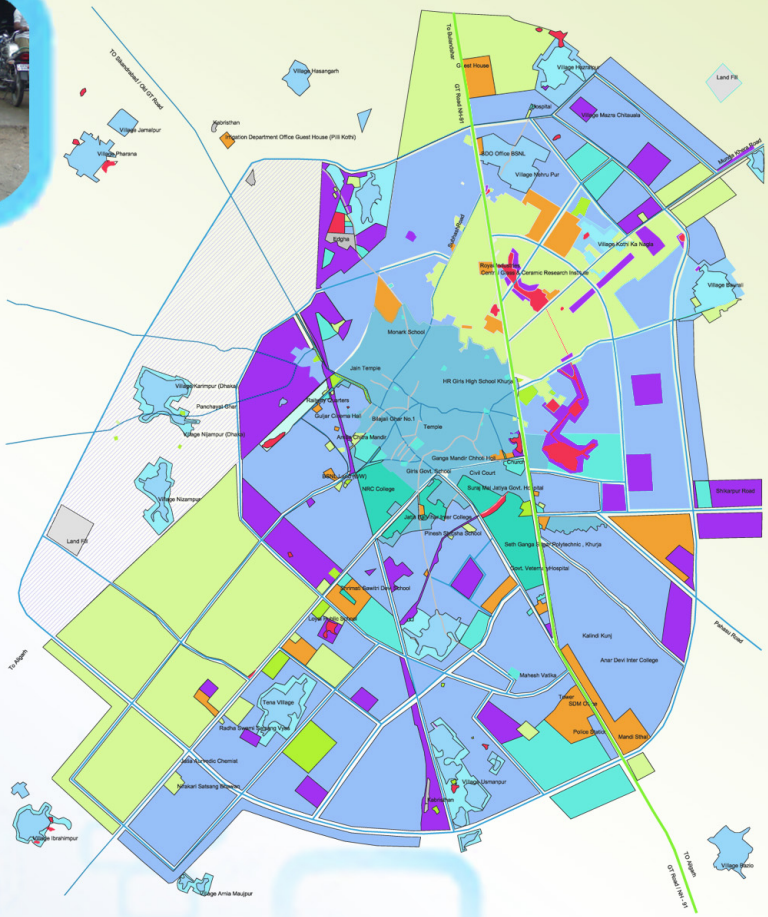
ADB

Asian Development Bank

National Capital Region Planning Board



Khurja
City Level Environmental Infrastructure Investment Plan

ADB TA No. 7055-IND
Capacity Development of the NCRPB (Component B)

WilburSmith
ASSOCIATES

February 2011

NCR Planning Board
Asian Development Bank

Capacity Development of the National Capital Region Planning Board (NCRPB) – Component B

(TA No. 7055-IND)

City Level Environmental Infrastructure Investment Plan
Khurja

February 2011

ENGINEERS
PLANNERS
ECONOMISTS
WilburSmith
ASSOCIATES

Abbreviations

AC	:	Asbestos Cement
ADB	:	Asian Development Bank
C.C	:	Cement Concrete
BCM	:	Billion Cubic Meter
BOQ	:	Bill of Quantities
CGWB	:	Central Ground Water Board
CI	:	Cast Iron
COD	:	Chemical Oxygen Demand
CPCB	:	Central Pollution Control Board
CPHEEO	:	Central Public Health & Environmental Engineering Organization
CPWD	:	Central Public Works Department
C:N	:	Carbon to Nitrogen Ratio
DI	:	Ductile Iron
KDA	:	Khurja Development Authority
Ha	:	Hectares
HDPE	:	High Density Poly Ethylene
KMC	:	Khurja Municipal Council
KNP	:	KhurjaNagar Palika
HP	:	Horse Power
BKDA	:	Bulandshahr-Khurja Development Authority
HQ	:	Head Quarters
KL	:	Kilo Litre
lpcd	:	Litre Per Capita Per Day
LPS	:	Litres per Second
MLD	:	Million Litres per Day
Mm	:	Milli meters
MoEF	:	Ministry of Environment & Forests
MPS	:	Meters per Second
NAAQS	:	National Ambient Air Quality Standards
NCRPB	:	National Capital Region Planning Board
NEERI	:	National Environmental Engineering Research Institute
NH	:	National Highway
O&M	:	Operation & Maintenance
PWD	:	Public Works Department
RCC	:	Reinforced Cement Concrete
SFRC	:	Steel Fibre Reinforced Concrete
SPS	:	Sewage Pumping Station
Sq. Km	:	Square Kilometre
STP	:	Sewage Treatment Plant
SWM	:	Solid Waste Management
TA	:	Technical Assistance
UIDSSMT	:	Urban Infrastructure Development Scheme for Small & Medium Towns
ULB	:	Urban Local Body
UPPCB	:	Uttar Pradesh Pollution Control Board
XEN	:	Executive Engineer

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I. INTRODUCTION

A. Background

1. The National Capital Region Planning Board, constituted in 1985 under the provisions of NCRPB Act, 1985, is a statutory body functioning under the Ministry of Urban Development, Government of India. NCRPB has a mandate to systematically develop the National Capital Region (NCR) of India. It is one of the functions of the Board to arrange and oversee the financing of selected development projects in the NCR through Central and State Plan funds and other sources of revenue.

2. On Government of India's request, Asian Development Bank (ADB) has formulated the technical assistance (TA) to enhance the capacities of National Capital Region Planning Board and its associated implementing agencies. The TA has been designed in three components:

   (i) *Component A* relates to improving the business processes in NCRPB;

   (ii) *Component B* relates to improving the capacity of the implementing agencies in project identification, feasibility studies and preparing detailed engineering design; and

   (iii) *Component C* relates to urban planning and other activities.

3. ADB has appointed M/s Wilbur Smith Associates to perform consultancy services envisaged under Component B. In the context of this contract, City Level Environmental Infrastructure Plans are prepared for the towns Hapur, Panipat and Khurja.

1. Aim and Objective

4. The aim of the City Level Environmental Infrastructure Plan is to prepare a Perspective Plan for the Project ULBs for the next 30 years (2041). The objectives are set as below:

   (i) Prepare a Comprehensive City Level Environmental Infrastructure Plan for future 30 years.

   (ii) Assess the financial status of ULB status and sustainability level of ULB for the proposed investments; and

   (iii) Prepare the investment and recovery plan for the ULB

2. Scope of work

The proposed study is mainly based on secondary data available with the various concerned line agencies and primary data collection. As per the primary and secondary data, the demand and gap analysis has been carryout for respective of Environmental Infrastructure Sectors. The block cost estimates are worked out. The preparation of CLIEP broadly include the following:

(i) *Study of Present Urban Infrastructure Scenario.* Assessment of existing situation, needs, deficiencies, and future requirements in the sectors of water supply, sewerage and sanitation, solid waste management, drainage, basic services to urban poor/slums etc.

(ii) *Study of Growth Potential and Proposed Development Strategy.* Assessment of past growth and likely future trends in urbanization and spatial expansion of the town and preparation of conceptual plan for the town stating various sectoral development strategies to provide high quality life to citizens.

(iii) *Institutional and Financial Strengthening.* Assessment of human resource, technical and financial capacity and sustainability of ULBs to undertake improvement works in basic service delivery.

(iv) *City Level Environmental Infrastructure Plan.* Preparation of urban infrastructure development plan for the town (comprising of sectoral plans for various service sectors) for the next 30 years (2041); considering future growth trends, economic development, and institutional and financial sustainability of the ULB. This will also include prioritization of sub-projects and investments.

3. Approach and Methodology

The City Level Environmental Infrastructure Plan feasibility study is based on JNnurm / UIDSSMT guidelines:

(i) Preparation of City Level Environmental Infrastructure Plan (CLEIP). CLEIP will be prepared for 30 years (up to 2041) and will mainly involve existing situation analysis and identification of key issues in service delivery. Based on this, sectoral future strategies are worked out to fix Goals and a VISION for CLEIP-2041. A list of sub-projects will be identified along with the costing for investments to be taken up during the CLEIP period.

B. Structure of the Report

5. This Environmental Infrastructure Master Plan for Khurja Town Report comprises of seven sections:

(i) Section I provides an overview of the City Level Environmental Infrastructure plan Project.

(ii) Section II provides profile of Khurja town with a demographic and spatial land use assessment. This also identifies future directions and pace of development & population growth.

(iii) Section III reviews the existing municipal infrastructure services in NCR region, which includes water supply, sewerage & sanitation, solid waste management and storm water drains. This section is includes investment required for environmental infrastructure in NCR Region.

(iv) Section IV reviews the existing water supply system in khurja Town. This section also discussed about the deficiencies and issues related to water supply system in the town.

(v) Section V reviews the existing sewerage & sanitation system in Khurja Town. This section also discussed about the deficiencies and issues related to existing sewerage & sanitation system in the town.

(vi) Section VI reviews the existing solid waste management system in Khurja Town. This section also discussed about the deficiencies and issues related to solid waste management system in the town.

(vii) Section VII reviews the existing storm water drainage system in Khurja Town. This section also discussed about the deficiencies and issues related to storm water drainage system in the town.

(viii) Section VIII presents urban environment status of Khurja Town

(ix) Section IX on Urban Governance deals with the legal and regulatory framework governing municipal service delivery and institutional structure of Khurja ULB

(x) Section X is presents the financial status of Khurja, elaborates revenue and capital funds growth over assessment period.

(xi) Section XI reviews the existing financial situation of Khurja Nagar palika, analyses the future municipal revenues and estimates the financial sustainable capacity of the Khurja Municipality.

(xii) Section XII reviews the financial sustainable capacity of Khurja town. It also elaborates the reforms need to carried out to execute proposed investment and operation and maintenance.

II. TOWN PROFILE

A. Overview

6. Khurja Town is administratively part of Bulandshahr District in Uttar Pradesh State, and is an important town of National Capital Region. The population of Khurja Town was recorded 98,403 as per census 2001. At present, the jurisdiction of Khurja municipal area is 354 ha (3.54 sq. Km**,**). Utter Pradesh Town and Country Planning Department has prepared approve Master plan in 2005 and this approved Master Plan has been enforced till 2021. As per the Khurja Master Plan the commanded area is 28.17 sq. Km . The development area contains Khurja municipal area and six rural villages.

1. Location and Connectivity

7. The town is located at a distance of 85 km from Delhi towards south-east and 16 km from district headquarters of Bulandshahr. Geographically it is situated at 28^0 15' 0" N latitude and 77° 51' 0" E Longitude. It is well connected with important cities of country. National Highway 91 (Delhi-Kanpur) passes through Khurja city. The main Rail Line of Delhi-Meerut-Culcutta also passes through Khurja Town. Khurja city is situated at about 85 Km south-east of Delhi, 87 Km from Meerut, 16 Km from Bulandsahar and 422 Km from the State Capital, Lucknow.

2. History and Regional Importance

8. Khurja is the home town of Pathans of Khurja, who in 2004 celebrated their 400th year of arrival in India in Khurja, making them one of the oldest Pathan communities to settle in the Gangatic Plains. They are among the most important power groups in Khurja. There was a huge population of Pathans before 1947, when India was divided and many left for the newly created Pakistan. The town has a large area called Pathanwada (Pathan's place) where the pathans live. However, on outskirts of the town, another tribe of Pathans also inhabit in an area called "Barah Basti" meaning "Twleve Localities". Late Nadir Shah Khan of Khurja was considered as a Leader of Pathan's in India, he died in 1960's in Khurja. The town was surrounded all around by a wall with five gates- Delhi-Bulandshahr, Aligarh, Shikarpur, Pahasu and Jewar.

3. Topography

9. The topography of Khurja town is flat. The general average slope for every km is around 0.29 m. The elevation of Khurja town is 201 m to the MSL. The depth of groundwater in the town varies from 300-400 ft. The town is located in the catchment area of the Yamuna River. As Bulandashahr district forms part of the Gangetic plain and the sediments belongs to the Quaternary Age, which attain significant thickness in the central Ganga basin. The storm water flows into Yamuna River. The general nature of the soil is alluvium with admixture of sand, sandy clay and silt.

Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Location of Project Town

Legend

- NCR
- State Boundary
- District Boundary
- District Hq.
- Counter Magnet Areas
- River / Stream
- Project Town

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Wilbur Smith Associates

Drawn: Roopa	Checked:
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Map II - 1

4. Climate

10. Typical humid subtropical climate of north India prevails in Khurja, with high variation between summer and winter temperatures and precipitation. The average temperature ranges from a minimum of 3 ^{o}C to a maximum of 48 ^{o}C. Predominant winds are from north, northwest and west. The region receives rainfall mainly under the influence of southwest monsoon from July to September. Over 75 percent of the total rainfall is received from July to September. The annual average rainfall is 580 to 690 mm.

B. Demography

1. Population Growth

11. Urbanization and urban population growth are pointers towards the change in the occupational pattern of the community, from agriculture and allied livelihoods to industrial and other non-agriculture occupations. During 1981 the population of Khurja was recorded high decadal growth rate due to industrialization and subsequent decades the decadal growth rate has fluctuating around 20 percent. Following **Table II-1** shows the population growth of Khurja in the municipal limits. As per the discussion with municipal officials, present population of Khurja town is more than one lakh.

12. As per the Master Plan there are six villages are under urban agglomeration area. The total population of the villages recorded as 15,294 as per 2001 census. Past data on population of these villages is not available.

Table II-1: Population Growth of Khurja

Year	**Population (town)**	**Population (urban agglomeration area)**	**Decadal Growth Rate (town)**
	Nos.	*Nos.*	*%*
1951	38,482	-	8.72
1961	41,491	-	7.88
1971	50,245	-	21.10
1981	67,119	-	33.58
1991	80,305	-	19.65
2001	98,403	15,294	22.54

Source: Khurja Master Plan 2021 and censes

13. *Population Density*. The municipal area of Khurja Nagar Palika jurisdiction extends to an area of 3.54 sq. km. Gross average density has increased from 22,685 persons per sq. km in 1991 to 27,797 persons per sq. km in 2001. Out of total 25 wards fifteen wards are exhibiting high dense wards, six wards are medium dense and four wards are low dense wards as per the Master Plan density criteria. High dense wards are located along the NH 91 and Nagar palika chowk areas, surround these wards are medium dense and outer wards are exhibiting low density areas. The details of wards wise densities are shown in **Table II-2** and .

Table II-2: Wards wise density Details

Sl. No.	Range	Wards	Remarks
	Persons per Hector		
1	High Dense: More than 300	3, 4, 5, 12, 13, 15, 16, 17, 18, 19, 20, 21, 24, 25	Nagar palika chowk area and along NH 91
2	Medium Dense: In between 200 to 300	2, 6, 8, 9, 22, 23	Surrounding Nagar palika area
3	Low Dense: Less than 200	1, 7, 11, 14,	Outer areas within the municipal boundary

Source: analysis

14. *SC Population:* Schedule Caste (SC) comprises 13.5 percent of the total population. This is lower than the district level SC population at 20.21 percent. In agglomeration area, SC population exhibits 33 percent of the total village population.

15. Sex Ratio: The current sex ratio (female population per 1,000 male population) in Khurja is 895, which is higher than the district figure of 879. However, a healthy sex ratio is more than 970 for 1000 male population. Hence the Govt. of UP has to take measures for maintain healthy sex ratio.

16. *Literacy Rate:* As per the 2001 census, 53 percent of literacy recorded to the total Khurja population. It is greater than the literacy level of Bulandshahr district (48.34 percent) and lower than State Urban average (58.91 percent). In the agglomeration area, literacy is recorded as 47 percent, which is lower than the state and district.

17. *Household Size*. As per Census 2001, the total number of households in Khurja is 13,433 with a household size of 6.00. The household size in Khurja is below the national average household size of 6.3 (Census 2001).

C. Slums

18. *Slums*: As per Census 2001, the total slum population in Khurja town is 22,306 (11,592 are males and 10,714 are female) and the number of households are 3,182. The slum population is about 22.62 percent of the total population. The average household size exhibits around 7.0, which is considerable in high. The ULB is not implementing urban poor empowerment programs in municipal limits of Khurja, hence the municipality is not having information regarding slums infrastructure in the town. The list of slums are listed in the Table II-3 and location of slums are shown in **Map II-5.**

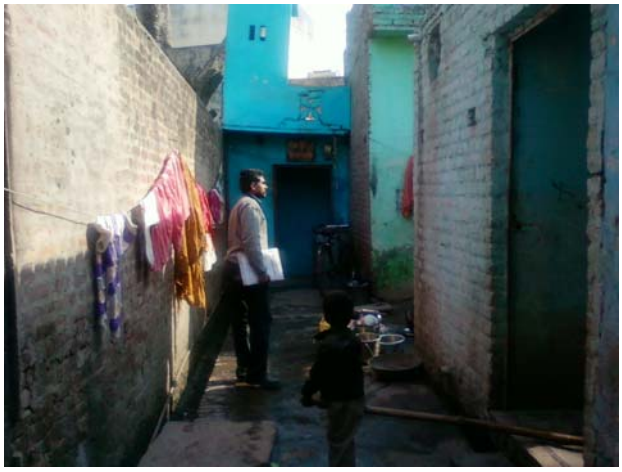
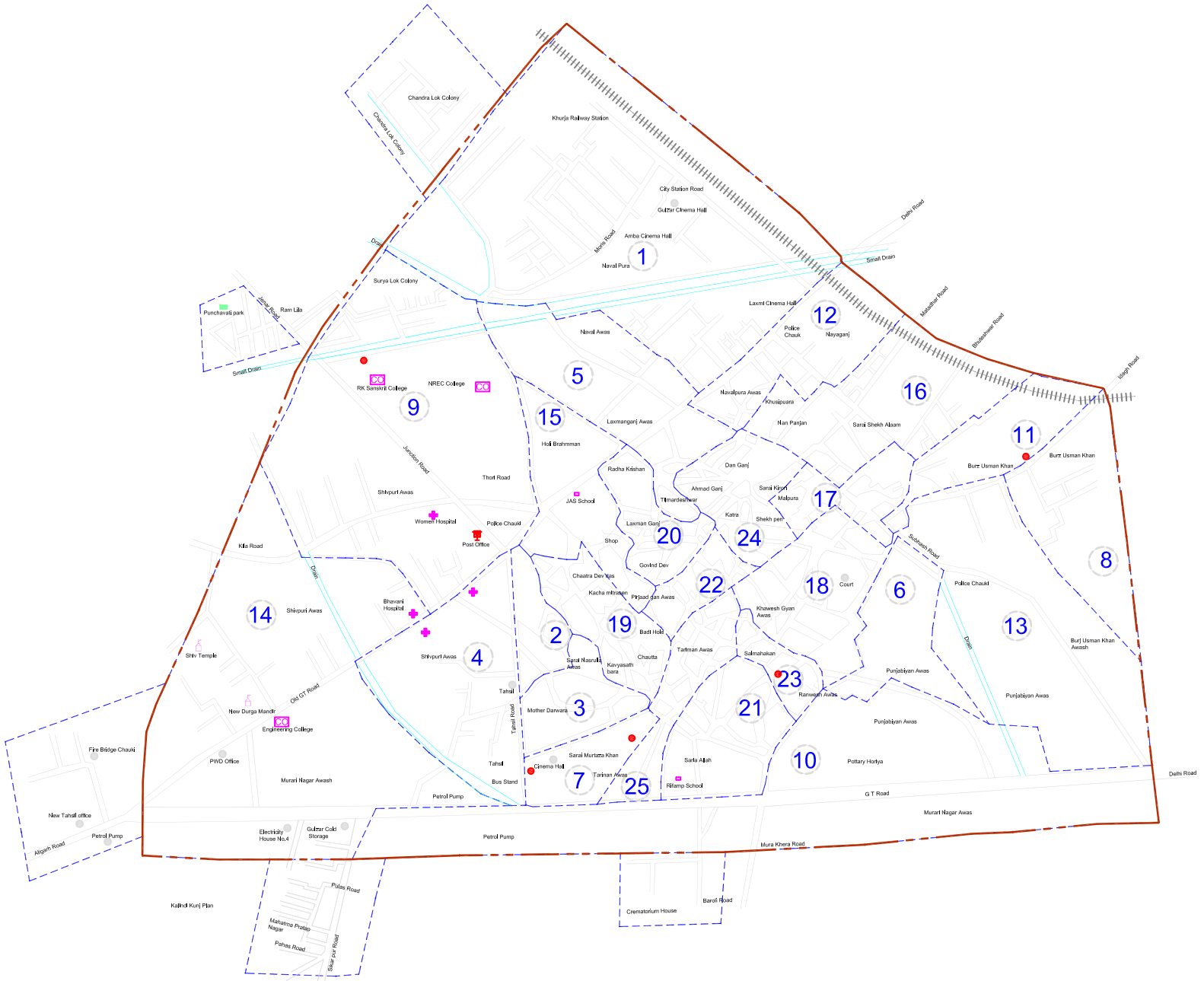


Table II-3: List of the slums

Sl. No	Slum Name
1	Vikas Nagar
2	NayaGanj
3	Chauhatta
4	Sarai Murtaja Kha
5	BurjUsman khan
6	Idhgah Road
7	Sarai Shaik Alam
8	Baradri
9	Madar-d-khaja Ram singh Ka Bara
10	Burari Nagar
11	Sarai Mohar Singh
12	Sarai Nasrullah
13	Tilmandi Shawar

Source: Nagar Palika, Khurja



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Khurja Nagar Palika's Jurisdiction

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Legend

Client:
Aslan Development Bank
National Capital Region Planning Board

Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
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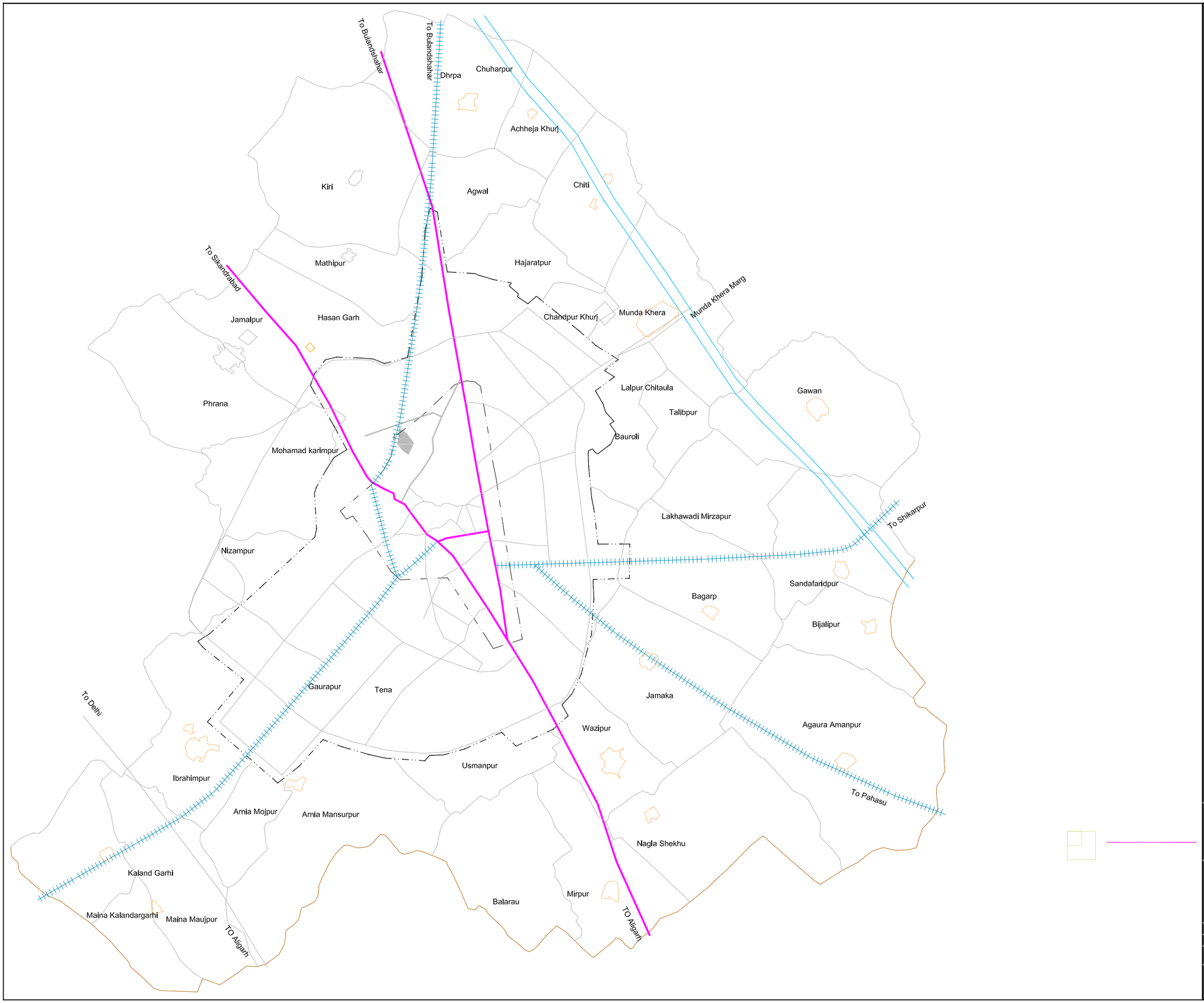
Map II-2



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Khurja Master Plan Jurisdiction (Villages)

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road

Client:

Asian Development Bank
National Capital Region Planning Board

Consultant

Wilbur Smith Associates

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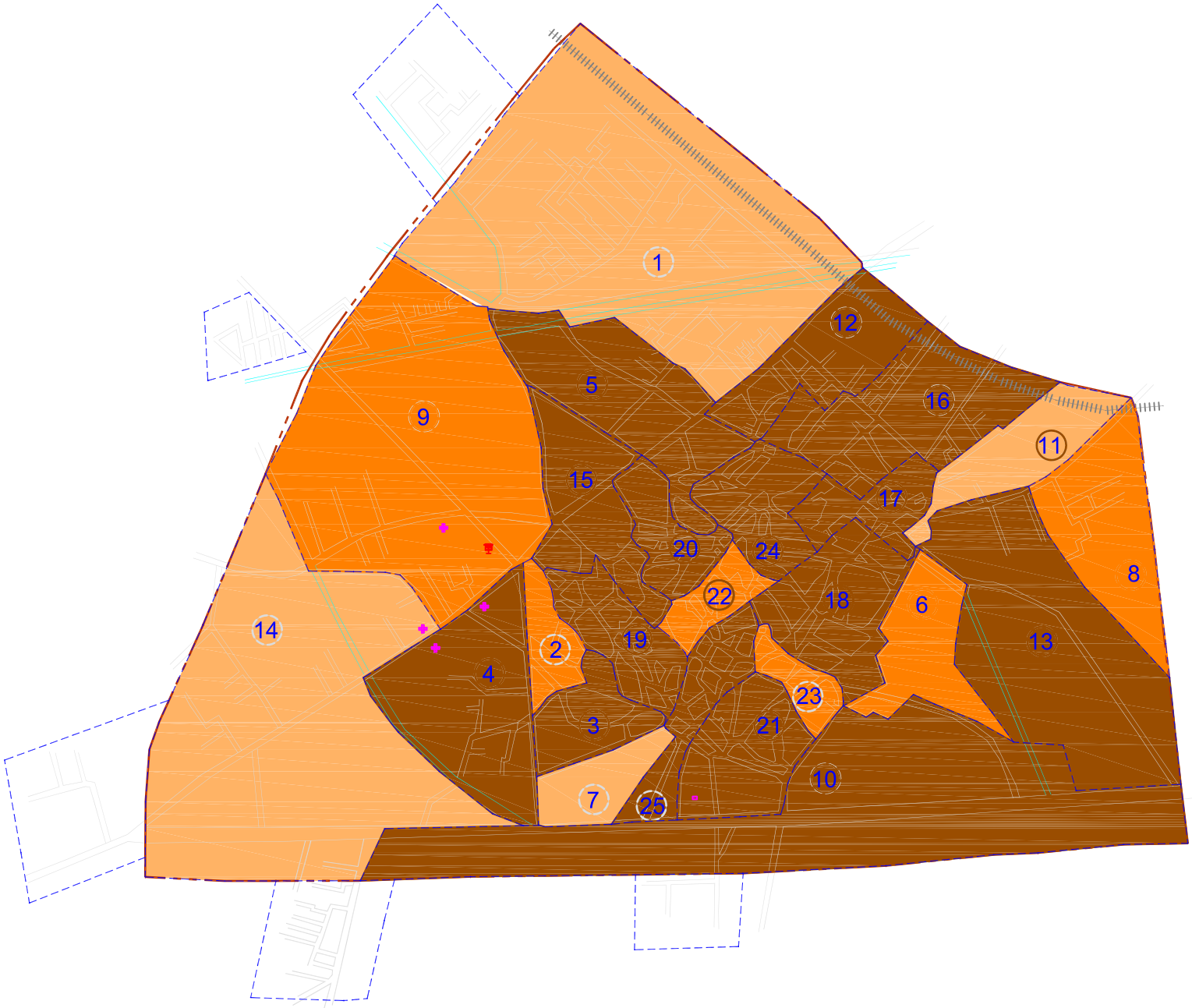

Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Population Density

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Drain
- Low
- Medium
- High

Client:
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Wilbur Smith Associates

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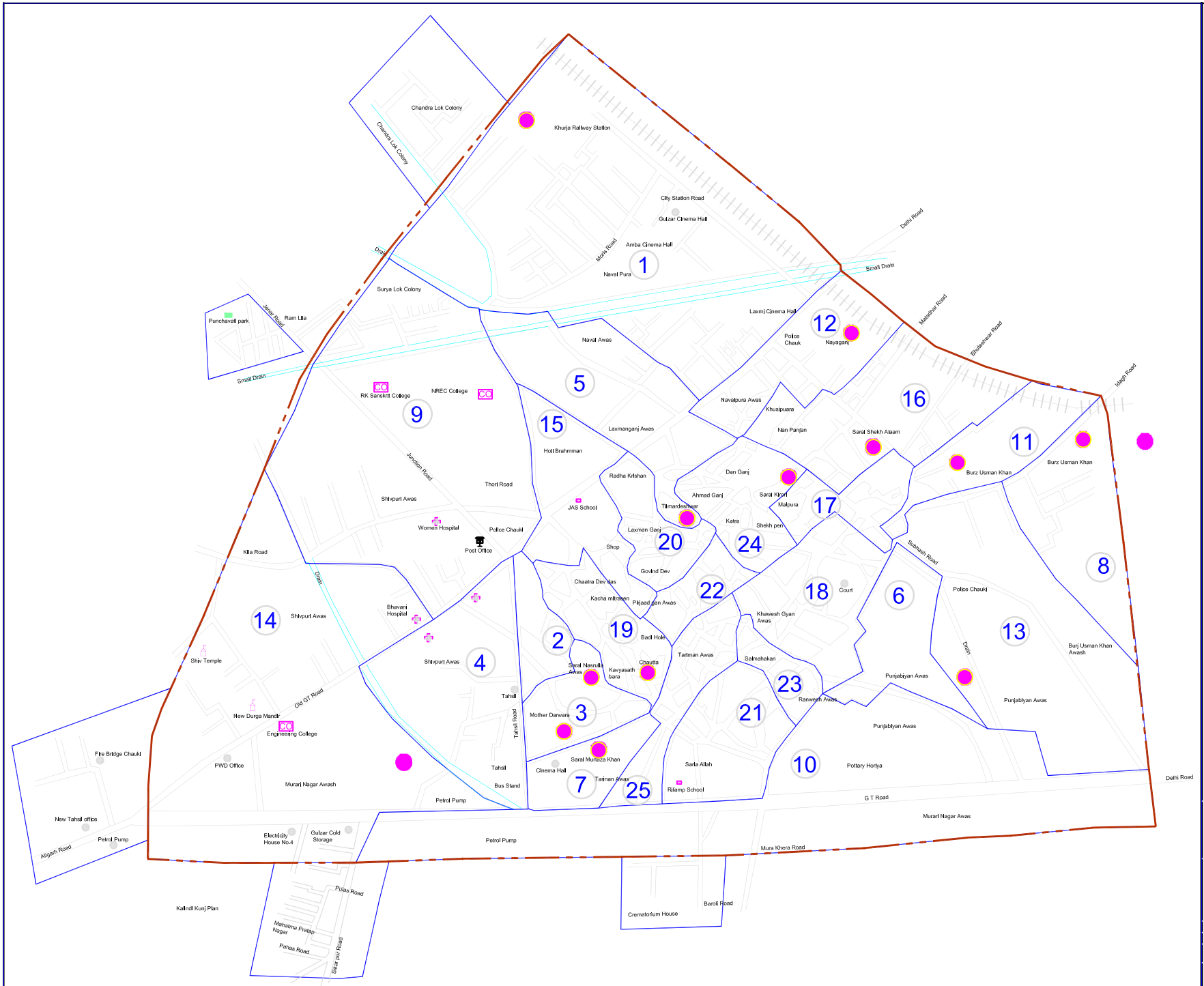
Map II-4



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Slum Location in Khurja Town

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Drain
- Slums

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Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map II-5

D. Urban Economy and Employment

1. Workforce Participation

20. Khurja is an important centre for trade, commerce and Industrial town in Bulandshahr district. The workforce participation rate is almost constant but the size of work force in the town has increased from 1991 to 2001 and it is fluctuating from 25 to 28 percent during last decades. The same is shown in the following **Table II-4**.

Table II-4: Workforce Participation Rate (WFPR)

Sl. No	Year	Population	Work Force	WFPR
		Nos.	*Nos.*	*%*
1	1971	50,245	13,850	27
2	1981	67,119	17,460	26
3	1991	80,305	20,700	25
4	2001	98,403	28,180	28

Source: Master Plan 2021 and Census of India 2001

Figure II-1: Occupational Structure as per 2001 Census

21. Total workers in Khurja is 28,180 including main and marginal workers. Error! Reference source not found. shows the workers in Agricultural, Household, cultivators and other workers in Khurja. Chart II-1 shows the Occupational Structure as per Census 2001. Majority of work force mainly engaged in other workers around 88 percent of total workforce. It is mainly due to small scale industries many people are engaged with other works. **Table II-5** shows the percentage of different workers in the town.

