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GOVERNMENT OF KARNATAKA

Karnataka Urban Water Supply Modernization Project (KUWSMP)

ENVIRONMENTAL AND SOCIAL ASSESSMENT (ESA) OF CONTINUOUS WATER SUPPLY PROJECT IN BELAGAVI (BELGAUM), KARNATAKA, INDIA

DRAFT FINAL REPORT
2014

KUIDFC

Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC)

Abbreviations

AE	Assistant Engineer
AEE	Assistant Executive Engineer
CMC	City Municipal Corporation
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health & Environmental Engineering Organisation
DoEE	Department of Ecology & Environment (DoEE)
DPR	Detailed Project Report
DRIP	Dam Rehabilitation and Improvement Project
EA	Environmental Assessment
EAC	Expert Appraisal Committee
EC	Empowered Committee
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EP	Environment Protection
ESMP	Environmental and Social Management Plan
FGD	Focused Group Discussions
GLSR	Ground Level Storage Reservoir
GoI	Government of India
GoK	Government of Karnataka
JE	Junior Engineer
Km	Kilometer
KSPCB	Karnataka State Pollution control Board
KUIDFC	Karnataka Urban Infrastructure Development Finance Corporation
KUWASIP	Karnataka Urban Water Sector Improvement Project
KUWSSDB	Karnataka Urban Water Supply Sewerage and Drainage Board
KUWSMP	Karnataka Urban Water Supply Modernization Project
LPCD	Litres per capita per day
mg/l	Milligrams per liter
MoEF	Ministry of Environment & Forests
NH	National Highway
NRRP	National Rehabilitation & Resettlement Policy (NRRP
O&M	Operation & Management
OD	Operational Directives
OHT	Over Head Tank
OP	Operational Policy
PAF	Project Affected Families (PAFs)
PIU	Project Implementation Units
PPP	Public Private Partnership
PSP	Private Sector Participation
PPE	Personnel Protective Equipment
R & R	Rehabilitation & Resettlement
RAP	Resettlement Action Plans
RPM	Respirable Particulate Matter
SEA	Social and Environmental Assessment
SEAC	State's Environmental Appraisal Committee
SEMF	Social and Environmental Management Framework
ESA	Environmental and Social Assessment

SH	State Highway
SPM	Suspended Particulate Matter
STP	Sewerage Treatment Plant
TDS	Total Dissolved Solids
ToR	Terms of Reference
UDD	Urban Development Department
UGD	Underground drainage
ULB	Urban Local Body
UWS	Urban Water Supply
UWSS	Urban Water Supply Sanitation
WB	World Bank
WSS	Water Supply and Sanitation

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EXECUTIVE SUMMARY

1.1. Background

In 2003, Government of Karnataka (GoK) with assistance from the World Bank launched Karnataka Urban Water Sector Improvement Project (KUWASIP) for providing a continuous water supply (24X7) to address issues of poor quality, intermittent supply, illegal connection and supply of contaminated ground water. The State Government selected five demonstration zones in three project towns of Hubli-Dharwad, Belgaum, and Gulbarga to pilot the 24X7 urban water supply (UWS). The project envisaged setting a policy, institutional and regulatory environment in the urban water sector, enabling service improvements, sustainable investments and coverage expansion. The project was successfully implemented and closed on 31st March 2011.

Based on the success of the project and with the support from the local communities, City wise scale up has been proposed through World Bank funding. The total project cost is for all the three cities is estimated at about Rs 1809 crores in or $ 279 million in US. This up scaling project for the identified cities known as "Karnataka Urban Water Supply Modernization Project" (KUWSMP) has been approved by the GoK.

Karnataka Urban Infrastructure Finance Corporation (KUIDFC) on behalf of the Government of Karnataka is preparing the Karnataka Urban Water Supply Modernisation Project (KUWSMP). The project involves modernizing water supply systems and capacity for providing continuous piped water supply in the three cities of Hubballi-Dharwad, Kalaburgi and Belagavi.

An Environmental and Social Assessment (ESA) has been carried out to integrate environmental and social concerns with project design, identify potential adverse environment and social impacts during different phases of the project implementation (pre-construction, during construction and post construction) and recommend mitigation measures, complying with environmental and social safeguard policies of the World Bank, Government of India, and Government of Karnataka.

1.2. Project Area Profile

Belagavi is the fourth largest city of the state of Karnataka, the first three being Bangalore, Mysore, Hubli – Dharwad. The project city lies between 15.87°N 74.5°E. It has an average elevation of 751 metres (2463 feet) and comprises in 58 Municipal administrative wards with a total area of 94.08 sq.km. Water to Belagavi City is supplied from two sources: 35 MLD of water is supplied from Rakaskop Reservoir situated about 24 kms from the city, around 20 MLD of water is supplied from the Hidkal Dam located at around 45 kms.

A summary profile of the city is presented in Table I below.

Table 1: Fact File

Sl.No	Attributes	Details
1.	Population 2011	4,90,045
2.	Total no. of hoseholds	1,11,874
3.	Area Belagavi Municipal Corporation	94.08 sq. km
4.	No. of Wards	58

5.	Population Decadal Growth rate (2001-2011)	22.19%
6.	Population Density (2011)	5190 person per sq.km
7.	Literacy Rate	80.2%
8.	Sex Ratio	936
9.	Economy	Tata Power, INDAL & Udyambag Industrial Estate

1.3. Project Description

KUWSMP will support the Government of Karnataka (GoK) and the participating urban local body to achieve the project development objective to "Improve water service quality to a continuous supply (24x7) across Belagavi city through the establishment of institutionally and financially sustainable service delivery arrangements at ULB level". The key project activities include financing goods and services to improve water supply systems in these three cities to 24X7 by investing in improved capacity to meet water demand, reduced non-revenue water, network expansion, setting up of city level water institutions (SPV) and hiring an Operator to strengthen and manage the systems for a duration (12 years). The operator will also strengthen the city level institutions.

The Project period would be of 12 years, consisting of a design & implementation period of 4 years (the "transition phase" to convert the system to continuous pressurized supply) & operation & management period of 12 years – comprising the 4 year transition phase and a further 8 years when the supply is continuous and pressurized.

As part of project preparation, detailed studies were carried out by *M/s Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd* in Sept 2012 to understand the physical and capital investments required for providing continuous water supply to Belagavi. However, the hired Operator shall study the existing system, measure performance and carry out assessments of the system and propose and implement investments that will ensure delivery of continuous water supply in the project cities. The activities of the Operator will include the following.

- Augmentation / development of water sources
- Rehabilitation of existing or laying of new transmission line(s),
- Rehabilitation or expansion or new water treatment plant(s)
- Development and / or expansion of pumping station(s)
- Renovation or rehabilitation or construction of new service reservoirs (underground or over-ground)
- Replacement and /or extension of distribution network
- Replacement and/ or provision new house service connections.

1.4. Environmental and Social Assessment of the Project

The Environmental and Social Assessment (ESA) was carried out with the objectives of:

- Identifying key social and environmental issues associated with the proposed water supply augmentation (24x7 water supply) such as rehabilitation works to be implemented at the pre-construction, construction and operation phases of project.
- Identifying the positive and adverse impacts of sub project activities on physical and social environments.

- Proposing suitable mitigation measures for potentially adverse environmental and social impacts, and measures for enhancement of positive impacts and preparing specific Environmental and Social Management Plans.
- Detailing out roles and responsibilities of various agencies involved in carrying out the proposed action plans.

The scope of work carried out under this study comprised of –

a) Reviewing all applicable policies including operational policies of the World Bank and environmental laws / regulations in India within which KUWSMP is to be implemented.
b) Detailed analysis of Environmental Profile of the project city including assessing and establishing base line water quality.
c) Socio-economic profiling of the cities through primary survey, stakeholder consultations, focus group discussions and analysis of secondary information.

1.4.1. Review of Environmental Policies and Institutions

The review of the environmental policies conclude that as the activities currently contemplated in this project fall under the rehabilitation & modernization project, these will not necessitate any detailed environmental impact assessment (EIA) studies. This project is identified as category B and the Operational Policy 4.01 will be applicable to assess the impacts however marginal or temporary it might be. Due to the dependence on multipurpose dams that share water for the drinking water needs of the city, Safety of Dams (OP 4.37) is triggered. OP 4.11 for Cultural Properties will be triggered, in cases of 'chance find' of cultural properties during the construction phase of the project.

The review reveals that various legal approvals and clearances on social and environmental aspects will have to be obtained during Transition and Sustaining stages. During constructions, the project would require consent from the state pollution control board to operate the DG set under Air (Prevention & Control of Pollution) Act, 1981 and also attract Noise Control Regulations under Environment (Protection) Act, 1986. Permissions/Approvals from Railways and State and National Highway Authorities is envisaged during Transition Phase. The storage and handling of chlorine for disinfecting the water, during Transition and Sustaining Periods, will necessitate consent from the Pollution Control Board as per the provisions of Manufacture, Storage and Handling of Hazardous Chemicals Rules, 1989.

1.4.2. Base Line Environmental Profile

The detailed base line environmental profiles do not indicate any sensitive environmental features that could be affected by the proposed activities under KUWSMP. Belagavi has a rich cultural past and the core City has developed around the existing fort. The project activities are not expected to impact these structures. However, necessary approval shall have to be obtained from National Monuments Authority, for carrying out construction within 300 m of the monument. In addition construction activities need to consider precautionary measures to avoid damages of archaeological structures during excavation works.

The entire Belagavi city has been divided in two sewerage zones viz. North and South zones. Both sewerage zones are drained by network of drains carrying sewage through

gravity to the Nalla, namely Kotekere Lake, Lendi Nala and Bellary Nala. The city does not have any Sewage Treatment Plant (STP) Water supply augmentation through the project is expected to increase waste water generation and provision of safe wastewater disposal arrangements need to be considered.

1.4.2.1. Base Line Sample Surveys

In order to establish the baseline water quality 10 samples were collected and bacteriological & physiochemical analysis was conducted to analyze water quality as below:

- One Raw water Sample from source (River intake at Hidkal Reservoir)
- One Treated water sample after chlorination from clear water storage reservoir at the treatment plant (Laxmitek)
- Eight water samples from public Public Taps.

These samples surveys indicated that the quality of water at supply end in all the three cities meets the standards of IS 10500. Coliforms were found in both raw and treated water sample. However, E. Coli was absent in Treated Water. Also residual Chlorine was observed high in the water samples taken at consumer end which confirms the protocol.

1.4.3. Socio-Economic Profile

The base line socio economic profile of the project area does not indicate the presence any sensitive social features. The primary survey and stakeholder consultation revealed that current intermittent water supply is not satisfactory and respondents have to adopt coping mechanisms to overcome its deficiencies. Further it indicated that the respondents are aware of the benefits of 24x7 water supply and are willing to pay for the better supply.

1.5. Impacts and Environmental Management Plan

Belagavi is not located near any eco-sensitive area. The proposed project activities will have environmental impact on the adjoining settlement in terms of dust and noise during construction. Soil pollution and impact on water quality and hydrology will be marginal and temporary. The critical issues will be to ensure adequate safety and precautionary measures to minimise impacts during construction and provision of sanitation facilities in the construction area to avoid contamination surface / sub-surface sources during operation. While the impacts are not very severe and permanent, care has to be taken to ensure that the ambient environmental conditions do not deteriorate. The negative impacts that are likely due to construction activities in narrow and congested roads need critical attention. Table 3 presents the summary of major impacts of the project and recommended mitigation measures.

1.6. Impacts and Social Management Plan

There are no significant adverse impacts by the project. The proposed project does not involve land acquisition, displacement of structures; does not cause any impact on community structures except for a few temporary inconveniences to the public during construction phase. Implementation of the suggested mitigation measures during different phases of the project will prevent or minimize adverse impacts. A standalone document, Resettlement Policy Framework (RPF) has been prepared that consists resettlement

planning and entitlement provisions. The RPF outlines the principles and approaches to be followed in minimising and mitigating the adverse social and economic impacts due to the project. Table 4 below presents the summary of major impacts of the project and recommended mitigation measures.

Table 3: Environmental Management Plan (SMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Pre construction activities	• The pre-construction phase will give rise to fugitive dusts and frequent exhaust emissions into the atmosphere as equipment is delivered to the pumping stations/ water treatment plant/ overhead tanks and along major roads and streets where the proposed new network will pass through. This will affect all project sites, particularly Ward, 11, 12, 14, 28, 30, 31, 32, 33, 34, 35, 36, 37 and 38.	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Operator	SPV
Construction/Transition Phase					
1.	River Intake at Hidkal Reservoir new structure	• Increase water pollution during construction • Deterioration of water quality • Temporary Disruption of water supply	➢ Use of barriers to reduce water pollution ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Prior water use plan shall be prepared and arrange alternate source of water to fulfil more basic needs ➢ Ensure prior information regarding supply of water to consumers ➢ Ensure implementation of Project Planning and Design Plan (ECoP) before planning of activity ➢ Site preparation should be as per Site Preparation Plan (ECoP) for site clearance	Operator	Operator /and ULB/ SPV

2.	Replacement of existing PSC pipe with 1000mm dia MS pipe for a length of 0.76 Km at Hidkal Scheme	• Increase in Dust levels due to earth work or replacement of pipe • Soil pollution or soil erosion • Increase noise levels due to excavation • Deterioration of water quality • Disruption of traffic flow during replacement • Landscape degradation	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Contractor	Operator and ULB/SPV
3.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 3.40 Km parallel to the existing alignment.	• Pressure on local resources • There may be cases of destruction of underlying existing water supply line which leads to leakages and shortage of water nearby locality. • Loss of Fertile Top Soil of the Agriculture Land along the alignment, if any • Loss of vegetative cover • Increase in Dust Levels to due to earth work and other construction activities • Accumulation of Excess Earth • Disruption of Utilities such as electricity, telephone and other services. • Disruption of traffic flow in the above roads especially Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages.	➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Discharge wastewater at authorized locations and after treatment ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management ➢ Avoid aggregate stockpile on site. ➢ Compact earthworks, road base, etc. ➢ Revegetate bare soil in landscaping areas prior to start of rainy season. ➢ Check leakages and prevent Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management	Contractor	Operator and ULB/SPV
4.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 16.50KM parallel to the existing alignment				

5.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 15.20KM parallel to the existing alignment.	• Damage to standing crops during break down of the transmission main or maintenance operations • Unhygienic condition in construction camp • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • May Increase Health problems in Labours and Populace.	➢ Locate handling sites away from populated areas ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for construction equipments ➢ Preparation of utility shifting plans, procuring appropriate approvals / permissions in advance and completion of activities in the earliest possible time ➢ Provision of temporary crossings/ bridges to avoid accidents and other construction hazards ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Ensure implementation of Water bodies Management Plan (ECoP 7.0,) during laying of pipeline near to water bodies ➢ Ensure implementation of Cultural Properties Plan (ECoP) if any cultural property is being impacted due to interventions ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP) ➢ Mid-term environment audit should be carried out for performance of ESMP implementation (ECoP)	Contractor	Operator and ULB/SPV
6.	Laying of 700mm dia MS pipe for a length of 0.80Km form Indal tapping point to proposed WTP				

7.	Construction of WTP/ Rehabilitation of existing WTPs	• Increase dust or other gaseous (SO2 & NO2) levels due to the movement of construction vehicles and equipments • Accumulation of construction waste • Accumulation of earth material • Loss of vegetative cover • Noise pollution • Contamination of water	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Avoid aggregate stockpile on site. ➢ Compact earthworks, road base, etc. ➢ Revegetate bare soil in landscaping areas prior to start of rainy season. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Discharge wastewater at authorized locations and after treatment ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Ensure implementation of Construction Camp Plan (ECoP) for labour camps ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Alternate material or material should be reused for construction of WTP (ECoP) to reduce construction cost ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor	Operator and ULB/SPV

8.	Dismantling of existing Elevated Service Reservoir	• Increase in Dust Level due to dismantling • Accumulation of demolished waste • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles	➢ Use of barriers to reduce exposure ➢ Ensure prior information on dismantling of reservoirs to the community ➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Measures to prevent accidental spills ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP) ➢ Provision of sprinkling of water & scaffolding. Sprinkling method is used for refilling of trenches so that shrinking should be minimized ➢ There should be proper covering of excavated or dismantled material while transportation of these waste materials	Contractor	Operator and ULB/SPV
10.	Construction of new overhead reservoirs	• Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipments • Soil pollution due to leakages from vehicles and equipments • Top Soil erosion • Accumulation of earth material • Accumulation of construction waste	➢ Air pollution control measure ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Cross contamination of water should be avoided	Contractor	Operator and ULB/ SPV

		•	➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Ensure implementation of Project Planning and Design Plan (ECoP) before planning of activity ➢ Site preparation should be as per Site Preparation Plan (ECoP) for site clearance ➢ Ensure implementation of water for construction plan (ECop) for water management ➢ Alternate material or material should be reused for construction of WTP (ECoP) to reduce construction cost ➢ Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP)		
Operation Phase					
12.	24X7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping.	➢ Before implementation of project an water connections census should be taken to reduce extra use of water ➢ Illegal water tapping source should be identified ➢ Ground water should be kept a backup supply source in system failure ➢ Ensure Indian Drinking Water Standards (BIS:10500)	Operator	ULB/ SPV

		• Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Deficiencies in Storage and Handling of Chlorine at the water treatment plant • Occurrence of chlorine intoxication if water is over chlorinated during treatment • Generation of sludge from WTP Leading to contamination of surface and sub surface sources • Generation of Waste Water	➢ Alternate supply arrangements such as supply through tankers should be provided if Leakages, Contamination and shortage of Water ➢ Check leakages and prevent ➢ Cross contamination of water should be avoided ➢ Plan and cost for augmentation and strengthening the storm water drainage network in the city ➢ Ensure environmentally sound and safe storage and containment of oil and diesel for DG Sets ➢ Ensure proper/efficient treatment of sludge before disposal. ➢ Ensure routine maintenance practices; ➢ Wastes should be collected, stored and managed on-site. Measures to ensure that wastes do not enter municipal water courses way must be ensured at all times during operations and maintenance in WTPs/Pumping stations. ➢ Procure diesel generators with soundproofing. ➢ Ensure environmentally sound and safe storage and containment of oil and diesel ➢ Ensure implementation of Water bodies Management Plan (ECoP) during laying of pipeline near to water bodies ➢ Proper sludge management has to be prepared and followed by SPV / Operator ➢ The untapped waste water component of 17% will be undertaken under the UGD program in a long term strategy and the cleaning of the existing sewerage network on continuous basis for smooth management.		

Table 4: Social Management Plan (SMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Awareness generation and people's confidence building Seeking participation of stakeholders Designing the project keeping in view the social, environmental and technical features	• People apprehension of the project • People's fear on loss of land and property • People's threat of inconvenience	➢ Meetings with stakeholders ➢ Loud speaker announcements on upcoming project seeking participation of people ➢ Insertions in cable TV on upcoming project and its benefits ➢ Hoardings indicating the temporary nature of inconvenience ➢ Design of socially acceptable, environmentally sensitive and technically feasible project engaging a team of consultants	ULB	ULB
Construction /Transition Phase					
2.	Replacement of existing PSC pipe and laying of new pipe	• Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Unhygienic condition in construction camp • Increase Health problems among labourers and Populace in general.	➢ Alternate supply arrangements such as supply through tankers should be provided. ➢ Awareness generation indicting temporary nature of disruption – targeting awareness more toward women who are the household water managers. ➢ Install speed breaker and sign ages near settlements ➢ Prepare traffic management plan. and prior intimation of the construction schedule to the people in the areas of construction. ➢ crossings/ bridges to avoid accidents and other construction hazards ➢ Provide safety measures (mask, gloves, hat etc.) to minimize exposure ➢ Provide sirens in vehicles to avoid any collision with human/animals ➢ Child labour must be strictly	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			prohibited ➢ Provision of temporary ➢ Ensure implementation of Construction Camp Plan (ECOP) for labour camps ➢ Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety		
3.	Construction of WTP	• Noise pollution • Increase health risk in nearby areas • Increase health risk in construction Labour	• Limit hours of operation in populated areas • Use of barriers to reduce noise pollution • Plants, machinery and equipment may be handled in such a way so as to minimize generation of dust. • Dump solid waste in specified place to minimize contamination of water • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Construction Camp Plan (ECOP,) for labour camps • Ensure implementation of Health & Safety Management Plan (ECOP 10,) for public and workers safety • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provision of temporary crossings/ bridges to avoid accidents and other construction hazards • Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
4.	Rehabilitation of existing WTPs	• Noise pollution • Increase health risk in nearby areas • Occupational Hazard leading to Health risk in construction Labour	• Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety.	Contractor & Operator	ULB/SPV
5.	Dismantling of existing Elevated Service Reservoir	• Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles	• Limit hours of operation in populated areas • Prepare traffic management plan • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP,) if any cultural property is being impacted due to interventions • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately subjected to medical treatment. Mosquito repellent to be provided to the labours such as odomas, coil and sprays. The camps to maintain cleanliness and hygienic condition. • Provision of scaffolding. • There should be proper covering of excavated or dismantled material while transportation of these waste materials	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
6.	Construction of new overhead reservoirs	• Increase noise levels due to movement of heavy vehicles and construction equipment • Disruption of traffic due to movement of vehicles and equipments • Increase health risk in nearby area • Increase occupational health risk of construction labourers • Increase sanitation problems due to construction camp • Accumulation of construction waste	• Limit hours of operation in populated areas • Cross contamination of water should be avoided • Prepare traffic management plan • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP) if any cultural property is being impacted due to interventions • Ensure implementation of Construction Camp Plan (ECOP) for labour camps	Contractor & Operator	ULB/SPV
7.	Laying of pipeline and construction of ESR in sensitive locations like schools, hospitals, religious, cultural and tourist locations	• Increase noise levels due to movement of heavy vehicles and construction equipment • There will be disruption to the movement of vehicles • Increase in Dust levels due to earth work or replacement of pipe • There will be noise pollution hampering classes and lectures. • Landscape degradation and	• Priority work planning in sensitive location • Limit hours of operation in sensitive zones during peak service hours. • Hospitals need special planning for emergency management • Laying of pipeline in alternate street, if possible, to avoid traffic disruptions and commuting problems • Install speed breaker and signages near settlements • Hoardings and signboards intimating the temporary nature of inconvenience • Construction activities to be	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation	scheduled carefully to minimize the impact of noise from construction machinery during school hours. • Barricades, temporary noise control measures and dust suppression measures through watering		
8.	Laying of pipeline and construction of ESR in commercial areas	• Loss of livelihood for vendors • Limited access to small shop and low sales	• Adequate provision for space shall be left so that the pedestrians have access to shops and local service providers • Immediate cleaning up of debris as part of planned process • Alternative livelihood planning to compensate or the temporary loss of livelihood	Contractor & Operator	ULB/SPV
9.	Construction of any nature and in any location	• Safety hazards and accidents • Occupational Hazards in all construction sites including health impacts due to absence of proper housing and sanitation facilities in labour camps	• Fencing of the excavation site and providing proper caution sign boards • Protective measures to workers as per occupational and safety norms • Develop women sensitive work conditions with toilets blocks catering to women's needs • Include creches in worksites. • Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as: • *excluding public from the site;* • *ensuring all workers are provided with and use Personal Protective Equipment (PPE);* • *health and safety Training for all site personnel;* • *documented procedures to be followed for all site activities; and* • *documentation of work-related accidents;* • *Ensure that qualified*	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			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; • Training of workers on safety and health and set down rules and regulations of all new workers at the site, personal protective protection and preventing injuring to fellow workers. • 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; and		
10.	Focus on cultural properties	• Access to any of the cultural properties is severed during	• Immediately after completion of construction, the Contractor will affect		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		construction;	clearance of the precincts of cultural properties. • Access needs to be restored at the Contractor's cost.		
Operations/Sustaining Phase					
11.	24X7 Continuous Supply of Water During Operation	• Disruption in water supply leading to inadequacy • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Occurrence of chlorine intoxication if water is over chlorinated during treatment	• Ensure alternate drinking water supply through tankers. In case of Contamination and/or shortage of Water • Involve ward level women's groups like SHGs and Neighbourhood Groups in monitoring. • Measures for water removal though pumping in case of flooding • Ensure implementation of Health & Safety Management Plan (ECOP for public and workers safety. • Ensure implementation of water quality Management (Eco for better water quality • Create awareness on precautions/preventive measures to be taken up in case of over chlorination.	Operator	ULB/SPV

Chapter 1: Introduction

The Karnataka Urban Infrastructure Finance Corporation (KUIDFC) on behalf of the Government of Karanataka is preparing the Karnataka Urban Water Supply Modernisation Project (KUWSMP). The project involves modernizing water supply systems and capacity for providing continuous piped water supply in the project cities. The project will be implemented in the three cities Hubballi-Dharwad, Kalaburgi and Belagavi in the state of Karnataka in India. The cities are 2nd, 4th and 5th biggest cities of the state by population and are located in the arid / semi-arid northern region of the state. Geologically, all the three cities are located in the Deccan Plateau and are known for their limited water resources (both surface and sub-surface). The project by virtue of the proposed water supply improvements would lead to positive improvements in the quality of water delivered to the consumers and associated health improvements due to reduced incidences of water borne diseases. To safeguard the environmental and social issues for implementation of KUWSMP, this document is prepared to highlight the Environment and Social impact Assessment and its management.

1.1 Project Background

In 2003, Government of Karnataka (GoK) with assistance from the World Bank launched Karnataka Urban Water Sector Improvement Project (KUWASIP) for providing a continuous water supply (24X7) to address issues of poor quality, intermittent supply, illegal connection and supply of contaminated ground water. The State Government selected five demonstration zones in three project towns of Hubli Dharwad, Belgaum, and Gulbarga to pilot the 24X7 urban water supply (UWS). The project envisaged setting a policy, institutional and regulatory environment in the urban water sector, enabling service improvements, sustainable investments and coverage expansion. The project was successfully implemented and closed on 31st March 2011.

Based on the success of the project and with the support from the local communities, City wise scale up has been proposed through World Bank funding. The total project cost is for all the three cities is estimated at about Rs 1809 crores or $ 279 million in US. This up scaling project for the identified cities known as “Karnataka Urban Water Supply Modernization Project” (KUWSMP) has been approved by the GoK and includes setting up of city level utilities (SPV) and hiring of an Operator to identify and implement investments that will ensure delivery of continuous water supply in the project cities. The activities of the operator will include the following.

- Augmentation / development of water sources
- Rehabilitation of existing or laying of new transmission line(s),
- Rehabilitation or expansion or new water treatment plant(s)
- Development and / or expansion of pumping station(s)
- Renovation or rehabilitation or construction of new service reservoirs (underground or over-ground)
- Replacement and /or extension of distribution network
- Replacement and/ or provision new house service connections.

The project will finance, amongst others, physical investments in the water supply system to facilitate continuous water supplies (Component 1) along with the systems, procedures and equipment that will build the institutions to sustainably deliver those improved services (Component 2).

Component 1 - Capital Investment Program

Capital Works: These include bulk capacity augmentation; enhancing capacity or resilience of transmission/feeder mains; treatment plant renovations/capacity enhancement; pump station upgrades; service reservoir improvements; distribution network sectorization, pipeline rehabilitation/replacement; water meters for bulk supplies and consumer consumption; replacement of house connections; and new connections to low income households.

Service Improvement Plan: The Operator will prepare and implement a Service Improvement Plan (SIP), approved by the Client, which will set out the needed investments for capital works and utility systems & equipment. The initial SIP will be prepared during the Start Up Period and will be updated annually to capture new and better quality data. An Expert Reviewer will advise on the suitability of, and any amendments required to, the SIP.

Construction Management: The Operator will act as the Client's Construction Manager for implementing the SIP and will contract with third party contractors for delivery of the agreed capital works and the systems & equipment. A Technical Auditor will certify payments to be made by the Construction Manager.

Component 2 – Institution Building

SPV set up and operations: This will finance costs associated with operationalizing the SPVs including (i) preparation of institutional staffing, training and delegation plan; (ii) office equipment (iii) staff training costs and (iv) incremental operating costs during the project period.

Systems and Equipment for Service Delivery: This will finance all the systems and equipment needed to establish well-run service delivery arrangements at the city level including computer systems (MIS, GIS, Billing and Collection, Call Center, CMMS), preparation of Standard Operating Procedures, and purchase of operational equipment and vehicles.

Partial payment of Operator Fees during the transition period: The project will finance 50% of the operator fee during the transition period as a result of the additional costs incurred at this time due to intensive staff training, capacity building, and heavier operating costs (especially for leakage control). These important activities will allow the operator to turnaround and stabilize service delivery in readiness for the Sustaining Period.

Component 3 – Technical Assistance for Sector Development

The project will support activities aimed at further developing the urban water sector in the State.

Preparing a State Urban and Rural Water Supply and Sanitation Strategy: The study would cover policy, service delivery arrangements, performance standards, regulatory requirements, investment needs and sector financing.

Developing Low Cost Sanitation approach in project cities: The study would look at national, regional and international experiences and would include preparation of detailed designs for pilot implementation in each city.

Project Impact Evaluation: This would assess the impact of providing continuous water supplies at both the household level and the city level.

Improving Social Accountability: This would support implementation and routine capture of consumer feedback on the quality of WSS services in each city and make it available on line for easy access by all stakeholders.

Improved dam management: Preparation of Operation and Maintenance Plans and Emergency Preparedness Plans for the five dams providing water to the three cities and considered Large Dams under the Bank's policy "Safety of Dams" (OP4.37).

Component 4 - Project Management

This component finances activities to ensure efficient and effective project implementation. This includes, among others, equipment to establish PMU/PIU offices, consultants to support technical evaluations, third party monitoring, expert reviewer, safeguards and fiduciary auditing, construction quality assurance, communications and others.

1.2 Belagavi City and the proposed Project

Belagavi, (Belgaum, name changed on 1st November 2014) is the fourth largest city of the state of Karnataka, the first three being Bangalore, Mysore, Hubli – Dharwad. The project city lies between 15.87°N 74.5°E. It has an average elevation of 751 metres (2463 feet) and comprises in 58 Municipal administrative wards with a total area of 94.08 sq.km.

Water to the Belagavi City is supplied from two sources: 35 MLD of water is supplied from Rakaskop Reservoir situated about 24 kms from the city, around 20 MLD of water is supplied from the Hidkal Dam located at around 45 kms. A total supply of 55 MLD, the gross per capita water supply to the city works out to 139 litres per capita per day. The storage capacity and distribution network in the city is inadequate. (14.24 MLD as against the total supply of 55.62 MLD) The total number of water supply connections is just 50817[1].

Belagavi City has over 51 kms length of sewer network (around 12% of the road length) spread across four zones of the city (Zones 1, 2, 3 & 5). In the light of the inadequate sewerage system, the wastewater generated in the city is drained into a number of water bodies such as Kotekere Lake (around 8 MLD), Lendi Nala (10-15 MLD) and Bellary Nala (around 25-30 MLD).

Belagavi City has around 300 kms of storm water drainage network covering 457 kms of the road network of the city. However, there is no segregated information available on the zone wise/ward wise network length. In the many localities that are not provided with / connected to sewerage network, wastewater is discharged into storm water drains leading to overflow of drains and subsequent unsanitary conditions. This has also led to blockages and associated network problems at a number of locations.

Detailed studies were carried out to understand the physical and capital investments required for providing continuous water supply to Belagavi in Sept 2012 and the study has identified the following key activities for the city.

A. Surface water source Rakaskop Scheme: The existing Electro Mechanical Works will require to be altered suitably.
B. Construction of new River Intake at Hidkal Reservoir
C. Replacement of existing PSC pipe with 1000mm dia MS pipe for a length of 0.76 Km from Intake to GLR Check Post at Hidkal Scheme.
D. Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 3.40 Km parallel to the existing alignment from Intake to GLR Check Post at Hidkal Scheme.

[1] Page 25, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belagavi; *Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.*

E. Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 16.50KM parallel to the existing alignment from GLR Check Post to Tummarguddi Pumping Station.

F. New Raw water transmission main of 800mm dia MS pipe for a length of 2.95KM is proposed to pump an additional 40 MLD of water parallel to the existing alignment form Tummarguddi Pumping Station to GLR Chandur Hillock.

G. Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 15.20KM parallel to the existing alignment from GLR Chandur Hillock to Indal tapping point.

H. Laying of 700mm dia MS pipe for a length of 0.80Km form Indal tapping point to proposed WTP at Basavankola.

I. Construction of WTP at Basavankola

J. Rehabilitation of existing WTPs

K. Dismantling of existing Elevated Service Reservoir (Udymbhag, RC Nagar 1st stage, Gummatmal, Sambhaji Udyan, TB Ward old tank, VV Nagar, Ambedkar Garden, RC Nagar 2nd stage, Subhash Chandra Nagar and June Belagavi).

L. Construction of six new overhead reservoirs.

M. Relaying of complete Water Distribution Network.

1.3 Need for Environmental and Social Assessment (ESA)

An Environmental and Social Assessment (ESA) has been carried out to integrate environmental and social concerns with project design, identify potential adverse environment and social impacts during different phases of the project implementation (pre-construction, during construction and post construction) and recommend provide for mitigation measures, complying with environmental and social safeguard policies of the World Bank, Government of India, and Government of Karnataka.

1.4 ESA Objectives

Within the broad framework of mitigation of the adverse influences in the environmental and social domains of the ensuing water supply project influences through ESA, the broad objectives are:

- Identification of key social and environmental issues associated with the proposed water supply augmentation (24x7 water supply) such as rehabilitation works to be implemented at the pre-construction, construction and operation phases of project.
- Identification of the positive and adverse impacts of sub project activities on physical and social environments.
- Propose suitable mitigation measures for potentially adverse environmental and social impacts, and measures for enhancement of positive impacts. This will be attained through a comprehensive Environmental and Social Assessment Studies and preparing “Environmental Code of Practice” that will ensure sound environmental and social management in the project and preparing specific Environmental and Social Management Plans.
- Detail out roles and responsibilities of various agencies involved in carrying out the proposed action plans.

In addition to the above mentioned objectives, ESA will also suggest additional detailed environmental and social studies / activities that may be required to be carried out to ensure sustainability and monitoring of ESMP.

1.5 Methodology and Approach to ESA

The approach in carrying out the ESA has been a mix of technical as well as participatory exercise. A comprehensive approach and methodology, with a step-wise approach, has been adopted to develop the Environmental and Social Management Plan for project area which is shown in **Figure 1.1.**

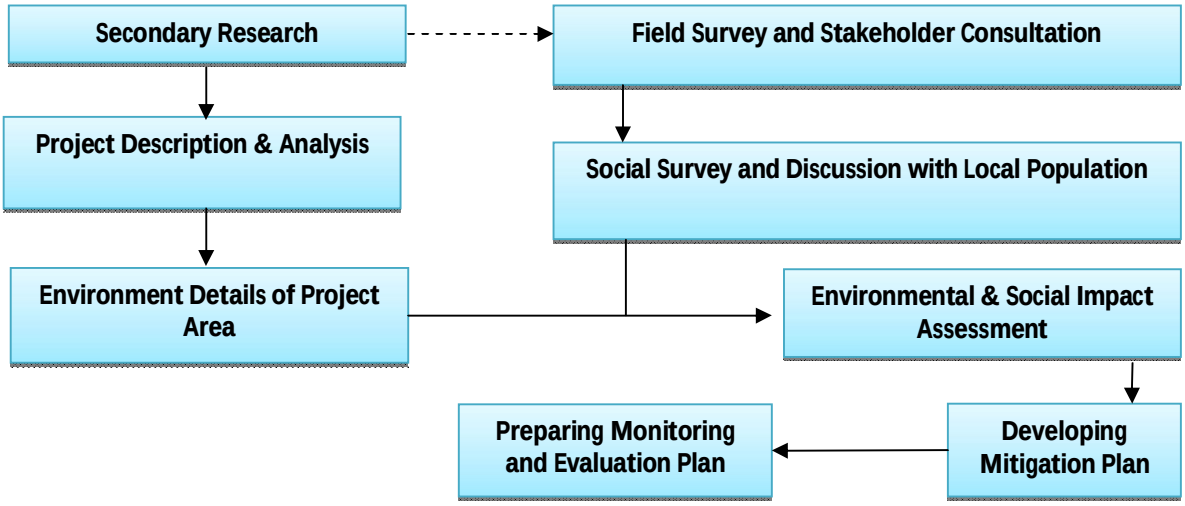


Figure 1.1: Methodology and Approach of ESA

The steps have been elaborated as follows:

Step 1: A comprehensive policy & regulatory review at national & state level has been carried out by summarizing the applicable policies and regulations. Applicable Safeguard policies of the World Bank have also been reviewed and summarized.

Step 2: Secondary and Primary data collection and analysis. All the relevant data from secondary sources has been presented geographically & in database format. Identification of issues with different attributes has been further confirmed through stakeholder consultations. This leads to identification of issues, causes and impacts on a broad level.

Step 3: Extent and level of impacts are assessed based on the outputs from the earlier studies.

Step 4: Based on the impact analysis of adaptive and mitigation, activities has been formulated and the Environmental and Social Management Plan (ESMP) has been devised.

Step 5: A monitoring and evaluation (M&E) plan including a list of key environmental and social indicators for monitoring at various levels has been prepared.

Step 6: An institutional assessment has been carried out and outputs of steps 4 and 5 have been mapped with respective institutions so that 'roles' and "responsibilities" for implementation are assigned during implementation.

1.6 Scope of ESA

1. Environmental Assessment will encompass the following:

Review of the key activities undertaken in pre-construction, construction and post construction phase and initial design of proposed 24x7 Water Supply Systems. The study includes review and analysis of available engineering reports. The outcome is further strengthened by discussions with various stakeholders (KUIDFC, KUWSDB, ULBs, Design Consultants, and Transaction Advisors) and is inter-linked to various environmental aspects.

Detailed Environmental Profile of the project city: The available secondary information and primary monitoring / investigations with regards to the physical, biological and socio-economic conditions are collected and analyzed. The outcome includes basic demographic and socio-economic characteristics, existing water supply situation, status of other related infrastructure (wastewater, solid waste, drainage, roads, ground water, etc.). It also describes physical environmental profiling considering air, water, noise, soil quality, attributes at different locations; ecological profiling in terms of aquatic / terrestrial flora and fauna and other environmental features in project areas. This section also entails mapping of physical feature and environment attributes.

Assess base line water quality and health profile of project city: This includes primary sample survey to assess water quality at critical locations of water supply network like source, treatment plant, service reservoirs and consumer points especially in slums and determining associated health impacts of water quality. It also entails soil sampling and inventory of possible locations of cross contamination or leakages duly correlated with existing drainage network.

The health profile and other household information of project city: from available secondary information and adequate primary household surveys, collected and analyzed.

Stakeholder consultations (jointly carried out along with other activities of social assessment) to understand the key environmental, social and health issues associated with current water supply systems and proposed project interventions to guide formulation of EMP and ECoP. Stakeholder Consultation was conducted in the city for identification of issues, impacts and their mitigation.

Policy, Regulatory and Institutional Framework: the environment management plan, its implementation and monitoring is to be reinforced by incorporating all applicable operational policies of the World Bank and environmental laws / regulations in India. It includes review policies, laws and acts regarding environment and analysis of institutional framework in terms of agencies involved in planning, designing, operating and maintaining the project activities and the relevant regulatory agencies, so as to assess the capacity, willingness and resource requirement of the institutions for effective integration / management of environmental aspects

Identification and analysis of key environmental issues: this includes analysis of the base line environmental data collected from various departments in terms of changes in the physical, biological or socio-economic environment and other negative and positive impacts likely to result from the proposed project improvements. It also covers provision of broad alternatives for various sub-components, choices of sites and identifies issues of particular concern for each such alternative / intervention regarding augmentation of water sources, its reliability and sustainability, location and; operation of water treatment plants, pumping stations.

Environmental Management Plan (EMP): The environmental management plan included (a) the recommended mitigation actions and management plan for the potential negative impacts identified; (b) the measures (prevention, mitigation and compensation) complying with the nature, scale and potential of the anticipated environmental impacts; (c) monitoring and supervision plan; and (d) defining roles and responsibilities of all agencies involved (contractors, the project implementation and monitoring agencies).

The measures to be included are both structural and non-structural measures.

The structural measures could comprise of

- Appropriate changes in the designs,
- Protection of physical entities to minimize impacts on ecology and hydrology.

The Non-structural approaches could include

- Construction schedules designed to minimize conflicts and
- Training agencies in principles and methods of environmental protection.

2. Social Assessment will include the following

The scope of work for social assessment will include the following

Review of the experiences from the predecessor project in the demo zones through stakeholder's consultations involving communities and other stakeholders. Experience sharing consultation with ULB staff and officials, elected members - past and present- of the ULBs, staff of Urban Water Supply Board, media, prominent institutions, NGOs, health institutions/service providers etc.

Review of reports on demo zone including (a) Project Appraisal document; (b) Implementation Completion Report; (c) Rapid social assessment and communications strategy; (d) M&E reports; (e) impact assessment study; (f) IEC materials; (g) land acquisition framework; and (h) resettlement action plans.

Socio Economic Profiling: Socio-economic profile includes different caste/religious groups (the dominant and marginal groups), socio-economic profile, occupational categories, gender relations, etc. It also cover analysis of geographical spread of the ULB and its relationship with socio-economic composition of the society with special emphasis on gender analysis.

Baseline survey of sample house holds for key parameters socio-economic profile, current service levels, coping costs, health parameters, an assessment of willingness to pay and ability to pay.

Indigenous people: Identify any indigenous people; examine the applicability or otherwise of the Bank's Operational Directive on Indigenous Peoples (OP 4.10). If the policy is found applicable on indigenous group, prepare a tribal development plan that meets the requirements of Bank policy.

Land Acquisition Requirements: It covers review existing R&R framework and update in consultation with KUIDFC. Identification of land acquisition requirements and develop the process and framework for land acquisition, compliance with provisions of the Bank's OP/BP 4.12 on involuntary resettlement. For land acquisition which may take place in the first eighteen months, the consultant will prepare Social Management Plan, following the Projects Social Management Framework, OP 4.12 and new LA and R&R Act 2013.

Stakeholder Consultations: It covers primary stakeholders, elected representatives, ULB officials, other Government departments, eminent citizens, other opinion makers and the general public. Stakeholder Consultation includes: (a) semi structured interviews, (b) PRA methods, (c) direct observation, (d) focus group discussions, and (e) secondary literature review.

Resettlement Policy Framework (RPF): Outlines Resettlement Action Plan (RAP) addressing key social issues; presents entitlement matrix for the project, poverty/gender/tribal development frameworks; road map for carrying out specific social Assessment and Rehabilitation Action Plans for each of these activities, Terms of Reference for preparing these RAPs.

Resettlement Action Plan (RAP): This includes Resettlement Action Plan (RAP) addressing key social issues, land acquisition; entitlements as per SMF and also poverty/gender/tribal development plans as required for the project.

3. Environmental Code of Practice (ECoP) for 24x7 Water Supply Systems

ECoP provides guidance in integration of environmental concerns during design, implementation and operation of water supply project (KUWSMP).The ECoP essentially covers code of practice for each activity and sub activity in project development cycle. It recommends mitigation measures for negative environmental impacts; provides specific guidance for good practices (with support information on type designs / drawings / lay outs, etc.) with examples; and specific environmental enhancement opportunities in terms of selection of suitable designs, technologies (for WTPs), opportunities for energy efficiency, conservation of water resources (including reuse / recycling).

It provides details of reference and resource materials; training and capacity building requirements; and general codes of practice for planning and design, construction, supervision and monitoring and operation of 24x7 water supply projects.

