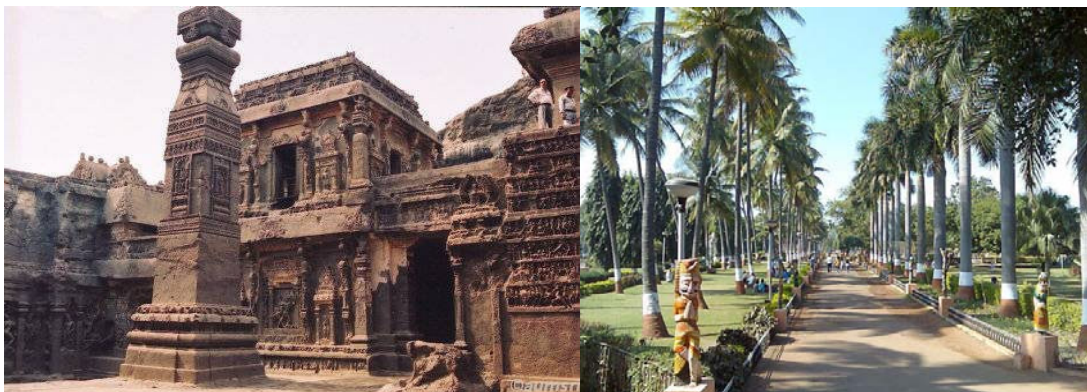


**URBAN INFRASTRUCTURE DEVELOPMENT SCHEME
FOR SMALL AND MEDIUM TOWN
Aurangabad Municipal Corporation**



**Detailed Project Report on Underground Sewerage System
For Aurangabad City
Volume I – Report and Estimates**



**Prepared by:
Fortress Infrastructure Advisory Services, Mumbai**

June 2013

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REPORT

1.0 EXECUTIVE SUMMARY

Aurangabad is one of the fast growing cities in Asia. The existing sewerage scheme was designed for population of 2 lacs. The present population of Aurangabad City is 11.65 lacs. The projected population in year 2030 will be 17.32 lacs and for year 2045 will be 23.26 lacs.

Currently the city receives about 135 MLD water supply through many sources such as Jayakwadi, Harshul, Nahar E Ambari . The main source is Jayakwadi Dam, having two existing schemes. Currently there is deficit of between demand and supply. Therefore a water supply project parallel to the existing scheme is planned taking into population projection for next 30 years.

The existing sewerage system for the collection, transportation and treatment of sewage was commissioned in early seventies. The Aurangabad Municipal Corporation in 1965 has started laying of the underground sewerage line and the first phase was completed in 1972 and second phase in 1976, the population projected at that time for 2001 was 2.0 lacs. The scheme was designed and constructed by Public Health Engineering Department of Govt. of Maharashtra.

The existing sewerage system was insufficient to cater to the increase in population to 4 - 5 times. The expansion of the city demands a new sewerage system with proper collection network and efficient treatment.

Presently the generation of the sewerage is about 88 MLD. Only 6.5 MLD sewerage is treated and remaining waste water goes to the Kham river and Sukhana river as untreated.





The prime concern is to treat the sewerage as the untreated sewerage ultimately goes to Jayakwadi Dam which the source of potable water for Aurangabad City and surrounding areas.

Planned and efficient collection network and main sewers along with sewerage treatment plants needs to be designed taking into consideration the future demand for the next 30 years. Therefore the collection network and the main sewers along the natural nallas are designed for 2045 (30 years) for population of 23.26 lacs. The sewerage treatment plants are designed for year 2030 (15 years) for 234 MLD for the population of 17.32 Lacs. The treatment plants are proposed for 15 years keeping in view the initial capital investment, the financial constraints of AMC. The other thought is that in coming years, development of the advanced technology will certainly reduced the capital cost of treatment plants.

The total Gross cost of the underground sewerage project is about Rs. 369.94 Crores. The cost of the collection network is 236.82 crores and the sewerage treatment plant cost is 129.45 crores.

City is divided in two basins Kham & Sukhana with 80:20 population distributions. The 7 main sewers along nallas in the Kham basin will generate 240.67 MLD sewerage and Sukhana basin with 2 out-fall sewers about 60.83 MLD sewerage for the ultimate population for year 2045.

The total length of the collection network is about 539 Kms, comprising of 150mm to 300 mm dia SWR pipes and 350 to 1800mm diameter RCC pipes. About 50% of the total length of sewer is proposed for upgradation. It is proposed to replace all the main sewers of length 60 Kms along the nalla which ultimately flow to Kham and Sukhana rivers.

The new sewage treatment plants will be of modern technology with automation. Contractor has to design, construct, maintain & operate STP including selling of waste water for 15 years.

.Maximum 3 years time will be required to lay outfall sewers & STP and to upgrade remaining network. After completion of the project, revenue generation is possible.

The underground sewerage system costing 369.94 Crores is viable and sustainable. Sewerage cess is already proposed by AMC from year 2012. Also it is proposed to target initially 10% of sale of treated waste water.

1.1 BACKGROUND OF THE PROJECT

The Govt. of Maharashtra has formulated the action plan for the development and improvement of the infrastructural particularly of urban area particularly small and medium town under UIDSSMT (Urban Infrastructure Development Scheme for Small and Medium Town) which can also give quality service sustainability, and possible expansion of the exiting services.

The projects are funded by the Govt. of India under UIDSSMT as well as by the State Govt. under the funding pattern of 80:20. 80 % share by Government of India, 10% Share by Government of Maharashtra and 10% by the Urban Local Body. The objective of the project is to create infrastructure and achieve quality service sustainability in the field of water supply, sewerage system, beautification of the garden along river side, roads, etc. after considering exiting as well as future demand of the citizens with short term and long term planning of the project area.

1.2 OBJECTIVE OF UIDSSMT

- a. To improve infrastructure facilities and create durable public assets and quality oriented services in cities and towns.
- b. To enhance Public-Private-Partnership in infrastructure Development.
- c. To promote planned integrated development of towns and cities.

Admissible Components:

- a. Widening of narrow streets, shifting of industrial / commercial establishments to reduce congestion, replacement of old and worn out water pipes by new/higher capacity ones.

- b. Water supply and sanitation.
- c. Sewerage and Solid Waste Management.
- d. Construction and improvement of drains / storm water drains.
- e. Construction / Upgradation of roads, highways/ expressways.
- f. Parking lots / spaces on PPP basis.
- g. Development of heritage areas.
- h. Preservation of water bodies.

The funding pattern between Central Govt. and State Govt. / ULB is 80:20. While preparing the DPRs for towns, priority has been given for water supply, sewerage and roads

Aurangabad Municipal Corporation (AMC) called a tender for appointment of consultant for preparation of Detailed Project report (DPR) for the following works.

- i. Improvement in sewerage system
- j. Provision of urban facilities to the localities under Gunthewari
- k. Nalla training works for the natural nallas

Fortress Infrastructure Advisory has been awarded the work for preparation of DPR for the above works for Aurangabad Municipal Corporation.

1.3 NEED OF THE SCHEME

The development in the Aurangabad City is rapid. This is directly affecting the amenities and facilities provided by the Municipal Corporation. One of the problems faced by the citizens is lacs of disposal system of the main sewers along the nallas. The waste water flows through the open natural nalla due to damage of the existing manholes, creating nuisance to the people residing nearby. If proper rehabilitation and upgradation of the system for collection and disposal of waste water is done, then the problem of pollution, contamination of water and other issues related with health will be critical. Also the untreated waste water flow to the Kham River and Sukhana river, polluting the ground water, affecting the water quality of the borewells and open wells. Also it is seen that the waste water is pumped by the farmers for agriculture purpose which will be a health issue.

This waste water flow in the Kham river, ultimately reaching to the Jayakwadi Dam, thus polluting the water which is the only source of Aurangabad City. As such it is essential to sort out the issues of sewerage system along with sewerage treatment plant immediately for this city.



The Detailed Project Report is intended to Design and propose technically and commercially suitable underground sewerage system for the Aurangabad City. The underground drainage system will have a collection system, main sewers, pumping stations, wet well and sewerage treatment plant. As the main sewers are along the natural nallas, there is minimal intermediate pumping station required. The whole exercise is meant for achieving the objective of pollution control. Also the possibility of water borne disease will be drastically reduced.

1.4 TECHNICAL FEASIBILITY FOR SEWERAGE SYSTEM

1. Sustainability of system
2. Adequate water supply level at the rate of 135 lpcd will be maintained in all seasons and hence sufficient flow will be available for efficient operation of the sewerage system.
3. Each house owner will be encouraged to connect their waste water to the sewerage system; in that case the treatment plant will run to the optimum capacity and the waste water can be used for irrigation and industrial purpose which may increase the revenue.
4. The treatment processes will be studied keeping in view regarding involving less man power due to automation and less land in view of deletion of primary and secondary setting tanks land with excellent outlet parameter.

1.5 FINANCIAL FEASIBILITY FOR SEWERAGE SYSTEM

The quality of the treated waste water from the treatment plant can be reuse for gardening, plantation and irrigation purpose, which can generate revenue to the municipal corporation. The MIDC waluj

area is near the Nakshatrawadi sewage treatment plant of capacity 136 MLD. There is a possibility of selling the bulk waste water to the MIDC, which can be distributed to the industries at a minimum cost, will be a major and assured source of income to the municipal corporation. A dialog with MIDC officials and major industries should be initiated at the earliest. This will generate revenue of about 6.89 crores/ year at the rate of 5kL. This rate can be increased in future looking at the potential buyers. The current rate of potable water of MIDC for industrial use for the Users inside MIDC premises is 15.5/KL and for the users outside industrial premises is 23.25/KL. Apart from this 4.5 MLD is proposed to be used at siddarth garden which will be used for washing of buses and gardening to siddarth garden.

The supply of treated waste water at the rate of 5/KL for the industrial use will encourage the industries to use the treated waste water.

The dried sludge is a good quality of manure, which can be used by the nearby farmers at a minimum cost to encourage the sale of sludge.

1.6 ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROJECT

Possibility of Recycling of waste water for gardening / plantation / irrigation purpose, will drastically reduced the fresh water demand.

Improvements over baseline services

1. Improvement in the health & hygienic conditions.
2. Inclusion of urban poor in the main system of the project.

Institutional aspects

The waste water from all institutional / organizations / establishments will be collected, conveyed to the disposal site for further treatment.

1.7 REFERENCES

Preparation of the DPR for sewerage system will be in accordance with CPHEEO manual, IS Codes with latest revision, UIDSSMT guidelines, Schedule of Rates 2012-13 for MJP Aurangabad region.

City Development Plan prepared by Fortress is referred for existing data and population projection.

Latest sewerage treatment technologies are referred in discussion with various technology providers and expert consultants.

PRINCIPAL FEATURES

Sr. no	Description	Details
1	Name of the project	Underground Sewerage System for Aurangabad City under Urban Infrastructure Development Scheme for Small and Medium Town
2	State & District	Maharashtra (Aurangabad)
3	Project area	AURANGABAD MUNICIPAL CORPORATION
4	Population As per 2001 census	8,73,211
	a. Population as on 2011	11,65,146
	b. Projected population as on 2015 (Base year)	12,67,379
	c. Projected population as on 2030 (Intermediate Stage)	17,32,300
	d. Projected population as on 2045 (Ultimate Stage)	23,25,994
5	Existing Water Supply Status	
	a) Existing Water Supply at Consumer end	140 MLD
	b) Existing per capita supply / day	120 LPCD
	Proposed Water Supply under UIDSSMT	
	a) Per capita water supply / day (in LPCD)	135 LPCD

Sr. no	Description	Details
	b) Total water / day in MLD (Year 2023)	265 MLD
	b) Total water / day in MLD (Year 2038)	382 MLD
6	Sewerage scheme status a) Existing Drainage scheme	Existing underground sewerage scheme
	b) Designed Population and Year	2.0 lacs and 1991
	c) Present disposal of waste water	The waste water generated from the city is collected through sewerage collection network. The main sewers along the nalla are damaged and waste water is disposed untreated in the Kham and Sukhana river.
7.	Proposed sewerage project	
	a) Per capita water supply / day (in LPCD)	135 LPCD
	b) Total waste water / day in MLD (Year 2015)	181.45 MLD
	c) Total waste water / day in MLD (Year 2030)	234.17 MLD
	d) Total waste water / day in MLD (Year 2045)	301.05 MLD
	e) No of sewerage zones	8
	f) No. of Phases	1
	g) No of collecting sump & Pumping station	One intermediate PS and 6 Terminal Pumping Station near STP
	h) Diameter proposed	150mm(min) & 2000 m (max) Total length of pipeline – 257 Kms out of 539 kms.
	i) Treatment process proposed	I. SBR/MBBR for new treatment plant II. Upgradation and refurbishment of existing STP at CIDCO(Airport)

Sr. no	Description	Details
	j) No of treatment plant and Capacities in Mld	

Sr. No	Name of STP	Capacity (MLD)	Type of Treatment.
1	Banewadi	30.00	(Modern technology) SBR/MBBR
2	Kanchanwadi	136.50	(Modern technology) SBR/MBBR
3	Siddharth Garden	4.50	(Modern technology) SBR/MBBR
4	Salim Ali	0.00	(Modern technology) SBR/MBBR
5	Padegaon	10.50	(Modern technology) SBR/MBBR
6	CIDCO	18.50	(Modern technology) SBR/MBBR Existing Upgradation and refurbishment.
7	Zalta	22.50	(Modern technology) SBR/MBBR
	Total	222.50 MLD	

8. Cost of the scheme Rs. 369.94 Crores

9. Per capita Cost

Sr.No	Year	Population Souls	Per Capita Cost (Rs)
1	2011	11,65,146	3175
2	2015	12,67,377	2919
3	2030	17,32,298	2136
4	2045	23,25,994	1590

9. Financial Sharing

10	GoI share – 80%	Rs 295.95 crores
11	GoM Share – 10%	Rs 36.99 crores
11	AMC Share – 10%	Rs 36.99 crores
12	Operation Maintenance Cost	Rs. 24.45 crores
13.	Sanitary / Sewerage tax / tariff	10% of NRV (Net Rated Value) for Residential consumers and 15% of NRV for Commercial Consumers.

1.8 Recommendation:

The Sustainability and Viability of project will be achieved with

- Sanitation Byelaws shall be prepared
- Target of house connections to the sewer shall be met
- Tax collection for the sewer shall be achieved
- Awareness programs should be conducted
- Sale of treated waste water should be properly planned
- Training program for staff to be conducted
- Sewerage Treatment Plants and Main sewers to be operated and maintained through private contractors.

Executive Engineer
Municipal Corporation
Aurangabad

City Engineer
Municipal Corporation
Aurangabad

Commissioner
Municipal Corporation
Aurangabad

AURANGABAD MUNICIPAL CORPORATION

CONSULTANT'S CERTIFICATE

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

Certified that our authorized representatives have walked over the streets, at the location of various works and along the alignment of all roads, existing drains, etc, and are fully conversant with the site conditions in order to ensure that the proposals made in the report, can be practically implemented.

Date-

For Fortress Infrastructure Advisory Services

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

C E R T I F I C A T E

Certified that the 100% Supervisory check has been exercised in this office and the calculations are found correct.

Deputy Engineer
Municipal Corporation
Aurangabad

Executive Engineer
Municipal Corporation
Aurangabad

City Engineer
Municipal Corporation
Aurangabad

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

C E R T I F I C A T E

1. Certified that the Municipal Corporation Aurangabad has passed the necessary Resolution, approving the underground sewerage system with all its financial implications vide its Resolution No. ----- dated. (Urban Infrastructure Development Scheme for Small and Medium Town)
2. Certified for DSR
 - a) Rates adopted in this scheme are as per Maharashtra Jeevan Pradhikaran Schedule of Rates (SOR) 2012-13 of Aurangabad region.
 - b) Rate Analysis done for the non DSR items
3. Certified that the cent percent check on the arithmetical calculations in this estimates has been exercised in this office and all the calculations are found correct.
- 4a. Certified that the collection system are checked for provision of suitable diameter of pipes, types of manholes, Chambers, etc. and correct provisions have been made.
- 4b. Certified that the Design, Estimates and Drawings have been checked and found correct.

Executive Engineer
Municipal Corporation
Aurangabad

City Engineer
Municipal Corporation
Aurangabad

Commissioner
Municipal Corporation
Aurangabad

2.0 HISTORY OF THE CITY

2.1 About Aurangabad District

Aurangabad is one of the important districts of Maharashtra State located in the central part of the State. The Aurangabad district includes 9 Talukas and 1344 villages, covers an area of 10100 sq. Km. With the population of 2897013 souls.

