Initial Environmental Examination

March 2009

IND: North Karnataka Urban Sector Investment Program Tranche 4 – Haveri CMC

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

Karnataka Urban Infrastructure Development and Finance Corporation, Government of Karnataka

North Karnataka Urban Sector Investment Program

Package I – Dharwad

Tranche I Sub-Projects in Haveri CMC

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Wilbur Smith Associates Private Limited (WSAPL)

Abbreviations

ADB	:	Asian Development Bank
ASI	:	Archeological Survey of India
ASP	:	Activated Sludge Process
BM	:	Bituminous Macadam
DoEEF	:	Department of Ecology, Environment and Forests
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
EP Act	:	Environment (Protection) Act, 1986
FAL	:	Facultative Aerated Lagoon
GoI	:	Government of India
GoK	:	Government of Karnataka
GSB	:	Granular Sub-base
IEE	:	Initial Environmental Examination
KSPCB	:	Karnataka State Pollution Control Board
MLD	:	Million Litre per Day
MoEF	:	Ministry of Environment and Forests
MSL	:	Mean Sea Level
MSS	:	Mix Seal Surface
NKUSIP	:	North Karnataka Urban Sector Investment Program
NOC	:	No Objection Certificate
NOx	:	Oxides of Nitrogen
OM	:	Operations Manual
PCC	:	Profile Concrete Course
PWD	:	Public Works Department
SOx	:	Oxides of Sulphur
STP	:	Sewage Treatment Plant
RSPM	:	Respirable Suspended Particulate Matter
TSPM	:	Total Suspended Particulate Matter
WMM	:	Wet Mix Macadam
WRDO	:	Water Resource Development Organization

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I. INTRODUCTION

A. Overview

1. The North Karnataka Urban Sector Investment Program (NKUSIP) proposes to improve the environmental quality of the urban areas through better urban infrastructure facilities and thus improve living conditions of the urban people. In the wake of poor infrastructure facilities and services such as water supply, sewerage and sanitation and solid waste management, the risk of infectious diseases through exposure to unhealthy environment runs high, particularly in the case of urban poor. Hence, the proposed Investment Program aims at minimizing or mitigating the risk and ensures the well-being of people.

2. Though the Investment Program aims to improve the environmental condition of urban areas, the proposed improvements of infrastructure facilities may exert certain adverse impacts on the natural environment. While developing urban infrastructure facilities, impacts during the construction stage are expected to be more severe than impacts during the operation phase, though for a short duration. Exceptions being some facilities such as sewage treatment plant, which may also exert adverse impacts during the operation phase also, if due care is not taken. Again, most of the impacts are activity-specific. However, if due care is taken during the construction phase, investment Program negative impacts will be far outweighed by positive impacts

B. Environmental Regulatory Compliance

3. The components of NKUSIP include environmental sanitation infrastructure, water supply infrastructure, urban roads improvement, slum infrastructure, and non-municipal infrastructure projects. Sub-components proposed for Haveri Town, which fall under the ambit of environmental regulations and mandatory requirement, are indicated in **Table 1**.

Table 1. Environmental Regulatory Compliance of NKUSIP Components

Sector	Sub-Component	Applicability of Acts / Guidelines	Compliance Criteria
Sewerage and Sanitation	• Sewage Treatment Plant	• Water (Prevention and Control of Pollution) Act, 1974	• Consent for Establishment and Consent for Operation from KSPCB
All Sectors	• All sub-components	• The Environment Policy and Operations Manual (OM) 20: Environmental Considerations in ADB Operation	• Categorization of sub-project components into A, B or C and developing required level of environmental assessment for each component

4. The above table indicates that as far as GoI and GoK Acts/Guidelines are concerned, the proposed Investment Programs do not need to go through environmental assessment process; however, as specified, few sub-project components may require consent from Competent Authorities. The ADB guidelines, on the other hand, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Investment Program preparation. For this, the ADB Guidelines categorizes the proposed components into various categories (A, B or C) to determine the level of environmental assessment required to address the potential impacts. Level of environmental assessment required for each category of Investment Program, as per ADB's Environmental Assessment Guidelines 2003 is presented below.

i) ***Category A:*** Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts.

ii) ***Category B:*** Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A Investment Programs. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

iii) ***Category C:*** Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

C. Purpose of Initial Environmental Examination

5. The NKUSIP Package I – Dharwad covers six sub-project towns. To fulfill the ADB's environmental assessment requirement for sector loans, the environmental assessment of sub-projects were carried out. Owing to the scale and nature of the proposed infrastructure components and environmental profile of the NKUSIP sub-project towns, prima facie almost all Investment Program components are unlikely to have adverse environmental impacts.
6. Therefore, as per the ADB's Environmental Assessment Guidelines, the sub-project components proposed in Haveri under NKUSIP are categorized as 'B' and an initial environmental examination (IEE) have been carried out.

D. Scope of IEE

7. The IEE was based mainly on secondary sources of information and field reconnaissance surveys; no field monitoring (environmental) survey was conducted. Stakeholder consultation was an integral part of the IEE.

E. Report Structure

8. This Report contains eight (8) sections including this introductory section: (i) introduction; (ii) description of Investment Program components; (iii) description of the environment; (iv) screening of potential environmental impacts and mitigation measures; (v) environmental monitoring plan; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions.

II. DESCRIPTION OF THE INVESTMENT PROGRAM COMPONENTS

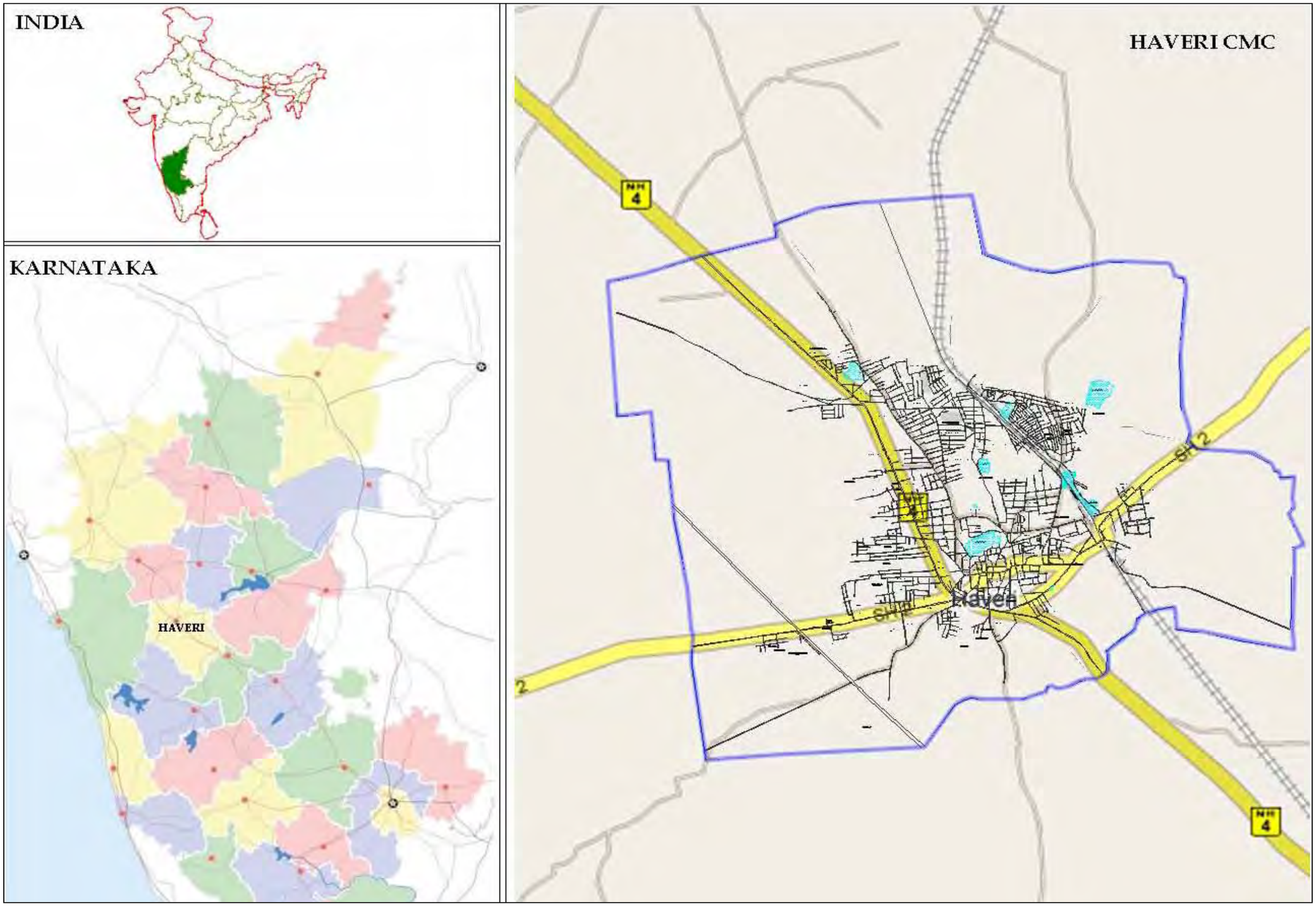
A. NKUSIP Investment Program Goal

9. The North Karnataka Urban Sector Investment Program (NKUSIP) will finance investment for (i) Environmental Sanitation Infrastructure; (ii) Water supply Infrastructure; (iii) Urban Roads Improvement; (iv) Poverty Alleviation; (v) Non-Municipal Infrastructure; (vi) Institutional Development; and (vii) Investment Program Assistance. The overall development goal of the NKUSIP is to facilitate economic growth in the towns of North Karnataka and bring about urban development through equitable distribution of urban basic services to the citizens that are environmentally sound and operationally sustainable. The development purpose is designed to assist Urban Local Bodies (ULBs) to "promote good urban management, and develop and expand urban infrastructure to increase economic opportunities and to reduce vulnerability to environmental degradation and urban poverty".

10. Thus the Investment Program goal is to facilitate economic growth in the towns/cities of North Karnataka and bring about urban development though equitable distribution of urban basic services to the citizens that is environmentally sound and operationally sustainable. The following are the urban infrastructure components proposed under the NKUSIP.

    i) Water Supply;
    ii) Sewerage;
    iii) Urban Drainage;
    iv) Urban Roads;
    v) Poverty Alleviation; and,
    vi) Non-Municipal Infrastructure (including Fire Services, Lake Development and Tourism)

11. Haveri city, located at the central part of Karnataka is one among the 25 cities of the state of Karnataka where urban sector investment program has been proposed. The location map of the investment program for Haveri is presented in **Map 1.**



Map 1. Project Location, Haveri City Municipal Corporation

12. NKUSIP program for Haveri City Municipal Council is planned to be implemented in a course of 6 years as two phases – Phase 1 and Phase 2 targeting to meet the demand for the year 2041. The investment has been proposed in water supply, sewerage, urban drainage, poverty alleviation and non municipal infrastructure including providing equipments for Fire Services for Haveri Municipality.

B. Need for Infrastructure Improvement in Haveri

13. Population in the city is growing as the city develops as an important destination for educational and commercial needs. Providing basic amenities to ensure high level of performance in environmental safe guard is quite necessary to ensure a long term urban sustainability. A study conducted by Department of Forests, Ecology & Environment, Government of Karnataka, 2003 has shown that the cities in the state of Karnataka has poor environmental performance due to lagging in ensuring basic infrastructure facilities to the urban population.

1. Karnataka - Health Status

14. In addition to the associated environmental pollution, importantly, due to lack of safe and adequate water supply and sanitation facilities, the risk of infectious diseases through exposure to unhealthy environment runs high, particularly in the case of urban poor. The State of Environment Report* (SOER), 2003, Karnataka, brings out the fact that the lack of safe water supply and sanitation facilities is essentially leading to the health related consequences. The following are the important observations of the report.

i) "Loss of access to the safe drinking water and sanitation is a matter of great concern. It is estimated that 75-80% of water pollution by volume is caused by domestic sewage. The remaining is industrial waste water which could be more toxic. Due to improper drainage and lack of disposal facilities, industries and local bodies use large areas of land for disposal of wastewater"

ii) "Adverse health effects are associated with ingestion of contaminated water, lack of access to sanitation, contact with unsafe water and improper management of water resources and agriculture. Infectious diarrhea makes the single largest contribution to the burden of disease associated with unsafe water, sanitation and hygiene. Besides the water borne diseases like cholera, jaundice, other gastrointestinal track infections are

* Department of Forests, Ecology & Environment, Government of Karnataka has prepared the SOER 2003.

quite significant amongst the population".

iii) "These diseases occur in different parts of the state, mostly during summer when there is scarcity of drinking water and source water gets contaminated. The data maintained by Health and Family Welfare Department (2003) indicates that number of attacks for gastroenteritis, viral hepatitis and typhoid are increasing. The yearly occurrence of water borne diseases like cholera and gastroenteritis makes it very clear that environmental impact of water on health is very profound and significant."

Table 2. Water borne / related Diseases in Karnataka

Year	Gastroenteritis		Cholera		Leptospirosis		Viral Hepatitis		Typhoid	
	Total	Fatal	Total	Fatal	Total	Fatal	Total	Fatal	Total	Fatal
1991	17455	691	747	16	-	-	659	17	-	-
1992	15262	608	402	14	-	-	282	17	-	-
1993	16206	855	424	13	-	-	678	7	26047	1
1994	15932	325	304	10	-	-	382	0	20349	0
1995	18645	396	532	38	-	-	7146	1	10250	0
1996	22983	377	657	6	-	-	1332	6	22221	12
1997	23665	361	714	10	67	2	1714	4	3880	5
1998	23881	501	434	2	1	0	3824	2	2435	0
1999	17743	126	134	3	54	2	4792	2	24356	1
2000	31132	265	354	3	3	1	3011	10	27210	0
2001	23893	198	342	1	68	7	5438	28	33346	6
2002	25218	146	384	0	27	0	4578	15	42936	2

Source: *SOER, 2003.*

15. Hence it is evident that the lack of safe water supply and sanitation facilities is leading to health consequences in the State. Considering the immediate attention required in improving the environmental quality of the city with prior emphasis to public health the present program is proposed to initially invest on following sectors

    i) Water Supply
    ii) Sewerage
    iii) Urban Drainage
    iv) Non municipal infrastructure – Fire Fighting

16. The following section details the status of water supply, sanitation and other infrastructure facilities in the Haveri town.