Chapter 2: Study Area and Project Description

2.1 Belagavi City and its Characteristics

Belagavi (earlier name Belgaum, name changed on 1st Nov 2014) is the fourth largest city of the state of Karnataka, the first three being Bangalore, Mysore, Hubli – Dharwad. The project city lies between 15.87°N 74.5°E. It has an average elevation of 751 metres (2463 feet) and comprises in 58 Municipal administrative wards with a total area of 94.08 Sq.km which is shown in **Figure 2.1.**

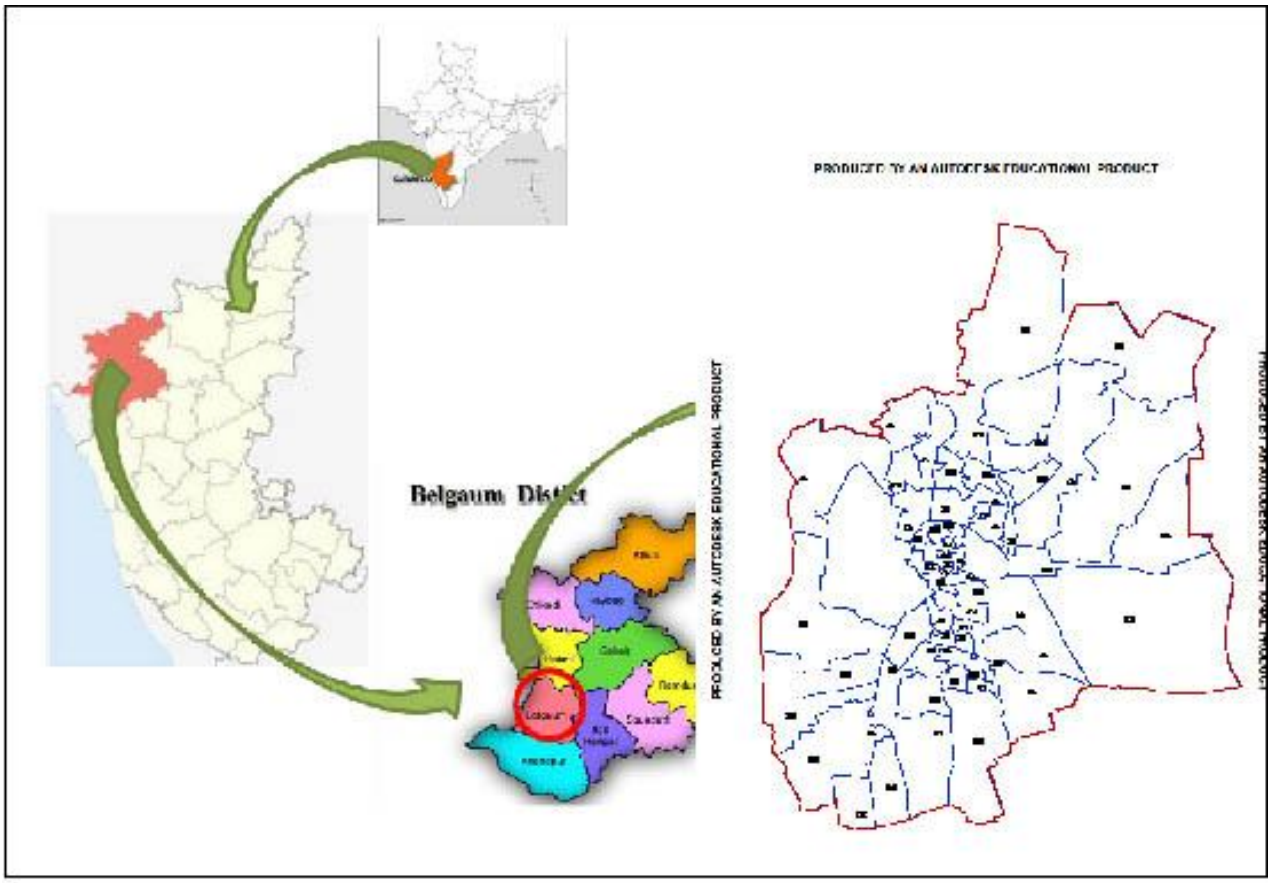


Figure 2.1: Location Map

Table 2.1: Fact File

Sl.	Attributes	Details
1.	Population 2011	4,90,045
2.	Total no. of hoseholds	1,11,874
3.	Area Belagavi Municipal Corporation	94.08 sq. km
4.	No. of Wards	58
5.	Population Decadal Growth rate (2001-2011)	22.19%
6.	Population Density (2011)	5190 person per sq.km
7.	Literacy Rate	80.2%
8.	Sex Ratio	936
9.	Economy	Tata Power, INDAL & Udyambag Industrial Estate

(Source: Census of India, 2011 and ULB records)

*(Ward Wise Population Projections is presented in **Annexure V**)*

Population

With regard to growth trends, the city has grown rapidly with a decadal growth rate of 22.19 %, which has increased from 8.24% in 1991-2001 and currently houses a population close to five lakhs. Administered by the Municipal Corporation, Belagavi is divided into 58 wards and presents a density of 5190 persons per sq.km.

Ward numbers 54, 40, 43, 11, 51, 50 and 42, are most populated wards, while ward number 60, 59, 44, 39 and 25 are least populated. Population in wards vary from 800 to 19500. The total SC population was found 38404 which were 8 percent of the total population and total ST population was found 15997 which was 3.3 percent of the total population. Proportion of SC /ST in wards varies from 1 percent to as high as 48 percent. Ward number 50, 51, 11, 43, 40 and 54 have highest proportion of SC/ST population (more than 22 percent). Nearly 20 percent of the total population is illiterate. The proportion of illiterate population in wards varies from 10 percent to 32 percent. Maximum illiteracy was observed in Wards 57, 56, 50, 54, 13 and 14.

Table 2.2: Population Growth trends and density – Belagavi

Year	Population	Growth Rate (decadal - %)
1951	1,01,110	-
1961	1,27,885	20.94
1971	1,92,427	33.54
1981	2,74,430	29.88
1991	3,69,177	25.66
2001	3,99,600	7.61
2011	4,90,045	18.46

Source: Census of India, 2011 & Belagavi Municipal Corporation)

Economy and Industry

Popularly known as the “Cradle of Infantry”, Belagavi houses defence establishments such as Military Training Centre and Air Base, besides major industrial establishments such as Tata Power and Indian Aluminium (INDAL) Factory. Indian Aluminium Company (INDAL), Tata Power, Gogatae Textiles, Markandeya Sugar Works are the major industries of the city. The several numbers of small-scale industries (like weaving mills, foundries, hydraulic machineries etc.), shopping complexes and business activities show the good economic condition of the city.

Belagavi is the commercial hub and divisional headquarters of north Karnataka and ranks second to Bangalore in terms of overall exports (mainly related to the automotive industry). It has been centre the manufacture of heavy machine tools, including the manufacture of high pressure oil hydraulics systems since 1970s. It has 200 foundries which produces more than 70,000 tons of automotive and industrial castings of ferrous base and supporting ancillaries like CNC and conventional machine. With 50,000 powerlooms Belagavi is a measure textile hub of the state. It is also famous for sarees which are sold under different brand names.

Around 30,000 people are directly dependent on the power looms. There are also ready-made garment units, some of them export oriented, besides those manufacturing Khadi

cotton products. Apart from these industries, a number of educational institutions and the cantonment contribute significantly to the economic growth of the city.

A 300-acre (1.2 km2) Special Economic Zone is being set up along the Pune-Bangalore highway to cater to the precision engineering requirements of the global aerospace, automotive and industrial verticals.

Total work force of the town was found 35 percent comprising of 171287 persons. Total main workers 155589 persons constituting 90.8 percent of the total work force. Main workers in wards range from 25-40 percent. About 92.46 percent of the total work force is engaged in other services, 2.99 percent work force is engaged in agriculture sector and remaining 4.54 percent work force is engaged in house hold industries.

Transportation services

Road: Belagavi is connected by road via the National Highways 4 (connecting Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu) and 4A (connecting Karnataka and Goa). NWKRTC run buses to all corners of Karnataka as well as neighbouring states. There are many prominent private bus servers to all major destinations in Karnataka and surrounding states. The length of the type of roads is Cement Concrete 15 km, Black Topped 578 km, Surface Roads 159 km and total length of the road is 615km

Air: The airport currently serving the city is Belagavi Airport at Sambra, located at 10 km from the city on SH20. Schedules have been erratic, as the air connectivity is primarily provided by feeder airlines. Belagavi currently has regular flights to Mumbai and Bangalore.

Rail: Belagavi is on the main Indian Railways grid being part of south western division and is well connected by rail to major destinations such as Bangalore, Mysore, Mangalore, Pune, Mumbai, Hyderabad, Goa and New Delhi. Belagavi railway station is oldest in this region.

Tourism and attractions

Belagavi is 502 km from Bangalore and 154 km from Panaji. Nestled in the foothills of the Western Ghats, it enjoys a cool, salubrious climate and is surrounded by natural beauty in the form of rivers, hills and dense evergreen forests. In the vicinity there are popular tourist's places like Amboli, Sindhudurg district and Jamboti.

A wide variety of historical sites, temples and churches exist in and around the city, most notably the Kamala Basti fort, Kapileshwar temple (South Kashi), the hills of Vaijyanath, Ramtirth waterfalls, Revan Siddeshwr Temple at Hunshevari in the valleys of Kakati, Siddeshwar Temple in Kanbargi, the aerodrome at Sambra, and others.

In and near the city are: Belagavi Fort, a huge construction in the center of the town. It dates back to 1519. The foundation of the Suvarna Vidhana Soudha, a legislative administrative office complex, was laid in Belagavi in August 2007 to celebrate the golden jubilee celebrations of the unification of Karnataka. Kamal Basati is a Jain temple and Safa Masjid is located within the walls of Belagavi fort. One can also visit Buthramanhatti Park, Hidkal Dam, jungles, and many waterfalls quite close to the city.

2.2 Current Water Supply System[2]

This section reviews and highlights the key activities and design parameters of the proposed 24x7 water supply systems in the city, based on the available **Feasibility Report** (Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water

[2] Secondary information from Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belagavi; *Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd*

Supply To Cover Entire Corporation – Belgaum; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.).

Currently about 104 MLD' of water at 135 lpcd is supplied to Belagavi City mainly from two sources namely, Rakaskop Reservoir and Hidkal Reservoir. . Numbers of interventions are proposed within the city in place of existing water supply infrastructure. All pipe lines will be relaid in place of the old pipe lines.

*(Availability of water supply system was analysed and as presented in **Annexure VI**)*

2.3 Source of Water Supply & Sanitation Status

Water is supplied to Belagavi City mainly from two sources namely, Rakaskop Reservoir and the Hidkal Reservoir. Numbers of interventions are proposed within the city in place of existing water supply infrastructure all pipe lines will be relayed at the old pipe line place which is shown in Figure 2.2 and flow diagram is shown in Figure 2.3.

1. Rakaskop Water Supply Scheme

The Rakaskop Reservoir is located on the western part of the city. At present water is drawn at a rate of 45.45 MLD against a designed discharge capacity of 54.45 MLD. During 2008-2009, a new gravity pipeline of 1100mm diameter (15.3 km.) was laid to Hindalga pumping station. Flow of the water was governed by gravity. Further a new Ductile Iron pipeline about 3.0 km. was also laid which serves as pumping main between Hindalga pumping station to water treatment plant at Laxmitek.

Scarcity of water is experienced due to frequent drying up of reservoir due to less rainfall in the catchment area. Assured available water supply from this source is 40-45 MLD. Thus, it is not considered as a reliable source of water.

2. Hidkal Water Supply Scheme

Hidkal Dam is constructed across Ghataprabha River on the northern part of the city, at distance of about 52km. It serves as a major source of water to Belagavi city. An intake well is constructed on the downstream of the Hidkal Dam. A RCC pipe of 1200 mm diameter has been laid to carry water from intake chamber inside the River to Jack well situated on right bank of the river. Raw water from Jack well pump house is delivered to the Ground Level Reservoir (GLR).

Water from the GLR flows through gravity to the intermediate pumping station located at Kundargi which is about 6.43 km away. The GLR is connected to this pumping station by a PSC gravity pipeline of 900 mm diameter of length 6.18 km and a MS gravity main of 1000 mm of length 0.25 km. The second intermediate pumping station is located near Tummarguddi village about 16.5 km away from Kundargi pumping station. The two pumping stations are connected with a MS pipeline of diameter 1102 mm (about 11.5 km length) and PSC pipe of diameter1200 mm (about 5.0 km length).

From Tumarguddi the water is pumped to Chandur Hilllock through a Mild steel rising main of diameter 1100 mm and length of about 2.95 km. A MS gravity pipeline of 1100 mm diameter and 12.2km length carries flow from Chandur Hillock to Kanburgi. The water from Kanburgi is conveyed till bifurcation point near INDAL through a MS gravity main of diameter 900 mm with 2.94 km length. The water from bifurcation point is supplied to some small scale industries promoted by KIADB, Tata power, KLE Society and Markandeya Sugar works. A mild steel gravity pipeline of diameter 698 mm and 8.4 km long carries water from bifurcation point near INDAL to water treatment plant at Laxmitek. Proposal is to increase water intake from 81.72 MLD to 121.72 MLD (as increase of 40 MLD) from this source to cater to the future population of the town.

3. Ground Water Source

About 624 numbers of bore-wells are operational in the town. 167 bore-wells are having power pumps and about 488 bore-wells are with hand pumps and supplying 4.55 MLD water to the city.Due to scanty rainfall during last few years, the ground water is dwindling and causing failure of hand pumps. Ground water is available at a depth of approximately about 30 m to 75 m (100ft to 250ft). Separate tanks have been constructed near the bore-wells where single phase pumps have been installed. These pumps lift water to the nearby tank (common tank).

*(Availability of water in these reservoirs was analysed and as presented in **Annexure VI)***

2.3.1 Water Treatment Plant

At present there is one Water treatment Plant of 68.2MLD capacity, in the town, located at Laxmitek. Another Treatment Plant at Basavankola is proposed with an installed capacity of 80 MLD to cater to future requirement.

2.3.2 Clear Water Pumping System

At present there are 10 Clearwater pumping station under operation. In the final reorientation design it is proposed to retain only 2 clear water pumping stations. The remaining eight stations are proposed to be abandoned.

2.3.3 Water Distribution Pumping Station

There are ten water distribution pumping stations. The town is divided into two Zones – North and South, out of which five are in northern zone and five are in southern zone of the city.

2.3.4 Service Reservoir

There exist 14 Elevated Service Reservoirs, 6 Ground level service reservoirs and 10 Clear water reservoirs in the city.

2.3.5 Distribution System

About 104 MLD of water is supplied to the city population.The city is divided into 58 Municipal administrative wards and the existing distribution of water is done through 6 GLSR's and 14 ESR's . Totally 30 water supply distribution zones have been formed for the equitable distribution of water.

2.3.6 Distribution Pattern

The city water supply distribution network was carried out during early 1970's. At present, water supply to the city is carried out once in three days for a period of 2 hours. In few areas viz. Azad Nagar, Malaprabha Nagar, Vadagaon, Majgaon, Market, people use online pumps for drawing water during supply hours due to non-availability of adequate pressure in the network.

2.3.7 Consumer Connection

The Belagavi city is having 50817 numbers of domestic water supply connections and 266 numbers of commercial connections. The City has a 24x7 water supply system for a portion of the area executed by KUIDFC and being operated by a Private Operator. Connections in this demonstration zone are by 100% metering system..

2.4 Existing Sewerage System

Corporation has implemented sewerage scheme in Belagavi city in the year 1965. The entire Belagavi city has been divided in two sewerage zones viz. North and South zones all sewerage

zones are drained by network of drains carrying sewage through gravity to the Nalla, namely Kotekere Lake, Lendi Nala and Bellary Nala.

The total length of existing sewerage network including the private layout, implemented by corporation, KUWSDB is approximately 337 km with about 69892 HH connected to sewer lines with capacity of proposed STP is 64 MLD and there is no existing STP facility in Belagavi city .

In addition to the above facilities, the city population has individual sanitation facilities such as septic tanks (28,466 households) and other sanitation arrangements. It is estimated that about 100374 households (91.95%) of the total 109,159 households have sanitation facilities. The remaining 8,785 households hence would require sanitation facilities.

2.4.1 Existing Sewage Treatment Plant

Presently Belagavi city is not having any sewage treatment plant.

2.4.2 Proposed Sewerage System for the City

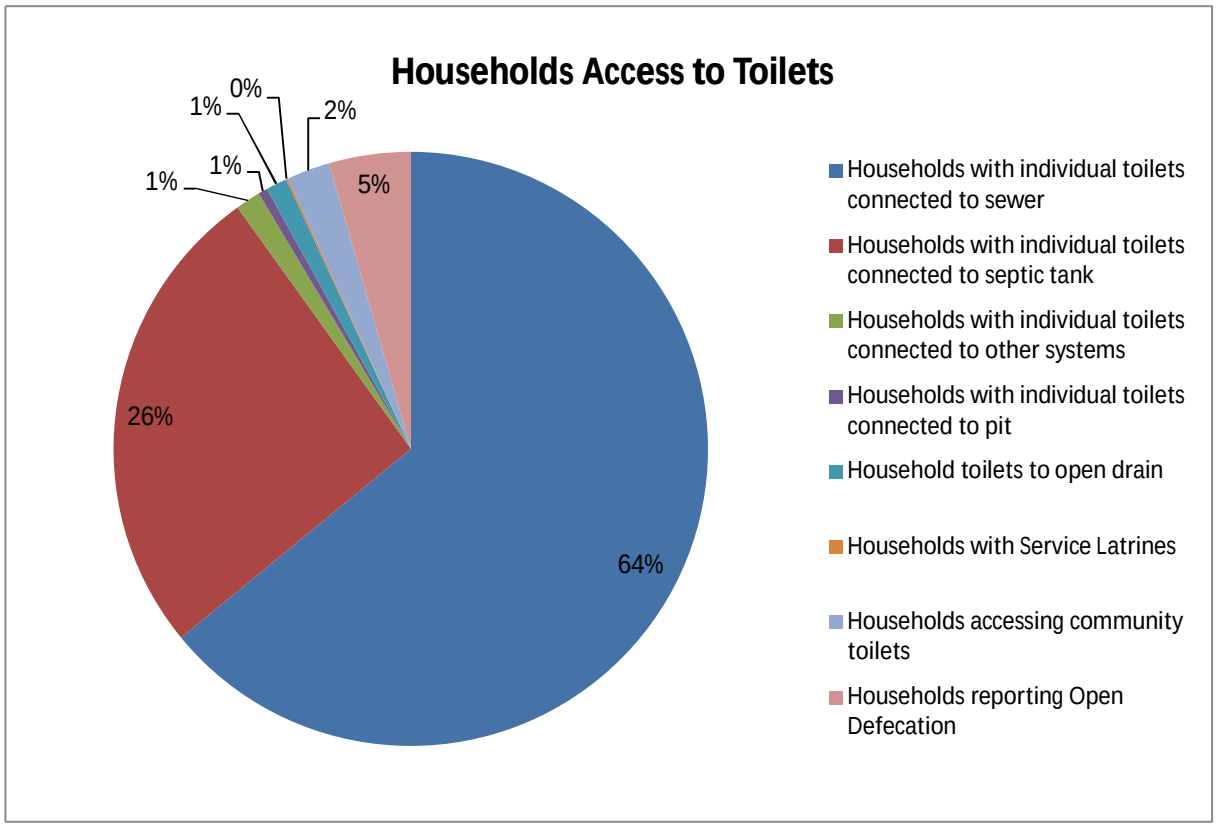
In order to improve the sewerage facilities in the city, a sewerage scheme comprising 275 km of additional network and a STP of 64 MLD was proposed as part of the ADB supported North Karnataka Urban Sector Improvement Project (NKUSIP). He project is not being implemented due to non availability of land for STP. With this proposed system, the city will be covered with 64.02% of sewerage connection. Only 35.98% of the households need to be addressed for the implementation of 24x7 water supply.

2.4.3 Sanitation Facilities Belagavi

Sanitation facilities in Belagavi as per 2011 census data indicate that 64.02% households are having individual toilets which are connected to sewer lines and 31.53% toilets are not connected to sewer lines.

2.5 Existing Storm Water Drainage System

Belagavi at present has around 30% storm water drains. The existing storm water drains are not maintained periodically. Silts and debris are a common sight in many of the existing drains. Due to undulating terrain and non-availability of proper drainage system the city has witnessed floods in the past few years. Water logging is a common sight in the low line areas. These low line areas are generally occupied by slum dwellers which add to the woes of the hygiene conditions. Water borne diseases are commonly reported during these periods. By the implementation of 24x 7 system water is supplied to the consumer in pressurized system. The distribution system is expected to be free from contamination and ingress of external water. Due to water logging in these low line areas during rainy season the region may pose serious threat to the quality of the water being delivered in the event of pipe burst. Hence it is recommended that the concerned authorities to provide a scientific means of collection and disposal of drainage for the city



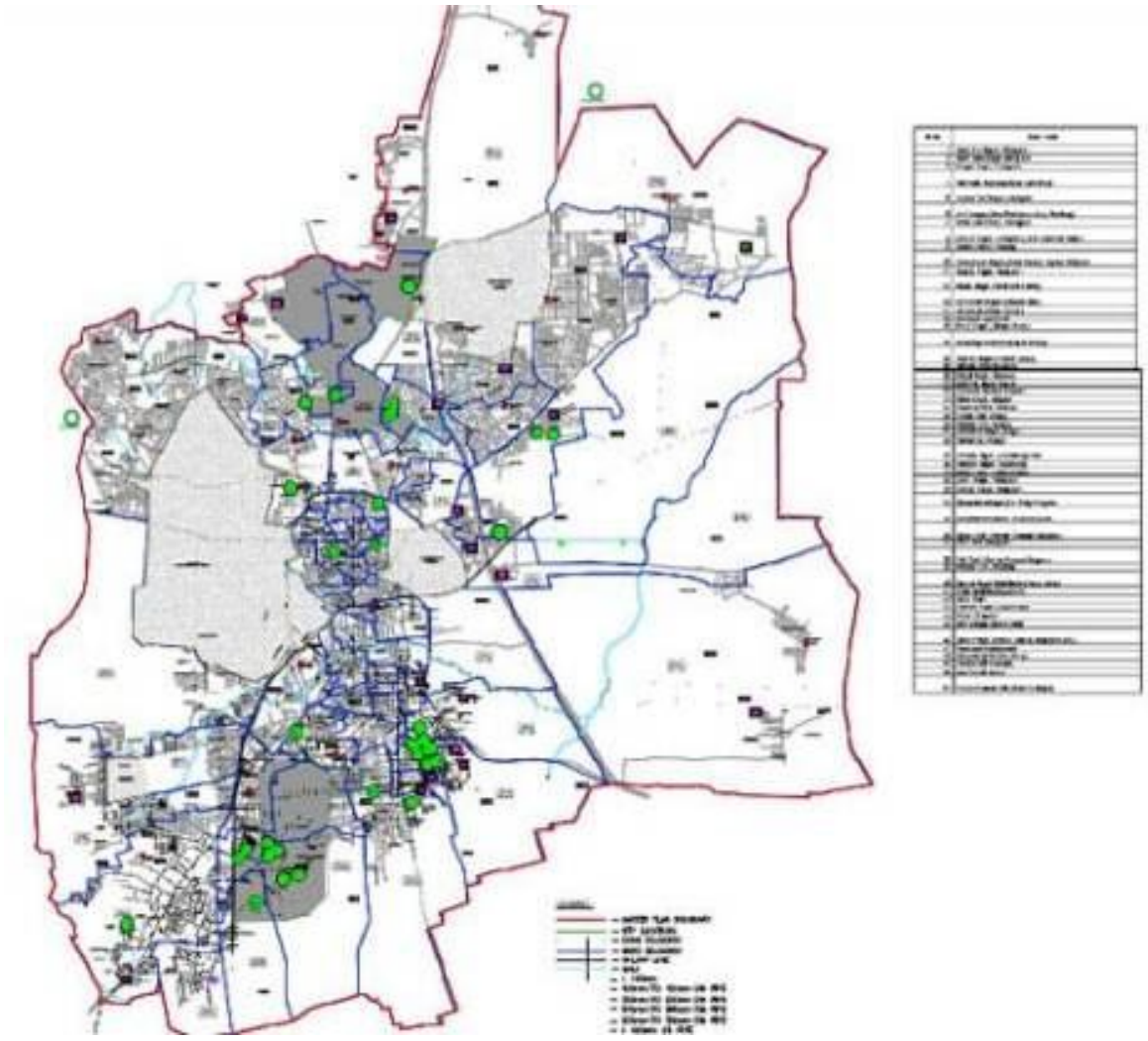


Figure 2.2: Existing Water Supply System and Sanitation

2.6 Study of Alternatives[3]

The Project Report addressed many technical issues pertaining to the Water supply component with respect to the Existing system, its conditions, and rehabilitation requirements, necessity of additional infrastructure requirements, Project area, and water demands for various consumers like Residential, Non Residential and Industrial users.

The existing piping system in the distribution and Transmission system was analyzed with respect to the existing field conditions, present O&M practices through interactions with the concerned line man/ section officers, Laboratory test reports and its probable impact with respect to the 24x7 up-scaling was analyzed. Based on the above aspects, its probable integration with the proposed system was analyzed and accordingly conclusions were drawn. The present available bulk water supply to the city is about 109MLD which can be up-graded to 136 MLD by upgrading the pumping machineries of Hidkal scheme.

Based on the average consumption of water in the city and the number of legal connections it was estimated that present NRW/ UFW of the city was about 56.05%. At most importance must be given for the reduction of UFW/NRW to the national standard of 15%. Possibilities of implementing the 24x7 through alternate approaches were carried out to find out other viable means of implementation such as:

2.6.1 Reduced Per-capita supply

Reduction in per capita supply from normative 135 LPCD to 100LPCD including the bulk supply system

2.6.2 Improved Operational Duration

The present operational durations of pumping stations and treatment plants are about 20 hours a day. Analysis was carried out to assess the quantity improvements by increasing the operational durations of pump stations to 22 hours and 24hours a day respectively.

Bulk Quantity enhancement of the transmission main was analyzed by replacing the existing pumping machinery to higher capacity pumps. The impacts on the initial capital investments and the increased O&M expenses were also analyzed.

2.6.3 Distribution System Integration

It is observed that about 26% of the project cost is estimated for the distribution network improvements only. Almost all distribution pipe is proposed for replacement that was arrived based on the analysis carried out both in the site and at the laboratory and have also analyzed other available options for project improvements in the Distribution system. The technology availability on pipe rehabilitation and its usage for the present scenarios were explored.

- Option-1: Complete replacement of the distribution network
- Option-2: 25% replacement of the existing distribution network
- Option-3: 50% replacement of the existing distribution network
- Option-4: 75% replacement of the existing distribution network

Emphasis was mainly on the UFW reductions, DMA formations, Pipe leakage repairs and rehabilitation etc.

*(Detailed analysis report for alternatives is provided in **Annexure 1)***

[3] Secondary information from Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belagavi; *Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.*

2.6.4 Conclusions on alternative Studies

Various possible alternatives have been analysed for the improvements in the system both in terms of the Bulk water supply and distribution system our conclusions and recommendations are as follows:

Per-capita consumption analysis: Considering increasing economic standards of the city and community demand for adequate water supply, a per capita supply level of 135LPCD was considered for up-scaling the water supply in Belagavi.

Bulk water supply: Various viable options of bulk improvements have been analysed with respect to the increase in hours of operation for Pumping stations and treatment plants. The possibility of overloading the treatment plants, replacements of existing pumping machinery was also analysed. Upon careful analysis of the system, it is observed that source reliability, power reliability along with the probable O&M expenses plays a major role in accepting the preferred alternative.

Under the given circumstances, it was felt that 20 hours operational durations of Pumping stations and treatment plants, along with balance demand can be extracted from the Hidkal source would be the ideal situation for Belagavi city.

Distribution system: Various alternatives for the existing distribution system integration have been analysed and techniques for UFW reduction, pipe rehabilitation works were also studied. Upon careful analysis of the alternatives, the KUWASIP-Consultants recommend that complete replacement of the existing distribution system for the following reasons.

- Rehabilitation of the existing system has constraints such as minimum diameters, straight stretches of pipe lines, etc. apart from time consuming process and may not be an economical option. This also requires details of underground assets mapping of various utilities.
- The behavioural characteristics of the pipes when subjected to 24x7 water pressure are unknown. This may have serious impact when 24x7 system is implemented.
- The end results of the pipe network after rehabilitation depends on the quality of the workman ship and the technology involved. There are every chances of quality compromise when implemented to such a large extent.
- The residents of the area would be severely affected due to stoppage of water supply, blocking and digging of roads during the rehabilitation works.
- UFW reduction programs is a time consuming process involving formation of DMA, carrying out water balance analysis, leak detection studies, repair of leaks. This is an iterative and continuous process to be carried out until the desired levels are achieved. The time factor plays a critical role in the overall process.
- This aspect will be further analysed by the operator and distribution system will be re-designed with optimum use / replacement of the distribution system.

2.7 Demand Projection

Proposed water supply system has been designed based on the design criteria and demand projections. The demand projection worked out as the design criteria for the project horizon has been as indicated below:

Table 2.3: Water Demand Projection

Sl. No	Description	Demand (mld)				
		2011	2021	2026	2031	2041
1	Domestic	76.88	92.18	100.37	108.93	127.13
2	Fire	2.66	2.92	3.04	3.17	3.42
3	Industries/ Bulk	10.05	10.05	10.05	10.05	10.05
4	Existing bulk pure water consumers	9.05	9.05	9.05	9.05	9.05

(Source: Page 72, 74 and 88, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belgaum; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

2.7.1 Source Studies

The population of the city is expected to reach 7,26,201 by the year 2031 and 8,47,534 by the year 2041 as per population projections. The present treated water requirement is about 106 MLD and this demand will be 138 MLD by the year 2031 and 155 Mld by the year 2041. The present supply is about 100 Mld from surface sources and about 4.55 Mld from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 155 Mld (57.24 Mcum per year).

The project proposes to utilize 54.45 MLD of water from Rakaskoppa reservoir and 121 MLD from Hidkal reservoir to meet future water requirements of the city. *Availability of water in these reservoirs was analysed and is presented in* ***Annexure VI***. 175 MLD of water is available to meet the requirements of

2.7.2 Water Treatment Plant

The water treatment plant requirements are worked out based on the demand estimation. The existing treatment facility available has been reviewed and a phase wise requirement of WTP has been worked out and the details are as indicated in Table given below.

Table 2.4: Treated Water demand for the Belagavi city

Sl No	Water Treatment Plant	Years				
		2011	2021	2026	2031	2041
Water Treatment Capacity Required in MLD						
1	Laxmitek	37.07	42.43	45.36	48.42	55.52
2	Basavankola	49.91	59.86	64.20	70.64	80.85
	Total	**86.99**	**102.29**	**110.55**	**119.06**	**136.38**
	Existing pure water bulk consumers	9.05	9.05	9.05	9.05	9.05
	Industrial pure water demand	10.05	10.05	10.05	10.05	10.05
A	**Grand total**	**106.09**	**121.39**	**129.65**	**138.16**	**155.48**
Existing Water Treatment Capacity in MLD						
1	Laxmitek	68.20	68.20	68.20	68.20	68.20

2	Basavankola	-	-	-	-	-
B	**Total**	**68.20**	-	-	-	-
Proposed Water Treatment Capacity in MLD						
1	Laxmitek	68.2	68.2	68.2	68.2	68.2
2	Basavankola	50.00	60.00	65.00	70.00	87.00
C	**Total**	**118.20**	**128.20**	**133.20**	**138.20**	**155.20**

(Source: Page 88, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belgaum; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

2.7.3 Storage Capacity

Reliability on availability of water is the most important aspect of the 24x7 system. Hence TCE Project Report have suggested to provide about 50% of the daily requirements as the storage to be provided in the reservoirs at various locations in the system to cater to the fluctuating needs of the system. About 35% of the demand requirements are proposed to be stored in the service reservoirs. The balance 15% is proposed to be stored in Ground level tanks near the Treatment plant areas.

Table 2.5: Storage requirements of Belagavi City

Sl No	Description	Total Demand (MLD)	Storage Capacity (ML)	Remarks
1	Service Reservoirs	148.00	52.00	
2	GLR at Lakshitek	68.20	10.00	In WTP area
3	GLR at Basavankolla	80.00	12.00	In WTP area
	Total		**74.00**	**50% storage**

(Source: Page 95, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belagavi; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

The above approach can take care of the following fluctuations.

- Minor Disruption in the Raw water Pumping stations, treatment plants
- Fluctuations in demand

2.7.4 Pumping System

Additional clear water pumping station is proposed for the Belagavi city. Many of the existing pumping stations have been used. The details of the observations for the pumping stations are provided in the TCE Project Report.

Existing Clear water pumping station at Mal Maruti is found to be in good condition apart from small maintenance issue like the plastering, water proofing and painting, rehabilitation of the pump pits etc. Hence, the pump station has been integrated with minor rehabilitation works into the proposed scheme. The existing Utsav Hotel pump house in RC nagar area is found to be in good condition. Hence has been suggested for integration with minor rehabilitation works.

Table 2.6: Details of clear water pump stations

S. No.	Location	Remarks
1	Shrinagar Clear Water Pumping station at Mal Maruti area	Existing
2	Utsav Hotel Clear Water Pumping station at RC Nagar area	Existing
3	Clear Water Pumping station Near freedom fighter colony at Ganeshpur area	Proposed

(Source: Page 95, Project Report- Final, Karnataka Urban Water Sector Improvement Project- Upscaling 24x7 Water Supply To Cover Entire Corporation – Belagavi; Tata Consulting Engineers In association with SREI Infrastructure Finance Ltd.)

2.7.5 Clear Water Transmission System

The entire project area has been further divided into different command area of the treatment plants based on the topography; physical boundaries and other man made features such that the system flows by gravity and feed the service reservoirs.

The existing clear water transmission main was laid about 30 years back and the supply pattern is not uniform and pipes are found to be very old and many tapings were observed, hence existing transmission main is discarded completely. The existing 508mm dia MS pipe from Laxmitek WTP to Gummatmal GLSR has been retained based on its present condition.

2.7.6 Local Distribution System

The distribution system network is divided into 30 zones for the equitable distribution of water. The command of the existing ESR and its pressure at the tail end points has been analyzed, accordingly the requirement of additional Reservoirs have been worked out. Accordingly 30 zones have been formed for the equitable distribution of water. Each zone is planned to be fed with a service reservoir. Interlinking of the zones has been formed at the boundary with a valve which shall be operated during emergency only. The summary of the distribution pipe network is provided in table given below.

Table 2.7: Summary of distribution network

S. No.	Summary	Length (KM)
1	Total Road Length	686.00
2	Total Pipe Length (suggested)	724.00

(Source: Page 95, TCE Project Report)

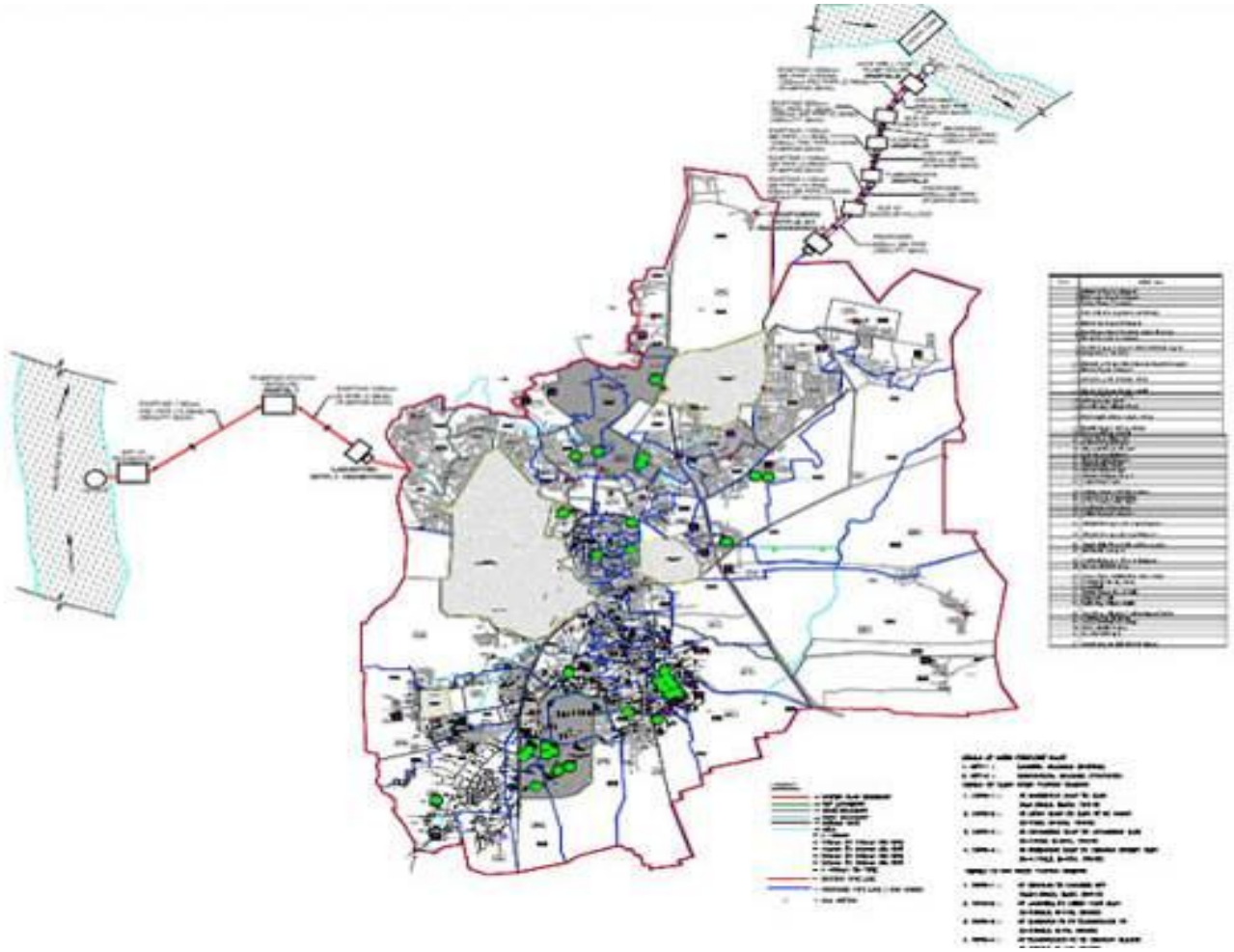


Figure 2.3: Flow Diagram of Water Supply – existing and proposed

2.8 SCADA

The SCADA system shall be used for effective monitoring of water supplied and consumed. In this contest flow meters are proposed to be installed at inlet and outlet of WTP, pumping station, reservoirs and DMA. Flow and pressure information measured at these locations will be transferred through GPRS/GSM wireless technology and will be stored at a central location. It is proposed to set up a SCADA unit at the corporation office/SPV. This would help in monitoring the water supplied and consumed at various stages of distribution.

Chapter 3: Legislative, Regulatory & Policy Framework

3.1 Introduction

The chapter reviews various policies, regulations and administrative framework within which "Karnataka Urban Water Supply Modernization Project" (KUWSMP) is to be implemented. It includes operational policies / directives of the World Bank, sector-specific Environmental and Social Policies & Regulations of the Government of India and the institutional profile of various agencies such as KUIDFC, KUWSDB, Project Local Bodies, KSPCB and other bodies associated with the project.

Policy and regulatory frameworks at national and state level have been formulated to provide for social and environmental safeguards in the last two decades. The policy framework includes in particular water sector related policies and policies related to environmental safeguards, both at the national and state level. Sector policies include Constitutional Provisions, National Water Policy and State Water Policy. Environmental & Social Safeguard related policies include National Environment Policy, National Forest Policy, State's Forest Policy & National Policy on Resettlement & Rehabilitation, State Resettlement & Rehabilitation and Karnataka Urban Drinking Water and Sanitation Policy. The EIA notification of 2006 forms the basis of environmental & social assessment of water resources project in Country as well in State of Karnataka. Wherever land acquisition is involved, Social Impact Assessment and R&R Plans are mandatory as per new LA and R&R Act 2013. Detailed review on various applicable policies and legislative framework has been discussed in the inception report and this section would just highlight the necessary protective measures.

3.2 Applicable Policy, Rules & Regulations to project interventions/activities: Environmental

3.2.1 EIA Notification

EIA is Guidelines for environmental impact assessment governing all development interventions that take place within the boundaries of India provided by the Government of India. EIA notification was first issued by Ministry of Environment and Forests (MoEF) in 1994 and later amended in 2002 and 2006. Under the latest EIA Notification, 14th September 2006, all projects listed in Schedule -1 of the Notification require prior environmental clearance. The objective of the notification is to formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage
- Involve stakeholders in the public consultation process
- Identify developmental projects based on impact potential instead of the investment criteria.

As per new notification, Category A projects require submission of EIA report as per issued Terms of Reference (ToR) by national environmental appraisal committee and public consultation before getting environmental clearance from Expert Appraisal Committee (EAC), MoEF while Category B projects require clearance from State's Environmental Appraisal Committee (SEAC)/SEIAA. Since the activities currently contemplated in this project fall under the rehabilitation & modernization project, this notification appears not to be applicable. ***However, environmental and social due diligence needs to be carried out,***

while preparing detailed project report for rehabilitation and modernization sub components.

3.2.2 Legal Framework of Government of India for Environment Compliance

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 is umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment and Forests (MoEF), Government of India and the Central Pollution Control Board (CPCB)/ State Pollution Control Boards (SPCBs).

3.2.3 Key Environmental Laws and other related Regulations

The key environmental laws and regulations as relevant to the investments under the project are given in the table below. The key environmental regulations can also be accessed at www.moef.nic.in/rules-and-regulations.