Roughly triangular in shape, the southern side corresponds to the Godavari and the northern side to the northeast trending arm of the Ajanta ranges. With an extreme east to west distance of nearly 175 kilometers, this district is bounded by Jalgaon district on the north, Buldhana and alana districts on the east, Beed and Ahmadnagar districts on the south and Nasik district on the west. With the decline of power, Aurangabad became part of the Hyderabad's dominion. In 1948, Hyderabad merged into the Indian Union. In 1956, with the reorganisation of states, it became part of Maharashtra state, and in 1960, a district of Maharashtra was created and the new district of Jalna was created.



Talukas
Km. With

Click at a glance Tahasil



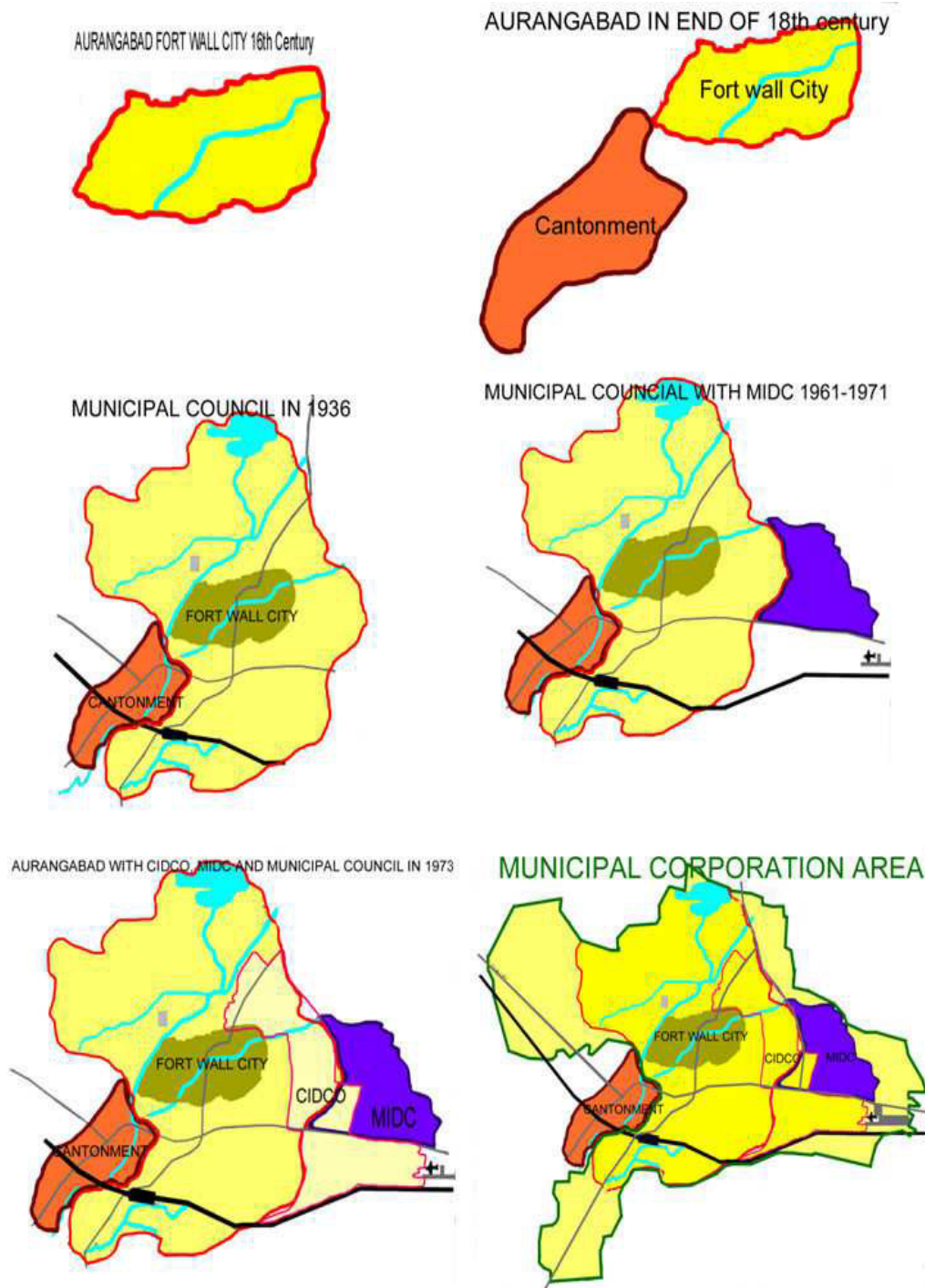
Mughal
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was

Bombay
In 1981, the

2.2 Evolution of the Aurangabad Urban Complex

Aurangabad was originally a small City called Khidki. The name apt in the context that the City served as a window between two worlds and cultures of Northern and Southern regions of the country. The walled city came up on 5.35 Ha of land.

Figure 1.0: Chronological Development of Aurangabad



The cantonment was established towards the end of 19th century developed on the western bank of the south-west walled city. Till the beginning of this century the development of the city was limited within the walled city, Begampura and Cantonment. As population started growing area outside the walled city started developing. The development was not possible on the northern part of the city due to the hilly land, which acts as a major physical constraint. Hence city started developing towards south and areas like Usmanpura, Padmpura, Kranti Chowk etc. The development of the area outside the walled city enjoin the formation municipal Council in the year 1936.

The city faster growth after the establishment of university and industrial areas in 1965 just on the east of the Municipal limits known as Chikalhana, and the industrial area has given a impetus for development. The influence of the industrialization has lead the high growth rate of population. The Government of Maharashtra visualized this high growth and appointed City and Industrial Development Corporation of Maharashtra (CIDCO) as the Special Planning Authority for the planned and orderly development of the city in 1972 on about 1200 ha land in between the existing city and Chikalhana industrial estate.

Table 1.0: Chronology of events of Development of Aurangabad City

Sr. No.	Event	Period	Area (Sqkm)
1	Original Village Was Khadki	1610	0.053
2	Named as Aurangabad	1653	0.053
3	Cantonment at Aurangabad	1886	0.108
4	Municipal Council Aurangabad	1936	54.50
5	Industrial Area establishment	1965	7.19
6	CIDCO Area Notified	1973	12.00
7	Municipal Corporation	1982	138.50

The increase in population of the Aurangabad city resulted in the formation of Aurangabad Municipal Corporation on 3rd December 1982 having an area of 138 Sq.km., which includes the area of Chikalthana industrial estate and CIDCO area, with the addition of 18 villages outside the Municipal Corporation limit.

The MIDC, industrial area just on the east of the Municipal limits have given a great inputs for development along Jalna Road, the proximity of the area to the northern Delhi Gate with the Himayat Bagh, the Government Office Complex, the Shahaganj area (city centre). Areas like Jyotinagar, Jawahar Colony and Garkheda etc started developing in 1980s with large no of apartments and are still developing today. On the south-west, city started developing towards Paithan road in the areas like Kanchanwadi, nakshtrawadi etc.

City is developing in three main directions, which are

- South of Railway Station
- Along the Jalna Road towards the east
- Towards north along Jalgaon Road and northwest side beyond Dr. Babasaheb Ambedkar Marathwada University.

Now city is developing beyond Garkheda towards Satara near Bid Bypass Road on the Southern side. This area is outside the Aurangabad Municipal corporation limit. Also due to establishment of new Five Star Industrial Estate at Shendra towards east, city is expected to grow in that direction.

2.3 Principal Characteristics of the City

The key characteristics of Aurangabad City, apart from its being the district headquarters are that it is famed for its Industrial centre, tourism hub and Education facilities.

2.3.1 Tourism

In the regional plan of Aurangabad Region the tourist spots of the Aurangabad region are classified on the basis of their identity as Sculptural tourist spots, Historic Tourist spots, Religious tourist spots, Natural scenic tourist spots, Local tourist spots Important places of tourist attraction in and around the Aurangabad city.

Sculptural caves

- Ajanta
- Ellora
- Aurangabad
- Pitalkhora



- Ghatotkach
- Banoti caves

Places of Historic Importance

- Devgiri fort
- Antur fort
- Vetawadi fort
- Sautada fort
- Ajanta fort
- Taltum fort



2.3.2 Industries

Aurangabad is a major industrial and agricultural city in Maharashtra. It is the fourth major city in Maharashtra after Mumbai, Nagpur and Pune and second auto-hub after Mumabi-Pune belt. It has good industrial base namely Chilkalthana, Aurangabad Industrial area within city and Waluj, Paithan, with newly developing industrial area in Shendra in the region. The establishment of these industrial areas has major contribution for development of the city.

Figure 2: Leading Companies in the Industrial Area of Aurangabad Region



Aurangabad	Chikalhana	Waluj	Paithon
Nirlep industries	HMT Ltd	Bajaj Auto	Jain Spinnes
Precision Engineers	Garware Polysters	Siemens	Devidaya Rolling Mills
Mahavir Paper Products	Lupin Laboratories	Colgate Palmolive	Kanakdhara Steel
Ajantha Tiles	Wockhardt Ltd	Larona Ltd	Aurangabad Paper Mills
Marathwada Spun Pipe	Greaves Lombardini	Ceat Tyres	Ajanta Drug Pvt Ltd
	Cosmo Films	Johnson & Johnson	
	Needle Roller	Sterlight	
	Maharashtra Distilleries	Rails India	
	Indo German Tool Room	Fair Deal Corporation	
	Hindustan Level Limited	Forbes Campbell	
	Dagerfost	Fosters	
		Wipro	
		Franke	
		Garware Polysters	
		Wockhardt	

2.3.3 Education

There are numerous educational institutions serving the region as well as the city. There are 5 Engineering, 3 Medical, 2 Dental Technical colleges and 31 Arts, 21 each of Commerce and Science colleges apart from basic educational facilities.

2.4 Aurangabad Municipal Corporation

2.4.1 Formation

Aurangabad Municipal Corporation was established in 1982 under the Bombay Provincial Municipal Corporation Act 1949 is the governing body of the city.

The elected representatives from the people govern the Corporation. The Mayor is the first person of the city elected by elected representatives. In Aurangabad Municipal Corporation there are 99 elected and 5 nominated representatives.

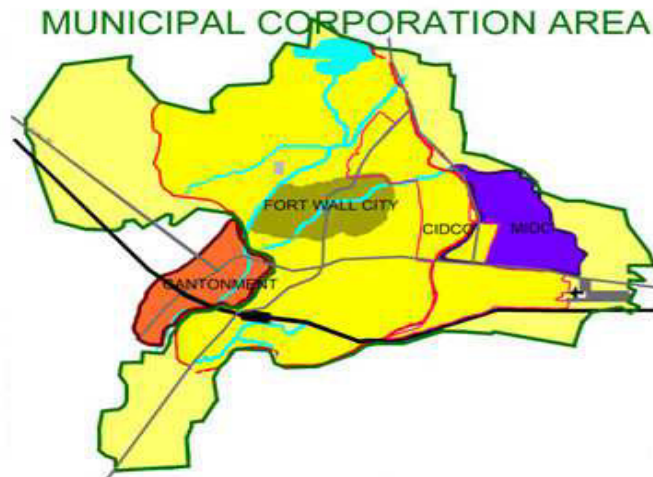
The administrative head of Aurangabad Municipal Corporation is the Municipal Commissioner assisted by senior officials discharging the function. The general body headed by the Mayor governs the functioning of the Corporation. The various committees assist the general body. The Standing Committee Specified under the BPMC Act is the most important committee consists of cooperators elected by the elected representatives.

There is ample evidence to believe that Aurangabad was developed as a trading hub four centuries ago. It lies on a major trade route that used to connect north-west India to the Deccan region.

AMC has also taken over the area of CIDCO since first April, 2006, for providing the services. This has facilitated integration of services with rest of the city. Municipal Corporation had general elections in February 2005. At present there are 99 electoral wards in city.

The Corporation is headed by a Mayor the elected representative. The AMC out the governance through the General meeting, standing committee and six committees (as per the 74th amendment to constitution on decentralizing governance) committees on different subjects - health, education, women and child welfare,

development,. In order to decentralize the governance the AMC is trying to address all the issues and problems of the citizens at the ward level. All the representatives discharge their duties through General Body which is the apex body for policy decision and is chaired by Mayor. Corporation derives its existence as well as most of its powers and duties through Bombay Provincial Municipal Corporations Act and is responsible for almost all the facets of an urban life, like roads, drainage, water supply, primary education, health including preventive as well as curative care, gardens etc. Corporation derives its financial resources by levying Property Tax, Water charges, Development Charges, Octroi etc.)



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2.4.2 Institutional setup

The Aurangabad city today comprises of three distinct physical entities – the old Aurangabad city including Aurangabad Industrial area, Chikalhana industrial area and the CIDCO of New Aurangabad. Till recently these three area were managed by respective institutions. There three institutions, which are involved in planning and provision of infrastructural services to Aurangabad City as well as Aurangabad Urban Agglomeration. They are.

- Aurangabad Municipal Corporation (AMC)
- City and Industrial Development Corporation (CIDCO)
- Maharashtra Industrial Development Corporation (MIDC)

CIDCO however has ceased to be a Special Planning Authority as AMC has taken over all the functions of CIDCO on first of April, 2006.

Each institution had prescribed territorial jurisdiction for provision of infrastructure. However, there were some functions performed by AMC within CIDCO and MIDC jurisdiction.

3.0 EXISTING INFRASTRUCTURE FACILITIES

3.1 Water Supply

3.1.1 Introduction

The water supply is the basic instrument for the urbanisation and development of the cities. In ancient times the settlements or the villages grew on the bank of the rivers. In Maharashtra the cities are having the developing trends because of the availability of the water i.e. Mumbai, Pune, Nashik, Nagpur, Aurangabad and Amravati.

Aurangabad is well known for the rapid development during last three decades. The population of the city as per the 2001 census is 873211 souls.

The information of the existing status of infrastructure facilities has been extracted from the CDP, in which the ultimate design year for water supply is considered as 2038. In this report, the design period for ultimate population is taken as 2045. So the calculations for the sewerage demand are as per the data populated in the chapter of population and water demand for year 2045.

The purpose of placing this chapter is to provide a brief on the existing water supply project and proposed parallel water supply project under UIDSSMT.

3.1.2 Water Requirement

The population of Aurangabad city in year 2011 is 1165146 souls. The water requirement for the city as per the uses is categorized as

- Drinking
- Industrial
- Public uses
- Firefighting

The distribution, system and line losses will be added to the water demand. The table below indicates the

standard requirement for the city as per the Indian standard.

Table: 2.0 Water Requirement of Aurangabad City – 2011

Sr. No	Purpose	Population	Litres per capita per day	Water requirement in MLD
1	Drinking	1175278	135	158.66
2	Industries	1175278	40	47.01
3	Public purposes	1175278	25	29.38
4	Fire Demand	1175278	15	17.63
5	Losses, Wastage & Thefts	1175278	55	64.64
		Total		317.32

Source: Indian Standard Code for basic requirement of Water Supply, Drainage and Sanitation

The water requirement as per the standard as on today for the city is 317.32 MLD.

In Aurangabad, the demand for the water supply to the industries is taken care by the Maharashtra Industrial Development Corporation. The drinking water in Aurangabad is the priority and fire occurs incidentally. The Assessment for the water supply for the city with 15 % distribution and 5% system and line losses is as presented in following table.

Table 3.0: Minimum Water Requirement of City - 2011

Sr. No	Purpose	Population	Litres per capita per day	Water requirement in MLD
1	Drinking	1175278	135	158.66
2	Public purposes	1175278	25	29.38

3	Losses, Wastage & Thefts - 20%	1175278	27	31.73
		Total		219.77

Source: Indian Standard Code for basic requirement of Water Supply, Drainage and Sanitation



Sources of Water Supply and Availability of water

a) Nahar – E - Ambari

Aurangabad is the city that has the water supply scheme from 600 years old history. Malik Amber built the system, which has roman influence. The Aurangabad city in early 70s was depending upon the water supply from the Nahar- E – Ambari.

b) Harsool Dam

The scheme at Harsool dam constructed in 1954, which takes care of the water supply of the cities old core area.

c) Jaykwadi Dam

The sudden drought in 1972 there was a need to identify the permanent source. A dam on river Godavari was constructed at Paithan, a dam is named as Jaykwadi. The Nathsagar dam is situated at Jaykwadi near Paithan 50kms away from the Aurangabad city. The two schemes were implemented on Jaykwadi dam.

Table 4.0: Availability of Water for supply for Aurangabad City

Sr. No	Source	Water Availability	Actual Water Supply with losses (Mld)
1	Jaykwadi dam		
2	Old Water Supply Scheme	56	50
3	New Water supply Scheme	100	90
4	Nahar - E - Ambari	2	0
5	Harsool dam	10	0
	Total	168	140

Source: AMC Report

It is assessed by the Aurangabad Municipal Corporation that there are 30% losses due to wastage and theft to the existing scheme of Jaykwadi the actual water supply to the city is of 130 to 140 MLD. The present rate for the water supply is 120 lpcd. This has forced AMC to supply the water in some wards in the city at an alternate day. The alternate day water supply itself indicates that there are more losses and deficiency in the water supply scheme.