C. Existing Basic Infrastructure Facilities in Haveri CMC

1. Sewerage System

17. There is no underground sewerage system developed in Haveri town; the open drainage system provided in the town caters for storm runoff as well as for the wastewater. The sullage from individual houses is disposed off into open drains or just let into streets; dry latrines and individual septic tanks provide the disposal system for the human waste. There are in all 8580 private latrines in the city municipal council. There are 13 public latrines in the city municipal council. Number of seats provided on an average in each latrine is 8 (4 for ladies and 4 for gents). Thus, total seats provided are about 104. All the latrines have septic tanks and effluent from the septic tanks flows into the roadside drains.

18. The effluent of the septic tanks is flushed into the open drains or let into streets to form pools in low laying areas. Further, at some times the sewage also joins the open drains. Chocking and silting of open drains leads to overflowing of drains and the wastewater generally flows on the streets forming wastewater pools. This creates filthy conditions in the areas giving rise to mosquito menace. The mosquito menace is the biggest problem in Haveri threatening the health status of the inhabitants. The leaching of leachate from the pit latrines may potentially contaminate the groundwater sources. Hence, it is imperative to improve the quality of life of the town. Providing a comprehensive sewerage system would help achieving this goal.

19. Due to non-availability of sewage treatment system, the wastewater through open drains joins the Dodda Halla (Heggere Kere overflow channel) which is acting as the primary drain for Haveri City, flowing in the southern part of the city. As this stream flows through the agricultural fields, the farmers use untreated wastewater for agriculture purpose, which may potentially lead to health and environmental pollution problems. However, at present out of the total generated sewage, only a fraction of it reaches the agricultural fields, because of non-availability of proper sewage collection system. Hence, it may not have much significant impact on agricultural fields, but at the same time creating unhealthy conditions in the town.

2. Water Supply System

20. The first organized water supply system for Haveri town was developed in 1960 with Varada River, an ephemeral river, as source. The system is of 4.54 MLD capacity and associated with a conventional water treatment plant located at 5.185 km at Karadigodda. Treated water is taken to a GLSR of capacity 1 ML

located at Soolamatti and further distributed. This system is presently not in operation. In 2003, another water supply scheme was developed with River Tungabhadra, located at around 32 km from Haveri, as source. From the intake point water is pumped to a newly constructed WTP of capacity 9.09 MLD located in the Municipal boundary limit near to Old DC office and further distributed through 6 service reservoirs. In addition to these surface sources, the CMC accommodates reportedly around 300 bore wells and open wells utilized for water supply drawing around 1.3 MLD.

21. Both sources are not from perennial rivers and hence the water supply during the normal season is adequate but during the summer lean season the total water supply reduces considerably. Again, due to the high water losses in the system, the supply at consumer end is considerably low. In normal seasons, supply is once every alternate day, for duration of about one hour, which in summers is curtailed to even once in a week.

22. The water distribution network in Haveri covers more than 60 percent of the total population; of the total 10,060 households around 6,038 are connected with individual water service connections and there are about 1,500 public stand posts.

23. The socio-economic survey conducted in the non-slum households indicate high dependence on water service connections (WSC) with 74 percent households being served by WSC, of which 29 percent have alternate access to open/bore wells. Twenty five percent of slum households in Haveri are served by water service connections (WSC). The following table shows the access of water supply to the surveyed households.

Table 3. Access to Basic Services – Water Supply

Sl. No	Description	Access to Non-slum Households (%)	Access to Slum Households (%)
1	WSC	45	-
2	Standpost	15	-
3	Open well/Bore well	11	75
4	WSC + Open well/Bore well	29	25

Source: Socio-economic Survey, 2004.

24. Considering the existing and future water supply issues it may be concluded that the system needs to be strengthened and expanded. The water losses, which are considerable at present (25 percent), need to be tackled; it is also necessary to develop an all weather reliable water source for the town.

3. Urban Drainage System

25. Haveri CMC is having tertiary storm drain network for around 87.5 km along

the existing road which constitute open drain. Secondary and tertiary drains are built on both sides of roads. About 32 percent of total road length is covered by pucca drains and another 45 percent by kutcha drains. In the absence of a proper sewerage network, these drains receive sewage from the residential and commercial areas in the city. Uncontrolled dumping of solid waste especially plastic carry bags along the sewer results in chocking of drains which results in overflowing of sewage along the roads causing environmental and public health risks. Especially two low laying areas in the city – Chikkan kere and Chouki Gunda experiences severe waste water logging causing health issues and odour problems for the public. The sewage from higher level areas flows down to these low laying areas forming waste water cess pools. During rainy season, both Chikken Kere and Chowki Gunda area become water logged. Further the stagnant water remains as an ideal breeding ground of mosquitoes which causes health consequences to the public around the area. Further stagnating waste water results in ground water pollution which further aggravates health consequences among the public.

26. From the detailed survey it is observed that in the existing system, 98% (86 Km) of the storm water drains are of size less than 3.0 m width. Around 1.5 Km length of drains are of size equal or greater than 3.0 m width.

Table 4. Storm Water Drains – Width wise

SI No	Width of Drain (m)	Length (m)	%
1	Less than 3.0 m	86157.46	98.01
2	Equal to 3.0 m	1076.35	1.22
3	Greater than 3.0 m	338.19	0.38
	Total	**87907.97**	**100.00**

Source: *Reconnaissance Survey*

4. Fire Fighting Infrastructure

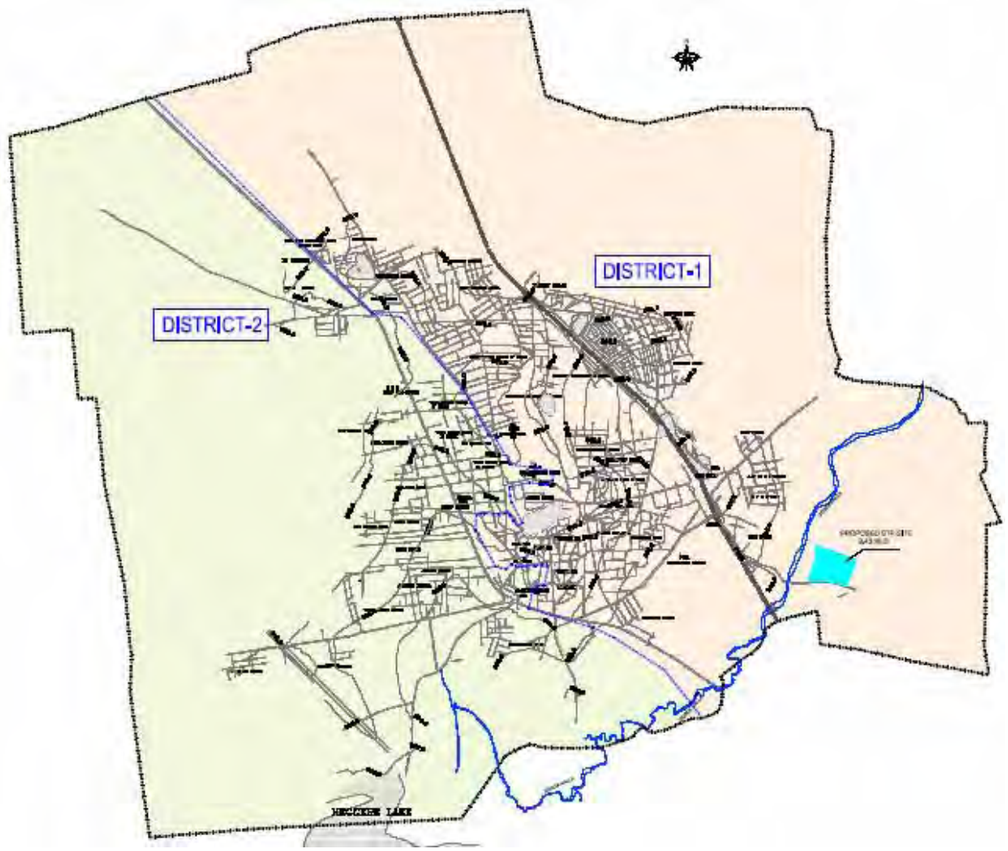
27. Karnataka State Fire and Emergency Services department, Government of Karnataka has a fire station located in the Haveri CMC. The fire station has to be upgraded by providing equipments and amenities such as quarters for fire service personals.

D. Proposed Improvements in Haveri CMC

1. Sewerage System

28. As there is no sewerage system in the town, under the present Investment Program it is proposed to develop a comprehensive sewerage system including

collection, conveyance, treatment and disposal system. It is proposed that the sewerage system will be put in place in two phases – starting from the densely developed city limit and further covering the growing peripheral areas. Based on the topographical features Municipal area is divided in to two sewerage Districts - District 1, and District 2. **Map 2** below shows the demarcation for the proposed sewerage districts for the municipal area of Haveri.



Map 2. Sewerage Districts for Haveri Municipal Council

29. The design period is taken as 30 years starting from 2011 to 2041. Both the Districts will be covered with a scientifically designed sewerage network by laying trunk mains and primary collection systems. It is proposed to lay a trunk sewer over a length of 4.42 km starting from ward 2 and ending at the joining point of trunk main from District 2. Sub mains and laterals from both sides shall be connected to this main. The total length of sub mains and laterals comes to 38.41 km. In District 2, it is proposed to lay trunk sewer for a length of 4.75 km along with sub main and laterals totaling to 14.5 km There are 1813 Manholes with provisions to give 10878 house connections. This network shall serve a population of 67645 (Ultimate 2041) and 47113 (Present 2011). Facultative Aerated Lagoon based STP will be constructed in modules with the immediate demand will be met through a 4.71 MLD unit by 2011 with subsequent addition in future.

30. The STP site is located within the municipal boundary along the outskirts of the city. The site is surrounded by agricultural fields along north, south and east with Dodda Halla, a natural stream boundaries western side. STP site has added advantage of being in the lower elevation hence the sewage from the city can be brought in through gravity. There is no residential belt in the immediate vicinity.

Table 5. Proposed Sewerage System Sub-components

No.	Sub-component
(i)	Laying of Trunk sewer for a length of 4.4 km along with main and sub main length totaling to a length of 38.41 km. This will cater to the need of district 1 and laying of sewer line (Trunk sewer line – 4.75 km + Sub main and laterals – 14.5 km) in District 2 for the design life of 30 years. A preliminary module of FAL based STP of 4.7 MLD will also be established with additional unit of 4.7 MLD subsequently which will be well enough to cater the need of the town for 2041.

31. The capacity of the proposed Sewage Treatment Plant will be 9.4 MLD, catering to the ultimate year need to treat sewage generated. There are number of options to treat the wastewater to the standards of disposal to Inland surface water. The options like Attached Growth Aerobic or Anaerobic Systems or Suspended Growth Systems shall be adopted. The availability of Land for Treatment plant, the cost of treatment and its operation and maintenance are the prime issues while selecting the suitable option. It is always advantageous to go for a treatment plant where much operational and maintenance aspects are less, if the land is sufficiently available.

32. Based on the above factors, Facultative Aerated Lagoon are proposed to treat

the Sewage to the standards of surface water disposal even though the treated sewage is expected to be utilized for agricultural facilities. There will be 5 cells in the Facultative Aerated Lagoon. About 90 percent reduction in the BOD and COD values shall be expected in the facultative ponds attributing to the design requirement.

Table 6. Design Parameters of STP

Parameter	Unit	Design Influent	Design Effluent	CPCB standard for Inland Surface Water Discharge
Design Flow	MLD	4.71	4.71	--
Biochemical Oxygen Demand	Mg/l	250	20-30	30
Detention Time		5 days	--	--

***Source**: DPR for Sewage Treatment*

33. The proposed treatment plant consists of pre-treatment and treatment units. The Pre-treatment Units comprises of two flow splitters followed by two screen chambers and grit chambers. This will be followed by a wet well designed to hold 5 minutes of flow for the year 2041. It is 6.35 m deep and 5m in diameter. There shall be 3 submersible pumps of 22.5 HP which can satisfactorily pump sewage at the rate of 0.086 m^3/s operating in the wet well.

34. The treatment will be carried out in Facultative Aerated Lagoon. The unit will be established with a capacity to handle 4.71 MLD of sewage with a flexibility of operation between 3.5 to 5 MLD without any deterioration in treated water quality. The lagoon will be partially under ground and partially above ground with 4 baffles. The top width of the baffle has been kept 1.5 m for easy movement of maintenance crew through the length of the lagoon and lagoon outer bund width has been kept 2.95 m for vehicular access. The dimension will be 160.84 m * 90.65 m * 4.8 m. The depth will include 3.8 m water depth, 0.5 m sludge depth with 0.5 m as free board. The sewage will have 5 days detention time and aeration will be done through 40 Nos.2.5 HP aerators, 8 units per chamber. Concrete weirs are planned on the incoming and outgoing bays to facilitate inlet and outlet. The overflow from outlet weir shall be collected by a leading channel that discharges on to Dodda Halla.

35. It is proposed to provide Buffer Zone with green plantations around the STP. There are provisions for access roads, DG room, lighting, etc. with the total area completely fenced and entry into the STP premises is restricted to the authorized ones. **Map 3** shows the layout of the proposed STP for Haveri.

36. Sewage will be treated in STP upto the discharge limit in surface water and will be discharged in to Dodda Halla, which will join River Varada at around 16.02

km at North Eastern Side of the city. It has been observed that there is no water supply schemes in the nearest vicinity of discharge point (Water Supply system for Haveri exist at 1.28 km upstream) hence the proposals does not pose any environmental risk to river water quality. Presently as the stream is carrying raw sewage from the city which causes significant impacts on its ecology and its neighborhoods, it is expected that the proposed STP will rejuvenate the ecological status of stream and will curtail environmental pollution due to irrigation with raw sewage along the agricultural fields.