Table 3.1: Applicable Environmental Laws and Regulations

Rules & Regulation	Major Provisions	Remarks
The Environmental Protection Act, 1986	Chapter 1, Item 2 Chapter II, Item 3 (1), (2) Chapter III, Items 7, 8, 9, 11, 15, 17 Environment (Protection) Rules 1986, Item 3	Umbrella act applicable for all activities. No specific approvals / clearances required..
The Water (Prevention and Control of Pollution) Act, 1974	Chapter 1, Item 2, Chapter V, Item 24, 25, 26, 28, 31, 32, 33, Chapter VII, Item 42, 43, 44, 45, 46, 48, 49 Water (Prevention & Control of Pollution) Rules 1975, Schedule IV	Applicable for the construction facilities such as labour camps, concrete batching plants, etc..
Forest Conservation Act 1980, and 1988 amendment	Item 2, 3 (A), 3(B) Forest Conservation Rules, Item 2, 6, 7, 8, 9	Not Applicable, as no forest land would be acquired.
Wildlife Protection Act (1972) (as amended up to 1993)	Item (24), (14), (15), (16), (17), (23), (24), (25), (26), (27), (28), (36), (37), Chapter 3, Chapter 4, (Part I, Part II, Part III, Schedule I, Part IV), Schedule II (Part I, Part II), Schedule III, (Part IV, Part V & Part VI)	Not applicable; No protected area is close to present activity.
The Air (Prevention and Control of Pollution) Act, 1981	Chapter I, Item 2, Chapter IV, Item 19, 20, 21, 26, 28, 29 National Ambient Air Quality Standards Schedule VII of EPA Act	Applicable during the construction phase e.g. operation of batching plant if required.
EIA notification dated September 14, 2006	Rule 2, Rule 3, Rule 4, Rule 5, Rule 7, Schedule 1 (c)	Not applicable
Noise Pollution (Regulation and Control Act) 1990	Sections 3, 4, 5, & 5A	Applicable for construction phase
The Municipal Solid Wastes (Management	Item 3, 5, 7, 9, Schedule 2, Schedule 3, Schedule 4	It will be applicable during the construction phase e.g. from

Rules & Regulation	Major Provisions	Remarks
and Handling) Rules, 2000		Construction Camp, disposal of construction debris and operation phase for the WTP sediments
Hazardous Wastes (Management & Handling) Rules, 2008	Chapter 1, Item 2 Chapter II, Item 4 (1)	Applicable during both construction and operation phase.
National Water Policy,2012	Clause 1.3 (iv & ix), 3.1,3.2, 3.6, 5 (5.1 to 5.4), 6.1, 6.2, 6.3, 7 (7.1, 7.2, 7.3 & 7.4), 8,2, 8.3, 9.6, 10, 11.3 & 11.5	Applicable in both construction and operation phase
National Environment Policy, 2006	Sub-Section 5.2.5 (i & ii), 5.2.8, 5.2.9, 5.2.10, 5.6 & 5.7	Application is restricted for mainstreaming and not required for clearance from Competent Authority.
National Forest Policy, 1988	Clause 4.4.1 & 4.8.1	Applicable only if forest land involved; unlikely as both existing and proposed water supply pipeline are part of project, which do not pass through any forest areas
National Policy on Resettlement & Rehabilitation, 2007	Chapter 1, Item 1 (1.1), (1.4), (1.6) and (1.7) Chapter II, Item 2 (2.1) Chapter III, Item 3 (3.1) Chapter IV, Item 4 (4.1 4.2.1, 4.2.2, 4.3.1, 4.3.2 and 4.4.1) Chapter VI (6) Chapter VII (7) Chapter VIII (8.1 & 8.2)	The proposed project rehabilitation and modernization is unlikely to involve any need of resettlement and rehabilitation (R&R).
Karntaka Preservation Tree Act, 1976	Chapter 1 & 5	Compensatory action as per the act shall be done
Manufacture, Storage and Import of Hazardous Chemicals Rules 1989, amended 1994 and 2000	Part I, II Column 2, 3, 4 Schedule I, II, III, IV, V, VI, VII, VIII, IX, X	The Rules provide indicative criteria for hazardous chemicals and require occupiers to identify major accident hazards and prepare on-site and off-site emergency plans

3.3 Applicable Policy, Rules & Regulations to project interventions / activities: Social

All strategic interventions on human development, spread across all social issues, need directives of policies and legal support to operationalize the appropriate actions. These policies and legislations help to overcome the constraints and support administrator, implementer, community and individual in delivery of justice. This section includes the National policies and Acts as detailed under:

3.3.1 National Policies and Acts

The **National Tribal Policy (2006)**, The Policy has the following objectives:

- Providing an environment conducive to the preservation of traditional and customary systems and regime of rights and concessions enjoyed by different ST communities, and reconciliation of modes of socio-economic development with these.

- Preventing alienation of land owned by STs and restoring possession of wrongfully alienated lands.
- Protection and vesting of rights of STs on forestlands and other forest rights including ownership over minor forest produce (MFP), minerals and water bodies through appropriate legislations and conversion of all forest villages into revenue villages.
- Providing a legislative frame for rehabilitation and resettlement in order to minimize displacement, ensure that affected persons are partners in the growth in the zone of influence, provide for compensation of social and opportunity cost in addition to market value of the land and rights over common property (NPV).
- Empowerment of tribal communities to promote self-governance and self-rule as per the provisions and spirit of the Panchayats (Extension to the Scheduled Areas) Act, 1996.
- Protection of political rights to ensure greater and active participation of tribal peoples in political bodies at all levels.

The **Right to fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (2013),** The Act is applicable to the whole of India except the state of Jammu and Kashmir. The provisions of this Act relating to land acquisition, compensation, rehabilitation and resettlement, shall apply, when:

- Government acquires land for its own use, hold and control, including land for Public sector undertakings.
- Government acquires land with the ultimate purpose to transfer it for the use of private companies for stated public purpose
- Government acquires land for Public Private Partnership Projects.

Only Rehabilitation & Resettlement provisions will apply when:

- Private companies purchase land for a project, and the same exceeds the area thresholds set by the State Governments for such purchase.
- Schedule I outlines the proposed minimum compensation based on a multiple of market value.
- Schedule II through VI outlines the resettlement and rehabilitation entitlements to land owners and livelihood losers, which shall be in addition to the minimum compensation per Schedule I.

*(Detailed resettlement & rehabilitation policies is presented in **Annexure IV**)*

3.3.2 Other Legislations in the Social Domain applicable to construction projects

Construction stage generally involves equity, safety and public health issues. The construction agencies therefore will be required to comply with laws of the land, which include the following legislation presented in Table 3.2.

Table 3.2: Legislations applicable to construction projects

S. No.	Act	Provisions under the Act
1	Contract Labor (Regulation and Abolition) Act, 1970	The Act provides for certain welfare measures to be provided by the contractor to contract labour
2	Minimum Wages Act, 1948	The employer is supposed to pay not less than the Minimum Wages fixed by the Government as per provisions of the Act.
3	Payment of Wages Act, 1936	The Act lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers

S. No.	Act	Provisions under the Act
4	Equal Remuneration Act, 1979	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees
5	Workmen's Compensation Act 1923	The Act provides for compensation in case of injury by accident arising out of and during the course of employment
6	Payment of Gratuity Act, 1972	The gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years
7	Employees PF and Miscellaneous Provision Act 1952	The Act provides for monthly contributions by the employer plus workers
8	Maternity Benefit Act, 1951	The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.
9	Payment of Bonus Act, 1965	The Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages
10	Industrial Disputes Act, 1947	The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment
11	Industrial Employment (Standing Orders) Act; 1946	The Act provides for laying down rules governing the conditions of employment
12	Trade Unions Act, 1926	The Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities
13	Child Labour (Prohibition and Regulation) Act, 1986	The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry
14	Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979	The inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home to the establishment and back, etc.;
15	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996	The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc
16	The Factories Act, 1948	The Act lays down the procedure for approval of plans

S. No.	Act	Provisions under the Act
		before setting up a factory, health and safety provisions, welfare provisions, working 4-6 hours and rendering information-regarding accidents or dangerous occurrences to designated authorities

3.3.3 Applicable Policy, Rules & Regulations at State level

Policy and regulatory frameworks at national and state level have been formulated to provide social and environmental safeguards in the last two decades as presented in Table 3.3.

Table 3.3: Rules and regulations at State Level

S. No.	Act	Provisions under the Act
4.	Karnataka Forest Act, 1963	This Act restricts the powers of the state in respect of de-reservation of forests, use of forestland for non-forest purposes and cutting of trees
5.	Karnataka Urban Water Supply & Drainage Board Act, 1973	To undertake the investigation, preparation and execution of schemes for the regulation and development of drinking water and drainage facilities in the urban areas, it is considered necessary to have a statutory board at the State level which will help in bringing about co-ordination in the activities relating to the implementation of such schemes.
6.	State Water Policy, 2002	Under this act, there should be an integrated and multi-disciplinary approach to the planning, formulation, clearance and implementation of projects, including catchment area treatment and management, environmental and ecological aspects, the rehabilitation of affected people and command area development.
7.	Karnataka Ground Water Act, 2011	To give priority for drinking water and for protection of drinking water sources in the State
8.	Karnataka Urban Drinking Water and Sanitation Policy, 2002	The policy focuses on raising the levels of efficiency in the management of drinking water systems in urban areas so as to give satisfactory service to the citizens while at the same time discouraging over exploitation of resources and preventing wastage.
9.	Karnataka Town and Country Planning Act, 1961	Applicable in both construction and operation phase. As per this act, the obligatory duties of the Municipal Corporation limits its role to construction and maintenance of such facilities as roads, water supply, sewerage, solid waste management, firefighting, schools & public places, markets etc. The law also specifies certain discretionary duties of urban local bodies like promotional activities such as welfare programmes for citizens, housing and provision of services (transport, promoting companies, co-operative societies to provide services in the city, acquisition of land, its development and management of facilities)
10.	Karnataka Municipal	Applicable in both construction and operation phase. As per this

S. No.	Act	Provisions under the Act
	Corporations Act, 1976	act, the obligatory duties of the Municipal Corporation limits its role to construction and maintenance of such facilities as roads, water supply, sewerage, solid waste management, firefighting, schools & public places, markets etc.

3.4 World Bank Policies

The operational guidelines under which World Bank (WB) projects are appraised are based on EAs in the "project cycle". WB's EA source book, directives, policies, drafts terms of reference and technical updates have guided the preparation of this EA. All central and state EA regulations and conventions referred were dealt in accordance with the WB procedures ensuring that all issues raised have been identified and satisfactorily addressed. The WB classify Category "A" projects as those "likely to have significant environmental impacts that are diverse and unprecedented". On the other hand Category "B" projects are those whose "potential adverse environmental impacts on human populations or environmentally important areas-including wetlands, forests, grasslands, and other natural habitats are less adverse than those of Category A projects[4]. The applications of World Bank Safeguard Policies in project are summarized in the Table 3.4.

Table 3.4: Application of Bank Safeguard Policies

WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
Environmental Assessment (OP/BP 4.01)	This is an umbrella policy to address environmental management issues in the project. The environmental consequences of the project are taken in to consideration during the project cycle and are taken into account in selection, siting, planning and designing of projects. It emphasizes upon the mitigation measures so as to reduce the adverse environmental consequences.	This project is identified as category B and the Operational Policy 4.01will be applicable to assess the impacts however marginal or temporary it might be. The proposed investments could have adverse but geographically limited environmental impacts. Physical/civil works are of rehabilitation nature on existing canal system and are unlikely to cause any significant adverse environmental or social impacts. Most impacts are likely to be limited to the rehabilitation phase of the infrastructure and no long-term adverse impacts are expected. The social and environmental assessment has been carried out and a range of preventive and mitigation measures are proposed as part of the Environmental and Social Management Plan (ESMP). Wherever required, Environmental Management Plans (EMP) are also prepared.
Natural habitats (OP 4.04, BP 4.04)	This policy emphasizes upon the conservation of the natural habitats like land, water, etc. It focuses upon the natural	This OP is not applicable to the project. The project investments would not convert any critical or non-critical natural habitats. Any identified adverse impact is limited in nature

[4] World Bank Operational Policy, 4.01, Environmental Assessment, January 1999

WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
	resource management so as to ensure environmentally sustainable development. It aims to support the protection maintenance and rehabilitation of the natural habitats and critical and semi-critical ecosystems.	and scope, both spatially and temporally. Further, any unlikely adverse impact on natural habitats would be addressed through the screening criteria included in the ESMP and an EMP has been prepared to deal with such possibilities. Finally, support for management of wetland and waterlogged areas will be enhanced in the project.
Forestry (OP 4.36, BP 4.36)	This policy emphasizes upon the management, conservation, and sustainable development of forest ecosystems and their associated resources.	No forestry activities or activities on forest land are envisaged. Additionally, there are no forests in the projects areas. This OP is not applicable to the project
Safety of Dams (OP 4.37, BP 4.37)	This policy is concerned with the safety of new and existing dams on which Bank financed projects are directly dependent. The policy distinguishes between construction of new dams and existing dams / dams under construction.	This OP is applicable to the project, due to the dependence on multipurpose dams that share water for the drinking water needs of the project cities. Hence, no significant impacts are anticipated due to the project activities. To ensure compliance to the policy, an assessment was carried out the measures are being implemented under the World Bank financed Dam Rehabilitation and Improvement Project (DRIP) and also through KUWSMP. The Dam Safety Panel and Unit in the State of Karnataka would be responsible under the DRIP to ensure issues of dam safety are addressed.
Cultural Properties (OP 4.11)	The policy ensures avoidance of impacts on cultural properties and supports development of mitigation and enhancement measures through porjects	No archaeological or other cultural sites of significance are impacted by the proposed project. This OP however is triggered, considering the historical back ground of the project cities and to address the instances of 'chance find' of cultural properties during the construction and operation phase of the project.
Indigenous Peoples (OP 4.10, BP 4.10)	This policy asserts that the adverse impacts of the development projects on the indigenous people should be mitigated or avoided and the benefits of the project should be accrued to them.	A detailed spatial census analysis does not indicate any tribal population in the proposed project area. Therefore, no impact (adverse or positive) is expected by project on tribal. This OP is not applicable to the project.
Involuntary Resettlement	This policy aims at avoiding, if not minimizing adverse impacts	The system rehabilitation and modernization is unlikely to involve any need of R&R. In any rare

WB Safeguard Policy	Summary	Application to the Project and Compliance Mechanisms
(OP 4.12)	on the local population due to project and where unavoidable it ensures that those affected improve or at least restore their livelihood.	event that this is needed, this shall be invoked in consonance with the Project R&R Policy and new LA and R&R Act 2013. This OP is applicable to the project.
Projects in Disputed Areas (OP 7.60, BP 7.60)	This policy is concerned with the disputed area in project	The project is not in a disputed area and the OP is not applicable to the project.

The analysis of the above policy, legal and regulatory framework indicated that a number of acts, regulations and agencies are involved at national, state and district level. All the agencies are functioning as per their mandate while there appears to be lack of integrating mechanism for overall development of the water sector in the state. With regard to planning and implementation of Karnataka Urban Water Sector Improvement Project (KUWASIP), Karnataka Urban Water Supply and Drainage Board (KUWSDB), KUIDFC, and other line departments will be the main agencies involved to provide drinking water and sanitation facilities in all urban areas. An institutional structure is also proposed for the overall execution of project.

3.5 Legal Monitoring Agency for Environmental Safeguards

The legal and institutional framework with respect to the environment is shown below:

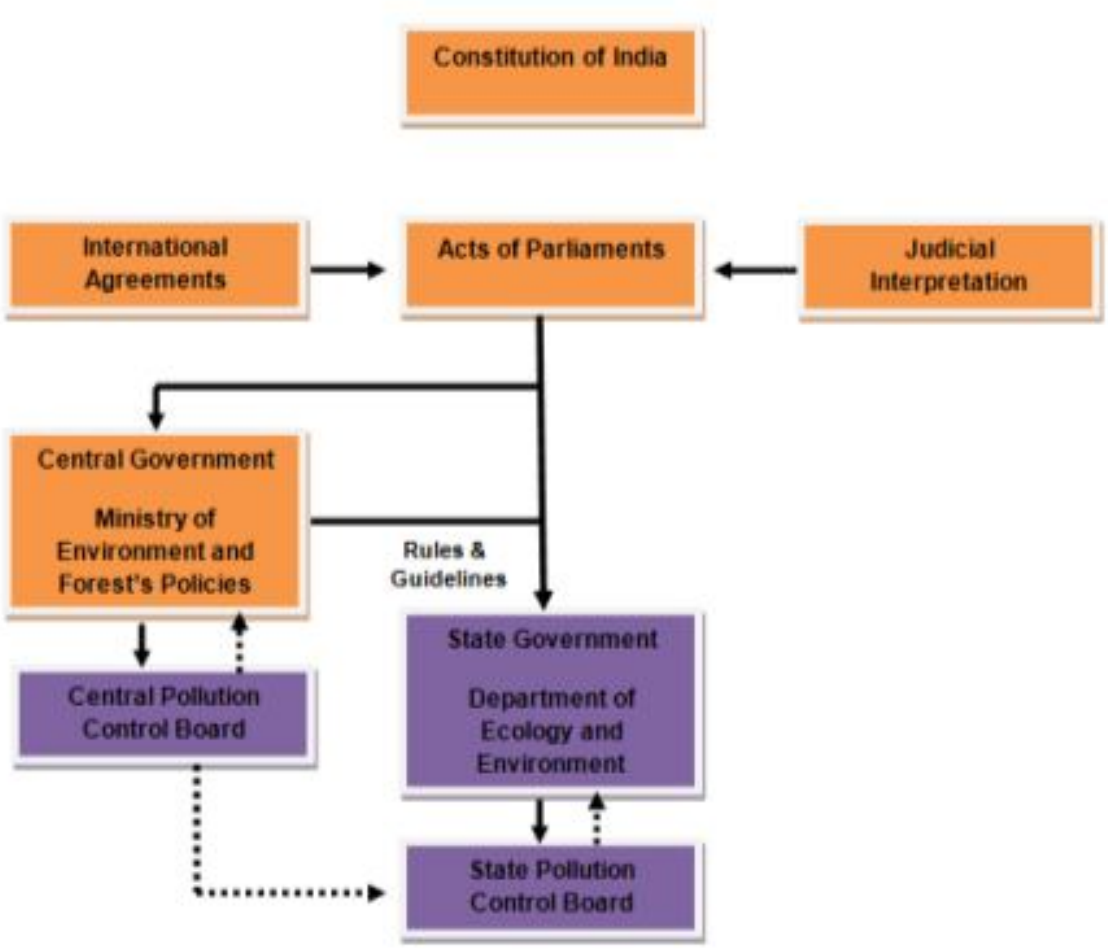


Figure 3.1: Legal Monitoring Agency for environmental safeguards

The Karnataka Department of Ecology & Environment (DoEE) is primarily responsible for protecting and preserving environmental quality in the state. The Karnataka State Pollution Control Board (KSPCB) is responsible for enforcing the regulations, and has a wider role in environmental governance than any other government body in the state and it reports both to the Central Pollution Control Board (CPCB) in Delhi and the DoEE. In addition to monitoring and enforcing industrial environmental standards, the KSPCB also monitors other environmental issues, such as municipal solid waste, and biomedical waste. The supervisory powers exercised by Ministry of Environment & Forests (MoEF) are not vested with the DoEE as per the regulatory framework but instead lie with KSPCB. DoEE is dependent on the state government for resources, whereas, KSPCB raises most of its financial resources through consent fee and water cess.

3.6 Other Line Agencies Involved

Table 3.5 shows the relevant departments and agencies and their roles and responsibilities.

Table 3.5: Line Departments and their Key Roles and Responsibilities

Department	Key Activities
Forest Department	The main function of the Forest Department is to protect, conserve and manage the forest. In the recent years, it has been noticed that the forest reserves have been decreasing. Henceforth, Joint Forest Management has been initiated so as to ensure protection of forest against encroachers, grazing and also to increase the vegetation cover. In addition to this, it has also pioneered research and development for improving the quality of seedlings. Green belt can be developed in the waste lands so as to increase vegetation cover. Further, plants which are of ecological and economic importance can be encouraged on the waste lands. Cooperation with the Forest Department should be encouraged in relation to natural habitats.
Department of Water Resource	The main responsibility of the Water Resource Department is to supply, conserve and manage the water resources in the State.
Department of Urban Development	The main functions of the Urban Development Department is to plan, regulate, control and facilitate urban development for creating major infrastructure facilities, development of residential layouts, construction of houses for under privileged citizens. To facilitate and finance creation of infrastructure to provide adequate water supply from assured and safe sources of supply and proper sanitation to all the Urban Local Bodies through Karnataka Urban Water Supply and Drainage Board (KUWSDB).
Social Welfare Department	The main objective of this department is to bring the target groups into the main stream of development by making them self-reliant. Various laws and policies are being implemented for the upliftment of the SCs/STs under protective discrimination basis.
Karnataka Pollution Control Board	The main function of KSPCB is to prevent, control or abate pollution. It advises the State Government on the matters concerning the prevention, control and abatement of pollution. Further, it disseminates information relating to pollution

In general, there is little available expertise/ functional position in the agencies with respect to environment and social sector to address various social and environmental issues. However, activities under the project will support greater attention to environmental and social issues.

3.7 Institutional Setup for Project

The Environmental Management Plan (EMP) and Resettlement Action Plan process does not stop once a project (planning and design) got approval for implementation. During implementation of project, Operator (Construction Manager for ULB) and Third Party Contractor will be responsible for ensuring that the environmental commitments made to regulatory agencies, lending agencies and other stakeholders during the EA process are met. To execute EMP and RAP is a cumulative responsibility of all parties involved, indicative responsibility mechanism has been presented in EMP and RAP, as developed for up gradation projects.

The institutional stakeholders in implementation of EMP and RAP are as shown in the following figure:

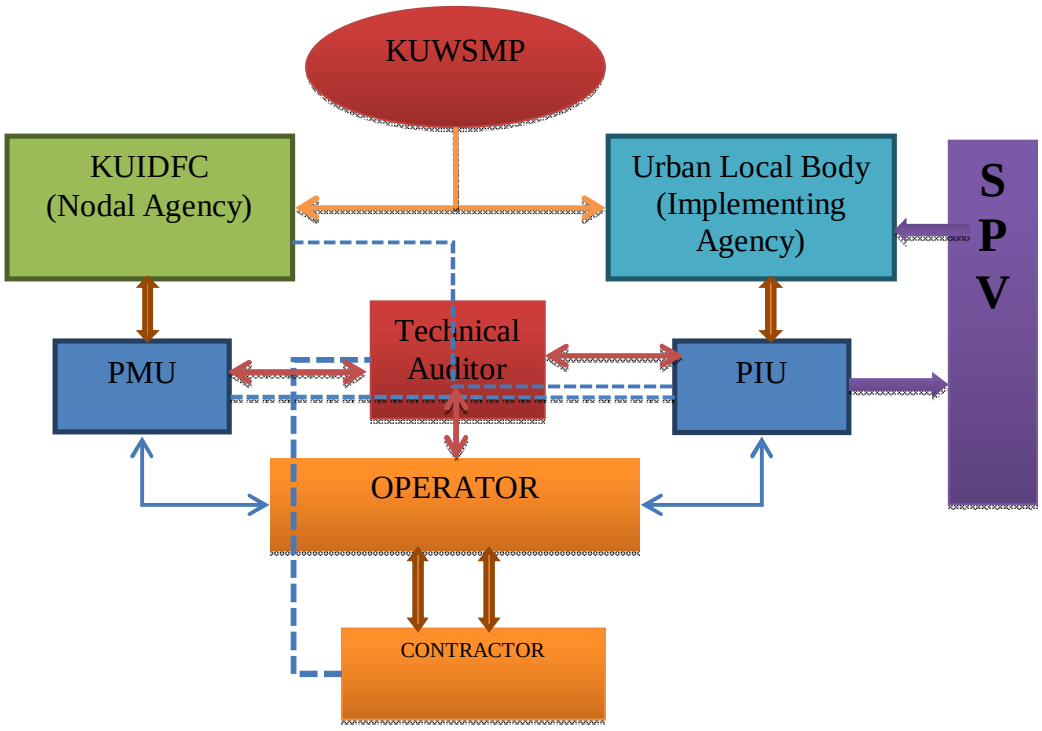


Figure 3.2: Roles and Responsibilities of Stakeholders

Environmental and Social Cell - shall be integrated under the PMU at KUIDFC and PIU at ULB/ SPV level and can serve for mainstreaming social and environmental safeguards for the project. The proposed cell will be include Environmental and Social experts The Cell will consist of M & E, Communication Experts and Civil Engineer to assist the Corporation for effective implementation of ESMP.The Cell officials and local body staff will assist SPV focal points in project area for planning, implementation & monitoring of ESMP. .

Key duties and function of the proposed cell would be:

ESMP planning, implementation and monitoring - Provide technical assistance in ESMP planning implementation & monitoring for each sub project activity. **Information/ Data**

Base Management - Manage comprehensive environmental & social information management system/data bases and documentation.

Training and Capacity building - Periodic workshops/ Meetings seminars on Social & Environment aspects; develop tailor made courses; organize basic /orientation training programs; organize documentation of staff experience on Social & Environmental issues/ solutions / lessons learned program ; develop environmental 'tool kits' for staff – CDs/ slides organize inter and intra states field visits; experience sharing program; organize study tours to provide exposure to the similar experience /best practices of the oversees etc. Enhancement of the staff capacity and their commitment are key pre-requisite for the effective implementation of project.

Awareness/ Sensitization - Develop/ Implement social & environmental awareness/ sensitization programs. **Inter-sectoral linkages and inter-agency coordination -** Facilitate effective inter-sectoral linkages and inter-agency coordination among and between agencies and other key stakeholders involved in water sector management in relation to socio-environmental issues.

Grievance Redressal – Provide technical assistance to PIU related to grievance redressal mechanism to attend to any social and environmental grievances made by any person, community group. **Provide assistance for Project -** Provide essential guidance and inputs related to Environmental & Social aspects for Next Phase.

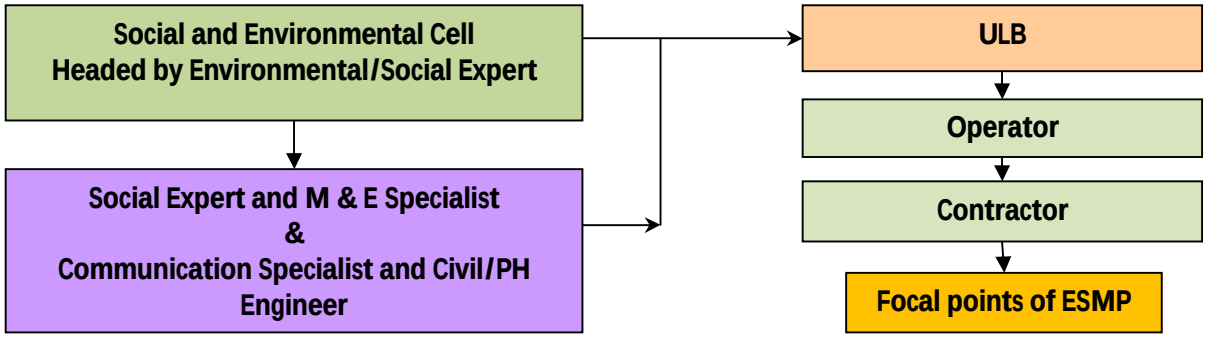


Figure 3.3: Environmental and Social Organizational Cell Structure

3.8 Legal Approvals / Clearances Required

The following are the various legal approvals and clearances on social and environmental aspects that the GoK may require before initiating site work.

Table 3.6: Legal Approvals and Clearances

Project Activity	Compliances/Clearances	Responsible Agency	
		Primary	Overall
Use of Diesel Generator sets at any stage during project cycle.	Consent from KSPCB under Air Act	Operator	SPV/PIU
Replacement of Old Pipe line, laying new pipe line, construction	Approvals / authorisation from State Forest Department in case of land appropriation of forest land (if any other than the identified proposed sites.) and cutting of	Operator	SPV/PIU

Project Activity	Compliances/Clearances	Responsible Agency	
		Primary	Overall
of WTP and Reservoirs	trees **Belagavi: None as per the proposed design**		
	Permissions from Railways for crossing railway lines **Belagavi: Central Railway at locations Zone 1, 7,8 and 10 (Ward no :** 13, 8, 19, 27**)**	PIU	SPV/PIU/
	Permissions from PWD/NHAI for road cutting. **Belagavi: NH 4, and 4A. SH 20 (Ward no :** 13, 27, 44, 19, 03, 49, 27**)**	PIU	SPV/PIU/
	Permissions from Irrigation Department for drawing water from irrigation dam for water supply.	PIU	SPV/PIU
	Permission from Central Ground Water Board for withdrawing Ground Water (if required at any stage of project)	PIU	SPV/ULB
	Permission from Traffic Police Commissioner office for traffic management.	PIU	SPV/PIU
Storage and Handling of Chlorine for Water Treatment	Permission from KSPCB under MS&H Rules, 1989 for Storage and Handling of Chlorine	ULB	ULB/SPV
Archeological Clearances	Permission from National Monuments Authorities to carry out augmentation works around heritage structures in the city	Operator	SPV

Chapter 4: Baseline Environmental and Social Profile

Environmental Profile

An analysis of environmental characteristics and issues has been carried out for Project. The baseline environmental conditions are described in terms of Land Environment, Climate & Air Environment, Water Environment, Forest & Biodiversity and public health.

4.1 Land Environment

Land environment is described in terms of Geology, Topography, Soil and land use.

4.1.1 Geology and Topography

The rock formations of Belagavi chiefly consist of the Dharwars, Gneisses and Kaladgi series and the Deccan trap. The Dharwars are predominant in Belagavi taluk. These rocks are represented by schist's, phyllites, quartzite and banded ferruginous quartzite. Sandstone and quartzite are noticeable in Belagavi in the form of low ridges. A "rugged terrain" marks the western part of Belagavi taluks with deep cutting ravines on the foothills of the Western Ghats. The elevation of these hills varies from 796 to 1025m above msl.

4.1.2 Soil Characteristics

The soils of Belagavi can broadly be classified into red soils and black soils. These soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. By and large, black soils predominates the Deccan Trap terrain and the red soils are found in the south-western and south-eastern part of the district in gneissic terrain.

4.1.3 Land Use

The total proposed planning area of the city is 8212.06 sq.km as per the revised Master Plan (Revision II) of Belagavi Urban Development Authority. The industrial growth along the Khanapur road and Pune road has temporarily restricted the city sprawl on the Northern and southern part of the Town. The city topography lies between contours between 815 m and 740 m and is sloping gradually towards North-South. The details of the proposed Land use Pattern for Belagavi City is summarized in Table 4.1.

Table 4.1: Land use Pattern

S. No	Land Use	Pattern Area (ha)	% of total area
1	Residential	3795.85	46.97
2	Commercial	241.39	3
3	Industrial	839.75	10.39
4	Public & Semi Public	549.61	6.8
5	Park, Open Space and Play Ground	800.19	9.9
6	Public Utilities	157.04	1.94
7	Transportation and Communication	1696.88	21
	TOTAL	**8080.71**	**100**
8	Water Sheet	131.35	
	GRAND TOTAL	**8212.06**	

(Source: Proposed Landuse - Master Plan - 2021 (Revision II) for Belagavi Local Planning Area; Belagavi Urban Development Authority, Government of Karnataka)

4.2 Climate and Air Environment

4.2.1 Climate and Rainfall

The climate of Belagavi is tropical and generally pleasant. The months of December, January and February are fairly dry. The maximum temperature was observed in May (35.7^0 C) and minimum in January (13.9^{0}C) in 2012.

The project city receives average rainfall of 13441 mm and about 74% of the annual rainfall precipitates during the southwest monsoon period (June to Sept). The contribution by the northeast monsoon or post monsoon (Oct to Dec) is nearly 15% and the rest 11% is the contribution of the dry weather and pre-monsoon period (Jan to May).

Table 4.2: Seasonal and Annual Normal Rainfall for the Period 2001 – 2010 (mm)

Station	Pre-Monsoon	South West-Monsoon	North East Monsoon	Annual
Belagavi	126	1087	128	1341

(Source: District Ground Water Brochure, Belagavi, 2012)

4.2.2 Wind Speed and Direction

The predominant wind direction in Belagavi is south-east to north-east. The winds blow mainly from south-west and west during the period from April to September. In October, winds blow commonly between North and East directions. During November and December, winds are mostly North-easterly or easterly, while in January they are south westerly or westerly.

4.2.3 Air Quality

The Karnataka State Pollution Control Board (KSPCB) monitors ambient air quality in the State. The ambient air quality data was collected form Karnataka State Pollution Control Board (KSPCB) from April to December 2013. The parameters wise air quality is summarized below.

SO2 and NO2: Both SO2 and NO2 concentration was observed within the limit, which is shown in Figure 4.1. Highest NO2 was recorded in May while lowest in December 2013.

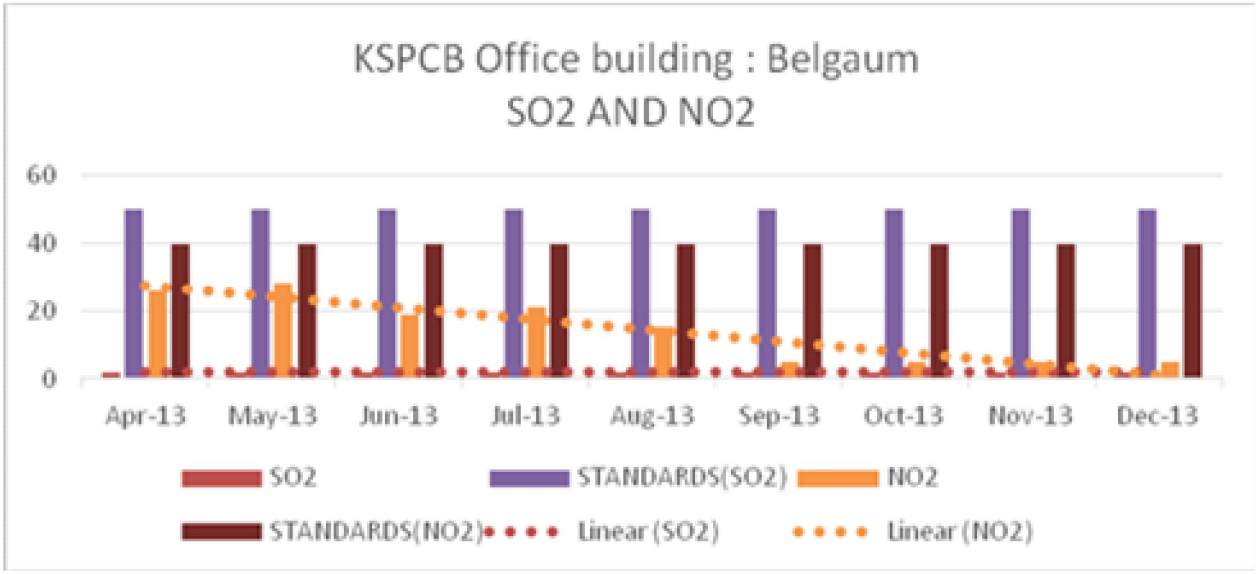


Figure 4.1: SO_2 and NO_2 Concentration

Particulate Mater$_{2.5}$ ($PM_{2.5}$): The $PM_{2.5}$ was found within the permissible limit except April, May, October, November and December months of 2013. Highest $PM_{2.5}$ was observed in

April while lowest in August (Shown in Figure 4.2).

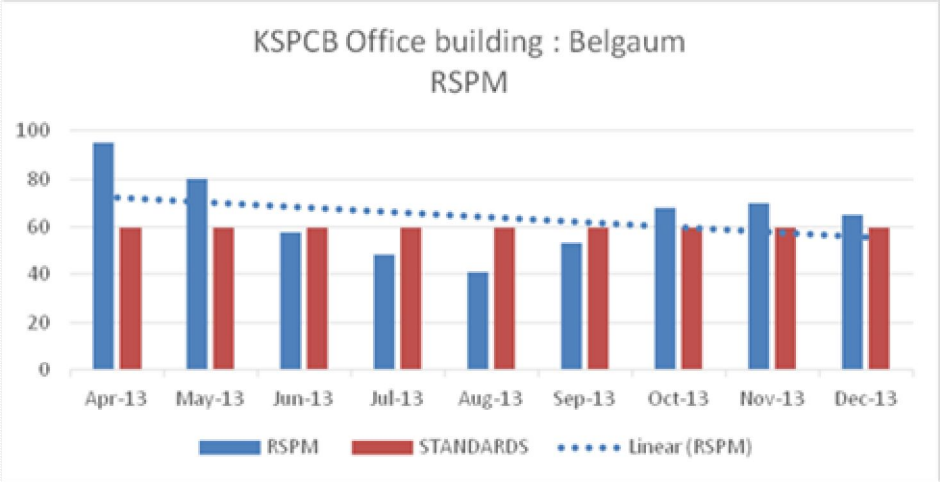


Figure 4.2: Particulate Mater$_{2.5}$ Concentration

The ambient air quality may be changed during construction phase due to movement of vehicles and construction activities.

4.3 Water Environment

Water environment of the study area is described in terms of surface & ground water resource and surface & ground water quality.

4.3.1 Surface Water Resources

The city falls in the Krishna river basin. The river Krishna, along with its tributaries Ghataprabha and Malaprabha are perennial and effluent in nature and flow in easterly direction. The drainage density varies from 0.80 to 3.4km/sq.km.

There are no major rivers or reservoirs in the near vicinity of the city other than present surface water sources. Currently, drinking water demand is meeting through Rakaskop Reservoir and Hidkal Dam. The index map shows the locations of these surface water sources **(Figure 4.3).**

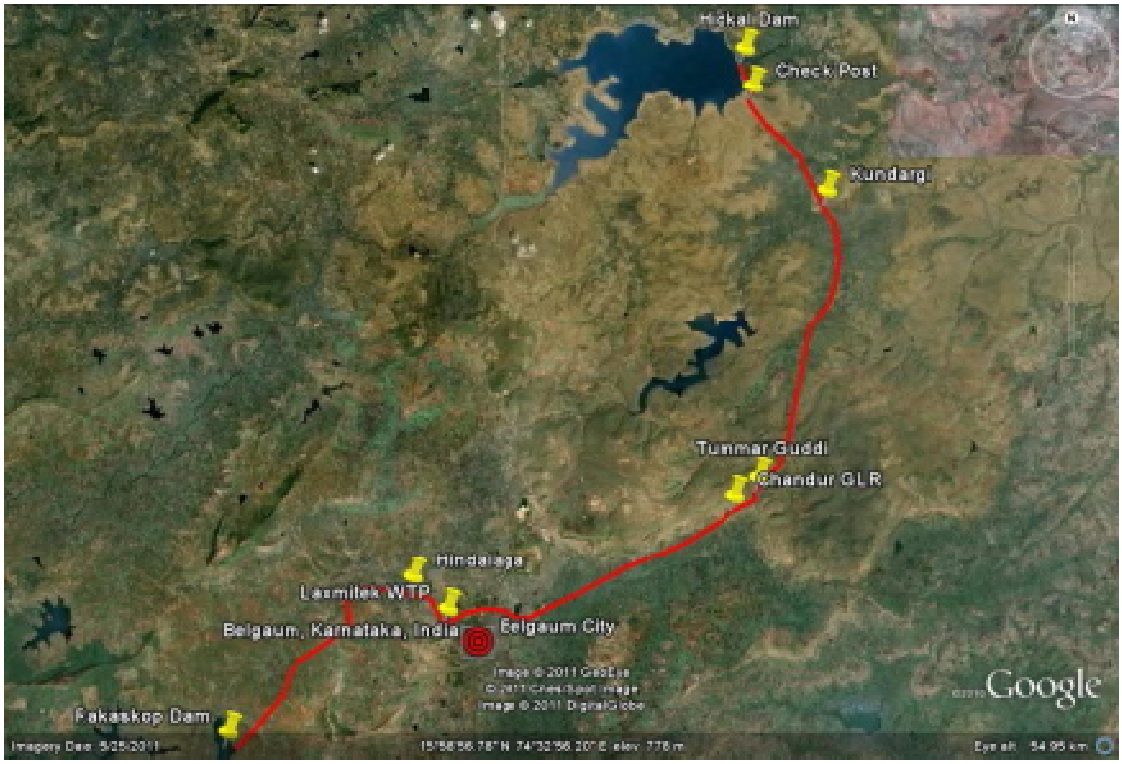


Figure 4.3: Locations of Dam

Rakaskop Reservoir: Rakaskop Reservoir was formed by constructing an earthen dam across Markandeya River, a tributary of Ghataprabha River and located at about 22 km from the City. It has three outlets at different levels for effective drawl of water. Rakaskop water supply scheme was developed in the year 1962 (Stage-I, 27.28 MLD) and then strengthened in the year 1983 (Stage-II, 27.20 MLD). As per the feasibility report, Belagavi, due to scanty rainfall in recent times, only up to 40 to 45 MLD water is available at source.

Hidkal Reservoir: It was created by constructing a dam across Ghataprabha River at Hidkal. It has catchment area of 1412 sq.km with a yield of 1980 Mcum. The gross storage capacity of the reservoir is 1449 Mcum. The reservoir is located at about 40 Km from Belagavi City. This is a multipurpose reservoir mainly used for irrigation. Stage- III of Belguam City Water Supply Scheme has been implemented with Hidkal reservoir as source of water.

4.3.2 Surface Water Quality

Surface water quality of project area is assessed based on data collected from Regional Laboratory, Dharwad, State Pollution Control Board (SPCB). In 2012 & 2013, pH was found slightly acidic to alkaline in nature at all locations which varies 6.74 to 9.94 (Table 4.3). Highest pH was recorded at Kakti Pond (9.94) while lowest at Vishwakarma Temple. Turbidity was found beyond the permissible limit at all locations; biological oxygen demand was observed within the permissible limit at all locations except Angole Lake (near Vishwakarma temple) and Beilary Nalla (Kudachi Bridge and Sulebhavi).

Table 4.3: Surface Status

District	Water Station	Sample Location	pH	DO	BOD
Belagavi	Angol Lake	Near Vishwakarma Temple	6.74	-	34.5
		Outlet of lake	6.81	0.9	3
	Kakti Pond	Kakti Pond near Culvert	9.94	-	8.9
	Kalmeshwar Tank	Kalmeshwar Temple	7.27	-	2
	Killa Lake	Opposite Hotel Vandhana Palace	8.39	-	2.76
		Near BUDA Oflice	8.34	-	2.04
	Rakkashopa Tank	Rakkashopa Tank	8.6	6.8	1
	Beilary Nalla	near Sulebhavi	7.47	-	33
		Kudachi Bridge	7.41	-	45
		near Alarwad Cross	7.61	-	24

(Source: Regional Laboratory, Dharwad, Karnataka State Pollution Control Board, 2012 &2013)

4.3.3 Hydrogeology & Ground Water Resource

Ground water occurs in all weathered formations of the district under phreatic conditions and in fractured and jointed formations under semi-confined conditions. Deccan basalts act as a multilayer aquifers having low to medium permeability. In Deccan basalts that comprise different flows, fractures and interstitial pore spaces of vesicular zones, are good repositories of ground water. Groundwater occurs under phreatic conditions in weathered zone of these basalts and under semi-confined to confined conditions in inter-trapeans and also in joints and fractures at deeper levels. The ground water development in the study area is given in **Figure 4.4.**

As per the Ground Water Brochure of Belagavi, Central Ground Water Board (CGWB), (2012), annual ground water recharge of the district was in the range of 0.025 – 0.10m in Belagavi Taluk. The net annual ground water availability was 1, 13,799 ham. The existing total ground water total draft was 1, 21,866 ham. The net ground water availability for future irrigation development was 19,941 ham. As per CGWB data, Belagavi taluk 91% taluk area falls in 'safe' category.

Depth to Water Level: Pre & Post Monsoon 2011, depth to water table of the district is shown in **Figure 4.5 & 4.6.** In District, Pre-monsoon water level ranged from 0.89 to 18.35 mbgl while in post-monsoon it ranged from 0.81 to 12.78 mbgl.