3.1.3 Distribution Network

There are 34 reservoirs of different sizes having storage capacity of 43.87 ML are used for supplying water across 8 zones covering entire city area. AMC covers 90% of the area through the distribution networks.

3.1.4 Water supply for villages

The city of Aurangabad includes the eighteen villages, surrounding the city. The tap water is supplied to most of the villages. The water supplies to the unauthorized localities like Pundaliknagar are by tankers and private sources like tube wells, bore wells. Presently there are 125 wells in Aurangabad City. The few of them are contaminated and the water is not useful for drinking purposes.

However, some private wells are used for tanker supply and other purposes. Some of the Municipal wells are useful for supplying water to the locality after proper treatment at Mitmita, Rosabagh Area.

3.1.5 Analysis of water supply

The city is assessed for the water supply with the standard prescribed by Indian standard code of basic water supply, drainage and sanitation is at 270 litres per capita per day. The requirement as per the standard is 317.32 MLD.

In Aurangabad the water for the industrial use is taken care by the MIDC therefore the water assessment without industrial use is 219.77 MLD.

As the drinking water is the priority for the city demand, for the other uses are flexible one the water demand with 135 lpcd and 20% losses with resultant demand of 162 lpcd is calculated as 190.38 MLD.

The water availability from all sources is 160 MLD.

There are heavy losses to the existing water supply scheme, with the losses the actual water supply is 105 MLD.

Table 5.0: Water Supply Analysis – Aurangabad City

Particulars	Water requirement as per standard in MLD	Water assessment with minimum requirement in MLD	Water assessment for residential use as priority with 20% loading in MLD	Water availability in MLD	Actual water supply with 30% losses in MLD
Water assessment	317.32	219.77	190.38	160	140

3.1.6 Water Supply for Industrial Areas

MIDC has created infrastructure for adequate water supply to all the Industrial areas in the region. At present the 30MLD pumped to these areas supply.

3.1.7 Projected Water Supply to the City by 2038

It is revealed from the above there is a deficit on the part of demand and supply in the city, a comprehensive planning is required for the water supply to the city. The analysis is carried out to find out the future requirement. The scheme has to be planned for the future 30 years.

The Aurangabad Municipal Corporation has prepared a detail project report for the water supply to the scheme. The water requirement of the city is at the rate of 187 lpcd. however the priority is for the drinking water; the water supply requirement is taken as 135 lpcd with the addition of 20% loading. The resultant requirement is 162 lpcd. The following table presents the projected water requirement of the city. The projected demand for the water supply is taken for year 2038.

3.1.8 The Parallel Water Supply Scheme – Proposal

In the detailed project report for the water supply which is approved under UIDSSMT, forecasted the population for the year 2038 is 23,58,899 souls. The per capita water supply considered is 135 lpcd with 20% loading. The project is divided in two phase's i.e. for the population of year 2023 and year 2038.

Table 6.0: Details of Future Water requirement

Phases	Year	Population	Unit with 20% addition on 135 (lpcd)	Total Requirement (MLD)	Existing water Supply Considered (MLD)	Design Quantity (MLD)
Phase-I	2023	1625643	162	265	105	160
Phase-II	2038	2358889	162	382	75	307

Source: Water Supply DPR, AMC and Analysis

The Project Components for Parallel Water Supply Project are.

1. Intake Channel
2. Jack well (size 36mx15 m)
3. Approach Bridge

4. Raw Water Pumping Machinery: (700HPx 6Nos)
5. Raw Water Pumping Main: (Dia 2200 mm and length 26.25 Km)
6. Water Treatment Plant (192Mld)
7. Sump & Pump house (80,000litres)
8. Pure Water Pumping Machinery: (1200HPx 6Nos)
9. Pure Water Pumping Main :(Dia 2200 m and length 12.16 Km)
10. Master Balancing Reservoir (10ML)
- 11 Power supply and miscellaneous works

The development of scheme involves the following components.

- Raw water pumping
- Transportation of raw water
- Purification of Raw water
- Transportation of pure water
- Storage of pure water
- Distribution of Pure water

3.2 Sewerage

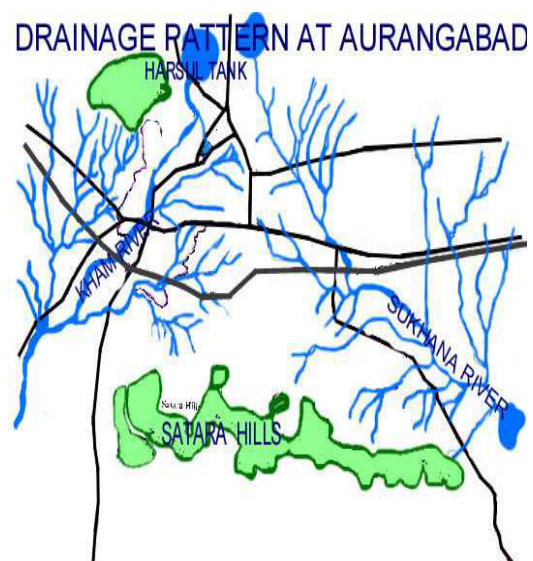
3.2.1 Introduction

Sewage produced by all human communities is often left to compost naturally or it is treated using processes that separate solid materials by settlement and then convert contaminants into biological sludge and into gases such as carbon dioxide or methane. Sewage infrastructure is designed as a safety feature that reduces sewage backups and minimizes public health impacts for residents.

The Aurangabad is one of the fast growing cities in Asia having population of 11.65 lacs in the year 2011. The scheme for the transportation, collection and treatment of sewage was commissioned in early seventies. The Municipal Corporation in 1965 has started the laying of underground sewerage line and completed the first phase in 1972 and second phase in 1976. The population projected at that time for 2001 was 2.0 lacs. The scheme was designed and constructed by Public Health engineering department of Govt. of Maharashtra however sudden increase in population to 4 - 5 times the scheme proved to be insufficient.

3.2.2 Present Situation of Sewerage system

The area of Aurangabad Municipal Corporation is 138.44 sq. km. The area consists of CIDCO area and MIDC Area. Aurangabad Corporation has prepared a comprehensive plan development of sewerage system covering entire AMC through M/S Shah consultants Mumbai in was proposed to align the main trunks along the slops and nallahs.



CITY area, Municipal for area of 1987. It existing

3.2.3 Natural Drain Network in Aurangabad

Topographically the area of Aurangabad city is divided into two natural drainage systems.

Zone A: Comprises of Kham River and its tributaries, nallahs,

Zone B: Comprises of Sukhana River and its tributaries.

The majority of area is having slope towards Kham river basin 75 to 80 % sewage flow can be attributed to Kham river and 20 to 25 % flow drains in Sukhana River. The scheme was taken up for development in piece meal as per availability of funds.

3.2.4 Catchment Area

Kham River Catchment Area - Zone (A)

In this Zone A, the old part of city, Municipal limits, additional municipal area including Padegaon, Mitmita, Bhavsinghpura, Garkheda, Shahnoorwadi, Part of Harsul, Kanchanwadi, Nakashatrawadi etc. has been included. This Zone A has further been divided into seven parts and considering natural slope, Nallah flow, water flow etc. main sewer lines have been designed. These lines are as follows:

1. Main Sewer A: Western part of Bibi Ka Maqbara
2. Main Sewer B: Part of Kham River flowing through Himayat Bagh Nallah flowing through.
3. Main Sewer C: Majnu Hill to Siddharth Garden, Barudgar Nala- Saraswat Bank-Nageshwarwadi.
4. Main Sewer D: Nallah flowing through Hotel Rama International to Samarth Nagar-S.B. Colony-Nageshwarwadi.
5. Main Sewer E: Forest Office – Padampura - Kham River.
6. Main Sewer F: Nallah flowing through St.Francis High School - Tilaknagar – Vedant Nagar.
7. Main Sewer K: High court – Gajanan Maharaj Mandir - Jawahar Colony Police Station - Shahnoorwadi.



3.2.5 Catchment Area of Sukhna River - Zone (B)

In this Zone B, the areas of Naregaon, Brijwadi, Masnatpur, Chikalthana, MIDC, Mukundwadi, Cidco, Harsul, Jadhavwadi etc. for these areas two main sewer lines have been designed which area as follows.

1. Main Sewer L: Nallah flowing through N-2, Cidco - Sukhna River.
2. Main Sewer M: Chikalthana Gaothan - Chikalthana MIDC - Sukhna River.

The above main sewer pipelines are further divided into sub zones according location of the STP's. This will help to identify that which main sewers are flowing to which STP s. In this report also the nomenclature of the sewers are kept as earlier for ease of understanding. The map showing the STP zones are attached as Annexure.

Table 7: Main Sewers and STP zones

Name of STP Zone	Name of Main Sewers	Area of STP Zone (Ha)
Banewadi and Part Nakshatrawadi	B,C,D,E	3825.67
Part Nakshatrawadi	F,K	2640.84

Name of STP Zone	Name of Main Sewers	Area of STP Zone (Ha)
Cidco and Zalta	L,M	4096.84
Padegaon	A	3236.65
	Total	13800

3.3 Coverage of the Underground Sewerage system

The area of the Aurangabad Municipal Corporation is divided into administrative and institutional set up as city area, CIDCO area and MIDC area. In MIDC area the sewerage is taken care by the individual industrial units whereas in the city area and CIDCO area the sewer lines are laid by Municipal Corporation and CIDCO.

During the Reconnaissance survey and physical marking of the manholes, it can be analyzed from that the sewerage network covers about 85% of the total road length. All the areas of the city are having sewerage network in the form of laterals and sub laterals.

3.4 Sewage Flow and Treatment of Sewer

The population of the Aurangabad city as per census 2001 is 8.73 lacs. The present population of the city is 11.65 lacs. The Aurangabad Municipal Corporation receives 130 – 140 MLD water at Nakshtrawadi master balancing reservoir. And from other schemes city receives about 5 MLD water.

The total water received is about 130 – 140 MLD. At present there is hardly any treatment for the sewage and the same is flowing untreated through nallahs and river.

3.5 Existing Situation

The natural topography of the city is divided into two basins viz. Kham river & Sukhana river. The map shows the catchment area of the Kham and Sukhana. During reconnaissance survey and subsequent site visits, it is seen that most of the main sewer along the nallas are damaged. Due to this the waste water flows in the nalla and finally reaches Kham river and Sukhana river. At present only 6.5 MLD waste water is treated and remaining waste water goes to river untreated.

As the waste water is directly released into the river, it certainly creates environmental hazards in the long run and is also felt even now. Therefore treatment to the waste water is very much required.



3.5.1 Issues

- In absence of the treatment plants, the waste water disposed off in nallas and Kham River remain untreated and polluted the environment.
- The trunk main are old one and damaged, leaked at various places.
- The manholes are filled with garbage, plastics obstructing the flow of the sewer.
- Due to manholes are filled up with garbage and soil, there is tendency to damage the manhole and let the water in natural nallas.



3.5.2 Proposals

- Construction of sewage treatment plant for demand of 2030.
- Laying of sewer lines on internal roads to reduce the gaps.
- Construction of main sewers along Kham river and Sukhana river for ultimate demand for 2045.
- Arresting leakages in existing sewer mains.
- Repairs to existing manholes and construction of new manholes.
- Upgradation and replacement of the main sewers and collection network as required.
- Using treated sewage water for agriculture purpose, industrial usage.

3.6 Projections for Future Requirement

While preparing the project for the collection system the population to be considered is for the future of 30 years. However for the sewerage treatment, the design year is considered as 2030 with population of 17.32 lacs, due to restraint of the financial capacity of AMC to pay back loan liability.

The ultimate stage of 30 years is 2045. The present sewerage collection network is in operation and 88 MLD waste water is let out in Kham River untreated, due to damage of main sewer pipelines.

1. Construction of 222.5 MLD capacities STP (less 6.5 already operative & 5.0 MLD under construction) will solve problem of sewerage treatment & treated waste water will generate revenue.
2. The proposed capital cost for the complete project of about 369.94 Crores is sustainable and will enable AMC to pay back. After repayment of the loan amount additional balance work can undertaken with a fresh loan.

All the pipe lines / structures fit well for ultimate stage design. Only additional STP & P/M will be required. The expenditure under this scheme is productive and sustainable for ultimate stage requirements.

4.0 DEMOGRAPHIC PROFILE OF AURANGABAD CITY

4.1 Introduction

The urbanization is inevitable in the world, it is expected that by 2030 the 60% of the world population live in urban areas. In India urbanization has been increasing steadily for decades today about 27% of the total population lives in urban area. In Maharashtra the urban population is about 42%. The Aurangabad district is having population of 28.97 lacs spreads over an area of 10100 sq. Km. The urban population of the district is 37 %. This is above the national urban rate and slightly less than the states urban growth rate.

4.2 Population Growth - Aurangabad Municipal Corporation

The increasing industrialization in the Aurangabad region has lead to growth of urban population. During the decade 1981 to 1991 Aurangabad was the fastest growing city in Asia. The population of Aurangabad municipal corporation area as per 2001 census is 873311. The decadal growth of the city is 79.32 %. The table below represents the growth of population from 1931 to 2001.

Table 8: Population Growth of Aurangabad City

Year	Population	Increase / Decrease	Decadal Growth Rate
1931	29288		
1941	41644	12356	42.19
1951	57949	16305	39.15
1961	87579	29630	51.13
1971	150483	62904	71.83
1981	284807	134324	89.26
1991	487025	202218	71.00

Year	Population	Increase / Decrease	Decadal Growth Rate
2001	873311	386286	79.32
2011	1165146	291835	33.42

Source: Census 2001, AMC for 2011

The population growth indicates the increasing trend over the last three decades. This growth of urban population needs the suitable framework and planning of infrastructure for orderly development of the city.

4.3 Socio Economic Indicators

The urbanization rate for the Aurangabad city is three times higher than the National urban rate almost two times the state. The density per sq km. is 6300 persons per sq.km. The average size of the household is 5. The sex ratio is unhealthy 901 as against 927, also sex ratio below six years of age is 887 which is too poor. The literacy rate is very strong having 84% literate population. The table below indicates the comparison of socio-economic indicators with urban areas. Nashik and Solapur cities in Maharashtra were taken as similarity in economic activity is found.

Table 9: Comparison of Aurangabad City with other Urban Areas

Sr.No	Socio-economic Indicators	State Urban	District Urban	Aurangabad City	Nashik City	Solapur City
1	Population 2001	41100980	1087150	873311	1077236	872,424
2	Area (sq. km.)	--	--	138.5	259	178.57
3	Density (persons /hectare)	--	--	63	42	49
4	No. of households	8403224	205163	167081	225190	161349
5	Household Size	4.9	5.3	5.2	4.8	5.4
6	Sex Ratio – Females per 1000 males	873	905	901	871	961
7	Sex Ratio (Below 6 years)	908	886	887	882	926
8	SC Population (%)	9.2	15.9	17.1	12.5	13.4

Sr.No	Socio-economic Indicators	State Urban	District Urban	Aurangabad City	Nashik City	Solapur City
9	ST Population (%)	2.7	1.3	1.0	6.8	2.0
10	Literacy Rate (%)	85.5	82.7	83.7	86.3	76.7
11	Female Literacy Rate (%)	79.0	74.3	75.8	79.7	66.5
12	Workers Participation Rate	33.8	28.9	28.6	34.5	34.8
13	Female Workers Participation Rate	12.5	10.2	9.7	13.6	20.9

Source: Census of India 2001

From above it can be seen the sex ratio in age group 0-6 years is 887 and is concern which corporation has to look in. The workers participation rate as well as female participation rate in work is less than the state urban and also other cities. SC population when compared is on higher side of 17.1% which has to be considered while taking development activities as the need of special attention.

4.4 Population Projection for AMC Area

Planning infrastructure for urban areas requires study of demography, analysis and forecasts of population, economic activity and land use. These elements are the basic determinants of demand in infrastructure. Thus preparing city development plan, it becomes necessary to forecast population based on the background of the City after analyzing the growth trends of the City. The population projection is done by Arithmetical increase method, Geometric progression and incremental increase.

But it is contemplated that the high growth in the previous four decades will ease out by through assessment of the development activities, infrastructure availability by looking into following considerations

- Overall Urban growth rates are decreasing at National perspective
- Technology advancements and development of infrastructure in rural areas will decrease the effective migration.
- The City Infrastructure especially Water Supply will not hold this high growth in future and migration will decrease.
- Saturation in densities and reduction in peripheral developments as presently seen
- The growth rate within the city limits decrease as good infrastructure development is taking place outside the present city limits

- Even though after decades the city limits may increase to these areas also, the infrastructure will be in place and this population is not needed for the present analysis.