Table II-5: Work force participation in Khurja

Sl. No	Workers type	Number	% to the total workers
1	Cultivators	604	2
2	Agricultural Workers	825	3
3	Household Workers	1,894	7
4	Other Workers	24,857	88
	Total Workers(Main + Marginal)	28,180	
Urban Agglomeration Area			
5	Surrounding 6 villages (Cultivaters)	5,200	*34.74

* Percentage to the total village population
Source: Census of India, 2001

22. *Industry*: The Khurja town is known for small scale Pottery item manufacturing. The main products from these industries are Spares and tools, Jute rope, Packaging material, Paper, Ceramic items like stoneware crokery, sanitaryware, H.T. and L.T. Insulators, hospital ware, chemical porcelain, electro ceramics, kiln furniture, special ceramics, Gunny bags, and pottery machinery, etc. Many of the industries are located along Delhi- Kanpur Highway (NH-91). These finished goods are exporting across the country. The details of industries are illustrated in **Table II-6**.

Table II-6: Details of large and small scale industries in Khurja

Sl. No.	Type of Industries	No of Units
1	Body-mix making	15
2	Raw-material dealers	25
3	Transfer decoration units	30
4	Packaging material industry	4
5	Jute rope making units	3
6	Gunny bag making units	20
7	Pottery machinery manufacturers	10
8	Spares & tool dealers	15
9	Transporters	40
10	Transfer paper manufacturers	4
11	Khurja pottery wholesalers	100
12	Khurja pottery retailers	50
13	Labour for raw material handling / movement	25

Source: Informal survey; there will be a change in actual figures due continuous changes.

2. Agriculture

23. The main crop seasons are Kharif and Rabi. The main crops of the area are Cereals/ Millets, Pulses, Oilseeds etc. Among the cash crops the major crops are sugar cane, Potatoes and tobacco. Improved agricultural practices as use of high yielding variety of seeds, fertilizers, improved agricultural implements; plant protection measures are being adopted by the agriculturists in the town and surrounding villages. There are three canals with a total length of 58 km in the block for serving the agricultural needs. There are eleven Fertilizers depots, one seed depot, ten Agri chemical depots, ten rural godowns, two cold storages, fifty milk collection centers and two milk chilling plants are supporting agricultural activities in Khurja block.

E. Existing and Proposed Land Use Distribution

24. Bulandshahr Khurja Developement Authority (BKDA) was established by Uttar Pradesh Government vide their order dated 21/08/1987. The Commissionar of meerut is the chairman of BKDA. UP Government declared Bulandshahr, Khurja Development region by its GO dated 19-12-1992 and extended it's limits to cover-up Bulandshahr, Khurja, Sikandrabad and Jahagirabad municipality and villages for development by GO dated 25-06-1998. The main objective of BKDA is to acquire land for developing residential and commercial schemes to facilitate citizens by providing them affordable & economic housing, in order to keep entire developments in pre-planned manner the preparation and implementation of master plans, improving infrastructure by construction of new roads,

drainage system, sever facility, broadening of main roads and beautification by the arrangements of lights, amusement parks etc.

25. Under the UP Urban Planning and Development Act, 1973 and UP Regulation of Building Operation Act 1958, the first master plan was prepared before 1990 and the second Master Plan for Khurja was prepared in 2001 and it was approved in 2005, enforced till 2021. As per the second Master Plan the total area demarcated under developed land is 2,817.46 ha, however the developed land as per 2003 is around 969.55 ha. Which is half the area of proposed master plan for 2021 and both existing and proposed landuse is presented in .

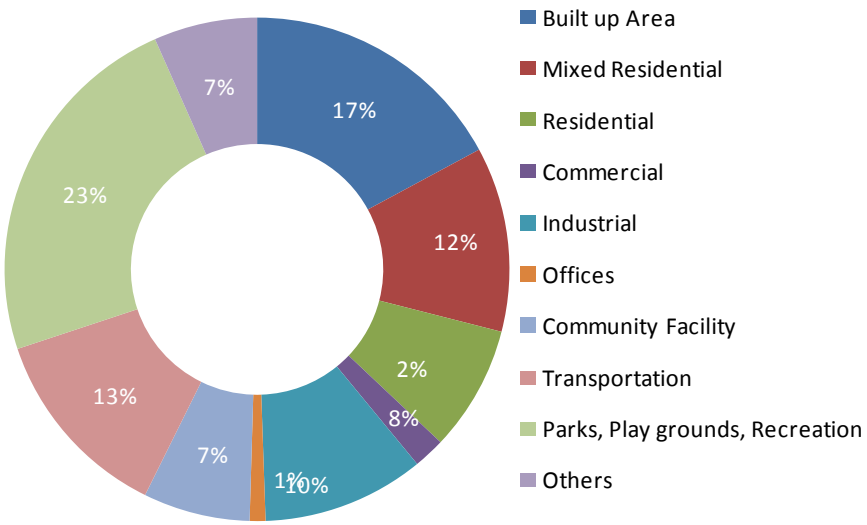
26. Uttar Pradesh Housing Development Corporation has developed a few housing colonies for economically weaker sections and developed a few layout in and around Khuja town. The landuse details are illustrated in **Table II-7**. The existing and proposed landuse is shown in and respectively.

Table II-7: Existing and Proposed landuse

Sl. No	Type	Existing Land use (2003)		Proposed Land use (2021)	
		Area (Ha)	*%*	*Area (Ha)*	*%*
1	Built up Area	166.12	17.13	251.75	8.94
2	Mixed Residential	114.82	11.84		
3	Residential	77.88	8.03	977.00	34.68
4	Commercial	19.68	2.03	84.87	3.01
5	Industrial	101.04	10.42	639.50	22.70
6	Offices	9.79	1.01	32.74	1.16
7	Community Facility	66.60	6.87	220.47	7.83
8	Transportation	121.79	12.56	320.18	11.36
9	Parks, Play grounds, Recreation	227.40	23.45	290.59	10.31
10	Others	64.43	6.65		
	Total	969.55	100.00	2,817.46	100.00

Source: Khurja Master Plan 2021

Figure II-2: Percentage of Existing Landuse



(i) *Residential:* According to Khurja first master plan, it is proposed that 1158.52 ha area is to be developed as residential area. But only 244 ha land was developed. Main reason for this variation is slow growth rate of population (It is projected that the population will be 2,50,000 by 2001, however recorded 40 percent of that in 2001 census. According to the master plan residential areas are bifurcate low residential, medium residential and residential density. The **Table II-8** describes locations of proposed residential areas around the town according to the densities.

Table II-8: Master Plan Density Classification wise areas

Type of Residential	Proposed Density	Locations having proposed densities
High Residential Density	>300 persons/ ht	Northwest – between Old GT road and new Delhi- Aligarh GT Road.
Medium Residential Density	200 to 300 Persons /ht	At extreme west side of the town along the GT road. Along NH 91 towards Murari Nagar Near commercial area along the civil court road.
Low Residential Density	<200 persons/ht	Along the boundary of master plan, towards South direction and near railway line Extreme Southeast of the town away from the Old GT road.

Source: Master Plan 2021

(ii) Commercial. Commercial areas are exists along major corridors like NH 91 and along the civil court road also major commercial areas are existing. The main business existing in the town are Ceramic products. According to Master plan 2021, 131.80 ha land has been proposed for commercial activities. At present only 17.12 ha land is under commercial activities.

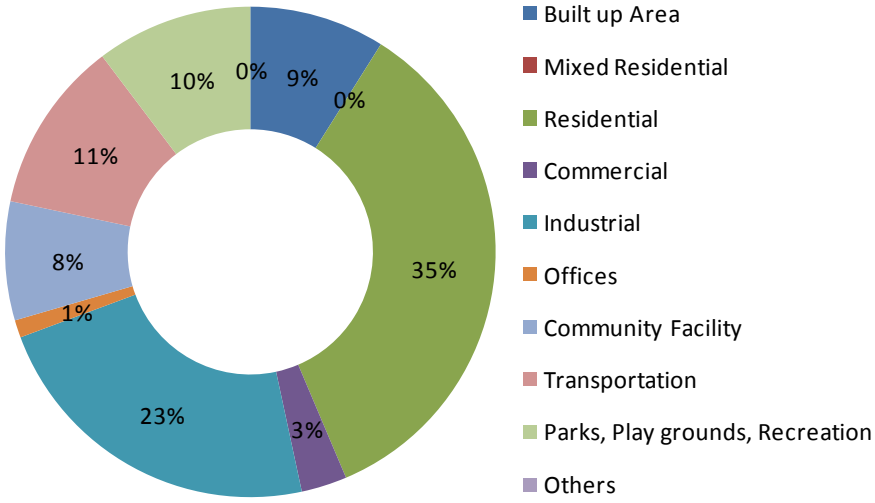
(iii) Industrial: Industrial development plays vital role to enhance the economy base of any town. In khurja, proposed landuse for industrial activity is 444.14 ha according to 2021 Master Plan. The industrial lands are demarcated towards junction road, Bulandshahar road and Mundhakhera road. But according to survey, development at Junction road is not going accordingly. Major development of Industries taken place on G.T road and Mundakhera road only.

(iv) Pubic and Semi Public. Khurja is an administrative head quarters for Khurja Tahsil in Bulandshahr District. Owing to this more number of Central, State Government and Semi-government offices is functioning in town. Khurja town has 20 educational centers, 2 government hospitals and some private nursing homes, one family and child welfare center and also private doctors. Most of the existing and proposed public and semi-public areas are at the heart of the town. Majority of public and semi public activities are proposed in between NH 91 and old GT road.

(v) Traffic and Transportation: Although there was a proposal in 2021 Master Plan to construct a circular ring road (connecting G.T Road, Shikarpur marg, Pahasu marg, mundkhera road, delhi road, sikandrabad road, Jewer road and Aligarh road) to avoid the through traffic entering the town, it has not been implemented. The entire

traffic pass through the town's narrow roads, which is causing traffic jams and nuisance in the town area. Apart from this, there is a few proposals like Transport Nagar and Bus stand has been proposed in Master Plan 2021.

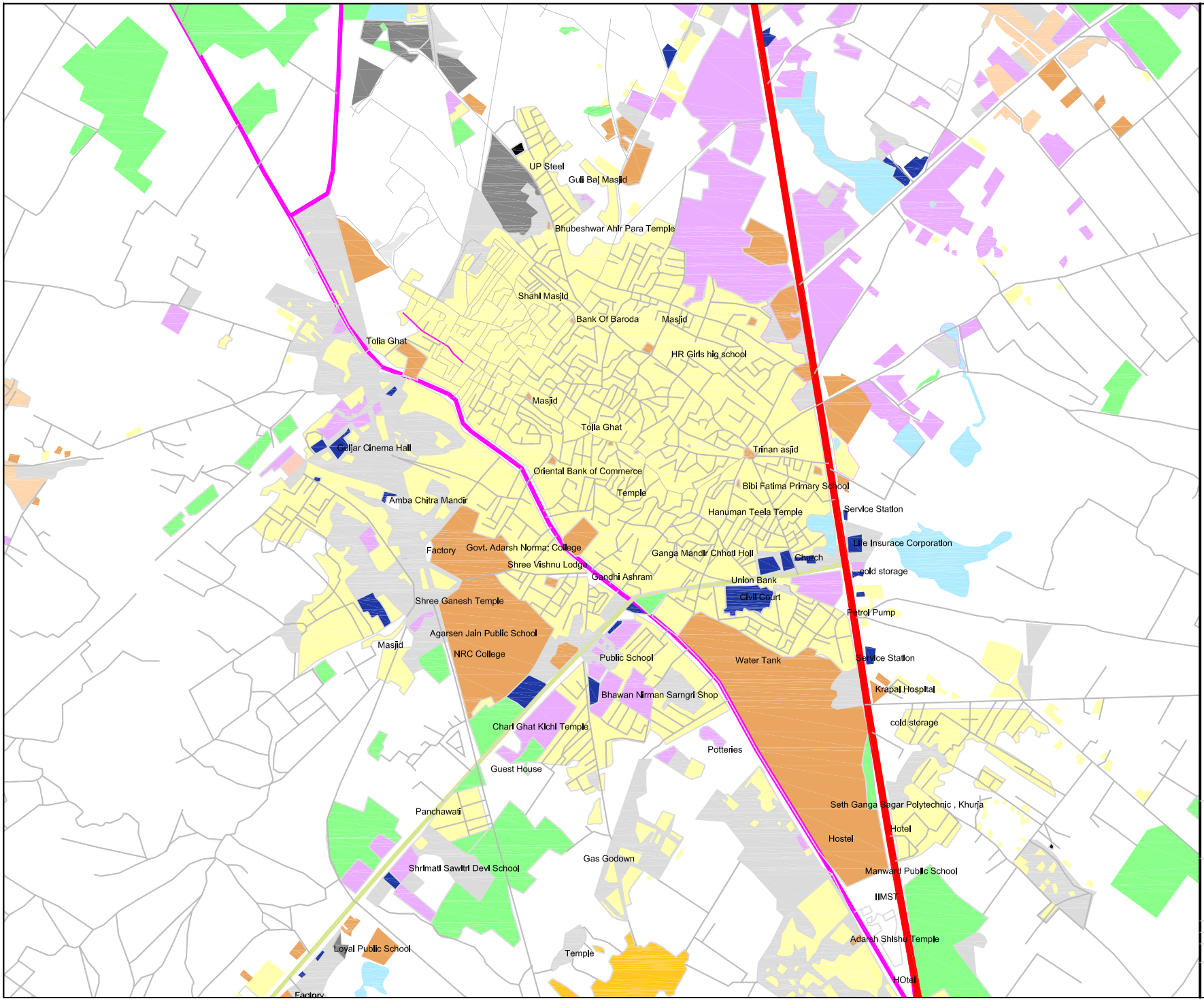
Figure II-3: Percentage of Proposed Landuse



1. *Future Spatial Growth*

27. The town is growing towards East and West directions along the routes leading to Aligarh and Bulandshahr. The potential lands for developments are towards southwest in between highways and Jewar road. This area will continue to receive major attention for residential and commercial developments. Residential developments are expanding towards the Munda Khera road, Shikarpur road and Pahasu road.

28. Taking the advantage of connectivity to Lucknow, Delhi and other places, industrial development will continue to grow along G.T Road/NH-91. As per the requirement the commercial areas are year marked in Master Plan for 2021 towards NH – 91 and other district rods.



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Existing Landuse

Legend

- Open Area
- Garden Area
- Residential Area
- Village
- Industrial
- Commercial
- Water
- Cremation Area
- Community Facility
- Office
- Transportation Area
- Railway Land

Client:
Asian Development Bank
National Capital Region Planning Board

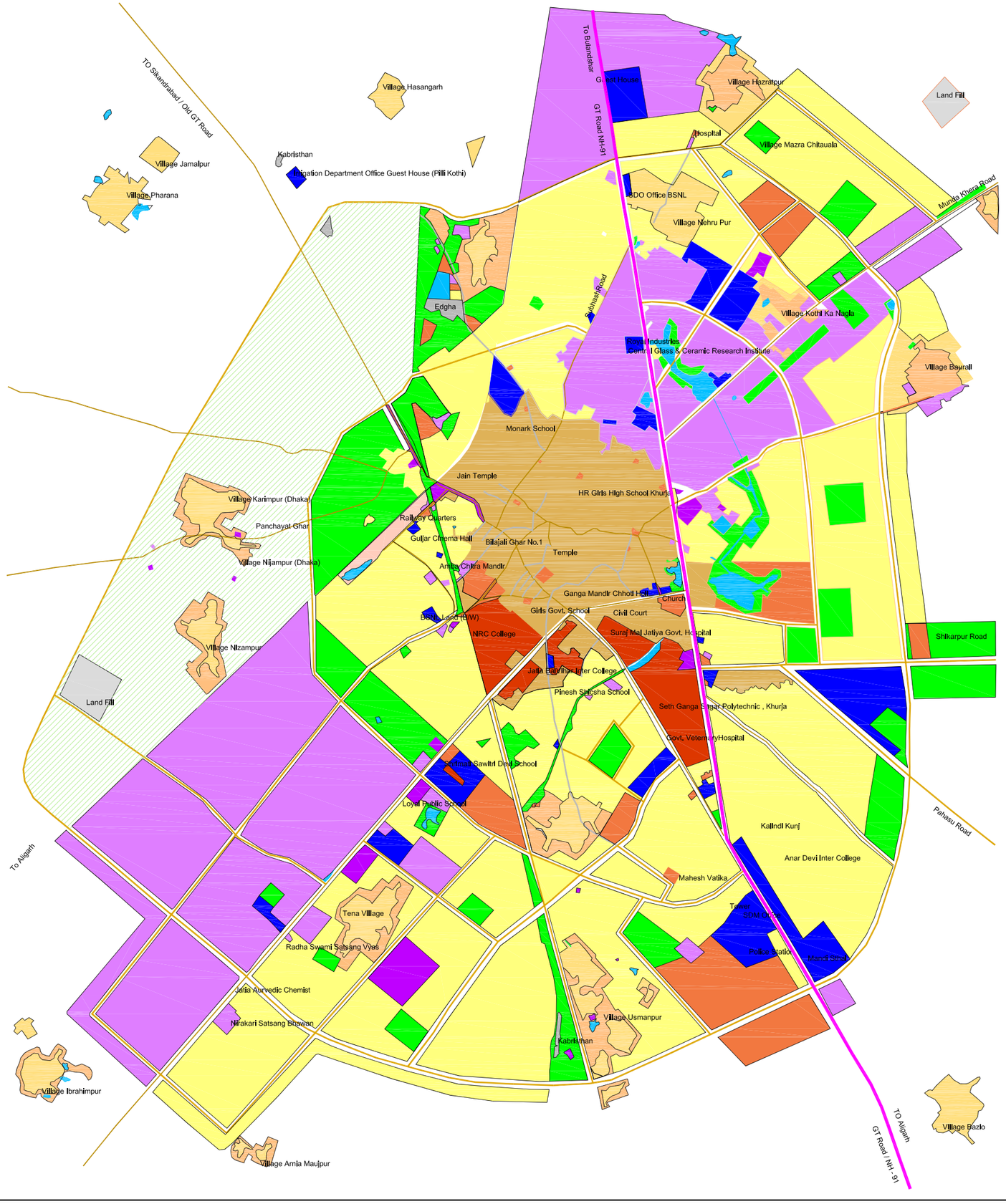
Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map II-6

Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Proposed Landuse



Legend

- Built up
- Residential
- Commercial
- Industries
- Office
- Community Facility
- Transportation
- Cremination Area
- Village
- Village Extn
- Park & Play Ground
- Agriculture
- Railway land
- River / Canal
- Major Road
- Minor Road
- National Highway
- Proposed Road
- Railway LIne

Client:

Asian Development Bank
National Capital Region Planning Board

Consultant

Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map II-7

F. Population Projection

29. Different prevalent methods such as Arithmetical Increase, Incremental Increase, Geometrical Increase, Graphical Method, etc. were used to project Khurja population. However, considering high growth proposed in National Capital Regional Plan, Geometrical Increase Method has been adopted to estimate future population as it resembles to the projections carried out in Regional Plan 2021.

The following **Table II-9** presents the population projection carried out for different years for Khurja town and also presented estimated population projected by different departments. The Geometrical Increase Method is considered for population projection. Based on the estimated population, the requirement of investment for environmental infrastructure is estimated.

The equation for the Geometrical Increase Method is,

Base year Population (Pt) = $P(1+rg)^t$

Where, P is population of the known year, t is no. of decades to be projected and rg is growth rate.

Table II-9: Population Projections for Khurja Town

Year	Population	Decadal Growth Rate %	Annual Growth Rate %
1991	80,305		
2001	98,403	22.79	2.07
2011	121,088	22.79	2.07
2016	134,180	22.79	2.07
2021	148,689	22.79	2.07
2026	164,766	22.79	2.07
2031	182,581	22.79	2.07
2036	202,323	22.79	2.07
2041	224,199	22.79	2.07

Source: Analysis

G. Service Adequacy and Issues

30. Preparation of Master Plan for landuse zoning/planning and development control regulations; its timely implementation and revision are the key factors for planned development and in regulating haphazard growth of any town. Since Khurja ULB has been covered under Uttar Pradesh Urban Planning and Development Act, 1973, the Master Plan for the Khurja town has prepared in 2005 and effective till 2021.

31. Khurja town is an important railway junction in Bulandshahr district and well connected with other parts of the country by roads. The town is well established with small scale industries and commercial hub for surrounding villages. The town is exporting ceramic products to the Capital City of India and many other parts of the country. The above activities are influencing the town growth. The key issues in growth management hence can be envisaged as:

(i) Densification of areas and wards along NH-91 towards Aligarh from Delhi;
(ii) Spill over of growth in Municipal boundary Limits;
(iii) Lack of housing layouts to guide planned development of the town;
(iv) Lack of housing layouts/areas demarcated for urban poor;
(v) Violation of zoning and building bylaws leading to haphazard development; and
(vii) Congested main roads due to encroachments.

H. City Physical Growth Goal and Future Strategies

32. The Environmental Infrastructure Plan has developed sectoral goals and strategies for town's physical growth, municipal and social infrastructure, urban governance and finance etc. which together will form a VISION for Khurja ULB for the year 2041.

Box 1: Town Physical Growth Goal
'Achieve Sustainable Urban Growth and Preserve Socio-economic and Socio-cultural Fabric of the Town'

Future Strategies

(i) Planned development of the town in line with the UP Urban Planning and Development Act, 1973
(ii) Integration of landuse planning with the Environmental Infrastructure Plans
(iii) Make awareness among the town people significance of plan development

III. URBAN ENVIRONMENTAL INFRASTRUCTURE IN NCR

A. Overview

33. The unprecedented growth of metropolitan cities in the country has become a source of serious concern to Government of India, on the one hand, and metro-city corporators, planners, demographers and social scientists, on the other. The Census 2001 reveals that the number of million-plus cities has almost tripled over the last three decades, jumping from a mere 12 in 1981 to 23 in 1991 and 35 in 2001. In this contest, the Govt. of India moved a legislation which would control and regulate development in the region and finally Parliament enacted the National Capital Region Planning Board Act in 1985 with the concurrence of the constituent States "*to provide for the constitution of a Planning Board for the preparation of a plan for the development of the National Capital Region and for coordinating and monitoring the implementation of such plan and for evolving harmonised policies for the control of land uses and development of infrastructure in the National Capital Region so as to avoid any haphazard development of that Region and for matters connected therewith or incidental thereto*".

1. Constituent Areas

34. The National Capital Region covers an area of 30,242 sq kms. The region includes the Delhi State and parts of the States of Haryana, Rajasthan and Uttar Pradesh. The Administrative units are as follows:

(i) Delhi State;
(ii) Haryana Sub-region comprising Faridabad, Gurgaon, Rohtak and Sonepat districts; Rewari tehsil of Mahendragarh district and Panipat tehsil of Karnal district;
(iii) Rajasthan Sub-region comprising six tehsils of Alwar district, namely, Alwar, Ramgarh, Behror, Mandawar, Kishangarh and Tijara; and
(iv) Uttar Pradesh Sub-region comprising three districts namely, Meerut, Ghaziabad and Bulandshahr.

B. Location and Hydrology

1. Location

35. The National Capital Region lies between 27o 03' and 29o 29' North latitude and 76o 07' and 78o 29' East longitude. The region includes the National Capital Territory of Delhi and parts of the States of Haryana, Rajasthan and Uttar Pradesh. The physiography of the region is characterised by the presence of the Ganga skirting it as its eastern boundary, the Yamuna traversing north-south forming the boundary between Uttar Pradesh and Haryana, and the sand dunes and barren low hills of the Aravalli chain and its outcrops in the west, flat topped prominent and precipitous hills of the Aravalli range enclosing fertile valleys and high table lands in the south-west, and the rolling plains dominated by rain-fed torrents in the south. The rest of the region is plain with a gentle slope of north-east to south and south-west.

2. Availability of Ground Water

36. The major rivers in NCR are the Ganga, the Yamuna, Hindon and Kali, which flows from north to south and a small part of Sahibi, which flows in the south-western part. Most of the NCR is also predominantly irrigated through well-developed canal network except Alwar and Gurgaon districts, which are irrigated by ground water.

37. Mostly the top water table zone and the deeper semi-confined aquifer have the same static water level surface because of their interconnections. The depth of water table below ground level varies in general between 5-20 metres. A number of ground water structures by way of open wells and shallow tube wells (60-70 metres deep) exist in this formation in different parts of NCR with varying degrees of discharge rates. On the whole, discharges around 2-3 cubic metres per hour and at times even less (down to one cubic metre) or more (upto 4-5 cubic metres), with an average of about 15-20 metres of the aquifer-zone are available.

38. The thickness of the alluvium and the proportion of clean granular zones in aggregate within the same are the two main criteria, which determine the availability of ground water in the alluvium. A major portion of NCR is covered by alluvium, which is fairly thick. It is more than 450 metres thick in some parts of Haryana in the upper Yamuna basin (Sonepat, Panipat, etc.). In general, the thickness increases as we proceed towards the northern and eastern areas of NCR away from the hard-rock outcrops, with modifications resulting from tectonics or the bedrock topography sub-surface. Depending upon the thickness of the alluvium, one or more aquifer zones have been identified in the alluvium. The occurrence of ground water sub-area wise, under water table and confined to semi-confined conditions has been described in the following paragraphs. Phreatic water surface is generally shallow, about 3 to 5 metres below ground level (m.b.g.l.). It could be even as low as one metre or so, in the newer alluvium along the present day flood plains or the low level terraces. Such shallow water levels may be encountered even in the older alluvium.

39. Deeper confined aquifers or medium deep semi-confined aquifers have their piezometric surfaces within about 20-25 m b.g.l. in general. Open wells, shallow tube wells, gravity wells and deep tube wells are abundant in the areas covered by the alluvium. Their discharges vary anywhere from 18 to 25 cubic metres per hour for about 2 to 3 metres draw downs in the open wells to about 162 per cubic metre per hour for about 8-12 metres draw downs in the deep tube wells tapping granular zones about 70-100 metres in aggregate thickness. As far as ground water quality is concerned, there are few fresh water pockets in the north-east and the south-east corners of NCR area, otherwise in these areas the Total Dissolved Solids (TDS) are more than the desirable limits and the other quality parameters are within the desirable range. The TDS, nitrate and fluorides are more than the desirable limits in the NCT-Delhi area and most parts of the north-west and south-west portions of NCR. However, in the central part of the north-west zone of NCR, fluorides are within the desirable limits.

C. Urban Demography in NCR Region

1. Population Distribution

40. The NCR comprises the entire NCT of Delhi, eight districts of Haryana, one district of Rajasthan and five districts of Uttar Pradesh with a population of over 371 lakhs in 2001. The Sub-regions of NCT-Delhi, Haryana, Rajasthan and Uttar Pradesh accommodated 37.33%, 23.42%, 8.07% and 31.19% of NCR's population respectively. The relative share of NCT-Delhi in the population of NCR has been steadily increasing during the last two decades, as seen in **Table III-1** and it reveals that during the past two decades, the urban share in NCR has registered a higher growth rate as compared to its rural counterpart. The urban share increased from 45.87% in 1981 to 50.23% in 1991 and 56.39% in 2001. However, in NCR excluding NCT-Delhi, the share of urban population in 1991 was only 29% and there has been practically very little increase during 1991-2001. Sub-region wise urban population growth during 1981-2001 was about 146%, 122%, 137% and 124% in Haryana, Rajasthan, Uttar Pradesh and NCT-Delhi respectively.

Table III-1: NCR Region population and its growth

Sub region / Year	**Population (Person)**			**Decadal Growth Rate (%)**		**Share of Population (%)**		
Year	**1981**	**1991**	**2001**	**1981-1991**	**1991-2001**	**1981**	**1991**	**2001**
NCT-Delhi	62,20,406	94,20,644	1,38,50,507	51.45	47.02	31.28	34.43	37.33
Haryana	49,38,541	66,43,604	86,87,050	34.53	30.76	24.84	24.28	23.42
Rajasthan	17,55,575	22,96,580	29,92,592	30.82	30.31	8.83	8.39	8.06
Uttar Pradesh	69,68,646	0,01,704	1,15,70,117	29.17	28.53	35.05	32.9	31.19
NCR	1,98,83,168	2,73,62,532	3,71,00,266	37.62	35.59	100	100	100

Source: NCRPB Regional Plan 2021

2. Density

41. The density of population in NCR including NCT-Delhi is 1,105 persons per sq km against the all India average of 324 persons per sq km in 2001, while excluding NCT-Delhi it is 724 persons per sq km. The Sub-region wise population density is shown in **Table III-2**.

Table III-2: Region wise Existing Population Density

Sub-region/ Year	Density (Person/sq km)	
	1981	2001
NCT-Delhi	4,192	9,340
Uttar Pradesh	642	1,066
Haryana	368	648
Rajasthan*	238	382
NCR	634	1,105

Source: NCRPB Regional Plan 2021

3. Population Projection

42. Total population of NCR is projected to be 641.38 lakhs by 2021, which is proposed to be accommodated within the region. Keeping in view the population assignment for NCT-Delhi additional expected population has been distributed proportionately amongst Haryana, Rajasthan and Uttar Pradesh Sub-regions. The assigned population for NCR is given in **Table III-3**.

Table III-3: Population Projection in NCR Region

		NCT-Delhi		Haryana		Rajasthan		Uttar Pradesh	
Year	NCR Total	Population	% to total	Population	% to total	Population	% to total	Population	% to total
		in lakhs		*in lakhs*		*in lakhs*		*in lakhs*	
2001	371	138.5	37.33	86.87	23.42	29.92	8.06	115.7	31.19
2021	641.38	225	35.08	163.5	25.49	49.38	7.7	203.5	31.73

Source: NCRPB Regional Plan 2021

D. Environmental Infrastructure in NCR Region: Water Supply

1. Water Supply Existing

43. As per the available data during preparation of NCR Regional Plan 2001, it is estimated that an average water availability of 225 lpcd in Delhi, in urban centres of Haryana Sub-region ranges from 45 lpcd in Ganaur to 145 lpcd in Panipat, 35 lpcd in Shahjahanpur to 98 lpcd in Alwar in Rajasthan Sub-region and 28 lpcd in Phalauda to 142 lpcd in Meerut in Uttar Pradesh Sub-region. Per capita availability of water in most of the urban centres has dwindled over the last decade due to rapid urbanisation and lack of financial resources for augmentation.

44. The status in rural areas presented a dismal picture since not enough database was available to exactly determine the position of water supply in these areas. Moreover, many villages did not have local sources of water and almost equal numbers did not have adequate sources.

2. Issues regarding water supply

45. *Lack of Regional Planning Approach:* Towns/Cities have so far been planned by their respective authorities for their individual needs. There has been total lack of regional approach for sustainable use of available water and its conveyance from areas of plenty to scarcity. The raw water augmentation should not be territory specific but it should be region wise irrespective of State boundaries.

46. *Dependence on Outside Sources:* In order to meet the raw water requirement of NCR, the major sources have been through inter- state allocations of the Yamuna water, Ganga water and, in future, through storage dams to be developed in Himachal Pradesh and Uttaranchal. However, so far these water storage reservoirs/dams have been considered as source only for Delhi and not for other parts of the region. Further, there has been lack of emphasis on planning and development of ground water sources including recharge of ground water through rainwater harvesting and schemes to harness the sources/potential of water in NCR which are necessary for sustainable development.

47. *Unaccounted for Water (UFW):* There are significantly high losses at different stages of water supply system ranging from 30% to 50% in conveyance and distribution system apart from treatment plants including pilferages. These need to be capped to 15%.

48. *Dependence on Plan Funds:* State Governments and their local bodies operating and maintaining the water supply schemes are totally dependent on plan funds. There is a wide gap between revenue and expenditure of the local bodies. Characteristics like ineffective billing, poor collection of revenue and operation and maintenance inefficiencies etc. attribute to bad financial health of the local bodies. There is need to introduce efficiency of services i.e., efficiency in cost recovery and demand management through telescopic pricing in order to improve the revenue generation.

49. *Regional Plan-2001: Norms and Standards:* The drinking water supply norms proposed in Regional Plan-2001 and Master Plan for Delhi-2001 could not be met because neither adequate financial resources were allocated to meet their requirement nor physical efforts to tie up the water resources management had been undertaken.

50. *Depletion of Ground Water:* Ground water is depleting at a very fast pace in the region and the quality of ground water is also deteriorating due to over exploitation and contamination. Historical water bodies/ponds are being neglected or encroached upon.

3. Norms and Standards

51. Minimum norms and standards should be adopted for drinking water supply in the region as follows: The norms for urban settlements are presented in **Table III-4** .

Table III-4: Norms for Urban Settlements

Towns/Cities	**Recommended Water Supply**
	Lpcd
NCT-Delhi	225
Population one lakh and above	200
Population below one lakh	135

Note: This includes demand for commercial areas and floating population.
Source: NCR Regional Plan – 2021

52. *Rural Settlements:* A minimum of 70 lpcd including a supply of 30 lpcd for cattle is proposed. If independent connections are proposed to be given, a minimum rate of 100 lpcd of water supply has been advised. Spot sources may supply a minimum of 40 lpcd, which can supplement the piped supply. In rural areas, where water is provided through public standposts, 40 lpcd should be considered. In urban villages rate of water supply should be similar to the town with which it is surrounded.

53. Unaccounted for water should be limited to 15%.

54. The bulk requirement of institutional establishment should be assessed separately with proper justification.

55. Fire fighting requirement should be added to this as per norms in the CPHEEO water supply Manual.

4. Demand of Water Supply in NCR Region

56. Total tentative projected drinking water supply demand for the region in the year 2021 is 11,984 mld (11.984 MCM/day or 4,374 MCM/annum), which includes 5,822 mld demand for Delhi also. An equivalent demand has to be considered for industrial use. Therefore, integrated Regional Plan to augment water should be done for about 23,968 mld of water. The future demand for drinking water is illustrated in **Table III-5**.

Table III-5: Demand for Drinking Water in NCR Region

Sub-region	**Drinking Water Requirement (mld)**	
	2001	*2021*
Haryana	1,046	2,412
Rajasthan	266	664
Uttar Pradesh	1,433	3,086
NCT-Delhi	3,584	5,822
Total	6,329	11,984
	6.329 MCM/day	11.984 MCM/day
	2310. 07 MCM/annum	4374.27 MCM/annum

Source: NCR Regional Plan – 2021

5. Water Supply Investment Plan

57. Total water requirement in the region would be 11,984 mld by the year 2021. Accordingly, there will be need to produce additional water and to strengthen/expand the water supply distribution system in the region. Total investment required for the production / augmentation of water would be about Rs.5,992.15 crores by the year 2021 and for strengthening/expansion of distribution system/network, it would be about Rs.7,190.57 crores. This cost does not include the cost of conveying water from long distances through canals/pipes. Sub-region wise fund requirement for the region has been given in the following **Table III-6**.

