual report to include summary of complaints/ grievances, remedial actions taken, and, if necessary, additional environmental mitigation measures	Included in CMC cost
2	Physical and chemical quality of supernatant not being determined prior to discharge.	EMP to include supernatant monitoring	Decommission phase and defects liability period O&M phase	Contractors (during decommissioning and defects liability period) CMC (during O&M)	Results to be submitted to PMU	Semi-annual report to ADB (during decommissioning and defects liability period)	Included in contractors cost (during decommissioning and defects liability period) Included in CMC cost (during O&M phase)
3	Sludge quality not being determined prior to reuse as raw material in manufacturing bricks	EMP to include sludge quality monitoring	Decommission phase and defects liability period O&M phase	Contractors (during decommissioning and defects liability period) CMC (during O&M)	Results to be submitted to PMU	Semi-annual report to ADB (during decommissioning and defects liability period)	Included in contractors cost (during decommissioning and defects liability period) Included in CMC cost (during O&M phase)

Appendix 8: Technical Details of Doddakere Lake

Appendix 9: Government Notification for Transferring of Lake to Ranebennur CMC

Control of Ranebennur Tank has been ... Irrigation Dept & CMC ... 26.9.2007

ಸುವರ್ಣ ಕರ್ನಾಟಕ 2006

ಸಂ: ಸನೀನಿವಿ:ರಾಬೆ:ಹಸ್ತಾಂತರ:2007-08:/872

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು,
ಸಣ್ಣ ನೀರಾವರಿ ಉಪ ವಿಭಾಗ ಇವರ ಕಾರ್ಯಾಲಯ,
ರಾಣೇಬೆನ್ನೂರು, ದಿನಾಂಕ: 27 SEP 2007

ಪೌರಾಯುಕ್ತರು,
ನಗರ ಸಭೆ,
ರಾಣೇಬೆನ್ನೂರು. ಇವರಿಗೆ,

ವಿಷಯ: ಹಾವೇರಿ ಜಿಲ್ಲೆ ರಾಣೇಬೆನ್ನೂರು ನಗರದಲ್ಲಿರುವ ಸ.ನಂ. 606 ರ ಸಣ್ಣ ನೀರಾವರಿ ಇಲಾಖೆಯ ಕೆರೆಯನ್ನು ರಾಣೇಬೆನ್ನೂರು ನಗರ ಸಭೆಗೆ ಹಸ್ತಾಂತರಿಸುವ ಕುರಿತು.

ಉಲ್ಲೇಖ:
1) ಸರ್ಕಾರದ ಆದೇಶ ಸಂಖ್ಯೆ: ಸ.ನೀ.ಇ.140:ಕೆಜಿಕೆ 2007 ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 27-7-2007.
2) ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು, ಸಣ್ಣ ನೀರಾವರಿ ವಿಭಾಗ, ಧಾರವಾಡ ಇವರ ಪತ್ರ ಸಂಖ್ಯೆ: 3229, ದಿನಾಂಕ: 10-8-2007.
3) ತಮ್ಮ ಪತ್ರ ಸಂಖ್ಯೆ: 897, ದಿನಾಂಕ: 26-9-07.

ಮಾನ್ಯರೇ,

ಈ ಉಪ ವಿಭಾಗದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಹಾವೇರಿ ಜಿಲ್ಲೆ ರಾಣೇಬೆನ್ನೂರು ತಾಲ್ಲೂಕಿನ ರಾಣೇಬೆನ್ನೂರು ರಿ.ಸ.ನಂ. 606 ರ ದೊಡ್ಡ ಕೆರೆಯನ್ನು ರಾಣೇಬೆನ್ನೂರು ನಗರ ಸಭೆಗೆ ಹಸ್ತಾಂತರ ಮಾಡಲು ಉಲ್ಲೇಖ (1)ರಲ್ಲಿ ಸರ್ಕಾರ ಅನುಮೋದನೆ ನೀಡಿರುತ್ತದೆ. ಅದರಂತೆ ಕೆರೆಯ ತಾಂತ್ರಿಕ ವಿಷಯಗಳ ನಿರ್ವಹಣೆಯೊಂದಿಗೆ ಸರ್ಕಾರದ ಆದೇಶದಲ್ಲಿರುವ ಷರತ್ತುಗಳಿಗೆ ಒಳಪಟ್ಟು ಈ ಮೂಲಕ ದಿನಾಂಕ: 26-9-2007 ರಂದು ಕೆರೆಯನ್ನು ಹಸ್ತಾಂತರಿಸಲಾಗಿದೆ.

ತಮ್ಮ ವಿಶ್ವಾಸಿ,

ಅಡಕಗಳು:
ಹಸ್ತಾಂತರಗೊಂಡ
ಪ್ರತಿಗಳು.

ಸಹಾಯಕ ಕಾರ್ಯನಿರ್ವಾಹಕ ಅಭಿಯಂತರರು
ಸಣ್ಣ ನೀರಾವರಿ ಉಪ ವಿಭಾಗ,
ರಾಣೇಬೆನ್ನೂರು.

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Appendix 10: Land Record Extract of the Lake
(Government Lake in Surey No261 area 259.31 acres)