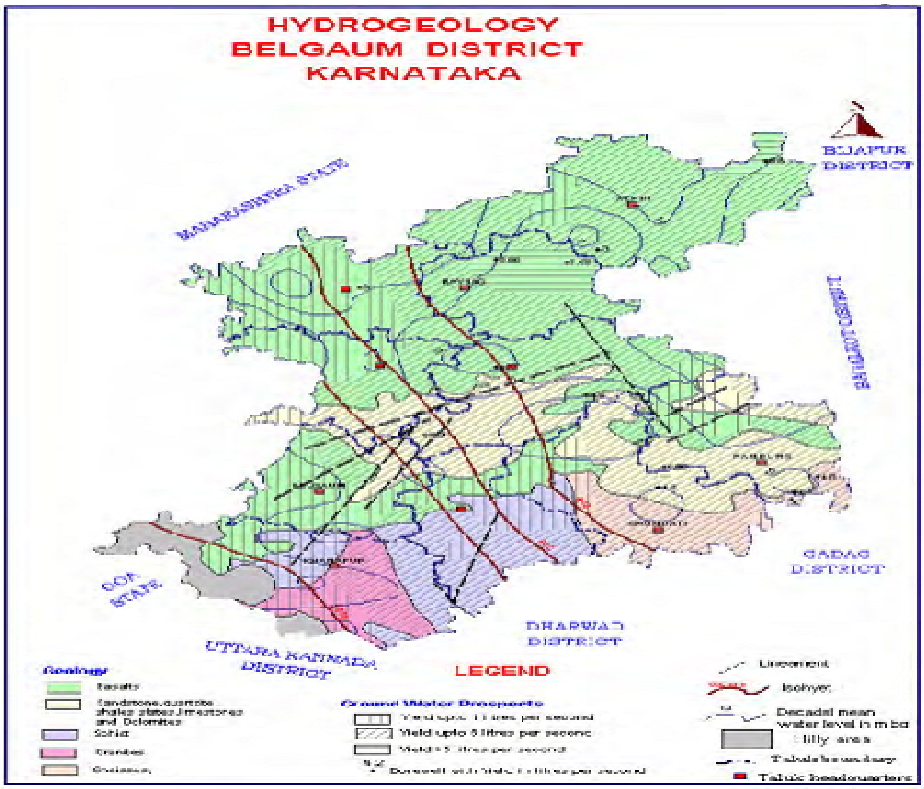


Figure 4.4: Hydrogeological Map of Belagavi District

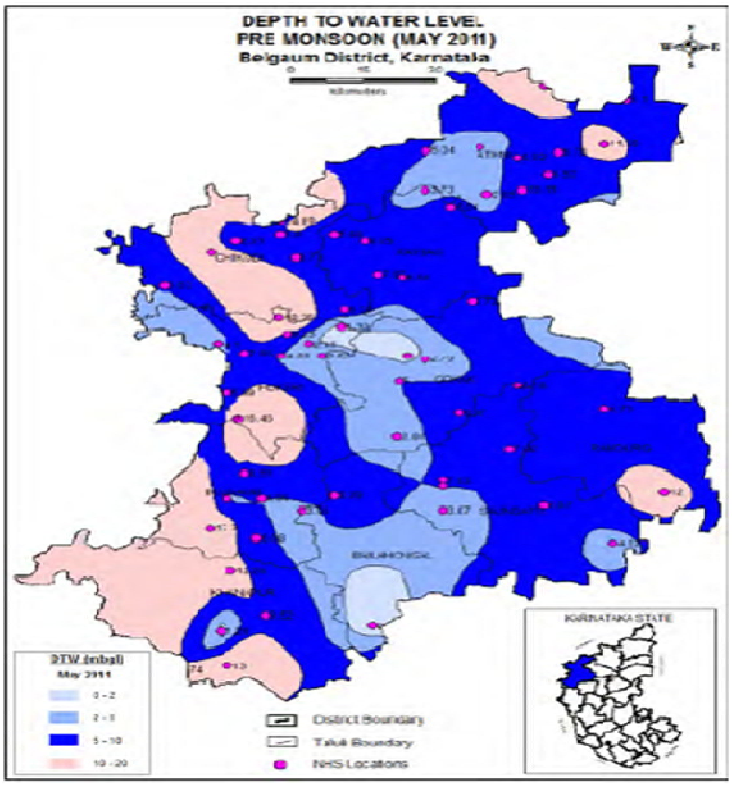


Figure 4.5: Pre-Monsoon Water Level Belagavi

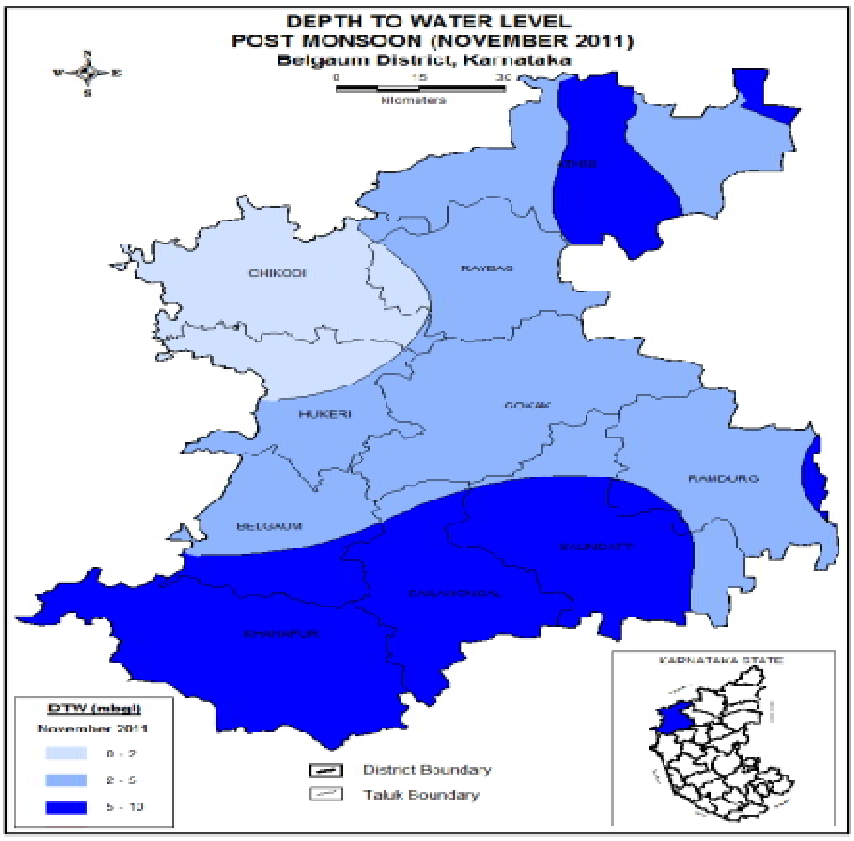


Figure 4.6: Post-Monsoon Water Level Belagavi

4.3.4 Ground Water Quality

The groundwater quality was assessed in Belagavi between 2005 and 2007 by CGWB. Nitrate content was found above permissible limit in the Belagavi taluk while other parameters were within permissible limit which is shown in **Figure 4.7.**

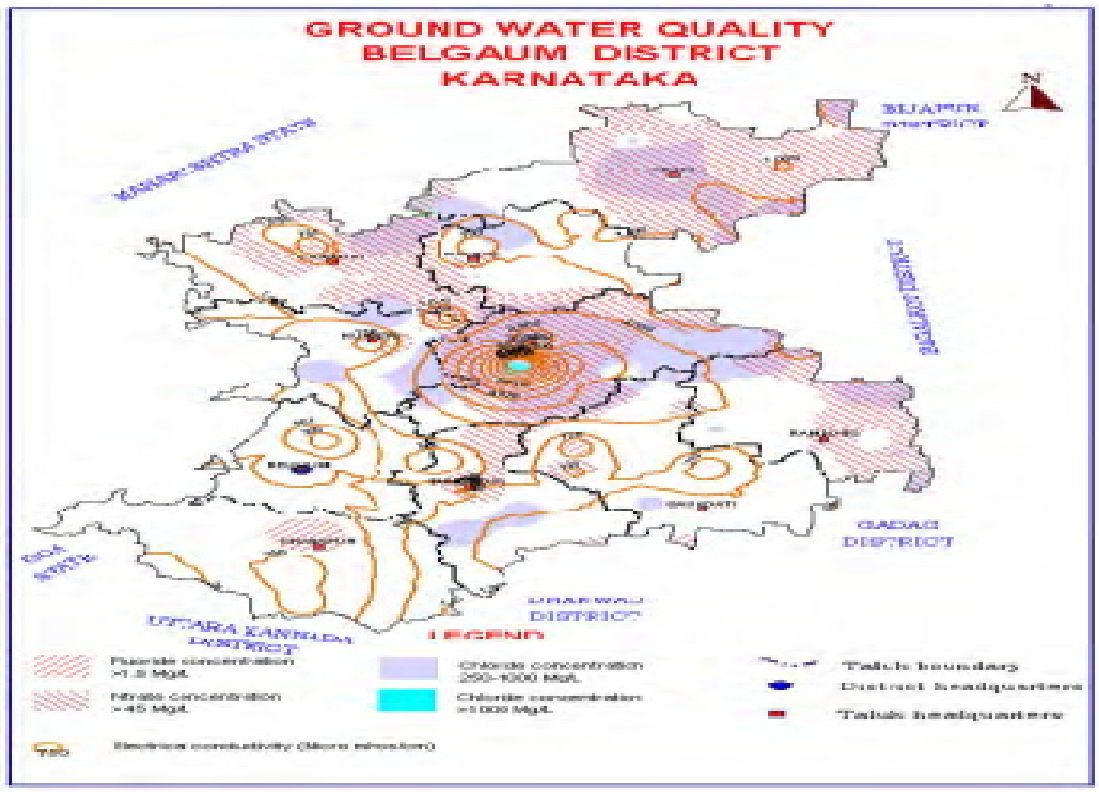


Figure 4.7: Ground Water Quality Map of Belagavi District

As per Central Ground Water Board, the no. of Groundwater Monitoring Wells (as on 31st March 2007) is 87 Dug wells and 41 Piezometer. Pre-Monsoon depth to water level during May 2011 is 0.89-18.35 mbgl whereas during Post-Monsoon, the depth to water level during Nov 2011 is 0.81-12.78 mbgl. Long term water level trend in 10 years (2002-2011) shows 79% of wells rise in water level & only 21% of wells shows fall in water level during May 2011 whereas during Nov 2011, shows 93% of wells rise in water level & only 7% wells shows fall in water level.

4.4 Forest and Biodiversity Aspect

As per the Forest Survey of India, Forest Cover is showing marginal increasing trend in Belagavi district (**Table 4.4**) which can be due to plantation**.** The proposed project is rehabilitation and modernization of existing water supply infrastructure, which do not pass through any forest area. Therefore, there is no impact anticipated on forest land.

Table 4.4: Forest Cover in Project Area

District	Year	Geographical Area (GA)	Very Dense Forest	Moderate Dense Forest	Open Forest	Total	% of GA	Change	Scrub
Belagavi	2011	13415	17	757	320	1094	8.16	2	465
	2007	13415	17	757	318	1092	8.14	1	467
	2005	13415	19	697	371	1087	8.10	-1	465

Source: Forest Survey of India Report, 2007, 2009 & 2011

4.4.1 Protected Areas

A significant proportion of Karnataka biodiversity is found in the protected areas which are listed in **Table 4.5.** There are one wildlife sanctuaries and one bird sanctuary in project district: Bhimgad wildlife sanctuary in Belagavi located at a distance of 35km from the city

and Ghataprabha Bird sanctuary is 65.kms away.. The proposed project is rehabilitation and modernization of existing water supply infrastructure (Water Supply Pipeline) which does not pass through any protected area. Therefore, no impact is anticipated due to proposed project.

Table 4.5: Protected Areas and Impact

District	Name of Protected Area (PA)	Area in sq.km	Potential Impact
Belagavi	Bhimgad Wildlife Sanctuary	190.42	No Impact anticipated
	Ghataprabha Bird Sanctuary	29.78	

Source: State Environment Report, Karnataka, 2003

The district has a rich variety of fauna. Wild animals commonly found are the leopard cat, jungle cat, toddy cat, Indian civet, striped hyena, small Indian mangoose, Indian jackal, wild dog, common porcupine, giant flying squirrel, wild pig etc. But these are confined to forest areas and agricultural lands, and are hardly found within the city.

4.4.2 Wetlands

As per the National Wetland Atlas of Karnataka (2010), the district comprises of 288 wetlands, which were mapped besides 431 small wetlands (<2.25 ha). These wetlands account for 33412 ha. Three wetland types (Table 4.6) were Reservoir/Barrages, (19213 ha) followed by River/Stream (9936 ha) and Tanks/Ponds (3832 ha) exists in the district, shown in **Figure 4.8.** Aquatic vegetation has an increase from 4190 ha in post-monsoon to 5402 ha in pre-monsoon. Analysis of wetland status in terms of open water the district had recorded 22090 ha and 13639 ha of during post-monsoon and pre-monsoon respectively out of 32981 ha (excluding wetlands <2.25 ha). Qualitative turbidity of the open water dominated by moderate (20625 ha) followed by high turbidity (1465 ha) while low turbidity has not been observed in post-monsoon. During pre-monsoon the turbidity was dominated by moderate (8491 ha) followed by low (4282 ha) and high (866 ha).

Table 4.6: Number and Types of Wetland in Belagavi

Sr. No.	Wet code	Wetland Category	No. of wetlands	Total Wetland area	% of wetland area	Open Water	
						Post-monsoon area	Pre-monsoon area
1	1106	River/Stream	30	9936	29.74	8333	6619
2.	1201	Reservoirs/Barrages	3	19213	57.50	11190	5393
3.	1202	Tanks/Ponds	255	3832	11.47	2567	1627
Sub-Total			**288**	**32981**	**98.71**	**22090**	**13639**
4		Wetlands (<2.25 ha), mainly Tanks	431	431	1.29	-	-
Total			**719**	**33412**	**100.0**	**22090**	**13639**

Source: National Wetland Atlas, Karnataka, 2010

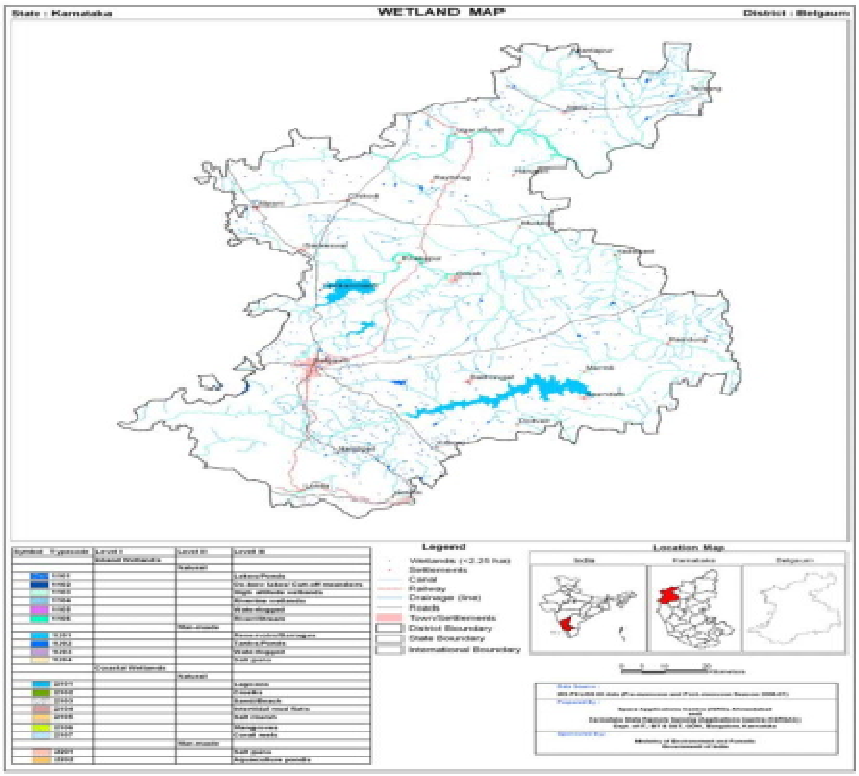


Figure 4.8: Wetland Map of Belagavi, 2010

4.5 Heritage

Belagavi has a rich cultural past and the Core City has developed around the existing fort. The Fort, two Jain temples, the remains of a Hindu temple and Safa Masjid (in Belagavi Fort) are found as historical monuments under the central protection category. Safa masjid is located on the national highway in the city center inside the fort area.

The project activities are not expected to impact these structures. However, necessary approval shall be obtained from National Monuments Authority, for carrying out construction within 300 m of the monument. In addition Construction activities need to consider precautionary measures to avoid damages of archaeological structures during excavation works. List of monuments and heritage sites as per Archeological Survey of India:

- ✓ Belagavi Fort, a huge construction in the center of the town. It dates back to 1519. The foundation of the Suvarna Vidhana Soudha, a legislative administrative office complex, was laid in Belagavi in August 2007 to celebrate the golden jubilee celebrations of the unification of Karnataka.
- ✓ Kamal Basati is a Jain temple located within the walls of Belagavi fort.
- ✓ Hunshevari, the holy place of the "Shree Revan Siddeshwar Temple", in the valleys of Kakati village, 7 km from Belagavi city on the Pune-Bangalore national highway.
- ✓ Siddeshwar Temple in Kanabargi village is a famous temple in a hill cave.
- ✓ Yellur Gad, on a hill surrounded by a circular wall, is a popular location visible from a long distance.
- ✓ The Belagavi Cantonment Area with its lush cover of greenery. The MLIRC (Maratha Light Infantry Regimental Centre) is also based here.
- ✓ Jamboti, 25 km south-west of Belagavi, is a popular tourist spot with its evergreen hilltop forests.
- ✓ Vajrapoha Falls on the Mandovi river are 26 km from Belagavi.

4.6 Baseline Water Sample Survey

Quality of water supplied to consumers is very critical in assessing the impacts of proposed improvements under the project. The present practice of intermittent water supply to the project cities is expected to deliver bad quality of water due to systemic problems such as illegal connections, cross contamination due to soil, wastewater inflows and various other means adopted by the consumer to cope with the low pressure problems.

A reconnaissance survey of the entire supply and distribution system was carried out before finalizing the number and locations of the samples in project city and the operation and flow sequence of the system was studied. Based on the survey, 10 samples were collected at the following locations on 16th May, 2014 and bacteriological & physiochemical analysis were conducted to analyze water quality at supply end.

- ✓ One Raw water Sample from source (River intake at Hidkal Reservoir)
- ✓ One Treated water sample after chlorination from clear water storage reservoir at the treatment plant (Laxmitek)
- ✓ Eight water samples from public Public Taps and locations are given below.

Sr. No.	Water Samples Locations	Ward Number
1	Rani Channamma Nagar	2
2	Buda Colony	6
3	Managai Nagara	11
4	Nanawedi	18
5	Madavara Road	27
6	College Road	40
7	Mahanthesh Nagar	51
8	Rukmini Nagar	54

The water samples were analysed by Bangalore Test House with parameters benchmarked under National Drinking Water Standards (IS: 10500) for two samples and rest eight samples for residual chlorine and E. Coli. The water sampling results are at Annexure VI

4.6.1 Water Quality at Source

Both raw and treated water samples were collected for quality assessment and results are given in Table 4.7.

Table 4.7: Raw and Treated Water Results (Physical & Chemical)

S. No	Parameters	Result		As per IS 10500 (2012)
		Raw water	Treated water	
1	Colour, Hazen Unit	<2.0	<2.0	Max.5
2	Odour	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable
4	Turbidity,NTU	0.7	1.4	Max.1
5	pH	7.71 @24^{o} Celsius	7.41 @24^{o} Celsius	6.50 To 8.50
6	Total Dissolved Solids	62	60	Max.500
7	Aluminum, mg/l	0.01	0.02	Max. 0.03
8	Ammonia, mg/l	<0.05	<0.05	Max. 0.5
9	Anionic, mg/l	<0.2	<0.2	Max. 0.2
10	Barium, mg/l	<0.1	<0.1	Max. 0.7
11	Boron, mg/l	<0.1	<0.1	Max. 0.5
12	Calcium, mg/l	9.4	8.2	Max. 75

S. No	Parameters	Result		As per IS 10500 (2012)
		Raw water	Treated water	
13	Chloramines, mg/l	<0.05	<0.05	Max. 4.0
14	Chlorides, mg/l	5.2	6.9	Max. 250
15	Copper, mg/l	<0.05	<0.05	Max. 0.05
16	Fluorides, mg/l	0.04	0.05	Max. 1.0
17	*Free Residual Chlorine, mg/l	0.05	0.1	Min. 0.2
18	Iron, mg/l	0.15	0.1	Max. 0.3
19	Magnesium, mg/l	2.4	2.5	Max. 30
20	Manganese, mg/l	<0.1	<0.1	Max. 0.1
21	Nitrates, mg/l	0.4	0.4	Max. 45
22	Phenolic Compounds, mg/l	Absent	Absent	Max. 0.001
23	Selenium, mg/l	<0.01	<0.01	Max.0.01
24	Silver, mg/l	<0.01	<0.01	Max. 0.1
25	Sulphates, mg/l	2	1.8	Max. 200
26	Sulphide, mg/l	<0.05	<0.05	Max. 0.05
27	Total Alkalinity, mg/l	37.6	31.2	Max. 200
28	Zinc, mg/l	< 0.01	0.01	Max. 5
29	Total Hardness, mg/l	33.7	30.6	Max. 200
30	Cadium, mg/l	< 0.003	< 0.003	Max 0.003
31	Cyanide, mg/l	Absent	Absent	Max 0.05
32	Lead, mg/l	<0.01	<0.01	Max 0.01
33	Mercury, mg/l	<0.001	<0.001	Max 0.001
34	Molybdenum, mg/l	<0.01	<0.01	Max 0.07
35	Nickel, mg/l	<0.01	<0.01	Max 0.02
36	Total Arsenic, mg/l	<0.01	<0.01	Max 0.01
37	Total Chromium, mg/l	<0.01	<0.01	Max 0.05

Microbiological tests:

S. No	Parameters	Result		As per IS 10500 (2012)
		Raw Water Sample	Treated Water Sample	
1	Coliform Organisms/100 ml	92	11	Less Than 1
2	E.Coli Bacteria/100ml	Present	Absent	Absent

From the Table 4.7, Turbidity was observed low (0.7) in raw water and high (1.4) in treated water. It could be due to chlorine dose. The pH levels for both Raw water and Treated water samples was observed slight alkaline in nature. All heavy metals were found within the permissible limit in both Raw and Treated water sample. Coliforms were found high in both raw and treated water sample. Highest coliform numbers was found in raw water sample as compare to treated water sample. E.Coli were present in the raw water sample while absent in treated water sample.

4.6.2 Water Quality at Consumer End

Water quality sampling at consumer end was also conducted and results are shown in Figure 4.9 and given in Table 4.8.

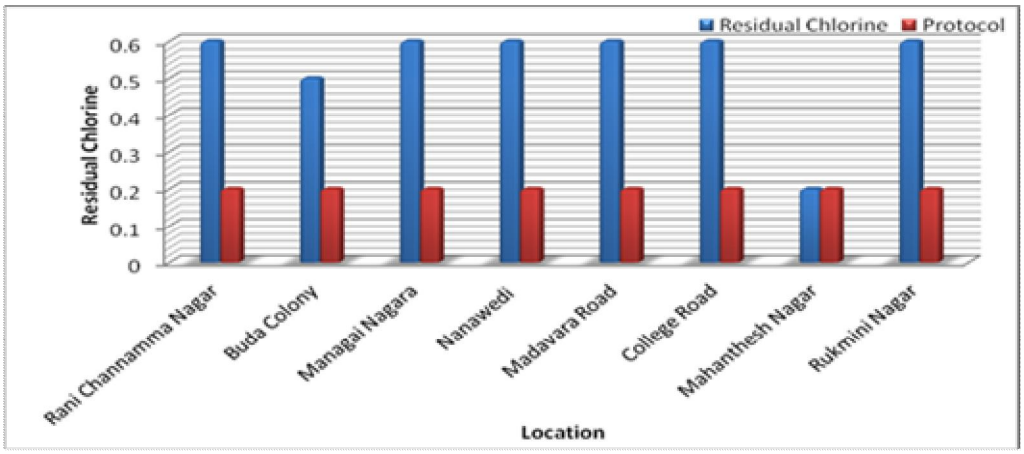


Figure 4.9: Residual Chlorine at Consumer End

Table 4.8: Water Quality at Consumer End (Tap Water)

Sl.	Location	Ward no.	Free Residual Chlorine		E.Coli Bacteria/100ML	
			Result	Protocol	Result	Protocol
1	Rani Channamma Nagar	2	0.6	Min 0.2	Less Than 1CFU	Absent
2	Buda Colony	6	0.5	Min 0.2	Less Than 1CFU	Absent
3	Managai Nagara	11	0.6	Min 0.2	Less Than 1CFU	Absent
4	Nanawedi	18	0.6	Min 0.2	Absent	Absent
5	Madavara Road	27	0.6	Min 0.2	Less Than 1CFU	Absent
6	College Road	40	0.6	Min 0.2	Absent	Absent
7	Mahanthesh Nagar	51	0.2	Min 0.2	Absent	Absent
8	Rukmini Nagar	54	0.6	Min 0.2	Absent	Absent

From the Figure 4.9 and Table 4.8, Residual Chlorine was observed high (0.6) at all water sampling locations except Mahanthesh Nagar (0.2) which just confirm protocol. While E.Coli were found less than 1 CFU in Rani Channamma Nagar, Buda Colony, Managai Nagara, Madavara Road water sample and absent in Nanawedi, College Road, Mahanthesh Nagar and Rukmini Nagar water samples.

4.7 Soil Quality

In order to assess possibility of cross contamination in the demonstration zones in the project city; soil samples were collected at the distribution network under the demo zone project (KWASSIP) and analyzed for its bacteriological and physiochemical characteristics. Two soil samples along the distribution network were collected in Belagavi city. Soil was red loamy and exhibits poor to medium porosity. All samples were found alkaline in nature. Nitrate levels in the samples were found moderate. High coliform counts were also recorded in the samples with fecal coliforms ranging from 10 to 15 colonies in plate count test. This indicates the potential of the soil to contaminate drinking water supplies.

4.8 Major Findings from Secondary Data Analysis

The issues identified from the secondary data are summarized below (Table 4.9).

Table 4.9: Major Issues / Findings based on Secondary Data related to Proposed Project

Major Issues	Cause	Major findings
Soil Erosion in the area, which leads to silt deposition water in bodies.	Soil erosion from upper reaches of surface water body	Silting of surface water sources. De-silting is undertaken by Irrigation

Major Issues	Cause	Major findings
		Department
Limited Water Supply infrastructure available	Good Rainfall and Inadequate water storage infrastructure	Decreased Water supply and storage capacity
Reduction in open spaces	Forest cover is going to reduce Changes in land use	Open spaces is only 9.9% in the area
Limited availability of Surface Water	Insufficient natural surface water resources, Insufficient funds for care & maintenance of surface water resources	Per Capita water supply is poor
Limited availability of Ground Water	Topography and geological conditions of the area.	91% Ground water development of the region. Increasing use of ground water
Surface & Ground Water Quality	Three Nala's (Bellary Nala, Lendi Nala and Kotekere Lake) in the city receive the sewage / wastewater generated in the city. Kotekere lake receives over 8 MLD of sewage from the city. The other two nalas (Bellary and Lendi) also carry wastewater from the city and ultimately join River Marakandeya at about 30 kms down stream of Belagavi. (Source: Demo Zone Report, KWASSIP)	Surface and Ground water quality is of concern.
Depletion of Ground Water Level	Increased withdrawal of ground water	Increased dependence on ground water resources due to limited availability of surface water

4.8.1 Social Profile

Social profile Belagavi City was analysed based on secondary source information primarily drawing from the Census report 2011

4.8.2 Sex Ratio

Sex ratio (female population per 1,000 male population) in 2011 in Belagavi was 988, which was higher than the district figure of 969, district urban figure (926) and state urban average (963).

4.8.3 Literacy Profile

In 2011, the literacy rate (percentage of literate population to the total population above six years of age) in the city was 80.2 percent. The literacy rate in Belagavi City was higher than the district (76.69percent), however lower than the state urban average (87.58 percent). The male and female literacy rate was 83.4 percent and 76.9 percent, respectively census 2011). The high literacy rate in the city is attributed to large number of educational institutions.

4.8.4 Average Household Size

As per Census, 2011, the total numbers of households in City were 111874, with household size of 4.4 peoples. There has been decrease in household size from 4.8 in 2001 to 4.4 in 2011.

4.8.5 Workforce Participation

As per Census, 2011, Total work force participation rate of the town was 171287 persons (35 %). Total main workers were 155589 persons (90.8%) of the total work force. About 92.46% of main workers were engaged in other services followed by 2.99% in agriculture sector and remaining 4.54% were engaged in household industries.

4.8.6 Ward-wise Analysis

Population: In 2011, total ward wise population was 490045 and ranged from 823 (in ward 60) to 19374 (in ward 54). Analysis of population distribution (ward wise) shows that ward numbers 37, 50, 35, 25 22, 65 and 40 were most populated while ward 49, 46, 43, 34, 12, 52 and 45 were least populated.

Child Population: The child population [0-6 years] was reported to be 52649 comprising 10.74 percent of the total population. The child population in the wards was found to vary significantly. Highest population (2609) was found in ward 54 which was 5% of total child population while ward 60 had the least number of children (76 i.e. 0.1 percent of the total children population).

SC/ST Population: The percentage of the SC and ST population in the town was 7.8 percent and 3.3 percent respectively. The lowest SC/ST population was found in wards number 28 and 37 while highest (more than 20 percent) was in ward numbers 50, 51, 11, 43, 40 and 54.

Literate Population: The percentage of literate population was found to vary across the wards. The proportion illiterate population in wards varied from 10.8% (in ward 17) to 32% (in ward 57). The maximum (more than 25%) population illiterate were observed in 57, 56, 50, 54, 13 and 14.

4.8.7 Slum Location, Spread & Details

Slum and squatter settlements in Belagavi are growing at alarming rates due to increased construction activities and industrial activities. The general composition of majority of slums comprises of scheduled tribes, scheduled caste, and other backward classes, forming the weaker section of the society. The Regional Centre for Urban and Environment Studies, Hyderabad was analyzed existing housing scenario in terms of the structures, its type, access to electricity and other related issues which are summarized below.

Table 4.10: Slum Details

Slum Types					
Area (Sq. mt.)	**0-20,000**	**20,001 to 40,000**	**40,001 to 60,000**	**60,001 to 80,000**	**80,001 to 10,0000**
No. of Slums	33	10	3	3	2
Slum is Located					
		Core		**Fringe**	
No. of Slums		36		15	
Physical location of slum					
	Along Nallah (Major Storm	**Along Railway Line**	**Along Major Transport**	**Others (Non-Hazardous/ Non-**	

	water Drain)		Alignment	objectionable)
No. of Slums	2	4	2	43
Slum is prone to flooding due to rains				
	Not prone	**Up to 15 days**	**15-30 Days**	**More than a Month**
No. of Slums	40	7	2	2
Type of Area surrounding Slum				
	Residential	**Industrial**	**Commercial**	**Institutional**	**Other**
No. of Slums	41	4	0	0	6

(Source: Report on Slum free city plan of action, Belagavi, Page no 29, Ministry of Urban Development, Govt. of India)

84% of the slums are on the sites of non-hazardous / non objectionable and remaining on the objectionable areas. Hence 16% of slums require special attention before undertaking any development, the beneficiaries cooperating and their livelihoods are of paramount importance.

4.9 Findings of the Primary Survey

The Communications and Social Intermediation Strategy (CSIS) study was undertaken in the Belagavi city by Samaj Vikas, Development Support Organisation with a 3.3% sample size. The present population (2011) of Belagavi is 490,045 respectively and the annual population growth of the city is 2.26 respectively. The household survey covered all wards and slum /non-slum households. The overall sample covered 11% of slum households in Belagavi city.

Table 4.11: Sample Size

City	Population	Total Households	Actual Sample Size	%
Belagavi	4,90,045	80,963	2696	3.3

The findings are summarized below:

4.9.1 Socio-Economic Features

In general, social backwardness is associated with limited access to services and impoverishment. The study has identified the disadvantaged groups such as SC/ST in the sample. The caste wise distribution of the sample households, as given in Table below, indicates a 12% coverage of SC & ST households where general population comprised 88%.

Table 4.12: Population Trend and Caste-Wise Distribution of HH

Caste-wise Distribution of Sample Households (fig in % HH)	
Caste	**Belagavi**
SC & ST	12
Others	88
Total	100

Family size has a direct implication on number of water users. The survey thus focused on understanding the family size. Average family size is 4.8 in Belagavi, which is reflected in the predominance (49%) of the sample households in the 3-5 family size category followed by domination in the 1-3 family size category. This shows that there are more nuclear families in Belagavi.

Table 4.13: Household Distribution based on no of Family Members (%)

No of Family Members	% of Respondents
1-3	23
3-5	49
5-7	19
More than 7	9
Total	100

Economic Profile

Income data of the sample population indicates that 36% of slum households in Belagavi, have an average monthly income of less than Rs. 5000 while 17% of the non slum households fall in this category. 11% of the slum households have an average monthly income of more than Rs. 20,000/- while this is nearly 25% of non slum dwellers in this category.

Table 4.14: Average HH Monthly Income Non Slum and Slum

Average HH Monthly Income - Non Slum and Slum Belagavi		
Range	% of Respondents	
	Non slum %	Slum %
Less than Rs 5000	17.4	36.5
Rs 5000 - 10000	27.3	29.1
Rs 10000 - 20000	30.8	23.3
More than Rs 20000	24.6	11.1
Total	100	100

Gender Segregated Literacy Profile

The survey data indicates that 86.1.1% males and 63.5% females are illiterate. 26.4% males and 18.8% are educated till SSLC. 5.8% males and 2.9% females are professional.

Table 4.15: Earning HH Head and Education Level in Belagavi

Earning HH Head and Education Level in Belagavi				
Belagavi	Male		Female	
	Freq	%	Freq	%
Illiterate	255	13.1	62	36.5
1-9 Class	355	18.2	39	22.9
SSLC	515	26.4	32	18.8
PUC	195	10.0	4	2.4
Graduation	326	16.7	17	10.0
Post Graduation	71	3.6	3	1.8
Professional	114	5.8	5	2.9
Diploma	102	5.2	5	2.9
Others	21	1.1	3	1.8
Total	**1954**	**100**	**170**	**100**

4.9.2 Supply of Water

Drinking Water Supply is a basic function provided by the Municipal Corporations. The key responses of sample survey on service features have been provided below:

Sources of Water Supply

Municipal Household Connection (63%) is the major source of water supply for the sample population. People do depend on other sources as well. In Belagavi, 13% households use either stand posts or hand pumps for drinking water and 17% households are using dug well (open well) water in city.

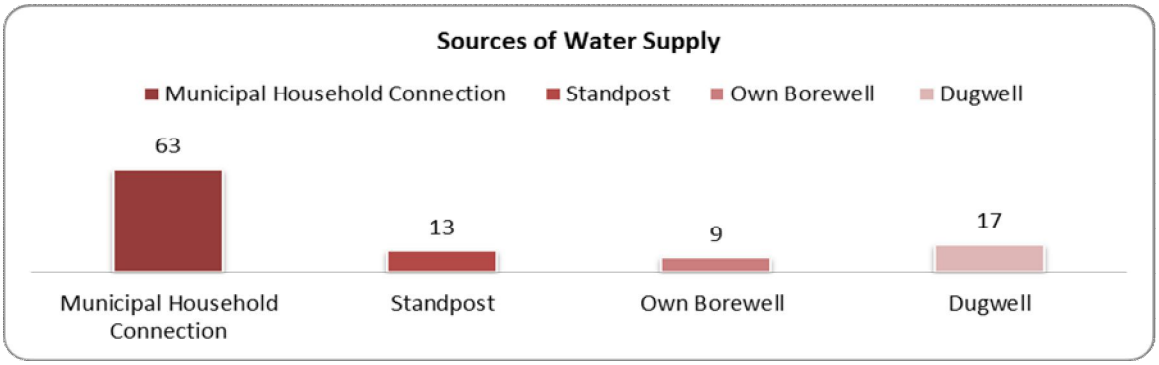


Figure 4.10: Source of HH Water Supply

People do depend on other sources as well. 13% of sample households use either stand posts or hand pumps for drinking water. 17% households use dug well (open well) water.

However, in and Belagavi, 12% of slum households use stand post/ hand pump respectively. Dug wells are used in Belagavi by 14% slum households.

Frequency of water supply

Table 4.16: Frequency of water supply for HH connection

Once in days	% of Respondents
1	42
2	30
3	12
4 & above	16
Total	**100**

Every urban household desires assured water supply at convenient timings. Belagavi has different durations of water supply in different parts of the city; 72% of the households report water supply up to two hours and the balance households report water supply from two to above four hours.

Table 4.17: Hours of supply on day of supply

In hrs	% of Respondents
1	42
2	30
3	12
4 & above	16
Total	100

Per Capita Water Consumption in the ULBs

The field survey attempted to understand water consumption pattern in the ULB at the household level. The data indicates that around 80% households use upto 100 litres

/capita/day. There is no major difference in water use in demo zone and non demo zone houses as seen from the data.

Table 4.18: Per Capita Water Consumption in Belagavi

Per Capita Water Consumption in Belagavi		
Consumption In Litres / capita / day	**% of Respondents**	
	Non Demo	**Demo**
Less than 40	10	16
40 – 70	57	48
70 - 100	20	15
100 - 135	7	10
Above 135	5	11
Total	100	100

Comparisons over slum and non- slum respondents imply that 70-100 litres consumption has been recorded by majority in both the areas.

Table 4.19: Per Capita Water Consumption in Belagavi

Per Capita Water Consumption in Belagavi (%HH)		
Consumption In Litres/capita /day	**% of Respondents**	
	Non Slum	Slum
Less than 40	10	20
40 – 70	54	64
70 - 100	20	13
100 - 135	9	2
Above 135	7	1
Total	100	100

User Adoptions

The survey findings indicate that 345 out of 1705 sample households (21%) having Municipal Household Connections resort to pit-tapping (dug pits) to get water and most of them use booster motor pumps as well.

Table 4.20: Methods Used to Get Water from HH Connections

Methods Used to Get Water from HH Connections	
	% of Respondents
No of HH Connection Users	1705
No of HH having Pits Dug	345
No of HH Using Motor Pump	348
% HH having Pits Dug	20
% HH Using Motor Pump	20

Fetching Water

The study finds that each household on an average spends about half an hour to two hours to fetch water from stand post. Table 4.23 shows that women are the primary group who are engaged in fetching water

Table 4.21: HH members involved in getting water from stand post

HH member involved in getting water from stand post % HH	
Family member fetching water	**% of Respondents**
Wife	57.8
Daughter	3.4
Daughter-in-law	5.9
Granddaughter	0.3
Head	18.3
Son	14
Others	0.3

Coping With Intermittent Supply- storage practices

The intermittent supply with low frequency has compelled citizens to adopt coping mechanisms by creating household level storage. All types of households, across income ranges, in the three cities depend on storage facilities. The survey collected data on these coping mechanisms and the **Figure 4.11** presents coping mechanisms by sample slum households. It can be observed that more than 90% of households in slums in the use drums, buckets and vessels for storing the water. Some of them do use overhead tanks and underground sumps as well for storage of water.

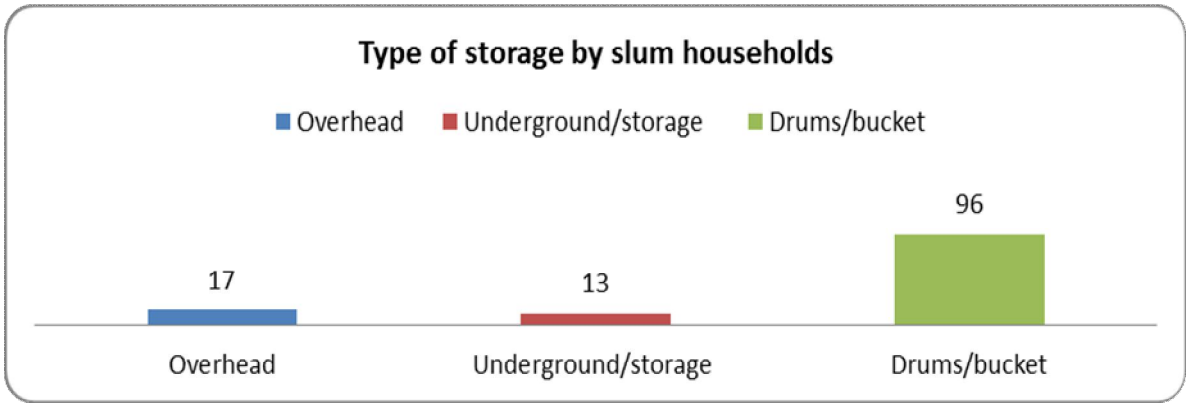


Figure 4.11: Type of Storage by Slum Households

Water Quality

The survey collected users perceptions regarding water quality in demo zones and non-demo zones. Demo zone households reported no water quality problem. This is due to the fact that they receive safe 24/7 water supply. Only 3% of sample households in Belagavi perceive water quality problems. The survey went further to understand type of problems perceived by the users. Out of 3% households, who reported water quality problems in Belagavi, 88% had reported turbidity (muddy) as a problem.

Household Level Water Treatment

Though water quality is perceived as a problem by survey respondents, more than 40-60% sample households; both slum and non-slum, do not take up any further treatment. Filtering by cloth is a common practice by more than 10-40% of the households; in both slum and non-slum areas. Candle filters are used by about 5-20% of the households. About 5 % households other electric/ non-electric purifiers for improving water quality. This is another reason for switching over to safe 24/7 water supply. There is a definite need of creating awareness on the water quality assurance and benefits under 24/7 water supply regime.

The survey listed the water treatment practices across social categories. It can be seen from the table below that 54% of the SC/ST households in the sample survey are not treating water at household level. Another 30% SC/ST households just filter by cloth and only 16% treat water using various means. The water treatment practices followed by other households from other social categories are not significantly different. This further strengthens the need for good quality water supply requiring no further treatment at household level. There is a need to create awareness among these households on safe water handling practices at household level.

Table 4.22: Social Category wise HH level water treatment practices

Social Category wise HH level water treatment practices (% HH)		
Type of Treatment	**% of Respondents**	
	SC/ST	**Others**
No further treatment	65	47
Filtration by cloth	15	11
Use candle filters	10	21
Boiling	7	10
Water purifiers & other gadget (electric)	2	8
Water purifiers & other gadget (non electric)	1	3
Others	0	0
Total	100	100

Water Charges

In the demo zones, payments are made by households as per the metered readings. The findings are presented below:

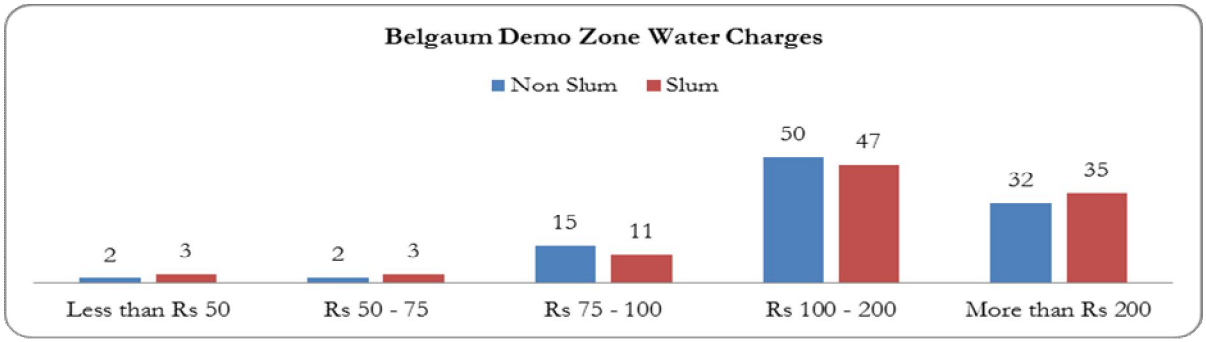


Figure 4.12: Belagavi Demo Zone Water Charges

The data shows that about 50% of the respondents in Belagavi demonstration zone; both slum and non-sum receive a monthly bill in the range of Rs. 100 to Rs. 200/.The Municipal Corporations has provided subsidy for meter installation and connection to poor and slum households. As there is no subsidy on water charge payment, the water bills are based on usage. However about 17% of slum households in Belagavi respectively pay less than Rs. 100 a month. Further about 3% slum households in Belagavi pay less than Rs. 50 a month.