Table III-6: Proposed Investment for Water Supply Sector in NCR Region

Sub-region	Distribution Network	Production of Water	Total
	(@ Rs. 0.60 crores per mld)	*(@Rs. 0.50 crores per mld)*	*Rs in Crore*
Haryana	1,447.21	1,206.01	2,653.22
Rajasthan	398.24	331.87	730.11
Uttar Pradesh	1,851.99	1,543.33	3,395.32
NCT-Delhi	3,493.13	2,910.94	6,404.06
Total	**7,190.57**	**5,992.15**	**13,182.72**

Source: NCR Regional Plan – 2021

E. Environmental Infrastructure in NCR Region: Sewerage

1. Sewerage Existing Situation

58. At present barring Delhi, where 80% population is covered under sewerage and 1,500 mld of waste water is being treated, the sewerage cover ranges from 30 to 70% in U.P. and 60% to 80% in Haryana in the DMA (now CNCR) towns only. Among the CNCR towns, treatment facilities are available in Faridabad, Gurgaon, Ghaziabad and NOIDA. No sewerage treatment facility is available in any of the priority towns of U.P. Sub-region or Rajasthan Sub-region. Coverage of sewerage system in various priority towns ranges from 40.0% to 70.0% in Haryana, 3.0% to 5.0 % in Rajasthan and 0.0% to 30% in Uttar Pradesh. Not enough database is available to determine the position of sanitation in rural areas. However, the overall picture is dismal. High incidence of water borne diseases in NCR is indicative of the poor state of sanitation in the region.

2. Issues

The major issues are regarding sewerage is as follows:

(i) System Drawbacks and Lack of Coverage;
(ii) Lack of Operation & Maintenance and Management Effort;
(iii) Lack of Waste Minimization and Recycling/Reuse; and
(iv) Population living in marginal settlements and slum areas lack coverage.

3. Norms and Standards

59. As per the CPHEEO norms, towns within NCR, which do not have sufficient resources or have unsuitable terrain to provide proper sewerage system and treatment facilities, may initially be provided with low cost sanitation systems which can be upgraded in the later stages within the time frame of this Plan.

4. Investment Plan

60. Total estimated sewage generation in the urban areas of the region is estimated to be 6,935 mld by the year 2021. Accordingly, there will be need to strengthen/expand the sewerage system and its treatment capacities. Total investment required for laying of sewerage system would be Rs.3,467.47 crores by the year 2021 and for treatment of waste water, the

investment would amount to Rs.4,854.46 crores. Sub-region wise and Plan wise fund requirement for the region has been given in the following **Table III-7**.

Table III-7: Proposed Investment for Sewerage Sector in NCR Region

Sub-region	Sewerage System	Sewage Treatment Plant	Total
	(@ Rs. 0.50 crores per mld)	*(@ Rs. 0.70 crores per mld)*	*Rs in Crore*
Haryana	561.49	786.08	1,347.57
Rajasthan	140.8	197.13	337.93
Uttar Pradesh	740.18	1,036.25	1,776.43
NCT-Delhi	2,025.00	2,835.00	4,860.00
Total	**3,467.47**	**4,854.46**	**8,321.93**

Source: NCR Regional Plan – 2021

F. Environmental Infrastructure in NCR Region: Solid Waste Management

1. Existing Situation SWM

61. None of the towns in the region are disposing of solid waste in environmental friendly manner. The landfill sites are not lined to protect the ground water from leachate percolating into it. No other disposal system has been adopted by the local bodies.

62. As per estimates, at present 13,499 MT/day of garbage was being generated in the year 2001 in the region, of which about 1,540 MT/day was being generated from Haryana Sub-region, 201 MT/day was being generated from Rajasthan Sub-region and 2,270 MT/day was being generated from U.P. Sub-region and remaining from the NCT-Delhi Sub-region. Total garbage generation in the region is likely to be about 27,236 MT/day by the year 2021 and handling of this kind of waste will need special efforts and funds. Sub-region wise details have been given in **Table III-8**.

Table III-8: Generation of Garbage in NCR Region

Sub-region	Garbage Generation	
	2001	**2021**
	(in MT/day)	
NCT-Delhi	9,488	15,413
Haryana	1,540	4,569
Rajasthan	201	1,116
Uttar Pradesh	2,270	6,138
Total	**13,499**	**27,236**

Source: NCR Regional Plan – 2021

2. Issues in SWM

The major issues are regarding sewerage is as follows:

(i) Lack of Knowledge of the Local Bodies regarding Solid Waste Management
(ii) Non-availability of suitable Land for Solid Waste Disposal in Environmental Friendly Manner
(iii) Lack of Public Awareness
(iv) Non-Availability of Funds

(v) Piecemeal Approach for Handling of Solid Waste
(vi) Dependence on Departmental Staff causing Labor Related Problems
(vii) Lack of coverage
(viii) Poor collection system especially in the narrow and circuitous lanes, making the collection more difficult
(ix) Mixed variety of organic and inorganic solid waste
(x) Non-involvement of NGOs/informal sector and private agencies.
(xi) Unsanitary conditions in and around community bins.
(xii) Handling of specialized wastes
(xiii) Shortage of vehicles
xiv) Shortcomings at landfill sites
(xv) Organizational inadequacies
(xvi) Shortage of equipment and committed supervisory staff
(xvii) Financial stringency

3. Norms and Standards

63. Norms and standards provided in the CPHEEO Manual for solid waste management which provides guidelines for collection, transfer, transport and disposal of solid waste in environmental friendly manner should be followed. This also provides the directions for handling of medical and hazardous wastes. In this regard, the notification of the Ministry of Environment and Forests under the Environmental Protection Act, 1986 should also be followed.

4. Investment Plan

64. Total solid waste generation in the urban areas of the region would be about 27,236 MT/day by the year 2021 and accordingly, there will be need to develop appropriate system for collection, transportation and disposal of solid waste in environmental friendly manner either through properly designed sanitary land filling or through other treatment methods. Total investment required for this would be about Rs.1,361.81 crores up to the year 2021. However, Sub-region wise and Plan wise fund requirement for the region has been given in the following **Table III-9**.

Table III-9: Proposed Investment for Solid Waste Management in NCR Region

Sub-region	**Requirement**
	(Rs. in Crores) @ Rs. 0.05 crores per MT
Haryana	228.46
Rajasthan	55.8
Uttar Pradesh	306.92
NCT-Delhi	770.63
Total	**1,361.81**

Source: NCR Regional Plan – 2021

G. Environmental Infrastructure in NCR Region: Drainage

1. Existing Situation and issues

65. Studies have revealed that there is lack of integrated planning in the drainage for storm water which is not local but has got regional bearing covering areas in Haryana, Rajasthan, U.P. and NCT-Delhi Subregions. Untreated sewage continues to flow in most of the drains in the region and ultimately falls into the rivers Ganga and Yamuna. Encroachment by slum dwellers along the drains causes choking of drains and flooding in the upstream areas due to reduced carrying capacity. Major issues are related to storm water drainage system is (i) Lack of regional approach and (ii) Lack of funds

2. Norms and Standards

66. The urban drainage system may be designed for maximum rainfall of five years frequency storm for internal as well as peripheral drains and ten years frequency storm for the main drains. The likely time of concentration for each case may be worked out and corresponding storm values adopted. Usually the system is designed for a maximum rainfall of one-hour duration.

67. The rural drainage system may be designed for three days rainfall of five years frequency to be drained in three days. An appropriate area dispersal factor should be adopted for computing the run off.

68. The coefficient of runoff may be calculated for areas with composite land use pattern on the basis of anticipated land use in the new areas and existing land use pattern for the areas already developed.

69. Where it is not possible to work out the run off coefficient due to land use policies not indicated, run off coefficient not less than 0.2 may be adopted for rural areas with flat to moderate slopes and 0.4 for steeper slopes. For urban area, run off coefficient not less than 0.6 may be adopted in absence of adequate details of the areas.

3. Investment Plan

70. Investment requirement in this sector will depend upon the District Level drainage Master Plans to be prepared by the respective State Governments and the Integrated Regional Drainage Plan, therefore, Investment Plan cannot be proposed in the Regional Plan.

H. Summary of Environmental Infrastructure investment in NCR Region

The total proposed investment is required for environmental infrastructure except storm water drainage is Rs. 22,866 crores till 2021 in NCR region. The summary of investment is presented in **Table III-10**.

Table III-10: Summary of Proposed Investment in NCR Region except SWD

Item	2021 Investment
	Rs in crores
Water Supply	13,182.72
Sewerage	8,321.93
Solid Waste Management	1,361.81
Total	**22,866.46**

Source: NCR Regional Plan – 2021

IV. KHURJA WATER SUPPLY SYSTEM

A. Overview

71. In Uttar Pradesh State, while Uttar Pradesh Jal Nigam (UPJN) is responsible for the creating capital assets of water supply and sewerage infrastructure, the respective ULBs are responsible for operation and maintenance in their jurisdictions. In Khurja, the ULB provides basic urban services like water supply, wastewater, storm water drainage and solid waste management. This section presents the assessment of existing situation of water supply service, which will set goals to be achieved as a part of Khurja Vision 2041 and identify prospective interventions required to achieve the sector goals.

1. Service Delivery

72. *Water Abstraction*. In vicinity of Khurja municipality there is no surface water source, which can serve drinking water to the town. Hence the municipality is depending on ground water source.

73. At present, ground water is available in sufficient quantity for domestic purposes at around 91.5 mt depth throughout the year. The quality of ground water in and around Khurja is good enough for human consumption according to ULB officials. There is no studies are available on ground water potential and quality of water. Due to unavailability of surface water surrounding areas of Khurja town, the ground water is the source for water supply.

74. Currently, the municipality is having seven tube wells in which six tube wells are functioning. The municipality is extracting water about 7.2 MLD and supplying to the town. The average yield of each tube well is 1.03 ML per day and each tube well operates 5-7 hours per day. The tube wells are fitted with vertical turbines pumps with a capacity of 30 to 60 HP as shown in adjacent picture. As per the 2001 census population the municipality is supplying water at a rate of 73 lpcd to the town. The locations of tube wells are illustrated in **Table IV-1**.

Table IV-1: Tube well Locations in Khurja

Sl. No.	Location of Tube wells	Total (No)	Yield(ML)
1	Madar Darwaza	1	1.03
2	Ahirpura	1	1.03
3	City Station	1	1.03
4	Tilak park	1	1.03
5	Nagar Palika office	1	1.03
6	Jatiya Hospital (not functioning)	1	1.03
7	Punjabiyan	1	1.03
	Total	**7**	**7.30**

Source: Khurja Nagar Palika

75. *Water Treatment*. The raw water is being extracting from ground, hence the raw water may not require treatment. Water is disinfected before the supply. The ULB is having a setup of 100 liters capacity of chlorination tanks at every tube well. The discharge of liquid chlorine tank is connected to the raw water main, which releases at the rate of 0.5 ppm. There is no monitoring system with the Municipality to measure the residual chlorine at the consumer end.

76. *Storage*. Khurja has 33 percent of storage capacity over daily supply of water. As per the CPHEEO norms 33 percent of storage capacity against total supply of water should require. Khurja has a total storage capacity of 2.43 ML comprising three elevated storage reservoirs (Over Head Tanks). In some areas, distribution is being carried out directly from tube wells. This incurs heavy losses of water in distribution system and uneven pressure fluctuations during supply. The details and locations of Over Head Reservoirs are shown in **Table IV-2**.

Table IV-2: Details of Over Head Tanks

Sl. No	Location	OHSR	Storage Capacity (ML)
		Number	*ML*
1	Madar Darwaza	1	1.20
2	Sarai Shaik Aalam	1	0.61
3	Post Office	1	0.61
	Total	**3**	**2.43**

Source: Khurja Nagar Palika

77. *Distribution System*. The total length of existing water distribution network in Khurja Town is around 30 km, which includes transmission mains, feeder mails and distribution mains. The existing distribution system covers 26.5 percent of road length. The rest of uncovered areas are depending on their own system of bore wells and public hand pumps. The material used for pipe diameter 200 mm and below was CI material. The diameter and pipe material is shown in the **Table IV-3** diameter wise length details are not available.

Table IV-3: Diameter and material details in Khurja town

Sl. No.	Diameter	Material
	mm	
1	90 mm	C.I Pipes
2	110 mm	C.I Pipes
3	140 mm	C.I Pipes
4	160 mm	C.I Pipes
5	200 mm	C.I Pipes

Source: Khurja Nagar Palika

78. *Service Connections*. Khurja Nagar Palika delivers water to the civic through service connections and public stand posts. The existing water supply service connections are covered only 37 percent of total property tax assessments in the Town. There is no metered connection in the town, hence there is no proper measurement of quantity extraction of water and distribution. There are 4,500 domestic connections and 1,500 are non domestic connections existing in the town. Only seven stand posts are serving to slum dwellers and economically weaker sections. Based on rough estimation the Municipality is supplying potable water to 35 percent of Khurja population. Remaining population are depending on hand pumps and own arrangements. Apart from piped water supply municipality provided 160 hand pumps across the town.

The connection details are illustrated in **Table IV-4**.

Table IV-4: Domestic and Non Domestic connection details

Mode of Delivery	Numbers
Domestic water service connections	4,500
Non-Domestic water service connections	1,500
Total	6,000
Number of Households as per 2001	13,433
Stand Posts	7
Hand Pumps	160

Source: Khurja Nagar Palika

79. *Water Charges*. Municipality is charging flat rate to the consumers as given in **Table IV-5** At present Nagarpalika is charging a monthly charge of Rs. 20 for domestic and Rs. 40 for non domestic connections. Khurja Nagar Palika collects one time connection deposit Rs. 240 for domestic and Rs. 800 for non domestic connections.

Table IV-5: Water Supply Connection Fee and Deposit

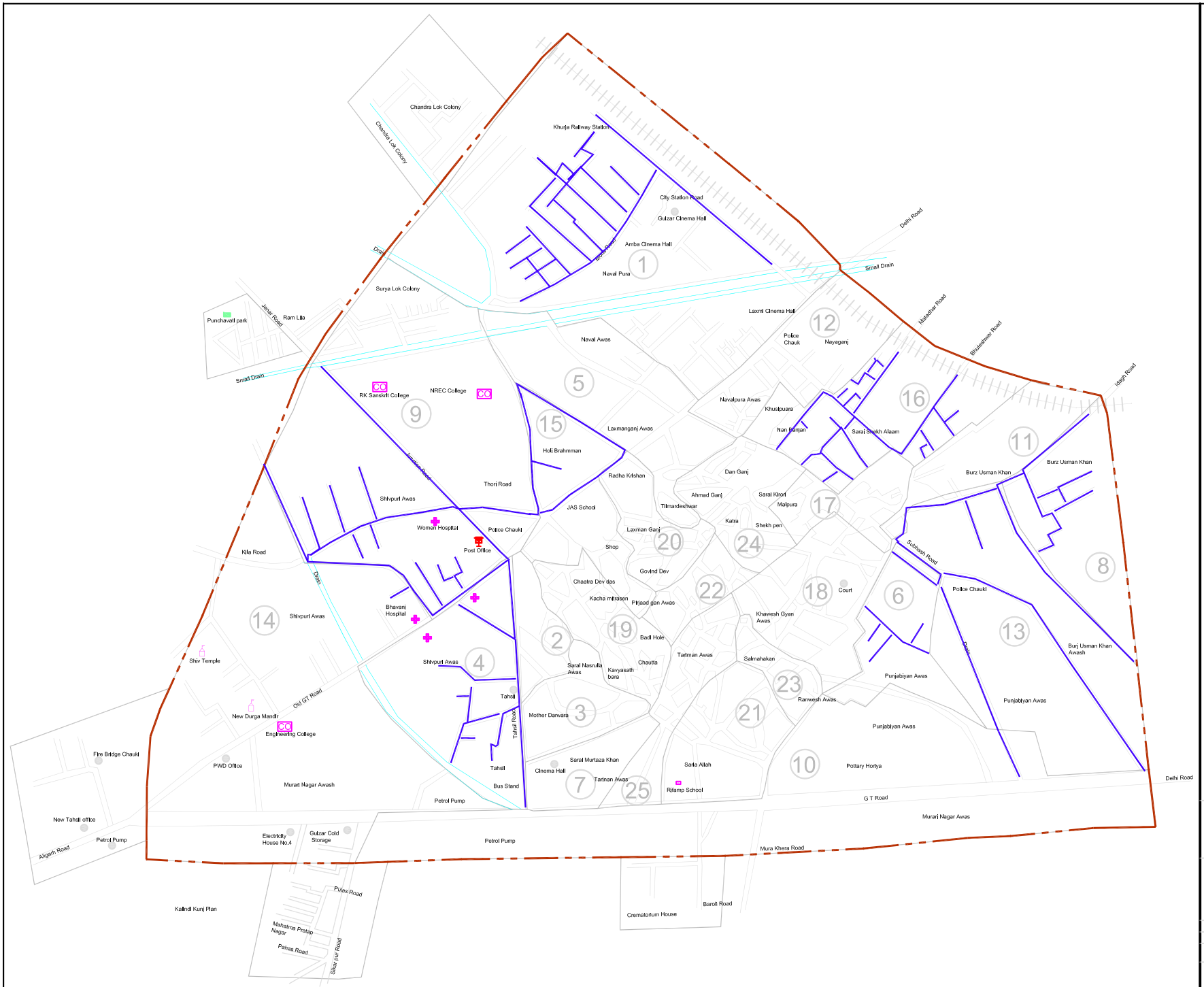
Type of Connection	Monthly Tariff	Connection Deposit
	Per Month in Rs.	*Rs.*
Domestic	20.00	240.00
Non-domestic/commercial	40.00	800.00

Source: Khurja Nagar Palika

80. UIDSSMT *Water Supply Project:* As the town has been growing rapidly both in area and population the existing water supply system has become inadequate with respect to the available quantity of water from the existing tube wells, storage capacity as well as the distribution system. The existing pipeline network is also to be strengthened taking into consideration the increase in population density of Khurja town. Some new areas are developed periphery of the town, which are yet to be supplied with potable water.

81. Thus, there is urgent need to extend, revamp and reorganize the entire water supply arrangement to mitigate the requirement of adequate, safe and potable water supply to the inhabitants of Khurja town. Considering this, UP Jal Nigam has proposed a new water supply scheme under UIDSSMT with an estimated cost of 124.4 million, which covers most of the un served area of the town. At present this project is under implementation by Jal Nigam and it likely to complete by end of 2011.

82. In UIDSSMT water supply scheme, there are new two OHRs and nine TWs (Tube Wells) are proposed under this scheme. The pumping mains from the tube wells are connected to the proposed OHTs across the town. Key features of proposed scheme are given in **Table IV-7.**



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Existing Water Supply System in Khurja

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Drain
- Existing Water Supply Line

Client:

Asian Development Bank
National Capital Region Planning Board

Consultant

Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map IV-1

Table IV-6: Proposed Comprehensive Water Supply Scheme

Third Water Supply Scheme	Details
Commissioning Agency	UP Jal Nigam
Design Period and Year	25 years from 2009-2034
Design Population	1.84 Lakhs in 2034
Design Demand	22.1 MLD in 2034
Design rate of Supply as per CPHEEO	135 lpcd and extra 15% for unaccounted water, 80.5 lpcd for public stand posts
Distribution Network	45 km in uncovered and rehabilitation areas.
No. of Tube Wells	9
No. of OHSRs	2

Source: Khurja Nagar Palika

83. Details of various infrastructure components being developed under the UIDSSMT water supply scheme in Khurja are presented below:

84. *Source:* Under this scheme 9 new tube wells are proposed for extraction of water. With a size of 350 X 200 mm diameter and 400 ft deep, each tube well is design for a discharge of 2000 lpm. The total water to be abstracted from 9 tube wells will be 22.1 MLD in addition to existing extraction of water. The details of tube wells proposed in **Table IV-7**.

85. *Pumping Plants and Chlorination:* The proposed 9 tube wells will be fitted with submersible pumps having 20/40 HP capacity at a depth of 25/50 meter head. These submersible pumps are proposed to work for 16 hours per day. At each tube well one room pump house is proposed, which will contain one chlorination tank. This system will operate during pumping and maintains 0.5 ppm residual chlorine in the raw water. The extracted chlorinated water will be pumped to the various OHTs for further supply into distribution network. Each pumping house has tow centrifugal pumps (one stand by) having capacity of 115/75/60 HP. The details of tube wells, type of pumps and its capacities are illustrated in **Table IV-7**.

Table IV-7: Proposed Tube wells, type of pumps and its capacity etc.

Location	Tube Wells	Type of Pumps	HP	Discharge (LPM)	Head (m)
Old GT Road	1	Submersible	20	2000	25
SS Ram J Hospital	1	Submersible	40	2000	50
PWD Office	1	Submersible	40	2000	50
Tehsil, Ward No.4	1	Submersible	40	2000	50
Ranwesh Avaas	1	Submersible	40	2000	50
Punjabiyan Avaas	2	Submersible	40	2000	50
Burz Usman Khan	1	Submersible	20	2000	25
Edgah Road	1	Submersible	20	2000	25

Source: Khurja Nagar Palika

86. *Storage Capacity.* Under this water supply scheme, there are additional two Over Head Tanks are proposed. At present the municipality is having 2.43 ML storage capacity and it will be enhanced to 6.9 ML. The scheme estimated ultimate demand of water supply in 2036 is 38.04 MLD, as per the norms 33 percent of storage capacity is sufficient for effective distribution. It works out to 12.6 ML storage capacity required as per the norm, hence the ULB has to develop 5.7 ML storage capacity in future.

The location wise storage capacity of proposed OHT are shown in **Table IV-8**.

Table IV-8: Details location wise storage capacities

Sl. No.	Location	Existing OHT	Proposed OHT	Total Storage Capacity
		KL	*KL*	*KL*
1.	Madar Darwaza	1,200		1,200
2.	Sarai Shaik Aalam	614		614
3.	Post Office	614		614
4.	Khurja Nagar Palika Office		2,250	2,250
5.	Industrial Area		2,250	2,250
	Total	**2,428**	**4,500**	**6,928**

Source: Khurja Nagar Palika.

87. *Feeder Mails and Distribution Network:* The designed diameter for feeder mains and distribution mains are varying from 400 to 110 mm. Total proposed length of distribution network is 45 km, which covers mostly uncovered areas. As per the requirement, municipality laid distribution network in adhoc basis. The proposed distribution network details are not available with ULB.

88. The suitable provision for sluice valves, scour valves, air valves, fire hydrants and vandal proof single tap stand posts has also been provided. Sufficient provision for road cutting and reinstatement of the same, interconnecting the proposed distribution lines with the existing distribution system at various locations, disconnecting the distribution system to segregate the zonal distribution network etc. has also been made.

89. The scheme was prepared by Jal Nigam under UIDSSMT and it is under implementation. By end of 2011 all the works proposed under the scheme will be completed. The Khurja municipality is getting 70 percent of capital cost from Central Govt, 20 percent cost from State Govt. as grant and municipality is contributing 10 percent of total capital cost of the project. The details of fund allocation are shown in **Table IV-9**

Table IV-9: Fund Contribution for UIDSSMT water supply project

Sl. No.	Institution	Share	Contribution
		Rs in millions	*%*
1	Government of India (Grant)	87.08	70
2	Government of Uttar Pradesh (Grant)	24.88	20
3	Urban Local Body (Own Contribution)	12.44	10
	Total	**124.4**	**100**

Source: UIDSSMT Water Supply Report

2. Existing Situation in Villages

90. There are six villages falling within the boundary of existing master plan. Out of six villages only one village (Nehrupur village) at present has piped water supply and rest of five villages depend on hand pumps. In Nehrupur village water is extracted from a tube well and pumped to a two lakh liter capacity OHT and distributed to the village people. Ninety percent of the village area is covered with piped water supply. There are around 50 domestic connections are existing out of 445 households. Remaining households are depending on public stand post and government hand pumps.

B. Service Adequacy

91. *Source Augmentation.* Khurja Municipality is responsible for day-to-day operation and maintenance of water supply system. Piped water supply system was expanded as per the requirements. Only 26.5 percent areas covered as per the road length with water supply, 29 percent coverage as property tax assessments, and present rate of water supply in the town is about 73 lpcd as per 2001 census populations which is less than normal design rate of supply 135 lpcd. It is estimated that total demand at design stage will be around 29.3 MLD at 2034, hence there is need to augmentation of source to 22.1 MLD, which is proposed in UIDSSMT water supply DPR. This scheme is under execution.

The design period for the CLEIP is 2041 and this project covers entire Master Plan of Khurja Town. The demand and gap worked out for entire Master Plan area including villages. There is need of water augmentation immediately in the villages and phase wise augmentation is require in the Master Plan area. The demand and gap is shown in **Table IV-10**.

Table IV-10: Demand and Gap Analysis in Khurja Water Supply

Year	Population		Supply	Supply	Demand	Gap
	Jal Nigam	WSA Estimate	At Present	Augmentation UIDSSMT Scheme	Mld	Mld
2034	1,84,481		7.3	22.10	**38.04	**9.47#
2041		2,59,205	7.3	22.10	41.85	13.28#

** Estimated year 2036 as per projected population
#Gap including village demand

92. The major issues regarding water supply sector is listed as below:

(i) *Water Losses.* Groundwater is abstracted from 6 tube wells. Out of six tube wells three tube wells are pumping to the OHTs. The other three tube wells directly connected with distribution system. These tube wells are away from the OHTs and near low pressure areas, hence the ULB connected clear water mains into the direct distribution system. This practice causes for more water losses. No arrangement has been made to predict unaccounted for water in Khurja Town.

(ii) *Chlorine Measurement.* There is no equipment with the Municipality to measure the residual chlorine at clear water stage and end user point.

(iii) *Power Shortage.* Due to the power fluctuations and regular power cuts, sometimes the ULB is unable to extract the water as required.

(iv) *Lack of Technical Staff.* There is no technically sound staff available with ULB to attended the day to day operations effectively.

(v) Very less involvement of ULB staff with UP Jal Nigam in execution of water supply capital assets.

(vi) Except one village there is no safe drinking water supply mechanism.
(vii) There are no measures to improve ground water table by ULB, though the Municipality depending on ground water as source.

C. Water Supply Indicators

100. Table below provides an assessment of key water supply indicators:

Table IV-11: Water Supply – Service Level Indicators in Khurja town

Service Indicators	Unit	Value	Value after UIDSSMT Scheme	Norms
Daily per capita supply (gross) as per 2001 Census Population	Litres	73	135	135-150
WSCs as percentage of properties	Percent	37	80	80-90
Population Covered under Safe Drinking Water	Percent	35	67	100
Supply Duration	Hrs/daily	2	3	24
Roads covered by Distribution Network	Percent	26.5	67	80-90
Total Storage Capacity to present supply	Percent	13	23	33-50

Source: Analysis.

1. Water Supply Sector Goal and Future Strategies

Box 2: Water Supply Sector Goal
'Provide Safe and Reliable Drinking Water to all Citizens of Khurja ULB'

Future Strategies

(i) Water is accessible to all citizens, everyday
(ii) The quality and quantity of water available to citizens conforms to the Central Public Health and Environmental Engineering Organization (CPHEEO) standards.
(iii) Full cost of water service is achieved by the year 2041.
(iv) Improve ground water table by construction of rain water harvesting structures
(v) Minimize water leakages and un accounted for water

V. SEWERAGE AND SANITATION

A. Overview

101. There is no sewerage system in the town at present. The wastewater coming from the households were disposed into the road side drains. The town population largely depend upon individual toilets for their domestic wastewater disposal. The households are disposing the sullage into open drains. Due to less coverage of drains and lack of maintenance, the drains are chocked and overflowing. There is an immediate necessity in providing sewerage system in the town. The line departments are not prepared DPR for sewerage system in Khurja.

B. Existing Sanitation Facilities

1. Household Latrines

102. There are total 13,433 households in Khurja Nagar Palika, in which around 12,090 of households are having individual sanitation facilities. There are around 90 percent of the HH having safe sanitation facilities and rest of the population depending on public toilets. Most of the slum dwellers and BPL families are not having individual safe sanitation facilities.

2. Public Latrines

103. Khurja Nagar Palika has constructed two public conveniences at bus stand area and another near Gajita hospital on Mandir road, with a total capacity of 12 seats. However, due to lack of maintenance of these public conveniences are in dilapidated condition. The existing sanitation facilities are shown in

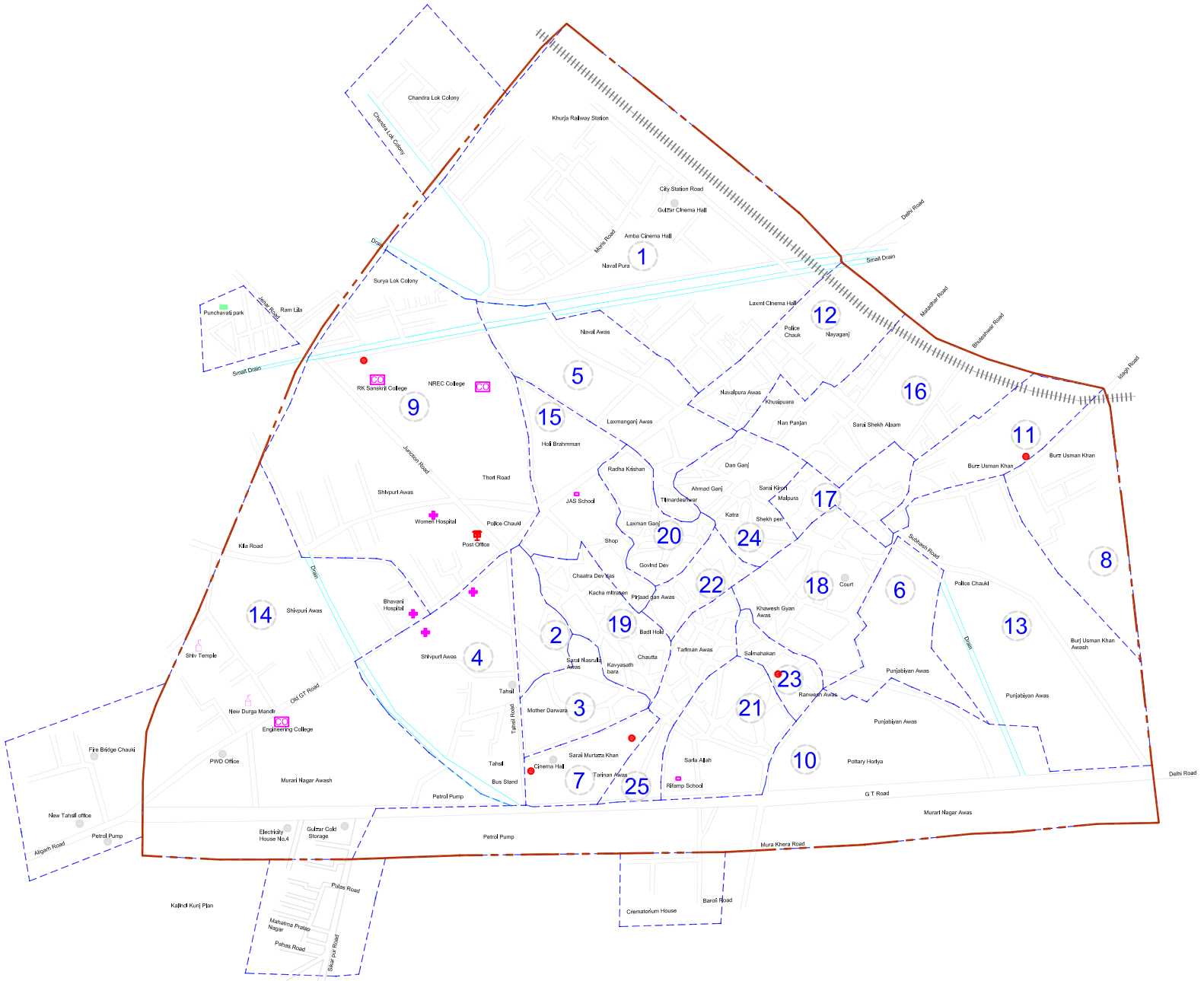
1. Existing situation in surrounding villages

104. At present, surrounding villages are not having 100 percent safe sanitation system. Based on discussions and secondary data there are around 75 percent of households are having safe sanitation facilities. Rest of the villagers are having practices of open defecation, which causes for unhygienic conditions. The details of sanitation facilities are illustrated in **Table V-1**.

Table V-1: Existing situation of Sanitation in villages Khurja Master Plan area

Sl. No	Name of the Village	Total HH (~)	HH having LCS(~)	% of safe sanitation
1	Hazratpur	417	313	75
2	Barauli	1320	990	75
3	Usmanpur	542	407	75
4	Kothi ka Nagla	305	229	75
5	Nehrupur	534	400	75
6	Tena	644	483	75
	Total	**3,762**	**2,822**	**75**

Source: Secondary and Primary data



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Khurja Nagar Palika's Jurisdiction

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Legend

Client:
Aslan Development Bank
National Capital Region Planning Board

Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map II-2

2. Service Adequacy and Issues

105. There is no sewerage system in the Khurja town. Due to lack of sewerage system, most of the open drains are blocked at a few places are overflowing. All the storm water drains are in the town carrying sullage and sewage together.

106. Poor Maintenance of Public Latrines. The existing public latrines are very poorly maintained. Public latrines in Khurja Nagar Palika lack the basic facilities like water supply or safe disposal of the waste.

107. Absence of Safe Disposal System. The town does not have UGD system. In addition, due to dearth in sanitary units a majority of the population having own septic tanks and remaining practices open defecation and sullage and night soil is disposed into roadside/storm water drains. This has resulted in to roadside/storm water drains leading to nuisance related health and hygiene implications.

108. Absence of Safe Disposal System in villages. Surrounding six villages are not having 100 percent safe sanitation facilities. Only 75 percent of HH are having LCS system and remaining villagers are having practices of open defecation. This practice leading to nuisance related health and hygiene implications.

3. Wastewater Indicators

109. **Table V-2** below provide an assessment of key water supply indicators:

Table V-2: Indicators for Sewerage and Sanitation

Service Indicators	Unit	Value
Households with Septic Tank	Nos.	~12,090
Percentage of Population covered	Percent	90
LCS in villages	Percent	75
Septic Tank to Property Tax Assessments	Percent	97

Source: Analysis.

4. Sewerage and Sanitation Sector Goal and Future Strategies

Box 3: Sewerage and Sanitation Sector Goal
'Improve Sanitation Conditions through Safe Disposal of Human Waste'

Future Strategies

(i) Safe sanitation facilities are accessible to all citizens
(ii) Public safe sanitation facilities are provided with basic infrastructure and are regularly maintained
(iii) Public awareness is increased of safe sanitary practice and of citizens' responsibilities to achieve and maintain hygienic environment
(iv) Appropriate options for wastewater recycling and reuse are introduced to supplement water for non-domestic usage.