Map 3. Layout of Proposed STP in Haveri CMC

2. *Water Supply System*

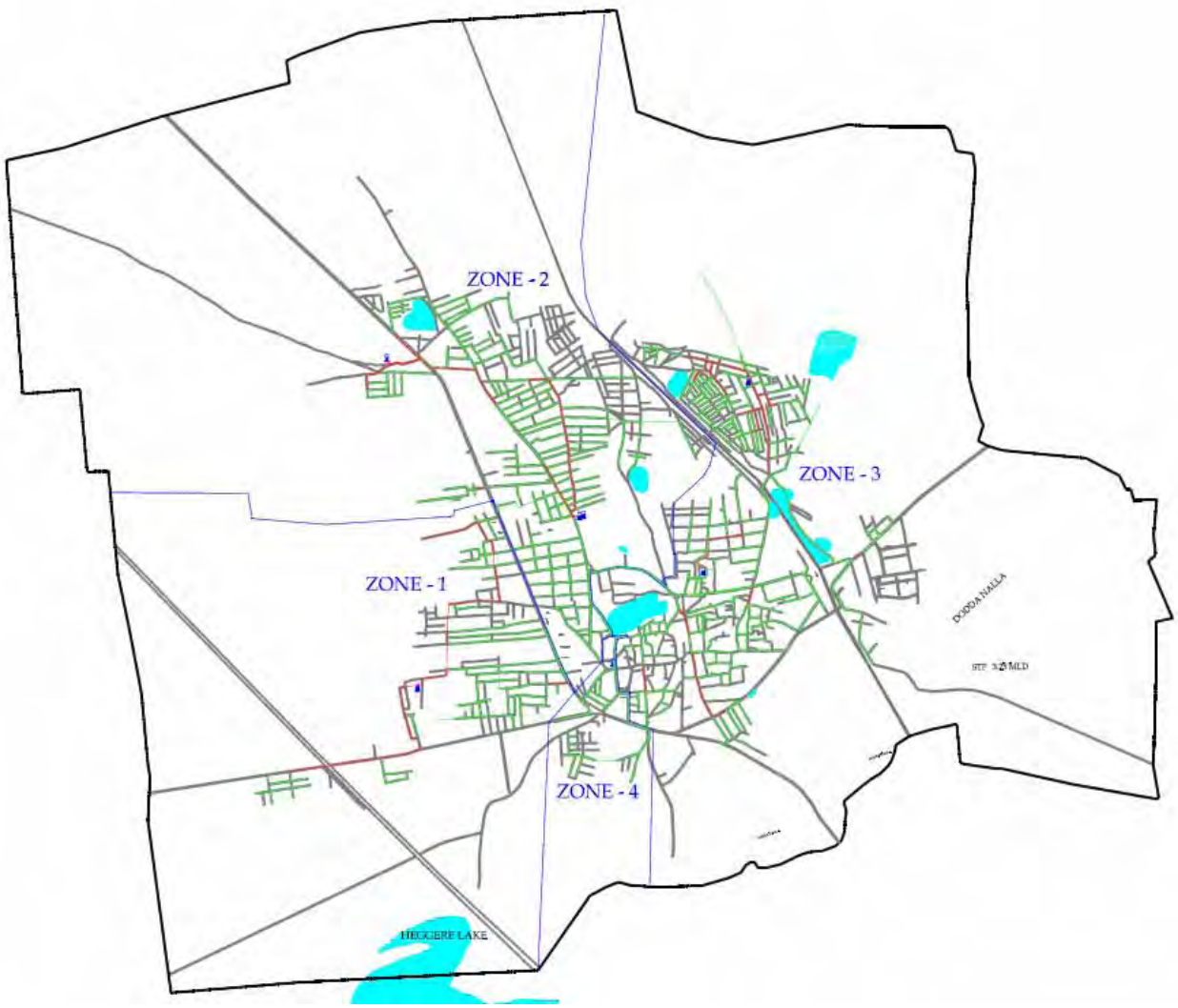
37. The proposed water supply system rehabilitation in Haveri aims at providing safe, adequate and reliable water supply to the inhabitants. The objectives of system improvement are:

i) Improving the longevity of the individual components and the system;

ii) Improving the operational performance of the components and the system; and

iii) Reducing the loss of the water and increasing the utilizable output of the system.

38. The Haveri Municipal area is divided in to four zones based on the distribution pattern. Zone 1 comprises areas such as Vidyanagar West, Shivaji Nagar, Viabhava Laxmi Nagar, Bharathi Nagar and Aswini Nagar and is catered by the 1.0 ML ELSR at Aswini Nagar. Total length of network in this zone is 12.119 km. Zone 2 comprises areas such as Indira Nagar, Manjunath Nagar, Netaji Nagar, Basaveswara Nagar, Vidyanagar East and Rajendra Nagar and is catered by the twin tanks near Municipal High School (old ELSR 0.5 ML, New ELSR 1.0 ML). There is small 50000 litres capacity ELSR at Netaji Nagar floating on the distribution system in this zone. Total length of network in this zone is 24.19 km. Zone 3 comprises areas such as Vijay Nagar, Nagendra Matti, Udaya Nagar, Melina Pet Siddadevapura Kondwad Oni, Desai Oni, Shivling Nagar and Market area and is catered by the 1.0 ML old GLSR at Soolamatti. Total length of network in this zone is 26.88 km. Zone 4 is a small zone comprises areas such as Desai Oni, Googi katti, JP Circle and Daneswar Nagar and is catered by the 0.5 ML ELSR near J.P Circle. Total length of network in this zone is 3.03 km. The zones are depicted in **Map 4.**



Map 4. Zone wise Demarcation for Water Supply Improvements, Haveri City

39. From the analysis of the existing system it was observed that the immediate requirement in this sector is developing a surface water storage which can store water for the lean periods of 90 days. Further it was found that the distribution mains and sub mains are not of the required sizes which require augmentation and the distribution network requires further extension inside the city limit.

40. In order to ensure the regular water supply during lean months, the alternative options studied were

    i) Construction of a barrage across Thugabhadra Near Guttal

    ii) Identifying an impounding reservoir which can store water for summer requirement

41. Out of the above options, it was observed that construction of a barrage across Thungabhadra is not feasible since the width of the river is too long and the plain topography at the intake will necessitate substantial inundation. Further this proposal will have impact on the existing inter state Krishna River water dispute and further the allocated fund is not sufficient to construct a new reservoir at this location. It was observed that Heggere Kere - a lake of capacity 1400 ML located at 1.5 km away from the heart of the city located near to the new WTP can be converted to an impounding reservoir. It is proposed to pump the surplus water from river Varada for 240 days in a year and utilize the stored water after treatment through New WTP of the adequate capacity during lean months. This proposal was found to be the most feasible option which requires laying of pipeline from river Varada to Heggere Kere and further from lake to new WTP along with necessary pumping arrangements.

42. From the analysis of existing distribution network using Water GEMS V8 XM Edition hydraulic modelling software it was observed that in zone 4 the distributions system is having its capacity to meet the ultimate year demand. Zone 1, Zone 2 and Zone 3 have inadequately sized transmission system and in order to improve the distribution system it was proposed to do rehabilitation in Zone 1, 2 and 3 to meet the requirements of year 2041 for 6.5 km and extending network to un covered areas by laying 12.54 km of distribution network within the city limit. Other proposals along with Tranche 1 include feeding OSHR at Netaji Nagar with dedicated feeder of 10".

43. Further to cater the future demand, in 2026, the town has to plan for an

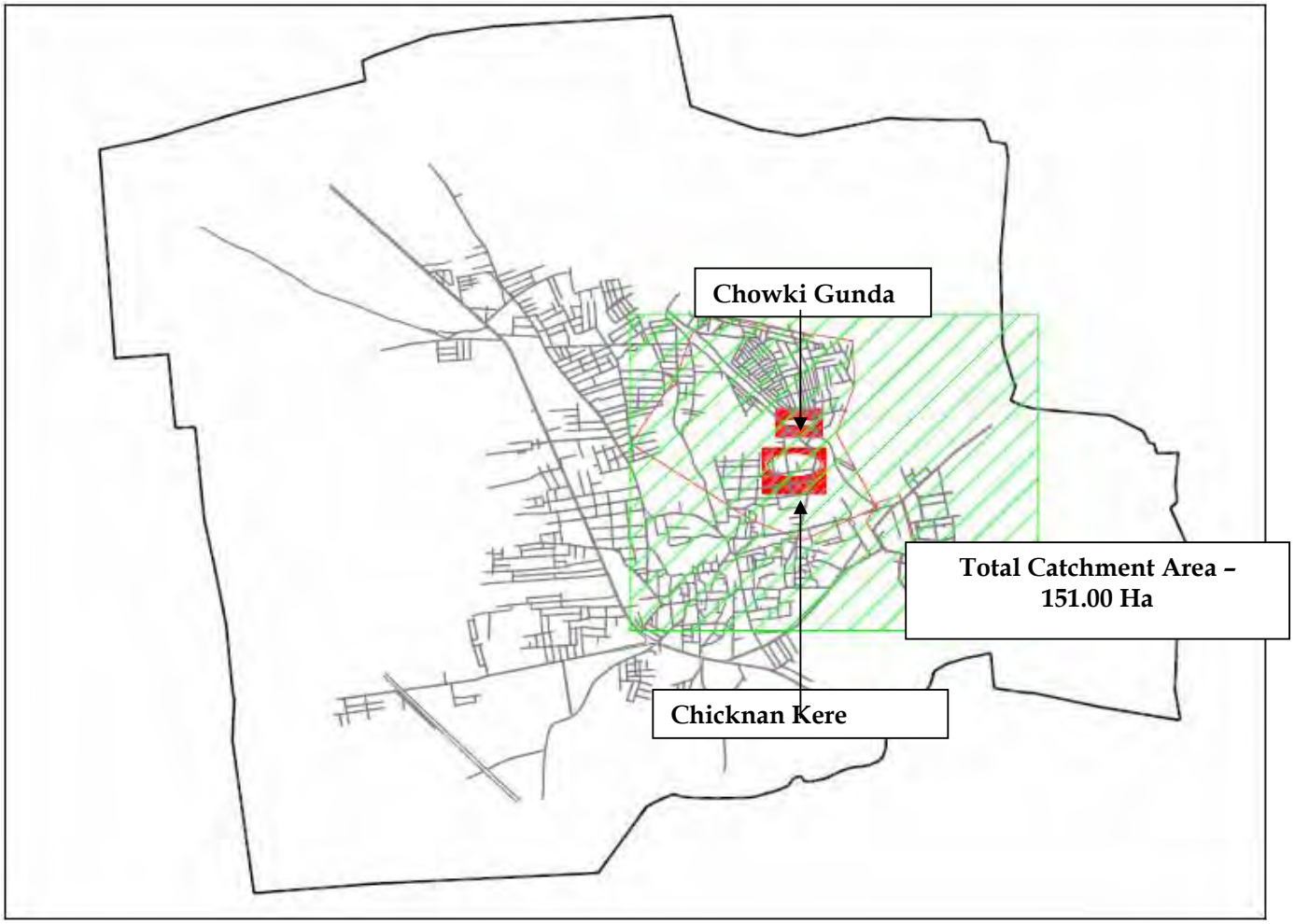
additional 3.5 MLD scheme using its own budgetary funds existing by augmenting the pumping and treatment capacity. The total network length also needs to be increased. This way the ultimate year requirement can be met.

Table 7. Proposed Water Supply Sub-components

No.	Component
Tranche I	
(i)	Extension of Distribution network for a length of 12.54 km
(ii)	Rehabilitation of existing distribution system for a length of 6.5 km
(iii)	Laying 300 / 400 DI pumping main for puming suplus water from River Varada to lake and further transfer of stored water to WTP and installing at Heggere Lake pump sets of 50 HP / VT (3 nos) along with providing flow meters.

3. Urban Drainage System

44. Under this component, it is proposed to provide secondary drains for the low-lying areas of Chicknan Kere and Chouki Gunda. These secondary drains will be connected to Dodda Halla, which is acting as the primary drain of the city near to the proposed STP site. The total length of the Drainage is of 1.377 km out of which 856 m is pucca drains made of concrete and the rest 521 m is earthen. The depth of the pucca drain varies from 1.6 – 1.65 m with width of 2.5 m. The kutcha drain depth varies from 0.98 – 2.02 m with width of 3.0 – 4.5 m. The proposed drainage will cover the catchment area of 151 ha as presented in **Map 5.**



Map 5. Drainage Proposal for Haveri CMC

4. Fire Fighting Infrastructure

45. Under the present program it is proposed to invest on upgradation of existing infrastructure for Haveri CMC. In Tranche 1 it is proposed to procure equipments for fire and emergency services and under Tranche 2 the fireman quarters will be constructed in Haveri CMC. The equipments planned to be procured through Tranche I and the total investment earmarked are presented in **Table 8.**

Table 8. Proposed Fire Fighting Improvements

Sl.No	Equipment	Specifications	Total Cost
1	Water Tender	1 No	2,500,000.00
2	AFT System	1 No	1,000,000.00
3	Portable pumps	1 No	215,000.00
4	Breathing Air Compressor	1 No	257,000.00
5	Foam Compound	3261 litres (Rs 50/litre)	163,050.00
	Total Cost		4,122,000.00

46. Under Tranche 1 , the procurement of equipments will enhance the potential of the fire services station to respond more effectively in case of emergencies and do not have any environmental impacts.

E. Investment Program Implementation Schedule

47. The Investment Program is to be implemented over an six-year period, commencing in FY 2009-10 and civil works construction starting in FY2009-10. Completion is scheduled by end FY 2015-16.