By taking into consideration of above points and with the declining birth and death rates continuing, the city is expected to grow at a moderate rate.

The population projection by incremental increase method shows the realistic figures and the same was adopted for the purpose of all the infrastructure computations. The average growth rate of above 70% had been lowered to 20% per decade as practically and physically seen.

The water supply project already sanctioned by Central Government under UIDSSMT is design based on the population projection by incremental increase method. The copy is enclosed herewith for reference. The population projected for 2011 at the time of water supply project considering incremental increase method is 1175278, which is fairly matching with the actual population figures given by corporation for 2011 which is 1165146.

Table 10: Projection of Population for Aurangabad City

Sr no	Year	Population	Increase in Population	Percentage increase in population per decade	Incremental Increase	Decrease in Percentage increase
1	1961	87579				
			62904	71.83		
2	1971	150483			71420	-17.43
			134324	89.26		
3	1981	284807			67894	18.26
			202218	71.00		
4	1991	487025			184068	-8.32
			386286	79.32		
5	2001	873311			-94451	45.90
			291835	33.42		
5	2011	1165146				

Population Projection - Aurangabad City			
Year	Arithmetical Method	Incremental Increase	Geometrical Progression
2015	1251351	1267377	1425312
2026	1488416	1595728	2480943

2030	1574621	1732298	3034914
2041	1811686	2155084	5282665
2045	1897892	2325994	6462235

Therefore the population of 23.26 for year 2045 is to be considered for further calculations.

Considering Aurangabad City, the growth rate of Population is considered from 1961-2001 was correct due to expansion of CIDCO area, formation of Corporation, setting up of new Industries as Chilkalthana and Waluj, proposed development at Shendra Village and due to old Heritage on World Map.

With reference to the above population projection data, the future projected population for Aurangabad City is given below.

Table 11: Population for Aurangabad City

Sr.No	Year	Population Souls	Status of year
1	2011	11,65,146	Design Year
2	2015	12,67,377	Base Year (0 year)
3	2030	17,32,298	Intermediate Year (15 years)
4	2045	23,25,994	Ultimate Year (30 years)

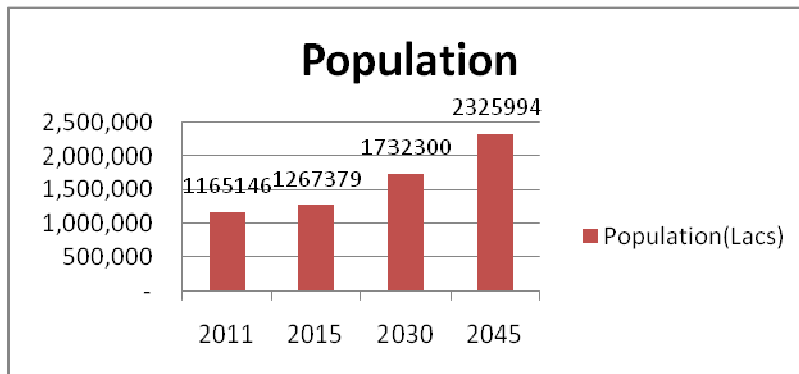


Fig 3: Chart Showing Population Projection

4.4.1 Density and Ward Population

The gross density of Municipal Corporation Area in 2001 is 63 persons per hectare, which were 41 persons in 1991 for the same corporation area of 138.5 sq.km.

Table 12: Change of Population Density through decades in City area

Sr. No	Census Year	Population	Area in sq.km	Gross Density -pph
1	1951	57949	----	
2	1961	87579	40.87	21.43
3	1971	150483	40.79	36.89
4	1981	284607	40.79	69.77
5	1991	573272	138.5	41.39
6	2001	872667	138.5	63.01
7	2011	1165146	138.5	84.13

Source: Census Handbooks & AMC

Table 13: Ward wise population of new Election 99 wards

Ward No	Population	Ward No	Population	Ward No	Population	Ward No	Population
1	24339	26	10242	51	12357	76	13308
2	28805	27	11024	52	11823	77	17780
3	9610	28	12034	53	11930	78	11114
4	21435	29	13123	54	10043	79	12772
5	15690	30	8273	55	9625	80	13355
6	7594	31	10242	56	9902	81	19818
7	17654	32	11514	57	8733	82	23515
8	22385	33	10328	58	10148	83	10355
9	10831	34	10099	59	8817	84	20061
10	9391	35	9186	60	8698	85	13306
11	7821	36	10034	61	9127	86	13574
12	10462	37	8825	62	8469	87	13316

Ward No	Population	Ward No	Population	Ward No	Population	Ward No	Population
13	10358	38	7639	63	8557	88	17949
14	8677	39	10427	64	8515	89	11026
15	7872	40	9673	65	9234	90	10396
16	9164	41	11502	66	9963	91	8070
17	9589	42	7522	67	8511	92	9295
18	9781	43	12877	68	11773	93	7309
19	8921	44	10912	69	10267	94	11328
20	9419	45	10642	70	14820	95	8806
21	23184	46	10064	71	10306	96	8832
22	12993	47	9763	72	10655	97	13060
23	14516	48	10900	73	11007	98	17892
24	11114	49	8972	74	10894	99	16749
25	11024	50	9695	75	9845		

Source: AMC

4.5 Proposed Landuse Pattern:

The proposed landuse pattern given in the City Development Plan is adopted for the calculation of the total sewage generation. The proposed landuse is given below.

Table 14: Proposed Landuse Plan

Sr. No.	Land Use	Area in Ha.	CIDCO Area in Ha.	MIDC Area in ha.	Addl area for proposed Land use in ha.	Total	% to Total Area in Ha.	UDPFI standards %
1	Residential	1291	375		3514	5179	37.29	35-40
2	Commercial	22	67	22	366	476	3.43	4-5
3	Public Semipublic	596			1113	1709	12.3	10-12
	a)Educational		44			44	0.32	
	b)Institutional and administrative		23			23	0.17	
	c)Health		9			9	0.07	
	d)Social Facilities		16			16	0.12	
4	Industrial	45	4	472		520	3.75	12-14
5	Public Utility	29	17	36		82	0.59	
6	Open Spaces Play ground Parks And Gardens	137	161	73	1125	1496	10.77	12-14
7	Transport and Communication	323	279	123	1202	1927	13.88	18-20
A	Total Area Developed	2443	994		7320	11482	82.67	100
8	Agriculture	7	0			7	0.05	
9	Water Bodies	72	18			90	0.65	
10	Vacant Lands	8	0			8	0.06	
B	Total Undeveloped Area	87	18			105	0.76	
Total A+B		2530	1012	725	7320	11587	83.43	
14	No Development Zone	1869	0	0		1869	13.46	
15	Overlapping Area	392	0	0		392	2.82	
C	Total Other Area	2261	0	0		2261	16.28	
Total A+B+C		4791	1012	725	7320	13848	100	

The percentage of the landuse adopted for calculation of sewage demand other than residential is as below.

Table 15: Landuse Percentage Adopted

Land use pattern adopted for ERA	% to Total Area in Ha.
Residential -	37.29
Commercial -	3.43
Institutional	12.3
Industrial	3.75
Public utility, open spaces and other area	15.89
Transport and communication	13.88
No development	13.46
Total	100

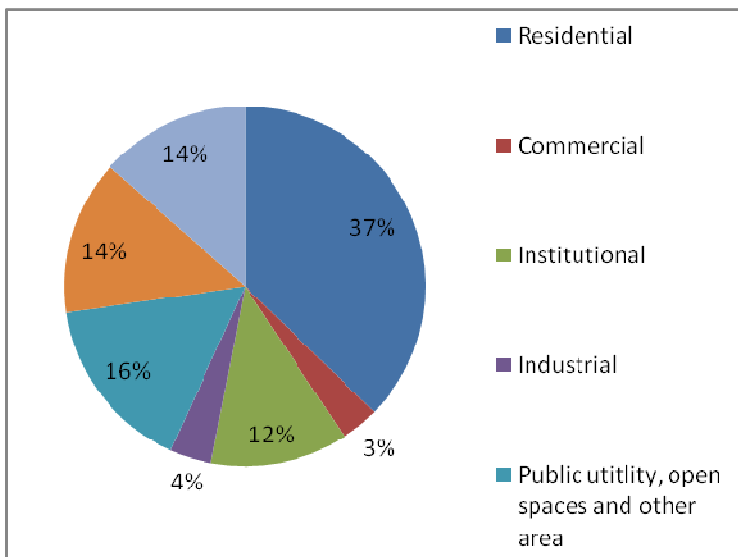


Fig 4: Chart Showing Proposed Landuse

Table 16: Projection of sewerage flow

Projected Sewerage Generation						
Year	Incremental Increase	Water Supply at the rate of 135 lpcd at	Water Requirement in MLD	Projected Residential Sewage Generation in MLD -	Additional demand for the other area such as	Total Sewage Demand (MLD)

Projected Sewerage Generation						
		consumer end		Considering 80% of the water demand and 5% as infiltration	commercial, industrial and institutional demand	
2011	1165146.00	135.00	157.30	132.13	37.73	169.86
2015	1267377.00	135.00	171.10	143.72	37.73	181.45
2030	1732298.00	135.00	233.87	196.45	37.73	234.18
2045	2325994.00	135.00	314.01	263.77	37.73	301.50

Source: Analysis

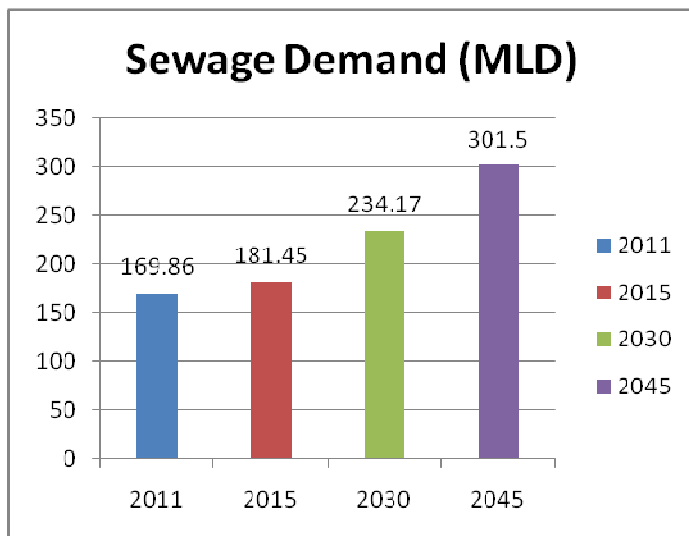


Fig 5: Chart Showing Sewerage Demand

4.6 Computation of Nodal Demand

The nodal demand is calculated based on the Equivalent Residential Area (ERA) method. The density of the area is projected on the development pattern of the city. Saturated population is considered for the old

and existing area. The detailed analysis of the population projection and ward wise demand is given in Annexure.

The complete city is divided in eight zones as per the main sewer pipelines and STP's. The abstract of sewage demand as per the zones is as below.

Table 17: Zone Wise Demand and Distribution of Ward

Zone No	Ward Nos	Ward Name	Demand (MLD) Year			
			2011	2015	2030	2045
Zone I	64,65,66,67,68,69,71,82,83,84,85,86,87,88,89,90,91,92,93,96,97,98,99	Kranti Chowk, Ramanagar, Shiv Shankar colony, Buddha nagar, Uttamnagar, Vishnu nagar, Jawahar colony, Vidhya Nagar, Vidhya Nagar, Nyaynagar, Bharat nagar, Matoshri nagar Garkheda, Pundalik nagar, Kalpataru colony, Balkrishna Nagar, Garkheda, Priyadarshani, Indiranagar, Ulkanagari, Jai Vishwabharati colony, Jyotinagar, Eknatnagar, Osmanpura, Kabadinagar, Vedant nagar, Hamalwada Railway Station, Banewadi, Nakshatra wadi, Shivaji nagar	44.27	47.33	61.24	79.01
Zone II	29,30,32,34,35,36,37,38,39,40,42,44,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,94,95	Fazalpura, Harshnagar, Kabadipura, Budilane, Gulmandi, Khadkeshwar, Kotwalpura, Nageshwar wadi, Bhoiwada, Aurangapura, Paithangate, Gandhi nagar, Rajabazar, Nawabpura, Roshangate, Maqsud colony, Kiradpura, Altamash colony, N-6 CIDCO, Aviskar colony, Gulmohar colony, Surana nagar, Indira nagar (S), Baijipura, Bari colony, Sanjay nagar, Bhavani nagar, Sanjay nagar, Jinsi, Kaisar colony, Bhavani nagar, Kailas nagar, Ajab nagar, Khokadpura, Sillekhana, Samarth nagar, Kotla colony, Kokanwadi, Bansilal nagar, Padampura	45.89	49.25	64.51	84.02
Zone III	10,11,12,16,17,18,19,25,26,27,28,31,41,43,45	Jaisinghpura, Bhadkalgate, Ghati parishar and Asifiya colony, Mayurnagar, Sudharshan Nagar, Shrikrishna nagar, Shrikrishna nagar, Pawannagar, Shivneri colony and Mhada colony, Ayodhya nagar, Ganesh nagar, Shatabdi nagar, Nehru nagar, Lotakaranja, Shahbazar, Sharif colony, Roshan gate, Rahemania colony	20.56	21.87	27.83	35.42
Zone IV	1,4,5,15	Harsul, Wankhedenagar N-13, Asephiya colony, dilras colony, Swami Vivekanand nagar	10.74	11.42	14.51	18.46
Zone V	6,7,8,9	Begumpura, Bhavsinghpura, Padegaon, Shantipura	6.80	7.44	10.36	14.09

Zone No	Ward Nos	Ward Name	Demand (MLD) Year			
			2011	2015	2030	2045
Zone VI A	2,20,21,22, 23,24,77,78	Jadhav Wadi mayur Park, Ambedkar nagar, Misarwadi, Naregaon, Masnatpur and Chikalthana, MIDC Chikalthana, Kamgar colony, Vitthalnagar, Chikalthana	15.12	16.44	22.43	30.09
Zone VI B	72, 73, 74, 75, 76, 79, 80, 81	N-3, N-4 CIDCO, ST colony N-2 CIDCO, Dyaneshwar colony Mukundwadi, Sanjaynagar Mukundwadi, Ramnagar, Mukundwadi, Mukundwadi, Ambika nagar Mukundwadi, Ambika nagar Mukundwadi, Jaibhavani Nagar CIDCO	19.23	20.24	24.85	30.74
Salim Ali STP	3,13,14	Yadavnagar , Vishwasnagar, Rosabag	7.24	7.45	8.43	9.67
Total Sewerage Demand (MLD)			169.86	181.45	234.17	301.50

Looking at the development pattern of the city, the demand assessment of the city is done as per the ward wise population density and demand. The average demand of the wards is allotted to the manholes and diameters are calculated. The map showing the sewerage zones is shown below.