VI. SOLID WASTE MANAGEMENT

A. Overview

110. Metropolitan cities in India with growing population, changing life styles, migration of people from rural areas to cities and rapidly growing up of tourism end up generating an enormous quantity of Municipal Solid Waste (MSW) every day. By and large, the Municipal Bodies / Urban Local Bodies (ULB) in various cities collect the MSW, transport it to the dump yards and dispose it off in open ground dumping or non-sanitary landfill. These landfill sites are an environmental hazard – emanating methane causing greenhouse effect, smell & dirt causing health problems, and leachate contaminating the ground water, etc.

111. In Uttar Pradesh, Solid waste Management is the major challenge faced by the state governments and urban local bodies in urban areas. The collection efficiency of solid waste is much better in larger cities than in smaller urban centers. This could also be due to the motorized transportation vehicles deployed in larger cities. Some of the smaller urban centers still depend on tricycles and animal carts for waste collection. A factor that affects waste collection and transportation is the maintenance of vehicles. Poor maintenance of fleet affects collection and transportation efficiency. Vehicles, especially in smaller urban centers, are often not replaced even when there is a dire need to replace them. Lack of finances for fleet replacement is a major cause of this state of affairs.

1. Service Delivery

112. Municipal solid waste management is an obligatory function of the urban local bodies in India. As per the definition provided by the Municipal Solid Waste (Management and Handling) Rules, 2000 of Government of India, municipal solid waste (MSW) includes commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. With growing population and increasing waste generation, solid waste management has become a major environmental issue. ULBs across India face similar challenges in handling and disposal of municipal solid waste: lack of adequate financial and human resources, poor technology and lack of public participation to list a few. Solid waste management in Khurja is the responsibility of Khurja Municipality. Existing solid waste management system of Khurja is presented in this section.

2. Solid Waste Generation

113. Spreading over an area of 3.54 sq. km, the Khurja Municipal Area is divided into 25 municipal wards for administrative purposes. Khurja Nagar Palika undertakes solid waste management in all 25 wards. As per the current estimates of the Khurja Nagarpalika, about 40 tons of solid waste is generating daily, at a per capita waste generation rate of 313 gm per day per person (projected population of 2009 is 1,25,000). The main solid waste generation sources are residential, commercial and institutional establishments, vegetable and meat markets, hospitals, hotels and restaurants, and construction and demolition waste (debris) and waste generation from street sweeping. The length of municipal roads is around 113 km. Due to a large number of small scale industrial units (mostly Ceramic-

based) in the town, industrial solid waste also enters illegally into municipal solid waste. The source of waste generation is presented in **Table VI-1**.

Table VI-1: Solid Waste Generation Sources in Khurja

Sl. No	Source	Quantity	% of Waste
		Tons	*%*
1	Residential	9.3	23.3
2	Commercial	5.8	14.5
3	Hotels	1.5	3.8
4	Institutions	0.8	2.0
5	Hospitals	0.9	2.3
6	Markets(Vegetable, Fruit & Meat)	3.0	7.5
7	Construction & Street Sweeping	5.2	13.0
8	Garden Waste	0.6	1.5
9	Industrial	7.9	19.8
10	Other Waste	5.0	12.5
	Total	**40.0**	**100**

Source: Khurja Nagarpalika

3. Solid Waste Composition & Characteristics

114. No data on composition of waste generated in Khurja is available. A study conducted in UP districts in 2009 indicated the composition as: biodegradable - 56 percent, recyclable - 28 percent, and inert and other waste – 16 percent. Based on a study conducted by NEERI in 2005 in 59 cities across India, the following **Table VI-2** provides waste composition in the towns of similar population size as Khurja.

Table VI-2: Composition of Waste in Indian Cities of 1-5 lakh Population

Sl. No	Composition	Value/Fraction
1	Compostable Matter	34% - 62%
2	Recyclable Fraction	13%-36%
3	Moisture Content	24% - 63%
4	C:N Ratio	14% - 37%

Source: "Assessment of Status of Municipal Solid Wastes Management in Metro Cities and State Capitals", study conducted in 59 cities by NEERI/CPCB in 2005

115. In absence of waste composition data from Khurja, as per the eye judgment and discussions with Municipal staff, tentative percentages are estimated for Compostable, Recyclable and Inert and others.

(i) Compostable matter – 56 percent

(ii) Recyclable fraction – 15 percent

(iii) Inert and other waste – 29 percent

4. Solid Waste Collection

116. Primary Collection. There is no door to door solid waste collection system in Khurja. Waste collection is through community dust bins. ULB provided 50 collection bins for the purpose, but there are many unauthorized open collection points. The municipality regularly collects the waste from these open dumping points. Due to lack of proper collection system and civic sense, almost all households throw waste onto the streets, drains and open spaces within the localities creating unhealthy conditions. Lack of door-to-door collection is also one the main reason for this situation. Most open drains in the city are choked due to indiscriminate solid waste disposal. There are a number of open points where people dump waste regularly. The municipality provided one collection bin per around 3 km.

117. Street Sweeping. One of the major activities of the solid waste management is street sweeping, which is time consuming and labor intensive. Due to open drain system, regular desilting of drains is also necessary. Since throwing and indiscriminate disposal of waste on to streets is prevalent, collection of waste is mainly through street and road sweeping. Khurja Nagarpalika carries out both street sweeping and drain desilting activities in all 25 wards. Sweepers use traditional short-handled brooms to sweep, and collect and transport community bins/intermediate collection points using wheel barrows. The sweeping is carried on the basis of a single-tier system by forming “beats”. Each beat is allocated to a sanitation worker/sweeper. Sweepers work in single shift.

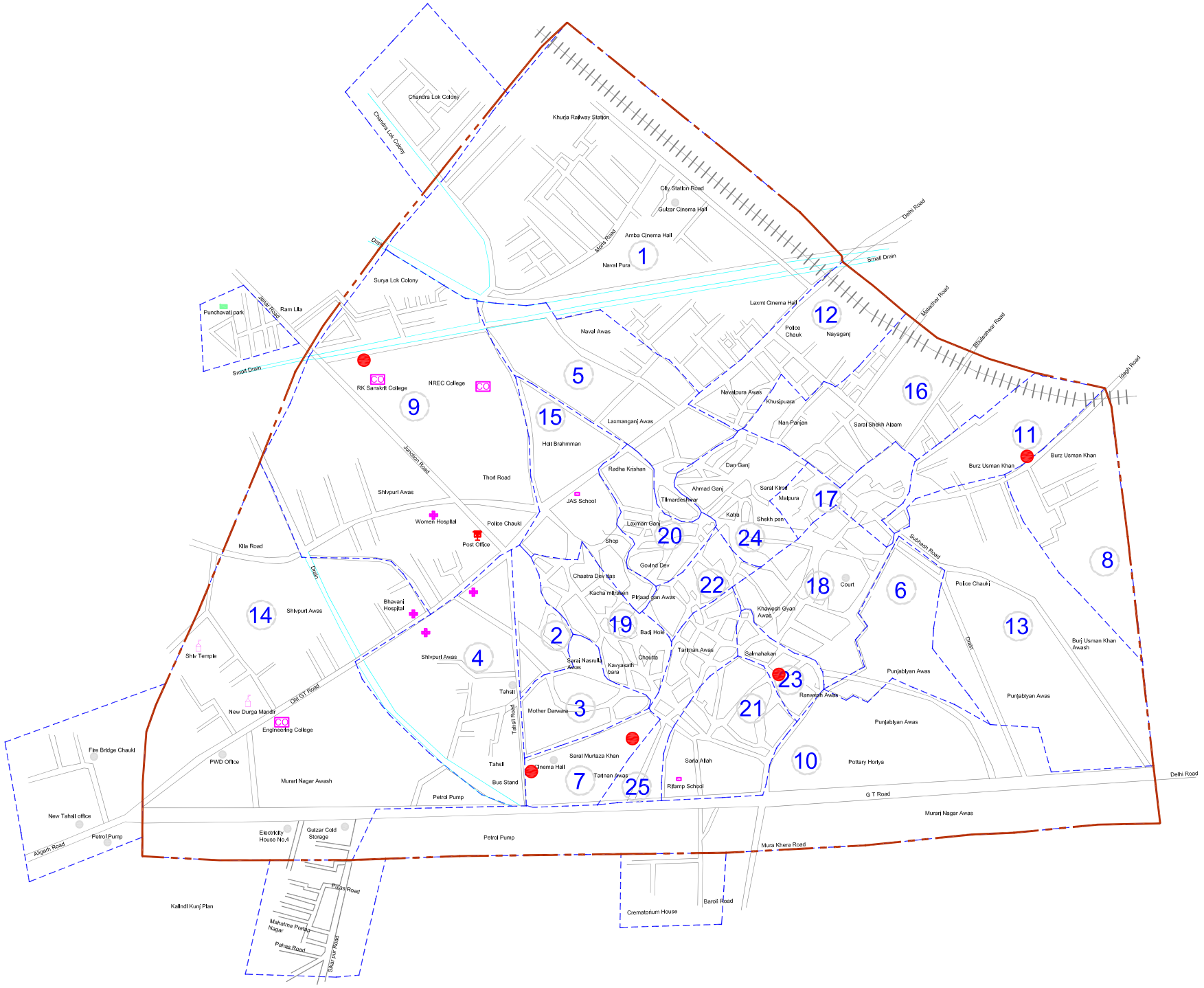
5. Transportation of Solid Waste

118. Waste from community dust bins/open collected points is manually lifted into vehicles for transportation to disposal site along the roads of outskirts. There is no proper dumping site for disposal of waste. Khurja Nnagarpaliks transports waste using tractors and loaders. Of the total generated 40 tons, ULB collects and transports just about 67 percent daily.

Table VI-3: Details of Transportation Vehicles

Description	**Owner Ship**	**Nos.**	**Vehicle Capacity**	**Trips / Day**	**Total Quantity**
			Tons	*Nos.*	*Tons*
Tractor-Trolley	Municipality	3	1	2	6.0
Mechanical Loader	Municipality	2	-	-	-
Hydraulic tippers	Municipality	1	3	1	3.0
Auto Rickshaws	Municipality	4	0.5	2	4.0
Bhaisa Buggi (bullock cart)	Municipality	16	0.5	2	16.0
JCB	Municipality	2	-	-	-
Hand Carts	Municipality	34	-	-	-
Total		**62**	**-**	**-**	**29.0**

Source: Khurja Nagarpalika



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Existing SWM system

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Legend
- SWM Collection Points

Client:
Asian Development Bank
National Capital Region Planning Board

Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map VI-1

6. Solid Waste Disposal

119. There is no scientific solid waste processing or disposal facilities are exists in Khurja. Due to not having landfill site with the municipality, the ULB is disposing the waste at outskirts along the major roads and low lying sites. Private lands of low lying type were also used for dumping the waste by subsequent covering with soil with prior permission from the owners. The list of indicators are shown in **Table VI-4**.

7. Existing situation in Villages

There is no proper Solid Waste Management system in surrounding villages which are under the Khurja Master Plan jurisdiction. Open waste collection points are found in each village at end of streets outside the house premises. There is no responsible person from Panchayat to collect and dispose the solid waste.

8. Service Adequacy and Issues

120. Khurja municipality collects nearly 67 percent of the waste. Indiscriminate disposal of solid waste into drains, roads and vacant plots is prevalent. In most of the areas, drains are chocked with solid waste, and surroundings are very unhygienic. Due to crude open dumping the areas have become unhygienic.

121. Waste is collected and loaded on to tractors/trucks manually and is not covered during transportation. Workers use no safety or protective equipment while loading the waste manually. Currently, there is neither proper safe waste disposal facility nor a designated disposal site. Waste is disposed by open crude dumping method along the roads. Due to winds plastic covers and waste materials often finds its way onto roads and surrounding areas. The areas are filthy and unhealthy posing threat to the health and environment.

Table VI-4: Solid Waste Management – Service Level Indicators

Description	Value	Remarks
Per capita waste generation	313 gm/day	No proper estimates of waste generation are available with KNP
Collection performance	67%	Acceptable is over 95%.
Door-to-door waste collection coverage	Nil	No door-to-door waste collection system in Khurja
Average distance between dust bins	-	There are only 50 dust bins (Open type) covering total road length of 113 km. Acceptable spacing is 100 m.
Waste segregation percentage	Nil	Not practiced. Waste is collected and disposed unsegregated, although street rag pickers collect recyclable waste from dust bins, streets and disposal area.
Waste collection frequency	Frequency varies from a day to 1 month	This refers to waste collection and disposal from community dust bins/open points. It is necessary that biodegradable waste is collected and disposed daily. Since waste is not segregated, total waste generated shall be disposed daily.
Collection type	Multiple and manual collection	Multiple waste collection and handling is often inefficient and some waste left on ground at each point. Manual waste handling is unhealthy.
Road length per sweeper		Data not available
Disposal	No safe disposal facility	Waste is disposed by crude open dumping method along major roads. Due to non availability of disposal site.
Private sector participation in SWM	Nil	No private sector participation in SWM activities in Khurja
O & M expenditure on SWM	-	Details not available

Source: Analysis

122. Some of the key issues are:

(i) There is no door to door collection in the town and villages.

(ii) There are many open waste disposal points locations in the town and villages

(iii) Collected solid waste is disposed without treatment at road side.

(iv) Due to crude dumping at disposal site, plastic covers and other light weight waste flying into nearby areas and roads.

(v) No weigh bridge and log book facilities are available.

(vi) No collection, transportation and disposal of waste in villages.

9. Solid Waste Management Sector Goal and Future Strategies

Box 4**:** Solid Waste Management Sector Goal

'Improve Quality of Life of Citizens through Environmentally Safe and Healthy Solid Waste Management Practices'

Future Strategies

(i) Developing waste management practices conform to MSWM Rules, 2000;
(ii) Municipal Solid Waste Management covers the entire town;
(iii) Public awareness is increased to achieve and maintain hygienic environment; and
(iv) Achieve 100 percent scientific treatment of generated waste.

VII. STORM WATER DRAINAGE

A. Overview

123. The existing municipal boundary of Khurja Town encompasses about 3.54 Sq. Km. area, whereas the Master Plan area is about 28.17 Sq. Km. The elevation of the Town is in range of 200 - 203 m above the Mean Sea Level (MSL). The general topography of the town is flat having slopes towards North-East to South-West. The region receives rainfall mainly under the influence of southwest monsoon from July to September. Over 75 percent of the total rainfall is received from July to September. The annual average rainfall is 580 to 690 mm.

1. Service Delivery

124. *Natural Drains*. There are two major natural drains flowing through the master plan area of the Khurja. There are three natural drains called Khurja drain, Jamalpur drain and one normal drain. Out of these, two drains (Khurja drain and normal drain) are flow through the municipal boundary of the town. Further the normal drain flows into the major Khurja drain at the downstream.

125. All the drains ultimately flow into the Karwan, which is at the south-east of the town. Jamalpur drain converge into Khurja drain and flow in to the Karwan River. **Map VII-1** shows the existing drain network in Khurja.

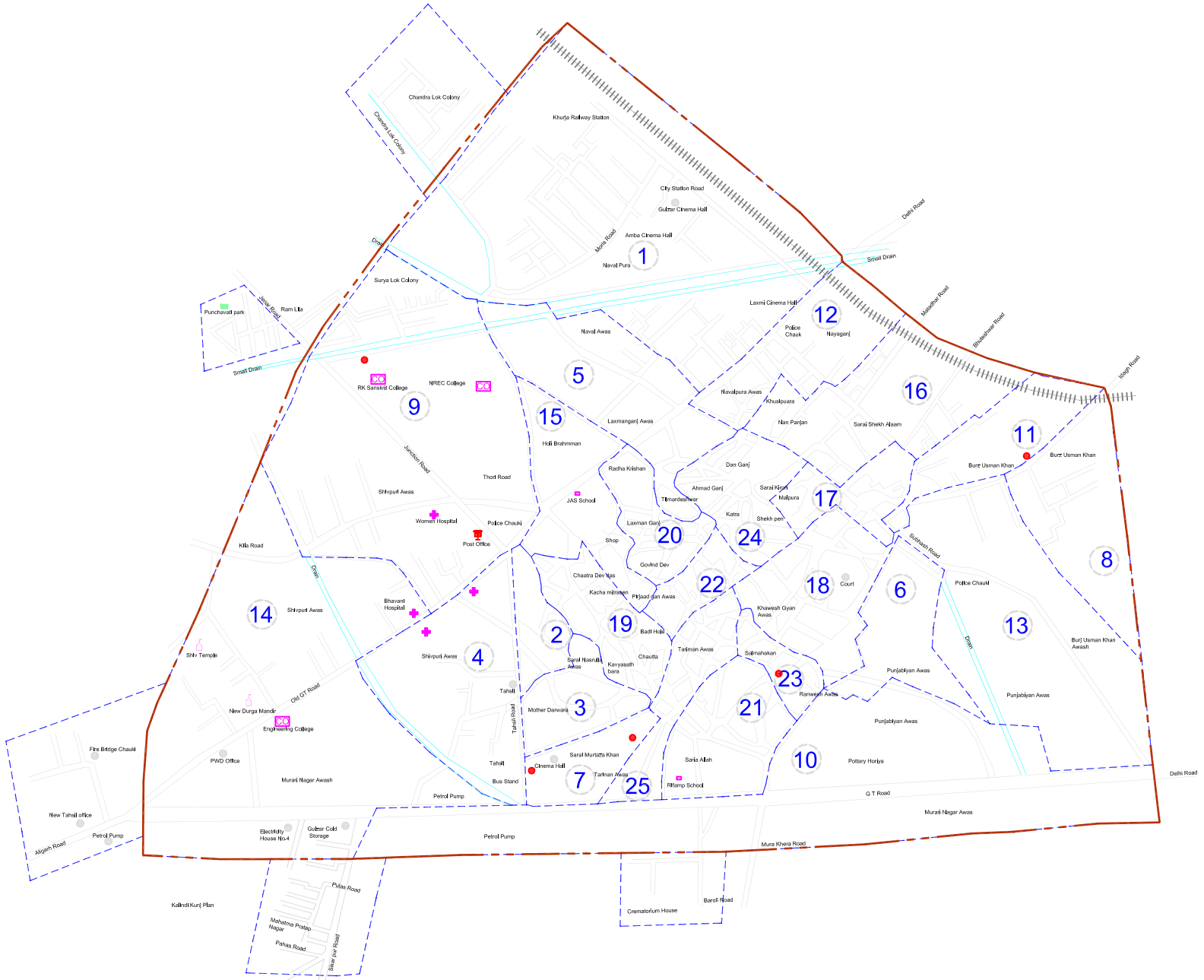
Table VII-1: Details of Natural Drains

Sl. No.	Name of the Drain	Flowing from and to	Length in
			Km
1	Khurja Drain	Bulandshahr to Karwan River	~35.0
2	Jamalpur Drain	Jamalpur village to Khurja drain	~4.5
3	Normal Drain (Service station-Gas godown)	Service station, khurja to khurja drain	~3.0

Source: Survey

126. *Khurja Drain:* This is the main drain of the Khurja town and this drain flows outer area of the municipal boundary of the town. The drain enters into the master plan area from Khurja and draining into the Karwan River. The length of the drain is about 35.0 km (including length outside the Master Plan area).

127. *Jamalpur Drain:* The drain enters the master plan area at Karimpur village and flows into Khurja drain. The length of the drain within the Master Plan area is about 4.5 Km.



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Existing Drain Network

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Existing Drain

Client:
Asian Development Bank
National Capital Region Planning Board

Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map VII-1

2. Roadside Drains

128. Total road length is around 113 km in Khurja town. To have best storm water drainage 1.5 to 2 times of road length of drains are preferable. However, the Town is having only 10.8 km of storm water drains. Only nine percent of the roads are covered with drains.

3. Roadside Drains in Villages

129. As per the eye judgment and discussions with Pradhans, the existing drains are in bad condition. Only 30 percent of the village area covered under drains and rest of the areas are directly let into roads. This practice is making village areas are unhygienic.

4. Service Adequacy and Issues

130. Open drainage system is provided in the town to cater for collection and conveyance of storm water during rains. This open drain network consisting of primary, secondary and tertiary drains. Tertiary drains collect water from various streets and disposes into secondary drains, which are further connected to primary drains, and to natural stream.

131. Following are the key issues:

(i) In absence of the sewerage system in most part of the town, the drains act as carrier of wastewater.
(ii) Due to encroachment of streams and flood plains, during monsoon rains, many areas experiences flooding.
(iii) Drains are choked with silt, solid waste in town and villages etc.
(iv) Lack of proper cleaning maintenance.
(v) Villages are not having proper drainage facilities

5. Storm Water Drainage Sector Goal and Future Strategies

Box 5**:** Storm Water Drainage Sector Goal
'Improve Sanitation Conditions through Safe Disposal of Storm Water Runoff'

Future Strategies

(i) Storm water drainage facilities to be provided throughout the town
(ii) Storm water runoff is appropriately collected and discharged into natural drainage

VIII. URBAN GOVERNANCE

A. Overview

132. Conforming to the 74th Constitutional Amendment Act, Khurja Nagar Plaika will be the implementing agency for projects proposed within the municipal limits, however due to administration setup water supply & sewerage projects has been implementing by Jal Nigam, Major roads by PWD etc. Urban Governance section hence mainly focuses on existing institutional arrangements, its capacity, and policy context to address institutional strengthening issues.

B. Legal and Regulatory Framework

133. Urban services delivery and management in Khuraj ULB is governed by various legislative and administrative reforms undertaken by Government of Uttar Pradesh (GoUP) and Government of India (GoI). The silent features of the same are as given below:

1. Uttar Pradesh State Acts

134. *Uttar Pradesh Municipalities (UPM) Act 1916*. Municipal Boards (*Nagar Palika Parishad*) in the State are formed and governed by the provisions of this Act. Provision and maintenance of water supply, sanitation, drainage, roads, solid waste disposal service, street lighting etc. are obligatory functions of Nagar Palika Parishad under Section 7 of the UP Act.

135. *The water (prevention & control of pollution) act, 1974. [ACT NO. 6 OF 1974]:* This Act was enacted for prevention and control of water pollution and maintaining or restoring of wholesomeness of water. The Central and State Pollution Control Boards have been constituted under section 3 and 4 of the Act respectively. The Act was amended in 1978 and 1988 to clarify certain ambiguities and to vest more powers in Pollution Control Board.

136. *The Air (Prevention & Control Of Pollution) Act, 1981:* This is an Act to provide for the prevention, control and abatement of air pollution in the country so as to preserve the quality of air. Central and State Boards constituted under section 3 and 4 of Water (Prevention and Control Pollution) Act, 1974 were deemed also as Central and State Boards for Prevention and Control of Air Pollution.

137. *The Environment (Protection) Act, 1986:* This is an Act to provide for the protection and improvement of environment and for matters connected there with. This is a comprehensive umbrella legislation.

138. *The Water (Prevention & Control Of Pollution) Cess Act, 1977:* This is an Act to provide for the collection and levy of cess with a view to augment the resources of Pollution Control Board.

139. *Uttar Pradesh Water Supply and Sewerage Act, 1975:* The Uttar Pradesh Water Supply and Sewerage Act was enacted in the year 1975. This Act created two entities: (i) Uttar Pradesh Jal Nigam (UPJN) which was entrusted with the responsibility of planning, designing, and implementing all water supply and sewerage schemes in the State of U.P.; and (ii) U.P. Jal Sansthan (UPJS) that was entrusted with the responsibility of O&M of all schemes implemented by UPJN and handed over to it on completion. Both of these entities are statutory corporations, with their respective Boards and budgets. The area of operation of the UPJS was restricted to the Bundelkhand, Garhwal and Kumaun regions and the 5 KAVAL cities (Kanpur, Allahabad, Varanasi, Aligarh and Lucknow). The other urban local bodies (ULBs) in U.P. continued to manage the O&M functions related to water supply and sewerage by themselves or through private companies. In Hapur, O&M of water supply and sewerage is the responsibility of Hapur Nagar Palika.

140. *Uttar Pradesh Special Areas Development Act, 1956:* Provides for declaration and development of special areas of importance. Set-up of Special Area Development Authority to prepare Master Plans, and regulate construction and land development activities. Formulation of development control regulations and building bye-laws in their jurisdiction

141. *Uttar Pradesh Regulations of Building Operations Act, 1958:* Declaration of regulated areas and appointment of Controlling Authority. Controlling Authority to prepare Master Plans, and regulate construction and land development activities. Formulation of development control regulations and building bye-laws in their jurisdiction.

142. Uttar Pradesh Urban Planning and Development Act, 1973: Formation of development areas and Development Authorities. Development Authority to prepare Master Plans and Zonal Development Plans, and regulate construction and land development activities. Formulation of development control regulations and building bye-laws in their jurisdiction.

2. Central Acts/Policies/Guidelines

143. *74th Constitutional Amendment Act (CAA).* The 74th CAA lays out an agenda for restructuring local authorities to address the processes of decentralization, devolution and privatization of delivery and maintenance of urban infrastructure, formation of new partnerships for the supply and management of public services and amenities. The passage of the 74th Constitution Amendment Act (CAA) provided momentum to urban sector reforms in the country. The 74th CAA intended to create a democratic governance structure, with local responsibilities being assumed and managed at the local-level.

144. *The Municipal Solid Waste (Management and Handling) Rules, 2000.* Every municipal authority is responsible for implementation of provisions under these Rules. As per this legislation, the municipal authority shall make an application for grant of authorization for setting up waste processing and disposal facility from the State Pollution Control Board (in Khurja, UPPCB). The Rules outline the guidelines and principles for collection, segregation, storage, transportation, processing and disposal of waste. The Rules specify the criteria for selection of landfill site and monitoring activities to be carried out before and after commissioning of the landfill.

145. *Central Public Health and Environmental Engineering Organization (CPHEEO).* CPHEEO is a Technical Wing of Ministry of Urban Development, Government of India, and deals with the matters related to urban water supply and sanitation including solid waste management in the country. The CPHEEO has developed manuals/technical guide books for policy makers and practitioners in these areas such as

(i) Manual on Water Supply & Treatment, Third Edition, Revised-updated, May 1999;
(ii) Manual on Sewerage & Sewage Treatment, Second Edition, 1993;
(iii) Manual on Municipal Solid Waste Management, 2000; and
(iv) Manual on Operation and Maintenance of Water Supply systems, 2005.

C. Institutional Framework

146. There are eight major stakeholders having active participation in town development. The institutions are listed and explained their responsibilities, coverage in the following **Table VIII-1**.

Table VIII-1: Municipal Service Delivery and Administrative Structure

Agency	Responsibilities	Coverage
Housing and Urban planning, Govt. of UP	Policy, planning and administration of all urban departments, Corporations and Development Authorities. Directly oversee Lucknow based urban agencies, City Corporation and Development Authorities.	Uttar Pradesh
Urban Development, Govt. of UP	Urban policy, supervision of municipalities, redressal of public grievances co-ordination of select State and national level programs and projects.	City and municipal councils and Panchayats' Local Areas
Municipalities and Corporations	Delivery and maintenance of obligatory, special and discretionary services and functions stipulated under each Act and subsequent amendments.	Within the area under their jurisdiction
Town and country Planning Department	Enforcement of Uttar Pradesh Town and Country Planning Act, 1919. Preparation of outline and comprehensive development plans for towns, regional development plans and advises the State Town Planning Board on matters relating to planning.	Urban areas in Uttar Pradesh.
Jal Nigam	The State Government Constituted a Corporation by the name of UTTAR PRADESH JAL NIGAM in the year 1975 which came into existence with effect from 18th June 1975. Its area of operation extends to whole of Uttar Pradesh excluding Cantonment areas under an Act called as Uttar Pradesh Water Supply & Sewerage Act, 1975. The basic objective of creating this corporation is development and regulation of water supply & sewerage services and for matters connected therewith.	Urban areas in Uttar Pradesh.
Development Authorities (DA)	Implementation of Uttar Pradesh Town & Country Planning Act, 1919 in designated areas in terms of preparing outline and comprehensive development plans, implement plan (scrutiny and approve) and land development.	Corporations and Urban Local Bodies in UP

Agency	Responsibilities	Coverage
U.P. Housing and Development Board	Development of urban housing.	Corporations and Urban Local Bodies in UP
Urban Employment & Poverty Alleviation Department. (SUDA UP)	Implementation of slum improvement programs.	Corporations and Urban Local Bodies in UP

D. Structure of Khurja ULB

147. As per The Uttar Pradesh Municipalities Act, 1916,Khurja ULBs obligatory functions include: (i) supply of potable water; (ii) operation and maintenance of drainage and sewerage systems; (iii) public lighting; (iv) sanitation and public hygiene; (v) construction and maintenance of bus terminals, roads, culverts, and bridges; (vi) maintenance of public parks and gardens; (vii) ensuring systematic urban growth; (viii) regulation of building construction; (ix) licensing of commercial activities etc. **Figure VIII-1** gives the organizational structure of Khurja ULB. Khurja ULB is governed by two wings – the administrative wing comprising of elected councilors and the executive wing comprising of municipal workers. A President heads the administrative wing while a Chief Officer heads the executive wing.

1. Administrative Wing

148. The municipal council, which is the elected governing body of the Nagar Palika, comprises elected members depending on the number of wards. Apart from these elected members, there are Government nominated members and the corresponding MLAs and MPs, a majority of whose constituencies falls within the jurisdiction of the ULB. There will be direct voting for president of ULB. The nominated members from the Government are residents of the ULB with special knowledge and experience in municipal administration or matters relating to health, town planning, education and social work. The nominated members do not have a voting power in the meetings of the municipal council.

149. The council functions through standing committees and monthly meetings of the councilors and the executive. The councilors elect a Standing Committee consisting of councilors, not more than eleven or less than five as the ULB may decide (the President and the vice-president are not eligible for election as members of the standing committee, but are ex-officio members without voting powers), which holds office for a period of one year. As per The Uttar Pradesh Municipalities Act, 1916, the Standing Committees discuss and decide on matters relating to: (i) taxation, finance and appeals; (ii) public health, education and social justice; (iii) town planning and city improvement; and (iv) accounts.

150. The Municipal President and the Executive Officer act as linkages between the elected representatives and the bureaucracy. The Executive Officer is responsible for preparation of a list of resolutions in the order in which they were received and is responsible for communicating to the councilors whose resolutions have not been admitted indicating the reasons for disallowance. The President also has the power to decide which of the resolutions communicated to him by the councilors is to be admitted for submission at the general meeting. Each agenda is discussed in detail in the joint meeting and action plans are drawn up in these meetings. Resolutions of the Standing Committees are submitted to

the general meeting and these resolutions are moved and seconded by the members of the concerned committees for adoption by the General Body of the ULB. Any work proposal of the ULB and the corresponding allocation has to be sanctioned in these meetings.

2. Executive Wing

151. The Executive Officer heads the executive wing of the ULB, and various officers in charge of different departments or sections assist the Executive Officer in managing the ULB. The personnel include a manager, an accounts superintendent, senior health officers, a revenue officer and junior engineers. These officers are assisted in their work by junior officials. Roles and responsibilities of ULB departments/key staff are as follows:

(i) Executive Officer. The Executive Officer is at the apex of this structure and is responsible for all activities carried out by the ULB. The Executive Officer is responsible for preparation and certification of all periodical records, returns and furnishes all information as may from time to time be required by the Municipal Council or the Standing committees. He is also responsible for preparation of accounts. At each general meeting, the Executive Officer along with some other key officials, discuss various issues with the elected representatives. The Executive Officer is responsible for the preparation of the agenda for the monthly meetings under the direction of the President.

(ii) General Administration. Manager heads the General Administration Section. The Manager follows the Executive Officer in the hierarchy and is responsible for the daily functioning of the ULB. He/she collects information from different departments and provides inputs for the monthly meetings. The clerical staff assists the Manager. The Manager disburses monthly salaries to the staff.

(iii) Accounts Section. The Accounts Section is a key department of ULB which manages Municipal finances and monitors the use of allocated funds for different schemes. It plays a major role in the formulation of the budget. The Accounts Superintendent is responsible for supervising all financial transactions related to the ULB, advising the Executive Officer on all internal financial matters, updating financial receipts and expenditure details in accordance with the utilization of funds, reporting deviations in expenditure of funds in any of the allocated schemes, assisting preparation of the Municipal budget, maintenance of accounts regarding stamp duty, SFC Grants, MP Grants, maintenance of petty cash book and general cash book and attending to audit requirements and other such accounts-related duties.

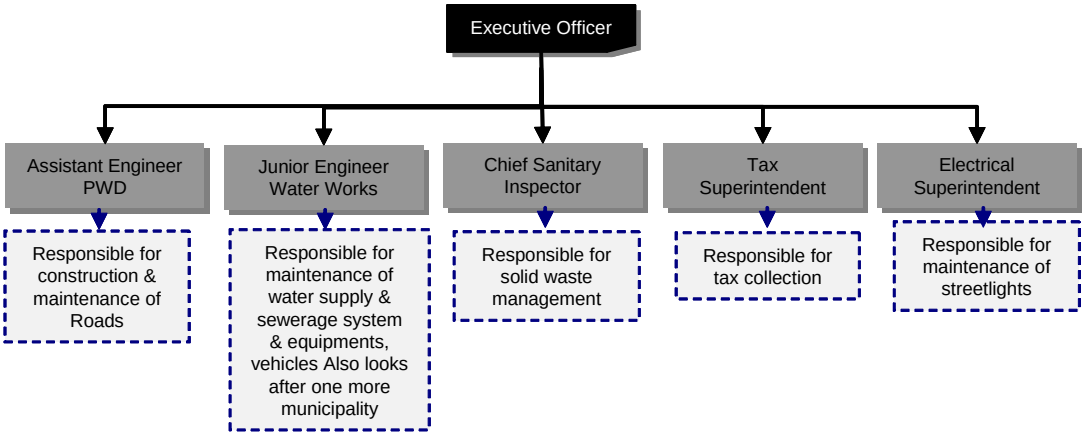
(iv) Revenue Section. The Revenue Section is another key section of ULB, consisting of a Revenue Officer, first-grade/division revenue inspector and several bill/tax collectors. Revenue Officer oversee collection of various taxes (such as trade tax, house tax, advertisement tax, and entertainment tax); and development charges; transfer of properties; collection of duty; and issuing notices for recovery of tax.