Willingness to Pay by Volumetric Billing

The sample survey indicates that above 40-60% of the non-slum households are willing to pay up to Rs. 250/- per month for 24/7 water supply. This was the response of the households when asked 'if the present water supply is improved to 24/7, then how much would you be willing to pay'. About 11% of respondents are willing to pay as per meter (as per use). The study further reveals that about 60% of the slum households are willing to pay Rs. 250 per month for 24/7 water supply. This indicates that the slum households which include poorare suffering so much from the intermittent water supply that are willing to pay

comparable charges as that of the non- slum dwellers for an assured safe 24/7 water supply.

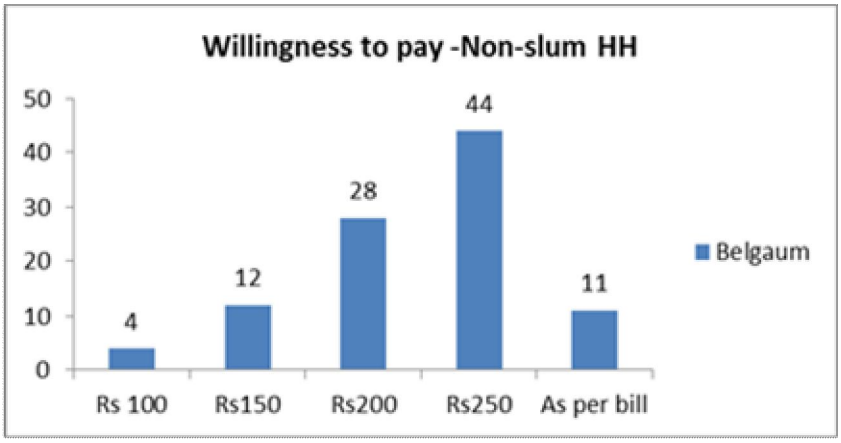


Figure 4.13: Willingness to Pay by Non Slum HH

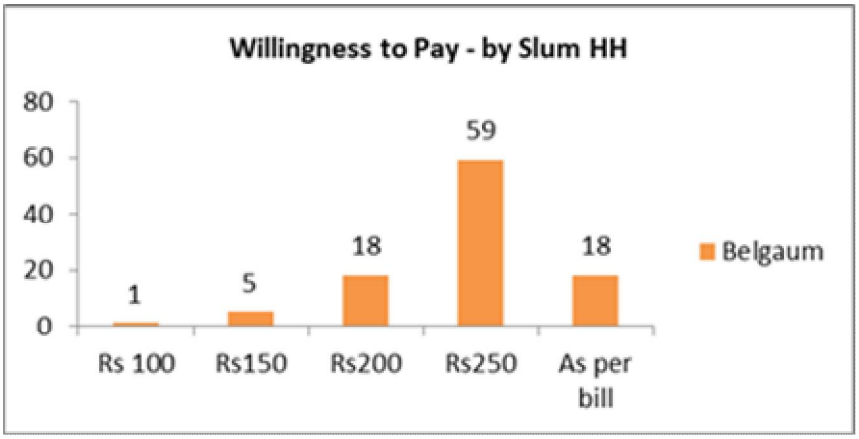


Figure 4.14: Willingness to Pay by Slum HH

The field survey reveals that one –third (30%) of the stand post users are also willing to pay Rs 250/- for continuous water supply followed by 30% who are willing to pay Rs 200. This indicates that stand post users are put to such hardship under intermittent water supply regime that they are craving for more assured and reliable water supply and are willing to pay more for the same.

Table 4.23: Willingness to Pay by Different Facility Users

Monthly Water Charges	% of Respondents	
	Stand posts	HH Connection
Rs 100	5	4
Rs 150	15	10
Rs 200	14	31
Rs 250	30	47
As per meter	35	8
Total	100	100

Table 4.24: Willingness to Pay across Income Categories

Willingness to Pay across Income Categories (% HH in non-slum areas– all cities together)

Monthly Water Charges	Less than Rs 5000		Rs 5000 – 10000		Rs 10000 - 20000		More than Rs 20000	
	Non Slum	Slum	Non Slum	Slum	Non Slum	Slum	Non Slum	Slum
Rs 100	5	4	4	4	5	4	5	6
Rs 150	8	4	7	4	7	6	7	7
Rs 200	16	9	19	13	20	14	23	15
Rs 250	56	63	55	64	53	64	48	63
As per meter	16	19	15	15	16	30	17	10
Total	100	100	100	100	100	100	100	100

The above table reveals that there is willingness to pay for assured water supply across different income categories; both among slum and non slum sample households. This indicates that citizens, irrespective of their income category are looking forward to having assured continuous water supply and are willing to pay more for this. It can also be seen that more number of slum households are willing to pay upto Rs. 250/- per month. This reminds us of the need for a project pro-poor policy to encourage such behavior among the poor and vulnerable and for making sure they access the services.

Reasons for not having house connections

The survey also aimed at understanding reasons for households not having municipal house service connection. According to this data 63.2% of the sample households have Municipal Household Connection. This means that the the remaining 36.8% households; both slum and non-slum have no Municipal Household Connection. The following table provides reasons as enumerated by these households for not having Municipal Household Connection.

Table 4.25: Reasons for not having HH Water Connection

Reasons for not having HH Water Connection		
Reasons	% of Respondents	
	Non Slum	Slum
Can't afford	30	3
No proper records	0	0
No distribution in the area	226	31
No pressure/technical not possible	106	7
Lengthy process getting one	52	3
Others	36	4
Total	450	48
Total No of Survey Households	2394	302
% HH not having HH connections	**18.8**	**15.9**

The data shows that among those who do not have household connection, one-third of sample households have not taken connections as there is no distribution network in their area. The technical reasons such as low/no pressure are cited by 24% in Belagavi.

Lengthy process for getting house service connection was reported as a reason by 12%. Affordability as an issue was raised by 6%.

4.9.3 Health Profile

As per the household survey conducted by CSIS, around 80% of the respondents were aware of the water borne diseases such as typhoid, diarrhoea, gastroenteritis, cholera and others. The monthly medical expenditure reported by the respondents ranged between Rs. 20 to Rs. 3, 000 per month, with more than 86% of the respondents spending less than Rs. 500 per month. During the last six months, the medical expenditure incurred by the respondents was of a minimum Rs. 400. About 86% of the respondents visited private health centres and the 14% visited government health centres for treatment.

Table 4.26: Respondents Reporting Water Borne Diseases

Diseases	% of Respondents
Typhoid	39.8 %
Diarrhoea	18.1 %
Gastroenteritis	10.8 %
Cholera	31.3 %

Table 4.27: Average Household Monthly Medical Expenditure

Range of Monthly expenditure	% of Respondents
Less than 0	1.55 %
0-100	6.09 %
100-1000	86.93 %
More than 1000	5.43 %

Table 4.28: Knowledge of Water Borne Diseases

Knowledge about Water-borne diseases	% of Respondents
No	46.44 %
Yes	53.56 %

Table 4.29: Source of Medical treatment

Treatment Source	% of Respondents
Non-Government	85.68 %
Government Hospital	14.32 %

4.10 Conclusion

The base line socio economic profile of the project area does not indicate the presence any sensitive social and environmental features, which could be impacted due to the project activities. Belagavi, with its rich historic back ground has a few heritage structures. The project activities shall ensure that these structures are not impacted during the construction or operation phase of the project. Other than the above, the project is critical in improving the water supply service levels in Belagavi.

Chapter 5: Assessment of Environmental Impacts

5.1 Introduction

The proposed project will lead to several impacts on the environmental and socio-economic status of the project area. A good number of these impacts will be beneficial, especially the improvement of availability of potable water in city, reduction of water borne diseases, reduction in man- hours spent (especially women and children) in sourcing for water, and the establishment of an environmentally sound, safe and sustainable water sanitation system.

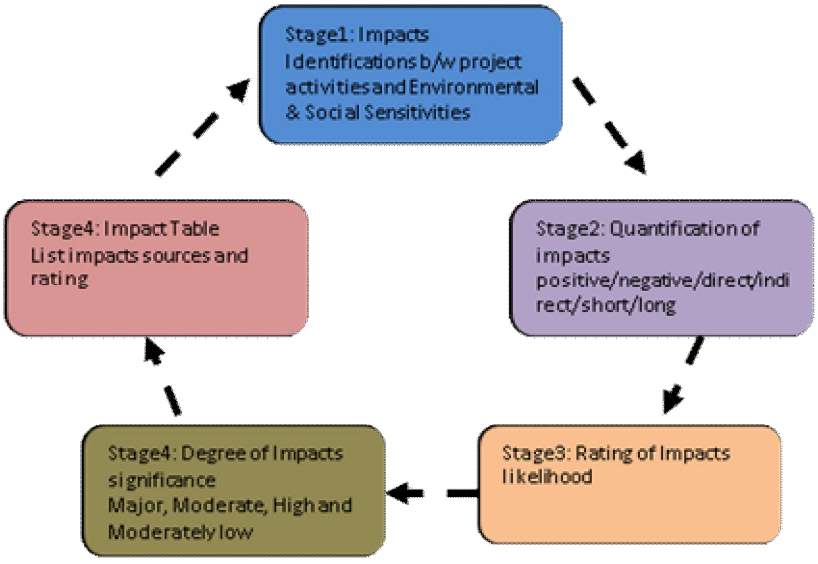
This chapter presents a summary of the identified potential beneficial and adverse impacts associated with the Belagavi water supply project. Identification of all potential environmental impacts due to project is an essential step of EIA. In case of water supply projects, impacts on biodiversity, air pollution, water pollution, waste management and social issues are significant.

5.2 Associated and Potential Environmental Impacts

For the identification and rating of key issues and impacts that are likely to occur during the phases of this project and the significance of the associated impacts, a "5-Step-Tool" was used.

5.2.1 Rating of Impacts

Five steps were followed sequentially in order to rate the impacts of the various activities of the project as shown below:



5.2.2 Determining the magnitude of impact

For the identification and rating of key issues and impacts the "5-Step-Tool" has been adopted on environmental impact and the impact assessment matrix has been prepared.

Impact Assessment Matrix

Likelihood	Negative Consequence				
	Hardly any	Little	Considerable	Great	Extreme
High	Moderate	Moderate	Major	Major	Major
Medium High	Minor	Moderate	Moderate	Major	Major
Medium	Minor	Minor	Moderate	Moderate	Major
Medium Low	Negligible	Minor	Minor	Moderate	Moderate
Low	Negligible	Negligible	Minor	Minor	Moderate

LOW	Consequences			High
Hardly any	Little	Considerable	Great	Extreme
Local, small-scale, easily reversible change on social characteristics or values of the communities of interest or communities can easily adapt or cope with change.	Short-term recoverable changes to social characteristics and values of the community of interest or community has substantial capacity to adapt and cope with change.	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has some capacity to adapt and cope with change.	Long-term recoverable changes to social characteristics and values of the communities of interest or community has limited capacity to adapt and cope with change.	Irreversible changes to social characteristics and values of the communities of interest or community has no capacity to adapt and cope with change

Associated and Potential Impacts

Activities during lying of new trunk main will involve excavation, transportation & lying of pipe and reinstating excavated farm land, road and stream sections. Replacement and strengthening of the feeder mains will include digging of roads in the areas where replacement and strengthening is planned and reinstating the roads and drains thus disturbed.

The alignment of the proposed new main transmission line are proposed in such a way that the main runs principally along public roadsand that, there will be no land acquisition.

The project proposes dismantling of OHT/ELSR/GLSRs and construct new structures. It is proposed to dismantle overhead reservoirs and construct the new ones in its near vicinity. Extra care needs to be taken during the dismantling of the structures like caution board and prior information to nearby community. Dismantling and new construction may lead to air pollution and health & safety problems to nearby habitation. **It is strongly recommended during construction of both ELSR and GLSR a detailed geotechnical/ soil study should be carried out**. An environment management plan or mitigation measures have been suggested in Chapter 7.

Since the distribution network in the city is to be re-laid, extra precaution needs to be taken

in areas which are congested. Proper barricading needs to be provided on such stretches. Proper "Caution" tapes and signboards need to be put in place in both local and English language to highlight the working area.

Before the work is undertaken in the city, a proper traffic flow management plan should be prepared and implemented to ensure that the public and good movement is not adversely effected due to the construction activity.

There should be proper parking facilities at nearby houses, parks, playgrounds. Alternate lanes should be taken for pipeline laying so that access can be provided to residents. Start and end period date for the implementation and lying of pipeline work should be displayed in boards which are written in both local and English language.

5.3 Land Environment

Both existing and proposed pipelines are aligned along Belagavi- Hidkal Dam Road (Gokak Road-54) and follows the road alignment for the entire stretch. The road abuts reserved forests near Dasanhatti and Tumarguddi. Both existing and proposed raw water main pipelines cross Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages. Laying the trunk pipelines will involve excavating a trench. The width of the trench would depend on the pipeline diameter and in no case would exceed 2.5 m. for the entire length of alignment. These earthwork activities will be localised and will have temporary impact on the topography of the area.

Similarly, excavation of roads to replace the distribution pipeline will not have a significant impact on the topography.

Soils: The impact on soil due to the project will be in terms of localised topsoil erosion along the alignment, due to construction activities. Since the alignment is along developed roads and along the existing pipelines, topsoil loss will have little impact on future agricultural yield. No quarries are envisaged in the project. Hence no impact on the soil is envisaged.

5.4 Water Environment

1. **Water Availability:** Surface water has traditionally been the major source of water for drinking, irrigation and industrial uses city. There are no major rivers or reservoirs in the near vicinity of the city other than present surface sources. The present sources, a) Rakaskop Reservoir and b) Hidkal Dam have been studied in detail by KUWASIP-Consulatnts to estimate the available quantity and dependability as a source for water supply to city for the horizon year 2041.

   In the absence of sufficient data such as inflows of Rakaskop reservoir, simulation studies could not be work out the availability and dependability of source in the feasibility report. However based on the records of drawls from the reservoir for the water supply to Belagavi city for the past 10 years was assessed that this source could yield 40 Mld at 100% dependability.

   The 117 Mld is available from Hidkal reservoir. This quantity is just 3% of the gross storage of the Hidkal reservoir. Supply for Drinking water gets top priority as per National water policy and if situation demands irrigation releases may be curtailed. Based on the catchment yield and the reservoir storage capacity of Hidkal Reservoir, this source is considered 100% dependable for the supply of 117 Mld to Belagavi city to meet water demand by the year 2041. Ground water source shall be treated as supplementary source in case of any emergency or till implementation of distribution system in those

areas.

*(Detailed water availability in these reservoirs is presented in **Annexure VI)***

2. **Surface Water Quality:** The proposed alignment of main is along the existing pipe line and roads which does not encroach / pollute any surface water bodies in the city. Hence no significant impacts are anticipated on the surface water quality. Although leakages are found in existing pipeline at many places along the entire stretch and Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages have a rivulet where a causeway is built for the road and the existing pipeline crosses the rivulet through a pipe support bridge.

   However the free flow of water will be obstructed during the construction period, at the location of the intersection of the proposed alignment with the local drainage system. Hence adequate temporary bypass arrangements during construction and permanent drainage arrangements post construction, in the areas of intersections, are required to avoid flow imbalances and flooding.

   Improvement in the distribution system will not have any direct impact on the surface water quality. With the increase of population, the water demand would increase which in turn will lead to higher generation of sewage. As such proper sewerage system needs to be put in place along with the water supply scheme to ensure that the surface water quality is not adversely affected.

3. **Ground Water Quality:** Since alignment of the pipeline is on a fairly flat terrain, no activities of the project construction or operations are expected to interfere with the ground water characteristic of the region. Hence impacts on ground water quality are not anticipated. Improvement works in the feeder mains will not have any impact on the ground water quality during construction. The ground water table in Belagavi is in the range of 5-10 m below the ground level and is susceptible to pollution. Hence proper collection and disposal of sewage will be a critical factor to avoid pollution of the shallow ground water table.

   Also, it is recommended that some water harvesting schemes be implemented in the city to recharge the depleting ground water.

5.5 Climate and Air Environment

1. **Impacts on Climate:** No changes in climatic conditions are anticipated due to the project execution.
2. **Air Quality:** Suspended particulate matter and dust are major sources of air quality impacts during the excavation and construction process. As the project envisages lying of the pipeline along road network and/or on existing pipelines, the impact of air pollution will not be very significant.

   However, on site the impact on air quality due to the project is likely to be higher. Adequate dust suppression measures and protective measures to the work force will significantly reduce impacts. AWS (Automatic Weather Station) technique should be use for the monitoring of air pollution.

   Considering the size of the pipe material being laid, transportation and lifting machinery will be required during the construction phase. The movement of these vehicles on these temporary roads will contribute to the deterioration of air quality.

   No air quality impacts are anticipated during the operation phase of the project.

5.6 Noise Environment

1. **Construction Phase:** Movement of vehicles transporting construction material and noise generating activities at the construction site, are major sources of noise pollution during construction. Material movement and associated laying work are primary noise generating activities on site and will be distributed over the entire construction period. Proper safety measures as mentioned in the management plan need to be adopted, to mitigate any adverse impact of the noise generated by such equipment.

   Activities involving replacement of existing pipeline in the close proximity of households will have an adverse impact due to noise pollution. This impact is temporary and limited to the construction phase.

   However, selection of construction equipment and timing of activities, as envisaged in the management plan, will mitigate the impact.

2. **Operation Phase:** Except during regular maintenance activities, no noise generating activities are envisaged during the project operation phase and hence no noise impacts are predicted then.

   Ecological Resources: The project activity does not involve encroachment of sensitive environmental features or cutting of trees / vegetation. Hence no impacts are predicted on the ecological resources of the project area.

   Archaeological / Cultural Properties: No structures of archaeological or historical importance lie along the main alignment route and hence there would be no impact on the Archaeological / Cultural properties. While in city, Fort, two Jain temples, the remains of a Hindu temple and Safa Masjid (In Belagavi Fort) are found as historical monuments under the central protection category. Construction activities around these structures need to include adequate precautionary measures and clearances from NMA (if come in any stage).

   Other Issues: It is understood that the right of way for the proposed alignment will be in understanding with landowners. The pipeline will be laid one meter below ground level and as such no existing activity will be affected.

5.7 Construction Phase Specific Impacts and their Rating

The potential impacts and their severity are associated with different phases summarized below.

Table 5.1: Construction Phase-specific Environmental Impact

Sr. No.	Project Activity	Environmental Impact
I.	**Construction Stage**	
1	River Intake at Hidkal Reservoir new structure	• Increase water pollution during construction • Deterioration of water quality • Temporary Disruption of water supply
2.	Replacement of existing PSC pipe with 1000mm dia MS pipe for a length of 0.76 Km at Hidkal Scheme	• Increase in Dust levels due to earth work or replacement of pipe • Soil pollution or soil erosion • Increase noise levels due to excavation • Deterioration of water quality • Disruption of traffic flow during replacement • Landscape degradation • Disruption of water supply to the consumers during

Sr. No.	Project Activity	Environmental Impact
		implementation • Water conflicts due to shortage of water
3.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 3.40 Km parallel to the existing alignment.	• Pressure on local resources • There may be cases of destruction of underlying existing water supply line which leads to leakages and shortage of water nearby locality. • Loss of Fertile Top Soil of the Agriculture Land along the alignment, if any. • Increase in Dust Levels to due to earth work and other construction activities • Accumulation of Excess Earth • Disruption of traffic flow in the above roads especially Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages. • Disruption of Utilities such as electricity, telephone and other services. • Damage to standing crops during break down of the transmission main or maintenance operations • Unhygienic condition in construction camp • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • May Increase Health problems in Labours and Populace.
4.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 16.50KM parallel to the existing alignment	
5.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 15.20KM parallel to the existing alignment.	
6.	Laying of 700mm dia MS pipe for a length of 0.80Km form Indal tapping point to proposed WTP	
7.	Construction of WTP	• Increase dust or other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipment • Increase health risk in nearby areas • Increase health risk in construction Labour • Accumulation of construction waste • Accumulation of earth material
8.	Rehabilitation of existing WTPs	No major impact anticipated
9.	Dismantling of existing Elevated Service Reservoir	• Increase in Dust Level due to dismantling (Udymbhag, RC Nagar 1st stage, Gummatmal, Sambhaji Udyan, TB Ward old tank, VV Nagar, Ambedkar Garden, RC Nagar 2nd stage, Subhash Chandra nagar and June Belagavi). • Increase health risk in nearby areas • Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles
10.	Construction of new reservoirs	• Increase dust levels due to construction of reservoirs nearby area especially Mrutyunjay Nagar, Kaveri Nagar, Sambhaji Udyan, Goodshed Road, Hasbag, Ganeshpur, Visheshwarayya

Sr. No.	Project Activity	Environmental Impact
		Nagar, Nehru Nagar, Vaibhav Nagar, Auto Nagar and Kanbalgi • Increase noise levels due to movement of heavy vehicles and construction equipments in nearby areas • Disruption of traffic due to movement of vehicles and equipments • Soil pollution due to leakages from vehicles and equipments • Top Soil erosion • Accumulation of earth material • Increase health risk in nearby area • Increase occupational health risk of construction labours • Increase sanitation problems due to construction camp • Accumulation of construction waste • Increase risk on ground water contamination • Impact on city drainage system
11.	Relaying of complete Water Distribution Network.	• Increase dust levels due to excavation of earth. This will affect all project sites, particularly Ward, 11, 12, 14, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, defence area, schools, colleges, university and hospitals. • Increase noise levels due to movement of heavy vehicles • There may be cases of destruction of underlying cables (Telephones and internet) • Water pollution due to leakages or damages of existing distribution lines • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Soil pollution due to leakages from vehicles and equipments. • Soil erosion and accumulation of excavated materials • Increase occupational health risk of construction labours. • Increase sanitation problems due to excavation. • Accumulation of construction waste • Increase risk on ground water contamination • Impact on city drainage system • There will be an increase in traffic congestion on major roads and streets as a result of intermittent movement of equipment and materials. This will impact on travel time, and may result in negative perception about the project, amongst road user s, residents and commercial establishments • If project implementation will require the procurement of more than one contractor, the possibility of conflicts and workplace violence occurring may arise. This may hinder or slow down project activities. Impediment to the work schedule will pose a negative social impact as successful project management and monitoring will be thwarted

Sr. No.	Project Activity	Environmental Impact
II	**Operation Stage**	
	24x7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping. • Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Occurrence of chlorine intoxication if water is over chlorinated during treatment

5.8 Activity specific impacts in Sensitive Areas

While the phase specific impacts have been elaborated above, impacts of contraction will have specific and significant in sensitive locations – sensitivity being defined in terms of critical social, cultural, religious services with being delivered in those locations. Critical or sensitive locations include hospitals and health units, schools and educational institutions, crematorium, historic and tourist locations, market place, major residential complexes and major road junctions. Impact caused due to construction activities in critical locations of the town have been elaborated below.

Table 5.2: Activity Specific Social Impacts in Sensitive Areas

S. No.	Activity	Identified locations which will be affected	Nature of impact
1	Laying of pipeline in sensitive institutional locations like Schools	• St. Xavier's High School • Government Kannada Boys School • Indal Kannada School • Herwadkar English High School • St. Joseph's Canossian Convent School • Bhartesh English Medium High School • Chintaman Rao High School • St. Paul's School, • Kendra Vidyalaya • Belagavi Military School • Visvesvaraya Technological University • KLE, the Karnatak Lingayat Education Society, and KLS, Karnatak Law Society • Rani Channamma University • Maratha Mandal Colleges • S. Nijalingappa Sugar Institute (	• There will be disruption to the movement of vehicles and students / Teachers. • Increase in Dust levels due to earth work or replacement of pipe • There will be noise pollution hampering classes and lectures. • Landscape degradation and uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation

S. No.	Activity	Identified locations which will be affected	Nature of impact
		construction of ESR	
2	Laying of pipeline near hospitals	• Jawaharlal Nehru Medical College & Hospital • KLES PBK Hospital & Medical Research Center Nehru Nagar • KMC Shivaji Nagar • Dist Hospital, Dr Ambedkar Road • Belagavi Cancer Hospital, NH4, Ashok Nagar	The medical facility will face problems in terms of transportation of patients, visits by patient party and handling emergencies Disruption of water supply to hospitals during implementation
3	Construction of ESR in close vicinity to health units	• KLE Society's Hospital and Medical Research Centre	
4	Laying of pipeline in Commercial areas	All markets and commercial areas particularly commercial areas in old Belagavi at Vadagaon, Khasbagh and Shahpur are engaged in business with power looms. Automobile-related trade and manufacture happens in the Fort Road area of the city and Udyambag. The Raviwarpeth area is known as the wholesale market.	Since there will be disruption to the movement of vehicles and pedestrian. There is a possibility of commercial activities being affected due to non-commutable road conditions. Vendors may have to shift locations which might affect their regular business Loss of livelihood and sales
5	Proposed ESR construction in commercial areas	Big Bazaar in Mrutyunjay Nagar where the proposed ESR site has been identified	Increase dust levels due to construction of reservoirs Increase noise levels due to movement of heavy vehicles and construction equipments There is a possibility of commercial activities being affected due to non-commutable road conditions. Vendors may have to shift locations which might affect their regular business Loss of livelihood and sales
6	Laying of pipeline Tourist attractions, Religious and Historic Places	A wide variety of historical sites, temples and churches exist in and around the city, most notably the Belagavi Fort and Kamala Basti within it, St. Mary's Church, Kapileshwar temple (South Kashi), Siddeshwar Temple in Kanbargi, Aerodrome at Sambra, and others.	Tourism will be affected temporarily because of disruptions in connectivity and commuting
7	Construction of ESR in Cauvery	Ganesh Temple in Cauvery Nagar Ganesh Temple in Khasbag	Regular devotees will face

S. No.	Activity	Identified locations which will be affected	Nature of impact
	Nagar and Khasbag near temples		problems in commuting
8	Laying of pipeline through Intersections and Main City Roads, Narrow Lanes, Densely Populated areas	About 95% of the roads are maintained by Belagavi City Corporation, while the remaining is maintained by the PW,P&IWT. Khade bazaar road running in east-west direction connecting Pune-Bangalore road and Belagavi-Panaji road, Ganapati Galli road running north-south are the important roads in the CBD area of Belagavi. National Highway 4 i.e. Pune Bangalore Road and Belagavi–Panjim (NH 4A) are the two major roads passing through Belagavi. The north-south bound traffic passing through the city limits have to negotiate three level crossings, Gate Number 1 on Congress Road, Gate Number 2 on Congress Road, Gate Number 3 on NH-4A, which cause heavy traffic jam as well as hardship to the public during the period of closure of level crossings.	There will be disruption to the movement of vehicles and pedestrian. Traffic congestions on major roads will lead to delay in commuting for regular commuters. The problem will be pronounced if there are no route diversion possibilities.
9	Construction of ESR close to residential colonies in Kanbargi and Auto Nagar	KHB Colony in Kanbargi Auto Nager Area	• Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipment • There will be disruption to the movement of vehicles and pedestrian. • Traffic congestions on major roads will lead to delay in commuting for regular commuters. • The problem will be pronounced if there are no route diversion possibilities.

Based on 5 step tool and Impact Assessment Matrix as described above, a conclusive rating has been done and presented below:

Table 5.3: Rating of Environment Impacts

Project Phase	Sub-component	Potential Impact	Degree of Consequence	Rating
Pre - construction	Air	Fugitive dust and exhaust fumes from vehicles	Considerable	Moderate
	Soil	Soil compaction and soil structure changes due to influx and stationary positioning of heavy duty equipment and vehicles	Little	Minor
		Leakages from stacked equipment and subsequent seeping through of contaminated oils and chemicals	Considerable	Moderate
	Noise	Increase above permissible noise level, (55Db in residential, 65 in commercial and 75 in industrial area) due to movement of vehicles, equipment and machines to the pumping stations	Considerable	Moderate
Construction	Ground water	Saltwater Intrusion	Considerable	Moderate
		Increase of groundwater vulnerability	Considerable	Moderate
		Introduction of turbid waste water into surface water during cleaning	Considerable	Moderate
	Air	Cement, dust (during demolition), other dusts, exhaust fumes, hazardous gases (NOx,CO, SOx, PM 2.5, PM10)	Considerable	Major
		Demolition works releasing asbestos dust into the atmosphere	Great	Major
		GHG Emissions	Considerable	Minor
	Water quality / Hydrology	Contamination from (oils, fuel, chemicals substances etc)	Great	Moderate
		Contamination by human faecal wastes	Considerable	Moderate
		Water contamination by sediments	Considerable	Moderate
	Soil / Geology	Creation of pathways for contaminants as a result of borehole/well drilling	Considerable	Moderate

Project Phase	Sub-component	Potential Impact	Degree of Consequence	Rating
		Loss or compaction of top soil due to movement of heavy vehicles and equipment	Considerable	Moderate
		Contamination of soil by oil spills, fuel etc	Considerable	Minor
	Noise	Extensive noise pollution as a result of on-going construction works.	Considerable	Moderate
	Waste	Social and health concerns arising due to poor waste management practices	Considerable	Moderate
	Traffic	Increase in travel time due to works.	Considerable	Moderate
Post Construction	Air	Exhaust fumes from equipment and diesel generator plant.	Little	Minor
	Soil	Groundwater contamination from accidental spills.	Considerable	Moderate
	Noise	Nuisance due to increase in noise levels	Little	Negligible
	Water quality and hydrology	Cross Contamination/ Leakages	Considerable	Moderate

5.9 Conclusion

Belagavi is not located near any eco-sensitive area. The construction of proposed units will have environmental impact on the adjoining settlement in terms of dust and noise during construction. Soil pollution and impact on water quality and hydrology will be marginal and temporary. The impact on the air quality due to the operation of construction machineries in the site is found to be considerable due to digging of trenches and demolition activities. The negative impacts that are likely due to construction activities in narrow and congested roads need critical attention. For mitigation of these impacts following measures are suggested: Compliance with Air Act 1981 and Noise Rules, EP Act 1986 will be mandatory for contractors. There will be no significant adverse impacts in terms of flooding, gas emission, waste discharge, health risks etc. Hence no Environmental Clearances are required for the project.

Chapter 6: Stakeholders Assessment

Consultation with relevant stakeholders had been an important component of the social and environmental baseline assessment and to obtain the perceptions and views of the stakeholders on social and environmental concerns pertaining to the local areas. The objective of stakeholder consultation was to identify environmental & social issues, impacts, and options to minimize potential negative impacts. The views held by the stakeholders were analyzed and are presented in this section.

Stakeholder consultations conducted by M/s Samaj Vikas Development Support Organisation as part of Communication and Social Intermediation Strategy (CSIS) study and City wide Consultations held by KUIDFC have also provided a forum for the Stakeholders to provide their opinions/suggestions.

6.1 Major Findings from Stakeholders Consultation

The methodology followed in focus group discussion and stakeholder consultation meeting is given below:

- ✓ Inviting the key stakeholders to the meeting
- ✓ Motivating and encouraging interactions and deliberations on pertinent issues
- ✓ Eliciting feedback and responses from the participants and recording them
- ✓ Consultations at the demo and non-demo level were carried out through a checklist.

The in-depth discussion on various water supply and related subjects brought forth some key issues which are as mentioned below:

Highlights of the Stakeholder Consultations & Recommendations

Demo zones (24x7)

- Willingness to pay and acceptance of the levied tariff is very high.
- Reduction/almost negligible incidence of water borne diseases.
- Consumers especially women get more free time to attend to other chores/recreation and also take up other economic activities to compensate their monthly income.
- Children /vulnerable/elderly are no longer being burdened by the task of fetching water.
- Consumers are satisfied with the services and quality of water. This metered water has also over a period of time inculcated a habit of judicious water usage.
- In certain areas where the demo and non-demo zones are near, animosity between the consumers has been reduced as the demo zone consumers are providing non demo zone consumer's good quality water at minimal charges. Especially in the semi/slums where community fights are very common this sharing of water has created a congenial atmosphere and there have been no reported incidences of damage being done to the 24x7 supply system by the non-demo consumers.
- The metered water system has aided them to cultivate habit of saving to pay their bills on time even in the daily /weekly wage earner category.

Non Demo zones (Bore well/tankers/water board limited water supply)

- The water supply is very limited and not on a daily basis. Water tankers are also sent to mitigate the scarcity but is not meeting the daily needs.
- The maintenance of taps /pipe lines/bore well etc is very poor. It is observed that the community many a times pools in and bears the cost of minor repairs. However it is not possible for them to undertake these activities on a large scale. Thus it is leading them high and dry for water.

- It's mostly women /children/elderly who are working tediously to fetch water from near /far off to meet there bare minimum requirements. Many places children are being pulled out of school to fetch water since most of the households are involved in informal sector economic activities the adult males are not available for fetching water.
- There are evident incidences of water borne disease and those arising from unhygienic conditions. Women seem to be worst affected as lack of water forces them not to adopt hygienic practices especially during menstruations.
- The silver lining is that most of them are aware of the importance of pure drinking water and its non-availability responsible for water borne diseases. Thus they are making a concerted effort in fetching drinking water from nearby demo zones (on payment) or other sources.
- Most of them are aware of the 24x7 supply and are quite equivocal in pressing their demand to get this service. They are willing to pay the tariff. However some of them voiced the opinion that they feel a step motherly treatment is being meted out to them by making them bereft of such facilities in spite of repeated promises made by the elected local body/govt from quite some time now. There is certainly a growing unrest among them for non-availability of 24x7 supply.
- The water tanker being pressed in to meet there demand is not able to meet the water needs.In certain areas they have reported that they even pay Rs 5 -10/ to the Tanker driver for availing this facility. This practice and very limited demand met is leading to widespread discontent and fight within the community. Thus the otherwise harmonious social fabric is getting divided /jeopardized.
- Even though water is a rare commodity some wastage is observed though more so because of improper maintenance of the supply system/leakages etc.
- Especially women find themselves consuming maximum time in fetching /filling water that there alternative economic activities get hampered thus negatively affecting the overall family income.
- Widespread discontent had been voiced by the community regarding the low quantity and quality of supplied water.
- Also very proactive involvement of elected local body members in mitigating there a water woe is very limited.

Highlights/Recommendation for supplier end

- Keeness to implement the 24x7 supply has been observed and all hampering issues (land acquisition/Alternate options etc) seem to be dealt with in a very systematic and in a very fast track/practical way.
- Since the acceptance/eagerness level for 24x7 is high the non-demo zones must be covered in the scheme as early as possible.
- Natural existing sources of water to support 24x7 are also being explored/pressed in functioning.
- Locals are being involved at all stages for acceptance/knowledge flow and ownership of the program.
- Water quality checking is being done twice a week and the private operations and maintenance staff seems to be providing satisfactory services and have a good rapport with their consumers. The provision of good quality water has reduced the incidence of water borne diseases to almost nil in demo zones.
- The water tariff receipts provided for the 24x7 water supply provides educative

information like Customer care address and phone numbers. This enables the local users in speedy redressal of their problems.

- Payment recovery seems satisfactory. The provision of paying any accrued amount in installments has made recovery rate improve and reduced the burden on the consumer.
- The creation of demo zones and there successful implementation has prepared the community to accept willingly or rather press in keen demand for 24x7.The good quality of water has made the non-demo zone users aware of the water borne diseases and they are making self-efforts in procuring drinking water. This certainly reflects in the health status of the districts covered.
- More regular and sufficient water tanker services needs to be provided to non-demo zone users.
- In the non-demo zones especially where water is being made available through bore wells, local users from the area may be trained in minor repairs to enable them to cut down on the cost of repairs which they have to undergo due to delay from supplier end.
- Renewable of non-conventional /old sources of water has been observed to support the existing system with the help of information from local senior citizens. Some implementation costs have been garnered through contribution of Rotary /Lions club etc. This synergetic effort brings in community ownership and involvement (Belagavi) such initiatives need to be adopted widely and encouraged.
- Rain water harvesting especially where good rainfall is recorded needs to be encouraged/supported.
- The involvement of Private players in Operation and maintenance only seems to be understood largely by the community but still there are a recognizable percentage of users not very acceptable to this idea. More awareness needs to be done for this. It is also advisable to diplomatically channelize the energies of local leaders to encourage by getting involved positively in acceptance of this system.

6.2 Discussions on gender related issues

At the outset it was deemed necessary to understand the prevalent gender issues in the project cities. A series of stakeholder consultation in different project cities have been conducted at this stage of social assessment to find out women's concerns regarding the 24x7 water supply project to be taken up. The consultation was carried out in local language to establish the comfort level. Consultation team was present to initiate this process where their primary role was to facilitate discussions and analysis with the women. Initial selection of women's groups for consultation was done in a manner that they represented women from demo zones, non-demozones.. Women stakeholders of various categories, including women office bearers in local bodies and line agencies, self-help groups, women headed households, NGO representatives, working women and teachers of local schools / colleges were considered for gender consultation and situational analyses. The issues are highlighted below:

- Cutting across caste/class/color women's lives revolve around the water availability in the household.
- In the 24x7 supply demo zones the women members were hassle free from fetching and storing water.
- Their families are enjoying a good health status with no incidences of water borne diseases and adoption of hygienic practices.
- The women folk are getting ample time to take up gain full employment resulting in economic upliftment of their families. They get time to even indulge in other household chores/recreation etc.
- In the non-demo zones the women are most of the time involved in fetching water and storing it.
- They are experiencing a lot of physical discomfort in fetching water from far/near sources.
- The spurt of water borne diseases is affecting their health and they have to spend both time and money in tending to those who are ill in the family.
- Personal hygiene becomes difficult to practice when each and every drop of water counts.

- Adding on to all the other woes is the community fights which occur due to lack of water. Many a times it takes a violent turn with the male members getting involved as well.

*(The detailed stakeholder consultation is provided in **Annex III)***

6.3 CSIS Stakeholders Consultation

This was arranged in coordination with Belagavi Municipal Corporation. The list of invitees included users from the demonstration zones, representatives of various institutions such as educational institutions, Lions Club, Rotary Club, Resident Welfare Associations, student groups, Local NGOs, eminent persons like teachers, professors, former corporators, Industry Leaders, academicians, professional such as architects, entrepreneurs, media representative and officials of Municipal Corporation, Water Board, Operator, etc. The session was open to share their concerns, opinion, feedback and suggestions. Key points raised were:

- Users in demonstration zone expressed their satisfaction regarding 24x7 water supply and suggested that it definitely needs to be expanded to other parts of the city.
- The need of creating awareness on judicious use of water was emphasized by the housing society representatives. Wastage of water in housing societies needs to be avoided in non -demo zone areas of the city.
- Need of awareness generation among public representatives; MLAs and corporators, was stressed.
- Women participants in demo zone areas shared their experience. Prior to the demo zone pilot, women had to struggle for water and were required to adjustments in their domestic and social commitments; which is not the case now.
- The participants expressed the need of taking up the up-scaling project at the earliest.
- Citizen participants welcomed the idea of "Pay as per Use" and indicated willingness for volumetric tariff.

6.4 Conclusion

The Stakeholder Consultations revealed that there is clear support for the project and people are in fact impatient for the arrival of 24x7water. The stakeholders are aware of the benefits of continuous water supply specifically health benefits to the family. Women, who play a key role in ensuring water for the family, are eagerly waiting for this project. In addition to health benefits, they indicated that time saved can be used for economic and social activities. The environmental aspects may be included during communication campaigns to increase awareness among stakeholders.

Chapter 7: Assessment of Social Impacts

7.1 Introduction

The proposed project will generate some social impacts in the project area. A good number of these impacts will be beneficial, especially the improvement of availability of potable water in city, reduction of water borne diseases, reduction in man- hours spent (especially women and children) in sourcing for water, and the establishment of an environmentally sound, safe and sustainable water sanitation system. However there will be some negative impacts in the project which although will be in the form of temporary inconveniences, will have to be mitigated.

Social Impact are social ramifications and it is imperative that decision-makers understand the consequences of their decisions before they act and people get negatively affected Social assessment helps to make the project responsive to social development concerns.

This social impact assessment has been undertaken to ensure *social sustainability relating to equity, empowerment and security.*

In simple words, social impact component seeks to understand the community as it is now as understood from the baseline, and seeks to determine:

- What will change as a result of this project?
- What social implications will it have as a result of these changes?
- How can those social impacts be assessed?
- What can be done to reduce the impacts of this project?
- What can be done to maximise the benefits of this project?

This chapter presents a summary of the identified potential impacts associated with the Belagavi water supply project in the social domain.

7.2 Social set up of ESR sites

This section provides spatial information along with the social and environmental conditions around the proposed sites. As evident from the design, major components of WS Project will be constructed within the existing component locations as there will be alterations and rehabilitations of the existing structures. However construction of the ESR will involve dismantling of the existing structures and constructing new structures.The locational features of the proposed ESR have been provided below.

1. Mrutyunjay Nagar:

Proposed ESR is near Big-Bazar and RPD bus stop. It is on 22 Khanapur Road. The surrounding mainly consists of commercial plots. There is no Flora and Fauna concentration in the site. The site is vacant and has sparse settlements in close proximity to the proposed ESR.

2. Cauvery Nagar

Proposed ESR is near Ganesh Temple. It is on Kaveri Nagar 3rd cross Road. The surrounding mainly consists of residential plots. There is no Flora and Fauna concentration in the site. The site is vacant and has dense settlements in close proximity to the proposed ESR.

3. Sambhaji Udyan:

Proposed ESR is near Existing Sambhiji Udyan OHT. It is surrounded by Mahadwar Road and Tannaji Galli. The surrounding mainly consists of residential plots. There is no flora and fauna concentration in the site. The site is vacant and has dense settlements in close proximity to the proposed ESR.

Goodshed Road:

Proposed ESR is near an existing well. It is on Goodshed Road, Shastri Nagar. The surrounding mainly consists of residential plots. There is no Flora and Fauna concentration in the site. The site is vacant and has dense settlements in proximity to the proposed ESR.

4. Khasbag:

Proposed ESR is near existing ESR and Ganesh Temple in Teachers Colony. It is on junction of Bazar Galli and Maruti Galli. The surrounding mainly consists of residential plots. There is no Flora and Fauna concentration in the site. There are dense settlements in proximity to the proposed ESR.

5. Ganeshpur

Proposed ESR land in lakshmi tek area

Filter tank of Belgaum city where raw water is received from Rakaskop reservoir and Hidkal Dam

S. Nijalingappa Sugar Institute

Proposed ESR Site

Proposed ESR is near S. Nijalingappa Sugar Institute. It is on Laxmitek 1st Cross. The surrounding of the site is vacant. There is no Flora and Fauna concentration near the site. There are sparse settlements in proximity to the proposed ESR.

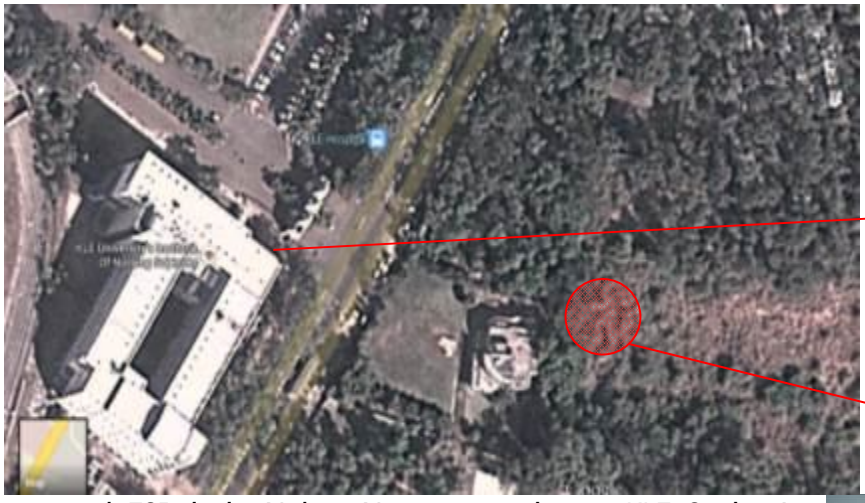
6. Visheshwaryya Nagar

D.C. Bungalow

Proposed ESR Site

Proposed ESR is in Vishweshwaraya Nagar, Sadashiv Nagar near D.C. Bunglow. The surroundings mainly consist of government quarters. There is no Flora and Fauna concentration near the site. There are sparse settlements in close proximity to the proposed ESR. It is proposed to demolish the existing ESR and build a new on the existing site.