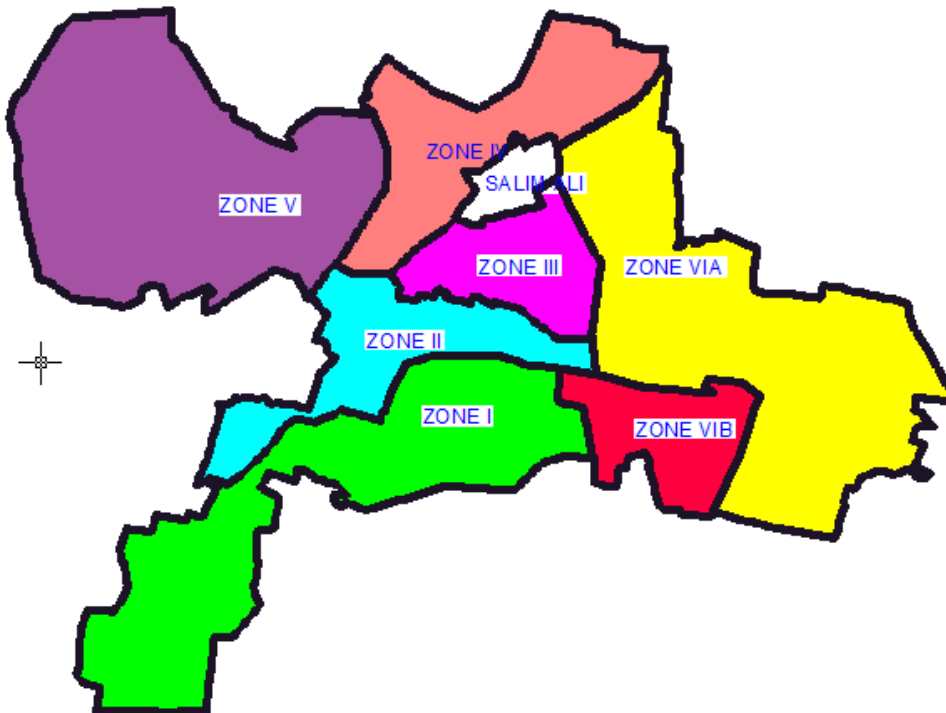


Fig 6: Map Showing Sewerage Zones

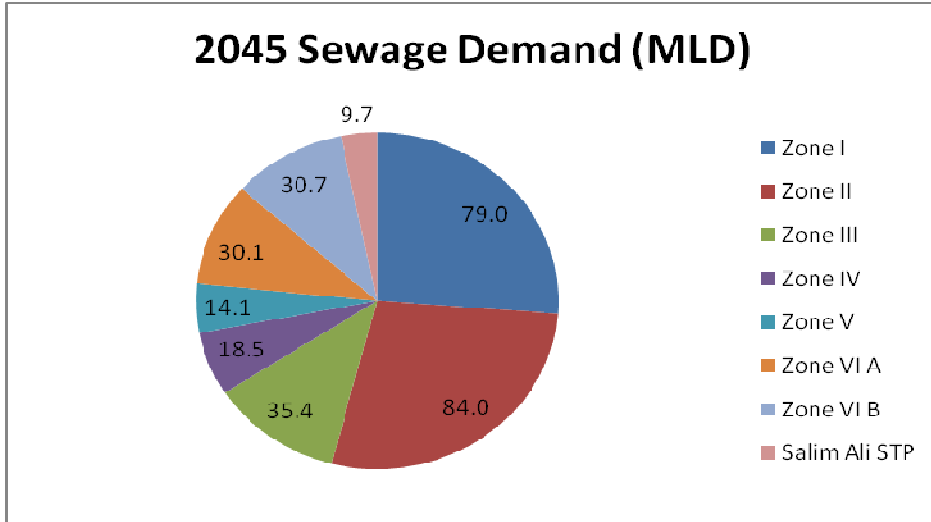


Fig 7: Chart Showing Zonewise Sewerage Demand (MLD)

5.0 STAKEHOLDERS AND FIELD INPUTS

5.1 The Stakeholders for this Project Area

1. Residents in the corporation area through elected representatives.
2. Residents in cantonment area.
3. AMC – (1) Water Supply Department (2) Sewerage Department. (3) Property department – Account Department. & General Administration Department.
4. Contractors
5. MSEB
6. End Users – Treated waste water users and purchasers of Manure

5.2 Residents in the corporation area

The population projection is based on the details given in the City Development Plan. The rate of water supply is considered at 135 LPCD for a population of 23.26 lacs for the year 2045.

Active participation of beneficiaries is obtained by conducting Zone wise meeting in Zonal offices in present of elected representatives and concerned officials of AMC.

In this meeting existing problems in sewerage system were discussed.

5.3 AMC :

The success of the Project is based on inter – Departmental co-ordination of different Departments of AMC.

- a) The plans to augment WS by parallel line and construction of WTP and service Reservoirs in phased manner will directly alter the flow of Sewerage. Matching figures of proposed water supply with those of sewerage generated is shown in table. Simultaneous implementation of augmentation of water supply scheme is necessary to make this sewerage project sustainable. At design stage there is no disparity.
- b) Putting all properties on record for sewerage connection will be a must, similarly permission for new building or completion report certificate of building has to be directly linked to record sewerage connection. Unless 85% properties are put on record showing sewerage connection the sustainability of this Project will be subjected to question mark. In fact many properties are having sewerage connection, but it is not on record and hence the role of this department of AMC is important as a stake holder.
- c) Account Department: - The collection of sewerage cess and service connection is the back bone of O & M of the Project. Different rate for families below poverty line and gunthewari area have to be framed. Higher rates for commercial activities will have to be worked out. All educational institutions and offices will have to be brought in the net to collect taxes for the services provided by AMC.

d) Administrative Department : - The implementation to collect biological waste in plastic bags for hospitals and dispensaries will have to be regulated by Administrative and regulated; Solid waste disposal from vegetable markets, hotels, etc will have to be strictly regulated by this Department. Similarly blocking the MH flow and lifting the sewerage for irrigation will require separate vigilance authority to check this problem for out fall sewers passing in vicinity of agriculture land.

Last but not least disposal of solid waste in Zopadpatti area and narrow lanes in locality by separate channel is a must. The MH in such area should have locking arrangement. Vigilance not to permit disposal of solid waste into sewerage system will result in trouble free operation of the system.

In short adequate and effective disposal of the solid waste is a guarantee for successful operation of sewerage system.

5.4 Contractors

Basically the concept refers to technology providers. SBR Process of treatment is being proposed in this Project. The old process of oxidation pond is not feasible in the present, since non-availability of the huge land required in oxidation pond process of treatment. Practically least supervision and higher quality of waste water are added features in the new Technology.

The contractor will be expected to provide design, drawing and construct the Plant and run the Plant for 5 years (at cost) including sale of waste water and manure.

Pipe line for sale of treated waste water to farmers / institutions will be laid in the STP Tender. Necessary flow measuring meters / devices will be provided on pipe line to measure quantity of waste water solid.

The contractor will also train the staff designated by AMC to run the Plant after the expiry of the contract period.

5.5 MSEB

Continuous power supply is to assured at one pumping station at Golwadi area and 7 STP (Salim Ali, Padegaon, Siddarth Garden, Banewadi, Nakshtarwadi, Airport and Zalta)

Alternatively diesel generator sets are proposed as standby arrangement for emergency requirement in case of power failure.

5.6 End Users

Unless the sale of waste water from STP is regulated, the sewerage project will not be viable.

So the sale of waste water is the back bone of the success of the project. The outlet characteristics of treated waste water are as follows.

BOD - < 10 mg/l

COD - < 20 mg/l

TSS - < 10 mg/l

This quality of waste water can also be utilized for washing the buses near Siddarth Garden, Gardening and washing premises of Airport. Clearance of Government Public Health Laboratory will be obtained before such use. Similarly clearance from irrigation Department Water Testing Lab will be obtained before letting out waste water for agriculture purpose. Hence agriculturist, Airport authority, MSRTC, MIDC Waluj and Agriculture School are amongst the prospective end users.

Supply of measured quantity of waste water and revenue collection will have to be given to private contractor for making the Project viable. Sale of manure where SBR Technology is adopted will be additional source of income.

5.7 Field Inputs

a) Zone Meetings: - Zone meetings were conducted by elected Zonal chairman in the presence of elected ward representatives of that zone, AMC representatives were also present in the meeting. The programme was fixed by AMC authorities. The venue of the meeting was Zone office copy of AMC city Engr's (Marathi) letter No. 2010/521 at 21/12/2010 showing meeting date and venue of Zone level meeting is attached for ready reference.



b) Meeting with Corporators: - Since the Zone meeting included the ward Corporators, so separate meeting with individual Corporators was not planned. However some of the Corporators who could not attend zone meeting have given their suggestions. The list is follows.

Table 18: Corporators Meeting

Sr. No.	Ward No.	Name of Corporator
1	64 Kranti Chowk	Shri Renukadas Vaidya
2	39 Raja Bazaar	Shri Jagdish Siddha
3	66 Shiv Shankar Colony etc.	Shri Trimbak Tupe
4	81 Jai Bhavani Colony	Shri Balasaheb Munde
5	33 Gulmandi	Sow Preeti Santosh Totla
6	88 Jai Vishwa Bharti	Sow Sadhna Suradkar
7	68 Vishnu Nagar	Shri Sanjay Kenekar
8	8 Padegaon	Sow Savitribai Hiralal Wani
9	73 N – 2	Sow Sataybhama Shinde
10	87 Ulkanagari	Shri Sanjay Joshi
11	70 Vidya Nagar	Sow Kala Ravinandan OJha
12	18 Pawan Nagar	Sow Urmila Nitin Chitte

- c) Meeting with Technical Department officials of AMC has been conducted at about two meetings per month. The meeting was mainly about progress of work and administrative difficulties.
- d) Approach Paper: - Based on ground data and other related documents like CDP, an approach paper has been submitted giving the methodology of preparation of Project.
- e) AMC Zone – Wise annual reports were referred for data collection.
- f) For about 900 nos of Manholes cover was physically removed and its depth and direction of flow was physically noted at site. This was necessary due to inability of the client to give absolutely any data or drawings of the existing system, having a network of about 600 – 700 Kms. Physical verification of about 10% of number of Manholes was done to prepare the scheme. Site visit to existing STP such as Zalta, CIDCO and Nakshtarwadi and under construction STP at Salim Ali was undertaken. Actual Photographs have been taken to co-relate the proposed work, with existing work. Dia. of main Sewers, its grade etc is also not available on record from the collection network. Except Sewerage network in CIDCO Area, all other information has been generated by consultants from actual survey & verification.
- g) 118 Gunthewari area have been notified survey map of about 85 Gunthewari have been made available. The sewerage network details such as dia. end point of disposal etc. is not available. The sewerage collection system network is not included in this Project Report, but the load of sewage generated on trunk sewer in Gunthewari area is accounted due to this habitation.

- h) The location of rising main from Banewadi to Nakshtarwadi STP is neither available on paper nor actual location because of construction of number of houses on the existing rising main. So an alternative alignment to reach Nakshtarwadi STP surveyed and studied in Nallas.

6.0 SEWERAGE PROJECT DETAILS

6.1 Definition of the Project in the context of the recommended development alternative (Strategic Plan) & Explanation for the priority of the Project.

Aurangabad is one of the fast growing cities in Asia. The population in the year 2011 is 11.65 lacs, projected population in year 2030 – 17.32 lacs and 2045 – 23.26 Souls, Water Supply rate is 135 lpcd through out till 2045 and sewerage is generated at rate of 80% of the water supply and additional 5% infiltration is considered.

The city 138 Sq. Km. in area is divided in two basins via Kham & Sukhana. Kham basin has 7 outfall sewer and Sukhana basin two outfall sewers. The division between Kham & Sukhana is 80:20. So the capacities STP respectively in year 2045 will be 240.67 MLD and 60.83 MLD Capacity for the Kham and Sukhana basin respectively.

At present about 88 MLD waste water is let out in rivers. Only one STP 6.5 MLD (Airport) is functional but without revenue generation. One STP of 5.0 MLD is commissioned in April 2013.

The collection system is designed for the year 2045, STP is designed for 2030, which will be expanded as per the future requirement.

The main thrust is on laying main sewers and construction of STP. Only after treatment, the waste water can sold to generate revenue. Simultaneously laying of sewerage lines in developing area along with upgrading existing system will be under taken.

6.2 Assumptions:

6.2.1 Collection System : Collection system is designed for 30 years as per the CPHEEO manual.

6.2.2 Sewerage Treatment Plant (STP):

As per CPHEEO manual, STP should be designed for 30 years. But we have proposed STP's for 15 years due to following reasons

- a) Presently, the total sewage of about 88 mld is let out in natural drains without treatment. Only 6.5 mld is treated at CIDCO STP near airport. Our prime concern will be to treat the 88 mld flow.
- b) Proposing STP for 15 years i.e year 2030 will help AMC to treat the present sewerage about 88 mld immediately. This will help AMC to generate revenue, which can be used for O&M expenses.
- c) If the STP is constructed keeping in view sewerage generation after 30 years, the funds of AMC will be locked for 15 years for extra capacity provided now.
- d) Technology up gradation in coming years will help to reduce further the cost of treatment for the balance quantity after 15 years.

6.2.3 MainSewer

Outfall sewer is designed for 30 years.

6.2.4 Pipe Diameter:

The minimum diameter of the pipeline is proposed as 150mm diameter as per CPHEEO manual. The pipe material is proposed as Double Wall Corrugated High Density Polyethylene DWC HDPE. It was suggested by MJP and CPHEEO to use DWC HDPE pipe upto 315mm diameter.

6.2.5 Pipe Material:

Comparison of Stoneware Pipe and RCC Pipes

A) Chemically Resistant Stoneware pipes:

Salt Glazed Stoneware Pipes are mostly manufactured in sizes 80-1000 mm but sizes greater than 380 mm are generally not used due to economic considerations. The length of these pipes is 60 cm, 75 cm and 90 cm. These pipes are good for corrosion resistance and erosion resistance. However due to less length, more joints, difficulty in jointing, requirement of special bedding and less compressive strength of pipes manufactured in India; Ultimate Strength of Stone ware pipe is 1600kg/m² (CPHEEO Page no 88) for all types of dia. of pipes. Therefore these pipes are not feasible for higher diameter of pipes.

Disadvantages:

- a) Pipe Manufactured in India are having less compressive strength.
- b) As pipes are available in shorter length of 60cm, 75cm, and 90cm, so number of joints in network increases this leads to leakage of sewer through joints and hence chances of ground water pollution is high. Laying is also difficult as it required special type of bedding
- c) Pipes having diameter higher than 380mm are costly.
- d) Not recommended for heavy traffic loads because of its low crushing strength.

Advantages:

- A) Mostly recommended when sewer contains high acidic component.
- B) Smaller diameter of pipes ranging from 150mm diameter to 300mm diameter are cost economical and can be used upto a maximum depth of 3.5 m.

But look at the current situation of the SWR pipes in the AMC RCC NP2 pipes are proposed.

B) RCC Pipes (NP2/NP3/NP4):

RCC pipes are mainly used where pipes subjected to maximum external loading due to backfill or traffic load. Ultimate Strength of RCC NP3 pipe is 2055kg/m for 200mm dia. and 12933 kg/m for 1800mm dia. of pipe (IS 458, page n:8)

Recommendations

- a) For gravity sewer: Pipe diameter 150 mm to 315 mm DWC HDPE pipes are proposed, and from 350mm and above upto 2,000 mm dia: RCC NP2/ NP3/NP4 pipes are proposed in this project.

6.3 Brief description of each component of the Project:

6.3.1 Development of New Sewerage lines for Future developed Areas:

The total area under AMC is 138 Sq. Km. Except for small area. Sewerage collection network is available, considering 10% area (i.e. 1380 ha.) from residential Zone will be added to the sewerage collection network under this scheme. The areas which are being developed specifically near padegaon, nakshatrawadi and satara parishar etc are taken into consideration for development of new areas. The sewer lines will be laid as per the progress of development. The network in this area will be designed for the population in the year 2045. The main sewers are designed for the ultimate design load of the new areas.

6.3.2 Upgradation of Existing Sewers Lines:

The existing sewerage collection network is having diameter ranging from 150mm to 500 mm for the collection network. Up gradation by laying additional line in parallel and of changing the dia. depending upon site conditions will be strategy for up gradation. This up gradation will be designed for the population in the year 2045. The detailed hydraulic design is given as Annexure.

The whole city is divided in Six nos of Zones. The details of the six zones along with the demand given below.