(v) Engineering Section. One Assistant Engineers (AE), one Sanitary Officer for public health engineering works (water supply, sewerage and sanitation, drainage etc.) and no separate staff for PWD works (roads, buildings etc.) work under Engineering Section of ULB.

(vi) Public Health Section. The Public Health Section is responsible for solid waste management services in the ULB. Environmental Engineer heads the section who is further assisted by health inspectors, sanitary supervisors, sanitary workers, cleaners, sweepers etc.

152. At present Khurja Municipality is operating and maintaining water supply system. There is only one qualified engineer in town administration. Capital works are done by UP Jal Nigam. UP Jal Nigam is a competent organization. Municipality lacks managerial and technical capacity and shortage of financial resources to operate and maintain the water supply system. The municipality needs to be strengthened to handle water system professionally.

Figure VIII-1: Organizational Structure of Khurja Municipality



E. Issues

153. Service delivery is directly linked with the institutional capacity and management. Hence key issues in institutional strengthening for implementation of CLEIP Project can be:

(i) Low understanding level of technical staff affecting service delivery and O&M
(ii) Inadequate technical qualifications or up-to-date knowledge to oversee service delivery
(iii) Inadequate staff strength to undertake high level investment
(iv) Inadequate management and accounting skills
(v) Lack of external support and training to upgrade skills
(vi) Missing efforts from ULB side in water supply and sewerage capital works execution

F. Urban Governance Sector Goal and Future Strategies

Box 6: Urban Governance Sector Goal

'Provide Efficient Management Service to Citizens, which is Transparent, Accessible and Inclusive'

Future Strategies

(i) Efficient utilization of human resources to provide sustainable services in equitable manner to all citizens
(ii) Capacity building of technical and administrative staff
(iii) Community participation and public involvement
(iv) Private sector participation in service delivery
(v) Transparency in administration, planning and implementation of the projects

IX. MUNICIPAL FINANCE

A. Overview

154. The objective of this chapter is to assess the current fiscal situation of the urban local body and forecast the finances of the local body for period of 20 years to assess the financial sustenance capacity. The objective of assessing the financial sustenance capacity is to assess the financial capability of the local body to execute the proposed projects.

B. Review of Municipal Accounts

155. The Municipality maintains the accounts on a cash basis single entry system. The detailed accounts of Khurja Municipality have been reviewed for the period of four years starting from 2006-10. Out of these four assessment years two years budget is revised estimation. For the purpose of review the municipal accounts have been classified under two major heads revenue items and capital items;

(a) Revenue Account: All recurring items of income and expenditure are included under this head. These include taxes, charges, salaries, maintenance expenditure, debt servicing etc.
(b) Capital Account: Income and expenditure items under this account are primarily non-recurring in nature. Income items include loans, contributions by GoUP, other agencies and capital grants under various State and Central Government programmes. Expenditure items include expenses booked under developmental works and purchase of capital assets.

1. Municipal Fiscal Situation

156. Revenue income of Khurja Municipality has grown to a level of INR 104 million in the FY 2009-10 from INR 90 million in FY 2006-07, thus registering an average annual growth of over 5 percent (CAGR), while revenue expenditure increased at an average annual rate of 23 percent during the same period. Khurja Municipality had consistently maintained a good revenue surplus excerpt 2009-10 assessment year, however capital income and expenditure have been negative in assessment period. The summary of actual income and expenditure are presented in **Table IX-1** and the detail annual accounts, indicating actual transaction amounts, sectoral contributions and growth trends are presented in Appendix 1.

Table IX-1: Summary of Municipal Finances

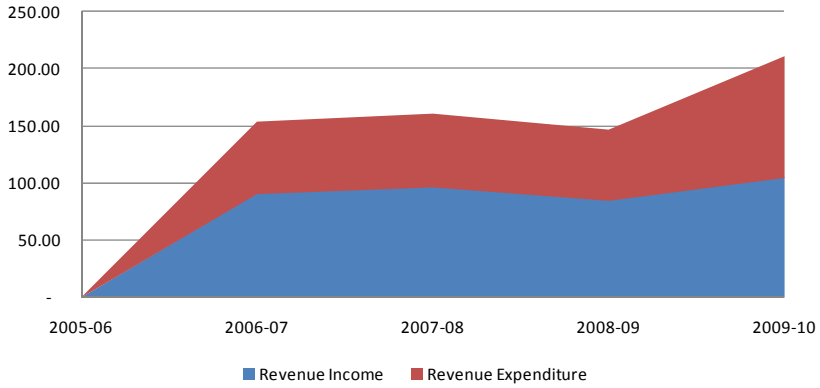
Item	2006-07	2007-08	2008-09	2009-10
	Amount in Rs. Million			
Revenue Account				
Revenue income	90.47	96.33	84.62	104.59
Revenue expenditure	63.33	64.40	62.27	106.38
Surplus/Deficit	27.14	31.93	22.35	(1.79)
Capital Account				
Capital income	30.06		60.12	56.00
Capital expenditure	45.46	12.90	78.02	66.50
Surplus/Deficit	(15.40)	(12.90)	(17.91)	(10.50)

Item	2006-07	2007-08	2008-09	2009-10
	Amount in Rs. Million			
Revenue Account				
Overall Fiscal Status	11.74	19.03	4.44	(12.29)

Source: Khurja Municipality and Analysis

2. Revenue Account

Figure IX-1: Revenue Income and Expenditure



157. The Revenue Account comprises of recurring items of income and expenditure. These are essentially all financial transactions related to the day-to-day operations of the municipality. **Table IX-2** summarizes the status of the Revenue Account. The details of each of major revenue contributing items are discussed in the following section. The figures of overall status of revenue account indicate that the Municipality has maintained surplus revenue account status during the review period.

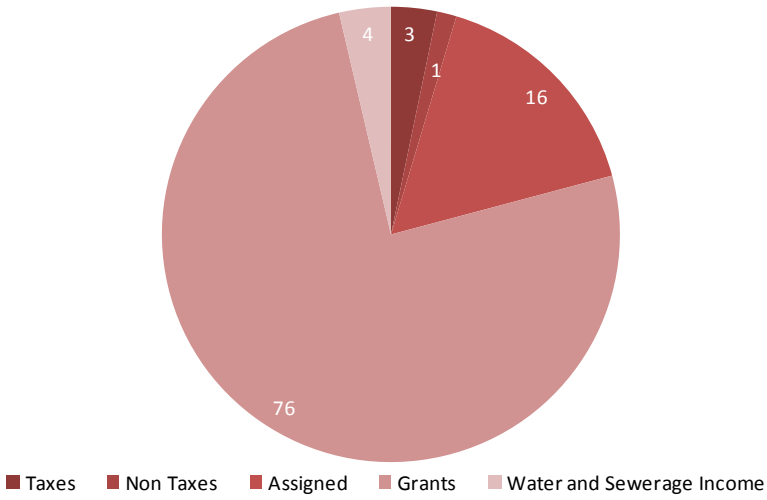
Table IX-2: Revenue Account Status

Item	2006-07	2007-08	2008-09	2009-10
	Amount in Rs. Million			
Revenue Income				
Taxes	2.42	2.20	2.64	4.90
Non Taxes	0.89	1.11	0.67	2.49
Assigned	15.63	13.61	17.65	14.07
Grants	68.97	76.88	61.06	77.18
Water and Sewerage Income	2.56	2.53	2.59	5.96
Total- Revenue Income	**90.47**	**96.33**	**84.62**	**104.59**
Revenue Expenditure				
Establishment cost	18.96	17.07	20.86	58.10
O & M	4.72	3.86	5.57	4.76
Water and Sewerage Establishment	30.62	28.48	32.77	33.60
Water Supply and Sewerage O & M	5.82	8.94	2.69	2.43
Debt Serving	3.21	6.05	0.38	7.49
Total- Revenue Expenditure	**63.33**	**64.40**	**62.27**	**106.38**
Revenue Account Status	**27.14**	**31.93**	**22.35**	**(1.79)**
Status of Water Account	**(33.88)**	**(34.89)**	**(32.87)**	**(30.07)**

Source: Khurja Municipality and Analysis

158. *Property Tax:* This item head comprises of income sourced primarily from House tax, water tax and sewerage tax, the ULB raising one bill including these three taxes together to the individual assessments. Property tax alone contributes minimal of 3 per cent of municipal revenue income, property tax that is levied on all assessed properties on as percentage of ARV. Currently there are about 16,124 assessments with an annual demand of INR 4.84 million.

Figure IX-2: Composition of Revenue Income



159. *Non Tax*. This item head comprises of income from trade license fee Building permission, development charges, fee for ULB assets and other miscellaneous income. On an average, through the assessment period, own source/non tax income constitutes over 1 percent of the total revenue income.

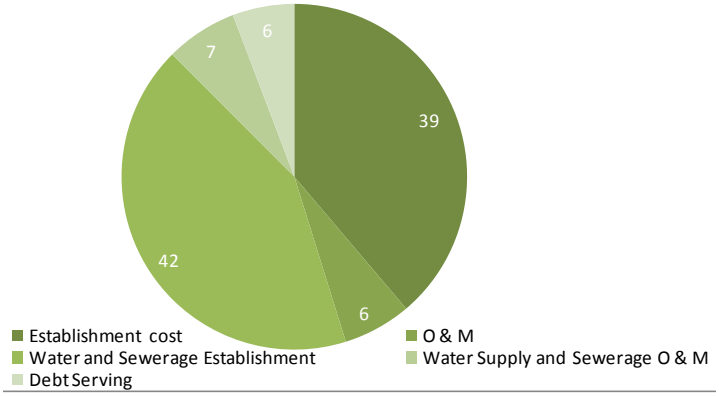
160. *Assigned Revenues.* This item head comprises of income collected by various departments of Government of Uttar Pradesh on behalf of the local bodies. The income items generally include surcharge on Property Transfer tax, Kanji House rent from the Govt., per capita grant, and other transfers. Assigned revenue constitutes about 19 percent of the Municipal revenue income and it has fluctuating during assessment period.

161. *Revenue Grants.* This item mainly comprises State and Central government grants towards specific programmes of the government like NSDP, SJSRY, MP/MLA Fund, 12th Finance Commission and some grants are on ad-hoc basis to meet state programs etc. In case of Khurja ULB, revenue grants are contributing about 76 percent of the total revenue income and the growth has been inconsistent with an average annual growth rate of about 5.6 percent during the assessment period.

162. *Income from Water Account.* Khurja municipality is responsible for providing potable water to the civic. The municipality is maintain water as separate head, but it is not treated as separate account head, in order to assess the cost recovery aspect of this major service, while doing the analysis the water heads have reviewed a separate account to assess the cost recovery and recommend tariff structure to achieve full cost recovery. It is noticed that the water account is in deficit during the assessment period. The figures are presented in **Table IX-2** indicates that during the last four year water account was in deficit and it could achieve only 9 percent of recovery.

163. *Revenue Expenditure.* The revenue expenditure of Khurja Municipality has increasing during assessment period, it exhibits an average growth rate of 23 percent during the review period against the growth in revenue income by 5 percent. Revenue expenditure comprises broadly of three categories of expenditure – establishment, operation and maintenance and debt servicing.

Figure IX-3: Composition of Revenue Expenditure



164. *Establishment Expenditure:* This head comprises expenditure on pay and allowances of salary and pension and gratuity related to all functions including salaries of water supply staff. Expenditure under this head accounts for about 81 percent of the total revenue expenditure contributing to establishments.

165. *Operation and Maintenance Expenditure:* This item of expenditure includes all recurring maintenance cost and other consumables etc, except for water supply operations. The total expenditure on this head of account is about 6 per cent, the expenditure mainly towards roads and street lighting etc.

166. *Water and Sanitation:* Water and sanitation O & M accounts for about 7 per cent of the total revenue expenditure. This growth has been inconsistent, mainly due to repairs and electricity charges variation.

167. *Debt Servicing:* As per the Municipal accounts, the ULB is not having loans to repay. For all the major capital will be meeting through state and central Govt. grants. However, the municipality has to pay back the advance amount, which may be procured from the contractor as security deposits.

3. Capital Account

168. The Capital Account comprises of income and expenditure, for and on capital works. Table X 3 summarizes the capital account of the ULB. The capital account of the ULB shows a deficit status in assessment period, thus indicating utilization of revenue surplus for funding the capital expenditure, which is positive sign. However, the Municipality is mobilizing these additional funds from State Govt. and central Govt. grants. The sources of capital income comprise largely of grants under state Govt. /central government schemes (UIDSSMT). But the capital income is very much inconsistent and expenditure is mainly on road works, water supply and others. The details of growth trend of Municipal accounts are presented in Appendix 1

Table IX-3: Capital Account Status

Item	2006-07	2007-08	2008-09	2009-10
	Amount in Rs. Million			
Capital Income				
Grant under Scheme I.D.S.S.M.T/U.I.D.S.S.M.T and others	30.06	-	60.12	56.00
Total- Capital Income	30.06	-	60.12	56.00
Capital Expenditure				
Roads	17.32	12.90	21.74	10.50
Water Supply	28.14	-	56.29	56.00
Total- Capital Expenditure	45.46	12.90	78.02	66.50

Item	2006-07	2007-08	2008-09	2009-10
	Amount in Rs. Million			
Capital Account Status	(15.40)	(12.90)	(17.91)	(10.50)

Source: Khurja Municipality and Analysis

C. Key Financial Indicators

169. A set of key financial indicators has been derived using the financial data procured from the Municipality for the assessment period. Table X-4 presents these indicators. These indicators are used to assess the ULB performance with regards resource mobilization, fund utilization, financial performance and collection efficiencies.

Table IX-4: Key Financial Indicators

Item	2006-07	2007-08	2008-09	2009-10	Average
Own Income Share -%	6	6	7	13	8
Dependency on Grants-%	76	80	72	74	75
Operating Ratio	0.70	0.67	0.74	1.02	0.78
Capital Utilisation Ratio	1.51		1.30	1.19	1.33
Establishment cost as % of Rev. Exp.	78	71	86	86	80
Establishment cost as % of Revenue Income	55	47	63	88	63
Debt Servicing Cost as % of Revenue Income	4	6	0	7	4

Source: Analysis

170. *Resource Mobilization Indicators*. These indicators summarize the performance of the ULB with regards sources of funds. Khurja Municipality derives about 8 percent of its revenue income from own sources, while dependency on grants is about 75%, thus about 16 percent of ULB income is from assigned. This is not healthy financial situation, any ULB can have 20 percent dependency on grants and 80 percent of income should be mobilised from own source (including assigned revenue).

171. *Fund Application Indicators*. These indicators are a measure to ascertain the utilization from the Municipal fund. Over 80 percent of the revenue expenditure is spent on establishment heads, leaving only about 13 percent for O&M, debt serving and new capital works. In terms of revenue income about 63% is spent on salaries, which seems quite high.

172. *Overall Financial Performance Indicators*. These indicators are a measure to assess the overall financial performance of the ULB with regards to operational performance and effective growth in revenue income and expenditure. The average operating ratio during the assessment period was an effective 0.78 and the capital utilization ratio was more than one which is indicating effective utilization of revenue surpluses in asset creation. Currently the debt servicing ratio to revenue income is very low at 4% which would be paid for electricity and advance repayment etc.

1. Key Issues

(i) Maintenance and Reporting of Accounts
(ii) Revenue Realization
(iii) Fund Application
(iv) Operating Ratio

Box 1: Municipal Finance Sector Goal

Municipal Finance

Future Strategies

(i) A common accounting and financial reporting code, updated annually, with interim updations when required, supported with a user manual
(ii) Widening the coverage of taxes and charges with better collection efficiency
(iii) Sustainable and efficient tariff structure
(iv) Upto-date information with regard to actual assets and liabilities
(v) Increase the revenue base and control over the revenue expenditure so as to have operating ratio with less than unity continuously.

Prospective Interventions:

(i) Double entry computerized accounting system with adequate training to municipal officials
(ii) Development of GIS based property and other service details through MIS and achievement of 85 percent collection efficiency for both property tax and water charges
(iii) Sector based accounting system for service deliveries and sustainable tariff system that ensure full O&M recovery and part capital cost recovery
(iv) Detailed MIS on assets and liabilities for better fiscal control
(v) Increase the revenue base through own sources and better control over establishment expenditure

X. CLEIP SUBPROJECTS AND COSTING

A. Water Supply

1. Sub-Project Rational and Design Criteria

173. Performance benchmarking of the existing water supply system indicates per capita water supply of 73 lpcd against norms of 135 lpcd, storage 13% of water supply against norms of 33%, distribution system covers 26.5% road length against requirement of 100%. Moreover consumer meters are not provided on domestic and non domestic consumers, water losses and unaccounted for water (UFW) is very high, present system is financially non sustainable. Although a scheme is under implementation under UIDSSMT to increase coverage and storage capacity yet improvements are required to have sustainable scheme. Moreover so far no planning has been done on larger scale to think of providing water supply in the likely urbananiseable area in year 2041. Thus the UP Jal Nigam has been prepared water supply DPR to meet requirements of year 2034 for the Khurja ULB area. However, for CLEIP planning period is 2041, hence it is estimated for uncovered area and Master Plan area.

174. The planning of the water supply will be based on following design criteria:

(i) As per the recommendations of CPHEEO, water supply at consumer end will be 135 lpcd with UFW as 15%. Thus water supply shall be designed for 160 lpcd. Water requirement of major industries, commercial establishments and institutions with bulk requirement will be met by themselves;

(ii) It provides the most economical project design and best utilization of resources. It ensures that there is no intrusion of pollution in the distribution system thus ensuring quality of water distributed. It provides high level of consumer satisfaction. It saves from substantial indirect costs on local storages and purification/disinfections equipments to be provided at consumer end by the consumers;

(iii) Based on the recommendations in the CPHEEO Manual on water supply, following design periods have been adopted;

Water Treatment Plant	15 years
Raw and Clear Water main pipe lines	30 years
Distribution system	30 years
Clear water ground/over-head tanks	15 years
Pump house buildings	30 years
Pumping equipment (E&M)	15 years

(iv) Reducing unaccounted for water (UFW) by repairs and replacement of the existing old distribution system and by demand management measures like metering of water connections; and

(v) Reducing the O & M costs by better management of the system

2. Sub-Project Identification and Costing

175. This City Level Environmental Infrastructure Investment Plan (CLEIP) is proposed to be implemented over a period of 30 years (2011-2041), and accordingly improvements and augmentation required for water supply system in the Town and villages, which comes within the boundary of Master Plan. These sub-projects are proposed for implementation in three phases: Phase I (2011-16); Phase II (2017-21) and Phase III (2022-26). The implementation phases are shown in .

176. As mentioned in the Chapter IV, UP Jal Nigam is executing UIDSSMT water supply Scheme project. The components included are augmentation of source, chlorination, storage, extension of distribution network & rehabilitation of existing distribution network within the municipal limits of Khurja. The scheme is designed for year 2034 but geographically provides water supply system in existing municipal boundary. Design population is 1.84 lacs and design demand is 22.1 MLD excluding existing supply. 9 tube wells of 2000 LPM with submersible pump set and rising mains, 2 over Head Service Reservoirs having total capacity of 5 ML and 45 KM distribution network has been proposed.

177. *Water Supply Demand*. Population of Khurja municipal area and villages out side municipal area has been projected. Per capita supply of 135 LPCD has been taken. As per the discussions with ULB staff, losses and non revenue water is estimated around 45 percent at present. The same percentage of non revenue water is considered till 2016 and reduced to 15 percent at the end of project period. After implementation of these master plan proposals the losses in system are proposed to be reduced to 35% in year 2021, 25% in year 2026 and15% in year 2031.Fire demand has been taken as per water supply manual. Present source has been taken as the quantity of water to be supplied after completion of ongoing UIDSSMT scheme. Deficit in future shall be 11.59 MLD in year 2026 and 19.75 MLD in year 2041. The demand for water supply in future is illustrated in **Table X-1**.

Table X-1: Water supply demand in Khurja Master Plan area

Year	**Population**		**LPCD**	**Losses**	**Demand**	**Losses**	**Fire Demand**	**Total**	**Present Source**	**Deficit**
	Khurja	*Villages*		*%*	*MLD*	*MLD*	*MLD*	*MLD*	*MLD*	*MLD*
2011	139,900	18,812	135	45	18.89	8.50	1.18	28.57	7.30	21.27
2016	155,864	20,975	135	45	21.04	9.47	1.25	31.76	28.57	3.19
2021	171,827	23,138	135	35	23.20	8.12	1.31	32.63	28.57	4.06
2026	191,434	25,799	135	25	25.84	6.46	1.38	33.69	28.57	5.12
2031	211,041	28,460	135	15	28.49	4.27	1.45	34.22	28.57	5.65
2036	235,123	31,733	135	15	31.74	4.76	1.53	38.04	28.57	9.47
2041	259,205	35,006	135	15	34.99	5.25	1.61	41.85	28.57	13.28

Source: Analysis

178. *Water Supply Source:* Due to unavailability of surface water near to the Khurja town, the ground water is the source for water supply. The Municipality has to depend on ground water as source. The line agencies need to conduct Hydro Geological Study in this region to known the ground water availability. Apart from this the ULB has to focus on rain

water harvesting structures in open grounds, parks and individual houses.

179. Augmentation of Source: Yield of tube wells as per available record of existing tube wells is 2000 LPM and pumping hours as per availability of power is 16 hours in the day. Thus each tube well can produce 1.92 MLD water. Additional quantity of water required in different years is given in **Table X-2**. No of tube wells required to produce additional quantity of water is given in **Table X-2**. The life of tube well is 15 years as such existing 5 tube wells will be required to be replaced in year 2021 and 9 tube wells recently constructed under UIDSSMT scheme would also be required to be replaced in year 2026. Pumping sets will be procured 50% standby. Requirement of pump sets is worked out and given in **Table X-2**.Submersible pumping sets of 15 KW 2000 LPM at 25 m head shall be required. The tube well pump will pump water in CWR to be constructed in each distribution zone. Water from CWR will be pumped in to OHSR –one in each distribution zone. The pumping head shall be water table 15 m + draw down 2.5 m+ seasonal variation in water table 2.5 m + losses in Rising Main 5 m=25 m. Pump efficiency shall be 60% and this gives pump of 15 Kilo Watt.

Table X-2: Requirement of Additional Tube wells

Year	Deficit	T/W Required	Actual Required	Phasing	Replacement of old Tube wells	Total T/W Required	Pumps Required
	MLD						
2016	9.66	6	6	Phase 1		6	9
2021	10.53	6	0	Phase 2		0	0
2026	11.59	7	1	Phase 3	5	6	9
2031	12.12	7	0	Phase 3	15	15	23
2036	15.94	9	2	Phase 3		2	3
2041	19.75	11	2	Phase 3	1	3	5

Source: Analysis

180. *Pumping Main.* The pumping main to take 2000 LPM water from one tube well shall be of 250 mm diameter as per economical analysis done. Generally 3 tube wells will feed in one CWR and all 3 shall be radially connected and location of tube well shall be suitable for radial connection. Length of pumping main shall be 300 m per tube well. In some cases two tube well water may combine and in that case combined discharge shall be 4000 LPM and economical pipe sizing for this quantity of water will be 300 mm. Quantity of 300 mm pipe has been taken at 100 m per tube well.

181. *Storage:* Clear Water Level Reservoir (CWR) Capacity and OHSR capacity has been kept 35% of supply. OHSR capacity of 35% is to take care of fluctuating demand in water during the day. Assuming continuous water supply the excess demand in peak consumption period will be taken care by the 35% capacity of OHSR. CWR capacity equal to 35% or 8 hour pumping shall take care of power outage of maximum 8 hours in a day. Capacity of each OHSR and CWR shall be 2 ML. No of OHSRs and CWRs required is given in

Table X-3.

Table X-3: Storage Capacity Required

Year	Water Demand	Required capacity of OHSRs	Existing capacity of OHSRs	Additional capacity required	Number of OHSRs	No of GLSRs	Phasing of investment
	MLD	*35%*	*ML*	*ML*	*No*	*No*	
2041	41.85	14.65	7.43	7.22	4	4	Phase 3

Assumptions: Capacity of each OHSR and CWR 2 ML
Source: Analysis

182. *Clear Water Pumping Station.* It is proposed that 3 tube wells will pump water in CWR and from CWR water will be pumped in OHSR. OHSR shall be filled in 8 hours i e 2 ML pumping from CWR to OHSR in 8 hours. Using one working and one standby pump in Clear Water pumping Station the discharge of pump shall be 70 LPS. The pump head shall be staging of OHSR 20 m _+ water column in OHSR 6 m + losses in pumping main 4 m (i.e. a total of 30 m). Assuming pump set efficiency of 60% the motor Kilo Watt works out to 40 KW. No of CWPS will be 4 in phase 3.

183. *Distribution System.* The total road length in Khurja is around 113 km. After UIDSSMT water supply scheme distribution length will extend to 75 km. The rest of 38 km will be provided in Ist phase of implementation. The development area within the Master Plan area is 2817 hectares and proposed road length is 308 km. The distribution required in outside municipal area over the period 2016-2035 in 2 phases is 247.92 km. The distribution system required in each of 2 phases shall be 123.96 KM. Distribution system shall be of HDPE pipes PE 100 Class 8.Minimum size shall be 100 mm dia.

184. *Consumer Metering.* It is proposed to have 100% consumer metering. This is essential for conservation of water, water audit to reduce losses (NRW) and make water supply sustainable. It is proposed to provide meters to all consumers (domestic, commercial, industrial and institutional). In phase 1 bulk consumers having connection size 25 mm and above and all commercial, industrial and institutional consumers shall be covered. In phase 2 and 3 remaining consumers shall be provided with water meters. The contract will be supply of water meters, installation and maintenance of meters for 5 or 7 years. Meter specifications shall ensure good quality of meters so that maintenance is less. The contract will also include meter reading preparation of bills and distribution of bills to consumers.

185. *Bulk Metering.* It is proposed to provide one meter for each tube well to know quantity of water produced from each tube well. It is also proposed to provide one meter in delivery header of Clear Water Pumping Station to assess discharge of pumps and efficiency of pumps. This will help to undertake energy audit of CWPSs. Bulk meters shall also be installed at outlet of each OHSR to know the quantity of water supplied in a distribution zone. The existing tube wells, OHSRs and proposed under UIDSSMT will be provided bulk meters in phase 1. In other phases bulk meters shall be provided as and when tube well, OHSR, CWPS will be developed.

186. *Chlorination.* Data on ground water quality is not available in Khurja. Hence, the source being ground water chlorination is proposed for disinfection. This will be achieved by providing vacuum chlorinators in each CWPS. Chlorine gas will be fed in inlet pipe of

CWR or in delivery header of CWPS. Chlorine tonners will also be provided.

187. *Reduction of Non Revenue Water.* It is important to reduce Non revenue Water as with present level of 45% NRW the water supply scheme cannot be made financially sustainable. About 70% of Physical losses are in consumer lines and in ferule/saddle piece. As such it is proposed to replace consumer service lines by MDPE pipes. Each distribution zone shall be further divided in smaller zones called District Meter Area (DMA). Each DMA will be distinct and bifurcated from other areas. Bifurcation will be done by providing sluice valves. Adequate bulk meters will be installed to know quantity of water incoming in the DMA. Assessment of losses will be done for each DMA by knowing water supplied in DMA and water consumption as sum of consumption shown in water meters of consumers in that DMA. Consistent efforts will be done to reduce losses and reach target level of maximum allowable losses of 15%. This being a long exercise it will spread in phase 1, 2 and 3.

188. *Water Supply Development in Villages:* The villages outside municipal boundary but with in development area will be provided with water supply system. There are 6 villages and at present one village Nehrupur partly has piped water supply through one tube well and OHSR. Other villages have hand pumps. At present it is proposed to construct tube wells and provide distribution system in phase 1 so as to provide safe water supply system immediately. OHSRs shall be in subsequent phases and OHSRs will not be for individual village but for bigger distribution zones as proposed separately above in the development area. Thus in villages tube wells and distribution system shall be provided immediately so that inhabitants get benefits of protected water supply. Details of works proposed are given in Appendix 3**.**

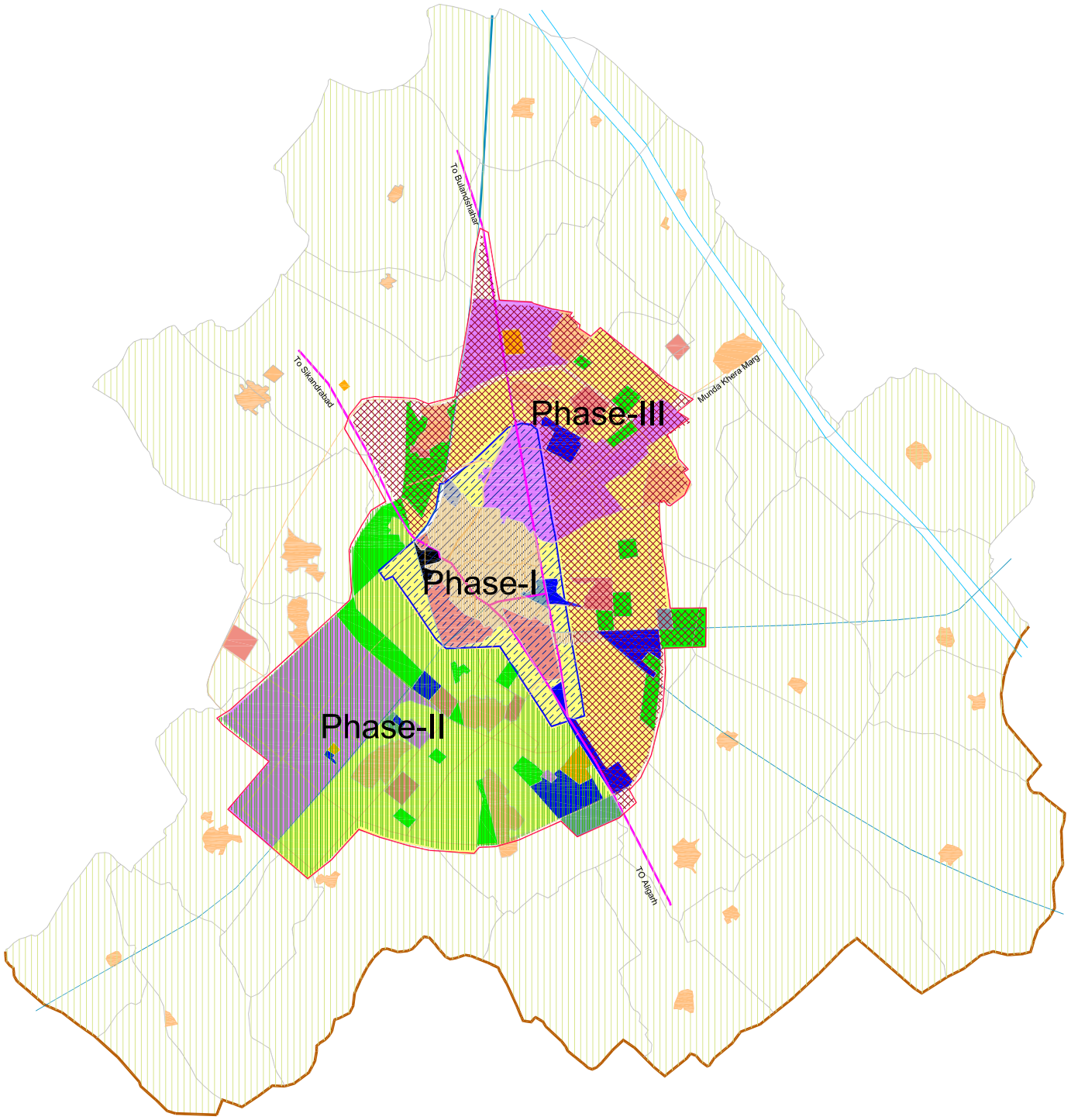
189. *Estimated Cost*: A summary of the total investments required for improvement of water supply system in the planning area is presented in **Table X-4.** The total investments are divided into three phases for implementation to satisfy the design demand of 2041, the last phase of investment being 2022-2026. The total investment requirement is estimated as INR 856 million. Appendix 3 presents the detailed costs estimates.

Table X-4: Summary of water supply investment

Sl No	**Item**	**Total Phase 1 to 3**	**Phase 1: 2011-2015**	**Phase 2 : 2016-2020**	**Phase 3: 2021-2025**
		Rs million	*Rs million*		
1	Construction of Tube wells	28.80	5.40	-	23.40
2	Construction of Pump House (civil works)	6.40	1.20	-	5.20
3	Pump set with electrical & mechanical	1.23	0.23	-	1.00
4	Construction of CWRs	24.00		-	24.00
5	Construction of OHSRs	64.00		-	64.00
6	Clear Water Pumping Station	4.00		-	4.00
7	Rising Main DI Pipe K7			-	-

Sl No	Item	Total Phase 1 to 3	Phase 1: 2011-2015	Phase 2 : 2016-2020	Phase 3: 2021-2025
		Rs million	*Rs million*		
	250 mm diameter	28.87	5.42	-	23.45
	300 mm diameter	12.20	2.29	-	9.92
8	Distribution system	429.00	57.00	186.00	186.00
9	Domestic Meters	9.00		4.00	5.00
10	Bulk Consumer Meters	4.50	4.50	-	-
11	Bulk System Meters for Tube wells	2.30	1.00	-	1.30
12	Bulk System Meters for OHSRs	2.70	1.50	-	1.20
13	Bulk System Meters for CWPS	0.80		-	0.80
14	Chlorinaters and tonners	1.35	0.75	-	0.60
15	Reduction of NRW & Replace Service Line	12.00	2.00	4.00	6.00
16	Electric Connection on Tube Wells	2.40	0.45	-	1.95
17	Electric Connection on CWPS	0.60		-	0.60
18	Water supply in Villages	91.50	91.5	-	-
19	Sub Total	725.65	173.23	194.00	358.42
20	Contingencies @ 18%	130.62	31.18	34.92	64.52
21	Grand Total	**856.26**	**204.41**	**228.92**	**422.94**

Source: Analysis.