F. Investment Program Benefits

48. In view of the lack of basic infrastructure facilities and its adverse impacts on the environment and also on socio-economic characteristics, the proposed Investment Program aims at providing infrastructure facilities such as adequate and safe water supply and sanitation facilities, to overcome negative environmental impacts. Investment Program benefits and beneficiaries in the Haveri are provided below.

1. Sewerage System Improvements

49. Benefits arising from the provision of a well reticulated sewerage network and safe treatment and disposal of sewage comprise (i) reduced incidence of water-borne diseases and mosquito menace (ii) improvement in public health conditions with better sanitation; (iii) reduction in risks of ground water contamination; (iv) stoppage of sewage flow in open storm water drains and from stagnating sewage pools; (v) reduced risk of treated water supply

contamination; (vi) reduced health risk of agricultural laborers due to usage of raw sewage for irrigation; (vii) reduced risk of contamination of agricultural fields; and (viii) availability of treated effluent for agricultural purposes. Investment Program beneficiaries will be households getting new connections through proposed sewer lines under this Investment Program. Households who are getting new connections will gain from improved environmental sanitation conditions through properly functioning sewerage system. The proposed system will benefit for 82% of total households in the ultimate year, 2041. The growing peripheral area of city will be served with sewage network in the subsequent years and the complete system will be operational with capacity of 2041 demand for the city.

2. Water Supply System Improvements

50. Benefits arising from improved water supply comprise (i) reduced risk of water-borne diseases due to access to potable and adequate water supply; (ii) reduced ground water exploitation; and (iii) reduced time and costs in accessing alternative sources of water.Investment Program beneficiaries will comprise households with existing connections and households with new connections who previously obtained municipal water from standposts. Benefit of the project is presented in **Table 9**.

Table 9. Investment Program Benefits – Water Supply System Improvements

Pre investment scenario	
Total Network Length in km	63
Number of House Connections	6649
Population covered	39894
Population covered per m	0.6318
% coverage (base 2011 population)	59
Post investment Scenario	
Total network length after investment in km	75
Population covered per m	0.75
Additional connection expected in existing network due to improved reliability	1244
Extension of distribution proposed in km	11.5
Additional number of house connection	1200
Total new connections	2444
Total house connection after investment	9090
Total population covered	54540
% coverage (base 2011 population)	80

3. Urban Drainage System Improvements

51. Benefits arising from improvement in the drainage system comprise (i) reduction in blocked drains and canals and overflowing of culverts, thereby reducing adverse health impacts on residents in low-lying areas; and (ii) improvement in health and environmental conditions due to non-incidence of water stagnation and mosquito breeding; (iii) reduction in pollution risk of downstream water bodies; and (iv) direct benefits to households from avoided flood damage costs and work time lost.

G. Investment Program Alternatives

52. The environmental suitability of the proposed components are judged through the selected location and proposed process/technology during both the construction and operation phases. The interaction and the level of interference with the surrounding land use determine the environmental sustainability of the Investment Program components. However, the components proposed under NKUSIP are basic urban infrastructure services, most of which are location fixed providing scope for alternatives only in terms of technology, which again are limited. However, facilities such as sewage treatment plants offer variety of technologies. The following **Table 10** shows environmental suitability of the selected alternatives.

Table 10. Investment Program Alternatives

Sub-Component	Suitability of Selected Alternative
Sewerage System	The best alternative for the sewerage system is to design the system based on gravity flow. The proposed gravity system will be simple in operation and require less man power and importantly does not require energy. The natural gravity is utilized to run the system. There are various options to treat the wastewater to the standards of either river discharge or for land disposal after treatment. Options like Attached Growth Aerobic or Anaerobic Systems or Suspended Growth Systems may be adopted. The availability of land for establishing a treatment plant, the cost of treatment and its operation and maintenance are prime issues considered for selecting suitable treatment options. Availability of land provides reason to adopt treatment technologies with minimal operation and maintenance costs. Based on these considerations, Facultative Aerated Lagoons are proposed for Haveri. In Haveri, two alternative sites were selected for establishing the STP based on topographical considerations.

Sub-Component	Suitability of Selected Alternative
	Alternative 1: This site is located near Yattinahalli Village 4 km from the town. This site was found unsuitable considering that (i) the site is not easily accessible; (ii) the outfall sewer has to cross two streams to reach the STP, which may potentially pollute streams; and (iii) requires land acquisition for approach road and for laying of trunk sewer. **Alternative 2:** This site is located at Shidhadevapura Village 2 km from Haveri. This site was selected because (i) it is located ideally in the vicinity of the town, away from habitation; and (ii) has proper access and therefore ruling out any land acquisition for approach roads.
Storm Water Drainage	It is proposed to provide secondary drains for the two low laying areas of the city Chiknan Kere and Chowki Gunda through a gravity flow system.
Water Supply	The best alternative for water supply is to design the system based on gravity flow. However, due to topography and required pressure at the consumer end, the system is designed as partly gravity and partly pumping. As the existing system losses are on a higher side (25%), reducing the losses and improving the efficiency of the system is identified as an important component under NKUSIP.

III. DESCRIPTION OF THE ENVIRONMENT

A. Environmental Profile of Haveri

1. Physiography

53. Haveri is situated in the central part of Karnataka. Geographically, the town is located at $75^0$35'E longitude and $14^0$35'N latitude. The town is developing as an important trade centre in the district. It has good educational facilities. The town extends to an area of 26.19 sq. km and houses more than 55,000 population as per Census 2001.

54. The town is situated on a flat terrain, with predominant slope from north to southeast. The ground levels vary from the maximum of 570 m in the north to 555 m in the south. The predominant soils in this town are red and black cotton soil. The major commercial crops grown on these soils are Jowar, Red Chilly and Maize.

2. Seismology

55. As per the seismic zoning map of India, the Haveri town falls under the Zone II, which is the lowest earth quake risk zone in India. This zone is termed as "low damage risk zone".

3. Climatic Conditions

56. The town is characterised with hot summer months and low rainfalls during monsoon. The temperature varies between 42^0C during summer and 17^0C during winter. Generally, April and May are the hottest months while December to February is the coldest. The following **Table 11** shows the mean maximum and minimum temperature recorded in the region. As there was no meteorological observatory present at Haveri, the data presented here is of the observatory located at Gadag, around 50 km north of Haveri. This data is considered as representative data as both the towns are located in the same physiographical zone and also they are closely located.

Table 11. Mean Maximum and Mean Minimum Temperature (in ^{O}C)

Month	Long term normal (30 Years) – Mean				2004 (Actual) – Mean	
	Daily Max	Daily Min	Highest in a month	Lowest in a month	Max daily	Min Daily
Jan	30.2	16.6	32.5	13.9	31.0	16.1
Feb	33	18.7	35.6	15.2	33.0	18.3
Mar	36.1	21.1	38.1	17.9	37.2	21.4
April	37.3	22.5	39.4	19.9	37.8	22.3
May	36.1	22.3	39.6	19.7	34.0	22.4
June	31.0	21.6	35.8	20.0	30.0	21.3
July	28.4	21.1	31.6	20.0	29.6	20.8
Aug	28.6	20.8	31.8	19.7	28.5	20.4
Sep	29.8	20.5	33.3	18.8	29.4	20.5
Oct	30.6	20.5	33.4	18.3	30.6	19.9
Nov	29.8	18.4	32.0	15.0	30.4	18.3
Dec	29.1	16.4	31.4	13.6	29.8	14.6

Source: *Meteorological Centre, Bangalore*

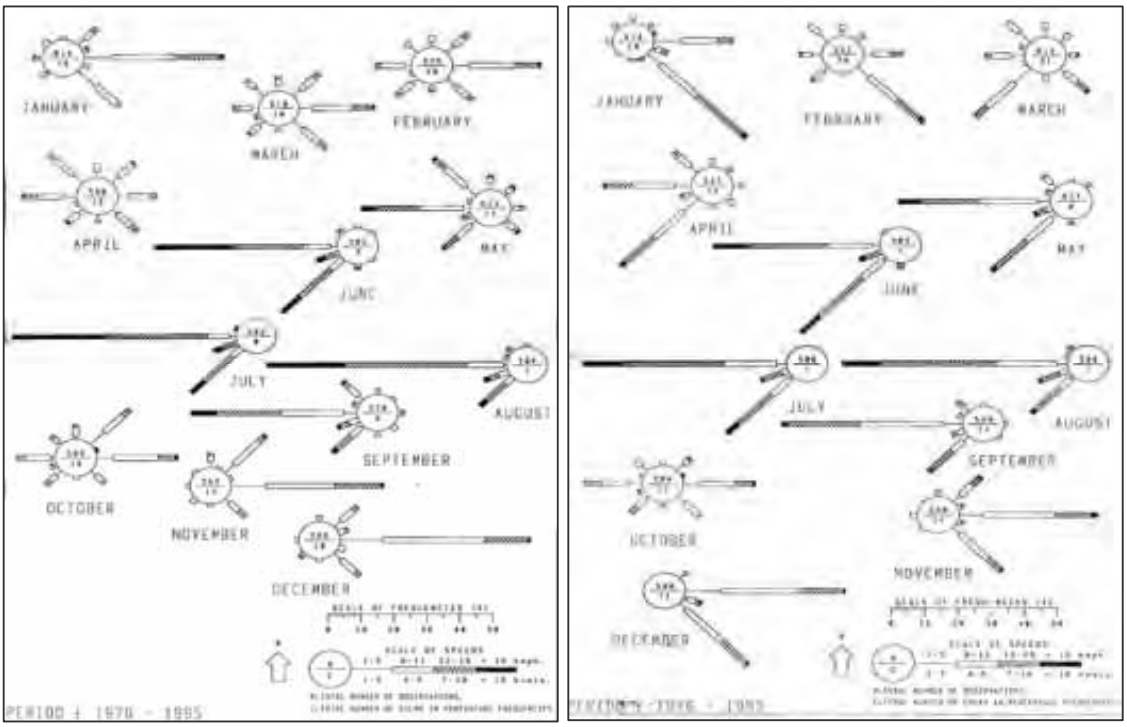
57. The town experiences southwest monsoon from June to September and the period between the months of October and November can be termed as post monsoon months. The town experiences scanty rainfall and the long term annual average rainfall is 696 mm. The rainfall is confined and about 60 percent of the annual rainfall is received during the months of June to September. The maximum rainfall is registered during the month of August. The morning relative humidity (RH) varies from 51 to 87 percent while evening RH varies from16 to 67 percent; and the RH is generally higher during the southwest monsoon.

58. The region is continuously experiencing below normal rainfall from the last few years. The actual rainfall recorded in the year 2002 was 490 mm as against the normal rainfall of 696 mm marking a departure of -30 percent while in 2004 the actual rainfall was 511 mm marking a departure from normal of -26 percent. The region experiences moderate winds; as shown in **Figure 1** the wind blows predominantly from west during May to September while during November and December predominant wind direction is from east. Most of the winds occur in the range of 12 – 19 kmph, however during the period of June to August winds of more than 19 kmph also occur. The following **Table 12** shows the climatological details.

Table 12. Climatological Characteristics of Haveri

Month	Long Term Avg. (30 Years) – Mean				2004 – Actual			
	RH Max	RH Min	Wind Speed	Total Rainfall	Mean RH 0830 Hrs	Mean RH 1730 Hrs	Wind speed	Total Rainfall
	%	%	*Kmph*	*Mm*	%	%	*kmph*	*mm*
Jan	68	41	7.1	2.6	71	36	8.7	0.0
Feb	61	35	7.1	1.1	51	25	9.3	0.0
Mar	62	32	7.7	5.3	55	16	10.1	Trace
April	70	37	9.6	43.4	65	25	10.2	17.6
May	78	45	13.4	85.8	75	51	14.2	105.4
June	84	66	18.1	83.9	83	63	16.5	59.8
July	88	75	18.8	72.4	87	67	14.0	72.8
Aug	88	73	17.2	81.5	87	67	15.4	52.4
Sep	87	69	12.8	134.3	86	65	9.2	166.2
Oct	82	60	7.6	130.1	80	51	10.3	37.1
Nov	73	51	6.9	34.5	67	38	11.9	Trace
Dec	72	48	7.3	7.7	62	29	9.6	0.0
Total / annual mean	76	53	11.1	695.6	72	44	11.6	511.3

Source: Meteorological Centre, Bangalore



***Source**: Meteorological Centre, IMD, Bangalore (1969 – 1987 at Gadag Observatory)*

Figure 1. Wind Rose Diagram of Haveri (0830 Hrs and 1730 Hrs)

4. Surface Water

59. Heggere Kere (lake) located in the southern side of the town is an important

surface water body. It is said that the lake was once the main source of water for the town. Dodda Halla (a stream) is the major natural stream flowing along the southern and southeastern boundary of the town. This stream carries overflows of Haggere kere and also carries runoff from surrounding areas.

60. The Dodda Halla runs dry for almost complete year except during for a short duration of monsoon. The stream at present carries wastewater from the Haveri town; this water is mainly used for irrigation purpose. Almost entire area in the town drains into the stream. This stream joins River Varada in the northeastern side of the town at about 12 km from the town. Given the low flow, extraction for the irrigation and also the dry weather condition of the town, the wastewater never meets the river. The proposed sewage treatment plant (STP) is located near this stream and the treated sewage is proposed to be disposed off into the stream.

5. Groundwater

61. Sizable population in Haveri depends on groundwater for the daily water needs. However, the main source of water supply for the town is from the Rivers, Varada and Tungabhadra, flowing considerably far from the town. In the unserved areas of the town, the population is dependent on groundwater sources. The groundwater table is the area is deep fluctuating between 30 m and 50 m below ground level.