Table 19: Name of Zones and Respective Wards

Zone No	Ward Nos	Ward Name	Demand (MLD) Year			
			2011	2015	2030	2045
Zone I	64,65,66,67,68,69,71,82,83,84,85,86,87,88,89,90,91,92,93,96,97,98,99	Kranti Chowk, Ramanagar, Shiv Shankar colony, Buddha nagar, Uttamnagar, Vishnu nagar, Jawahar colony, Vidhya Nagar, Vidhya Nagar, Nyaynagar, Bharat nagar, Matoshri nagar Garkheda, Pundalik nagar, Kalpataru colony, Balkrishna Nagar, Garkheda, Priyadarshani, Indiranagar, Ulkanagari, Jai Vishwabharati colony, Jyotinagar, Eknatnagar, Osmanpura, Kabadinagar, Vedant nagar, Hamalwada Railway Station, Banewadi, Nakshatra wadi, Shivaji	44.27	47.33	61.24	79.01

Zone No	Ward Nos	Ward Name	Demand (MLD) Year			
			2011	2015	2030	2045
		nagar				
Zone II	29,30,32,34,35,36,37,38,39,40,42,44,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,94,95	Fazalpur, Harshnagar, Kabadipura, Budilane, Gulmandi, Khadkeshwar, Kotwalpur, Nageshwar wadi, Bhoiwada, Aurangapur, Paithangate, Gandhi nagar, Rajabazar, Nawabpur, Roshangate, Maqsd colony, Kiradpur, Altamash colony, N-6 CIDCO, Aviskar colony, Gulmohar colony, Surana nagar, Indira nagar (S), Baijipura, Bari colony, Sanjay nagar, Bhavani nagar, Sanjay nagar, Jinsi, Kaiser colony, Bhavani nagar, Kailas nagar, Ajab nagar, Khokadpur, Sillekhan, Samarth nagar, Kotla colony, Kokanwadi, Bansilal nagar, Padampur	45.89	49.25	64.51	84.02
Zone III	10,11,12,16,17,18,19,25,26,27,28,31,41,43,45	Jaisinghpura, Bhadkalgate, Ghati parishar and Asifiya colony, Mayurnagar, Sudharshan Nagar, Shrikrishna nagar, Shrikrishna nagar, Pawannagar, Shivneri colony and Mhada colony, Ayodhya nagar, Ganesh nagar, Shatabdi nagar, Nehru nagar, Lotakaranja, Shahbazar, Sharif colony, Roshan gate, Rahemania colony	20.56	21.87	27.83	35.42
Zone IV	1,4,5,15	Harsul , Wankhedenagar N-13 , Asephiya colony, dilras colony, Swami Vivekanand nagar	10.74	11.42	14.51	18.46
Zone V	6,7,8,9	Begumpura, Bhavsinghpura, Padegaon, Shantipura	6.80	7.44	10.36	14.09
Zone VI A	2,20,21,22,23,24,77,78	Jadhav Wadi mayur Park, Ambedkar nagar, Misarwadi, Naregaon, Masnatpur and Chikalhana, MIDC Chikalhana, Kamgar colony, Vitthalnagar, Chikalhana	15.12	16.44	22.43	30.09
Zone VI B	72, 73, 74, 75, 76, 79, 80, 81	N-3, N-4 CIDCO, ST colony N-2 CIDCO, Dyaneshwar colony Mukundwadi, Sanjaynagar Mukundwadi, Ramnagar, Mukundwadi, Mukundwadi, Ambika nagar Mukundwadi, Ambika nagar Mukundwadi, Jaibhavani Nagar CIDCO	19.23	20.24	24.85	30.74
Salim Ali STP	3,13,14	Yadavnagar , Vishwasnagar, Rosabag	7.24	7.45	8.43	9.67
Total Sewerage Demand (MLD)			169.86	181.45	234.17	301.50

The sewer Pipelines are designed for ultimate year 2045 with a peak factor of 2.25. The hydraulic design is done with the help of latest software with all the design considerations as per CPHEEO manual.

The Zone I to Zone V is under the Kham River Basin and Zone VI A & B are under the Sukhana River Basin. The abstract of zone wise pipelines are given below.

Zone I : This zone comprises of the area on the south of Jalna road upto satara. Sewer F and sewer K are flowing through this zone.

Zone II, III, IV : The zone II, III, IV are the zones where main sewer B, C, D flows. These three zones are designed combinely as the C and D sewer joins near Varad Ganesh mandir and then these two sewers joins to B sewer at Siddarth Garden.

Zone V : Zone V is the zone where sewer A is proposed. The majority of the areas in the zone V are the of Educational Institutions, University and Padegaon.

Zone VIA and VIB: The zone VIA is the zone comprising of area such as jai bhavani nagar, N-2 cidco etc. The main sewer line of zone VIA flow to Existing CIDCO STP.

The zone VIB consists of the east portion of Jalgaon road comprises of Jadhav wadi, Masnatpur, Chikhalthana etc wherein the main sewer line flow upto Existing Zalta STP.

Zone Salim ali STP: This zone basically comes under the catchment of kham basin on the upstream of zone II, III. This zone was earmarked due to the proposed STP of 5.5 MLD which is under construction at Salim Ali lake. Looking at the topography, this zone was designed, to meet the demand of Salim Ali STP.

The Total length of the pipeline is 541 Kms. This includes sub laterals, laterals, and main sewer and trunk sewers.

As per the survey conducted, it is found that most of the areas are covered under existing sewer network of diameter ranging from 150 mm diameter to 500 mm diameter. About 70 to 80% of the city is covered with 150 mm diameter sewer pipeline. Remaining 20% of the pipeline is of diameters from 200 mm to 500 mm of material RCC and SWR.

It is proposed to upgrade the diameters from 200 mm and above. Tender should be framed in such a manner that the contractor should verify the existing sewer as per the design and drawings provided. During execution, at the time of physical survey, if it is found that the existing diameters are less than the proposed diameter or else as per the condition of pipeline, than the line should be upgraded.

Also for every zone, about 20% of 150 mm diameter pipeline is proposed for rehabilitation due to chocking, breakages, overflows etc. The quantity of 20 % of the pipeline to be replaced is the outcome of the survey conducted randomly and meeting with the Corporators to understand the problems. The change of the pipeline has to be decided during the construction of the sewer pipelines and as decided by the AMC officials.

Table no 20: Abstract of Sewer Pipe Diameters

DIA	Length (m)					Total Design Cummulative Length	Proposed Sewer Length
	Zone I	Zone II,III,IV	ZONE V	Zone VI A & B	Zone Salim ali		
150 mm	125136	162702	20637	36152	6764	351391	70278
200 mm	7680	11916	2115	4606	1176	27494	27494
250 mm	6308	14444	3502	4145	848	29246	29246
300 mm	7720	11941	4408	3800	665	28533	28533
350 mm					250	250	250
400 mm	9257	12176	4930	5893	100	32356	32356
450 mm	1591	2337	0	0	684	4612	4612
500 mm	1114	7730	736	2085	13	11677	11677
600 mm	2972	3090	1575	4373	167	12177	12177
700 mm	2623	3575	334	2882	0	9414	9414
800 mm	567	3144	0	894	0	4605	4605
900 mm	2356	4103	0	3747	0	10206	10206
1000 mm	0	2387	0	17	0	2404	2404
1100 mm	0	2953	0	0	0	2953	2953
1200 mm	1639	2554	0	0	0	4193	4193
1400 mm	4116	320	0	0	0	4435	4435
1600 mm	2264	592	0	0	0	2856	2856
1800 mm	0	2157	0	0	0	2157	2157
2000 mm	272			0		272	272
Total (m)	175613	248120	38237	68593	10667	541231	260118

6.3.3 Development of Seven Main Sewers in Kham River

There are 7 Nos of existing main sewers in Kham basin which are flowing along the nallas. The same nomenclature has been retained as per the existing project. It is found that almost all the main sewer manholes are damages/silted and is in very sorry state. The manholes are damage to let the sewer in the natural nallas.

“The New Scheme is designed retaining the pattern of flow and names of the outfall sewers”.

Only some portion of outfall sewer in Kham River and in Sukhana River is serviceable. All others sewers are damaged / defunct. Out of 7 main sewers A,B,C,D,E,F,K flows to Kham river and Sewer L, M flows to Sukhana river.

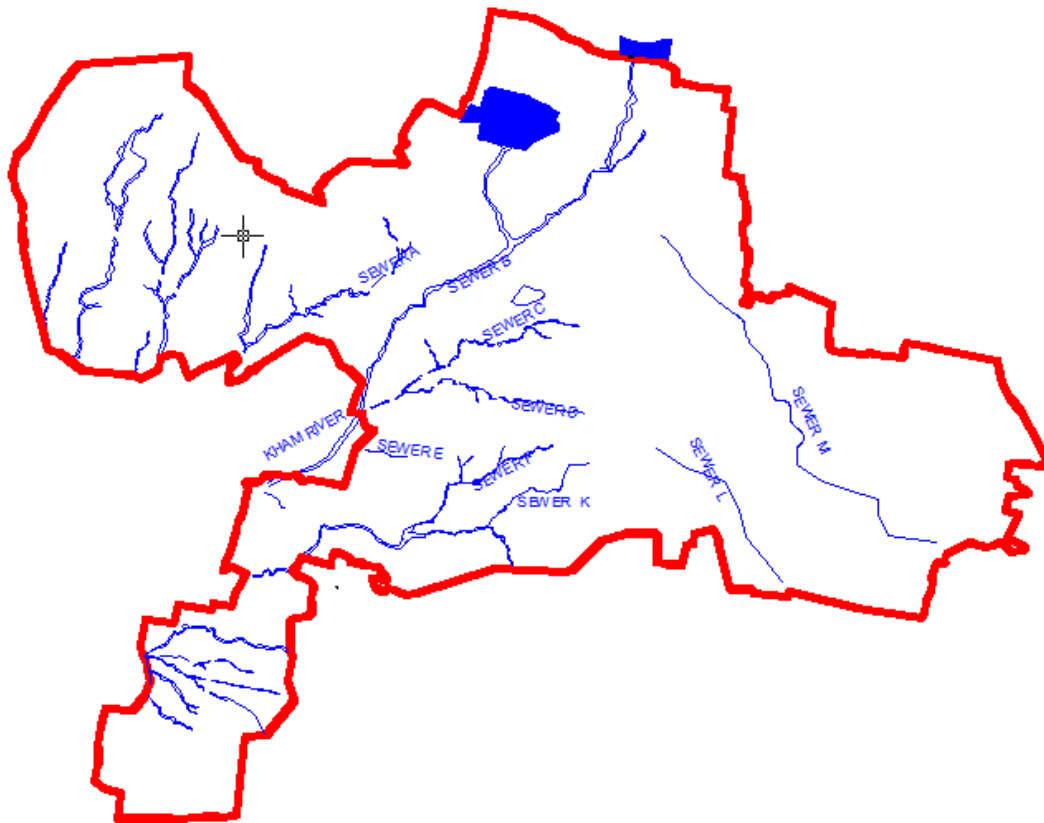


Fig 8: Plan Showing Main Sewers

The details of the areas from where the main sewers flow along the nalla are given below

The main sewers are considered from diameters from 400mm to 2000mm.

1. **Main Sewer A:** Western part of Bibi Ka Maqbara to University to Padegaon – Length 2798 m
2. **Main Sewer B:** Part of Kham River flowing through Himayat Bagh Nallah – Siddharth Garden – Banewadi – Golwadi. Length 13340m
3. **Main Sewer C:** Majnu Hill – City Chowk - Barudgar Nala- Saraswat Bank-Nageshwarwadi – Varad Ganesh – Siddharth Garden. Length 9009m

- 4. Main Sewer D:** Nallah flowing through MGM – Jafar gate - Dalalwadi - S.B. Colony- Nageshwarwadi – Varad Ganesh – Siddharth Garden. Length 3723m
- 5. Main Sewer E:** Forest Office – Padampura - Kham River. Length 4286
- 6. Main Sewer F:** Nallah flowing through St.Francis High School - Tilaknagar – Vedant Nagar – MIT College Length 8829m
- 7. Main Sewer K:** High court – Gajanan Maharaj Mandir - Jawahar Colony Police Station – Shahnoorwadi – MIT college – Nath Seeds- Golwadi Length 4403m

6.3.4 Two sewers in Sukhana basin:-

- Main Sewer L:** - Nallah is flowing through N-2 CIDCO to Sukhana River.Length 5117m
- Main Sewer M:** - Jadhav wadi - Chikalthana Gaathan – Chikalthana MIDC – Sukhana River.Length 9883m

The cumulative Length of all the main sewers is 60056 m i.e 60 Kms. As per the survey conducted, it is found at many places that the nalla are covered with the buildings, slabs, drain covers and temporary constructions.

There is no space available for construction of main sewers. Taking into consideration of such problems, the main sewers at some places are diverted to main roads for ease of construction. Due to the diversion, the depth of excavation is increased, but the laying of pipeline will be feasible.

Table no 21 :Abstract of Length of the Main Sewers is given in Annexure

Sewer Name	Location		Diameter (mm)													Total Length (m)	
	Start point	End Point	400	450	500	600	700	800	900	1000	1100	1400	1500	1600	1800		2000
A	Bibi-ka-maqbara	Padegaon STP	1552		912		334										2798
B	Himayat Bagh	Golwadi TPS			3655	827	44	954	711				562	2646	2214	396	12009

Sewer Name	Location		Diameter (mm)													Total Length (m)	
	Start point	End Point	400	450	500	600	700	800	900	1000	1100	1400	1500	1600	1800		2000
C	Majnu Hill	Siddarth Garden STP	2252			1177	1053	661		1435	1591	320	521				9010
D	MGM Hospital	Siddarth Garden STP			335		462	455	609	868	993						3722
E	Forest Office	Kham River	1061		228	81	2069	847									4286
F	Saint Francis High School	MIT College	459	195	168	584	346	857	866			5353					8828
K	High Court	Golwadi TPS	871			1491	551		1490								4403
L	N-2 CIDCO	Sukhana River	204		2003	292	1476		1130	11							5116
M	Jadhav wadi	Sukhana River	1211		2147	2590	436	637	1689	1174							9884
Total Length of Main Sewers (M)			7610	195	9448	7042	6771	4411	6495	3488	2584	5673	1083	2646	2214	396	60056

6.3.5 Construction of Sewage Treatment Plant: -

Six STPs (Total 222.5 MLD) are proposed to cater the waste water demand for next 15years. Four STP are proposed to be constructed in Kham Basin and Two New STP will be constructed in Sukhana Basin.

SBR Technology is proposed for the 6 STP's. The cost excludes laying of pipe line to supply waste water to agriculturist, institutions & gardens. Metered sale of waste water is expected to generate maximum revenue. The detail of comparison of various technologies is discussed in chapter 11.

Table 22: Summary of Sewerage Treatment Plants (STP) Aurangabad

Sr no	Name of STP	Total Capacity Required 2045 (MLD)	Total Capacity Required 2030 (MLD)	Existing STP (MLD)	Capacity of STP proposed for 2030 (MLD)	Capacity of STP Proposed for 2045 (MLD)
					Proposed	Proposed
1	Banewadi	30.00	30.00		30.00	0.00
2	Kanchanwadi	187.08	136.50		136.50	50.58
3	Siddhartha Garden	4.50	4.50		4.50	0.00
4	Salim Ali	5.00	5.00	5.00	0.00	0.00
5	Padegaon	14.09	10.50		10.50	3.59
6	Cidco	30.09	25.00	6.50	18.50	5.09
7	Zalta	30.74	22.50		22.50	8.24
		301.50	234.00	11.50	222.50	67.50

Table 23: Summary of Sewerage Treatment Plants (STP) for Year 2030

Sr. No	Name of STP	Basin	Total (MLD)	Zones Covered	Type of Treatment
1	Banewadi	Kham	30.00	Zone II, III, IV.	Mordern Technology (SBR/MBBR)
2	Kanchanwadi	Kham	136.50	Zone I, II, III,	Mordern Technology

Sr. No	Name of STP	Basin	Total (MLD)	Zones Covered	Type of Treatment
				IV.	(SBR/MBBR)
3	Padegaon	Kham	4.50	Zone V	Mordern Technology (SBR/MBBR)
4	Siddharth Garden	Kham	0.00	Zone II, III, IV.	Mordern Technology (SBR/MBBR)
5	Zalta	Sukhana	10.50	Zone VIA, VIB	Mordern Technology (SBR/MBBR)
6	CIDCO	Sukhana	18.50	Zone VIB	Mordern Technology (SBR/MBBR)
7	Salim Ali STP	Kham	5		Mordern Technology (SBR/MBBR)

6.3.6 Refurbishment of Existing Conventional STP of CIDCO to SBR: -

Existing CIDCO 6.5 MLD Treatment is functional since more than 10 years, but revenue generated is nil. Treated waste water pipe line with metered connection is to be laid to Airport garden area, and also to other agriculturist which will generate revenue and will help to maintain STP in a sustainable manner. Apart from refurbishment of the STP of capacity 6.5 MLD, It is proposed to construct SBR for the remaining capacity.

6.3.7 Intermediate Pumping Stations - 1 Nos: -

The area in the Ward no 98 where all the existing small nallas, drains are having slope from east to west. The proposed location of Nakshatrawadi STP is on the upstream of all the nallas. Therefore it is proposed to collect the sewer at the junction of all the nalla and pump directly to the Nakshatrawadi STP for Treatment. The design of the pump house, pumps are given in Annexure. The Pumping Station will require small length of DI pipe line as pumping main with necessary pumping facilities. The economical diameter

arrives as 400 mm DI pipeline. The wet well is designed for a retention period of 5 minutes. The diameter of wet well is about 5.5 m diameter and 2.0 m liquid depth. The length of rising main is 1.77 Km upto Nakshatrawadi STP.

6.3.8 Terminal Pumping Station at Golwadi to Nakshatrawadi STP:

The 100 MLD STP at Nakshatrawadi will get flow from the outfall sewers which are in the kham basin. The main sewers B, C, D and E flows upto Banewadi and Sewers F and K flows upto nath seed and then ultimately meet Kham river at golwadi. The location where sewers meet at golwadi is the ideal location for Terminal Pumping station for Nalshatrawadi STP.