7. Nehru Nagar



Proposed ESR is in Nehru Nagar opposite to KLE Society's Hospital and Medical Research Centre. There is no Flora and Fauna concentration near the site. There are sparse settlements in close proximity to the proposed ESR.

8. Vaibhav Nagar

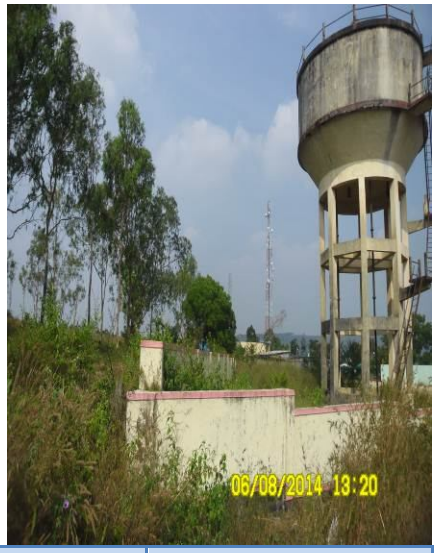
Proposed ESR is in Vaibhav Nagar. The surrounding is mainly vacant land. There is no Flora and Fauna concentration near the site. There are sparse settlements in close proximity to the proposed ESR.

9. Kanbargi

Proposed ESR is in Kanbargi near the existing OHT of KHB Colony layout. The surrounding is mainly vacant land but plotted for future development. There is no Flora and Fauna concentration near the site but dense at a distance. There are sparse settlements in proximity to the proposed ESR..

10. Auto Nagar

Proposed ESR is near the existing OHT, 2nd Main Road, near Pollution Control Board (PCB). The surrounding is mainly vacant land. There is no Flora and Fauna concentration near the site but sparse at a distance. There are industries in proximity to the proposed ESR.



The locational attributes indicate that the components are not located in eco-socially sensitive locations and thus would not create major impacts. Preliminary land availability has been checked for the proposed water treatment plants, clear water reservoirs and clear water pumping stations and Service reservoirs.

Proposed Required - LAND DETAILS[5] – Belagavi

Sl. No	Area	ESR/GLSR/OHT	LAND OWNERSHIP	AREA REQUIRED (sq m)
1.	Vadgaon	ESR	CCB	668
2.	Udyambhag	ESR	CCB	2500
3.	Mrutyunjay Nagar	ESR	CCB	800
4.	Cauvery Nagar	ESR	CCB	1176
5.	Sambhaji Udyan	ESR	CCB	800
6.	Goodshed Road	ESR	CCB	875
7.	Khasbag	ESR	CCB	918
8.	Udyambhag	ESR	CCB	600
9.	Gumtmal	ESR	CCB	680
10.	Ranichennamma Nagar 2nd Stage	ESR	CCB	1140

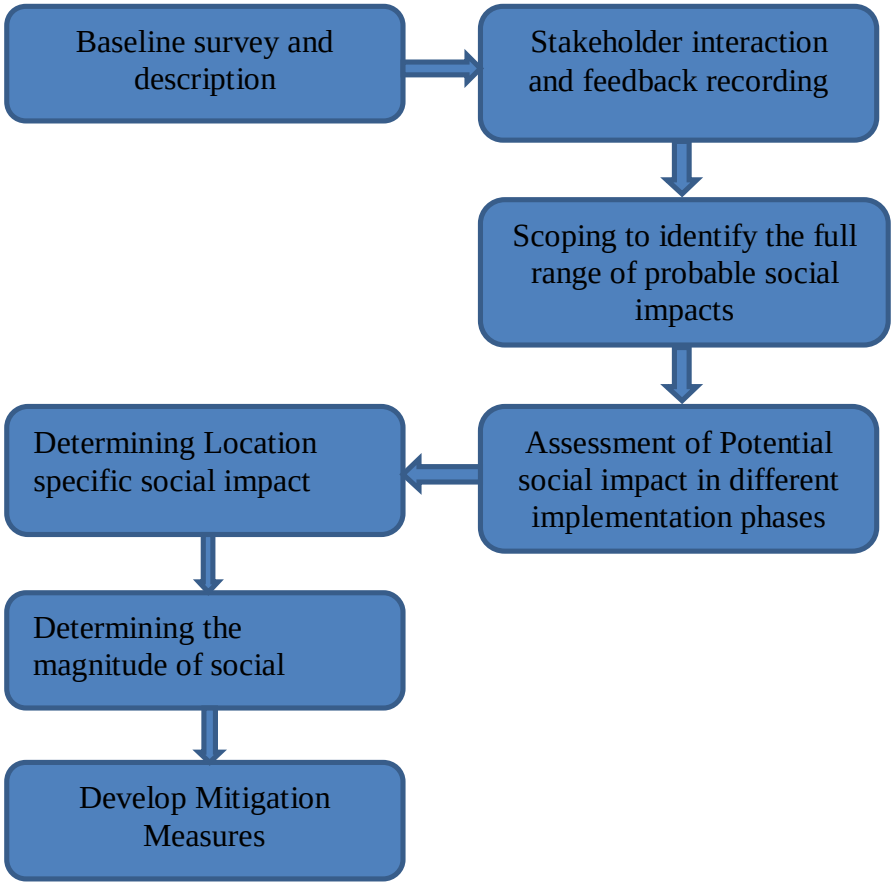
[5] Ref: Project Report on KUWSIP-Up scaling 24x7 Water Supply and updated in consultation with KUIDFC.

Sl. No	Area	ESR/GLSR/OHT	LAND OWNERSHIP	AREA REQUIRED (sq m)
11.	Near TB Ward Sadashiv Nagar	ESR	CCB	578
12.	S P Office Road	ESR	Police Dept.	900
13.	Mutyanhatti	ESR	CCB	400
14.	Kudachi	ESR	CCB	1500
15.	Ganeshpur	GLSR	CCB(KUWS&DB)	2500
16.	Visheshwaryya Nagar	ESR	CCB	713
17.	Nehru Nagar	ESR	KPTCL	2036
18.	Vaibhav Nagar	ESR	CCB	2500
19.	Kanbargi	ESR	KHB-Kanbargi	1083.75
20.	Auto Nagar	ESR	KIADB	822.50
21.	Anjaneya Nagar	ESR	CCB	2300

All the proposed sites are in possession of either Government Departments/City Corporation. “No Objection” certificates issued by other Departments to transfer above areas of land to the Corporation issued by the Departments are at Annexure II.

7.3 Process for Social Impact Assessment

The Social Impact assessment and mitigation process is a multi-stage progression involving participative and technical approaches. The process has been presented below



7.3.1 Baseline survey and stakeholder feedback

The detailed baseline analysis has been presented in chapter 4. Belagavi has a population of 490045 in 2011 increasing the growth of the city. Slum and squatter settlements in Belagavi are growing at alarming rates due to increased construction activities and industrial activities. Sample survey indicates that Municipal Household Connection (63%) is the major source of water supply among the sample population. People do depend on other sources as well. In the slums 13% households use either stand posts or hand pumps for drinking water and 17% households are using dug well (open well) water in city. 12% of slum households use stand post/ hand pump respectively. Dug wells are used in Belagavi by 14% slum households (table 4.10). Belagavi has different durations of water supply in different parts of the city as revealed from sample survey. 72% of the households report having water supply up to two hours (Table 4.19). Every urban household desires assured water supply at convenient timings. People suffer from water borne diseases with incidence of typhoid topping the list (Table 4.28).

Stakeholder interactions revealed the limited water supply situation and its mitigation through water tanker coupled with low maintenance of existing infrastructure in non-demo zones. Women are worst affected as this kind of supply is causing hardship to users, in particular to employed women and low-income households. This unassured irregular supply at inconvenient timings propels users to look forward to safe and assured 24/7 water supply as in the demo zones.

Prevalence of water borne diseases arising out of unhygienic conditions was mentioned by participants in stakeholders consultations. On the other hand demo zones depict a picture of positivity where consumers are satisfied with the services in terms of quantity and quality. Disease incidence is low. The positive impacts for people in general and women, in specific has been indicated below;

All Users	
Positive	• Availability of quality water for a duration required and at a time wanted by all • Health and Environmental improvements • Reduced health expenses and thereby increasing savings • Productive use of time • Less suffering during monsoons and adverse climatic conditions • Improved public safety • Better infrastructure facilities • Improved access to services • Improvements in quality of life
Women	
Positive	• Availability of quality water for a duration required and at a time wanted by all • Reduced drudgery of carrying water from long distances • Reduced disease burden due to reduction in water borne and water related diseases • Productive use of time directing towards gainful employment • Women have leisure • Less suffering during monsoons and adverse climatic conditions • Improved safety

Hence the water supply project will induce a major positive impact touching upon the quality of life of people and in addressing the Millennium Development Goals.

However along with the overarching positive impact of improvement in quality of life, a full range of other social impacts – negative and positive – needs to be determined which will call for focused intervention. This has been attempted in the following section.

7.3.2 Scoping to identify full range of social impacts

The potential social impacts associated with any construction activity are as follows

i) Negative perception about the project

Considering that Belagavi is already impacted by heavy traffic jams, further increase in traffic congestions as a result of movement of equipment and materials along the road and streets where works will be conducted is envisaged. This will impact on travel time, and may result in negative perception about the project, amongst residents and road users. It will also disrupt movement of inhabitants to places of work, business and schools, resulting in loss in man-hours. Traffic in city is already heavy and will be highly affected by this.

ii) Impact on human health

One of the potential impacts of the proposed sub-projects will be on the air quality due to the dust generated during excavation. The amount of dust generated will be depending upon the level of digging and the prevailing weather conditions. Thus, it is expected to lead to marginal impact on ambient air quality. No major health related issues due to air pollution during construction phase of the proposed project are anticipated.

iii) Traffic Congestion

The construction activities could lead to inconvenience to public during water supply pipeline laying along thick commercial areas and narrow streets, or where public facilities are located. This could lead to inconvenience to access business, residential and other immediate facilities for the public and impact on livelihood due to loss of access to business. Resident may not be able to take out their vehicles from their house premises and space for parking may also be reduced. However, such impacts are likely to last for a short duration only.

iv) Impact on livelihood

The excavation and alignment of pipeline work may lead to road blockage and as a result the commercial establishments and vendors will have some inconvenience in operating their business on daily basis. But loss of livelihood is not expected. The vendors can move to nearby places as and when required. Thus, overall no loss of livelihood is anticipated. As per anecdotal evidence gathered during field visit, most shop-owners and mobile vendors are welcoming the water supply project implementation as they see a direct benefit of improved living and working conditions. They are aware of, and prepared to face temporary inconveniences caused by construction if the project is implemented in a timely manner.

v) Impact on existing utility services

The road opening activities may damage the underground water pipelines or electricity poles in the vicinity of the site for the proposed sub-projects. This will lead to water supply interruptions, disruption in electricity supply and will involve expensive repair costs. Hence, it is recommended that adequate precautions be taken during construction phase to minimize such impacts.

vi) Safety hazards

There are potential hazards like falling in the trenches and excavated area for the workers as well as for the pedestrians. Safety equipment for workers has been recommended as a part of the DPR. It is also recommended that construction sites be properly fenced with appropriate signage.

vii) Elevated Noise Levels

Increased noise pollution from construction equipment will disturb residences, and especially schools and institutions in area. For elderly and students, noise is disturbing and affects their comfort. This could be a problem especially in sensitive areas like schools and hospitals located in vicinity of the construction sites. The severity of such impacts is expected to be low/marginal.

viii) Failure to Restore Temporary Construction Sites

Excessive debris, trash or construction remnants (e.g. dirt piles) would create problems related to drainage, unhygienic conditions and poor aesthetics.

ix) Increased employment potential

About 100 persons are likely to be employed during construction phase. Some of the locals will also get employment. This will marginally improve the employment scenario during project construction phase.

7.4 Potential Social Impacts in different implementation phases

Social impacts are linked with different phases of implementation and thus such impacts during pre-construction, construction and operation were identified. Operationally there will be minimal social impacts and these can be addressed through good management practice and good local communication by the Executing Agency. The construction phase impinges the maximum primarily because of the multiplicity of activities at different project sites linked with different components like

- River Intake at Hidkal Reservoir
- Laying of pipe
- Rehabilitation of Existing WTP
- Dismantling of existing Elevated Service Reservoir
- Construction of six new overhead reservoirs
- Relaying of complete Water Distribution Network

The local community is directly impacted due to the high influx of construction workers for extended periods of time and also due to access issues, dust, noise, increased traffic on site. On the other hand from workers perspective occupational hazards are significant during this stage where women especially remain vulnerable from security, privacy and health and hygiene aspects.

The implementation phase specific impacts with special reference to varied construction activities have been identified below:

Table 7.1: Identified Potential Impacts by Phases

Pre-construction phase		
Social Impacts		
Positive	1	The project will undertake a stakeholders/public consultation exercise to sensitize the inhabitants of Belagavi on the social safeguards components of the project. The public consultation process is seen to be a positive impact, as it will form a basis for project concept decision-making and implementation.
	2	The implementing agency (KUIDFC/ULB) may also help establish project supervision committees at the community levels to enable participation, monitoring and evaluation when rehabilitation works commence.
Negative	1	Considering that Belagavi is already impacted by heavy traffic jams, further increase in traffic congestions as a result of movement of equipment and materials along the road and streets where works will be conducted is envisaged. This will impact on travel time, and may result in negative perception about the project, amongst residents and road users. It will also disrupt movement of inhabitants to places of work, business and schools, resulting in loss in man-hours. Traffic in city is already heavy and will be highly affected by this.
	2	Noise from vehicles and equipment may exceed the MoEF/CPCB acceptable noise level limits, resulting in nuisance.
	3	Properties may be accidentally damaged or destroyed during the movement of heavy duty vehicles and equipment
	4	Accidents involving vehicles or pedestrians are likely to occur during vehicle and equipment movement to pumping stations/Water Treatment Plant and work areas within the city. This may occur around Ward, 11, 12, 14, 28, 30, 31, 32, 33, 34, 35, 36, 37 and 38 area where many schools are located close to the working areas
Occupational Health and Safety		
Positive	1	During the pre-construction phase, Occupational Health and Safety (OHS) awareness programs will be conducted. Awareness programs and interactive sessions will benefit primarily the operator/contractors' personnel and ULB staff. Guidelines on safe practices and safe behaviours will be made available to these groups in order to minimize the occurrence of occupational incidents or accidents in the course of implementing project activities. This is especially in the areas where major construction works will take place.
Negative	2	During the pre-construction phase air pollution from exhaust fumes of vehicles and equipment moving to the pumping stations and work areas may occur. This will pose an occupational health risk (respiratory infections and diseases), especially for people living in and carrying out activities around the neighbourhoods and also, personnel conveying equipment to the construction site
	3	Exposure to noise pollution, injuries and accidents during movement of equipment to the work areas.
Construction Phase		
Social Impacts		
Positive	1	Employment of skilled and unskilled labour will be promoted. Artisans and professionals from the Belagavi will be provided contractual employment during this phase. This will help promote community goodwill.
	2	The construction phase will see to the implementation of a viable waste management plan for project activities

Negative	1	River Intake at Hidkal Reservoir • Increase water pollution during construction, • Deterioration of water quality, • Temporary Disruption of water supply
	2	Laying of pipe • Increase dust levels due to excavation of earth. This will affect all project sites, particularly Ward, 11, 12, 14, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, defence area, schools and hospitals. • Increase noise levels due to movement of heavy vehicles • There may be cases of destruction of underlying cables (Telephones and internet) • There may be cases of destruction of underlying existing water supply line which leads to leakages and shortage of water nearby locality. • Loss of Fertile Top Soil of the Agriculture Land along the alignment, if any. • Loss of vegetative cover • Damage to standing crops during break down of the transmission main or maintenance operations • Accumulation of Excess Earth • Disruption of traffic flow in the above roads especially Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages. • Disruption of Utilities such as electricity, telephone and other services. • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water
	3	Rehabilitation of Existing WTP in Laxmitek • Noise pollution • Contamination of water
		Construction of WTP at Basavankola • Increase dust, noise other gaseous (SO_2 & NO_2) levels due to the movement of construction vehicles and equipment
	4	Dismantling of existing Elevated Service Reservoir (Udymbhag, RC Nagar 1st stage, Gummatmal, Sambhaji Udyan, TB Ward old tank, VV Nagar, Ambedkar Garden, RC Nagar 2nd stage, Subhash Chandra nagar and June Belagavi) • Increase in Dust Level due to dismantling • Accumulation of demolished waste • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles
	5	Construction of six new overhead reservoirs • Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipment • Accumulation of construction waste • Increase risk on ground water contamination • Impact on city drainage system
Occupational Health and Safety		
Negative	1	In the course of rehabilitation works, there would be a moderate to severe likelihood of the occurrence of workplace hazards. Activities such as removal and replacement of pipes, trench digging, mechanical, structural works and electrical

		installations could predispose personnel to hazards. "Unsafe behaviours" and "unsafe conditions" will pose a serious occupational health and safety risk. Women are in a more vulnerable situation and are prone to health hazards without hygienic conditions. Hazardous conditions or practices likely to impact on occupational health and safety will include: a. Works involving removal and replacement of transmission and distribution pipes (collapse) b. Works involving valve replacement and installation of valve chambers. c. Conveying and lifting of heavy equipment (transformers, generators) d. Works at heights (i.e. rehabilitation of elevated tanks) e. Use and exposure to hazardous energy f. Water treatment upgrades g. Electrical installations etc. h. Demolition works
Operation and Maintenance Phase		
Social Impacts		
Positive	1	Improvement in overall water supply and sanitation services for Belagavi
	2	There will be job creation and employment. For instance, more workers may be employed in water supply department as managers, Technicians etc.
	3	Surge in improved health, standard of living; personal and infrastructural hygiene is envisaged as there would be an availability of flowing water in households and public places (Markets, motor parks).
	4	Services delivered by commercial establishments (restaurants), hospitals, businesses etc. will be enhanced directly and indirectly
	5	The upgrades in the pumping stations and entire water supply and sanitation system will make it suitable for educational tours, (for example university students studying in the fields of water engineering, etc)
Negative	1	Operation Failure of Transmission Lines- due to mechanical failure or third party interference.
	2	Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping.
		Power outages, which may disrupt water supply
		Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators
		Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources
	3	Occurrence of chlorine intoxication if water is over chlorinated during treatment

7.5 Conclusion

There are no significant adverse impacts by the project. Focus Group Discussions have been done in the project area to discuss the project details and identified impacts with stake holders. The proposed project do not involve land acquisition, displacement of structures; do not cause any impact on community structures except for a few temporary inconveniences to the public during construction phase. Implementation of the suggested mitigation measures during different phases of the project will prevent or minimize adverse impacts. Therefore, no further studies are required and no rehabilitation plan is necessary.

Chapter 8: Environmental Management Plan

8.1 Introduction

The Environmental Management Plan and Resettlement Action Plan details out impacts due to project activities at different phases of the project. Both EMP and RAP also details the mitigation/ enhancement measures which will be required over and above the project design. Implementation schedule for each of the suggested measures along with the primary responsibility for implementation is also incorporated in the EMP and RAP. This chapter also includes the Monitoring Plan as well as the Institutional Arrangement in implementing EMP and RAP.

8.2 Environmental Mitigation Measures

The mitigation measures in the environmental domain are presented as below:

AIR

- Dust suppression should be instituted, using water tankers mounted on tractors and sprinklers for dust control.
- Vehicles transporting construction materials prone to fugitive dust emissions should be covered.
- Trucks carrying sand should have tarpaulin sheets to cover bed and sides of trucks.
- Idling of delivery trucks or other equipment should not be permitted during loading and unloading
- All construction vehicles should comply with emission standards and maintained.
- Dust suppression measures in addition to the traffic management should be followed on roads used for transportation o material.

LAND

The solid waste generated during the construction phase is usually Excavated earth material and Construction debris. Excavated earth material should be reused for backfilling between foundations; to fill up the low-lying areas with consultation local municipal body and whereas, topsoil will be reused for Landscaping/Greenbelt development purpose.

WATER

- Construction equipment requiring minimum water for cooling and operation for optimum effectiveness should be chosen.
- Appropriate sanitation facilities, septic tank and soak pits should be provided for the workers onsite and offsite to reduce impact on water resources
- Discharge of construction wastes to surface water bodies or ground water should not be allowed during construction.
- During Construction period in rainy season, the water quality is likely to be affected due to the construction work and loosening of topsoil. This is likely to increase the suspended solids in the run – off during heavy precipitation. In order to reduce the impact on water quality, temporary sedimentation tanks will be constructed for the settlement of the suspended matter. However, it is envisaged that the monsoon period will be avoided for cutting and filling of earthwork.

NOISE

- Restriction on the usage of noise generating activities, and traffic movement in the Residential areas during night to avoid high noise avoiding sleep disturbance to residents during the construction phase.
- Generator sets should be provided with noise shields around them.
- Vehicles used for transportation of construction material should be well maintained.
- The workers operating high noise machinery or operating near it should be provided with adequate personal protective equipment including ear plugs.

8.3 Environmental Management Plan

The Environmental management Plan provides the road map for managing adverse environmental impacts arising from the implementation of such a project. The detailed plan has been provided in the following table.

Table 8.1: Environmental Management Plan (EMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1	Pre construction activities including	• The pre-construction phase will give rise to fugitive dusts and frequent exhaust emissions into the atmosphere as equipment is delivered to the pumping stations/ water treatment plant/ overhead tanks and along major roads and streets where the proposed new network will pass through. This will affect all project sites, particularly Ward, 11, 12, 14, 28, 30, 31, 32, 33, 34, 35, 36, 37 and 38.	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used	Operator	SPV
Construction/Transition Phase					

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
1.	River Intake at Hidkal Reservoir new structure	• Increase water pollution during construction • Deterioration of water quality • Temporary Disruption of water supply	➢ Use of barriers to reduce water pollution ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Prior water use plan shall be prepared and arrange alternate source of water to fulfil more basic needs ➢ Ensure prior information regarding supply of water to consumers ➢ Ensure implementation of Project Planning and Design Plan (ECoP) before planning of activity ➢ Site preparation should be as per Site Preparation Plan (ECoP) for site clearance	Operator	Operator and ULB/SPV
2.	Replacement of existing PSC pipe with 1000mm dia MS pipe for a length of 0.76 Km at Hidkal Scheme	• Increase in Dust levels due to earth work or replacement of pipe • Soil pollution or soil erosion • Increase noise levels due to excavation • Deterioration of water quality • Disruption of traffic flow during replacement • Landscape degradation	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
3.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 3.40 Km parallel to the existing alignment.	• Pressure on local resources • There may be cases of destruction of underlying existing water supply line which leads to leakages and shortage of water nearby locality. • Loss of Fertile Top Soil of the Agriculture Land along the alignment, if any • Loss of vegetative cover • Increase in Dust Levels to due to earth work and other construction activities • Accumulation of Excess Earth • Disruption of traffic flow in the above roads especially Rustampur, Kundargi, Dasanhatti, Ankalgi, Hudali, Tumarguddi, Chandur, Khanagav and Aste villages. • Disruption of Utilities such as electricity, telephone and other services. • Damage to standing crops during break down of the transmission main or maintenance operations • Unhygienic condition in construction camp • Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • May Increase Health problems in Labours	conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Discharge wastewater at authorized locations and after treatment ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management ➢ Avoid aggregate stockpile on site. ➢ Compact earthworks, road base, etc. ➢ Revegetate bare soil in landscaping areas prior to start of rainy season. ➢ Check leakages and prevent Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Locate handling sites away from populated areas ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for construction equipments ➢ Preparation of utility shifting plans, procuring appropriate approvals / permissions in advance and completion of activities in the earliest possible time ➢ Provision of temporary crossings/ bridges to avoid accidents and other construction hazards ➢ Using low noise generating equipment such as	Contractor	Operator and ULB/SPV
4.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 16.50KM parallel to the existing alignment			Contractor	Operator and ULB/SPV
5.	Laying of New Raw water transmission main of 800mm dia MS pipe for a length of 15.20KM parallel to the existing alignment.			Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
6.	Laying of 700mm dia MS pipe for a length of 0.80Km form Indal tapping point to proposed WTP	and Populace.	pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Ensure implementation of Water bodies Management Plan (ECoP 7.0,) during laying of pipeline near to water bodies ➢ Ensure implementation of Cultural Properties Plan (ECoP) if any cultural property is being impacted due to interventions ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP) ➢ Mid-term environment audit should be carried out for performance of ESMP implementation (ECoP)	Contractor	Operator and ULB/SPV
7.	Construction of WTP	• Increase dust or other gaseous (SO2 & NO2) levels due to the movement of construction vehicles and equipments • Accumulation of construction waste • Accumulation of earth material • Loss of vegetative cover	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust.		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			➢ Avoid aggregate stockpile on site. ➢ Compact earthworks, road base, etc. ➢ Revegetate bare soil in landscaping areas prior to start of rainy season. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Discharge wastewater at authorized locations and after treatment ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Ensure implementation of Construction Camp Plan (ECoP) for labour camps ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Ensure implementation of water for construction plan (ECop) for water management ➢ Alternate material or material should be reused for construction of WTP (ECoP) to reduce construction cost ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
8.	Rehabilitation of existing WTPs	• Noise pollution • Contamination of water	➢ Cross contamination of water should be avoided	Contractor	Operator and ULB/SPV
9.	Dismantling of existing Elevated Service Reservoir (Udymbhag, RC Nagar 1st stage, Gummatmal, Sambhaji Udyan, TB Ward old tank, VV Nagar, Ambedkar Garden, RC Nagar 2nd stage, Subhash Chandra nagar and June Belagavi).	• Increase in Dust Level due to dismantling • Accumulation of demolished waste • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles	➢ Use of barriers to reduce exposure ➢ Ensure prior information on dismantling of reservoirs to the community ➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Measures to prevent accidental spills ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP) ➢ Provision of sprinkling of water & scaffolding. Sprinkling method is used for refilling of trenches so that shrinking should be minimized ➢ There should be proper covering of excavated or dismantled material while transportation of these waste materials	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
10.	Construction of new overhead reservoirs	• Increase dust levels due to construction of reservoirs • Increase noise levels due to movement of heavy vehicles and construction equipments • Soil pollution due to leakages from vehicles and equipments • Top Soil erosion • Accumulation of earth material • Accumulation of construction waste • Increase risk on ground water contamination • Impact on city drainage system	➢ Air pollution control measure ➢ Limit hours of operation in populated areas ➢ Use of barriers to reduce exposure ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Half Yearly Air/Noise quality monitoring may be conducted at construction sites. ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Ensure implementation of Project Planning and Design Plan (ECoP) before planning of activity ➢ Site preparation should be as per Site Preparation Plan (ECoP) for site clearance ➢ Ensure implementation of water for construction plan (ECop) for water management ➢ Alternate material or material should be reused for construction of WTP (ECoP) to reduce construction cost	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
11.	Relaying of complete Water Distribution Network.	• Increase dust levels due to excavation of earth • Increase noise levels due to movement of heavy vehicles • There may be cases of destruction of underlying cables(Telephones and internet) • Water pollution due to leakages or damages of existing distribution lines • Soil pollution due to leakages from vehicles and equipments • Soil erosion and accumulation of excavated materials • Accumulation of construction waste Increase risk on ground water contamination	➢ Air pollution control measure like water sprinkling ➢ Limit hours of operation in populated areas ➢ Laying of pipeline in alternate street to avoid traffic jam and inconvenience to community in congested areas ➢ Use of barriers to reduce exposure ➢ Plants, machinery and equipment may be handled so as to minimize generation of dust. ➢ Low emission construction equipment generator sets and pollution free certified vehicles may be used ➢ Dump solid waste in specified place to minimize contamination of water ➢ Ensure implementation of Waste Management Plan (ECoP) for environmentally sound management of waste ➢ Alternate supply arrangements such as supply through tankers should be provided ➢ Check leakages and prevent ➢ Cross contamination of water should be avoided ➢ Measures to prevent accidental spills ➢ Organise awareness programs on environmental resource management ➢ Locate handling sites away from populated areas ➢ Ensure implementation of Construction Plants & Equipments Management Plan (ECoP) for management of construction equipments. ➢ Ensure implementation of Water bodies Management Plan (ECoP) during laying of pipeline near to water bodies ➢ Ensure implementation of water for construction plan (ECop) for water management ➢ Alternate material or material should be reused for construction of WTP (ECoP) to reduce construction cost	Contractor	Operator and ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			➢ Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction ➢ Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights ➢ Prior Consultation should be carried out for implementation or laying of pipe line in private land and habitat (ECoP)		
Operation Phase					
12.	24X7 Continuous Supply of Water During Operation	• Operation Failure of Transmission Lines- due to mechanical failure or third party interference. • Bursting or breakage of distribution mains- as a result of increased pressure or aggressiveness of pumping. • Power outages, which may disrupt water supply. • Air quality impacts that would arise during the operation of the pumping stations would include emissions from generators • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Deficiencies in Storage and Handling of Chlorine at the water treatment plant	➢ Before implementation of project an water connections census should be taken to reduce extra use of water ➢ Illegal water tapping source should be identified ➢ Ground water should be kept a backup supply source in system failure ➢ Ensure Indian Drinking Water Standards (BIS:10500) ➢ Alternate supply arrangements such as supply through tankers should be provided if Leakages, Contamination and shortage of Water ➢ Check leakages and prevent ➢ Cross contamination of water should be avoided ➢ Plan and cost for augmentation and strengthening the storm water drainage network in the city ➢ Ensure environmentally sound and safe storage and containment of oil and diesel for DG Sets ➢ Ensure proper/efficient treatment of sludge before disposal. ➢ Ensure routine maintenance practices; ➢		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
		• Occurrence of chlorine intoxication if water is over chlorinated during treatment • Generation of sludge from WTP Leading to contamination of surface and sub surface sources • Generation of Waste Water	➢ Wastes should be collected, stored and managed on-site. Measures to ensure that wastes do not enter municipal water courses way must be ensured at all times during operations and maintenance in WTPs/Pumping stations. ➢ Procure diesel generators with soundproofing. ➢ Ensure environmentally sound and safe storage and containment of oil and diesel ➢ Ensure implementation of Water bodies Management Plan (ECoP) during laying of pipeline near to water bodies ➢ Proper sludge management has to be prepared and followed by SPV / Operator ➢ The untapped waste water component of 17% will be undertaken under the UGD program in a long term strategy and the cleaning of the existing sewerage network on continuous basis for smooth management.	Operator/ ULB	ULB/SPV

8.4 Environmental Monitoring Plan

The monitoring programme is devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit to the target population. To ensure the effective implementation of the ESMP, it is essential that an effective monitoring programme be designed and carried out. Broad objectives of the monitoring programme are:

- To evaluate the performance of mitigation measures proposed in the ESMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations
- To provide feedback on adequacy of Environmental Impact Assessment

8.4.1 Monitoring Indicators

The monitoring programme contains monitoring plan for all performance indicators, reporting formats and necessary budgetary provisions. Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs), The Performance Indicators shall be evaluated under three heads as:

- Environmental condition indicators to determine efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures.
- Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/ enhancement designs proposed.
-

Table 8.2: Environmental Monitoring Indicators

S. No.	Indicator	Details	Stage	Responsibility
A.	**Environmental Condition Indicators and Monitoring Plan**			
1.	Air Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared (Refer Table 7.4)	Construction	Contractor under the monitoring of PIU
2	Noise Levels		Construction	Contractor under the monitoring of PIU
3	Water Quality		Pre-construction, Construction and Operation	Contractor under the monitoring of PIU
B.	**Environmental Management Indicators and Monitoring Plan**			
1.	Construction Camps	Location of construction camps have to be identified and parameters indicative of environment. In the area has to be reported	Pre-construction	PIU
2.	Tree Cutting (if any)	Progress of tree removal marked for cutting is to be reported	Pre-construction	Forest Department to PIU
3.	Soil Erosion	Visual Monitoring and operation inspection	Construction &Operation	PIU

For each of the environmental condition indicator, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for environmental condition indicators of the project in construction and operation stages is presented in **Table 8.3.**

Table 8.3: Environmental Monitoring Plan

Attribute	Project Stage	Parameters	Special Guidance	Standards	Frequency	Duration	Location	Responsibility
Air Quality	Construction	All parameters as per National Ambient Air Quality Standards, 2009 like PM_{10}, $PM_{2.5,}$ SOx, NOx	High volume sampler to be located 50m from the plant in the Downwind direction. Use method specified by CPCB	Air (prevention and Control of Pollution) Rules, 2009	Quarterly in a Year	24 hours	Near the Construction area such as sensitive locations like Schools, Hospitals, Water bodies, etc	Operator
Surface Water	Construction	All Parameters as per drinking water standards (BIS:10500) and WHO guidelines	Grab sample collected from source and Analyze as per standards	National Drinking Water Standards (IS:10500} and Inland surface water (IS:2296), 1982	Daily	Grab sampling	Surface and Ground Water Sources	Contractor
	Operation							ULB
Noise	Construction	Noise level on Db (A) scale	Equivalent noise levels using a meter	Noise Rule, 2000	Quarterly in a year	Leq in dB (A) fir day and night time	Construction site, Hot mix or batching plant	Contractor

Monitoring and evaluation is primarily required to ensure proper and timely implementation of mitigation measures identified in the planning stage, based on the ESMP. Monitoring at regular intervals during implementation and for a specified period in the post implementation stages is necessary to identify and implement any change / improvement needed in the execution of the activity or in the mitigation measures.

A monitoring and evaluation cell to be created at State level (KUIDFC) under the supervision of an official familiar with environmental issues of the proposed scheme. In specific situations, one may consider appointing external agencies to carry out the monitoring and evaluation activities and report to the supervising official (EE/AE of KUIDFC/Engineers of ULB). The indicators to be monitored can be framed from the ESMP taking into consideration the activities involved.

The feedback received from monitoring and evaluation cell will be discussed with the implementing officials and the contractor and corrective actions will be taken, where necessary. The ESMP requires detailed supervision, monitoring and evaluation of the impact of the project on the environment.

8.5 Capacity Building and Training

The KUIDFC/ULB currently has limited capacity for environmental management. The training and capacity building program developed for the project aims at building environmental awareness and environmental management capacity in the project administration structure as well as in the intended target communities.

The training programs for the staff in the project agencies at various levels as well as for the communities will be organized. Both KUIDFC and ULB to work in the project will require capacity building for survey, design, preparation of designs, drawings and cost estimates for the water supply and sanitation schemes by using computer-oriented tools.

8.5.1 Objectives

The capacity building for environment management shall be integrated with overall capacity building component of the project with the following objectives:

- To build and strengthen the capability of urban water and sanitation agency/institutions (KUIDFC and ULB) and other partners (NGOs, Contractors and Supporting Organisations) to integrate sound environmental management in water and sanitation services.
- To orient the service delivery of staff and Welfare association representatives to the requirements of the projects' Environmental Management Framework.
- Systematic capacity building initiatives shall be introduced only after the completion of training needs assessment.
- The training shall be of plummet mode. All the trained staff and other shall in turn conduct further trainings at State, District and community levels for improved service delivery.

8.5.2 Training Approach

A specific training program for the key officials of the project, focused on the procedural and technical aspects of environmental assessment and management shall be developed. This training would be mandatory for the ULB Staff and Contractors personnel. The project shall fulfil (a) short-term training on ESMP application in planning and implementing of schemes under the proposed project to all stakeholders concerned including the potential beneficiary communities (b) water quality monitoring and conservation training to Department of urban

Development and regulating authorities (ULB). The training shall involve initial orientation, main training program and livener training programs. The main and livener training programs shall be for duration of 2-3 days each, where as the initial orientation workshop shall be of duration of one day.

8.5.3 Training Resources

Some specialized institutions identified for training are:

- Karnataka Urban Water Supply & Drainage Board
- Department of Environment and Ecology, Karnataka
- Environment Management and Policy Research Institute, Banglore
- Central Ground Water Board
- Karnataka Pollution Control Board

8.5.4 Training Programmes

The various training programmes along with the details are presented in the **Table 8.4** below.

Table 8.4: Training Programs

Sl.	Trainings	Purpose of the Training	Participants	Schedule	Course content
1.	Introduction to Environmental Management in Proposed Project including ESMP	➢ Procedural & technical aspects of Environmental Assessment. ➢ To equip with knowledge and skills necessary for undertaking environmental appraisal as per the requirements of the ESMP. ➢ To undertake periodic supervision of environmental performance of schemes ➢ To prepare for planning and monitoring implementation of environmental mitigation measures identified through the appraisal process. ➢ To equip with skills necessary for water quality testing using the field testing kits under the Community	Personnel from KUIDFC, ULB, Operator	➢ Orientation Workshop – 1 day ➢ Detail training with regards to the environmental and social management plan-2	Environment aspects pertaining to sustainability of water sources, water quality, protection of sources and Environmental appraisal. Water quality monitoring, prevention of pollution & surveillance.
2.	Environmental Awareness and Sensitization	To build awareness on safe drinking water, water conservation, environmental sanitation and personal hygiene.	Personnel of ULB, Welfare Associations and NGOs	One day workshop at the community level.	-
3.	Orienting for planning, design and implementation of project interventions including environmental issues/safeguard	➢ To create awareness among the implementation agencies as well as the monitoring units so as to have in depth understanding of the interventions being implemented under the proposed project. ➢ The orientation shall educate the agencies with regards to the environmental issues / safeguard to be taken into consideration during the implementation of the proposed interventions.	KUIDFC, ULB, Operator, Contrctor	3 day workshop – First day induction program, and next 2 days in detail training with regards to the environmental issues/safeguards.	
4.	Orientation for Water Quality	To build awareness on water quality monitoring amongst implementation agencies.	ULB, Operator staff, Lab staff,	One day training at the community level.	

Sl.	Trainings	Purpose of the Training	Participants	Schedule	Course content
	monitoring		Community, NGOs		

Cost Estimates for EMP

The environmental budget is estimated for the various environmental management measures in the ESMP, summarized in **Table 8.5.**

Table 8.5: Cost Estimates for EMP

Component	Stage	Item	Sampling / Locations	Frequency	Unit	Quantity	Unit Cost (INR)/sample	Total Cost (INR)
Mitigation Cost								
Air	Construction Phase	Dust Management with sprinkling of Water	Laying/replacement of mains and distribution pipeline	One time	Km	764	11,000.00	8,404,000.00
	Construction Phase	Dust Management with sprinkling of Water	Dismantling of existing Elevated Service Reservoir	One time	Number	10	11,000.00	110,000.00
Safety hazards to workers and residents	Construction Phase	Putting fences or other barricades to demarcate the area	At construction site during pipe laying Cost of barricading/ wire 100 kgs @Rs 600 per Kg = Rs 60,000/- Labour required for this work 4 nos @ 200/- = Rs 800/- per day=8000 (the same material will be reused)	Regular	KM	10	68,000.00	680,000.00
Monitoring Cost								
Air	Construction Phase	Monitoring at construction sites	Laying/replacement of mains (4 Nos.), Dismantling of existing reservoirs (10 Nos.), proposed WTP (2 Nos.) and proposed reservoirs (4 Nos.)	Quarterly	Number (20)	80	7,500.00	600,000.00

Component	Stage	Item	Sampling / Locations	Frequency	Unit	Quantity	Unit Cost (INR)/sample	Total Cost (INR)
	Operation	(if DG sets use as power backup)	WTP/Pumping Station	Quarterly	Number (5)	20	4,000.00	80,000.00
Water (Surface and Ground)	Construction Phase	From the Ground Water/ Surface water bodies of the Construction Site	From Intake point (2 Nos.), WTP (2 Nos.), and Sensitive Locations (6) Nos.	Quarterly	Number (10)	40	6,000.00	240,000.00
	Operation	At least one sample at each stage of supply consumer point and public tap	From Intake point (2 Nos.), WTP (2 Nos.), Public Tap (10 Nos.), and Consumer point (58 Nos. @1 sample from each municipal ward)	Daily	Number (72)	72	6,000.00	432,000.00
Noise	Construction Phase	Construction Site	Laying/replacement of mains (4 Nos.), Dismantling of existing reservoirs (10 Nos.), proposed WTP (2 Nos.) and proposed reservoirs (4 Nos.)	Quarterly	Number (20)	80	1,000.00	80,000.00
	Operation	(if DG sets use as power backup)	WTP/Pumping Station	Quarterly	Number (5)	20	1,000.00	20,000.00
Sub-Total							**47,500.00**	**10,646,000.00**
Environmental Audit						2	500,000.00	1,000,000.00
Preparation of specific environment related community awareness materials						LS	200,000.00	200,000.00
Trainings @2 Training/year						6	100,000.00	600,000.00
Internal Supervision/Year						7	200,000.00	1,400,000.00
Sub-Total								**3,200,000.00**
Contingencies@5%								692,300.00
Grand Total								**14,538,300.00**

Chater 9: Social Mitigation & Management Plan

9.1 Ressetlement and Rehabilitation Issues

A standalone document, Resettlement Policy Framework (RPF) has been prepared that consists resettlement planning and entitlement provisions. The RPF outlines the principles and approaches to be followed in minimising and mitigating the adverse social and economic impacts due to the project. The Resettlement Plan of RPF spells out the actions / tasks required to involve the community, and reduce adverse impacts on PAPs/PAFs at various stages of project along with the agency (agencies) responsible for these actions / tasks and their time frame.

9.2 Social Mitigation Plan

Social impact assessment is not just to forecast impacts - it should identify means to mitigate adverse impacts. This includes the possibility of avoiding the impact by not considering the project at all, if the felt impact is likely to be too severe. Alternately if the predicted impact is minimal and can be managed, mitigation measures must be put in place. This could be in the form of:

- Modification of the specific event in the project;
- Operation and redesign of the project or policy;
- Compensation for the impact by providing substitute facilities, resources and opportunities.

Ideally, mitigation measures should be built into the selected alternative, but it is appropriate to identify mitigation measures even if they are not immediately adopted or if they would be the responsibility of another person or government unit. Ideally effort should be to avoid all adverse impacts. The Social Management Plan presents the possible social impacts arising from the commissioning of such a project and institutional responsibility in mitigating the impacts.