Table 13. Groundwater Levels in Haveri (2002 – 2004)

Month	**Depth of Water Table (in m)**		
	2002	**2003**	**2004**
January	36.91	-	36.45
February	29.25	-	37.25
March	44.25	-	39.25
April	-	-	41.75
May	-	-	39.5
June	-	-	34.25
July	-	-	33.85
August	-	-	30.05
September	-	-	29.35
October	41.25	34.65	27.8
November	51.25	34	14.95
December	52.25	35.05	15.05

Source: *Department of Mines & Geology*

62. The following table shows the groundwater characteristics in the area. Some of the monitored parameters such as TDS, chlorine exceed desirable limits specified under Indian Standard (IS) 10500, but are under permissible limits. As presented in **Table 14**, the quality of water has improved from monsoon to post monsoon season. This is primarily because of high extractions during summer

when the water table is lowered considerably resulting into decline of water quality (refer Table above). Again, due to recharge of groundwater aquifers during monsoon, the water table and ground water quality has improved considerably. It may be noted that during this period the water table fluctuation was recorded as high as 19 m. It may be mentioned, therefore, that unsustainable levels of groundwater extractions are leading to decline in the water quality.

Table 14. Groundwater Quality – Haveri (2003)

Parameter	July 2003 (monsoon)	November 2003 (Post monsoon)
pH	8.39	8.39
Total Hardness	480	332
TDS	965	731
CO_3	10	19
HCO_3	78	191
Cl	389	232
SO_4	114.6	111
NO_3	72	11
Ca	96	64
Mg	60	43
Na	140	133
K	25	11
F	0	0.75
Fe	0.09	0.04

Source: *Department of Geology and Mines*
** all units are mg/l except pH*

6. Air Quality

63. As there are no major air pollution potential sources, the air quality of the town, in general, is within acceptable limits. Currently, no air quality monitoring stations are in operation within CMC limit.

7. Flora and Fauna

64. There are no forest areas within Haveri CMC and there are no sensitive environmental features such as National Parks, Wetlands, and Biospehre Reserves.

65. Ranebennur Taluka of Haveri district is notable for occurrence of good herds of Blackbucks. Wolves are also found but rare. Ranebennur Blackbuck sanctuary covers an area of about 119 sq. km. The natural vegetation in the sanctuary has been largely replaced by Eucalyptus plantations. Blackbuck (Antilope cervicapra), wolf (Canis lupus), jackal (C. aureus), porcupine and Indian hare (Lepus nigricollis) are the wild fauna species found here. Haveri district houses peacock sanctuary at Bankapura situated at 22 km away from Haveri Town spreading to 139 acres is the one among the two peacock sanctuaries in India.

Both sanctuaries are located far away from Haveri town and there is no interference of the proposed Investment Program components. No endangered/protected species of either flora or fauna are found in the town and their surroundings.

8. Socio Economic Characteristics

66. ***Demography:*** Haveri has witnessed a gradual increase in the urban population. The population had increased from 45,295 in 1991 to 55,900 in 2001 indicating a decadal growth rate of 23.41 percent. Extending to a total area of 26.19 sq. Km inhabiting 55,900 population, the gross density of the town is 2,134 persons per sq. km. The central part of the town is thickly populated where 3 wards are having population density more than 6000.

67. ***Sex Ratio:*** The sex ratio (2001) in Haveri was 956, which is higher than the district and the state urban average of 945 and 940 respectively. The town has higher and literacy rate in comparison with the district and as well the state of Karnataka. The respective figure in 2001, for Haveri was 80% and that of district and State urban was75% and 71.4 %.

68. ***Economic Base:*** Due to its connectivity and vast agricultural hinterland, the town of Haveri is becoming an important trading centre for agricultural based products in the district. Haveri has Agriculture Producers Market Committee (APMC) yard that caters to the surrounding towns and villages, and mainly deals with cottonseeds, groundnut, cardamom and other products. Haveri is administrative centre of the region. Haveri is also an important religious centre and houses number of mutts.

69. ***Poverty:*** Slum households constitute 11 percent of the total households in the town. Slums occupy 39.8 Ha of area, which is around 1.5 percent of the total CMC area.

9. Cultural and Historic Places

70. The town of Haveri is a historic place in the region. Siddeswara temple, situated in the town is an ancient and famous monument and an important place of worship. Here, one can witness the art of Dravida and Chalukya styles on the walls and columns of the temple. The temple is a protected monument by Archeological Survey of India (ASI). In addition, there are many important places like Kagindi, Kanakapheeta, Adikeshava Temples are situated in the town.

71. In the recent times the Haveri has become an important religious place in the region. The town is famous for Mutts; few famous mutts of Karnataka State, namely, Hukkeri Mutt, Hosakeri Mutt, Muragham Mutt, Sindhagi Mutt, and

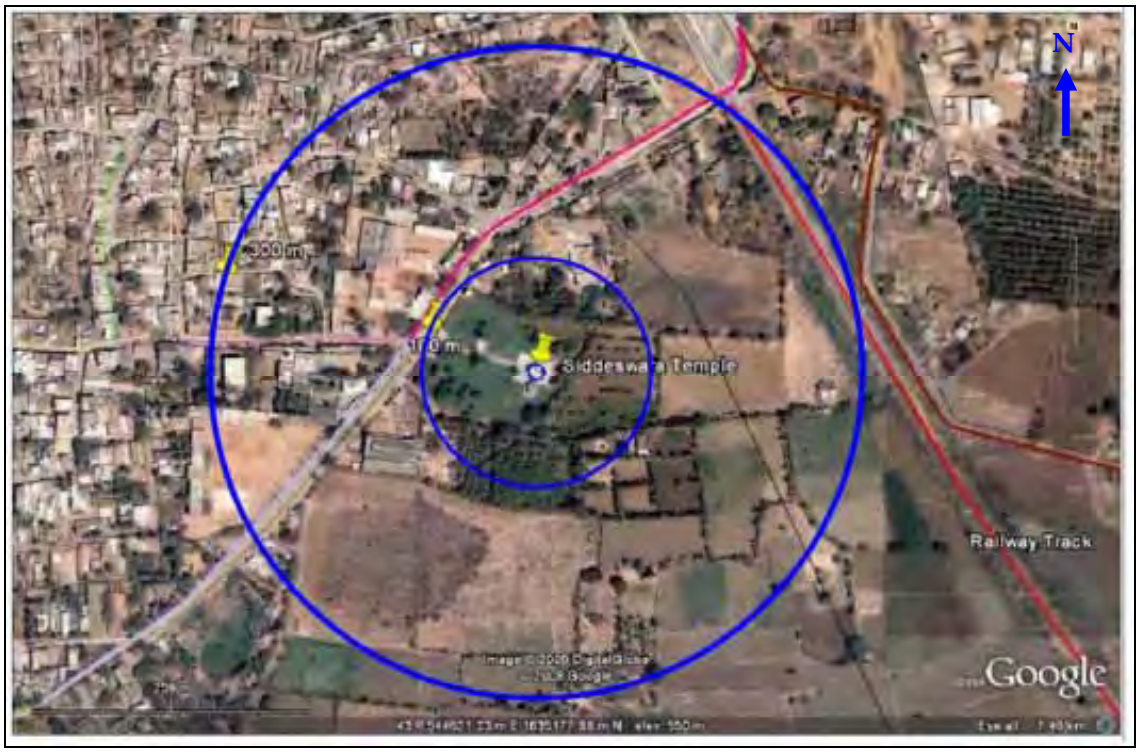
Raghavendra Swami Mutt are situated here.

B. Environmental Settings of Investment Program Component Sites

1. Sewerage

72. ***Sewer Lines:*** Sewer lines are proposed along the roads of densely built up areas of Haveri City. The city limit is well developed and there are no environmental hotspots along the proposed areas.

73. Siddeswara Temple located along SH 2 towards Guttal within Haveri CMC is a protected monument by ASI. According to Ancient Monuments and Archeological Sites and Remains Act, 1958, area within the radii of 100 m and 300 m from the "protected property" are designated as "prohibited area" and "regulated area" respectively. Construction of building, mining and excavation are not permitted in "prohibited area" and these activities in "regulated area" need prior permission of the Archaeological Survey of India. **Map 6** shows the prohibited and regulated area around Siddeswara Temple within Haveri CMC.



Map 6. ASI Prohibited and Regulated Areas With Respect to Siddeswara Temple

74. Due care has been given in the design stage to avoid laying of sewer line within the prohibited area by suggesting sewer line on the opposite side of SH 2 such that the activities does not fall within prohibited area. Further, according to Ancient Monuments and Archeological Sites and Remains Rules, 1959, sewer lining is not a restricted activity in regulated area. Hence the project does not

require consent from ASI.

75. ***STP Site:*** The location of the sewage treatment plant is selected based on the topography to provide for gravity flow till the disposal point. The town predominantly slopes towards south and south eastern side and therefore the STP site selected in the southeastern side of the town. Two alternative sites were selected for STP on topographical considerations. Site 1, located near the Yattinahalli village at about 4 km from the town was rejected considering that (i) the site is not easily accessible; (ii) the trunk sewer has to cross two streams to reach the plant; and (iii) requires land acquisition for approach road and for laying of trunk sewer. The Site 2, which is finally selected for STP, has accessibility and ideally located at about 2 km from the town and away from habitation areas. The STP location is shown in **Map 7.**

Map 7. Proposed STP Site and Surrounding

i) The peak flow for ulimate year is estimated to be 9.43 MLD. It has been estimated that the land requirement per MLD of the sewage to be treated with Facultative Aerated Lagoon is 0.84 acre. So the total land requirement for the STP Site for the peak flow of 9.43 MLD for the ultimate year, shall be 9.43 x 0.84 acre.

ii) Approximately 19 acres of land is available with the Ministry of Health, which has been handed over to the ULB for the purpose of establishing STP in this location.

iii) Topography of the site is predominantly flat. The soil of the site is characterised by clayey soil.

iv) The depth of groundwater table is deep at around 40 to 50m below ground level.

v) There is no development in the vicinity. Sparse development can be observed at around 1.0 km from the site.

vi) Site is surrounded by agricultural fields. Due to non-availability of irrigation facilities only rain fed crops are cultivated here. Cotton and pulses are the main crops cultivated in the area. No groundwater extraction points such as bore wells are located with in the vicinity.

vii) The site has proper access; a road passes adjacent to the site. A small seasonal stream, Dodda Halla which is presently draining the waste water from the town boundaries western side of proposed STP site. The stream runs dry for the entire year except for two to three months during the monsoon. This stream joins River Varada approximately at 16.02 km north of proposed STP site. As the stream runs through agricultural fields where farmers are utilizing the waste water for irrigation purpose, the water does not reach the river in down stream. In the present proposal, the treated effluent from STP is proposed to be discharged in to this stream.

2. Water Supply

76. Improvement at intake point of River Varada, developing Heggere Kere as an impounding reservoir, laying pipe line from River Varada to New WTP and Heggere Kere along with enhancement of distribution network in the CMC are the proposals made under NKUSIP.

77. ***Improvement at Intake Point of River Varada:*** The existing intake point in River Varada will be rehabilitated as the intake point during monsoon to store water in Heggere Kere to cater city's summer demand. There are no environmental sensitive issues along the intake point or neighboring.

78. ***Developing Heggere Kere as an impounding Reservoir:*** The lake is sufficient enough to store 1400 ML water but has to be developed as a fresh water reservoir. There are no significant environmental sensitive features along the proposed area.

79. ***New Pipe Lining from River Varada to New WTP / Heggere Kere:*** This will involve lying of pipeline for 11 km length. Landuse along major part of the alignment is agricultural.

3. Urban Drainage

80. Under Drainage component, two secondary drain links are proposed to serve the low-laying areas of Chicknan Kere area and Chouki Gunda. These secondary drains will be constructed to dispose the storm water from these low-lying areas by providing links with Dodda Halla - primary drain of Haveri town. The proposed drain will be constructed partially along the roads of residential areas and further extends through agricultural fields to reach primary drain. There are no sensitive environmental features along its length.

V. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

81. Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

82. Screening of potential environmental impacts is categorized into four categories considering Investment Program phases: location impacts and design impacts (pre construction phase), construction phase impacts and operations and maintenance phase impacts.

i) ***Location impacts*** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.

ii) ***Design impacts*** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.

iii) ***Construction impacts*** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

iv) ***O&M impacts*** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

83. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent). The following table shows the screening of impacts; N/T represents the lowest impact while S/P represents the highest impact. Numerator represents the Degree of Impact and denominator represents the Duration of impact.

84. In case of sewerage components, no significant impacts are anticipated since the laying of sewer line will be along the already built up area. STP location has

been selected sufficiently away from the habitation and along with provision for development of a buffer zone along the site boundary which is not expected to have any impact on existing environment or surroundings. In the proposed water supply scheme laying of new raw water pipe line has been suggested from River Varada to Heggere Kere. The proposed pipeline is not passing through any environmentally sensitive areas.

Table 15. Screening of Impacts

Duration of Impact	Magnitude (Degree of Impact)		
	Negligible(N)	*Moderate(M)*	*Severe(S)*
Temporary(T)	N/T	M/T	S/T
Permanent (P)	N/P	M/P	S/P

85. The following tables provide the potential environmental impacts and mitigation measures of all components proposed under NKUSIP in Haveri.