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Implementation phases

Legend

- Phase - I
- Phase - II
- Phase - III
- Major Road
- Municipal Boundary
- National Highway
- Master Plan Boundary

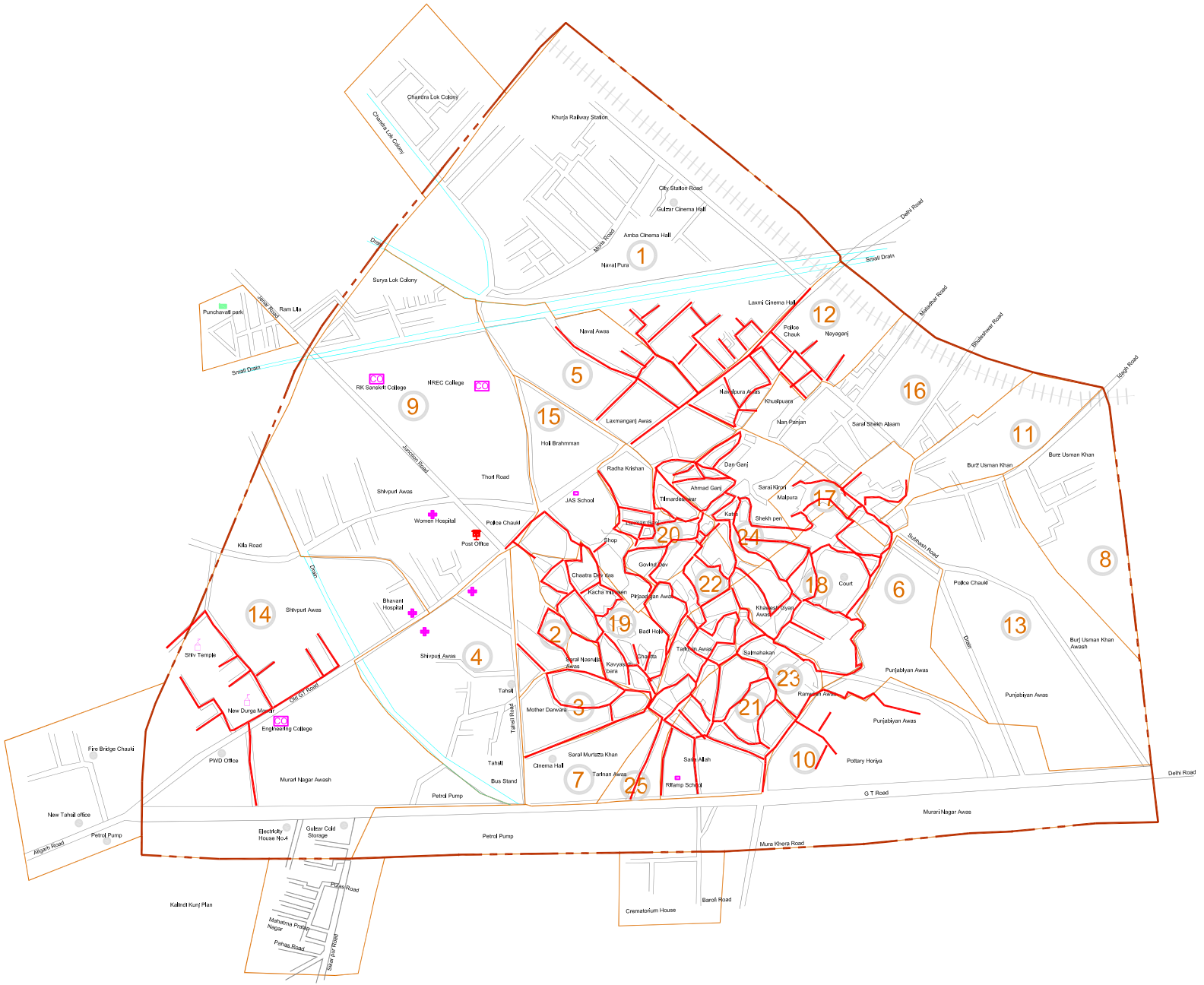
Client:
Asian Development Bank
National Capital Region Planning Board

Consultant
WIlbur Smlth Assoclates

Drawn: Roopa	Checked:
Date:	Approved:

Scale: Not to scale

Map X 1



Capacity Development of NCRPB: Component B (ADB TA 7055-IND)

Proposed Water supply system

Legend

- Municipal Boundary
- Ward Boundary
- Rail
- Road
- Drain
- Proposed Water Supply Line

Client:
Asian Development Bank
National Capital Region Planning Board

Consultant
Wilbur Smith Associates

Drawn: Roopa	Checked:
Date:	Approved:
Scale: Not to scale	

Map X-2

B. Sewerage and Sanitation

1. Sub-Project Rational and Design Criteria

190. *Need for Sewerage Project.* At present the town has no sewerage system. The roadside drains are blocked due to disposing wastewater in drains. Due to lack of sewerage system, the households are disposing sewage in drains. This creates unhygienic conditions, ground water pollution and degradation of environment. Open defecation is prevalent due to lack of sewerage system. As the sewerage system and STP doesn't existing the town, as such the wastewater remains untreated and is discharged without treatment. Thus it violates wastewater disposal standards as set out in environment protection act. The wastewater finally goes to river Yamuna and thus pollutes the river water used for water supply for many towns.. Moreover, piped water supply system exists in Khurja town and this is being extended to cover complete city. Thus sewerage system is essentially required in Khurja town.

191. *Planning Area*. The area considered for planning sewerage and sanitation system is the likely urbaniseable area in year 2041 i. e. development area planned for year 2041. Whole of the proposed development area for year 2041 will be covered with sanitation system. The implementation phases are shown in .

192. *Phasing of Investment.* The sewerage and sanitation system will be developed in 3 phases each of 5 years, Phase I (2011-16); Phase II (2017-21) and Phase III (2022-26).

193. Design Criteria: Existing service adequacy gaps and demand for CLEIP period (2011-2041) will be met based on the following design criteria:

(i) Providing underground sewerage system to collect, transmit and treat the sewage generated in the Master Plan area excluding the villages before its disposal;

(ii) The rate of water supply has been adopted as per the norms of CPHEEO manual as 135 lpcd at consumer end throughout the whole design period. 80 percent of the water supply has been considered as sewage flow into the sewerage system which works out 108 LPCD. In case of bulk consumers rate of water supply has been taken as per CPHEEO manual with a return factor of 80 percent or as per actual measured quantity of effluent.

(iii) Sewer network is designed as a gravity flow system; pumping stations are minimized with flow dependent entirely on slopes.

(iv) Estimate of flow in sanitary sewers includes flows due to infiltration of ground water where the sewer has been proposed below the subsoil water level. However, where the groundwater level is much below the sewer line no infiltration is considered. Where the sub-soil level is high, infiltration rate of 5000 Lit./ Hectare / day has been adopted as per CPHEEO manual.

(v) The sewage generates form the Industries are not allowed to discharge into sewerage system.

(vi) Design Period. Design period for sewer network shall be 30 years, land acquisition

for 30 years, in case of SPS, civil works shall be 30 years but electrical and mechanical equipment shall be 15 years. STP shall be modular with initial capacity of about 10 years.

(vii) The surrounding six villages are provided with Low Cost Sanitation units in phase I. The ninety percent of the village households will be provided with LCS and community toilets for rest of 10 percent. Subsequently, during the implementation of UGD in master plan area these villages will be provided by UGD and connected to main system.

2. Sub-Project Identification

194. *Providing sewerage network.* The entire municipal area will be covered under Phase-I for the sewerage system and subsequently to remaining phases. STP will be proposed with initial capacity and will be extended for the next period. The mechanical and electrical equipment and installation will be required accordingly along with pump house.

195. *Low Cost Sanitation Options*: Community/Public toilets will be provided for slum sanitation and sewage generated from the toilet blocks is either to be treated by constructing septic tanks followed by soak pits in the areas where sewer line is not available and sufficient space is available for its construction or to be disposed into the nearby sewer line and treated at the treatment plant. The norms for use of such toilets are 50 persons per seat; therefore the number of users for 10 seat complex shall be 500.

196. In Khurja city about 90% residents are having safe sanitation facilities and rest are depending on community toilets and others. Those households who are having space to construct toilet, the material cost shall be borne under the project and labour cost will be borne by beneficiaries. The remaining residents who do not have space for construction of toilets within the house shall be provided community toilets.

197. Experience of community toilets has not been good due to poor maintenance and after some time community toilets remain unutilized. Therefore community toilets shall be constructed only if beneficiaries can maintain and pay for use. Connection to sewerage system shall be encouraged. In slums also connection to sewerage system shall be encouraged. Construction of toilets in all houses should be ensured to have city open defecation free

198. There are about 6 villages outside municipal boundary but with in the development area. These villages do not have any sewerage system at present and in phase 1 sewerage system is not proposed in these villages. However looking to urgent requirement of sanitation system it is proposed to provide house hold toilet and soak pit in the houses which do not have toilets are used to open defecation. Low cost sanitation measures are proposed in phase 1. Number of community toilets and no of household toilets required are presented in **Appendix 4**. The estimated cost is Rs 15.5 million.

199. In Khurja the project area has been divided into 3 sewerage phases, named Phase 1 to 3. The contour map shows that Delhi–Aligarh road is at contour of 200 m and area on east side of Delhi –Aligarh road drains towards North to south, lowest point being near proposed STP(near Usmanpur village) at Kabristan. The area on west of Delhi –Aligarh road is generally flat at contour of 200 m, but the lowest point is towards Usmanpur village. In the master plan 2021 location for STP was not mentioned. Green area marked in the master plan is considered as the area for STP, i.e. near Usmanpur village. This site is

suitable from engineering aspects as situated towards depression, low levels. All the area under master plan will drain in this STP. The sewage flow in different years from different Phases is given in **Table X-5**.

Table X-5: STP capacity required for different years

Year	Population	Flow in MLD		
		Estimated Wastewater Generating	Estimated Wastewater from other Activities	Total
2011	139,900	15.1	2.0	17.1
2016	155,864	16.8	2.0	18.8
2021	171,827	18.6	2.0	20.6
2026	191,434	20.7	2.0	22.7
2031	211,041	22.8	2.0	24.8
2036	235,123	25.4	2.0	27.4
2041	259,205	28.0	2.0	30.0

Source: Analysis

200. Phase I is for which sewerage is to be provided on first priority. Phase II and III, are for which are of second priority. In phase I, capacity required is given in the **Table X-6**.

Table X-6: Capacity of STP required in Phase 1

Phase No.	Period	Ultimate Demand	Proposed Capacity
		MLD	*MLD*
I	2011 – 2016	18.80	20
II	2016 – 2021	20.60	20
III	2021 – 2026	22.70	30
	2026 - 2041	30.00	30

Source: Analysis

201. Connectivity to sewer system is very slow and STPs generally does not receive the anticipated flow and remain unutilized. Therefore STPs have been proposed modular such that planning will be done for year 2041 but construction will be in phases so that initially less capacity will be developed and subsequently capacity shall be added for optimum use and minimum investments. Accordingly STP is proposed for 20 MLD capacity. This capacity will serve demand for year 2021. It is proposed to further increase capacity of STP by 10 MLD in phase 3.

C. Sewage Treatment Plant: Process

202. There are a number of treatment technologies that have been applied for sewage treatment in India under different schemes including Ganga Action Plan and other River Action Plans of NRCD. The treatment technologies for organic pollution load that have been used are mostly biological processes and have their own merits and demerits. The strategy for sewage treatment is to provide low cost treatment with a robust process that takes into account local conditions. The effluents from the STPs should confirm to the standards as presented in **Table X-7**.

Table X-7: Effluent Standards

Discharge of Effluent	BOD5	TSS	Feacal Coliform
Into the river	30 mg/l	50 mg/l	1,000 MPN
On land for irrigation purposes	50 mg/l	50 mg/l	1,000 MPN

Source: CPHEEO

203. *Activated Sludge Process.* This consists of Grit chambers, Primary Settling tank, Aeration tank and Final settling tank. ASP is a suspended growth process which is used for municipal wastewater treatment. The ASP has the advantage of producing high quality effluent for a reasonable Operating and Maintenance cost. In view of good effluent quality and reasonable maintenance cost, ASP process has been proposed in Khurja.

204. The land required for Activated sludge process is 6 hectares for 30 MLD capacity STP. The green land location shown in master plan at Kabristan near Usmanpur village has been selected for STP. KDA/ Municipal Council khurja should proceed to acquire land as required for sewage treatment plant. The other option is Fluidised Aerobic Bed.

205. *Fluidised Aerobic Bed (F.A.B.).* This process consists Clari-flocculator and Sludge Thickener. The sewage is decomposed by continuous aeration in the reactor, wherein decomposed sludge deposits suspended plastic media and breaks downs after forming larger flocks. The decomposed sewage is pumped to Clari-floculator, where sludge is settled and drawn into Sludge Thickener. The thickened sludge is pumped to Sludge drying beds for drying as Sludge cakes. The effluent from Clari-floculator is collected and is flown back into the river or sent for irrigation. The power requirement of the process is high and needs continuous supervision by skilled staff, but the requirement of land is minimum compared to other mechanized plants.

D. Water Reuse

206. The effluents after treatment in the STP can be used for irrigation with faecal coli forms within the desired limits[1]. Phosphates and nitrates are present in the effluent which is advantageous for irrigation. The treated water can also be used for industrial purposes, with further treatment as required. Considering approximately 10 percent as reduction in volume after treatment the minimum quantity of water available for reuse is given in **Table X-8.**

Table X-8: Quantity of Water Available for Reuse

Location of STP	Water for Reuse (MLD)		
	2011	2026	2041
STP at Kabristan	15.4	20.4	27.0

Source: Analysis

207. *Potential for Irrigation.* The water requirement to irrigate depends on the type of crops that are to be cultivated, type of soil and the climatic conditions. The average quantity of water required per day will be 125 - 250 m3/ha during dry seasons. The total area that can be irrigated per day in Khurja is given in **Table X-9**. In wetter periods of the year when

[1] Desired limit for Irrigation: pH between 6.0 to 8.5, Electrical Conductivity at 25°C micro mhos/cm Max.2250, Sodium absorption Ratio Max. 26, and Boron Max. 2mg/l as per CGWB

only supplementary irrigation is required a greater area could be irrigated.

Table X-9: Area for Irrigation

Location	Area for Irrigation (ha)		
	2011	2026	2041
STP at Kabristan	77.4	102.5	135.7

Source: Analysis

208. For sewer cleaning a high pressure water jetting machine will be required together with a suction tanker.

209. At present Municipal Council Khurja has no separate division for operation and maintenance of sewer. The Khurja Nagar Palika need to be strengthened to handle sewerage system professionally. The engineering department of corporation should be restructured such that at least Executive Engineer heads all engineering operations, supported by four Assistant Engineers, one assistant engineer will be in charge of sewerage operations that will be supported by 4 junior engineers dealing exclusively with sewerage. Municipal Corporation should be in charge of capital works also. However if required by them capital works can be got done from any other agency but Nagar Palika should have capacity to over view the works.

210. House Sewer Connections: Connection of waste to sewers: It is proposed to lay 110 mm/140 mm uPVC pipe under the project to connect sewage from house door to sewer man hole. This will ensure fast connectivity and avoid damage to manhole by unskilled people during connection.

E. Sustainability

211. Operation and maintenance cost should be recovered fully from beneficiaries so that proper maintenance is possible and scheme becomes sustainable.

F. Capital Cost

212. The total estimated cost in 3 phases is Rs 30423 lacs. This is based on current prices and excludes price contingency. However physical contingency at 10% and other contingencies 5% have been included. The main components and basis of estimation is given below

(i) Providing Sewerage System: The cost includes construction of complete sewer network for all the phases including laterals, Interceptors, Trunk Mains and Outfall sewers.

(ii) Sewage Pumping Stations and Rising Mains: The estimate includes two no sewage pumping stations near STP, wet wells and DI rising main. For planning purposes, it is assumed that the maximum distance that can drain to an STP is about 4.00 km. Non clog Submersible pumping sets have been proposed. In phase 1, one SPS will be provided. This will meet the flow of year 2021. Rate has been taken Rs 2000000 per MLD including civil works. In phase 2, no SPS will be provided. The wet well storage shall be 3.75 minutes at peak flow

(v) Sewage Treatment Plant: The total capacity of STP required for year 2041 will be

30 MLD. The construction shall be modular. Initially 20 MLD capacity shall be provided for STP. In third phase 10MLD capacity shall be additionally provided for STP. The treatment process shall be Activated Sludge Process consisting of Primary Settling tank, Aeration tank and Final settling tank. The land required shall be 6 hectares for STP. The provision for land acquisition has been made in first phase at Rs 10.0 million per hectare. The unit cost for STPs has been taken at Rs 5.0 million per MLD

213. Investment phasing has been done based on the following priority of interventions: (i) sewerage system to the municipal area and land acquisition for STP and pump houses; (ii) Sewage pumping station; (iii) STP (iv) sewerage in other than municipal area. Priority among these will be as per development plan priority of KDA. The detailed estimations are presented in Appendix 4. Accordingly, the total Master Plan investments are distributed in three Phases:

(i) Phase I: Providing sewerage system to municipal area; land acquisition for STP and SPS; sewerage system in all wards; STP at kabristan near Usmanpur village with SPS; providing house hold toilets and community toilets.

(ii) Phase II to III: Sewerage system will be developed in phase 2 and 3 including villages in each Phase.

Table X-10: Abstract Cost Estimates

S No	Item	Phase 1 20011-16	Phase 2 2017-21	Phase 3 2022-26	Grand Total
		Rs. Million			
1	Sewer Network	621.5	852.5	841.5	2315.5
2	Construction Sewage Pump house	40.0		20.0	60.0
3	Construction Sewage treatment plant	140.0		70.0	210.0
4	Cost of land for STP and SPS	60.0			60.0
5	Low cost sanitation and community facilities	15.5			
6	Total	877.0	852.5	931.5	2645.5
	With Contingencies	**1008.6**	**980.4**	**1071.2**	**3060.2**

Source: Analysis

G. Solid Waste Management

1. Sub-Project Rational and Design Criteria

214. Existing service adequacy gaps and demand for CLEIP period (2011-2041) will be met based on the following design criteria:

(i) Develop a process with above 90% door-to-door collection option
(ii) Ensure daily collection and safe disposal of bio-degradable waste
(iii) Streamlining street sweeping activities
(iv) Synchronizing the waste collection and transportation system across all wards
(v) Developing process for waste recycling in phases and developing sanitary landfill complying to the provisions laid in the Municipal Solid Waste (Management and Handling) Rules, 2000.
(vii) Integrating 4Rs (reduce, reuse, recycle and recover) concepts into the SWM as a long term strategy; and,
(viii) Information Education and Communication (IEC) activities

2. Sub-Project Identification and Costing

215. This City Level Environmental Infrastructure Plan (CLEIP) is proposed to be implemented over a period of 30 years (2011-2041), and accordingly solid waste management in the town and villages. This comes within the boundary of Master Plan. These sub-projects are proposed for implementation in six phases: Phase I (20011-16); Phase II (2016-21); Phase III (2021-26); Phase IV (2026-31), Phase V (2031-36) and Phase VI (2036-41).

216. *Waste Projection*. According to the CPHEEO SWM Manual, the per capita waste generation increases 1.41 percent annually. Current per capita waste generation of 243 gm/day will increase to 370 gm/day in 2041. Subsequently, city-level waste generated would increase from 29 tons/day in 2009 to 83 tons/day in 2041. **Table X-11** indicates the growth in per capita waste and city-level waste generated over the CLEIP period.

Table X-11: Projected Solid Waste Generation

Year	Per Capita Generation	Urban Area	Villages
	Gms/Day	*Tons/Day*	*Tons/Day*
2011	243	29	6
2021	280	42	7
2031	322	59	9
2041	370	83	11

Source: Analysis.

217. The component specific interventions comprise:

(i) Primary Collection. Door-to-door waste collection shall be introduced on priority and the waste shall be collected on a daily basis in the morning (06:30 hrs to 12:30 hrs). Waste collectors shall be provided with autos/push carts depending on the areas of collection, and collected waste shall be deposited in container bins. Each collection team (2 persons for auto collection, 1 for push cart collection) shall collect in a fixed area every day at a predetermined schedule. Litterbins shall be

provided along main roads to avoid littering. Number of autos and pushcarts are estimated based on net demand and replacements required after vehicle/equipment operational life.

(ii) Street Sweeping. High density areas comprising residential, commercial and market areas will be swept daily; medium density areas will be swept on alternative days/weekly twice and fringe areas will be swept weekly and undeveloped areas will be swept occasionally. Wheelbarrows with an operational life of 5 years, street cleaning implements will be provided to conservancy staff and litter bins will be provided on roads.

(iii) Waste Collection from Bulk Generators. Khurja Nagar Palika shall undertake direct collection of waste from large and medium sized hotels, restaurants, party halls, hospitals (domestic and non-bio medical waste) and from construction sites. Separate tractors with adequate crew shall be provided for the purpose and the collection shall be carried out on a fixed daily schedule; waste shall be directly transported to disposal site. Existing waste transport vehicles available with Nagar Plaika will be utilized and therefore no new equipment is proposed. Each vehicle will employ two sanitary workers and two vehicle crew, including the driver.

(iv) Temporary Waste Storage. Closed metal container bins will be provided at appropriate places. Two separate container bins shall be provided at each location for bio-degradable and other waste streams; containers will be replaced every seven years. Bio-degradable waste will be collected on a daily basis and non-biodegradable waste collected on alternative days.

(v) Waste Transportation from Containers to Disposal Site. Since the transportation system will be in synchronization with temporary storage container bins, manual handling of waste is eliminated. Filled up container bins will be lifted mechanically and transported to the disposal site.

(vi) Waste Processing and Disposal. At present Khurja Nagar Palika has no proper land for disposing the solid waste. Government land is also not available for the proposal. Private land is to be acquired for developing the integrated waste processing and disposal facility. It is proposed to set up a composting plant with private sector participation; for the landfill capacity, it is estimated that the final waste that reaches landfill is about 55 percent (including composting rejects) of total waste generation. With a 10 m high sanitary landfill, the gross site requirement (including buffer areas) is estimated at 5.2 ha with a design life of 30 years. Khurja Nagar Plaika needs to procure 4.7 ha land based on the design site requirements. Landfill will be designed and constructed as per the provisions of the MSWM, Rules 2000 and will be provided with necessary vehicle and equipment.

218. *Long-term Solid Waste Management Strategy*. The implementation of the above proposed sub projects can ensure that the solid waste management operations in Khurja are safe and efficient and confirm to the national regulations. The success however depends on many factors, important of which is the public participation, co-operation, and support. In addition to this as long terms strategy, it is important to make the solid waste management economical and environmentally safe. As seen above, the per capita waste generation is likely to increase at a rate of 1.41 percent annually, and therefore the quantity to be handled will increase manifold, and coupled with resource constraints (land and financial), the SWM will be an appalling task.

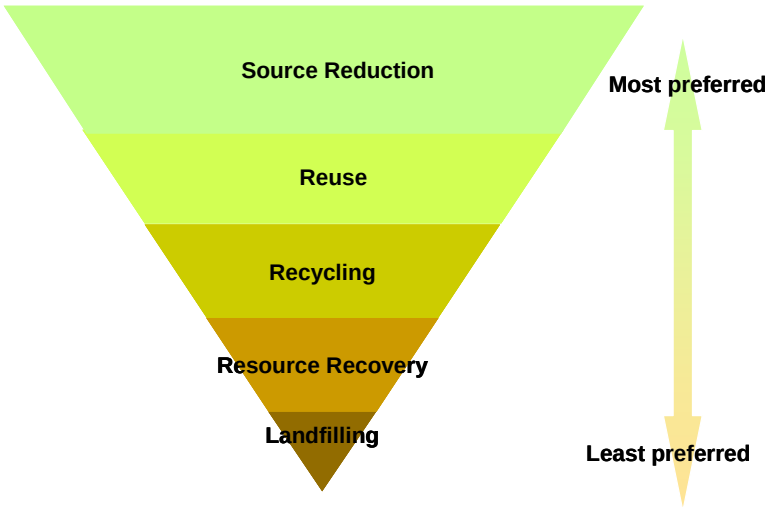
Therefore it is suggested to integrate 4Rs (Reduce; Reuse; Recycle; and Recover) strategy into the SWM.

(i) Public Participation: Swachata Samities (SSs), at ward level, shall be created. Door-to-door waste collection can be brought into the direct monitoring of SSs. A stakeholder based monitoring system shall be initiated to check the quality of service delivery and the SS would certify door-to-door collection, street sweeping and container lifting services under their jurisdiction. At the city-level, a monitoring system shall be developed with the participation of NGOs.

(ii) Public Awareness Creation. In addition to awareness on public health and SWM linkages, awareness about source reduction, reuse, segregation and temporary storage of waste at household level is crucial. Source reduction and reuse will reduce the net quantity of waste to be handled. Improved segregation at household level will essentially enhance the waste recovery ratio thus reducing the net quantity to be land filled and secure additional revenue from waste recovery. Practice of temporary waste storage at household level would mitigate street littering. Awareness creation through short films, neighborhood-level meetings shall be initiated; films/information will be screened/disseminated in the city with the help of local cable TV network. Public awareness shall be a continuous activity.

(iii) Integrate 4 Rs Strategy. As a long term strategy, the ULB shall initiate programs to integrate the 4Rs strategy into the solid waste management. As depicted in the following figure, the priority shall be first source reduction, then to reuse, recycle and recover. The aim of this is to reduce the quantity of waste to be handled and disposed by the ULB.

Chart X-1: 4R Strategy for Solid Waste Management



(iv) Source Reduction is any action that reduces or eliminates the generation of waste at source, usually within a process. Source reduction measures include process modifications, material substitutions, improvements in housekeeping and management practices, and recycling within a process. For example, an individual resident could achieve source reduction by bringing bags to the grocery store to package their purchases. It is imperative that the ULB practices the source reduction strategies at its facilities and offices, to set an example for the public to follow. The ULB can also influence decisions made by residents and businesses by public

education and promotion. The fundamental goal of this effort is to influence attitudes and change behaviour.

(v) Reuse is the process of separating a given solid waste material from the waste stream and using it, without processing or changing its form, other than possible size reduction, for the same or another end use. For example, building materials that are removed during renovation or demolition can be installed in another building. Used clothing and household items can be collected for resale and reuse.

(vi) Recycling is the process of separating a given waste material from the waste stream and processing it so that it may be used again as a raw material for a product, which may or may not be similar to the original product. Recycling primarily addresses materials such as: metals, glass, plastic and paper fiber. In Khurja, recycling is practiced through informal rag picking activity on streets. However, as the waste is disposed unsegregated, recovery of recycled material is low. The current unhealthy informal activity needs to be streamlined and waste segregation at source shall be implemented.

(vii) Resource Recovery is the recovery of a usable produce like compost/fuel pellets or energy from the solid waste. These processes reduce the volume of waste to be disposed safely through a landfill. Thus reduces the land and resource requirement for waste landfill. This also provides additional financial resources to the ULBs through selling of resource recovered like compost product.

219. The total investments over the planning period are Rs. 131 million. **Table X-12** provides a breakdown of investment over the planning period. Detailed estimation is presented in Appendix 5**.**

Table X-12: Khurja Sub-Projects and Costing – Solid Waste Management

Particulars	**Total (2011-41)**	**2011-16**	**2016-21**	**2021-26**	**2026-31**	**2031-36**	**2036-41**
	Rs. Million						
Equipment & Vehicles (Collection & Transportation)							
Containerized Push Carts for D2D Collection	4.90	0.62	0.69	0.76	0.84	0.93	1.03
Auto Tippers for D2D Collection	3.80	1.25	0.25	-	1.50	0.50	0.25
Push Carts for Street sweeping	19.30	3.13	3.16	3.20	3.24	0.33	3.33
Litter Bins	3.90	0.63	0.64	0.64	0.65	0.66	0.67
Closed Containers (3 m3 capacity)	6.00	1.15	0.20	1.45	0.50	0.18	0.90
Dumper Placers (twin containers of 3 m3)	4.20	1.20	-	0.60	1.20	-	1.20
Closed Containers (4.5 m3 capacity)	3.40	0.72	0.07	0.91	0.20	0.12	0.39
Dumper Placers (twin containers of 4.5 m3)	2.70	0.90	-	-	1.80	-	-
Total - Collection & Transportation	*48.20*	*9.59*	*5.00*	*7.56*	*9.93*	*8.34*	*7.77*
Landfill Facility							
Equipment							
Backhoe Loader	4.00	2.00	-	-	-	2.00	-
Bull Dozer	12.00	6.00	-	-	-	6.00	-
Sub-total	16.00	*8.00*	-	-	-	*8.00*	-
Civil Works							

Landfill Cell Development	23.70	2.35	2.79	3.32	3.94	5.10	6.22
Other infrastructure (roads, drains, fencing, building, etc	2.60	1.36	-	-	-	1.23	-
Sub-total	26.31	*3.70*	*2.79*	*3.32*	*3.94*	*6.34*	*6.22*
Total - Landfill Facility	*42.31*	*11.70*	*2.79*	*3.32*	*3.94*	*14.34*	*6.22*
Compost Plant							
Equipment							
Backhoe Loader	4.00	2.00	-	-	-	2.00	-
Tipper Truck	4.80	2.40	-	-	-	2.40	-
Tipper Tractor	1.60	1.60	-	-	-	-	-
Water Tanker (3000 lt)	0.60	0.30	-	-	-	0.30	-
Weight Bridge (20 MT)	2.00	1.00	-	-	-	1.00	-
Plant & Machinery	20.00	10.00	-	-	-	10.00	-
Sub-total	33.00	*17.30*	-	-	-	*15.70*	-
Civil Works							
Internal roads, drains, tipping floor, office building, store, etc	7.50	7.50	-	-	-	-	-
Total - Compost Plant	*40.50*	*24.80*	-	-	-	*15.70*	-
Total	**131.00**	**46.09**	**7.79**	**10.87**	**13.86**	**38.37**	**13.98**

Source: Analysis.

H. Storm Water Drainage

1. Sub-Project Rational and Design Criteria

220. Existing service adequacy gaps and demand for CLEIP period (2011-2041) will be met based on the following design criteria:

(i) Expansion of drains to cover entire road network to collect and dispose the storm runoff safely in town and villages
(ii) Rehabilitating existing drains in town and villages
(iii) Desilting and rehabilitating natural drains
(iv) Considering both side drains for roads

2. Sub-Project Identification and Costing

221. This City Level Environmental Infrastructure Investment Plan (CLEIP) is proposed to be implemented over a period of 30 years (2011-2041), and accordingly improvements and new infrastructure required for the storm water drainage system in the Towns are identified. This comes within the boundary of Master Plan. These sub-projects are proposed for implementation in three phases: Phase I (2011-16); Phase II (2017-21) and Phase III (2022-26). The implementation phases are shown in **Map X-1.**

3. Rehabilitation and Augmentation of Existing Drains

222. SDO office BSNL to crossing at NH91 and Civil court to Loya Public School are pucca drains and needs to be desilted and needs to be channeled with regular shape and size as per the estimated discharge. The section wise recommendations for rehabilitation and

augmentation are as follows:

(a) *From SDO office BSNL to crossing at NH91*. Though the section is channelized, but weeds have grown and also carrying polythene covers, thereby blocking the flow. This needs to be rehabilitated.

(b) *From Crossing at NH91 to Police station Tehsil along NH91*. As the drain is pucca for some distance and the remaining is kutcha in this area, the drain needs to be channelized and made complete pucca.

(ii) Civil court to Loyal Public school. This the second major drain along the municipal roads. Many official buildings like civil court, Nagar Palika office etc and other commercial buildings are existing along this drain. The drains are choked and running at full capacity. The section wise recommendations are as follows:

(a). *Civi court to Nagar Palika chowk.* As the drain carries the waste water, the arrangement for diverting this waste water to sewerage system is the prime necessity. As this is pucca, the drain required to be provided with cover.

(b). *Nagar Palika chowk to Loyal public school*. The drain has to be constructed partially in this portion. This drain is carrying huge load due to disposal of wastewater into the drains. Drain has to be desilted and wastewater is to be diverted to sewerage system. The drain finally meets Nala at Loyal college.

(c). *Nagar Palika chowk to Tolia Ghat.* As the drain passes through the populated area and sewerage makes way into the drain. It is recommended to eliminate the sewerage from the existing drain through sewerage system in adjoining colonies. The drain is very narrow and not sufficient to carry the load during heavy rains and floods. Presently, the solid waste from the commercial shops entering into the drain. It is recommended to provide a cover at this location.

(d). *Crossing at NH91 to Masjid toward village Kothi ka Nagla*. As many pottery industries are located along this road, drains are choked due to entering of pottery waste. The drain is to be channelized and cover should be provided over the drains.

4. New Proposed Drains

223. A drain along with the Outer ring road has been proposed along the master plan boundary. Other than this many new roads were proposed in the Master Plan 2021. Subsequently new drains should be constructed along these roads as they are in residential and commercial areas.

224. *Secondary and Tertiary Drains*. In addition to the main drains, all the roads should have secondary drains and colonies road should have tertiary drains. The tertiary drains may be integrated along with the roads and proper slope should be provided as to drain out the storm water. During construction of roads, proper camber should be provided and sufficient longitudinal slope need to be designed and accordingly the road should be drain. It is estimated that 102 km of drains need to be construct on both sides of roads. Apart from this, the new drains to be developed in phase 2 to 3 including villages also estimated.

225. The total investment in storm water drainage sector to meet the ultimate demand of 2041 is estimated as Rs. 528 million and details are illustrated in **Table X-13**. Detailed

estimation is presented inAppendix 6**.**

Table X-13: Khurja Sub-Projects and Costing – Storm Water Drainage

Item	**Phase 1 20011-16**	**Phase 2 2017-21**	**Phase 3 2022-26**	**Grand Total**
	Rs in Million			
Construction major, secondary and tertiary drains	102.2	154.7	153.3	410.2
Villages: New Construction of Secondary & Tertiary drains		46.3	23.7	70.0
Sub Total	**102.2**	**201.0**	**177.0**	**480.2**
Physical contingencies @10% of sub total	10.2	20.1	17.7	48.0
Total	**112.4**	**221.1**	**194.7**	**528.2**

Source: Analysis.

Summary of Costing

226. The total investment estimated for Khurja CLEIP is Rs. 4,558 million. Base cost of sub-project components were determined using the NCRPB toolkit Rates and where designs / detailed reports were available. The cost summary is indicated in **Table X-14.**

Table X-14: Summary of CLEIP investment

S. No	**Item**	**Phase 1 20011-16**	**Phase 2 2017-21**	**Phase 3 2022-26**	**Grand Total**
		Rs. Million			
1	Water Supply	204.41	228.92	422.94	856.26
2	Sewerage & Sanitation	1008.6	980.40	1071.20	3060.20
3	Solid Waste Management	46.09	7.79	77.08	130.96
4	Storm Water Drainage	112.40	221.10	194.70	528.20
	Total	1353.60	1438.21	1765.92	4557.72

Source: Analysis

XI. FINANCIAL OPERATING PLAN

A. Proposed Investments

227. The objective of this section is to assess the investment sustenance of the Khurja Municipality vis-à-vis for the envisaged CLEIP estimated investments for proposed project. The preceding sections reviewed the Municipal fiscal situation, while this section determines the capital sustenance capacity of the local body, as the funds for the proposed project assumed to be on loan basis. This exercise will carry out in two conditions, which are (i) Base case scenario and (ii) UIDSSMT Scenario (80% grant from Central Govt., 10 % grant from State Govt. and 10 % Contribution).