The pumping station at Golwadi can be justified by following reasons

- All the waste water flows by gravity upto golwadi and the same will be pumped at Nakshatrawadi from one single pumping station instead of two pumping stations at different locations.
- The alignment of pumping mains from two different locations is through the residential areas.
- No additional pumping station at Nakshatrawadi STP.

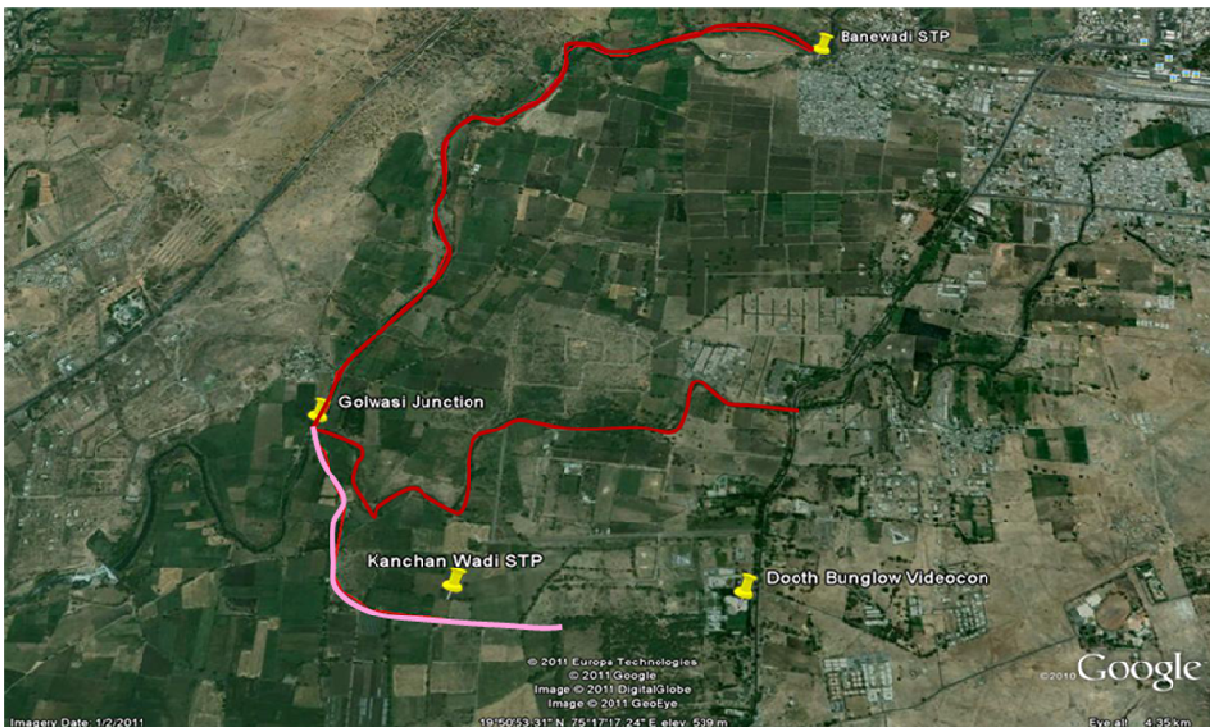


Fig 9 : Image Showing the Location of Golwadi TPS, Banewadi STP and Nakshatrawadi STP

6.3.9 Sub-Station for Terminal Pumping Station: -

Independent power Sub-Station is proposed.

6.3.10 Gap in Outfall Sewers up to Zalta Pumping Station: -

The existing outfall Sewers in Sukhana River is short of STP by about 70 mtrs. If this gap is filled, sewerage can be delivered at Zalta STP.

6.4 Technology Specifications (dimension, material) and Performances Specifications.

6.4.1 Development of New Sewerage lines for Future developed Areas: -

The collection network will be of ISI marked RCC pipes. Live load, dead loads is considered in design. The depth of sewer will be such that minimum 75 cm cover at starting point is maintained and maximum depth will be not more than 2.5 mtrs. RCC pipes with socket and spigot arrangements with gasket will be used. Manholes will be constructed in Brick masonry with heavy duty SFRC cover. The other specification of manhole will be adopted. Heavy duty cast iron steps about 15 kg each, with center to center distance of 40 cm will be embedded in walls during construction in man holes. Steps will be protected by a suitable plastic / PVC or similar material is guard against corrosion.

Sewer connection will be as per Para 7.1.8 (page 132) of CPHEEO manual. Similar backfilling vide Para 7.1.9 & removal of sheeting vide Para 7.1.10 page 133 of the CPHEEO manual will be adopted.

6.4.2 Up gradation of Existing Sewers Lines: -

For up gradation, same specification as for new area development in above para in respect RCC pipes will be adopted. Since collection network is functional (having sewerage flow) up gradation will be mostly by additional parallel lines. At some places existing sewerage pipe line will be uprooted and new bigger dia. pipe lines will be laid. Construction of appurtenance is also to be provided depending upon site conditions.

6.4.3 Development of Trunk Main along Kham River: -

Trunk mains will be RCC socket and spigot pipes. The old names of outfall sewers will be retained. Flow in the year 2045 will be basis of design. Storm water flow is not considered in the design. RCC manholes will be constructed in M 250 concrete with CI steps duly protected from corrosion by PVC / Plastic coating. Heavy duty RCC cover with locking arrangement is proposed. The manhole will have one side vertical with circular shape. The c/c distance will be restrained to 40 m (max). Suitable bedding as per foundation strata will be designed. Live loads and dead loads with uplift pressure during floods will be accounted.

6.4.4 Construction of Sewage Treatment Plant:

Modern Technology for treatment is proposed. Automation will solve day and night uninterrupted running of Plant. Treated waste water will have following parameters.

Daily production of manure cake by centrifuge process will generate revenue. Land requirement will be less. The cost excludes laying of waste water pipe network up to consumer point. Only supply up to bulk consumer point will be provided. With SBR/MBBR Technology the waste water will have a BOD around 10 mg/lit and even bulk consumers like MIDC waluj can buy this waste water from Nakshatrawadi STP of 136 MLD Capacity. The contractor will run & operate the plant for 5 years including selling the waste water. Necessary meters will be fixed.

6.4.5 Refurbishment of Existing Conventional STP of CIDCO to SBR: -

The existing 6.5 MLD plant is functional for more than 10 years. But revenue generated is Nil. At present running the plant is a liability. If the Technology is changed, the waste water can well be sold to Airport authority for garden & agriculturists with daily generation of manure of treatment cake. The expansion involved will make plant sustainable with improved hygiene in neighborhood.

6.4.6 Intermediate Pumping Stations - 1 Nos: -

The intermediate pumping station is proposed at the ward no 98 where all the local nallas meet.

6.4.7 Terminal Pumping Station at Banewadi to Nakshtarwadi STP: -

Terminal Pumping Station Banewadi will be RCC, dry and wet well about 13.0 m dia. with bye pass arrangements. The foundation will be designed for uplift press. The Inlet will have bye-pass arrangement also. The well will be partly covered and partly open. The flooring will be above high flood level. Area around well will be filled with Murum up to floor level.

6.4.8 Sub-Station for Terminal Pumping Station: -

A electrical power station will have 4 pole structure with meter room, cabling and Trans-formers mounted on pedestal. About 300 HP load is expected.

6.4.9 Gap in Outfall Sewers up to Zalta Pumping Station: -

RCC socket & spigot pipe for design period flow in the year 2045 will be laid for this 100 m gap. RCC MH and River crossing work is included in estimate. Design for uplift during flood will also be accounted in design.

6.5 Stages of Preparation of designs & Drawings of each Component.

Three stages in preparation of designs & drawings of each component are adopted.

Discussion with elected members of AMC, citizens in presence of officials of AMC Actual site visits with officials of AMC to strategic spots. Actual site verification, of 5% to 10% of MH, (By physically checking the depth and levels and to verify the dia. of the existing pipes and co-relating the data between two manholes)

The feasibility report will be submitted, based on these lines. Comments and suggestions of AMC will be incorporated at time of detail designing.

The project will be completed in two stages. Stage caters to the requirement in the year 2030 and stage 2, requirements in the year 2045.

All works proposed for the year 2030 will also be part of total requirement of the year 2045, it means that neither the works undertaken for the year 2030 will go waste nor will be inadequate for the year 2045. In the second phase mainly additional STP will be constructed and collection network will be laid in developing area. Only a very small portion of collection network will require up gradation. The pumps to be installed for requirements of years 2030 will become due for replacement in natural course after expiry of 15 years of life in the year 2030.

6.5.1 Constructing-in-House facilities.

The construction work will be as per regular procedure of PWD /AMC/MJP. Only pre-Qualified tenderers will be given tender documents. The specifications will be as per Red for civil work Book of Specifications. The tests provided in ISI – specifications about material and built Structure will be incorporated in tender.

For all the tenders, a separate Quality Assurance Plan will be required. Only approved manufacturers / suppliers will be eligible to supply materials to contractor.

Factory test and inspection by AMC/Consultants will be compulsory before dispatch of materials / goods to the site. This is over and above the regular test certificates of the manufacturer. Only after written direction to dispatch the materials /goods by AMC officials through their representatives, the materials / goods can be transported to site.

The contractor will be required to set up field laboratory, with all equipment and skilled and unskilled staff to carry out tests and record in writing the results. The field test should be done in presence of officials of AMC through its representative.

Only after successful test at manufacturing point and at site payment as per tender conditions will be paid

Apart from test at manufacturing point and field tests (coarse & Fine aggregate, sand, bricks & M.S. bars etc from time to time will also be tested at Govt. Engineering College) Govt. Polytechnic Aurangabad.

The maintenance period by the contractor of STP is proposed as 15 years. The maintenance period of sewerage system network including outfall sewers will be 15 years from date of last successful Hydraulic testing.

6.5.2 Tendering

6.5.2.1 . Single contract package in proposed keeping in view the responsibility of the operation and maintenance. To maintain the competition, two packages can be proposed based on the bifurcation of basin such as one single package for sukhana basin and another for kham basin.

7.0 Project Cost

Table 24 - Recapitulation cost.

RECAPITULATION COST

Sr. No.	Particulars	Revised Amount for UIDSSMT as per MJP DSR 2012-13(in Rs. Lacs)	Revised Amount for UIDSSMT as per MJP DSR 2012-13(in Rs. Lacs)
1	Collection System		
	A] Zone I - Sewer F and K	6,483.58	7,170.07
	B] Zone II,III,IV - Sewer B,C,D,E	8,211.94	10,179.10
	C] Zone V - Sewer A	2,728.60	1,989.88
	D] Zone VIA and VI B- Sewer L & M	4,108.38	3,682.72
	E] Zone Salim Ali STP	685.34	660.40
2	Construction of Sewage Treatment Plant.		
	a) STP for Kham River Catchment at Nakshatrawadi	6,770.30	5,683.79
	b) STP for Kham River Catchment at Banewadi	2,430.30	1,511.42
	c) STP for Kham River Catchment at Siddartha Garden	599.41	268.07
	d) STP for Kham River Catchment at Padegaon	1,259.32	616.13
	e) STP for Shukna River Catchment at Zalta	2,023.56	1,200.17
3	Refurbishment of Existing Conventional STP of CIDCO to SBR	1,302.24	1,015.26
4	Terminal Pumping Station		
	a) SPS at STP for Kham River Catchment at Golwadi	1040.38	1144.88
	b) SPS at STP for Kham River Catchment at Banewadi	187.75	208.73
	c)SPS at STP for Kham River Catchment at Siddarth Garden	71.82	66.59
	d) SPS at STP for Kham River Catchment at Padegaon	147.42	152.68
	e) STP for Shukna River Catchment at Zalta	197.57	253.01
	f) STP at CIDCO	157.24	191.39

5	Intermediate Pumping Station at Ward no 98 near junction of 5 nallas	86.79	104.32
6	Rising Main from Golwadi SPS to Nakshatrawadi and ward no 98 to STP	587.40	529.17
	Total (Lacs)	39079.34	36627.79
	Add 1% for Labour Welfare/Upkar	390.79	366.28
	Add 2% for Establishment, Tools and Plants	0.00	
	Add 2.4% for Consultancy Charges	0.00	0.00
	ADD 0.25 % Technical Scrutiny Charges	0.00	0.00
	ADD 12% Service Tax	0.00	0.00
	Total (Lacs)	39470.13	36994.06

The cost of the project has been revised based on the comments given by CPHEEO. The cost has been reduced due to the average cost of the STP's.

8.0 Project Financial Viability

The Project cost of the Aurangabad Sewerage is approximately Rs 385.62 crores. As per the UIDSSMT the funding pattern of Municipal Corporation is 80 % of GoI, 10% of GoM & 10% Corporation share.

Corporation will have to raise a loan of Rs. 183.58 crores for contributing its share. Financial assistance is being availed from HUDCO.

The table below shows the cash flow statement and share of GoM and Municipal Corporation after the commissioning of the sewerage project.

Table 25 – Cash Flow Statement

Sr. No.	Sub Work	Gross Cost (Rs Lacs)	Year wise expected expenditure		
			Ist Year	IInd Year	IIIrd Year
1	Total Gross Cost of the Project	36,994.06	7,398.81	18,497.03	11,098.22

Table 26: Financial Share – GoI, GoM and AMC

Year	Expenditure likely to be incurred	GoI(80%)	GoM(10%)	Municipal Corporation Share (10%)
20013-14	7398.81	5919.05	739.88	739.88
2014 -15	18497.03	14797.62	1849.70	1849.70
2015 -16	11098.22	8878.58	1109.82	1109.82
Total	36994.06	29595.25	3699.41	3699.41

8.1 Total Annual O&M Charges

The Scheme is viable and Sustainable and it is possible to repay loan in 20 years period with good management.

The total O &M Charges are given in Annexure

8.2 Revenue Generation.

The detail of financial viability is given in separate financial report. The overall revenue and expenses of Aurangabad Municipal Corporation has been considered for calculation of project viability.

Table no: 27 Assumptions for calculation are given below.

1	Slum population will reduce gradually and it will be zero after 2025		
2	During construction period the water charges are collected on bulk basis		
3	Mtering will be done in stages		
4	CAGR for Population increase		2.15%
5	Average house hold size	5	
6	Water Use	135	lpcd
7	Maximum water usage for any connections is 30KL per month		
8	Once connection enters into upper slab of usage it will consume full water of that slab		
9	(e.g. If connection enter into 8-17KL slab it will consume 17 KL of water for month)		
10	100% connections use 8 KL water per month		
11	80% of above connection (100%) use 17 KL water per month		
12	70% of above connections (80%) use 23 KL water per month		
13	35% of above connections (70%) use 30 KL water per month		
14	Revenue collection efficiency for water varies from 80% in 2012 to 98% in 2022		
15	Annual Operation Support Grant : 63 Cr in 2012		

16	Annual Operation Support Grant will increase by 6% every year		
17	Sewage Generation will be 80% of water supplied		
18	Sewage treatment efficiency will be 70%		
19	Treated sewage water selling rate: Rs. 5 Per KL		
20	Increase in Treated sewage water selling rate : 10% in every 3rd year		
21	Domestic to Residential Properties Ratio : 95:5		
22	Average Cess for Domestic property :Rs. 750 per property		
23	Cess For the Commercial Property : Rs. 1500 per property		
24	Drastic increase in properties in first two years (As registered properties are 135000 but as per survey actual properties are around 240000, corporation is privatising the property tax collection which will increase the revenue drastically)		
25	Total Construction cost	385.63	Cr
26	Grant	347.06	Cr
27	Debt	38.56	Cr
28	Rate of interest on debt	13%	
29	Debt Period (including Moratorium period of 3 years)	15	years

9.0 DESIGN METHODOLOGY

9.1 Design Methodology of Sewerage Collection System.

9.1.1 Design Assumptions

1. Population distribution is uniform in the project sub-areas
2. Water Supply rate is 135 liters per capita per day (lpcd)
3. Sewage Generated in a catchment area is distributed between the manholes with a realistic assumption that at the branches of tree system, the entire branch will carry the same flow as generated in the catchments.

9.1.2 Design Inputs

1. Ground Levels in Each Manhole
2. Design Constraints as per the design criteria from CPHEEO Manual.
3. Area based load in each manhole as applicable
4. Extreme flow factors based on population as per CPHEEO Manual.

9.1.3 Unit AREA BASED LOAD CALCULATION

1. Calculate the population density per ha using the total population of the zone and measured area (in AutoCAD)
2. Compute the sewage generated per ha area considering the population density as derived from the land use map of the Municipal area.
3. Create area based unit load using the parameters as calculated in above.

9.1.4 LOADS PER MANHOLE

1. Divide the sub-area into small catchment areas considering that the sewage generated in the catchment area will be contributing to manholes based on land use of the catchments' area and the branches of the tree system will carry the total flow through the whole length of the branch.
2. Compute the area of the catchment
3. Divide the total area of the catchment by number of manholes with it to get the area based load per manhole.