Table 16. Environmental Impacts and Mitigation Measures of Sewerage System

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
Location impacts				
Contamination of groundwater resources due to leaching of waste stabilization ponds.	**N/P** This may not be significant as the groundwater table is deep at around 40 to 50 ft	N/a.	N/a	N/a
Loss of amenity and odor nuisance to neighbors.	**M/P** Newly developing residential areas are located at 1000 m. Future expansion of town may be considered	Development of physical separation and visual screen around the facility will address this impact. A buffer zone in the form of landscaping and earthwork shall be created around the STP.	CMC Haveri	Part of Design costs
Design Impacts				
Discharge of partially treated sewage will have potential to pollute the agricultural fields.	**N/P** The treated sewage may be used for irrigation. However, this may not be significant as treatment will be designed to	The sewage retention period shall be fixed considering seasonal climatic variations. The effluent from the STP shall be confirmed to the following standards of discharge for inland surface water disposal:	CMC Haveri	Part of Design costs

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
	meet inland surface water discharge standards which is stringer than irrigation standards.	• BOD < 30 mg/l • Suspended solids < 100 mg/l		
Nuisance due to leakage / overflowing of sewers.	**N/P**	Regular maintenance will nullify the impact. Usage of appropriate maintenance equipment would substantially reduce the maintenance time.	CMC Haveri	Part of Design costs
Nuisance due to mosquito breeding and bad odours from STP.	**M/P** Newly developing residential areas are located at 1000 m. Considering the future expansion of the town, mitigation measure may be required.	Development of physical separation and visual screen around the facility will also address this impact. A buffer zone in the form of landscaping and earthwork shall be created around the STP. To avoid/reduce mosquito breeding, the banks of ponds shall be kept clear of grasses bushes, etc.	CMC Haveri	Part of Design costs
Pollution due to improper sludge disposal methods. Sludge removal from the ponds may be done once for every 2 or 3 years, depending on the sludge generation.	**M/P** Quantity of sludge generation will not be considerable. Contaminated work area may cause health hazards.	Safe sludge handling methods shall be employed. Personal protection equipment such as gloves, boots, shall be provided to the workers. Sludge shall be dried in drying beds before its disposal in low-lying areas. A sludge management plan shall be prepared.	CMC Haveri	Part of O & M costs Preparation of sludge management plan (consultant time: one person week)
Construction Impacts				
Inconvenience to access business, residential and other immediate facilities	**M/T** The access for business and	During construction period, planks / makeshift pathways should be provided	Head Contractor	Part of construction cost.

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
for the public and impact on livelihood die to loss of access to business.	other facilities along the proposed sewer laning areas will be disturbed during construction period.	along the construction areas for the public to access their requirements for residential, shopping and other facilities.		
Inconvenience to public during sewer laying along thick commercial areas and narrow streets; where public facilities are located.	**M/T** Reduced pedestrian and vehicle access to residences and businesses	Construction should be expedited in the least time frame. Activities requiring maximum access control should be done during non peak hours. Excavation along the road should be done in such a way that entire stretch will not be trenched at a time. Traffic management with diversion through alternate routes will be implemented by providing adequate sign boards.	Head Contractor Haveri CMC	
Nuisance due to dust and noise; road blocking due to laying of sewer network; and, increased traffic flow due to vehicle movement for construction activities.	**M/T** Dust generation may be significant as the dry weather condition prevails in the town.	Construction material shall be stockpiled to minimize traffic blockages. In case of excavations for sewer lines in busy streets such as central areas of the town (market area, old town area), adequate arrangements for traffic diversion including prior intimation and by erecting proper sign board shall be provided. Considering the	Head Contractor PMU, Haveri CMC	Part of construction costs

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
		market and dense residential areas in the core town area, preparation of construction site management plan is necessary. Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues.		
Dust and noise from construction of STP and lying/rehabilitation of sewer network activities.	**M/T** Sewer network will be laid all over the town including high density areas. As the proposed STP is located away the habitation, as far as laying of sewer network is considered, the dust and noise nuisance may be considerable in the core town area and in all other areas it may be negligible.	Construction material shall be stockpiled. Adequate arrangements for traffic diversions including erection of proper sign boards. Dust generation must be arrested by water spraying. Ensure usage of standard equipment to reduce the noise nuisance. Equipment shall comply with the noise levels of construction equipment laid out by the CPCB. High noise generating activities including material unloading shall be avoided during nights. The surrounding people shall be informed, especially in densely populated area, of nature and schedule of the high noise generating activities,	Head Contractor/CMC Haveri	Part of construction cost

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
		if any A construction site management plan shall be prepared. Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues.		
Improper disposal of Bituminous waste	**M/P**	Bituminous waste top be disposed in approved waste disposal sites.	Head Contractor	Part of construction costs
Improper handling of excess soil	**N/T**	Excess soil shall be disposed in low laying areas other than water bodies	Head Contractor/CMC	Part of Construction Cost. .
O & M Impacts				
Mixing of Industrial Waste water with sewage	**M/P** Treatment process in the down stream will be significantly affected Health risk to the sewer workers due to toxic effluent and gases	The rules and regulation will be strictly implemented to avoid mixing of industrial waste stream with sewage.	KSPCB and CMC Haveri	Part of O&M Cost
Odour nuisance due to STP This impact may be considered as negligible due to location of plant site and proposed buffer provision	**M/P** Newly developing residential areas are located at 1000 m. Future expansion of town may be considered	Buffer zone in the form of landscaping and earthwork shall be created and well maintained around the site.	CMC Haveri	Part of O & M costs

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
Potential pollution of stream/agricultural fields due to inadequate treatment.	**N/P** As the STP is designed for stream discharge standards, the impact may be minimal. However, overloading of STP may exaggerate these problems.	Ensure the following effluent discharge standards for stream discharge: • BOD < 30 mg/l - • Suspended solids < 100 mg/l	CMC Haveri	N/a.
Pollution and health hazards due to improper sludge disposal methods	**M/P** Quantity of sludge generation will not be considerable. Contaminated work area may cause health hazards.	Safe sludge handling methods shall be employed - Personal protection equipment such as gloves, boots, shall be provided. Sludge shall be dried in drying beds before its disposal. This sludge may be used as manure for non-food crops or land filled. Sludge Management Plan shall be implemented.	CMC Haveri	Part of O & M costs
Nuisance due to overflowing/chokin g of sewers.	**N/P** No major water bodies and ground water is very deep. However nuisance may be considered.	Implement the mitigation measures suggested in the design stage to avoid chocking. Sewer cleaning equipments have been provided	CMC Haveri.	Part of Construction Cost.

Table 17. Environmental Impacts and Mitigation Measures of Water Supply Rehabilitation

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
Location impacts				
Since the location of rehabilitation works will be at existing facilities, and the existing environment is not a sensitive environment, no location-specific impacts are envisaged.	N/a.	N/a.	N/a.	N/a.
Design Impact				
Since the location of rehabilitation works will be at existing facilities, and the existing environment is a built environment, no design-specific impacts are envisaged.	N/a.	N/a.	N/a.	N/a.
Construction Impacts				
Inconvenience to access business, residential and other immediate facilities for the public and impact on livelihood die to loss of access to business.	**M/T** The access for business and other facilities along the proposed pipe laying areas will be disturbed during construction period.	During construction period, planks / makeshift pathways should be provided along the construction areas for the public to access their requirements for residential, shopping and other facilities.	Head Contractor	Part of construction cost.
Inconvenience to public during pipe laying along thick commercial areas and narrow streets; where public facilities are located.	**M/T** Reduced pedestrian and vehicle access to residences and businesses	Construction should be expedited in the least time frame. Activities requiring maximum access control should be done during non peak hours. Excavation along the road should be done in such a way that entire stretch will not	Head Contractor	

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
		be trenched at a time. Traffic management with diversion through alternate routes will be implemented by providing adequate sign boards.	Haveri CMC	
Road blocking due to laying of water supply network and increased traffic flow due to vehicle movement for construction activities; inconvenience to the local community.	**N/T** The proposed network will be laid in the presently unserved fringe and extension areas. As these areas are not densely populated areas the impacts due to construction activities may not be significant. Traffic Management Plan for the construction phase has to be prepared for rerouting and avoiding slow movement of vehicles.	Construction material shall be stockpiled to minimize traffic blockages. Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues.	Head Contractor/CMC	Part of construction costs
Dust and noise from construction activities.	**M/T** Due to dry climatic condition the dust generation may be considerable. No major noise generating activities such as rock blasting and use of heavy noise generating equipment is not envisaged.	The practices such as spraying of water to arrest dust shall be employed. All equipments used in construction activities shall comply to CPCB noise emission norms.	Head Contractor/CMC	Part of Construction Cost. .
Improper disposal of Bituminous waste	**M/P**	Bituminous waste top be disposed in approved waste	Head Contractor	Part of construction costs

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
		disposal sites.		
Improper handling of excess soil	**N/T**	Excess soil shall be disposed in low laying areas other than water bodies	Head Contractor/CMC	Part of Construction Cost. .
Operation Impacts				
Recurrence of blockage and leakage problems.	**M/T** The existing system losses are around 25 %.	The leak detection and water auditing surveys shall be conducted. The leak restoration time shall be minimized.	CMC Haveri	Part of O & M Costs

Table 18. Environmental Impacts and Mitigation Measures of Drainage Upgradation

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
Location Impacts				
No location impacts are envisaged as the scale of activity is minimal	N/a.	N/a.	N/a.	N/a.
Design Impacts				
No loss or encroachment of cultural or historical properties is envisaged. No impacts are envisaged.	N/a.	N/a.	N/a.	N/a.
Construction Impacts				
Improper disposal of Bituminous waste	**M/P**	Bituminous waste top be disposed in approved waste disposal sites.	Head Contractor	Part of construction costs
Improper handling of excess soil	**N/T**	Excess soil shall be disposed in low laying areas other than water bodies	Head Contractor/CMC	Part of Construction Cost.
Disturbance to traffic due to storage of construction material/waste and material transport vehicles and other equipment.	**N/T** This impact may be insignificant as the scale of activity is small.	Construction activities will be planned to have least impact on traffic during material storage. Proper traffic management	Head Contractor, Haveri CMC	Part of Construction costs

Impact Description	Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
		plan has to be prepared prior to starting of construction activities.		
Operation Impacts				
Silting and pollution of water bodies due to non-clearance of construction work site.	**N/T**	Site clearance shall be ensured before termination of work.	Head Contractor/CMC	Part of Construction costs

V. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

A. Institutional Requirements

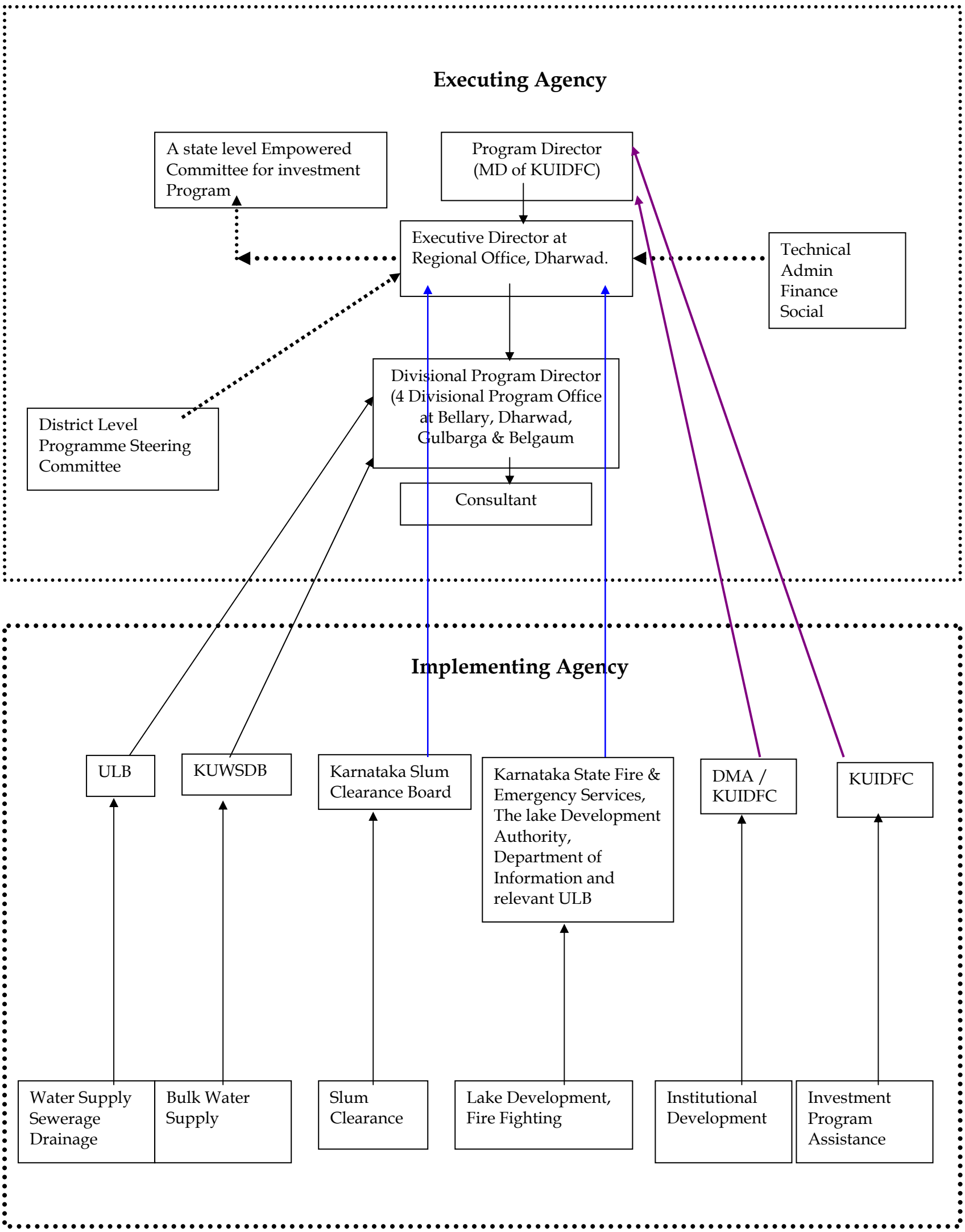
86. ***Nodal Executing Agency (EA):*** Karnataka Urban Infrastructure Development & Finance Corporation (KUIDFC) is the nodal executing agency (EA) responsible for implementing NKUSIP. Investment Program implementation activities will be monitored by KUIDFC through a separate Investment Program Management Unit (PMU), which will be set-up within KUIDFC. The Managing Director/KUIDFC will head the PMU and will be assisted by an Executive Director at the Regional office of KUIDFC at Dharwad to oversee the Investment Program progress. A team of senior technical, administrative and financial officials will assist the Executive Director in controlling and monitoring Investment Program implementation activities. The Executive Director at Regional Offices are Supported By Divisional Program Offices headed by Divisional Program Director, located at 4 geographical Regions; Gulbarga, Bellary, Dharwad and Belgaum. The consultant team will be under the Divisional Programme Director and will be involved in project planning, preparation of subproject and cost estimates, co ordination, technical guidance ans supervision, financial control, training and overall subproject management. All Investment Program decisions will be made by the Executive Director who shall operate from the PMU, Dharwad; only interactions with GoK, GoI and ADB shall be conducted through the KUIDFC office at Bangalore.