228. *Proposed Investments*. Following **Table XI-1** presents the estimated CLEIP investments for various sectors. The total estimated investment requirement is Rs. 4,557 million (455 crores), in which 1,353 million (135 crores) is proposed in Phase 1.

Table XI-1: Summary of CLEIP investment

S. No	Item	Phase 1 20011-16	Phase 2 2017-21	Phase 3 2022-26	Grand Total
		Rs. Million			
1	Water Supply	204.41	228.92	422.94	856.26
2	Sewerage & Sanitation	1008.6	980.40	1071.20	3060.20
3	Solid Waste Management	46.09	7.79	*77.08	131.00
4	Storm Water Drainage	112.40	221.10	194.70	528.20
	Total	1371.50	1438.21	1765.92	4575.63

Source: Analysis

B. Base Case Scenario

229. In this scenario, the performance of the ULB will remains same for the future. With same conditions financial operating plan (FOP) prepared for the Khuja Municipality for the period 2011-31. The municipality cannot sustain proposed investment at present conditions. The ULB financial situation will be in deficit from 2011. However, the municipality can control the capital expenditure towards roads and water supply so that the ULB cannot face deficit closing balance in upcoming years. National inflation i.e. ~10 percent is assumed for all the revenue, capital income and expenditure heads projection. The overall status of Municipal accounts is shown in **Table XI-2**.

Table XI-2: Scenario 1 – Base Cause

Item	2011	2015	2021	2031
	Rs. Million			
Revenue Account				
Opening Balance	(25.70)	(151.46)	(458.76)	(1,280.08)
Revenue Income	128.02	187.47	331.29	705.32
Revenue Expenditure	141.13	206.63	366.05	784.67
Closing Balance	(52.78)	(191.07)	(529.77)	(1,437.13)

Item	2011	2015	2021	2031
	Rs. Million			
Capital Account				
Capital Income	74.54	109.13	193.33	414.41
Capital Expenditure	88.51	129.59	229.58	492.12
Capital Status	(13.98)	(20.46)	(36.25)	(77.70)

Source: Analysis

C. Scenario two (UIDSSMT)

230. The sustainability analysis assumes that the Municipality will carry out minimum reforms indicated as assumptions for financial projections. A financial operating plan (FOP) prepared for the Khurja Municipality for the period of 2011-31 taking into proposed investment for the next five years. The final output of this section is to assess the Municipal fund status and the extent of investment it can sustain on loan and in addition to meet the debt commitment, additional O & M arising out of new investment.

231. Basic Assumptions for Projections

(i) Revenue Income: Revenue Income is projected based on two major income sources: property tax and water charges. Property tax is projected on the basis of the Average tax demand per assessment and at present collection performance of 20 percent of arrears and 50 percent of current demand. It is also assumed that the ARV will be revised every 3 years by 25% and the next revision will be in effect from FY 2012-13 and by FY 2015-16 the collection performance for current and arrears will improve by 75 percent and from FY 2020-21 current collection performance assumed as 80 percent till end of the projected year.

(ii) Water charges are increased at 15 percent every 3 years, and at present the collection performance of current and arrears are recorded as 50 and 20 respectively. It is assumed on a collection performance of 80 percent of current and arrears demand at the end of projected year– it is assumed that water connections will be provided to 97 percent and of the property tax assessments at the end of projected year.

(iii) Revenue Expenditure: The Revenue Expenditure items were forecasted based on the past trend subject to inflation of 10 percent per annum. For the heads of loans, repayment towards deposits, establishment expenditure and O & M are contributing significant expenditure, hence ULB should minimize expenditure towards these heads.

(iv) Proposed New Investment: The proposed investment will start from the year of 2011-12 to five years, implementation period is five years. The investment estimated by CLEIP is considered for wastewater with considering operation and maintenance. It is assumed that the loan shall be financed at an interest rate of 9 per cent repayable in 20 years including 5-year moratorium, interest being capitalized during the moratorium period.

(v) As the proposed investment is for new assets or infrastructure, Municipality will have to provide certain additional funds for the regular maintenance in addition to

its current o & M cost, it is assumed that this additional O & M will be 6 percent for water supply projects, 8 percent for sewerage projects and 4 percent for other capital investment.

232. Based on the above assumptions, the Financial Operating Plan (FOP) had been generated from FY 2011-12 to FY 2030-31. The details of financial review and FOP are presented in the Appendix 6. Assumptions for the second scenario is tabulated in **Table XI-4**

Table XI-3: Assumptions for Scenario 2

Sl. No.	Item	Assumption for Forecast	Basis
1	Property Tax		
	ARV Revision	By 25% from the FY 2012-13	Proposals Every three year same percentage revision
	Growth in Assessments	1%	Current Average/Proposal in case of non availability of data
	Collection Performance	Current collection FY 2020-21 80 % Arrears Collection FY 2030-31 95 %	Current total collection is 50 % during 2009-10
2	Water Charges		
	Current Charges	Dom: Rs. 20/ month Non Dom. Rs. 40/month	Current Charges
	Revision of Charges	By 15% during FY 2011-12 and thereafter every 3 years	Proposals
	Coverage of Property Tax assessment through Individual House Service Connection	75% by 2021	Current Coverage 37%, will increase by 5% per annum
	Collection Performance	By 2015 collection performance will improve as follows: Arrears Demand 31 % Current Demand 75%	Arrears Demand 20 % Current Demand 50%
	New Connection Fee (One time initial charge)	Dom: Rs. 240 Non Dom. Rs. 800	Current System
3	Sewerage		
	Connections	84 % of Property tax assessments	
	Charges	Domestic Rs. 20 Non Domestic Rs. 50 Every three years 15 % increase	
	Connection fee	Domestic Rs. 500 Non Domestic Rs. 1000	
4	Expenditure control		
	Capital expenditure towards Roads	Reduced to 9 %	
	Capital expenditure towards Water supply	Reduced to 6 %	

Source: Analysis

233. This scenario is worked out assuming that the proposed investment phase one investment from 2011 to 2016. The operation and maintained is added to the FOP calculations. The same assumption in the scenario two and loan grant mix is considered as UIDSSMT fund contribution. In this scenario, fund contribution from central govt. 80 percent and 10 percent from state govt. as grant and 10 percent ULB contribution were adopted.

Table XI-4: Scenario two (UIDSSMT)

Item	2011	2015	2021	2031
	Rs. Million			
Revenue Account				
Opening Balance	(18.28)	695.76	420.57	10.43
Revenue Income	129.49	192.53	338.14	716.29
Revenue Expenditure	141.13	206.63	458.96	877.57
Closing Balance	158.31	881.38	341.44	9.05
Capital Account				
Capital Income	292.77	327.36	193.33	414.41
Capital Expenditure	104.54	127.65	151.63	254.52
Capital Status	188.23	199.72	41.69	159.90

Source: Analysis

234. The result of the FOP in this scenario indicates that Khurja Municipality will able to sustain 29 percent of proposed investment for 2041. The proposed investment in phase one is Rs. 1,353 million. The municipality can sustain full investment with above mentioned reforms and 90 percent grant (State and Central), 10 percent own contribution. However, the ULB need to take serious steps to improve collection performance of their own source of fund like property tax and water supply. It is also noticed that there are many unassessed properties in the Municipality, it need to regularize and increase the water supply connections within the jurisdiction. Under this scenario the ULB can contribute Rs. 137 million towards the estimated investment with above mentioned reforms and grants. The status of this scenario is illustrated in **Table XI-5.**

Table XI-5: Proposed and Sustainable Investment

Item	Proposed Investment	Central Grant	State Grant	Own Contribution	Sustainable Investment
Phase 2011-2016	*Rs. in million*				
Water Supply	204.41	163.528	20.441	20.441	204.41
Sewerage and Sanitation	1008.6	806.88	100.8	100.8	1008.6
Solid Waste Management	46.09	36.872	4.609	4.609	46.09
Storm Water Drainage	112.4	89.92	11.24	11.24	112.4
Total	1371.50	1097.20	137.09	137.09	1371.50

Source: Analysis

Appendices

Appendix 1: Growth Trend of Municipal Accounts

Abstract of Detailed Municipal Accounts

Nagar Palika Khurja

			Actual					*Sectoral Contribution*						*Growth Over Previous Year*					
		Head of Accounts	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	***Average***	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	***Average***
			Rs. In million					*Percentage*						*Percentage*					
		Opening Balance	1.00	1.00	12.74	31.77	36.21												
		Revenue Account																	
		Revenue Receipts																	
	A	**Taxes**																	
	1	Property Tax	-	2.42	2.20	2.64	4.90	N.A.	2.68	2.28	3.13	4.68	3.19	-		(9.18)	20.22	85.30	32.11
		Sub Total A	-	2.42	2.20	2.64	4.90	**N.A.**	**2.68**	**2.28**	**3.13**	**4.68**	**3.19**	-		**(9.18)**	**20.22**	**85.30**	**32.11**
	B	**Non Taxes**																	
	1	Cinema Show Tax (Entertainment)	-	0.11	0.14	0.09	0.11	N.A.	0.13	0.14	0.10	0.10	0.12	-		22.60	(36.86)	19.59	1.77
	2	Extension of Building Construction	-	0.06	0.10	0.03	0.08	N.A.	0.07	0.10	0.03	0.08	0.07	-		54.86	(70.85)	189.21	57.74
	3	Licensing Fee	-	0.04	0.04	0.05	0.14	N.A.	0.05	0.04	0.06	0.13	0.07	-		(4.99)	10.51	197.21	67.58
	4	Rent (Land, House, Shop, Rental vehicles)	-	0.41	0.36	0.46	0.35	N.A.	0.45	0.38	0.54	0.33	0.42	-		(11.54)	26.10	(23.18)	(2.87)
	5	Miscellaneous	-	0.26	0.46	0.05	1.81	N.A.	0.28	0.48	0.06	1.73	0.64	-		81.10	(89.56)	3,633.26	1,208.26
		Sub Total B	**-**	**0.89**	**1.11**	**0.67**	**2.49**	**N.A.**	**0.98**	**1.15**	**0.79**	**2.38**	**1.32**	**-**		**24.70**	**(39.61)**	**272.04**	**85.71**
	C	**Assigned Revenues**																	
	1	Assets Transfer (2%)	-	14.74	12.68	16.80	14.00	N.A.	16.29	13.16	19.85	13.39	15.67	-		(13.97)	32.47	(16.66)	0.61
	2	Others	-	0.89	0.93	0.86	0.07	N.A.	0.99	0.97	1.01	0.07	0.76	-		4.33	(8.31)	(91.82)	(31.93)
		Sub Total C	**-**	**15.63**	**13.61**	**17.65**	**14.07**	**N.A.**	**17.28**	**14.13**	**20.86**	**13.45**	**16.43**	**-**		**(12.92)**	**29.67**	**(20.30)**	**(1.18)**
	D	**Revenue Grants**																	
	1	State Grants (State Finance Commission)	-	64.74	71.92	57.57	63.00	N.A.	71.56	74.66	68.04	60.23	68.62	-		11.08	(19.95)	9.43	0.19
	2	Twelve Finance Commission	-	4.14	4.96	3.31	3.50	N.A.	4.57	5.15	3.91	3.35	4.25	-		20.00	(33.33)	5.77	(2.52)
	3	MLA/MP Development Fund	-	-	-	-	3.50	N.A.	-	-	-	3.35	0.84	-					
	4	Miscellaneous	-	0.09	-	0.18	7.18	N.A.	0.10	-	0.21	6.86	1.79	-		(100.00)		3,931.35	1,915.68
		Sub Total D	**-**	**68.97**	**76.88**	**61.06**	**77.18**	**N.A.**	**76.23**	**79.81**	**72.16**	**73.79**	**75.50**	**-**		**11.47**	**(20.58)**	**26.39**	**5.76**
	E	**Receipts from Water Tax and Sewerage Tax**																	
	1	Water Charges	-	2.05	1.82	2.28	4.90	N.A.	2.27	1.89	2.70	4.68	2.88	-		(11.36)	25.64	114.67	42.98
	2	Others	-	0.51	0.71	0.31	1.06	N.A.	0.56	0.74	0.36	1.02	0.67	-		39.79	(56.93)	246.35	76.40
		Sub Total E	**-**	**2.56**	**2.53**	**2.59**	**5.96**	**N.A.**	**2.83**	**2.63**	**3.06**	**5.70**	**3.55**	**-**		**(1.17)**	**2.36**	**130.29**	**43.83**
		Grand Total Revenue Receipts	**-**	**90.47**	**96.33**	**84.62**	**104.59**	**N.A.**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**-**		**6.47**	**(12.16)**	**23.61**	**5.97**
		Revenue Expenditure																	
	A	**Establishment**																	
	1	Pay and Allowance to Municipal Staff	-	10.99	9.66	12.32	23.10	N.A.	17.36	15.01	19.79	21.71	18.47	-		(12.08)	27.49	87.49	34.30
	2	Pension Benefits	-	7.97	7.40	8.54	35.00	N.A.	12.58	11.49	13.71	32.90	17.67	-		(7.12)	15.33	310.04	106.09
		Sub Total A	-	**18.96**	**17.07**	**20.86**	**58.10**	**N.A.**	**29.94**	**26.50**	**33.50**	**54.61**	**36.14**	-		**(10.00)**	**22.22**	**178.58**	**63.60**
	B	**Operation & Maintenance -Municipal Services**																	
	1	Roads	-	1.56	2.21	0.91	0.70	N.A.	2.46	3.43	1.46	0.66	2.00	-		41.58	(58.73)	(23.21)	(13.45)
	2	Fire	-	0.03	0.04	0.01	0.04	N.A.	0.04	0.06	0.02	0.03	0.04	-		52.60	(68.94)	175.98	53.21
	3	Miscellaneous	-	3.13	1.62	4.65	4.03	N.A.	4.94	2.51	7.46	3.78	4.67	-		(48.41)	187.66	(13.36)	41.96
		Sub Total B	-	**4.72**	**3.86**	**5.57**	**4.76**	**N.A.**	**7.45**	**6.00**	**8.95**	**4.47**	**6.72**	-		**(18.07)**	**44.12**	**(14.54)**	**3.84**
	C	Water Supply and Sewerage Establishment																	
	1	Water Supply	-	3.09	3.37	2.81	2.10	N.A.	4.88	5.23	4.51	1.97	4.15	-		9.05	(16.61)	(25.27)	(10.94)
	2	Sanitation	-	27.53	25.11	29.95	31.50	N.A.	43.47	38.99	48.11	29.61	40.05	-		(8.79)	19.28	5.16	5.21
		Sub Total C	-	**30.62**	**28.48**	**32.77**	**33.60**	**N.A.**	**48.35**	**44.23**	**52.62**	**31.58**	**44.20**	-		**(6.99)**	**15.03**	**2.55**	**3.53**
	D	Water Supply and Sewerage O & M																	
	1	Transportation - Water Purchase	-	0.26	0.06	0.45	0.07	N.A.	0.40	0.09	0.72	0.07	0.32	-		(76.35)	645.68	(84.47)	161.62
	2	Repair and Maintenance	-	2.22	4.25	0.19	0.35	N.A.	3.51	6.60	0.30	0.33	2.69	-		91.55	(95.59)	86.48	27.48
	3	Health Establishment	-	1.37	1.32	1.43	1.40	N.A.	2.17	2.05	2.29	1.32	1.96	-		(3.77)	7.84	(1.84)	0.74
	4	Medicine	-	0.11	0.04	0.19	0.14	N.A.	0.18	0.06	0.30	0.13	0.17	-		(63.34)	345.58	(24.41)	85.94
	5	Cleaning System	-	1.85	3.26	0.44	0.47	N.A.	2.93	5.07	0.71	0.44	2.29	-		76.07	(86.41)	6.53	(1.27)
		Sub Total D	-	**5.82**	**8.94**	**2.69**	**2.43**	**N.A.**	**9.19**	**13.88**	**4.33**	**2.29**	**7.42**	-		**53.70**	**(69.88)**	**(9.68)**	**(8.62)**
	E	**Debt Servicing**																	
	1	Loan Repayment																	
	2	Allocation / Extraordinary and Loans	-	-	-	-	3.50	N.A.	-	-	-	3.29	0.82	-					
	3	Advance	-	0.55	0.95	0.14	3.64	N.A.	0.86	1.48	0.22	3.42	1.50	-		74.57	(85.43)	2,518.71	835.95
	4	Deposits	-	2.67	5.09	0.24	0.35	N.A.	4.21	7.91	0.39	0.33	3.21	-		90.93	(95.25)	44.65	13.45
		Sub Total E	-	**3.21**	**6.05**	**0.38**	**7.49**	**N.A.**	**5.08**	**9.39**	**0.61**	**7.04**	**5.53**	-		**88.15**	**(93.70)**	**1,866.10**	**620.18**

Appendix 2: FOP for Two Scenarios

Financial Operating Plan: Scenario 1																										
Nagar Palika Khurja																										
Scenario one							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Head of Account	**Current**	**Proposed Growth**	**Unit**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**
																Rs. in Lakhs										
	Opening Balance					*23.92*	*0.02*	*(25.70)*	*(52.78)*	*(82.64)*	*(115.71)*	*(151.46)*	*(191.07)*	*(235.11)*	*(282.85)*	*(335.84)*	*(394.78)*	*(458.76)*	*(529.77)*	*(608.75)*	*(694.55)*	*(789.76)*	*(895.60)*	*(1,010.65)*	*(1,138.27)*	*(1,280.08)*
Revenue Account																										
Revenue Receipts																										
A	**Taxes**																									
1	Property Tax	32.11	10	%	4.90	3.09	3.47	4.74	5.14	5.46	6.52	6.94	7.27	8.57	9.06	9.46	11.12	11.73	12.23	14.35	15.13	15.77	18.49	19.50	20.31	20.98
	Sub Total A				**4.90**	**3.09**	**3.47**	**4.74**	**5.14**	**5.46**	**6.52**	**6.94**	**7.27**	**8.57**	**9.06**	**9.46**	**11.12**	**11.73**	**12.23**	**14.35**	**15.13**	**15.77**	**18.49**	**19.50**	**20.31**	**20.98**
B	**Non Taxes**																									
1	Extension of Building Construction	57.74	10	%	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.16	0.18	0.20	0.22	0.24	0.26	0.29	0.32	0.35	0.39	0.42	0.47	0.51	0.57	0.62
2	Licensing Fee	67.58	10	%	0.14	0.15	0.17	0.19	0.20	0.23	0.25	0.27	0.30	0.33	0.36	0.40	0.44	0.48	0.53	0.58	0.64	0.71	0.78	0.86	0.94	1.04
3	Rent (Land, House, Shop, Rental vehicles)	(2.87)	10	%	0.35	0.39	0.42	0.47	0.51	0.56	0.62	0.68	0.75	0.83	0.91	1.00	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14	2.35	2.59
4	Miscellaneous	1,208.26	10	%	1.81	1.99	2.19	2.40	2.64	2.91	3.20	3.52	3.87	4.26	4.68	5.15	5.67	6.23	6.86	7.54	8.30	9.13	10.04	11.05	12.15	13.36
	Sub Total B				**2.49**	**2.73**	**3.01**	**3.31**	**3.64**	**4.00**	**4.40**	**4.84**	**5.33**	**5.86**	**6.45**	**7.09**	**7.80**	**8.58**	**9.44**	**10.38**	**11.42**	**12.56**	**13.82**	**15.20**	**16.72**	**18.39**
C	**Assigned Revenues**																									
1	Assets Transfer (2%)	0.61	10	%	14.00	15.40	16.94	18.63	20.50	22.55	24.80	27.28	30.01	33.01	36.31	39.94	43.94	48.33	53.16	58.48	64.33	70.76	77.84	85.62	94.18	103.60
2	Others	(31.93)	10	%	0.07	0.08	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.22	0.24	0.27	0.29	0.32	0.35	0.39	0.43	0.47	0.52
	Sub Total C				**14.07**	**15.48**	**17.02**	**18.73**	**20.60**	**22.66**	**24.93**	**27.42**	**30.16**	**33.18**	**36.49**	**40.14**	**44.16**	**48.57**	**53.43**	**58.77**	**64.65**	**71.12**	**78.23**	**86.05**	**94.66**	**104.12**
D	**Revenue Grants**																									
1	State Grants (State Finance Commission)	0.19	10	%	63.00	69.30	76.23	83.85	92.24	101.46	111.61	122.77	135.05	148.55	163.41	179.75	197.72	217.49	239.24	263.17	289.48	318.43	350.27	385.30	423.83	466.22
	Sub Total D				**73.68**	**81.04**	**89.15**	**98.06**	**107.87**	**118.65**	**130.52**	**143.57**	**157.93**	**173.72**	**191.09**	**210.20**	**231.22**	**254.35**	**279.78**	**307.76**	**338.53**	**372.39**	**409.63**	**450.59**	**495.65**	**545.21**
E	**Receipts from Water Tax and Sewerage Tax**																									
1	Water Charges	42.98	10	%	4.90	1.10	1.28	1.70	1.89	2.04	2.37	2.55	2.72	3.11	3.32	3.52	4.01	4.28	4.53	5.16	5.51	5.83	6.65	7.10	7.52	8.59
2	Connection Fee		10	%	-	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.11	0.12	0.12	0.13	0.14	0.14	0.15
	Sub Total E				**5.96**	**2.33**	**2.63**	**3.19**	**3.51**	**3.83**	**4.33**	**4.70**	**5.08**	**5.70**	**6.17**	**6.65**	**7.45**	**8.06**	**8.68**	**9.72**	**10.51**	**11.33**	**12.70**	**13.75**	**14.83**	**16.62**
Grand Total Revenue Receipts					**101.09**	**104.67**	**115.28**	**128.02**	**140.76**	**154.60**	**170.70**	**187.47**	**205.76**	**227.03**	**249.27**	**273.54**	**301.75**	**331.29**	**363.56**	**400.98**	**440.25**	**483.16**	**532.86**	**585.09**	**642.16**	**705.32**
Revenue Expenditure																										
A	**Establishment**																									
1	Pay and Allowance to Municipal Staff	34.30	10	%	23.10	25.41	27.95	30.75	33.82	37.20	40.92	45.02	49.52	54.47	59.92	65.91	72.50	79.75	87.72	96.49	106.14	116.76	128.43	141.28	155.41	170.95
2	Pension Benefits	106.09	10	%	35.00	38.50	42.35	46.59	51.24	56.37	62.00	68.21	75.03	82.53	90.78	99.86	109.84	120.83	132.91	146.20	160.82	176.91	194.60	214.06	235.46	259.01
	Sub Total A				**58.10**	**63.91**	**70.30**	**77.33**	**85.06**	**93.57**	**102.93**	**113.22**	**124.54**	**137.00**	**150.70**	**165.77**	**182.34**	**200.58**	**220.63**	**242.70**	**266.97**	**293.66**	**323.03**	**355.33**	**390.87**	**429.95**
B	**Operation & Maintenance -Municipal Services**																									
1	Roads	(13.45)	10	%	0.70	0.77	0.85	0.93	1.02	1.13	1.24	1.36	1.50	1.65	1.82	2.00	2.20	2.42	2.66	2.92	3.22	3.54	3.89	4.28	4.71	5.18
2	Miscellaneous	41.96	10	%	4.03	4.43	4.87	5.36	5.89	6.48	7.13	7.84	8.63	9.49	10.44	11.48	12.63	13.90	15.28	16.81	18.49	20.34	22.38	24.62	27.08	29.79
	Sub Total B				**4.76**	**5.24**	**5.76**	**6.34**	**6.97**	**7.67**	**8.43**	**9.28**	**10.20**	**11.22**	**12.35**	**13.58**	**14.94**	**16.43**	**18.08**	**19.88**	**21.87**	**24.06**	**26.47**	**29.11**	**32.02**	**35.23**
C	**Water Supply and Sewerage Establishment**																									
1	Water Supply	(10.94)	10	%	2.10	2.31	2.54	2.80	3.07	3.38	3.72	4.09	4.50	4.95	5.45	5.99	6.59	7.25	7.97	8.77	9.65	10.61	11.68	12.84	14.13	15.54
2	Sanitation	5.21	10	%	31.50	34.65	38.12	41.93	46.12	50.73	55.80	61.38	67.52	74.28	81.70	89.87	98.86	108.75	119.62	131.58	144.74	159.22	175.14	192.65	211.92	233.11
	Sub Total C				**33.60**	**36.96**	**40.66**	**44.72**	**49.19**	**54.11**	**59.52**	**65.48**	**72.02**	**79.23**	**87.15**	**95.86**	**105.45**	**116.00**	**127.60**	**140.36**	**154.39**	**169.83**	**186.81**	**205.49**	**226.04**	**248.65**
D	**Water Supply and Sewerage O & M**																									
1	Transportation - Water Purchase	161.62	10	%	0.07	0.08	0.08	0.09	0.10	0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.22	0.24	0.27	0.29	0.32	0.35	0.39	0.43	0.47	0.52
2	Repair and Maintenance	27.48	10	%	0.35	0.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Sub Total D				**2.43**	**2.68**	**2.52**	**2.77**	**3.05**	**3.35**	**3.69**	**4.06**	**4.46**	**4.91**	**5.40**	**5.94**	**6.54**	**7.19**	**7.91**	**8.70**	**9.57**	**10.53**	**11.58**	**12.74**	**14.01**	**15.41**
E	**Debt Servicing**																									
1	Advance	835.95	10	%	3.64	4.00	4.40	4.84	5.33	5.86	6.45	7.09	7.80	8.58	9.44	10.39	11.42	12.57	13.82	15.21	16.73	18.40	20.24	22.26	24.49	26.94
	Sub Total E				**7.49**	**8.24**	**9.06**	**9.97**	**10.97**	**12.06**	**13.27**	**14.60**	**16.06**	**17.66**	**19.43**	**21.37**	**23.51**	**25.86**	**28.44**	**31.29**	**34.42**	**37.86**	**41.64**	**45.81**	**50.39**	**55.43**
Grand Total Revenue Expenditure					**106.38**	**117.02**	**128.30**	**141.13**	**155.24**	**170.77**	**187.84**	**206.63**	**227.29**	**250.02**	**275.02**	**302.52**	**332.78**	**366.05**	**402.66**	**442.92**	**487.22**	**535.94**	**589.53**	**648.49**	**713.33**	**784.67**
Revenue Account Status- Surplus/Deficit					**(5.29)**	**(12.35)**	**(13.02)**	**(13.11)**	**(14.48)**	**(16.16)**	**(17.14)**	**(19.15)**	**(21.53)**	**(22.99)**	**(25.75)**	**(28.98)**	**(31.03)**	**(34.76)**	**(39.10)**	**(41.94)**	**(46.96)**	**(52.77)**	**(56.67)**	**(63.40)**	**(71.17)**	**(79.35)**
Capital Account																										
Capital Receipts																										
A	**Loans and Grants**																									
1	Grant under Scheme I.D.S.S.M.T/U.I.D.S.S.M.T	(53.42)	10	%	56.00	61.60	67.76	74.54	81.99	90.19	99.21	109.13	120.04	132.05	145.25	159.77	175.75	193.33	212.66	233.93	257.32	283.05	311.36	342.49	376.74	414.41
	Grand Total Capital Income				**56.00**	**61.60**	**67.76**	**74.54**	**81.99**	**90.19**	**99.21**	**109.13**	**120.04**	**132.05**	**145.25**	**159.77**	**175.75**	**193.33**	**212.66**	**233.93**	**257.32**	**283.05**	**311.36**	**342.49**	**376.74**	**414.41**
Capital Expenditure																										
	Capital Works																									
1	Roads	(2.90)	10	%	10.50	11.55	12.71	13.98	15.37	16.91	18.60	20.46	22.51	24.76	27.23	29.96	32.95	36.25	39.87	43.86	48.25	53.07	58.38	64.22	70.64	77.70
2	Water Supply	(50.25)	10	%	56.00	61.60	67.76	74.54	81.99	90.19	99.21	109.13	120.04	132.05	145.25	159.77	175.75	193.33	212.66	233.93	257.32	283.05	311.36	342.49	376.74	414.41
	Grand Total Capital Expenditure				**66.50**	**73.15**	**80.47**	**88.51**	**97.36**	**107.10**	**117.81**	**129.59**	**142.55**	**156.80**	**172.48**	**189.73**	**208.71**	**229.58**	**252.53**	**277.79**	**305.57**	**336.12**	**369.73**	**406.71**	**447.38**	**492.12**
Capital Account Status- Surplus/Deficit					**(10.50)**	**(11.55)**	**(12.71)**	**(13.98)**	**(15.37)**	**(16.91)**	**(18.60)**	**(20.46)**	**(22.51)**	**(24.76)**	**(27.23)**	**(29.96)**	**(32.95)**	**(36.25)**	**(39.87)**	**(43.86)**	**(48.25)**	**(53.07)**	**(58.38)**	**(64.22)**	**(70.64)**	**(77.70)**
Overall Account Status -Current Year					**(15.79)**	**(23.90)**	**(25.72)**	**(27.09)**	**(29.86)**	**(33.07)**	**(35.75)**	**(39.62)**	**(44.03)**	**(47.74)**	**(52.99)**	**(58.94)**	**(63.98)**	**(71.01)**	**(78.98)**	**(85.80)**	**(95.21)**	**(105.85)**	**(115.05)**	**(127.62)**	**(141.81)**	**(157.05)**
Closing Balance					**23.92**	**0.02**	**(25.70)**	**(52.78)**	**(82.64)**	**(115.71)**	**(151.46)**	**(191.07)**	**(235.11)**	**(282.85)**	**(335.84)**	**(394.78)**	**(458.76)**	**(529.77)**	**(608.75)**	**(694.55)**	**(789.76)**	**(895.60)**	**(1,010.65)**	**(1,138.27)**	**(1,280.08)**	**(1,437.13)**
Summary of Financial Indicators																										
1	Operating Ratio				1.05	1.12	1.11	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.11	1.10	1.10	1.11	1.10	1.11	1.11	1.11	1.11	1.11	1.11
2	Capital Utilisation Ratio				0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
3	Share of Estab.Cost including Terminal Benefits				86%	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
4	Share of Revenue Spent on Establishment				91%	0.96	0.96	0.95	0.95	0.96	0.95	0.95	0.96	0.95	0.95	0.96	0.95	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
5	Debt Servicing Cost as % of Revenue Income				7%	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
6	Annual Status of Accounts																									
	Water and Sewerage Account				(30.07)	(37.30)	(40.54)	(44.31)	(48.73)	(53.64)	(58.88)	(64.83)	(71.41)	(78.43)	(86.38)	(95.16)	(104.54)	(115.13)	(126.83)	(139.34)	(153.45)	(169.02)	(185.69)	(204.49)	(225.23)	(247.44)
	General Account				(5.29)	(12.35)	(13.02)	(13.11)	(14.48)	(16.16)	(17.14)	(19.15)	(21.53)	(22.99)	(25.75)	(28.98)	(31.03)	(34.76)	(39.10)	(41.94)	(46.96)	(52.77)	(56.67)	(63.40)	(71.17)	(79.35)
	Capital Deficit				(10.50)	(11.55)	(12.71)	(13.98)	(15.37)	(16.91)	(18.60)	(20.46)	(22.51)	(24.76)	(27.23)	(29.96)	(32.95)	(36.25)	(39.87)	(43.86)	(48.25)	(53.07)	(58.38)	(64.22)	(70.64)	(77.70)
7	Overal Municipal Account Status				(15.79)	(23.90)	(25.72)	(27.09)	(29.86)	(33.07)	(35.75)	(39.62)	(44.03)	(47.74)	(52.99)	(58.94)	(63.98)	(71.01)	(78.98)	(85.80)	(95.21)	(105.85)	(115.05)	(127.62)	(141.81)	(157.05)
8	Closing Balance				23.92	0.02	(25.70)	(52.78)	(82.64)	(115.71)	(151.46)	(191.07)	(235.11)	(282.85)	(335.84)	(394.78)	(458.76)	(529.77)	(608.75)	(694.55)	(789.76)	(895.60)	(1,010.65)	(1,138.27)	(1,280.08)	(1,437.13)