Based on the measures the Social Mitigation Plan has been presented as follows:

Table 9.1: Social Mitigation Plan (SMP) for the proposed Project

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
Design Phase					
1.	Awareness generation and people's confidence building Seeking participation of stakeholders Designing the project keeping in view the social, environmental and technical features	• People apprehension of the project • People's fear on loss of land and property • People's threat of inconvenience	➢ Meetings with stakeholders ➢ Loud speaker announcements on upcoming project seeking participation of people ➢ Insertions in cable TV on upcoming project and its benefits ➢ Hoardings indicating the temporary nature of inconvenience ➢ Design of socially acceptable, environmentally sensitive and technically feasible project engaging a team of consultants	ULB	ULB
Construction /Transition Phase					
2.	Replacement of existing PSC pipe and laying of new pipe	• Disruption of water supply to the consumers during implementation • Water conflicts due to shortage of water • Unhygienic condition in construction camp • Increase Health problems among labourers and Populace in general.	➢ Alternate supply arrangements such as supply through tankers should be provided. ➢ Awareness generation indicting temporary nature of disruption – targeting awareness more toward women who are the household water managers. ➢ Install speed breaker and sign ages near settlements ➢ Prepare traffic management plan. and prior intimation of the construction schedule to the people in the areas of construction. ➢ crossings/ bridges to avoid accidents and other construction hazards ➢ Provide safety measures (mask, gloves, hat etc.) to minimize exposure ➢ Provide sirens in vehicles to avoid any collision with human/animals	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
			➢ Child labour must be strictly prohibited ➢ Provision of temporary ➢ Ensure implementation of Construction Camp Plan (ECOP) for labour camps ➢ Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety		
3.	Construction of WTP	• Noise pollution • Increase health risk in nearby areas • Increase health risk in construction Labour	• Limit hours of operation in populated areas • Use of barriers to reduce noise pollution • Plants, machinery and equipment may be handled in such a way so as to minimize generation of dust. • Dump solid waste in specified place to minimize contamination of water • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Construction Camp Plan (ECOP,) for labour camps • Ensure implementation of Health & Safety Management Plan (ECOP 10,) for public and workers safety • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provision of temporary crossings/ bridges to avoid accidents and other construction hazards • Using low noise generating equipment such as pneumatic hammers / drills, provision of encasings around generators and avoiding construction during nights	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
4.	Rehabilitation of existing WTPs	• Noise pollution • Increase health risk in nearby areas • Occupational Hazard leading to Health risk in construction Labour	• Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety.	Contractor & Operator	ULB/SPV
5.	Dismantling of existing Elevated Service Reservoir	• Accumulation of demolition waste • Increase health risk in Construction labour • Temporary disruption of water • Increase noise levels due to demolition and movement of vehicles • Temporary disruption of traffic due to movement of vehicles	• Limit hours of operation in populated areas • Prepare traffic management plan • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan (ECOP) for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP,) if any cultural property is being impacted due to interventions • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately subjected to medical treatment. Mosquito repellent to be provided to the labours such as odomas, coil and sprays. The camps to maintain cleanliness and hygienic condition. • Provision of scaffolding. • There should be proper covering of excavated or dismantled material while transportation of these waste materials	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
6.	Construction of new overhead reservoirs	• Increase noise levels due to movement of heavy vehicles and construction equipment • Disruption of traffic due to movement of vehicles and equipments • Increase health risk in nearby area • Increase occupational health risk of construction labourers • Increase sanitation problems due to construction camp • Accumulation of construction waste	• Limit hours of operation in populated areas • Cross contamination of water should be avoided • Prepare traffic management plan • Preparation of traffic diversion plans and prior intimation of the construction schedule to the people in the areas of construction • Provide safety measures (mask, gloves, hat etc.) to minimize exposure • Organize awareness programs on environmental resource management • Child labour must be strictly prohibited • Ensure implementation of Health & Safety Management Plan for public and workers safety. • Ensure implementation of Cultural Properties Plan (ECOP) if any cultural property is being impacted due to interventions • Ensure implementation of Construction Camp Plan (ECOP) for labour camps	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
7.	Laying of pipeline and construction of ESR in sensitive locations like schools, hospitals, religious, cultural and tourist locations	• Increase noise levels due to movement of heavy vehicles and construction equipment • There will be disruption to the movement of vehicles • Increase in Dust levels due to earth work or replacement of pipe • There will be noise pollution hampering classes and lectures. • Landscape degradation and uneven dug surface will have possibility of accidents. • Disruption of water supply to the consumers during implementation	• Priority work planning in sensitive location • Limit hours of operation in sensitive zones during peak service hours. • Hospitals need special planning for emergency management • Laying of pipeline in alternate street, if possible, to avoid traffic disruptions and commuting problems • Install speed breaker and signages near settlements • Hoardings and signboards intimating the temporary nature of inconvenience • Construction activities to be scheduled carefully to minimize the impact of noise from construction machinery during school hours. • Barricades, temporary noise control measures and dust suppression measures through watering	Contractor & Operator	ULB/SPV
8.	Laying of pipeline and construction of ESR in commercial areas	• Loss of livelihood for vendors • Limited access to small shop and low sales	• Adequate provision for space shall be left so that the pedestrians have access to shops and local service providers • Immediate cleaning up of debris as part of planned process • Alternative livelihood planning to compensate or the temporary loss of livelihood	Contractor & Operator	ULB/SPV
9.	Construction of any nature and in any location	• Safety hazards and accidents • Occupational Hazards in all construction sites including health impacts due to absence of proper housing and sanitation facilities in labour camps	• Fencing of the excavation site and providing proper caution sign boards • Protective measures to workers as per occupational and safety norms • Develop women sensitive work conditions with toilets blocks catering to women's needs • Include creches in worksites.	Contractor & Operator	ULB/SPV

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)

			• Develop and implement site-specific Health and Safety (H&S) Plan which will include measures such as:
			  • *excluding public from the site;*
			  • *ensuring all workers are provided with and use Personal Protective Equipment (PPE);*
			  • *health and safety Training for all site personnel;*
			  • *documented procedures to be followed for all site activities; and*
			  • *documentation of work-related accidents;*
			  • *Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;*
			• Provide medical insurance coverage for workers;
			• Secure all installations from unauthorized intrusion and accident risks;
			• Provide supplies of potable drinking water;
			• Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
			• Training of workers on safety and health and set down rules and regulations of all new workers at the site, personal protective protection and preventing injuring to fellow workers.
			• 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		

Sr. No	Project Activities	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility
(1)	(2)	(3)	(4)	(5)	(6)
10.	Focus on cultural properties	• Access to any of the cultural properties is severed during construction;	• Immediately after completion of construction, the Contractor will affect clearance of the precincts of cultural properties. • Access needs to be restored at the Contractor's cost.		
Operations/Sustaining Phase					
11.	24X7 Continuous Supply of Water During Operation	• Disruption in water supply leading to inadequacy • Generation of Additional Quantity of Wastewater from the Zones leading to contamination of surface / sub-surface sources • Flooding of Low Lying Areas due to overflow of storm water drains • Occurrence of chlorine intoxication if water is over chlorinated during treatment	• Ensure alternate drinking water supply through tankers. In case of Contamination and/or shortage of Water • Involve ward level women's groups like SHGs and Neighbourhood Groups in monitoring. • Measures for water removal though pumping in case of flooding • Ensure implementation of Health & Safety Management Plan (ECOP for public and workers safety. • Ensure implementation of water quality Management (Eco for better water quality • Create awareness on precautions/preventive measures to be taken up in case of over chlorination.	Operator	ULB/SPV

Table 9.2: Entitlement Matrix

Sl No	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
Loss of Assets - Titleholders				
1	Loss of private land	Land owner(s) Individual/Household	As per provisions of RFCTLARR Act, 2013; or direct purchase. Amount equivalent to current stamp duty and registration charges on compensation amount for replacement of lost assets. In case of land owners become marginal farmers, landless or those who are already marginal, the following entitlement shall be provided: (a) Subsistence allowance of Rs 40,000/- (b) Assistance of Rs 1,00,000/- for creating Income Generating Assets and (c) the Training Assistance	

Sl No	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
2	Loss of structure (Residential or Commercial or Res-cum-Commercial)	Owner/Family	Replacement cost determined on the basis of R&BD current Schedule Rates and without depreciation and other provisions prescribed in RFCTLARR Act 2013; or direct purchase Shifting allowance as per provisions of RFCTLARR Act, 2013 Subsistence allowance of Rs 40,000 if the structure is lost completely (RFCTLARR Act 2013) Resettlement allowance of Rs 50,000 if the structure is lost completely (RFCTLARR Act 2013) Additional 25% structure compensation for partially affected structures towards reconstruction of affected structures. In case more than 25% of house is affected and unviable for retaining, full compensation will be paid. Right to salvage materials from affected land or structure	
Loss of Assets - Non Titleholders				
3	Encroachers - Unauthorized occupation of government lands by encroachments	Affected Person (Individual/Family)	Assistance amount equivalent for impacted structures at replacement cost determined on the basis of R&BD Schedule of Rates as on date without depreciation Encroachers shall be given advance notice of 2 months in which to remove assets	
4	Squatters residing on	Affected person (Individual/Family)	Assistance amount equivalent for impacted structures at	

Sl No	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
	public/government lands for residential or commercial or for both purposes		replacement cost determined on the basis of R&BD Schedule of Rates as on date without depreciation Shifting Allowance as per provisions under RFCTLARR Act, 2013 Subsistence allowance of Rs 40,000 if the structure is lost completely (RFCTLARR Act 2013) Resettlement allowance of Rs 50,000 if the structure is lost completely (RFCTLARR Act 2013) Two months advance notice to remove assets	
Loss of livelihood – Title and Non-Titleholders				
5	Loss of livelihood – title holders and commercial squatters	(Individual/Family)	One time grant of Rs 25,000 (value prescribed under RFCTLARR Act 2013) Training assistance	• For commercial squatters, the eligibility will become from the date of Census survey
6	Forseeable and unforeseen impacts* likely during the construction stage	Owner, affected person	Payment of damages if any to structures Temporary access would be provided, where necessary.	• Such as temporary impacts on structures, temporary disruption to access or passage, particularly in congested slums if the option of mobile units is not used;

Sl No	Impact Category	Unit of Entitlement	Details of Entitlements	Remarks
7	Temporary loss of income of mobile kiosks, if any; and	Kiosk owner	Two months advance notice to vacate the area	
Vulnerable people				
8	Vulnerable persons		Assistance to include in government welfare schemes if not included, if eligible as per Government criteria; and One time lump sum assistance Rs 20,000. Additional benefits to SC and ST as per the provisions of RFCTLARR Act 2013.	
9	Women		In case of extending any productive asset, joint ownership in the name of husband and wife will be offered in case of non - women headed households. While disbursing the entitlements, women will be given the first priority to receive the entitlement benefits over other entitled persons.	
10	Loss of or impact on any Common or cultural Property Resource such as shrine, temple, mosque, handpump, shed, etc.	Community, Village/ Ward	Resources such as cultural properties and community assets shall be conserved (by means of special protection, relocation, replacement, etc.) in consultation with the community.	
11	Unforeseen impacts		Any unforeseen impacts shall be documented and mitigated in accordance with the principles and objectives of the Policy	

9.3 Consultations Strategy and Participation Framework

To ensure peoples' participation in the planning phase and aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs of drinking water and problem and prospects of resettlement, various sections of project affected persons and other stakeholders will be engaged in various consultation throughout the project planning and implementation.

Public participation, consultation and information dissemination in a project begins with initial Social assessment activities during the initial phases of project preparation. Public consultation activities and information dissemination to PAPs and local authorities continues as the project preparation activities proceed in a project. Through respective local governments and civil society, PAPs are regularly provided with information on the project and the resettlement process prior to and during the project preparation and implementation stage.

The information dissemination and consultation with PAPs during project preparation should include but not limited to the following:

- project description and its likely impacts
- objective and contents of the surveys
- general provisions of compensation policy
- mechanisms and procedures for public participation and consultation
- resettlement options (reorganization on remaining land, relocation to a fully developed resettlement site, or cash compensation)
- grievance redress procedures and its effectiveness
- tentative implementation schedule
- roles and responsibilities of the sub-project proponents and local authorities
- feedback on the income generation activities and effectiveness
- feedback regarding relocation site(s)
- preferences for the mode of compensation for affected fixed assets (i.e., cash or land-for-land)

A detailed consultation and communication plan shall be developed for each sub-project as part of the RAP. This framework shall be a sub-set of the overall communication strategy of the project. Some of the methods that can be used for the purpose of communication will include provisions of information boards, pamphlets distribution, wall paintings, drum beating, organizing meetings with key informants and village committees and opinion gathering through post cards, phones and SMSes. Certain per centage of the project cost will be allocated for preparation and implementation of communication strategy.

It is good practice to document details of all public meetings held with people and local government officials with dates, location and the information provided and the major emerging issues. It is recommended that RAP and other documents include this list, as an attachment. Where public announcements are made, the details, together with a copy of the text of the announcements should be provided in the documents.

9.4 Grievance Redress Mechanism

The GRC will be constituted by the Project Authority with the aim to settle as many disputes as possible on LA and R&R through consultations and negotiations. There will be one GRC for each city. The GRC will comprise five members headed by a retired Magistrate. Other members of the GRC will include a retired ULB Officer, Social Development Officer, representative of PAPs and ULB Chairman/ or his/her nominee (Elected Head of Corporation/ULB) of the concerned city. Grievances of PAPs in writing will be brought to GRC for redressal by the RAP implementation agency. While the GRC is in place, in general all the grievances in first go will be reviewed and attempted to be addressed by the field level officer – JE/AE/anyother designated officer. All the unresolved and major ones will only be escalated to the level of GRC. The RAP implementation agency will provide all necessary help to PAPs in presenting his/her case before the GRC. The GRC will respond to the grievance within 15 days. The GRC will normally meet once in two months but may meet more frequently, if the situation so demands. A time period of 30 days will be available for redressing the grievance of PAPs. The decision of the GRC will not be binding to PAPs. This means the decision of the GRC does not debar PAPs taking recourse to court of law, if he/she so desires. Broad functions of GRC are as under:

- Record the grievances of PAPs, categorize and prioritize them and provide solution to their grievances related to resettlement and rehabilitation assistance.
- The GRC may undertake site visit, ask for relevant information from Project Authority and other government and non-government agencies, etc in order to resolve the grievances of PAPs.
- Fix a time frame within the stipulated time period of 30 days for resolving the grievance.
- Inform PAPs through implementation agency about the status of their case and their decision to PAPs and Project Authority for compliance.

The GRC will be constituted within 3 months by an executive order from competent authority from the date of mobilization of RAP implementation agency. The RRO will persuade the matter with assistance from implementation agency in identifying the suitable persons from the nearby area for the constitution of GRC. Secretarial assistance will be provided by the PIU as and when required.

9.5 Monitoring and Evaluation (M&E) at Project and Sub-project Level

M&E would be carried out for regular assessment of both process followed and progress of the RAP implementation. The Resettlement Action Plan will contain indicators and benchmarks for achievement of the objectives under the resettlement programme. These indicators and benchmarks will be of three kinds:

i) Input indicators, indicating project inputs, expenditures, staff deployment, etc.
ii) Output indicators, indicating results in terms of numbers of affected persons compensated and resettled, training held, assistance disbursed, etc,
iii) Impact indicators, related to the longer-term effect of the project on people's lives.

The benchmarks and indicators will be limited in number, and combine quantitative and qualitative types of data. Some of these indicators may include, percentage of PAPs actually paid compensation before any loss of assets; percentage of PAPs whose incomes after resettlement are better than, or at least same as before resettlement; percentage grievances resolved; and/or percentage of cases to court. The first two types of indicators, related to process and immediate outputs and results, will be monitored to inform project management about progress and results, and to adjust the work programme where necessary if delays or problems arise. The results of this monitoring will be summarized in reports which will be submitted to the PMU/World Bank on a regular basis. Provision will be made for participatory monitoring involving the project affected persons and beneficiaries of the resettlement programme in assessing results and impacts. Depending on the need, for participatory monitoring, options like joint monitoring teams with PAPs representatives; forming village/community teams for their own review and sharing their observations with the PIU; joint reviews of the implementation, etc will be attempted.

The internal monitoring will be carried out by the KUIDFC/PMU. The Project Authority will engage services of an external agency (third party), which will undertake independent concurrent impact evaluations at least twice during the project implementation period. Such independent evaluation will focus on assessing whether the overall objectives of the project have been met and will use the defined impact indicators as a basis for evaluation. Specifically, the evaluation will assess: (i) The level of success (including the constraints and barriers) in land acquisition programme, resettlement plan, and income recovery of the PAPs after they have been displaced from the project affected area, and, (ii) the types of complaints/ grievances and the success of the handling of grievance and public complaints towards the construction of project's infra-structures, means of redress for assets and lands and the amount of compensation, resettlement, and other forms of complaints.

Annexure I: Analysis of Alternatives (Technology & Site)

Since the proposed project is effectively an on-going modernization and rehabilitation of existing urban water supply infrastructure in the city, there is a limited scope for considering alternatives to achieve intended development objectives. One alternative considered, but rejected was to create new water supply infrastructure in the targeted areas. This would lead to major social and environmental impacts considering the baseline situation in the project areas. Instead, interventions focused on rehabilitation and modernization of existing water supply infrastructure would have limited impacts only. Various alternatives to the project are discussed in the sections below.

Option 1 - Increasing water supply efficiency and sufficiency by acquiring land

A positive alternative towards achieving efficient and sustainable water supply for the current and estimated projected population would be to acquire land for the construction of new pumping stations, Water treatment plant and new pipeline distribution to support the existing ones. This will provide new areas for water optimization and enhance pumping capacity and output especially in the new receiving areas. The option will encourage excavation of trenches, lying of new pipes etc.

Constraints

- High costs required for purchase of lands
- Availability of land required for establishment of a new water supply network.
- Heavy financial requirements for building new structures; purchase of additional piping materials; excavating new trenches; purchase and installation of mechanical and electrical equipment etc.
- Amount of power and energy required to pump water from new pumping stations

Option 2 - Alternatives to pipeline routes

This option will require the acquisition of new Right –of –Ways (ROWs), whereas in the proposed project most of the ROW is in existence and will only be upgraded.

Constraints

- Most neighborhoods and communities within the project area are already built up. Creation of new ROW will require removal of existing structures and displacement of people and movable property i.e. market tables etc.

Pipe Laying Alternatives

Several alternatives to laying of pipes within the project area exist. They include:

- Excavating old pipes and installing new pipes in the old pipeline routes by trench digging
- Abandon old pipes in the existing network and install new pipes parallel to the network
- Installing new pipes in a new pipeline route by trench digging

Option 1-Excavating old pipes and installing new pipes in the old pipeline routes by trench digging

This would involve the excavation of old pipes, which pass through the old pipeline network. Belagavi is a city, which is currently undergoing rapid infrastructural expansion, most especially with regard to its road network. Currently, a huge percentage of the old water pipeline network sits under newly expanded avenues and roads, pursuing this project implementation option would therefore mean a pseudo-destruction of parts of newly constructed roads, and reconstructing after new pipes are laid.

Option 2- Abandon old pipes in the existing network and install new pipes in a parallel position.

A modification of Option 1 would be to leave the existing pipeline as it is, especially networks consisting of asbestos pipes (in order to minimize the complexity of excavation and management of

disused asbestos material). New pipes could be laid parallel to the abandoned old network, thereby maintaining the same network channel but encouraging supply through new safer pipe-type alternatives e.g. PVC.

Option 3- Installing new pipes in a new water pipeline route by trench digging

This involves the installation of new pipes in a new pipeline route by digging trenches all along the newly proposed pipeline route. It is not necessarily the cheapest of all the options and it may have considerable short-term negative socio-economic impacts such as involuntary resettlement (in unplanned areas), temporary loss of income due to lost man-hours, lack of access to business space (in cases where business premises are affected by the need to resettle). It also creates local employment opportunities, as trench digging will require the engagement of local labour.

Option 4- Horizontal/Vertical Directional Drilling (trenchless pipe lying)

This option minimizes environmental disruption by installing pipes along surface bore paths. This can be achieved by exploiting new pipeline routes (expanded network) and through exploiting old pipeline routes (existing network). For instance, rather than removing or demolishing structures on the Right-of-Way, drainages, concrete walkways etc. could be drilled in order to lay new pipes. This will reduced the occurrence of compensation for displaced persons. However there is the likelihood of affecting the foundation of existing structures.

Advantages:

- Cost: Substantial cost savings are possible. However, even when trenchless methods are more expensive, such technology may be the best alternative because of other considerations discussed below.
- Environmental effects: Less soil is disturbed so impacts on adjacent organisms and water bodies can be reduced significantly.
- Disruption: Traffic delays are reduced or eliminated, as is heavy truck traffic associated with culvert excavation deep below the roadway.
- Speed of installation: Construction often takes less time, regardless of the road fill depth.
- Safety: Many safety concerns associated with steep-excavation slopes, work inside trench boxes, and worker exposure to traffic may be eliminated or reduced.
- Less engineering: Less surveying, fewer design calculations, and fewer drawings and specifications may be required.
- Fewer unknowns: Minimal ground disturbance results in fewer contingencies associated with subsurface conditions with pipe lining options

Disadvantages:

- Cost: Where placement is shallow and traffic is not a major constraint, excavation is usually more cost effective.
- Level of engineering difficulty: Specialized expertise in related technologies and the impact on subsurface site conditions is required.
- Decreased flow capacity: Practices such as lining pipes with thick structural sections reduce pipe openings, decreasing the pipe's flow capacity.
- Grade or alignment corrections: Effecting necessary changes to the existing grade and alignment are not always possible.
- Shorter design life: Rehabilitation techniques such as spot repair or grouting have a shorter design life than new pipe installation.
- Susceptible to fire damage: Forest engineers found that culverts lined with plastic or replaced with corrugated polyethylene pipe were damaged severely when subjected to wildfires. Fire caused the plastic to burn or melt from one-half to the complete culvert length. Engineers should be aware of this potential for fire damage.

Option 5 - Do Nothing

A No Project scenario was also considered but rejected, as there is a dire need to improve water supply service delivery and increase water availability to ensure minimum water requirement, as well as reform the water resources management to meet the demands of a fast growing population. This has been incorporated as its own project sub-component. Analysis of the no project versus with project scenario is presented in Table:

Analysis of No Project versus With Project Scenario

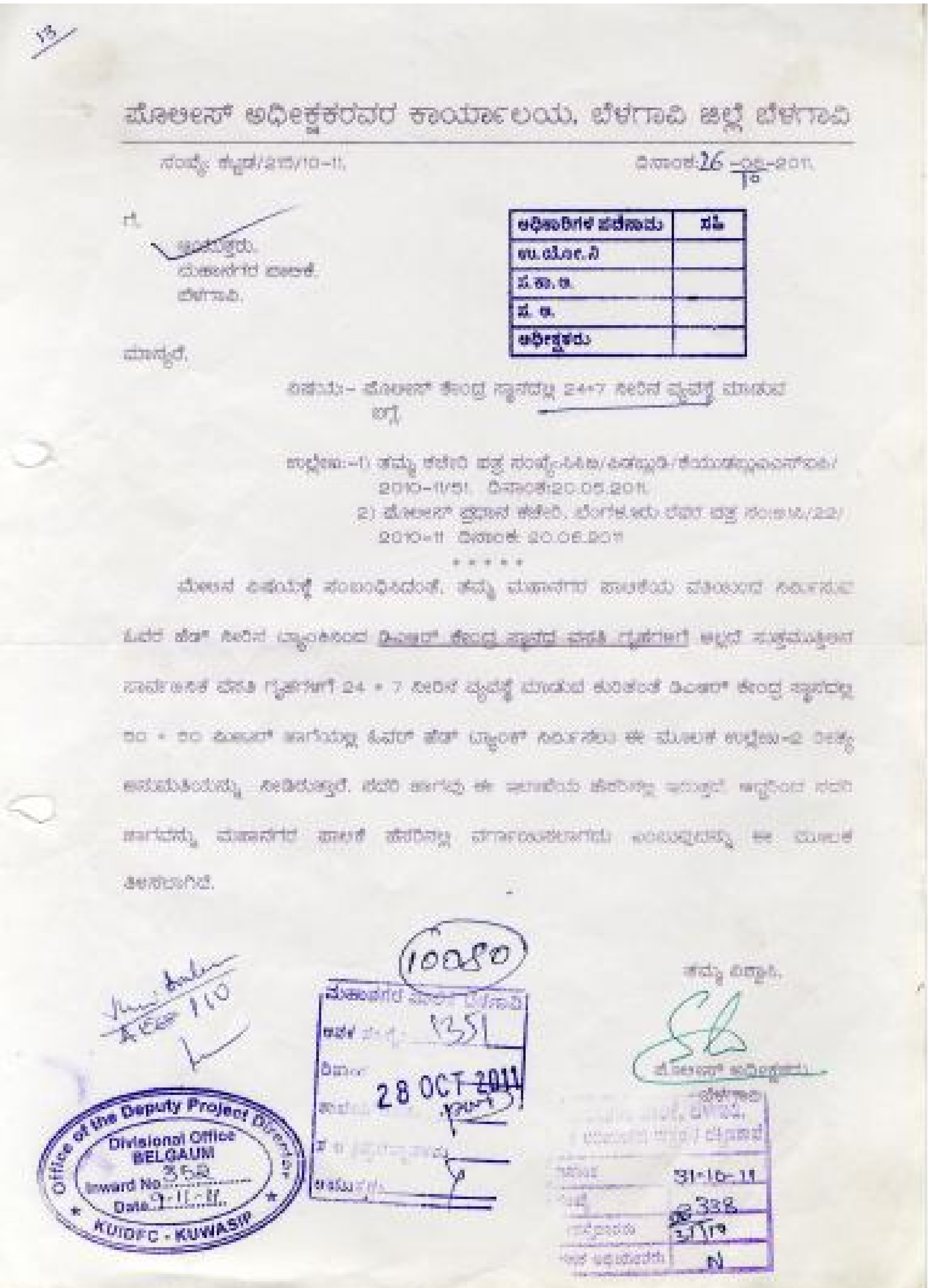
No Project Scenario	With Project Scenario
– Existing inefficient system will continue with environmental & social problems. – No new technologies use – Inefficient & unsustainable Water Resource Management – Unsafe water supply structures – Limited knowledgebase – Poor Water Quality – Unbalance water supply	– Improved, sustainable & efficient water delivery system (24x7) – Improved knowledgebase for implementing efficient water resource management system – Short term environmental impact during construction may take place but risk factor will reduce and better water management system will emerge – Possible increase in miss use of water and wastewater, but mitigated through awareness – Improve water quality – Safer water supply can be achieved.

The “do-nothing” option would involve maintaining the status quo. This would mean that no further rehabilitation and expansion of the existing network in the area would be undertaken, excluding water works and routine pipeline maintenance.
Alternatives available in site activities should be analyzed on the basis of:

a. Impact of each alternative
b. Mitigation measures for each alternative

During execution of the project, construction equipments, machinery and plants are likely to cause adverse impact on the environment. The impact can be due to the emissions, dust, noise and oil spills that concern the safety and health of the workers, surrounding settlements and environment as a whole. Impacts of construction activities can be reduce through good construction practices, environment and Social Management Plan and Environmental Code of Practices.

Annexure II: No Objection Certificates issued by Government Departments



ಪೊಲೀಸ್ ಅಧೀಕ್ಷಕರವರ ಕಾರ್ಯಾಲಯ, ಬೆಳಗಾವಿ ಜಿಲ್ಲೆ ಬೆಳಗಾವಿ

Office of the Deputy Project Director
Divisional Office
BELGAUM
Inward No. 352
Date 9-11-11
KUIDFC - KUWASIP

28 OCT 2011

31-10-11

KARNATAKA INDUSTRIAL AREAS DEVELOPMENT BOARD

(A Government of Karnataka Undertaking)

14/3, 2nd Floor, R.P. Building, Nrupathunga Road, Bangalore - 560 001
Phone : 22215383, 22215679, 22242006, 22215069, Fax : 080-22217702
Website : www.kiadb.in e-mail : kiadb@mail.kar.nic.in

Plot No-7/B-3 B K Kangrali Industrial Area P .Road Belgaum-10 Ph: 0831-2470498, 2475963.

No. IADB/DO/BGM/ 1550 /2011-12 Dated: 23.11.2011

To,

The Commissioner
City Corporation
BELGAUM

Sir,

Sub:- NO Objection for allotment of land for 24x7 water supply Project in Kanabargi & Kangrali Industrial Industrial Area Belgaum Dist

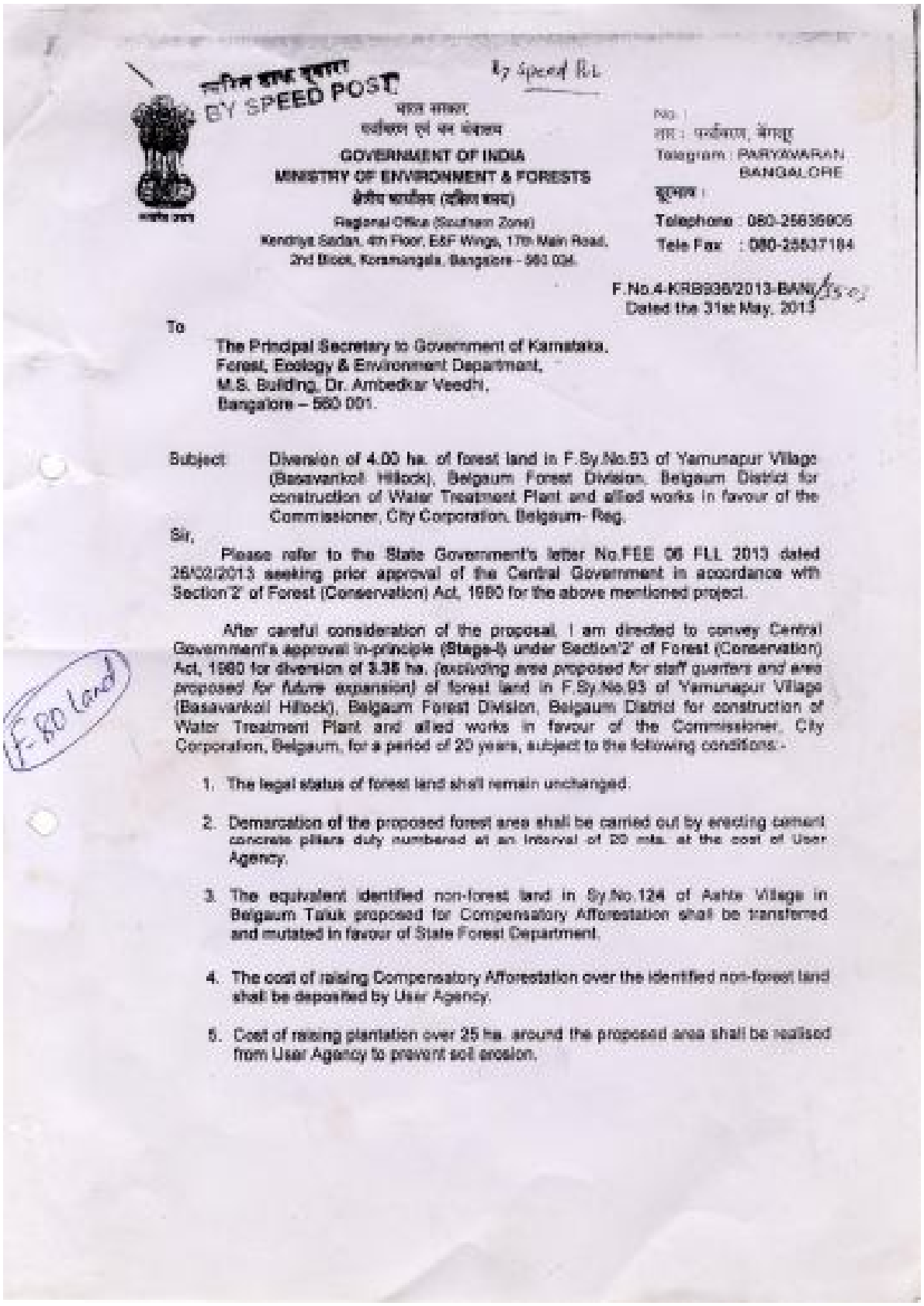
Ref:- 1) This office letter dated: 13.04.2011.
2) Meeting held at D.C. Office dtd: 04.11.2011

* * * *

With reference to the above subject, this is to inform you that the Board has no objection for allotment of the open land available near the existing Over Head Tank at Reliance Infrastructure Ltd at Kanabargi industrial Area Belgaum and also the land available in (HINDALCO) B K Kangrali Industrial Area Belgaum construction of E.L.S.R. for 24 X 7 Project as the same is identified by your officials along with the Assistant Executive Engineer PIU KUIDFC and Consultants

Yours faithfully,

Development Officer
K I A D B Belgaum



By Speed Post

BY SPEED POST

भारत सरकार
पर्यावरण एवं वन मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT & FORESTS
क्षेत्रीय कार्यालय (दक्षिण क्षेत्र)
Regional Office (Southern Zone)
Kendriya Sadan, 4th Floor, E&F Wings, 17th Main Road,
2nd Block, Koramangala, Bangalore - 560 034.

No. :
तार : पर्यावरण, बंगलूर
Telegram : PARYAVARAN BANGALORE
दूरभाष :
Telephone : 080-25636905
Tele Fax : 080-25537194

F.No.4-KRB936/2013-BAN/
Dated the 31st May, 2013

To

The Principal Secretary to Government of Karnataka,
Forest, Ecology & Environment Department,
M.S. Building, Dr. Ambedkar Veedhi,
Bangalore – 560 001.

Subject: Diversion of 4.00 ha. of forest land in F.Sy.No.93 of Yamunapur Village (Basavankoll Hillock), Belgaum Forest Division, Belgaum District for construction of Water Treatment Plant and allied works in favour of the Commissioner, City Corporation, Belgaum- Reg.

Sir,

Please refer to the State Government's letter No.FEE 06 FLL 2013 dated 28/02/2013 seeking prior approval of the Central Government in accordance with Section'2' of Forest (Conservation) Act, 1980 for the above mentioned project.

After careful consideration of the proposal, I am directed to convey Central Government's approval in-principle (Stage-I) under Section'2' of Forest (Conservation) Act, 1980 for diversion of 3.35 ha. (excluding area proposed for staff quarters and area proposed for future expansion) of forest land in F.Sy.No.93 of Yamunapur Village (Basavankoll Hillock), Belgaum Forest Division, Belgaum District for construction of Water Treatment Plant and allied works in favour of the Commissioner, City Corporation, Belgaum, for a period of 20 years, subject to the following conditions:-

1. The legal status of forest land shall remain unchanged.
2. Demarcation of the proposed forest area shall be carried out by erecting cement concrete pillars duly numbered at an interval of 20 mts. at the cost of User Agency.
3. The equivalent identified non-forest land in Sy.No.124 of Ashte Village in Belgaum Taluk proposed for Compensatory Afforestation shall be transferred and mutated in favour of State Forest Department.
4. The cost of raising Compensatory Afforestation over the identified non-forest land shall be deposited by User Agency.
5. Cost of raising plantation over 25 ha. around the proposed area shall be realised from User Agency to prevent soil erosion.

F-80 land

Copy to:-

1. The Director General of Forests & Special Secretary to Govt. of India, Ministry of Environment & Forests, Paryavaran Bhavan, CGO Complex, Lodhi Road, New Delhi –3.
2. The Principal Chief Conservator of Forests, Forests Department, Govt. of Karnataka, Aranya Bhavan, 18th Cross, Malleswaram, Bangalore – 560 003.
3. The Additional Principal Chief Conservator of Forests/Nodal Officer (FCA), Office of the Principal Chief Conservator of Forests, Forests Department, Govt. of Karnataka, Aranya Bhavan, 18th Cross, Malleswaram, Bangalore – 560 003.
4. The Commissioner, City Corporation, Belgaum (Karnataka).
5. Guard file.

(S.M. Somashekar)
Chief Conservator of Forests (Central)

2.15.13

Annexure III: Stakeholder Consultation and Focus Group Discussion

Major findings from Stakeholders Consultation

The stakeholder consultation was conducted with various groups involving officials, professionals and city population from various areas of the project towns. The in-depth discussion on various water supply and related subjects brought forth some key issues which are as mentioned below:

Minutes of the Meetings and Consultations held in Belagavi		
1.	**Meeting with ULB officials:**	Assess Environment and Social Impacts due to the availability of 24*7 water supply.
	Participants:	Shri. R. S. Nayak (City Engineer), Er. Umesh W. Nettuekan - Assistant Engineer (KUIDFC), Consultant (IPE Global Pvt. Ltd.)
	Date:	3rd February, 2014
	Venue:	Belagavi
	Discussion:	Er. Umesh. W. Nettuekan (AE. KUIDFC) gave an in depth overview of the 24*7 water supply scheme, its implementation and public response. According to him the users were willing to pay for water if it's available in the desired quantum and good quality. In order to meet the needs in the non-demo zone regular water tanker services are provided throughout the year. The frequency of it is increased during public functions/religious festivals/fairs etc. He also informed that for expanding infrastructure facilities to provide water round the clock most of the land requirement issues have been resolved thus nullifying land acquisition disputes or RR requirement. The incidences of water borne diseases do not occur in the demo zone and they try to supply as far as possible good drinking water in the non-demo zone as well. Dr. S. K. Potdar (Health officer) also confirmed the same. Mr. Naik, City Engineer is an excellent blend of technology and preservation promotion of traditional water sources in his thoughts and vision. Thus his water availability efforts in Belagavi have won him many an accolades at the State and National level. In consultation with Senior citizens many old wells which had got lost under debris and forgotten have been revived. Mini filtration units installed to compensate water requirement in the adjoining area.13 such units are successfully running and 3 new are on the cards very soon.This will be an ongoing work in a phased manner. Local organizations (Lions/Rotary club) community members /local elected members and people of all walks of life are contributing whole heartedly in this initiative. This is a good example of community initiative/ownership.

		They have also provisioned for providing water connections to temporary slum inhabitants who do not possess permanent address proof by accepting affidavit of tenancy. According to him however much still needs to done in promoting rain water harvesting on a large scale.
	Participants:	Shri. Ravikumar M. R (Commissioner)
	Date:	
	Venue:	
	Discussion:	
2.	**Site Visits:**	
	Agenda:	Inspection of the proposed Construction Sites
	Participants:	– Officials from City Corporation Belagavi, KUWS&DB and KUIDFC – ESA Team (IPE Global Private Limited)
	Venue : Ganeshpur: Behind Sugar Institute, Opposite Freedom Fighter colony, Sy no 16, Laxmitek 1st Cross **Date: 3rd February 2014**	 
	Venue : Visheshwaryya Nagar: Demolition of the existing ESR and build a new on the existing site **Date: 3rd February 2014**	 
	Venue : Nehru Nagar: Near KPTCL Engineers Association Building, Opp. KLE Hospital **Date: 3rd February 2014**	 
	Venue : Vaibhav Nagar: Adjacent to INDAL guest house, near existing OHT **Date: 3rd February 2014**	 

	Venue : Kanbargi: Near existing OHT in KHB colony **Date: 3rd February 2014**		
	Venue : Auto Nagar: Near existing OHT, 2nd Main Road, Near Pollution Control Board **Date: 3rd February 2014**		
	Venue : Anjaneya Nagar: Near Hanuman Temple, Sector 10, Anjaneya Nagar **Date: 3rd February 2014**		
	Venue : <u>Proposed WTP Construction site</u> in **Basavankolla – WTP:** An area of 6.0 acres of land is required for construction of 80 mld treatment plant along with clear water reservoir for the year 2041 **Date: 3rd February 2014**		
3.	**Interaction with Community**		
	Purpose:	Community Development & their needs	
	Participants:	Consultant (IPE Global Pvt. Ltd.), various respondents from community	
	Date:	**3rd Feb 2014**	
	Venue:	**Azam Nagar Demo Zone**	
	Discussion 	The area comprised of primarily middle and higher class community. The colony is planned and construction work is still in progress. The group consultant interacted with comprised of members from different class /caste and both new and old residents of that area. Univocally they were satisfied with the provision of 24*7 water supply both in quantity and quality.	

		The Customer care center was approachable for redressal and the tariff was acceptable by the users. They were getting appropriate bills as per there consumption. Azamnagar happens to be an upcoming colony and some of the participants informed that with the 24*7 water supply the tenancy rate has considerably increased in the area. People prefer renting houses in the locality now.
	Participants:	Consultant (IPE Global Pvt. Ltd.), various respondents from community
	Date:	**3rd Feb 2014**
	Venue:	**Shivabasav Nagar- Demo Zone**
	Discussion 	The inhabitants of this locality were primarily daily wagers. There houses were built on Municipality land.24*7 water supply was available and customer satisfaction with the services was observed. They were aware of the water borne diseases and with the availability of good quality drinking water the incidents of such diseases were taken care off. The women folk were very aware in this locality and as compared to the male members they knew more about the scheme in terms of tariff/Customer care centre etc. In most of the households it was the women members who were maintaining the tariff records and that to in a properly organized manner. Interestingly in this same locality about 30-40 households in just the opposite lane come under Non Demo zone. The water supply scenario was just the opposite. They get water supply for a very limited period once in every 4 days. This paucity is substantiated by the authorities through water tankers. However the community was unhappy with the quality and quantity of water provided through this mode. They also informed that they pooled in money ranging from Rs 150 -175/ in getting Tanker water also. The community members specially the women folk were aware of the water borne diseases and thus to safeguard the family health they bought (paying a minimal amount) drinking water from the demo zone neighbours across the street.Usually one sees a lot of animosity between the haves and have not's, but this locality presents a perfect congenial example of synergetic co-existence which is worth emulating and praise worthy.
	Participants:	- Consultant (IPE Global Pvt. Ltd.), - Various respondents from community

	Date:	**3rd Feb 2014**
	Venue:	**Shivabasav Nagar opposite lane- Non Demo Zone**
	Discussion	There are approximately 300 households in this locality and have only 8 taps from which water is supplied once every 5 days. The inhabitants are daily wagers and thus the male members go out to work in the informal sector.The burden of fetching water from far off areas falls on the women apart from other house hold chores. The unavailability of water leads to they not being regular in taking up work to compensate the meagre family income. Water woes lead to a lot of fights amongst women initially which at times even takes a violent shape when the male members of the community get involved. Incidences of water borne diseases are common thus lowering the health indicator in this area. The water woes in this locality is lowering both their health and economic status and the women/children /other vulnerable members are worst affected.
	Participants	- Consultant (IPE Global Pvt. Ltd.), - Various respondents from community
	Date:	**4th Feb 2014**
	Venue:	**Patilganj- Non demo zone**
	Discussion	Adequate water supply is provided to the users of this densely populated area. This has been possible by renewing the old well in the area by involving the senior citizens /community members/corporator etc. The filtration plant garners a lot of ownership by the community in its maintenance/supply. This alternative support system of water supply initiated by the Corporation to substantiate the water board supply is a boon for the users in this area. This was endorsed by the locals as well the Corporator of the ward Mr. Ranjit Chawan Patil. Some households have in house wells coming down the ages in the family. The water level is good in these wells and they use this water for all other requirements except drinking. The water available from the mini filtration plant is of good quality and thus water borne diseases are under control and the women are spared of deficient water woes.

Annexure IV: Key Tenets of the NRRP 2007 and Land Acquisition and R&R Act 2013

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
1	Involuntary resettlement should be avoided whenever feasible, if unavoidable it should be minimized	✓	✓	LAA is applicable wherever private land is to be acquired by Government for public purpose.
2	A Resettlement Plan should be prepared wherever resettlement is envisaged	✓	✓	According to the NRRP, RP should be prepared when it involves resettlement of more than 400 families (roughly about 2,000 persons) in plain areas and 200 families (roughly about 1000 people) in hilly areas, Desert Development Programme (DDP) blocks, areas mentioned in Schedule V and Schedule VI of the Constitution of India. New LAA states to prepare a SIA.
3	Affected people are to be identified and recorded as early as possible to establish their eligibility, through a census, which serves as a cut-off date, and prevents subsequent influx of Encroachers.	✓	✓	LAA provides for every affected person to receive a notification prior to acquisition and for a hearing in case of any objection. Acquisition under the Act is permitted within one year from the date of declaration of intent to acquire, failing which, the process has to start again. LAA does not regard non-titleholders as APs.
4	Detailed socio-economic surveys should be conducted to analyze impacts and Affected Persons (APs) should be classified under different categories	✓	✓	NRRP predefines the broad categories of APs and compensation packages for them. This compensation does not take into account the varying open market rates and local conditions in different urban and rural areas across the country. New LAA predefines specific land value estimation process and also compensation packages.
5	Losses of APs should be estimated on case-by-case basis	✗	✓	Broad categories of PAPs and compensation for each are predefined in the NRRP. The New LAA, however, differentiates the losses due to land acquisition in rural and urban areas.
6	All PAPs should be provided with better standard of living and absence of a formal title to land is not a bar to entitlements	✓	✓	NRRP indicates provisions for better living standard for PAPs. However, it does not provide scope for dealing with finer issues of resettlement because of predefined categories and compensation packages. Compensating PAPs without having formal title to land is also not clearly mentioned. New LAA considers this as important.