87. A **state level Empowered Committee** for investment Program with representatives from GoK and PMU of KUIDFC has been constituted and Executive Director from Dharwad will be reporting to this committee as and when needed. The committee members include Additional Chief Secretary (Committee Chair), MD of KUIDFC (Committee Secretary), Principal Secretary of the Urban Development Department, Principal Secretary of Planning Department, Secretary for municipalities and urban development authorities of Urban Development Department, secretary for expenditure of the finance department and director of Directorate of Municipal Administration.

88. ***Implementing Agency (IA):*** The ultimate implementation responsibility lies with ULB in co ordination with various other Departments of GoK. The programme component A, B, E will be implemented by ULB reporting to Divisional Program Director. Under the component B, for bulk water supply,

Karnataka urban Water Supply and Drainage Board (KUWSDB) will be acting on behalf of ULB reporting to Divisional Program Director. Slum upgradation will be done through Karnataka Slum Clearance Board reporting to Executive Programme Director. Component D will be implemented through co ordination of Karnataka State Fire & Emergency Services, The lake Development Authority, Department of Information and relevant ULB reporting to Executive Programme Director. Component F will be implemented through DMA and or KUIDFC reporting to Programme Director and Component G through KUIDFC reporting to Programme Director.

89. Other than the above institutional setup, District Level Programme Steering Committee will be set up in each district to monitor implementation of subprojects and institutional reforms. The District Level Programme Steering Committee shall consist of Deputy Commissioner of District, Divisional Program Director from concerned divisional office, Municipal Commissioners' / Chief Officers of Investment programme ULB and President / Chair of investment programme ULB. The District Level Programme Steering Committee will be reporting to Executive Programme Director. The organization hierarchy is as presented in **Figure 2.**



Component A - Sanitation (Sewerage & Drainage)
Component B – Water Supply
Component C – Slum Improvement
Component D – Non Municipal Infrastructure
Component E - Urban Transportation
Component F – Institutional Development
Component G - Investment Program Assistance

Figure 2. NKUSIP Implementing Organisation Hierarchy

90. Implementation Agencies (IA) will oversee sub-project component implementation at the sub-project towns, where the Investment Program ULB will implement sub-project components. The responsibilities of the IA shall include (i) carrying out detailed surveys, investigations and engineering designs of individual infrastructure components; (ii) tendering, evaluating bids and awarding works, contract administration, supervision and quality control; (iii) measuring works carried out by the contractors and certifying payments; (iv) conducting public awareness campaigns and participation programs, (v) carrying out environmental assessments; (vi) obtaining all statutory environmental and other clearances as applicable for each sub-project; and (vii) preparing monthly reports. The Investment Program Consultants (PC) will assist the Investment Program ULB in all the aforesaid activities; in the case of other IAs, the PC shall proof check designs and quality check construction quality.

91. Thus, the responsibility fulfilling environmental requirements of GoI/GoK and conducting required level of environmental assessment as per ADB guidelines lies with the borrowing ULB. The Investment Program Consultants will assist the ULB in this regard. The IEE/EIA reports prepared by ULB will be reviewed by the PMU as per the ADB's Environmental Guidelines and forwarded to ADB for review and approval. In case of IEE reports, the ADB could delegate approval of IEE reports fully to the PMU after reviewing the first two reports. However, all the EIA reports shall be sent to ADB for approval.

92. The mitigation measures identified through IEE/EIA are incorporated into the Investment Program cycle. Mitigation measures, which are implemented by the Contractor, shall form part of the Contract Documents. The other mitigation measures are undertaken by the ULB (itself or in assistance with Investment Program Consultants) as specified in the IEE.

Table 19. Institutional Roles and Responsibilities

Investment Program Phase	**Activity**	**Details**	**Responsible Agency**
Pre construction phase	Investment Program Categorization	Conduct Rapid Environmental Assessment (REA) for each sub-components using REA checklists	ULB
		Reviewing the REA and assigning Investment Program category (Ea/Eb/Ec) based on NKUSIP Environmental Assessment Guidelines and ADB Guidelines	PMU
	Conducting EA	Conducting IEE/EIA based on the Investment Program categorization Conducting Public Consultation and information disclosure Preparation of SIEE/SEIA	Investment Program Consultants
	Investment Program clearances	Fulfilling GoK/GoI requirement such as clearances from other Government Agencies	ULB
	Review of EIA/IEE	Reviewing the EIA/IEE and SEIA/SIEE Reports to ensure compliance of the report as per ADB Guidelines and approval of the same	PMU
	Disclosure of SEIA/SIEE	Information disclosure -SIEE/SEIA reports should be made available to the public, and on request IEE/EIA also made available.	ULB
	Incorporation of mitigation measures into Investment Program design	Incorporation of necessary mitigation measures identified in IEE/EIA in Investment Program design and in contract documents.	Investment Program Consultants
	Review of design documents	Review of design and contractual documents for compliance of mitigation measures	PMU
Construction Phase	Implementation of mitigation measures	Implementation of necessary mitigation measures	Contractor
	Monitoring	Environmental monitoring as specified in monitoring plan during construction stage; monitoring of implementation of mitigation measures	Investment Program Consultants
	Preparation of progress reports	Preparation of monthly progress reports to be submitted to PMU including a section on implementation of the mitigation measures	ULB in assistance of

Investment Program Phase	**Activity**	**Details**	**Responsible Agency**
			PC
	Review of progress reports	PMU to review the progress reports, consolidate and send to ADB review	PMU
Operation Stage	Environmental Monitoring	Conducting environmental monitoring, as specified in the environmental monitoring plan.	ULB
	Compliance Monitoring	Compliance monitoring to review the environmental performance of sub-project component, if required and as specified in Monitoring Plan	KSPCB

B. Training Needs

93. As described in the above table the PMU will involve in monitoring the Investment Program implementation while the ULB will implement the Investment Program. It is therefore important that these agencies and particularly the officials involved in the Investment Program to have understanding of the ADB's environmental assessment procedures and also of environmental issues of various urban infrastructure components. As far as implementation of mitigation measures on site is concerned the Contractor will be involved. Hence, it is important to orient the contractors and supervisory staff towards the implementation of mitigation measures and their consequences. Hence, considering the existing capabilities of the agencies involved in NKUSIP, the following training program is suggested. The following table presents the suggested training program.

Table 20. Training Needs (2008 – 2016)

Description	Contents	Schedule	Participants
Program 1 Orientation Program / Workshop for and Implementing Agency and Executing Agency	**Module 1 – Orientation** • Investment Program Cycle of NKUSIP • ADBs Environmental Assessment Guidelines • EA requirements of NKUSIP • Indian Environmental Laws & Regulations relating to urban infrastructure Investment Program • Environmental impacts of urban infrastructure Investment Programs **Module 2 Environmental Assessment Process** • Investment Program categorization as per ADB • IEE/EIA process, Formats and Reports • Identification of Environmental Impacts • Identification Mitigation Measures • Formulation of Environmental Management Plan • Implementation and	2 days	• PMU officials involved in the Investment Program • ULB officials involved in Investment Program implementation

Description	Contents	Schedule	Participants
	Monitoring • Summary EIA/IEEs • Review of EIA/IEE reports to comply with ADB requirements • Incorporation of mitigating measures in the Investment Program design and contracts		
Program - 2 Orientation Program / Workshop for Contractors and Supervisory staff	**Module 1 Implementation of Mitigation Measures** • Environmental issues related urban infrastructure Investment Programs during construction • Implementation of mitigation measures • Monitoring of implementation	1 day	• Contractors involved in NKUSIP • Supervisory staff of ULB
Program - 3 Experience Sharing	**Module – Experiences and Best Practices** • Experiences on implementation in terms of environmental concerns of implemented Investment Programs • Best Practices followed	1 day (every alternative year from the start of Investment Program, i.e. 2008)	• PMU officials • ULB officials • Local NGOs

C. Environmental Monitoring Plans

94. The following tables indicate the recommended environmental monitoring programs for sub-project components in Haveri. The monitoring program has been developed based on the impacts identified on various environmental parameters in the earlier section.

Table 21. Environmental Monitoring Plan for Sewerage System

Mitigation Measures	Parameters to be Monitored	Location	Measurement	Frequency	Responsibility	Preliminary Costing
Preconstruction Stage						
All location and design related mitigation measures. The measures are to mitigate the following through appropriate design of process and layout. (i)loss of amenity and nuisance (ii) sludge disposal	Incorporation of mitigation measures in the design including air dispersion modeling for STP site.	N/a.	Verification of Investment Program design documentation	One-off inspection of designs	PMU	N/a. Design checking
Construction Stage						
All construction related mitigation measures: construction site management plan to control the dust and noise nuisance, road blocks and provide access to businesses while pipe laying	Incorporation of mitigation measures in the contract documents	N/a.	Verification of Contract Documents before signing the contract	One-off inspection of Contract Document	PMU	N/a. Design checking
Implementation of construction site management plan: (i) noise and dust nuisance at site, (ii) traffic maintenance	Dust and noise nuisance and disturbance to traffic	at the sewer laying sites and surroundings	Monitoring of air quality and noise is not required. Ensure the implementation of mitigation measures (usage of standard equipment complying with CPCB Noise Standards for Construction Equipments); assess the situation through visual inspection and interviews with local people	Weekly	CMC Haveri with the assistance of Investment Program Consultants	Part of consultancy cost

Mitigation Measures	Parameters to be Monitored	Location	Measurement	Frequency	Responsibility	Preliminary Costing
Operation Stage						
Check for contamination of groundwater/ agricultural fields due to discharge of untreated/partially treated STP effluent.	Influent wastewater quality	Inlet of STP	Analyze the wastewater characteristics including heavy metals such as Mercury (As Hg), Lead (as Pb) Cadmium (as Cd), Total chromium (as Cr), Copper (as Cu), Zinc (as Zn) and Nickel (as Ni)	Monthly as part of plant operation	CMC Haveri	Sampling and laboratory test costs: Rs.5000 per sample
	Treated wastewater quality at outlet discharge point of STP	Outlet of STP	Analyze the characteristics to comply with the PCB disposal standards. These include: • BOD < 30 mg/l • pH – 5.5 – 9.0 • SS < 100 mg/l	Monthly as part of plant operation Seasonal (four seasons) as third party monitoring.	CMC Haveri KSPCB	N/a. Routine Operation Sampling and laboratory test costs: Rs.5000 per sample (Rs.20000 per year)
Implementation of the Sludge Management Plan - Check for health hazards due to sludge handling.	Health status of STP staff	N/a	Health check up for STP staff	Yearly once	CMC Haveri	Rs.5000 per person/year

Table 22. Environmental Monitoring Plan for Water Supply Rehabilitation

Mitigation Measures	Parameters to be Monitored	Location	Measurement	Frequency	Responsibility	Preliminary Costing
Pre Construction Stage						
Check for construction related impacts	Incorporation of mitigation measures into the contract documents.	N/a.	Verification of contract documents	One-off inspection before signing of the contract	PMU	PMU staff time as required
Construction Stage.						
All construction related mitigation measures: construction site management plan to control the dust and noise nuisance, road blocks and provide access to businesses while pipe laying	Incorporation of mitigation measures in the contract documents	N/a.	Verification of Contract Documents before signing the contract	One-off inspection of Contract Document	PMU	N/a. Design checking
Implementation of construction site management plan: (i) noise and dust nuisance at site, (ii) traffic maintenance	Dust and noise nuisance and disturbance to traffic	at the pipe laying sites and surroundings	Monitoring of air quality and noise is not required. Ensure the implementation of mitigation measures (usage of standard equipment complying with CPCB Noise Standards for Construction Equipments); assess the	Weekly	CMC Haveri with the assistance of Investment Program Consultants	Part of consultancy cost

Mitigation Measures	Parameters to be Monitored	Location	Measurement	Frequency	Responsibility	Preliminary Costing
			situation through visual inspection and interviews with local people			
Operation stage						
Check for blockage and leakage problems; reducing the water losses	Effectiveness of leak detection and water auditing in reducing the losses	N/a	Percentage of water losses	Yearly once	CMC Haveri	Part of O & M costs
Check for health hazards due to sludge handling.	Health status of WTP staff involved in sludge handling	N/a	Health check for WTP staff	Yearly once	ULB	Rs.5000 per person per year

Table 23. Environmental Monitoring Plan for Drainage Upgradation

Investment Program Phase	Mitigation Measures	Parameters to be Monitored	Location	Measurement	Frequency	Responsibility	Preliminary Costing
Preconstruction Stage. No significant impacts envisaged	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.
Construction Stage. No significant impacts envisaged	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.
Operation stage No significant impacts envisaged	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.	N/a.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

95. A two tier consultation process was adopted for NKUSIP for information disclosure and making all the concerned people involved in the project. Institutional consultations were conducted with the Governmental Departments such as Planning Department, Urban Development Board, Public Works Department, Pollution Control Board, Karnataka Urban Water Supply and Drainage Board, Haveri CMC, etc. After the consultations with Haveri CMC, the Commissioner has certified that the proposals for Haveri suit the requirements of the ULB. The certificates are presented as **Appendix 3.**

96. Public consultation involved focus group discussions. The people residing along the project activity areas were consulted during topographical surveys and site visits and due discussions were made regarding the proposals. It was observed that people are willing to extend their co operation as the proposed activities are supposed to enhance the living standard of the public. The public expressed their concern regarding the traffic management activities during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. It was demanded for a strong operation and maintenance system in place for the proposed sewer network for its best functioning to have the maximum health and aesthetic benefits.