Financial Operating Plan: Scenario 2

Nagar Palika Khurja

								1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Head of Account	**Current**	**Proposed Growth**	**Unit**		**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**2030-31**
																	Rs. in Lakhs										
	Opening Balance						*23.921107*	*2.3693065*	*-18.28253*	*158.30892*	*335.3137118*	*513.10773*	*695.76027*	*881.377844*	*781.3041972*	*685.92409*	*592.627758*	*503.3472389*	*420.5674983*	*341.4412957*	*266.708152*	*202.0181636*	*143.4723886*	*92.10405139*	*55.10845625*	*27.61854225*	*10.43499664*
Revenue Account																											
Revenue Receipts																											
A	**Taxes**																										
1	Property Tax	32.1128107	10	%		4.9	3.08675	3.47095	5.5139875	5.73177188	5.911141406	8.58310726	8.4694527	8.41708084	10.50561114	10.5157416	11.0901298	13.707264	13.62350052	13.64694962	17.15299475	17.28612775	17.44401675	22.01583757	22.24346208	22.46785305	23.81607175
	Sub Total A					**4.9**	**3.08675**	**3.47095**	**5.5139875**	**5.73177188**	**5.911141406**	**8.58310726**	**8.4694527**	**8.41708084**	**10.50561114**	**10.5157416**	**11.0901298**	**13.707264**	**13.62350052**	**13.64694962**	**17.15299475**	**17.28612775**	**17.44401675**	**22.01583757**	**22.24346208**	**22.46785305**	**23.81607175**
B	**Non Taxes**																										
2	Extension of Building Construction	57.738505	10	%		0.084	0.0924	0.10164	0.111804	0.1229844	0.13528284	0.14881112	0.1636922	0.18006146	0.198067606	0.21787437	0.2396618	0.263627984	0.289990782	0.31898986	0.350888846	0.385977731	0.424575504	0.467033054	0.51373636	0.565109996	0.621620995
3	Licensing Fee	67.5769649	10	%		0.14	0.154	0.1694	0.18634	0.204974	0.2254714	0.24801854	0.2728204	0.30010243	0.330112677	0.36312394	0.39943634	0.439379973	0.48331797	0.531649767	0.584814744	0.643296218	0.70762584	0.778388424	0.856227266	0.941849993	1.036034992
4	Parking Fee		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Slautory		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Rent (Land, House, Shop, Rental vehicles)	-2.8748122	10	%		0.35	0.385	0.4235	0.46585	0.512435	0.5636785	0.62004635	0.682051	0.75025608	0.825281692	0.90780986	0.99859085	1.098449932	1.208294925	1.329124418	1.462036859	1.608240545	1.7690646	1.94597106	2.140568166	2.354624982	2.59008748
7	Miscellaneous	1208.26368	10	%		1.806	1.9866	2.18526	2.403786	2.6441646	2.90858106	3.19943917	3.5193831	3.87132139	4.25845353	4.68429888	5.15272877	5.668001648	6.234801813	6.858281995	7.544110194	8.298521213	9.128373335	10.04121067	11.04533173	12.14986491	13.3648514
	Sub Total B					**2.485**	**2.7335**	**3.00685**	**3.307535**	**3.6382885**	**4.00211735**	**4.40232909**	**4.842562**	**5.32681819**	**5.859500012**	**6.44545001**	**7.08999501**	**7.798994516**	**8.578893968**	**9.436783365**	**10.3804617**	**11.41850787**	**12.56035866**	**13.81639452**	**15.19803398**	**16.71783737**	**18.38962111**
C	**Assigned Revenues**																										
1	Assets Transfer (2%)	0.61440386	10	%		14	15.4	16.94	18.634	20.4974	22.54714	24.801854	27.282039	30.0102433	33.01126767	36.3123944	39.9436339	43.93799727	48.331797	53.1649767	58.48147437	64.32962181	70.76258399	77.83884239	85.62272663	94.18499929	103.6034992
2	Property Transfer Tax		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Others	-31.931773	10	%		0.07	0.077	0.0847	0.09317	0.102487	0.1127357	0.12400927	0.1364102	0.15005122	0.165056338	0.18156197	0.19971817	0.219689986	0.241658985	0.265824884	0.292407372	0.321648109	0.35381292	0.389194212	0.428113633	0.470924996	0.518017496
	Sub Total C					**14.07**	**15.477**	**17.0247**	**18.72717**	**20.599887**	**22.6598757**	**24.9258633**	**27.41845**	**30.1602946**	**33.17632401**	**36.4939564**	**40.1433521**	**44.15768726**	**48.57345599**	**53.43080159**	**58.77388174**	**64.65126992**	**71.11639691**	**78.2280366**	**86.05084026**	**94.65592429**	**104.1215167**
D	**Revenue Grants**																										
1	State Grants (State Finance Commission)	0.18675337	10	%		63	69.3	76.23	83.853	92.2383	101.46213	111.608343	122.76918	135.046095	148.5507045	163.405775	179.746352	197.7209877	217.4930865	239.2423952	263.1666347	289.4832981	318.431628	350.2747908	385.3022698	423.8324968	466.2157465
	Sub Total D					**73.675**	**81.0425**	**89.14675**	**98.061425**	**107.867568**	**118.6543243**	**130.519757**	**143.57173**	**157.928906**	**173.7217961**	**191.093976**	**210.203373**	**231.2237107**	**254.3460817**	**279.7806899**	**307.7587589**	**338.5346348**	**372.3880982**	**409.6269081**	**450.5895989**	**495.6485588**	**545.2134146**
E	**Receipts from Water Tax and Sewerage Tax**																										
1	Water Charges	42.9812518	10	%		4.9	1.1038	1.284719	2.16190753	2.31617559	2.457040263	3.70488918	3.7670033	3.85673873	4.659347876	4.77220435	5.45786622	6.533624652	6.667612308	6.872770916	8.325344818	8.572156308	8.891589799	10.81389705	11.14239196	11.21067757	13.57510831
2	Connection Fee		10	%		0	0.06	0.06273	0.30559515	0.0806022	0.084358241	0.32830071	0.1044389	0.10938267	0.114572215	0.12001983	0.36573843	0.143741544	0.150643395	0.157888911	0.165495271	0.173480508	0.181863559	0.190664307	0.199903631	0.006596392	0.209636434
	Sub Total E					**5.964**	**2.3342**	**2.634889**	**3.88368668**	**3.95458019**	**4.254981143**	**5.91813079**	**8.2266751**	**8.42436082**	**9.650981923**	**9.97535206**	**11.2449888**	**12.47660336**	**13.01715575**	**13.57332265**	**15.60000816**	**16.31417678**	**17.15060355**	**19.77114803**	**20.74798538**	**21.27042164**	**24.75139381**
Grand Total Revenue Receipts						**101.094**	**104.67395**	**115.284139**	**129.493804**	**141.792095**	**155.4824398**	**174.349187**	**192.52887**	**210.25746**	**232.9142132**	**254.524476**	**279.771839**	**309.3642598**	**338.1390879**	**369.8685471**	**409.6661052**	**448.2047171**	**490.6594741**	**543.4583248**	**594.8299206**	**650.7605951**	**716.292018**
Revenue Expenditure																											
A	**Establishment**																										
1	Pay and Allowance to Municipal Staff	34.2992232	10	%		23.1	25.41	27.951	30.7461	33.82071	37.202781	40.9230591	45.015365	49.5169015	54.46859166	59.9154508	65.9069959	72.4976955	79.74746505	87.72221156	96.49443271	106.143876	116.7582636	128.4340899	141.2774989	155.4052488	170.9457737
2	Pension Benefits	106.085066	10	%		35	38.5	42.35	46.585	51.2435	56.36785	62.004635	68.205099	75.0256084	82.52816919	90.7809861	99.8590847	109.8449932	120.8294925	132.9124418	146.2036859	160.8240545	176.90646	194.597106	214.0568166	235.4624982	259.008748
	Sub Total A					**58.1**	**63.91**	**70.301**	**77.3311**	**85.06421**	**93.570631**	**102.927694**	**113.22046**	**124.54251**	**136.9967608**	**150.696437**	**165.766081**	**182.3426887**	**200.5769576**	**220.6346533**	**242.6981186**	**266.9679305**	**293.6647236**	**323.0311959**	**355.3343155**	**390.8677471**	**429.9545218**
B	**Operation & Maintenance -Municipal Services**																										
1	Roads	-13.4543	10	%		0.7	0.77	0.847	0.9317	1.02487	1.127357	1.2400927	1.364102	1.50051217	1.650563384	1.81561972	1.99718169	2.196899864	2.41658985	2.658248835	2.924073719	3.21648109	3.538129199	3.891942119	4.281136331	4.709249965	5.180174961
2	Drains		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Buildings		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Public Health- Solid Waste Management		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Miscellaneous	41.9626124	10	%		4.025	4.4275	4.87025	5.357275	5.8930025	6.48230275	7.13053303	7.8435863	8.62794496	9.490739456	10.4398134	11.4837947	12.63217422	13.89539164	15.2849308	16.81342388	18.49476627	20.3442429	22.37866719	24.61653391	27.0781873	29.78600603
	Sub Total B					**4.76**	**5.236**	**5.7596**	**6.33556**	**6.969116**	**7.6660276**	**8.43263036**	**9.2758934**	**10.2034827**	**11.22383101**	**12.3462141**	**13.5808355**	**14.93891907**	**16.43281098**	**18.07609208**	**19.88370129**	**21.87207142**	**24.05927856**	**26.46520641**	**29.11172705**	**32.02289976**	**35.22518973**
C	**Water Supply and Sewerage Establishment**																										
1	Water Supply	-10.940189	10	%		2.1	2.31	2.541	2.7951	3.07461	3.382071	3.7202781	4.0923059	4.5015365	4.951690151	5.44685917	5.99154508	6.590699591	7.24976955	7.974746505	8.772221156	9.649443271	10.6143876	11.67582636	12.84340899	14.12774989	15.54052488
2	Sanitation	5.21480237	10	%		31.5	34.65	38.115	41.9265	46.11915	50.731065	55.8041715	61.384589	67.5230475	74.27535227	81.7028875	89.8731762	98.86049387	108.7465433	119.6211976	131.5833173	144.7416491	159.215814	175.1373954	192.6511349	211.9162484	233.1078732
	Sub Total C					**33.6**	**36.96**	**40.656**	**44.7216**	**49.19376**	**54.113136**	**59.5244496**	**65.476895**	**72.024584**	**79.22704242**	**87.1497467**	**95.8647213**	**105.4511935**	**115.9963128**	**127.5959441**	**140.3555385**	**154.3910923**	**169.8302016**	**186.8132217**	**205.4945439**	**226.0439983**	**248.6483981**
D	**Water Supply and Sewerage O & M**																										
1	Transportation - Water Purchase	161.621221	10	%		0.07	0.077	0.0847	0.09317	0.102487	0.1127357	0.12400927	0.1364102	0.15005122	0.165056338	0.18156197	0.19971817	0.219689986	0.241658985	0.265824884	0.292407372	0.321648109	0.35381292	0.389194212	0.428113633	0.470924996	0.518017496
2	Repair and Maintenance	27.4809189	10	%		0.35	0.385	0	0	0	0	0	0	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046	92.9046
	Sub Total D					**2.4325**	**2.67575**	**2.519825**	**2.7718075**	**3.04898825**	**3.353887075**	**3.68927578**	**4.0582034**	**97.3686237**	**97.81502607**	**98.3060687**	**98.8462155**	**99.44037709**	**100.0939548**	**100.8128903**	**101.6037193**	**102.4736312**	**103.4305344**	**104.4831278**	**105.6409806**	**106.9146186**	**108.3156205**
E	**Debt Servicing**																										
1	Loan Repayment	0	10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Advance	835.947161	10	%		3.64	4.004	4.4044	4.84484	5.329324	5.8622564	6.44848204	7.0933302	7.80266327	8.582929595	9.44122255	10.3853448	11.42387929	12.56626722	13.82289394	15.20518334	16.72570167	18.39827184	20.23809902	22.26190892	24.48809982	26.9369098
	Sub Total E					**7.49**	**8.239**	**9.0629**	**9.96919**	**10.966109**	**12.0627199**	**13.2689919**	**14.595891**	**16.0554802**	**17.66102821**	**19.427131**	**21.3698441**	**23.50682854**	**25.8575114**	**28.44326254**	**31.28758879**	**34.41634767**	**37.85798243**	**41.64378068**	**45.80815875**	**50.38897462**	**55.42787208**
Grand Total Revenue Expenditure						**106.3825**	**117.02075**	**128.299325**	**141.129258**	**155.242183**	**170.7664016**	**187.843042**	**206.62735**	**320.19468**	**342.9236885**	**367.925597**	**395.427697**	**425.6800069**	**458.9575475**	**495.5628423**	**535.8286665**	**580.1210732**	**628.8427205**	**682.4365325**	**741.3897258**	**806.2382384**	**877.5716022**
Revenue Account Status- Surplus/Deficit						**-5.2885**	**-12.3468**	**-13.015186**	**-11.635453**	**-13.450088**	**-15.28396173**	**-13.493855**	**-14.098474**	**-109.937221**	**-110.009475**	**-113.40112**	**-115.65586**	**-116.3157471**	**-120.8184596**	**-125.6942952**	**-126.1625613**	**-131.9163561**	**-138.1832464**	**-138.9782077**	**-146.5598052**	**-155.4776433**	**-161.2795842**
Capital Account																											
Capital Receipts																											
A	**Loans and Grants**																										
1	Loans (Advance Payments / Deposits)	0	0	%		0	0	0	218.2338	218.2338	218.2338	218.2338	218.2338	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Grant under Scheme I.D.S.S.M.T/U.I.D.S.S.M.T	-53.424156	10	%		56	61.6	67.76	74.536	81.9896	90.18856	99.207416	109.12816	120.040973	132.0450707	145.249578	159.774536	175.7519891	193.327188	212.6599068	233.9258975	257.3184872	283.050336	311.3553696	342.4909065	376.7399972	414.4139969
3	Revolving fund		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Others		10	%		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Grand Total Capital Income					**56**	**61.6**	**67.76**	**292.7698**	**300.2234**	**308.42236**	**317.441216**	**327.36196**	**120.040973**	**132.0450707**	**145.249578**	**159.774536**	**175.7519891**	**193.327188**	**212.6599068**	**233.9258975**	**257.3184872**	**283.050336**	**311.3553696**	**342.4909065**	**376.7399972**	**414.4139969**
Capital Expenditure																											
	Capital Works																										
1	Roads	-2.8953799	9	%	10	10.5	11.445	12.47505	13.5978045	14.8216069	16.15555153	17.6095512	19.194411	20.9219077	22.80487943	24.8573186	27.0944773	29.53298021	32.19094843	35.08813379	38.24606583	41.68821175	45.44015081	49.52976438	53.98744318	58.84631306	64.14248124
2	Water Supply	-50.253777	6	%		56	59.36	62.9216	66.696896	70.6987098	74.94063235	79.4370703	84.203295	89.2554922	94.6108217	100.287471	106.304719	112.6830024	119.4439826	126.6106215	134.2072588	142.2596943	150.795276	159.8429926	169.4335721	179.5995864	190.3755616
6	Others		10	%		0	0	0	24.2482	24.2482	24.2482	24.2482	24.2482	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Grand Total Capital Expenditure					**66.5**	**70.805**	**75.39665**	**104.542901**	**109.768517**	**115.3443839**	**121.294821**	**127.64591**	**110.1774**	**117.4157011**	**125.14479**	**133.399197**	**142.2159826**	**151.634931**	**161.6987553**	**172.4533246**	**183.9479061**	**196.2354268**	**209.3727569**	**223.4210153**	**238.4458995**	**254.5180429**
Capital Account Status- Surplus/Deficit						**-10.5**	**-9.205**	**-7.63665**	**188.2269**	**190.454883**	**193.0779761**	**196.146395**	**199.71605**	**9.86357345**	**14.62936956**	**20.1047882**	**26.375339**	**33.53600646**	**41.69225701**	**50.9611515**	**61.47257285**	**73.37058114**	**86.81490915**	**101.9826126**	**119.0698912**	**138.2940977**	**159.895954**
Overall Account Status -Current Year						**-15.7885**	**-21.5518**	**-20.651836**	**176.591446**	**177.004795**	**177.7940144**	**182.65254**	**185.61758**	**-100.073647**	**-95.3801058**	**-93.296333**	**-89.280519**	**-82.7797406**	**-79.12620258**	**-74.73314368**	**-64.68998844**	**-58.54577495**	**-51.36833723**	**-36.99559513**	**-27.48991401**	**-17.18354561**	**-1.383630176**
Closing Balance						**23.921107**	**2.3693065**	**-18.2825295**	**158.308917**	**335.313712**	**513.1077262**	**695.760266**	**881.37784**	**781.304197**	**685.9240914**	**592.627758**	**503.347239**	**420.5674983**	**341.4412957**	**266.708152**	**202.0181636**	**143.4723886**	**92.10405139**	**55.10845625**	**27.61854225**	**10.43499664**	**9.051366464**

Appendix 3: Details of Water Supply Works and Estimations

Appendix 3

Estimated Investment Rquirement for Water Supply for the Period 2011-2041

S No	Item	Phase 1 : 2011-2015				Phase 2 : 2016-2020				Phase 3 : 2021-2025				Total Amount (Rs.)
		Quantity	Rate	Unit	Amount	Quantity	Rate	Unit	Amount	Quantity	Rate	Unit	Amount	
1	Construction of Tube wells	6	9,00,000	No	54,00,000	-	9,00,000	No	-	26	9,00,000	No	2,34,00,000	**2,88,00,000**
2	Construction of Pump House civil	6	2,00,000	No	12,00,000	-	2,00,000	No	-	26	2,00,000	No	52,00,000	**64,00,000**
3	Pump set with elecrical & mechanical	9	25,000	No	2,25,000	-	25,000	No	-	40	25,000	No	10,00,000	**12,25,000**
4	Construction of CWRs	-	3	Litre	-	-	3	Litre	-	80,00,000	3	Litre	2,40,00,000	**2,40,00,000**
5	Construction of OHSRs	-	8	Litre	-	-	8	Litre	-	80,00,000	8	Litre	6,40,00,000	**6,40,00,000**
6	Clear Water Pumping Station	-	25,000	KW	-	-	25,000	KW	-	160	25,000	KW	40,00,000	**40,00,000**
7	Rising Main DI Pipe K7, Dia in mm													
8	250 mm	1,800	3,007	m	54,12,600	-	3,007	m	-	7,800	3,007	m	2,34,54,600	**2,88,67,200**
9	300 mm	600	3,814	m	22,88,400	-	3,814	m	-	2,600	3,814	m	99,16,400	**1,22,04,800**
10	Distribution system	38	1,500	m	5,70,00,000	1,24,000	1,500	m	18,60,00,000	1,24,000	1,500	m	18,60,00,000	**42,90,00,000**
11	Domestic Meters	-			-	2,000	2,000	No	40,00,000	2,500	2,000	No	50,00,000	**90,00,000**
12	Bulk Consumer Meters	1,500	3,000	No	45,00,000									**45,00,000**
13	Bulk System Meters for Tube wells	20	50,000	No	10,00,000	-	50,000	No	-	26	50,000	No	13,00,000	**23,00,000**
14	Bulk System Meters for OHSRs	5	3,00,000	No	15,00,000	-	3,00,000	No	-	4	3,00,000	No	12,00,000	**27,00,000**
15	Bulk System Meters for CWPS	-	2,00,000	No	-	-	2,00,000	No	-	4	2,00,000	No	8,00,000	**8,00,000**
16	Chlorinaters and tonners	5	1,50,000		7,50,000	-	1,50,000	No	-	4	1,50,000	No	6,00,000	**13,50,000**
17	Reduction of NRW & Replace Service Line	1,000	2,000	No	20,00,000	2,000	2,000	No	40,00,000	3,000	2,000	No	60,00,000	**1,20,00,000**
18	Electric Connection on Tube Wells	6	75,000	No	4,50,000	-	75,000	No	-	26	75,000	No	19,50,000	**24,00,000**
19	Electric Connection on CWPS	-	1,50,000	No	-	-	1,50,000	No	-	4	1,50,000	No	6,00,000	**6,00,000**
20	Water supply in Villages				9,15,00,000									**9,15,00,000**
21	**Sub Total**				**17,32,26,000**				**19,40,00,000**				**35,84,21,000**	**72,56,47,000**
22	Physical Contingency, at 10 %				1,73,22,600				1,94,00,000				3,58,42,100	**7,25,64,700**
23	Design and supervision services at 5%				86,61,300				97,00,000				1,79,21,050	**3,62,82,350**
24	Environmental mitigation at 1%				17,32,260				19,40,000				35,84,210	**72,56,470**
25	Social Interventions at 1%				17,32,260				19,40,000				35,84,210	**72,56,470**
26	Institutional Development Interventions at 1%				17,32,260				19,40,000				35,84,210	**72,56,470**
27	**Grand Total**				**20,44,06,680**				**22,89,20,000**				**42,29,36,780**	**85,62,63,460**

Note: 1) In phase I for bulk meters of tw and ohsr's existing tube wells and OHSR were considered.

2) Industrial and commercial connections at present were considered for Bulk consumer meter

3) Domestic connections of 4500 were distributed as 2000 in phase-2 and 2500 in phase-3 for domestic meters

4) For Reduction of NRW & Service line, out of 6000 total connection, 1000 in phase-1, 2000 in phase-2 and 3000 in phase-3 were considered

Appendix 4: Details of Sewerage and Sanitation Proposed Works and Estimation

Appendix 4

Low Cost Sanitation & Community Toilets in Town & Villages

S. No	Name of the Village	Total Households in year 2010	Households with Toilets	Households without toilets	Low Cost Sanitation Scheme for 100% Households
1	Hazratpur	417	313	104	104
2	Baurauli	1,320	990	330	330
3	Usmanpur	542	407	136	136
4	Kothi ka Nagla	305	229	76	76
5	Nehru pur	534	400	133	133
6	Tena	644	483	161	161

Low Cost Sanitation & Community facilities in Muncipal area of Khurja

S.No	Name of the Town	Households with Toilets	Total Households in year 2011	Households without toilets	Low Cost Sanitation Scheme for 90% Households	Community Toilets for remaining 10 % of Households
1	Khurja	22,304	24,782	2,478	2,230	248

Note:1) As per Development plan 2021, Population in Panipat town is 148689.

2) Considering Household size as 6

Estimation and Costing for providing Low Cost Sanitation for villages

S.No	**Name of the Village**	Low Cost Sanitation Scheme for 100% Households in Phase -I	Total Cost for providing LSS(Rs. 3000 per household) in Phase -I
1	Hazratpur	104	3,12,728
2	Baurauli	330	9,89,843
3	Usmanpur	136	4,06,823
4	Kothi ka Nagla	76	2,28,780
5	Nehru pur	133	4,00,365
6	Tena	161	4,83,206
		Total	**28,21,743**

Estimation and Costing for providing Low Cost Sanitation and Community Toilets for Town

S.No	**Name of the Town**	Low Cost Sanitation Scheme for 90% Households in Phase -I	Total Cost for providing LSS(Rs. 3000 per household) in Phase -I	No.of Community Toilets of 10 seats for 500 persons	Total Cost for constructing of Community Toilets for municipal area , Rs. 20 lacs per CT (in RS.)
1	Khurja	2,230	66,91,140	3	60,00,000
		Total	**66,91,140**		**60,00,000**

Note :1) Govt will give subsidy by providing 50% of Toilet cost and remaining cost will be taken up by household owner only.

2) Community Toilets will be constructed by government but will be maintained by community toilet users only

3) Considering cost of each community toilet as Rs. 20 lacs having 10 seats including rest room and borewell etc

Operation and Maintenance Cost in Million Rs per year

	in Phase 1		Addl in Phase 2		Addl in Phase 3	
Item	**C**	**O&M**	**C**	**O&M**	**C**	**O&M**
Sewers	62.15	0.16	85.25	0.21	84.15	0.21
E & M maintenance	8	0.24			4	0.12
Civil works maintenance	12	0.12			6	0.06
Staff		0.06				0.03
Chemicals		0.05				0.025
Energy		0.848				0.424
Total		**1.47**		**0.21**		**0.87**

Note:

1) Staff O & M cost as 0.3 lakh per MLD
2) Energy cost as 4.24 lacs per MLD
3) Civil works maintenance as 0.6 lacs per MLD
4) E & M maintenance cost as 1.2 lacs per MLD
5) Chemicals maintenance cost as o.25 lacs per MLD
6) E & M cost capital is considered as 40 lacs per MLD
7) Civil cost is considered as 60 lacs per MLD

Detailed Estimate																						
S No	Item	Phase 1: 2011-2015				Phase 2: 2016-2020				Phase 3: 2021-2025				Phase 4: 2026-2030				Phase 5: 2031-2035				Grand Total
		Quantity	Unit	Rate	Amount	Quantity	Unit	Rate	Amount	Quantity	Unit	Rate	Amount	Quantity	Unit	Rate	Amount	Quantity	Unit	Rate	Amount	
	Rehabilitation of existing sewerage system																					
1	Replace Man hole covers & foot steps	200	each	5,000	10,00,000																	10,00,000
2	New man holes in existing system	200	each	20,000	40,00,000																	40,00,000
3	Sewer Cleaning >=300 mm dia	6,000	m	400	24,00,000																	24,00,000
4	Sewer Cleaning < 300 mm dia	10,000	m	300	30,00,000																	30,00,000
5	Extension of Rising Main 600 mm dia upto STP	1,300	m	6,000	78,00,000																	78,00,000
	Sewerage Network																					
6	Laterals with man hole @ 125 m per hectare																					-
7	Zone 1,(1142 hectare)	1,42,750	m	4,000	57,10,00,000																	57,10,00,000
8	Zone3,(500,hectare)	62,500	m	4,000	25,00,00,000																	25,00,00,000
9	Zone4,(363,hectare)	45,375	m	4,000	18,15,00,000																	18,15,00,000
10	Zone5,(910,hectare)					1,13,750	m	4,000	45,50,00,000													45,50,00,000
11	Zone6,(1090,hectare)									1,36,250	m	4,000	54,50,00,000									54,50,00,000
12	Zone7,(640,hectare)													80,000	m	4,000	32,00,00,000					32,00,00,000
13	Zone8,(560,hectare)																	70,000	m	4,000	28,00,00,000	28,00,00,000
14	Mains ,Truncks, outfall sewer																					-
15	Zone 1	14,275	m	6,000	8,56,50,000																	8,56,50,000
16	Zone 3	6,250	m	6,000	3,75,00,000																	3,75,00,000
17	Zone 4	4,538	m	6,000	2,72,25,000																	2,72,25,000
18	Zone 5					11,375	m	6,000	6,82,50,000													6,82,50,000
19	Zone 6									13,625	m	6,000	8,17,50,000									8,17,50,000
20	Zone 7													8,000	m	6,000	4,80,00,000					4,80,00,000
21	Zone 8																	7,000		6,000	4,20,00,000	4,20,00,000
22	Existing Pump House	160	KW	10,000	16,00,000																	16,00,000
23	SPS South & Rising main	200	KW	20,000	40,00,000					300	KW	10,000	30,00,000									70,00,000
24	SPS East rising main	35	KW	20,000	7,00,000					155	KW	10,000	15,50,000									22,50,000
25	STP South WSP	25	MLD	50,00,000	12,50,00,000	24	MLD	########	12,00,00,000													24,50,00,000
26	STP East WSP	5	MLD	50,00,000	2,50,00,000					14	MLD	50,00,000	7,00,00,000									9,50,00,000
27	Land Acquisition For STP & SPS @ 1.25 Ha per MLD	85	Ha	40,00,000	34,00,00,000																	34,00,00,000
28	Low Cost Sanitation, Mtc Eqp				2,00,00,000																	2,00,00,000
29	Sewer Cleaning equipment				50,00,000																	50,00,000
	Total Amount in Rs.				**1,69,23,75,000**				**64,32,50,000**				**70,13,00,000**				**36,80,00,000**				**32,20,00,000**	**3,72,69,25,000**
30	Physical Contingencies-10%				16,92,37,500				6,43,25,000				7,01,30,000				3,68,00,000				3,22,00,000	37,26,92,500
31	design and supervision services-5%				8,46,18,750				3,21,62,500				3,50,65,000				1,84,00,000				1,61,00,000	18,63,46,250
32	Environmental mitigation 1%				1,69,23,750				64,32,500				70,13,000				36,80,000				32,20,000	3,72,69,250
33	Social Interventions PP/A 1%				1,69,23,750				64,32,500				70,13,000				36,80,000				32,20,000	3,72,69,250
34	Institutional Development Interventions 1%				1,69,23,750				64,32,500				70,13,000				36,80,000				32,20,000	3,72,69,250
	Grand Total in Rs				**1,99,70,02,500**				**75,90,35,000**				**82,75,34,000**				**43,42,40,000**				**37,99,60,000**	**4,39,77,71,500**

Appendix 5: Detailed SWM Costing and Estimation

Table 4-1: Projected Population & Waste Generation

Year	Population	Decadal Growth Rate	Households	Waste Generation
	No,s		*No,s*	*Tons*
2001	98,610	41.87%	16,435	
2011	139,900	22.82%	23,317	34
2016	155,044		25,841	40
2021	171,827	22.82%	28,638	48
2026	190,427		31,738	57
2031	211,041	22.82%	35,174	68
2036	233,886		38,981	81
2041	259,205		43,201	96

Table 4-2: SWM Collection & Transportation Vehicles/Equipment Requirement (2011-2041)

Vehicles/Equipment			2011-16	2016-21	2021-26	2026-31	2031-36	2036-41
Containerized Push Carts for D2D Collection								
	Gross Requirement	no,s	62	69	76	84	93	103
	To be Procured	no,s	62	69	76	84	93	103
Auto Tippers for D2D Collection								
	Gross Requirement	no,s	5	6	6	7	8	9
	To be Procured	no,s	5	1	-	6	2	1
Push Carts for Street sweeping								
	Gross Requirement	no,s	313	316	320	324	328	333
	To be Procured	no,s	313	316	320	324	328	333
Litter Bins								
	Gross Requirement	no,s	125	127	128	130	131	133
	To be Procured	no,s	125	127	128	130	131	133
Closed Containers (3 m3 capacity)								
	Gross Requirement	no,s	23	27	33	39	46	54
	To be Procured	no,s	23	4	29	10	36	18
Dumper Placers (twin containers of 3 m3)								
	Gross Requirement	no,s	2	2	3	3	3	4
	To be Procured	no,s	2	-	1	2	-	2
Closed Containers (4.5 m3 capacity)								
	Gross Requirement	no,s	11	12	15	17	21	24
	To be Procured	no,s	11	1	14	3	18	6
Dumper Placers (twin containers of 4.5 m3)								
	Gross Requirement	no,s	1	1	1	2	2	2
	To be Procured	no,s	1	-	-	2	-	-

Table 4-3: Details of Processing and Disposal Facility

Particulars								
A. Compost Plant								
Design Life (Years)	20	30						
Waste Fraction Composted (%)	56%	56%						
Ultimate Design Capacity (ton/d)	38	54						
Land Required for compost (ha)	1.5	1.5						
Equipment required	Backhoe Loader-1, Tipper Truck-2, Tipper Tractor -2, Water Tanker (3000 lt)-1, Weight Bridge (20 MT)-1, Plant & Machinery-1							
B. Landfill Facility			2011-16	2016-21	2021-26	2026-31	2031-36	2036-41
Design Life (years)	20	30						
Waste Fraction Land filled (%)	30%	30%						
Design Capacity (tons)	110,216	210,793						
Land required for landfill (ha)	2.0	3.7						
Landfill cell area required (sq. m)	12,399	23,714	2,348	2,791	3,317	3,943	5,098	6,216
Equipment required	Backhoe Loader-1, Bull Dozer-1							
Total Land Requirement (20 Years)		3.5 ha (Compost + Landfill)						
Total Land Requirement (30 Years)		5.2 ha (Compost + Landfill)						

Table 4-4: Requirement of Sanitary Workers (D-to-D Collection & Sweeping)

Particulars	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41
For Sweeping & Drain Cleaning	293	296	299	303	307	311
For D-2-D collection (Auto Tipper)	13	14	15	17	19	21
For D-2-D collection (Push Carts)	66	73	81	90	99	110
Total (collection & street sweeping)	372	383	395	410	425	442

Table 4-5: Capital Cost Estimates

Particulars	Total (2011-2041)	2011-16	2016-21	2021-26	2026-31	2031-36	2036-41
		Rs. Lakhs					
Equipment & Vehicles (Collection & Transportation)							
Containerized Push Carts for D2D Collection	48.70	6.20	6.90	7.60	8.40	9.30	10.30
Auto Tippers for D2D Collection	37.50	12.50	2.50	-	15.00	5.00	2.50
Push Carts for Street sweeping	193.40	31.30	31.60	32.00	32.40	32.80	33.30
Litter Bins	38.70	6.25	6.35	6.40	6.50	6.55	6.65
Closed Containers (3 m3 capacity)	60.00	11.50	2.00	14.50	5.00	18.00	9.00
Dumper Placers (twin containers of 3 m3)	42.00	12.00	-	6.00	12.00	-	12.00
Closed Containers (4.5 m3 capacity)	34.45	7.15	0.65	9.10	1.95	11.70	3.90
Dumper Placers (twin containers of 4.5 m3)	27.00	9.00	-	-	18.00	-	-
Total - Collection & Transportation	*481.75*	*95.90*	*50.00*	*75.60*	*99.25*	*83.35*	*77.65*
Landfill Facility							
Equipment							
Backhoe Loader	40.00	20.00				20.00	
Bull Dozer	120.00	60.00				60.00	
Sub-total	160.00	*80.00*	-	-	-	*80.00*	
Civil Works							
Landfill Cell Development	237.14	23.48	27.91	33.17	39.43	50.98	62.16
Other infrastructure (roads, drains, fencing, building, etc	25.94	13.56				12.38	
Sub-total	263.08	*37.04*	*27.91*	*33.17*	*39.43*	*63.36*	62.16
Total - Landfill Facility	*423.08*	*117.04*	*27.91*	*33.17*	*39.43*	*143.36*	*62.16*
Compost Plant							
Equipment							
Backhoe Loader	40.00	20.00				20.00	
Tipper Truck	48.00	24.00				24.00	
Tipper Tractor	16.00	16.00					
Water Tanker (3000 lt)	6.00	3.00				3.00	
Weight Bridge (20 MT)	20.00	10.00				10.00	
Plant & Machinery	200.00	100.00				100.00	
Sub-total	330.00	*173.00*	-	-	-	*157.00*	
Civil Works							
Interal roads, drains, tipping floor, office building, store,	75.00	75.00				-	
Total - Compost Plant	*405.00*	*248.00*	-	-	-	*157.00*	-
Total	1,309.83	460.94	77.91	108.77	138.68	383.71	139.81

Appendix 6: Details of SWD Estimations

Appendix 6:

Storm water Drains in master plan area Phase wise

S.No	Phase	Total Population for the Year 2041	Length of Storm Water Drain (in KM) for	Cost for constructing the proposed storm water drains (in Rs)
1	**Phase - I**	2,24,199	102	11,24,20,000
2	**Phase - II**	86,179	201	22,07,21,875
3	**Phase -III**	99,913	177	19,50,71,250
				52,82,13,125

Storm water Drains in master plan area Phase wise

Phase - II

Considering cost as Rs. 10 lacs per km

S.No	Phase	Total area of Phase-II in ha	Proposed length of Storm water drains (in km) for the year	Cost for constructing the proposed storm water drains (in Rs)
1	Phase - II Urban are	1,237	155	15,46,56,250
2	Viilages		46	4,60,00,000
	Sub Total			**20,06,56,250**
	Physical contigencies @10%			2,00,65,625
	Grand Total			**22,07,21,875**

Note: Considering 125 m per ha

Phase -III

Considering cost as Rs. 10 lacs per km

S.No	Phase	Total area of Phase-II in ha	Proposed length of Storm water drains (in km) for	Cost for constructing the proposed storm water drains (in Rs)
1	Phase -III	1,227	153	15,33,37,500
2	Villages		24	2,40,00,000
	Sub Total			**17,73,37,500**
	Physical contigencies @10%			1,77,33,750
	Grand Total			**19,50,71,250**

www.WilburSmith.com

WilburSmith
ASSOCIATES
#8, Second Floor, 80 Feet Road,
RT Nagar Bangalore Karnataka - 560 032. India
w +91.80. 3918.7500 f +91.80. 2363.4097