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
7	All Project Affected Families (PAFs) should be compensated based on losses incurred	✗	✓	Under NRRP "project affected family" means a family/person whose place of residence or other properties or source of livelihood are substantially affected by the process of acquisition of land for the project and who has been residing continuously for a period of not less than three years preceding the date of declaration of the affected zone or practicing any trade, occupation or vocation continuously for a period of not less than three years in the affected zone, preceding the date of declaration of the affected zone. NRRP extends benefits based on the above mentioned definition. Loss of livelihoods of any PAF has to be compensated as per New LAA.
8	PAPs if non-titleholders	✗	✗	LAA does not recognize any PAPs other than titleholders. NRRP, though not clearly, but has the provision of benefits for PAPs residing for consecutive three years in the affected zone, as mentioned previously.New LAA also does not clearly say anything about non-titleholders entitlements for R&R assistances.
9	All PAPs should be compensated at replacement cost for lost assets, including transaction and transition costs	✗	✓	The NRRP's concept of replacement cost is not clearly defined. However, the NRRP does consider various compensation packages to substitute the losses of PAPs. New LAA predefines specific land value estimation process and also compensation packages.
10	Wherever feasible land-for- land option should be provided for acquired land	✓	✓	For, socially disadvantaged groups like SC / ST, the New LAA provides for this entitlement.
11	Land allotted should be in the joint name of husband and wife if families are affected	✓	✗	Only NRRP opines for it.
12	Vulnerable PAPs should be identified and provided with special assistance	✓	✗	NRRP clubs vulnerable PAPs including BPL persons, landless, elderly, physically challenged, widow, unmarried girls, orphans, SCs, STs and other minorities and provisions of benefits have been considered for them.

Sl. No.	Policy Principles	NRRP (2007)	New LAA (2013)	Remarks
13	Social networks and cultural links should be preserved. Common property resources should be replaced	✓	✗	Only NRRP recommends this.
14	PAPs are to be assisted to integrate economically and socially into host communities	✓	✗	Only NRRP recommends this.
15	Each involuntary resettlement is conceived and executed as part of a development project or program with time-bound action plan	✓	✓	LAA does not provide for resettlement. However, it specifies the time limit for acquisition, though the project / program for which it is conceived need not necessarily be time-bound. New LAA considers involuntary resettlement for land acquisition for public purpose not only to be executed as part of development project but also significantly as State Government's responsibility.
16	The Affected Persons are to be fully informed and closely consulted	✓	✓	LAA recognizes only titleholders, who are to be notified prior to acquisition. New LAA considers public disclosure as important but not necessarily for non-titleholders.
17	Organization and management of RP activities should be carried out through proper institutional structures and efficiently monitored	✓	✗	Under NRRP, a National Monitoring Commission is proposed to be set-up, which shall be chaired by the Secretary, Department of Land Resources, under the Ministry of Rural Development and comprise seven other Secretaries.
18	Provisions for grievance redressal procedures	✓	✓	Under NRRP, Grievances Redressal Cell will be set-up under the Commissioner, Resettlement. LAA, previous and new, provide for a hearing of objections filed by PAPs
19	All costs should be borne by requiring body and shall be a part of project cost	✓	✗	The New LAA says that all costs should be borne by the requiring body but not as part of project cost.

Annexure V: Ward Wise Area and Population

Ward No.	Ward name	Area (ha)	Ward no.	Ward name	Area (ha)
1	Majgaon	110.18	**30**	Shari Galli	13.00
2	Udymbhag	353.33	**31**	Deshpandae Galli	26.61
3	Guruprasd Colony	282.39	**32**	Raviwarpetta	26.12
4	Badmanji Colony	152.24	**33**	Kamat Galli	12.24
5	Shivshakti Nagar	26.84	**34**	Pangula Galli	8.74
6	Angola	300.65	**35**	Darbar Galli	14.50
7	Bhagya Nagar	102.48	**36**	Kamngral Galli	14.49
8	Talkwadi	74.11	**37**	Badkal Galli	18.44
9	Adarsh Nagar	31.89	**38**	Chavat Galli	21.83
10	Vadagon	362.98	**39**	Kaliambre	87.22
11	Vajyae Galli (Vadagoan)	20.76	**40**	Hanuman Nagar	415.78
12	Old Belagavi	14.16	**41**	Sadashiv Nagar	74.62
13	Old Belagavi	244.22	**42**	Sangmeshwar Nagar	138.22
14	Old Belagavi	18.50	**43**	Azham Nagar	95.93
15	Bharat Nagar (Vadgaon)	31.95	**44**	KEB Quarters	141.45
16	Hindwadi	56.68	**45**	Neharu Nagar	65.45
17	Chauglaewadi	127.41	**46**	Shivbasav Nagar	54.51
18	Nanawadi	491.27	**47**	Veerabadra Nagar	101.18
19	Shastri Nagar	98.45	**48**	Shivaji Nagar	16.49
20	Shapur	18.61	**49**	Shivaji Nagar	56.14
21	Shapur	18.18	**50**	New Gandhi Nagar	446.72
22	Kunchi Nagar	202.99	**51**	Gandhi Nagar	49.26
23	Sambhaji Galli Shapur	203.53	**52**	Shri Nagar	112.09
24	Narvekargalli Shapur	12.89	**53**	Mahantesh Nagar	73.95
25	Mahatmapullae Road Shapur	32.66	**54**	Auto Nagar	473.86
26	Nartaki	55.90	**55**	Hindalco	693.93
27	Mahwar road	40.91	**56**	Kanbargi	546.11
28	Kapleshwar road	14.68	**57**	Kanbargi	763.68
29	Tashildar Galli	18.38	**58**	Alwarwad Kudachi	1202.99
				Total	**9284.78**

Ward No.	Households	Population	31	1511	6241
01	1654	7194	32	1386	6104
02	2761	11176	33	1508	7248
03	1979	7986	34	1341	6616
04	2130	8931	35	1404	7026
05	1406	5884	36	1470	6307
06	2478	10802	37	1336	6143
07	2655	10436	38	1324	5885
08	1974	7540	39	1245	5519
09	2394	10164	40	3920	16656
10	1462	6248	41	1765	7466
11	2980	13008	42	2867	12573
12	1466	6693	43	2850	13312
13	1893	8840	44	1243	5055
14	2025	9173	45	1678	7737
15	1524	6731	46	1581	7078
16	1621	6658	47	1472	6977
17	1787	6846	48	1982	9011
18	2753	11172	49	1448	6239
19	2087	8805	50	2732	12783
20	1438	6335	51	2713	12851
21	1551	6790	52	2419	10923
22	2039	9358	53	1732	7211
23	1496	6886	54	4140	19374
24	1428	6229	55	2375	10256
25	1300	5565	56	1749	8443
26	2175	9176	57	1501	6760
27	2029	8585	58	1651	7249
28	1621	6945	59	241	1065
29	1498	6303	60	197	823
30	1489	6655	**Total**	**111874**	**490045**

Annexure VI: Proposed Water Supply System

GENERAL

It is proposed to upscale the existing system with required modifications as necessary for the successful implementation of 24x7 water supply system to the cover the entire service area.The system is designed such that the requirements of 2031 and 2041 are being addressed separately on the bulk and treatment plants. This can substantially eliminate the investments at the start of the project.Based on the source studies it is planned for implementing dual mechanisms so that in the event if any one system fails the other source can be used to cater to the demand to an extent. Hence the feeder system has been designed in such a way that the water can reach the reservoirs from any one of the source without any obstructions.

WATER POLICY IN KARNATAKA:

Objective:

- Provide drinking water at the rate of 55 litres per person per day in the rural areas, 70 litres per person per day in towns and 100 litres per person per day in the city municipal council areas and 135 litres per person per day in city corporation areas.
- Improve performance of all water resource projects.
- Provide a legislative, administrative and infrastructural environment, which will ensure fair, just and equitable distribution and utilization of the water resources of the State to benefit all the people of the State

Allocation priorities

In planning and operation of water resources projects, water allocation priorities arebroadly as follows:

- Drinking water
- Irrigation
- Hydropower
- Aquaculture
- Agro industries
- Non-Agricultural Industries
- Navigation and other uses

Private Sector Participation

- Private sector participation are encouraged in various aspects of planning, investigation, design, construction, development and management of water resources projects for diverse uses, wherever feasible.
- Depending upon specific situation, to bring in various combinations of private sector participation, in building, owning, operation, leasing and transferring of water resources facilities.

Water Rates:

Water rates for various uses to be revised in a phased manner and fixed so as to cover at least the operation and maintenance charges of providing services.

Monitoring:

Close monitoring of planning, execution and performance of water resources projects to be undertaken to identify bottlenecks and to obviate time and cost overruns.

Action plan:

- Make water accounting and audit mandatory.
- Mobilize community and stakeholder participation through Users Organizations, empower them, provide training, technical support and create public awareness.

DRINKING WATER AND SANITATION POLICY IN KARNATAKA:

Objective:

- Ensure universal coverage of water and sanitation services that people want and are willing to pay for
- Ensure a minimum level of service to all citizens.

Institutional arrangements:

- Policy formulation
- Encouraging the use of public private partnerships as well as private sector participation to achieve the sector goals.
- Ensuring co-ordination and collaboration among the various agencies both at the policy and operational level through the establishment of appropriate committees and agencies.

Tariff:

The longer-term objective is to establish an appropriate cost recovery mechanism through adequate tariff to ensure that revenue cover operation and maintenance costs, debt service plus a reasonable return on capital. In the medium term, however, subsidies to be continued to the needed and to be focused in areas such as pockets and communities of extreme poverty and investments with large-scale externalities like wastewater treatment. Tariff need to be structured in a manner so that excessive consumption and wastage of water is discouraged. Achieve 100% metering and volumetric pricing based on long run marginal costs.

Private Sector Participation:

To improve efficiency in service provision, continuously update technology and ultimately bring in private investment into sector, the GOK to actively encourage private sector participation.

SOURCE STUDIES

Background

The increase in the concentration of human activities intensifies the competition for all types of sources among the most vital of which is the water. Water has become a very important commodity for the growth of the towns/cities.

The major water related problems of rapidly growing towns/cities are;

a) The need for dependable supplies of potable water,

b) Severe and growing sanitation problems including pollution of streams, lakes, estuaries and ground water from domestic and industrial sewage and solid wastes, and

c) Depletion of ground water aquifers caused by reduction of infiltration and over pumping of aquifers. Identification of feasible and perennial source is imperative to meet the ever-increasing demand owing to increasing population and improved standards of living. The problem of source identification becomes easier in respect of cities/towns situated in the proximity of any perennial source, where there are no such facilities and where it has to depend upon seasonal monsoon rainfall only; it becomes rather difficult to cope up with the needs. Therefore, in locations where there is no scope for surface water identification then efforts becomes absolutely necessary to conserve the available water and depend on ground water. Source of water will be either surface or sub-surface provided it should be perennial besides technically and economically feasible. City

Municipal Corporation, Town / City Municipal Council (CMC/TMC) or any independent authority constituted for this purpose is responsible for providing safe drinking water of adequate quantity to the people of the city. The major objective of such authorities is to plan well ahead and identify additional sources of water to meet everincreasing demand owing to increased population and also for stepping up per capita supply.The population of the city is expected to reach 7,26,201 by the year 2031 and 8,47,534 by the year 2041 as per population projections. The present treated water requirement is about 94 Mld and this demand will be 129 Mld by the year 2031 and 148 Mld by the year 2041. The present supply is about 68 Mld from surface sources and about 4.55Mld from ground water source. There is a need for augmentation of present water supply system to take care of immediate as well as future water demand of the city. Considering transmission and treatment plant losses of 5% the raw water requirement to meet the water demand by the year 2041 is 157 Mld (57.24 Mcum per year).

PRESENT WATER SOURCE

At present water supply to BelagaviBelagavi City is from:

1 Ground Water Source

562 working out of 624 Bore wells drilled at different locations in and around the city with power pumps or hand pumps.

2 Surface Source

Two water sources, a) Rakaskop reservoir and b) Hidkal Dam.

GROUND WATER SOURCE

Some of the areas of the city are supplied with ground water through bore wells. 488 out of 624 are functioning. 167 out of 624 are fitted with power pumps of capacity various between 1 HP and 7.5 HP. The approximate yield from these bore wells fitted with power pumps is 4.55 Mld.

Ground water resource recharge and utilization status indicate that draft or exploitation is more than recharge. In the absence of sufficient recharge they are not likely to maintain the same yield for a longer duration. Hence it is suggested to augment/initiate recharge by constructing rain-harvesting structures in the catchment areas and also desilt the existing tanks in and around the city.

Ground water source cannot be used as source of water due to its non reliability of the effective yield of these bore wells, also it is observed that at many places these bore wells have dried up in the project area which makes it a non reliable source for future. Hence the use of Ground water as a source is completely discarded. Ground water table shall be recharged using rainwater harvesting methods and this source could be used when there is emergency and shortage of surface water because of bad monsoon.

SURFACE WATER SOURCE

There are no major rivers or reservoirs in the near vicinity of the city other than present surface sources. The present sources, a) Rakaskop Reservoir and b) Hidkal Dam have been studied in detail to estimate the available quantity and dependability as a source for water supply to city for the horizon year 2041.

1 RAKASKOP RESERVOIR

Rakaskop water supply scheme was developed in the year 1962 (Stage-I, 27.28 Mld) and then strengthened in the year 1983 (Stage-II, 27.20 Mld). Rakaskop Reservoir was formed by constructing a earthen dam across Markandeya River, a tributary of Ghataprabha River and located at about 22 km from the City. It has three outlets at different levels for effective drawl of water. The salient features of the Rakaskop Reservoir have been presented in Table given below. The area capacity details of the reservoir are given in Table given below. Due to scanty rainfall in recent

times, only up to 40 to 45 Mld water is available at source. The height of the reservoir also cannot be increased to store additional quantity of water as some of area of Maharashtra State would come under submergence.

SALIENT FEATURES OF RAKASKOP RESERVOIR

Sl. No	Particulars		Details
i)	Location	:	22 km from Belgaum city on west side
ii)	Catchment area	:	33.67 SqKm
iii)	Length of bund	:	Earthen Dam, 358.3 m (1175 ft.)
iv)	Slope U/S	:	3:1
	D/S	:	2:1 with berm 2.5:1
v)	Height of dam	:	20.13 m (66 ft.)
vi)	Top width of Dam	:	6.1 m (20 ft)
vii)	Bottom width of dam	:	113.0 m (370 ft.)
viii)	Tank bund level	:	758.95 m (2490 ft.).
ix)	Full Reservoir Level	:	754.38 m (2475 ft.)
	Maximum Water level	:	755.29 m (2478 ft).
x)	Reservoir capacity at FRL	:	16.62Mcum (587.00 Mcft.)
xi)	Dead Storage	:	0.5 Mcum (17.80 Mcft.)
xii)	Sill level of outlet	:	745.540 m (2446 ft)
		:	747.979 m (2454 ft)
		:	749.800 m (2460 ft)
xiii)	Design Spillway capacity	:	311.5 Cumecs (11000 Cusec)
xiv)	Gate Size &No	:	Steel Gates 6 Nos- size 6.1 m x 3.05 m (20ft x 10ft)
xv)	Rainfall at source	:	2805 mm
xvi)	Rainfall at Dam	:	1785 mm
xvii)	River Bed Level	:	738.83 m (2424 ft)

AREA-CAPACITY DETAILS OF RAKASKOP RESERVOIR

Reduced Level (m)	Capacity (Mcum)	Water Spread Area (M sq.m)	Remarks
745.541	0.505	0.075	Sill level of first outlet
745.846	0.669	2.196	
746.150	0.851	2.792	
746.455	1.051	3.447	
746.760	1.269	4.163	
747.065	1.507	4.943	
747.370	1.765	5.790	
747.674	2.047	6.715	
747.979	2.356	7.730	Sill level of second outlet
748.284	2.695	8.840	
748.589	3.063	10.049	
748.894	3.463	11.360	
749.198	3.895	12.779	
749.503	4.361	14.308	
749.808	4.862	15.952	Sill level of third outlet
750.113	5.400	17.717	
750.418	5.976	19.605	

Reduced Level (m)	Capacity (Mcum)	Water Spread Area (M sq.m)	Remarks
750.722	6.586	21.608	
751.027	7.228	23.713	
751.332	7.903	25.929	
751.637	8.611	28.252	
751.942	9.353	30.687	
752.246	10.131	33.238	
752.551	10.944	35.906	
752.856	11.794	38.694	
753.161	12.681	41.604	
753.466	13.606	44.640	
753.770	14.568	47.796	
754.075	15.577	51.105	
754.380	16.623	54.539	Full Reservoir Level

HIDKAL RESERVOIR

Hidkal Reservoir has been created by constructing a dam across Ghataprabha River near Hidkal village. It has catchment area of 1412 sq.km with a yield of 1980 Mcum. The gross storage capacity of the reservoir is 1449 Mcum. The reservoir is located at about 40 Km from BelagaviBelagavi City. This is a multipurpose reservoir mainly used for irrigation. This reservoir is with Irrigation Department, governmentMof Karnataka. The salient features of the Hidkal Reservoir have been presented in Table below. Stage- III of Belguam City Water Supply Scheme has been implemented with Hidkal reservoir as source of water. This scheme has been developed to cater to the additional demand of City caused by rapid growth with respect to population as well as industries. The scheme was partially commissioned in the year 1996 to supply bulk raw water to industries. The capacity ofthe Hidkal water supply scheme is designed for intermediate stage (year 2006) requirement of 54.55 Mld and ultimate stage (year 2021) requirement of 81.83 Mld.

SUMMARY OF SOURCE STUDIES

In the absence of sufficient data such as inflows of Rakaskop reservoir, simulation studies could not be carried out to work out the availability and dependability of source. However based on the records of drawls from the reservoir for the water supply to Belgum city for the past 10 years it is assessed that this source could yield 40 Mld at 100% dependability.The balance requirement of 117 Mld is available from Hidkal reservoir. This quantity is just 3% of the gross storage of the reservoir. Supply for Drinking water gets top priority as per National water policy and if situation demands irrigation releases may be curtailed. Based on the catchment yield and the reservoir storage capacity of Hidkal Reservoir, this source is considered 100% dependable for the supply of 117 Mld to BelagaviBelagavi city to meet water demand by the year 2041. Ground water source shall be treated as supplementary source in case of any emergency or till implementation of distribution system in those areas

SALIENT FEATURES OF HIDKAL RESERVOIR

1.Name of Project	Ghataprabha
2. River Basin	Krishna
3.Name of Stream/ sub-basin	Ghataprabha

4. Location	
a. Nearby village/town	Hidkal
b. Taluk	Hukkeri
c. District	Belgaum
d. latitude	160 - 9' - 0'' N
e. Longitude	740 - 38' - 0" E
5. Catchment area (Sq.Km)	1412
6. Yield (Tmc)	69.60 (1979.89 Mcum)
7. Storage (Tmc)	
a. Gross	51.16 (1449 .20 Mcum)
b.Live	46.68 (1321.86 Mcum)
c.Dead	2.13 (62.37 Mcum)
8. Planned Utilisation (Tmc)	
a. Withdrawals by canals	74.53 (2110.5 Mcum)
b. Reservoir losses	3.27 (92.6 Mcum)
c. Gross utilisation	77.80 (2203.1 Mcum)
9. Irrigable Area	331000 Ha.
10. Dam	
a. Type	Composite
b. Height (Mtrs)	53.34
c. Length (Mtrs)	10183
d. MWL (Mtrs)	662.94
e. FRL (Mtrs)	662.94
f. MDDL (Mtrs)	633.83
11. Spillway	
a. Location	Central
b. Length (Mtrs)	149.35
c. Flood Lift (Mtrs)	7.62
d. Discharging capacity (Cumecs)	4613
e. Gates	10 (12.19 m x 7.62 m) Vertical Crest Gates

RAW WATER TRANSMISSION SYSTEM

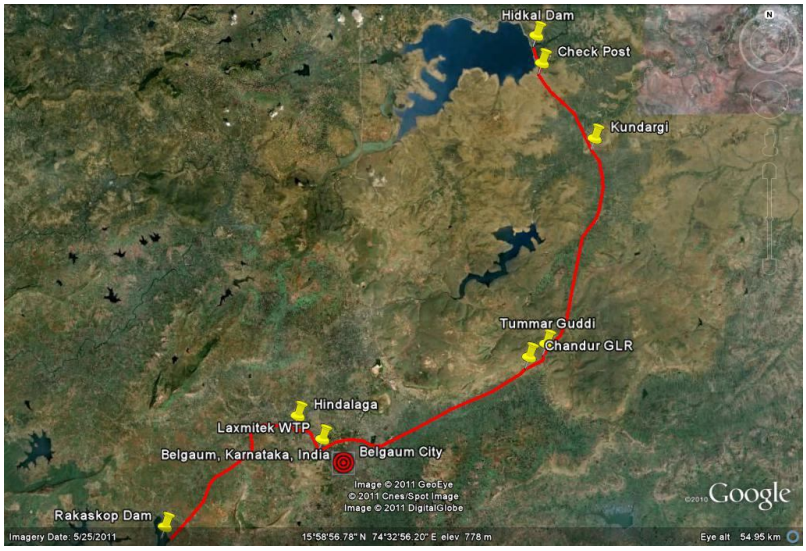
1 Rakaskoppa Scheme

The existing intake of Rakaskoppa Reservoir is planned to be retained as per the requirements. The existing pumping main will be used to pump raw water of 54.45 MLD as per the design capacity. The existing Electro Mechanical Works would require to be altered suitably. From the BPT raw water flows by gravity to existing IPS at Hindalga, from IPS Hindalga raw water is pumped to existing WTP at Laxmitek through the existing raw water transmission main.

Observations:

- The intake at Rakaskopa was constructed in early 1980's. The civil structure is found to be in good condition and hence suggested for integration.
- The mechanical and electrical parts rehabilitation is being dealt in the respective chapters.

The details of the scheme are per the details provided in the table given below



DETAILS OF RAKASKOPPA SCHEME- PROPOSED

Sl No	Type	Details	Remarks
1	River Intake at Rakaskoppa	54.45 MLD	Existing
2	Raw water Gravity main Main- 15.29Km – PSC-1100mm from intake to Existing Hindalga PS		Existing
3	Raw water pumping main- 3.28Km – MS-1000mm from existing Hindalga PS to Existing Treatment plant at Laxmitek		Existing
4	From Treatment Plant to Downstream Reservoir for distribution through feeder mains		

2 Hidkal Scheme

Existing intake of Hidkal Reservior is planed to be integrated with the proposed scheme raw water from the existing intake is pumped to existing GLR at check post through existing 1000mm and 1200mm MS and PSC pipes for a length of 2.63km and 0.76km respectively. MS pipe was found to be in good condition and hence integrated into the new network how ever PSC pipes was found to be in bad condition with reports on leakage being reported very often. Hence the exisitng PSC pipes is planned to be replaced with 1000mm dia MS pipe for a length of 0.76Km.

New Raw water transmission main of 800mm dia MS pipe for a length of 3.40 Km is proposed to pump an adiitional 40 MLD of water parallel to the existing allignment. As there is sufficent space available in the intake pumping station to install new pumping machineries no new intake pumping station is proposed.

From existing GLR at check post raw water flows by gravity to Kundargi IPS through 1000mm dia MS pipe for a length of 6.18 KM. The existing MS pipe of 1000mm dia for a lenth of 0.25Km is found to be in good condition, hence is suggested for integrattion with the proposed network. The above gravity line is suitable to carry 122 MLD of water.

From Kundargi IPS raw water is pumped to Tumarguddi IPS through 1100mm MS pipes for a lenth of 16.50Km out of which 11.50 Km is the existing pipe length which has beenretained based on its existing condition.

New Raw water transmission main of 800mm dia MS pipe for a length of 16.50KM is proposed to pump an adiitional 40 MLD of water parallel to the existing allignment. As there is sufficent space available in Kundargi pumping station to install new pumping machineries no new pumping station is proposed.

From Tumarguddi IPS raw water is pumped to Chandur Hilllock through existing 1100mm MS pipe for a length of 2.95KM which is in good condition hence integrated with proposed network.

New Raw water transmission main of 800mm dia MS pipe for a length of 2.95KM is proposed to pump an adiitional 40 MLD of water parallel to the existing allignment. As there is sufficent space available in Tumarguddi pumping station to install new pumping machineries no new pumping station is proposed.

From Chandur hillock raw water flows by gravity to Proposed WTP at Basavnkola, through existing pipe 1100mm and 900mm MS pipes upto the Indal tapping point. From indal tapping point a new gravity line is proposed to carry 40 MLD water to the proposed WTP at Basavankolla. Balance 14 MLD water will flow by gravity to existing WTP at laxmitek through existing 698mm MS pipe.

New Raw water transmission main of 800mm dia MS pipe for a length of 15.20KM is proposed to allow an adiitional 40 MLD of water parallel to the existing allignment. 700mm dia MS pipe for a length of 0.80Km is suggested form Indal tapping point to proposed WTP at Basavanakolla.

Observations:

The civil structure for intake point is found to be in good condition. Hence minor rehabilitation works have been suggested.

Raw water gravity main from GLR at check post to Kundurgi pumping station for a length of 6.18km is of PSC pipe hence it is replaced by 1000mm MS pipe

Raw water pumping main from Kundurgi to Tumurgudi pumping station for a length of 5km is of PSC pipe is replaced by MS pipe of 1000mm dia.

The mechanical and electrical parts rehabilitation is being dealt in the respective chapters.

DETAILS OF HIDKAL WATER SUPPLY SCHEME- PROPOSED

S.No.	Type	Details	Remarks
1	River Intake at Hidkal Reservior	81.72MLD	Existing
2	River Intake at Hidkal Reservior	40.00MLD	Proposed
3	Raw water Pumping Main- 2.63Km – MS-1000mm from intake to GLR at Check post		Existing
4	Raw water Pumping Main- 0.76Km – PSC-1200mm from intake to GLR at Check post		Existing / Replaced by 1000mm MS
5	Raw water Pumping Main- 3.4Km – MS-800mm from intake to GLR at Check post		Proposed
6	Raw Water gravity pumping main 6.5Km – MS -1000mm from check post to kundurgi pumping station		Proposed
7	Raw water pumping main – 11.5Km – MS – 1100mm from Kundurgi PS to Tumargudi PS		Existing
8	Raw water pumping main – 5.0Km – PSC – 1200mm from Kundurgi PS to Tumargudi PS		Existing/ Replaced by 1100 mm MS
9	Raw water pumping main – 16.5Km – MS – 800mm from Kundurgi PS to Tumargudi PS		Proposed
10	Raw water pumping main – 2.95Km – MS – 1100mm from Tumargudi to Chandur Hillock		Existing
11	Raw water pumping main – 2.95Km – MS – 800mm from Tumargudi to Chandur Hillock		Proposed

S.No.	Type	Details	Remarks
12	Raw water Gravity Main- 12.20Km – MS-1100mm from Chandur Hillock to Kanabargi Junction		Existing
13	Raw water Gravity Main- 2.94Km – MS-900mm from Kanabargi Junction to Indal Tapping Point		Existing
14	Raw water Gravity Main- 8.40Km – MS-698mm from Indal Tapping Point to Existing Treatment Plant at Laxmitek		Existing
15	Raw water Gravity Main- 15.2Km – MS-800mm from Chandur Hillock to Indal Tapping Point		Proposed
16	Raw water Gravity Main- 0.8Km – MS-700mm from Indal Tapping Point to Proposed Treatment plant at Basavankola		Proposed

Annexure VII: Water Quality Test Results

Format No. BTH/QF/164

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TEST REPORT

Page : 1 of 1

Report No. : ED/2014/05/0465	Report Date : 23/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014 Date of Receipt : 17/05/2014 Date of Start of Test : 20/05/2014 Date of Completion of Test : 23/05/2014 Job Order No. : ED/2014/05/0465
Sample Nature/ Name : Tap Water	Sample Particulars : Tap Water from Belgaum, Ward No: 54, Rukmini Nagar, Ashraya Colony, DOS: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
2	E. coli Bacteria/100ml	Absent	Absent	--	IS 1622-1981

ANALYST

AUTHORIZED SIGNATORY

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TEST REPORT

Report No. : ED/2014/05/0466	**Report Date** : 23/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 23/05/2014
Sample Nature/ Name : Tap Water	**Job Order No.** : ED/2014/05/0466
	Sample Particulars : Tap Water from Belgaum, Ward No: 51, Mahanthesh Nagar, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.2	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
2	E. coli Bacteria/100ml	Absent	Absent	--	IS 1622-1981

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TEST REPORT

Report No. : ED/2014/05/0467	Report Date : 23/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 23/05/2014
Sample Nature/ Name : Tap Water	Job Order No. : ED/2014/05/0467
	Sample Particulars : Tap Water from Belgaum, Ward No: 40, College Road, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
2	E. coli Bacteria/100ml	Absent	Absent	--	IS 1622-1981

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TEST REPORT

Report No. : ED/2014/05/0468	Report Date : 23/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference: Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
Sample Nature/ Name : Tap Water	Date of Completion of Test : 23/05/2014
	Job Order No. : ED/2014/05/0468
	Sample Particulars : Tap Water from Belgaum, Ward No: 18, Nanawedi, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
2	E. coli Bacteria/100ml	Absent	Absent	--	IS 1622-1981

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TEST REPORT

Report No. : ED/2014/05/0469	**Report Date** : 21/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 21/05/2014
Sample Nature/ Name : Tap Water	**Job Order No.** : ED/2014/05/0469
	Sample Particulars : Tap Water from Belgaum, Ward No: 27, Madavara Road, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and clear transparent liquid filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0471	Report Date : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
Sample Nature/ Name : Tap Water	Job Order No. : ED/2014/05/0471
	Sample Particulars : Tap Water from Belgaum, Ward No: 6, Buda Colony, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.5	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with few sediments filled in sterilised bottle.			
3	E. coli Bacteria	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

ANALYST

AUTHORIZED SIGNATORY

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TEST REPORT

Report No. : ED/2014/05/0472	Report Date : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
Sample Nature/ Name : Tap Water	Job Order No. : ED/2014/05/0472
	Sample Particulars : Tap Water from Belgaum, Ward No: 2, Rani Channamma Nagar 1st Stage, DOS: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with sediments filled in sterilised bottle.			
3	E. coli Bacteria/ml	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0470	**Report Date** : 22/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference** : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 20/05/2014
	Date of Completion of Test : 22/05/2014
	Job Order No. : ED/2014/05/0470
Sample Nature/ Name : Tap Water	**Sample Particulars** : Tap Water from Belgaum, Ward No: 11, Managai Nagara, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Test Method
1	Free Residual Chlorine, mg/L	0.6	Min.0.2	Min.1.0	IS: 3025 (P 26)
	MICROBIOLOGICAL TESTS:				
2	Description	Colourless and transparent liquid with few sediments filled in sterilised bottle.			
3	E. coli Bacteria	Less than 1 CFU	Absent	--	IS: 5887 (Part I) 1976

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TEST REPORT

Report No. : ED/2014/05/0473	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference**: Data Sheet, Dated: 16/05/2014
Sample Nature/ Name : Raw Water	**Date of Receipt** : 17/05/2014 **Date of Start of Test** : 19/05/2014 **Date of Completion of Test** : 29/05/2014 **Job Order No.** : ED/2014/05/0473
Sample Condition : Satisfactory	**Sample Particulars** : Raw Water from Belgaum, River Intake at Hidkal Reservoir, Date of Sampling: 16/05/2014

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
	Table 1: Organoleptic and Physical Parameter				
1	Colour, Hazen units	< 2.0	Max.5	Max.15	IS: 3025 (P 4)
2	Odour	Agreeable	Agreeable	--	IS: 3025 (P 5)
3	Taste	Agreeable	Agreeable	Agreeable	IS: 3025 (P 7&8)
4	Turbidity, NTU	0.7	Max.1	Max.5	IS: 3025 (P 10)
5	pH	7.71 @ 24 deg C	6.50 to 8.50	No relaxation	IS: 3025 (P 11)
6	Total Dissolved solids, mg/L	62.0	Max.500	Max.2000	IS: 3025 (P 16)
	Table 2: General Parameters				
7	Aluminium, as Al, mg/L	< 0.01	Max.0.03	Max.0.2	IS: 3025 (P 55)
8	Ammonia, as NH3, mg/L	< 0.05	Max.0.5	No relaxation	IS: 3025 (P 34)
9	Anionic Detergents, as MBAS, mg/L	< 0.2	Max.0.2	Max.1.0	Annex K of IS: 13428
10	Barium, as Ba, mg/L	< 0.1	Max.0.7	No relaxation	IS: 15302
11	Boron, as B, mg/L	< 0.1	Max.0.5	Max.1.0	IS: 3025 (P 57)
12	Calcium, as Ca, mg/L	9.4	Max.75	Max.200	IS: 3025 (P 40)
13	Chloramines, as Cl2, mg/L	< 0.05	Max.4.0	No relaxation	IS: 3025 (P 26)
14	Chlorides, as Cl, mg/L	5.2	Max.250	Max.1000	AN-S-003
15	Copper, as Cu, mg/L	< 0.05	Max.0.05	Max.1.5	IS: 3025 (P 42)
16	Fluorides, as F, mg/L	0.04	Max.1.0	Max.1.5	AN-S-003
17	*Free Residual Chlorine, mg/L	< 0.05	Min.0.2	Min.1.0	IS: 3025 (P 26)
18	Iron, as Fe, mg/L	0.15	Max.0.3	No relaxation	IS: 3025 (P 53)
19	Magnesium, as Mg, mg/L	2.4	Max.30	Max.100	IS: 3025 (P 46)

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TEST REPORT

Report No. : ED/2014/05/0473	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference**: Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
	Job Order No. : ED/2014/05/0473
Sample Nature/ Name : Raw Water	**Sample Particulars** : Raw Water from Belgaum, River Intake at Hidkal Reservoir, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
20	Manganese, as Mn, mg/L	< 0.1	Max.0.1	Max.0.3	IS: 3025 (P 59)
21	Nitrates, as NO3, mg/L	0.4	Max.45	No relaxation	AN-S-003
22	Phenolic compounds, as C6H5OH, mg/L	Absent	Max.0.001	Max.0.002	IS: 3025 (P 43)
23	Selenium, as Se, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 56)
24	Silver, as Ag, mg/L	< 0.01	Max.0.1	No relaxation	Annex J of IS: 13428
25	Sulphates, as SO4, mg/L	2.0	Max.200	Max.400	AN-S-003
26	Sulphide, as H2S, mg/L	< 0.05	Max.0.05	No relaxation	IS: 3025 (P 29)
27	Total Alkalinity, as CaCO3, mg/L	37.6	Max.200	Max.600	IS: 3025 (P 23)
28	Zinc, as Zn, mg/L	< 0.01	Max.5	Max.15	IS: 3025 (P 49)
29	Total Hardness, as CaCO3, mg/L	33.7	Max.200	Max.600	IS: 3025 (P 21)
	Table 3: Toxic Substances				
30	Cadmium, as Cd, mg/L	< 0.003	Max.0.003	No relaxation	IS: 3025 (P 41)
31	Cyanide, as CN, mg/L	Absent	Max.0.05	No relaxation	APHA
32	Lead, as Pb, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 47)
33	Mercury, as Hg, mg/L	< 0.001	Max.0.001	No relaxation	IS: 3025 (P 48)
34	Molybdenum, as Mo, mg/L	< 0.01	Max.0.07	No relaxation	By GFAAS
35	Nickel, as Ni, mg/L	< 0.01	Max.0.02	No relaxation	IS: 3025 (P 54)
36	Total Arsenic, as As, mg/L	< 0.01	Max.0.01	Max.0.05	IS: 3025 (P 37)
37	Total Chromium, as Cr, mg/L	< 0.01	Max.0.05	No relaxation	IS: 3025 (P 52)
38	* Applicable for Chlorinated water				

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TEST REPORT

Report No. : ED/2014/05/0473	Report Date : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
Sample Nature/ Name : Raw Water	Job Order No. : ED/2014/05/0473
	Sample Particulars : Raw Water from Belgaum, River Intake at Hidkal Reservoir, Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
MICROBIOLOGICAL TESTS:					
	Description	Colourless and transparent liquid with sediments filled in plastic can.			
1	Coliform organisms/100ml	92	Less than 1	--	IS: 1622 - 1981
2	E. coli Bacteria/100ml	Present	Absent	--	IS: 1622 - 1981

Remarks : The sample does not conform to IS: 10500-2012 for Microbiological tests in the above respect.
The sample is unfit for drinking in the above respect.

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TEST REPORT

Report No. : ED/2014/05/0474	**Report Date** : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	**Customer Reference**: Data Sheet, Dated: 16/05/2014
	Date of Receipt : 17/05/2014
	Date of Start of Test : 19/05/2014
	Date of Completion of Test : 29/05/2014
Sample Nature/ Name : Treated Water	**Job Order No.** : ED/2014/05/0474
	Sample Particulars : Treated Water from Belgaum, After Clear (Laxmitek WTP), Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
	Table 1: Organoleptic and Physical Parameter				
1	Colour, Hazen units	< 2.0	Max.5	Max.15	IS: 3025 (P 4)
2	Odour	Agreeable	Agreeable	--	IS: 3025 (P 5)
3	Taste	Agreeable	Agreeable	Agreeable	IS: 3025 (P 7&8)
4	Turbidity, NTU	1.4	Max.1	Max.5	IS: 3025 (P 10)
5	pH	7.41 @ 24 deg C	6.50 to 8.50	No relaxation	IS: 3025 (P 11)
6	Total Dissolved solids, mg/L	60.0	Max.500	Max.2000	IS: 3025 (P 16)
	Table 2: General Parameters				
7	Aluminium, as Al, mg/L	0.02	Max.0.03	Max.0.2	IS: 3025 (P 55)
8	Ammonia, as NH3, mg/L	< 0.05	Max.0.5	No relaxation	IS: 3025 (P 34)
9	Anionic Detergents, as MBAS, mg/L	< 0.2	Max.0.2	Max.1.0	Annex K of IS: 13428
10	Barium, as Ba, mg/L	< 0.1	Max.0.7	No relaxation	IS: 15302
11	Boron, as B, mg/L	< 0.1	Max.0.5	Max.1.0	IS: 3025 (P 57)
12	Calcium, as Ca, mg/L	8.2	Max.75	Max.200	IS: 3025 (P 40)
13	Chloramines, as Cl2, mg/L	< 0.05	Max.4.0	No relaxation	IS: 3025 (P 26)
14	Chlorides, as Cl, mg/L	6.9	Max.250	Max.1000	AN-S-003
15	Copper, as Cu, mg/L	< 0.05	Max.0.05	Max.1.5	IS: 3025 (P 42)
16	Fluorides, as F, mg/L	0.05	Max.1.0	Max.1.5	AN-S-003
17	*Free Residual Chlorine, mg/L	0.1	Min.0.2	Min.1.0	IS: 3025 (P 26)
18	Iron, as Fe, mg/L	0.1	Max.0.3	No relaxation	IS: 3025 (P 53)
19	Magnesium, as Mg, mg/L	2.5	Max.30	Max.100	IS: 3025 (P 46)

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TEST REPORT

Report No. : ED/2014/05/0474	**Report Date** : 29/05/2014
Issued to : **IPE Global Private Limited** **IPE Global House, B 84,** **Defence Colony, New Delhi,** **DELHI - 110024.**	**Customer Reference**: Data Sheet, Dated: 16/05/2014 **Date of Receipt** : 17/05/2014 **Date of Start of Test** : 19/05/2014 **Date of Completion of Test** : 29/05/2014 **Job Order No.** : ED/2014/05/0474
Sample Nature/ Name : Treated Water	**Sample Particulars** : Treated Water from Belgaum, After Clear (Laxmitek WTP), Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
20	Manganese, as Mn, mg/L	< 0.1	Max.0.1	Max.0.3	IS: 3025 (P 59)
21	Nitrates, as NO3, mg/L	0.4	Max.45	No relaxation	AN-S-003
22	Phenolic compounds, as C6H5OH, mg/L	Absent	Max.0.001	Max.0.002	IS: 3025 (P 43)
23	Selenium, as Se, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 56)
24	Silver, as Ag, mg/L	< 0.01	Max.0.1	No relaxation	Annex J of IS: 13428
25	Sulphates, as SO4, mg/L	1.8	Max.200	Max.400	AN-S-003
26	Sulphide, as H2S, mg/L	< 0.05	Max.0.05	No relaxation	IS: 3025 (P 29)
27	Total Alkalinity, as CaCO3, mg/L	31.2	Max.200	Max.600	IS: 3025 (P 23)
28	Zinc, as Zn, mg/L	0.01	Max.5	Max.15	IS: 3025 (P 49)
29	Total Hardness, as CaCO3, mg/L	30.6	Max.200	Max.600	IS: 3025 (P 21)
	Table 3: Toxic Substances				
30	Cadmium, as Cd, mg/L	< 0.003	Max.0.003	No relaxation	IS: 3025 (P 41)
31	Cyanide, as CN, mg/L	Absent	Max.0.05	No relaxation	APHA
32	Lead, as Pb, mg/L	< 0.01	Max.0.01	No relaxation	IS: 3025 (P 47)
33	Mercury, as Hg, mg/L	< 0.001	Max.0.001	No relaxation	IS: 3025 (P 48)
34	Molybdenum, as Mo, mg/L	< 0.01	Max.0.07	No relaxation	By GFAAS
35	Nickel, as Ni, mg/L	< 0.01	Max.0.02	No relaxation	IS: 3025 (P 54)
36	Total Arsenic, as As, mg/L	< 0.01	Max.0.01	Max.0.05	IS: 3025 (P 37)
37	Total Chromium, as Cr, mg/L	< 0.01	Max.0.05	No relaxation	IS: 3025 (P 52)
38	* Applicable for Chlorinated water				

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TEST REPORT

Report No. : ED/2014/05/0474	Report Date : 29/05/2014
Issued to : IPE Global Private Limited IPE Global House, B 84, Defence Colony, New Delhi, DELHI - 110024.	Customer Reference : Data Sheet, Dated: 16/05/2014 Date of Receipt : 17/05/2014 Date of Start of Test : 19/05/2014 Date of Completion of Test : 29/05/2014 Job Order No. : ED/2014/05/0474
Sample Nature/ Name : Treated Water	Sample Particulars : Treated Water from Belgaum, After Clear (Laxmitek WTP), Date of Sampling: 16/05/2014
Sample Condition : Satisfactory	

SL. No.	PARAMETERS	Results	Acceptable Limits as per IS: 10500-2012	Permissible Limits as per IS: 10500-2012	Protocol
MICROBIOLOGICAL TESTS:					
	Description	Colourless and transparent liquid with sediments filled in plastic can.			
1	Coliform organisms/100ml	11	Less than 1	--	IS: 1622 - 1981
2	E. coli Bacteria/100ml	Absent	Absent	--	IS: 1622 - 1981

Remarks : The sample does not conform to IS: 10500-2012 for Microbiological tests in the above respect.
The sample is unfit for drinking in the above respect.

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