Public Consultation at Haveri

Public Consultation at Varada Barrage

97. Further Focus Group Discussions were carried out with the houses located at the nearest vicinity of STP Site. The issues raised during Public Consultation

and the mitigation measures incorporated in design and IEE and presented in **Table 24.**

Table 24. Issues Addressed during Public Consultation along STP Site, Haveri.

Sl.No	Issues Raised during Focus Group Discussion	Mitigation Measures
1.	Odour, mosquito, noise nuisance and health risk to the public with stagnation of sewage in the proposed STP.	The FAL based STP will not pose odour nuisance as provision for forced aeration for fast degradation of pollutants are incorporated as part of STP. There will not be stagnation of sewage in any of the systems in STP; there is least possibility for anaerobic conditions within STP units and resultant fowl smell from the system. As the sewage is continuously flowing and aerated in the STP units; hence mosquito breeding is also not envisaged within STP units. The STP area will be kept hygienically, cleared off grass and weeds such that there won't be any mosquito or flies breeding from the site. Provision of Visual Screens and land scaping has been integrated as a part of STP which will effectively control the nuisance to the immediate surrounding.
2.	Over flowing of Sewage and polluting agricultural lands and affecting livelihood of public.	The proposed sewer networks are adequately sized to meet the projected sewage flow from city limit. Sewer lines will be cleaned regularly and the sewer cleaning equipments will be supplied during the project implementation stage. STP units are adequately sized to handle the sewage reaching the site. Further, DG back up will be provided for STP such that treatment unit will be operational round the clock; hence there is no possibility for overflowing of sewage from STP.
3.	If there is no regular and long term operation and maintenance system for STP; the proposed area will be a discharge ground for raw sewage generated in Haveri CMC.	Haveri Municipality is responsible for regular operation and maintenance of STP by allotting workers for sewer maintenance and STP operation through a qualified contractor.

As specified in the contract document, the contractor will be responsible for operation and maintenance of the STP for one month after construction of STP, during which the staff of CMC will be trained for safe operational practices of STP. There after the CMC workers will be skilled to handle the system independently.

Hence, there is no possibility for lagging in regular and long term maintenance of sewage system and to have adverse impact on public.

VII. FINDING AND RECOMMENDATIONS

A. Findings

98. Based on the screening of environmental impacts, all the proposed sub-project components in Haveri are found to be environmentally acceptable and therefore able to proceed to the implementation phase. In most cases, particular environmental issues identified are those that are typical for the type of component, and a range of proven mitigation strategies exist to address them. **Table 25** indicates the environmental consideration of the proposed infrastructure components.

Table 25. Environmental Issues of Infrastructure Components

Infrastructure Component	Environmental Impact Issue	Environmental Mitigations
Sewage treatment plant and sewerage upgradation	• Sludge handling and disposal • Construction and operation impacts a	Appropriate mitigation measures as suggested
Drainage upgradation	• No significant issues	N/a.
Water Supply Rehabilitation	• No significant issues • Construction and operation impacts	Appropriate mitigation measures as suggested

99. As described above, most impacts are relevant to typical construction and operation. The important sets of mitigation measures, which are relevant to most of the components, include preparation of activity plans using appropriate mitigation measures identified in the earlier sections. These activity plans include:

i) Sludge Management and Disposal Plan (to address sludge handling and disposal impacts at the STP).

ii) Health Risk Plan (to address the health related impacts of the STP workers and Sanitary workers)

100. These activity plans should be prepared by the ULB associated by Investment Program Consultant as compendium of the relevant mitigation measures identified in earlier section. They should form part of the contractual arrangements with construction contractors, or directly implemented by the CMC as facility operator, as required ' Work Practices'.

B. Recommendations

101. It is recommended that the PMU should be involved in monitoring the implementation of those components that are critical to acceptable environmental performance of the component. Owing to the location of proposed facilities and geographical setting of the town/region as a whole, no major impacts envisaged from any of the proposed sub-component Investment Programs in Haveri. In view of this importance, the PMU is delegated with the monitoring responsibility of the design stage to ensure the environmental sustainability of the NKUSIP.

VIII.CONCLUSIONS

102. It may be emphasized that, owning to: (i) scale of activity, (ii) location of the proposed sub-project component, and (iii) 'no environmental sensitivity' of the sub-project town, none of the components required to go through the process of EIA. It may be emphasized that the present IEE, which identifies potential impacts and suggests appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are simple and moreover proven mitigation measures exists to minimize/mitigate the same. Hence, no further study such as an EIA is required.

APPENDICES

APPENDIX 1: Rapid Environmental Assessment (REA) Checklist

SEWAGE TREATMENT

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India / North Karnataka Urban Sector Investment Program

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
B. Project Siting Is the project area…			
▪ Densely populated?	√		
▪ Heavy with development activities?	√		
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	√		Siddeswara Temple, a protected monument of Archeological Survey of India is within project area.
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	

SCREENING QUESTIONS	Yes	No	REMARKS
• Bay		√	
A. Potential Environmental Impacts Will the Project cause…			
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	The proposed activities are away (between 100 – 300 m) from the protected monument.
▪ Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	√		During the construction stage of underground sewer lines, traffic and human activities will be temporarily interfered along with pollution due to dust generation and noise due to operation of construction machineries. Traffic management plan with proper sign boards, sprinkling of water for dust suppression, stocking of construction materials away from the densely built up have been suggested.
▪ dislocation or involuntary resettlement of people		√	No land acquisition is required for project implementation so there is no resettlement of people.
▪ Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	√		The proposed system is designed to meet the discharge norms of Inland Surface water as suggested by Central Pollution Control Board. It is suggested that the STP system should be properly maintained to ensure the efficiency of treatment and also no industrial waste / effluents should discharge to sewer lines which will affect treatment.
▪ Overflows and flooding of neighboring properties with raw sewage?	√		Periodic maintenance of sewer lines has been suggested in the EMP to avoid overflowing and flooding of neighboring properties.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	√		It is suggested in EMP that sludge disposal has to be carried out once in 2 to 3 years. Sludge has to be disposed in pre-identified disposal sites to avoid surface water and soil pollution. It is suggested in EMP that the Haveri CMC has to ensure that no industrial effluent will illegally get discharged to the sewer lines.
▪ Noise and vibration due to blasting and other civil works?	√		It is suggested in EMP that all construction machineries used will comply with the noise standards as suggested by Central Pollution Control Board.
▪ Discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	√		It is suggested in EMP that Haveri CMC has to ensure that no hazardous waste will be illegally discharged in to sewer lines.
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	√		Buffer zone with screens and landscaping is suggested to provide proper shielding such that operation of STP will not have nuisance to surroundings.
▪ Social conflicts between construction workers from other areas and community workers?		√	The local labour force will be utilized by the contractor for construction activities and hence there is no possibility for social conflict regarding employment opportunities during construction phase.
▪ Road blocking and temporary flooding due to land excavation during the rainy season?	√		Road blocking and Traffic re routing will be required during construction stage of sewer .lines. Temporary flooding is not anticipated as there is no deep excavation or filling of low laying area envisaged in the project.
▪ Noise and dust from construction activities?	√		It is suggested in the EMP that all the construction machineries should comply with the noise standards as suggested by Central Pollution Control Board. Sprinkling of water should be done along the construction area for dust suppression.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Traffic disturbances due to construction material transport and wastes?	√		Traffic management with re routing of traffic during construction period is required to avoid conflict of public transport with construction material / waste transport.
▪ Temporary silt runoff due to construction?	√		The construction waste water will be channeled such that it will have sufficient time to settle the solids and do not deteriorate water quality of discharging courses.
▪ Hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		Regular maintenances of sewer line have to be carried out to avoid over flow of sewer lines and related impact of public health due to pollution. There is no possibility for groundwater pollution due to failure in sewerage system as the ground water table is sufficiently deep (30-50 feet)
▪ Deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		Sludge from the bottom of FAL has to be removed at regular intervals (normally once in 2-3 years) to avoid re-suspension in the treated water and there by deteriorating treated water quality. Direct discharge of untreated sewage water is not anticipated.
▪ Contamination of surface and ground waters due to sludge disposal on land?	√		Sludge should be disposed off only in pre-identified disposal sites. The sludge disposal areas should be properly lined with geosynthetic lining such that it will not leach to the nearby water courses / land and pollute environment.
▪ Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in sewage and sludge?	√		Mixing of hazardous / industrial effluents with sewage may result in toxic gas formation in sewer and STP which should be avoided through proper law and enforcement. The sewer cleaning and STP workers should be provided protective measures such as boots, masks etc to avoid exposure to pathogens in sewage and sludge.

APPENDIX 2: Rapid Environmental Assessment (REA) Checklist

WATER SUPPLY

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: India / North Karnataka Urban Sector Investment Program

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area…			
▪ Densely populated?	√		
▪ Heavy with development activities?	√		
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	√		Siddeswara Temple, a protected monument of Archeological Survey of India is within project area.
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	

SCREENING QUESTIONS	Yes	No	REMARKS
B. Potential Environmental Impacts Will the Project cause…			
▪ Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?	√		Pollution of raw water supply from upstream wastewater discharge is not anticipated since Varada River, the source of raw water is flowing through rural areas. However, pollution due to soil erosion runoff is anticipated, as the river is flowing through agricultural areas.
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	Siddeswara temple (protected monument) is more than 300 m away from the new raw water pipe line and hence there will not be any impact on the protected monument.
▪ Hazard of land subsidence caused by excessive ground water pumping?		√	There is no ground water exploitation for proposed water supply improvements for Haveri CMC. .
▪ Social conflicts arising from displacement of communities ?		√	There is no resettlement of people required for project implementation. Hence there is no possibility for social conflict related with displacement of people.
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	The proposal for Haveri CMC involves only pumping of surplus water from River Varada to an impounding reservoir, Heggere Lake during monsoon. This will not reduce the water availability in the river for any other uses all through the year.
Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		√	The existing raw water supply is supposed to continue.
▪ Delivery of unsafe water to distribution system?		√	The present project does not involve any upgradation / operation maintenance proposal for Water treatment plant. The treatment plant should be maintained properly by Haveri CMC to have the outlet quality meeting drinking water standards.
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		√	The existing intake well at River Varada is in good condition so there is no possibility for pollution due to inadequate protection of intake works / wells.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Over pumping of ground water, leading to salinization and ground subsidence?		√	There is no ground water exploitation required for the proposed improvements in Water supply.
▪ Excessive algal growth in storage reservoir?	√		Haveri CMC has to ensure that the storage reservoir will be cleaned regularly to avoid excessive algal growth.
▪ Increase in production of sewage beyond capabilities of community facilities?		√	The proposal involves ensuring regular supply of 100 lpcd for the public which will not result in excess sewage production. The proposed STP for the city is designed to meet the sewage generated with 100 lpcd.
▪ Inadequate disposal of sludge from water treatment plants?		√	The present project does not involve any proposal for altering design / facilities in Water Treatment Plant. Haveri CMC has to ensure that the sludge is removed from water treatment plants regularly to meet standards of treated water.
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	√		Sufficient buffer zone / noise barrier is to be developed around pumping station to alleviate noise.
▪ Impairments associated with transmission lines and access roads?	√		Temporary impairments are anticipated along the new transmission line routes during construction stage. No new access roads are proposed.
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	The present project does not involve any proposal for altering design / facilities in Water Treatment Plant.
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		√	The present project does not involve any proposal for any changes in operation of Water Treatment Plant. Haveri CMC has to ensure that proper safety practices are ensured for workers in water treatment plant
▪ Dislocation or involuntary resettlement of people		√	There is no resettlement of people for project implementation.
▪ Social conflicts between construction workers from other areas and community workers?		√	The contractor will be utilizing the local labour force so there is no possibility for social conflict regarding employment opportunities during construction stage.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Noise and dust from construction activities?	√		All the construction machineries employed have to comply with noise emission standards suggested by Central Pollution Control Board. Dust generation shall be suppressed with sprinkling of water along the construction area.
▪ Increased road traffic due to interference of construction activities?	√		The construction material transport will increase traffic within city. Proper traffic management will have to be implemented to avoid conflict between public transport and construction material transport.
▪ Continuing soil erosion/silt runoff from construction operations?	√		The construction debris / excess soil generated at construction sites should be properly disposed to avoid erosion.
▪ Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	The present project does not involve any proposal for altering design / facilities / operation and maintenance in Water Treatment Plant. Haveri CMC has to ensure efficiency of operation of water treatment plant.
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	The present project does not involve any proposal for altering design / facilities in Water Treatment Plant. Haveri CMC has to ensure optimal performance of Water Treatment Plant to avoid corrosion of distribution system with corrective chemicals.
▪ Accidental leakage of chlorine gas?		√	The present project does not involve any proposal for altering design / facilities / operation in Water Treatment Plant.
▪ Excessive abstraction of water affecting downstream water users?		√	The present proposal involves abstraction of water from River Varada only during surplus months of monsoon; hence drawing of water will not have any impact on downstream water users.
▪ Competing uses of water?		√	The present proposal involves abstraction of water from River Varada only during surplus months of monsoon, when there are no competing uses of water.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Increased sewage flow due to increased water supply	√		The proposal is for ensuring regular water supply of 100 lpcd for the public which will result in increased sewage generation. The proposed STP for the city is designed to meet the sewage generated with 100 lpcd.
▪ Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		The proposed STP for the city is designed to meet the sullage generated due to the project. Haveri CMC has to ensure that the sludge generated in STP is disposed off with safe disposal practices.

APPENDIX 3. Certificates from Haveri CMC on the Suitability of the Proposals for the ULB

City Municipal Council, Haveri

Certificate

Certified that the proposals made in the sewerage sector suits the requirement of the ULB.

Municipal Commissioner
City Municipal Council,
Haveri

City Municipal Council, Haveri

Certified the Following

1. The ULB shall maintain the Heggere Lake as water source for summer supply.
2. The conditions of existing water supply pipe-lines have been scrutinized by the consultant along with ULB engineer.
3. The proposals made for Water Supply suits the requirement of the ULB.

Municipal Commissioner
City Municipal Council,
Haveri