Note:

- 1) Design is based on the accuracy of topographical survey & the accuracy of design depends on accuracy of levels only.
- 2) As per detailed topographical survey, the total area includes all the roads which are to be covered under the proposed sewerage scheme.

9.2 DESIGN STANDARDS AND CRITERIA AS PER CPHEEO MANUAL

The design of the sewerage system is based on Central Public Health and Environmental Engineering Organization (CPHEEO) Manual on Sewerage System and Sewage Treatment. The following design criteria are adopted:

9.2.1 DESIGN PERIOD

The design period for different components of the sewerage system is as follows: (Ref. Table 1.1, p.6, CPHEEO Manual on Sewerage and Sewage Treatment).

Table.28 – Design Period for various components

Sr. No.	Component	Recommended Design Period in Years	Clarification
1	Collection System i.e. Sewer Network	30	System to be design for prospective population of 30 years
2	Pumping Station (Civil Works)	30	Duplication machinery within the pumping station would be easier/ cost of civil works will be economical for full design period.
3	Pumping Machinery	15	Life of pumping machinery is generally 15 years.

Sr. No.	Component	Recommended Design Period in Years	Clarification
4	Sewage Treatment Plant	30.	The construction may be in a phased manner as initially the flows may not reach the designed levels, and it will be uneconomical to build the full capacity plant initially.
5	Waste water disposal and utilization	30	Provision of design capacities in the initial stages itself is economical.

9.2.2 PEAK FACTOR

The quantity of water used in day varies during the hours of the day due to habits of people. For domestic sewage flows, the following criteria based on population, will be used (Ref. Ref. 3.2.5, p.39, CPHEEO Manual on Sewerage and Sewage Treatment):

Table 29 - Peak Factor

Contributory Population	Peak Factor
Up to 20,000	3.00
20,000 to 50,000	2.50
50,000 to 7,50,000	2.25
Above 7,50,000	2.00

The peak factor of 2.25 in contributory population is used in design using latest design software.

9.2.3 MINIMUM SIZE OF SEWERS

In order to ensure smooth flow for carrying peak discharge and easy cleaning, it is proposed to have minimum diameter of trunk sewer of 250 mm and branch sewers/laterals of 150 mm. Property Sewer connection shall be minimum of 150 mm.

9.2.4 CAPACITY OF SEWER

All sewers are to be designed to flow maximum up to 80% of the full diameter at ultimate peak flow, i.e. d/D ratio of 0.8. (Ref. 3.4.2.6 page 49 of CPHEEO Manual Sewerage and Sewage Treatment).

9.2.5 LIMITING VELOCITIES IN SEWER

It is necessary to maintain minimum velocity, i.e. the self-cleansing velocity, to ensure that suspended solids do not deposit and cause nuisance. Hence it is proposed to maintain a *Self-Cleansing Velocity* of 0.8 m/s at design peak flow in sanitary sewers is recommended subject to minimum velocity of 0.6 m/s for present peak flows. Hence while designing the sewers; it is proposed to maintain minimum velocity 0.6 m/sec for the present peak flows.

- *The minimum self-cleansing velocity is recommended as 0.8 m/sec at design peak flow subject to minimum of 0.6 m/sec at present peak flow.*
- *The maximum scouring velocity is limited to less than 3 m/sec.*

In case of starting manholes for laterals, branches and sometimes even on the intermediate sections, minimum velocity for design flow is likely to be less than the self cleansing velocity. But manholes and sewers will be flushed out during peak flow period carrying forward silt, which may get deposited during minimum flow period, especially during night hours. Adopting lower values of velocities through lesser gradients has helped in avoiding deep excavations. In developing sewer network, the point has given due consideration prior to design of sewers. In case where above velocity criteria is not met, prescribed slope for different flows in CPHEEO manual shall be adopted for design purpose.

9.2.6 MINIMUM GRADIENT FOR SEWERS

In general the minimum gradient for the design of house service connections and lateral sewers shall be considered as follows:

- For house / property connections minimum diameter of pipe shall be 150 mm and gradient shall be in the range of 1: 30 to 1: 60.
- For lateral sewers of diameters 150 mm, 200 mm and 250 mm minimum gradient shall be as follows.

150 mm = 1: 200

200 mm = 1: 250

250 mm = 1: 400

For diameters 300 mm and above, the gradients shall be designed to fulfill the requirements for self-cleansing velocity.

The crowns of sewers shall be always kept continuous. Transition shall be always made from smaller to larger diameter sewers.

9.2.7 SEWER TRANSITION

Sewer Transition is defined as an event or point at which there is change in

- Diameter of sewer
- Alignment of sewer

These changes can occur singly or as combination of two or more factors.

The preparation of hydraulic design of sewers has to take account of the changes in Hydraulic profile of sewers due to such transitions. These are discussed below:

a) Change in Diameter of Sewer

- Usually diameter of the sewer increases progressively. The crowns of the sewers are always kept continuous and suitably drop at the manhole is provided. This will ensure continuous HGL profile in the sewers and prevent losses.
- The transition from higher diameter to lower diameter will not be made.

b) Change in the alignment of sewer:

At each change in the alignment, there is a head loss. This is expressed by

$$H = K.V^2 / 2g$$

K = Coefficient which is a function of the

- Ratio of radius of curvature of the Bend to the width of sewer
- Deflection angle
- Cross section of flow
- Reynolds's number
- Relative roughness

V = Velocity in the sewer

The following values of 'K' are generally used:

For angle of 45° , K = 0.32

For angle of 90° , $K = 0.40$

9.2.8 HYDRAULIC FORMULA / DESIGN FORMULA

Manning's Formula shall be adopted for the design of gravity sewers,

$$V_f = 1/N \times (R)^{2/3} \times (S)^{1/2} \quad \& \quad Q_f = A \times V_f$$

Where, V_f = Velocity when pipe flows full in m/s

N = Manning's Roughness Coefficient, S = Slope of Hydraulic Gradient

R = Hydraulic Radius in m

Q_f = Flow rate when pipe flows full in m^3/s

A = Cross Sectional Area of pipe in Sq. M

The value of Manning's co-efficient for different pipe materials are given in Table 3.4 of CPHEEO manual.

For cement concrete pipes, values of n are as follows:

Table. 30 – Manning's Coefficient

Manning's Coefficient		
Conduit Material	Condition of Interior Surface	
	Good	Fair
Cement Concrete with collar joints	0.013	0.015
Cement Concrete pipe with socket and spigot joints	0.011	0.011
Plastic smooth	0.011	0.011
DWC HDPE	0.010	0.010

Therefore for cement concrete pipes a reduction in the value of n has been reported with increase in diameter.

Value of n i.e. co-efficient of roughness (Manning's Constant), is adopted 0.011 for all diameters of concrete pipes, and 0.010 for HDPE pipes

ii. Hazen – Williams Formula is used for the pressure flow and is expressed as follows:

$$V = 0.849 \times C \times R^{0.63} \times S^{0.54}$$

For circular conduits, the expression becomes

$$V = 4.567 \times 10^{-3} C D^{0.63} S^{0.54}$$

and

$$Q = 1.292 \times 10^{-5} C D^{2.63} S^{0.54}$$

Where

Q = Discharge in cum per hour

D = Internal diameter of pipe in mm

V = Velocity in mps

R = Hydraulic Radius in m

S = Slope of Hydraulic Gradient and

C = Hazen – Williams Co-efficient

The value of Hazen – Williams co-efficient C for new conduit materials and the values to be adopted for design purposes are furnished as follows:

Table.31 – Hazen Williams Coefficient of Roughness

Sr. No.	Conduit Material	Recommended Values for	
		New Pipes	Design
1.	Concrete (RCC & PSC) with socket and Spigot Joints	140	140
2.	Asbestos Cement	150	140
3.	Plastic Pipes /GRP	150	145
4.	Unlined CI, DI	130	100
5.	Unlined MS	140	100
6.	Centrifugally Lined CI / DI / MS, up to 1200 dia.	140	140

9.2.9 MANHOLE (SEWER APPURTENANCE)

Sewer transitions occur wherever conduits of different characteristics are connected. The difference may be flow, area, shape, grade, alignment and conduit material, with a combination of one or all characteristics, Manholes should be located at all such transitions.

For straight sections, the interval at manholes is given below:

- *On Sewers, which are to be cleaned manually, which cannot be entered for cleaning or inspection, the maximum distance between manholes should be 30m.*
- *The spacing of manholes above 90 m to 150 m may be allowed for sewers of diameter 900 to 1500 mm, 150 to 200 m may be allowed for 1.5 to 2.0 m and which may further be increased up to 300 m for sewer of over 2.0 m diameter.*

The circular manholes can be provided for all depths starting from 0.9 m. The internal diameter of circular manholes may be kept as following for varying depths (Ref. 4.2.1.2 of CPHEEO Manual on Sewerage and Sewage Treatment

Table.32 – Diameter of Manholes related to Depth

Sr. No.	Depth	Diameter of Manhole
1.	0.90 m to 1.65 m	900 mm
2.	1.65 m to 2.30 m	1200 mm
3.	2.30 m to 9.00 m	1500 mm
4.	9.00 m to 14.00 m	1800 mm

The size of manhole covers should be such that there should be clear opening of not less than 560 mm diameters for manholes exceeding 0.9 m depth (Ref. 4.2.1.3 of CPHEEO Manual on Sewerage and Sewage Treatment). All sewers above 450 mm diameter shall be provided with a scrapper manhole at interval not exceeding 120 m.

9.3 METHODOLOGY

This section presents a brief description of the way forward work plan and methodology for carrying out the exercises after the approval of approach paper.

9.3.1 PROJECT CONCEPTUALIZATION

The steps are:

- a. Analysis of the physical data available.

- b. Study the reports like, The Development Plan, DPR on Water Systems.
- c. Develop the concept on 'Sewerage System Planning' for the Area.
- d. Planning for various options considering the basic requirements.

9.3.2 DETAILED PROJECT REPORT (DETAILED PLANNING, DESIGN, DRAWINGS AND COST ESTIMATES)

- a. Detailed planning of sewerage system for the project area according to viable option.
- b. Design of the sewerage scheme using latest software.
- c. Cost estimation considering all components.
- d. Generate drawings as required.

Table 33: Sector specific requirement of Sewerage System

Sr.No.	Major components	Sub-components
1	Collection and Conveyance system	
(i)		Sewer Network
(ii)		Manholes
2	Sewage Pumping Stations	
(i)		Civil Works-wet well and dry well
(ii)		Plant and Machinery
3	Sewage Pumping Mains	
(i)		Trunk Mains
4	Sewage Treatment and Disposal (Civil works, Plant and machinery)	
(i)		Primary Treatment
(ii)		Secondary Treatment
(iii)		Tertiary Treatment
(iv)		Sludge Treatment
(v)		Chlorination
(vi)		Gas collection system
(vii))		Recycle and reuse
(viii)		Disposal System
(ix)		Control room and laboratory

10.0 GENERAL SEWERAGE SYSTEM

10.1 APPROACHES ON SEWERAGE SYSTEM

The proposed sewerage system of the Aurangabad City will have to be planned and designed after evaluating various feasible options. The following salient points to be noted while considering the new system:

- The final DPR will be based on population forecast for the year 2045.
- The total development will be based on part to whole concept, i.e. the implementation will be in phases.
- Energy efficient treatment technologies will have to be explored with the possibilities of reuse of the treated sewage.
- Primarily planning will be on a decentralized sewerage system with options being explored for onsite treatment in relatively large pockets of recreational as well as residential areas.
- The design will be based on the standard and criteria given in chapter 8 above.

10.2 Generation of Sewage / Wastewater Flows

The wastewater generation is estimated based on the allocation of water to various land uses. This will include the wastewater generated from Industrial use, Domestic use, Commercial use and Public and Semi-public areas. The average wastewater flows is estimated assuming the followings:

- For Residential Area: 80 % of water supply (Ref. CPHEEO Manual on Sewerage and Sewage Treatment, Chapter 3, Cl.3.2.4 – “In well developed areas flows may be as high as 90% due to industrial wastes, changed water use habits, etc.”)
- For Institutional Areas: 80% of water supply
- For Industrial Areas: 80% of water supply

10.3 Collection and Conveyance System

The system will include the house sewer connection to the branch and trunk sewer lines connected by manholes and consecutively discharging into the Sewage Pumping Stations (STP) to the Treatment Plant (STP). A Typical collection and conveyance system can be shown in the illustrative figure below:

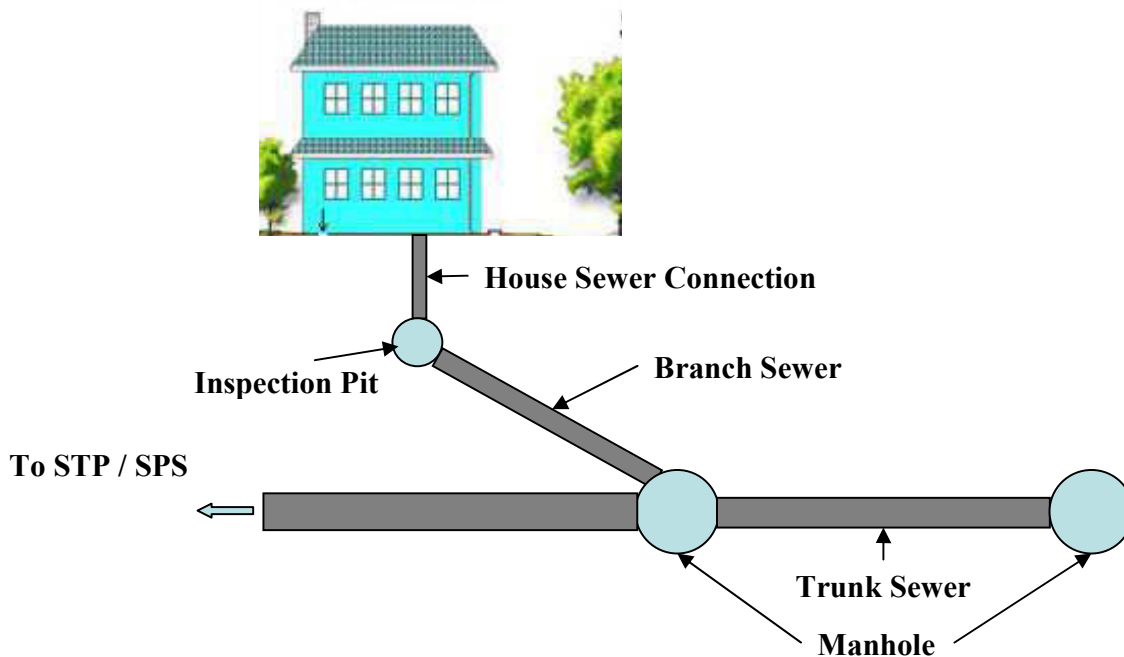


Fig 10: Typical Layout of Collection and Conveyance System

The collection and conveyance system will primarily be conceptualized considering a decentralized system as there may be requirement of reuse for irrigation, gardening. A decentralized system will need thorough planning of the system in service areas and possibility of on –site treatment in certain cases can be evaluated.

10.4 Centralized Vs. Decentralized Systems

Centralized System

- Huge Land Requirement
- Depths of sewers is more
- Large amount of Dewatering & shoring required for areas with high water table
- Diameters of sewers is large
- Number pumping station required are more
- Energy / power requirement for pumping & Treatment is more
- There is no use to treated effluent / water
- Overall project cost shall be more due to
- Huge land requirement

- Large diameter of pipes
- More depth of sewer lines the
- More dewatering is required
- More depth of manholes
- Greater power requirement for pumping of sewerage
- Greater power requirement for treatment

Decentralized System

The entire city is divided into the small areas known as sewerage district based on the

1. Population density
2. Topography
3. Availability of land for STP
4. Demand for recycled water.

Each sewerage district serves as independent modules that have their own collection, Conveyance & Treatment Facilities. Since the System serves less population & has less capacity everything smaller is required i.e.

- Miniscule land requirement
- Smaller diameter of pipes
- Less depth of sewer lines
- Less dewatering is required
- Less depth of manholes
- Lower power requirement for pumping of sewerage
- Lower power requirement for treatment

The Material requirement of Pipes & Type of STP can also be matched with sewer characteristics of that particular area. The Greatest advantage of the Decentralized sewer System is the utilization of the recycled water may be used for gardening and/or irrigation to the surrounding fields.

In view of the centralized and decentralized options, the best feasible option will be recommended taking into consideration, the topography of Aurangabad City, living habits of the people, operation and maintenance structure and possibility of revenue by selling water to the surrounding fields.

10.5 Sewage Pumping and Treatment

Sewage pumping stations (SPS) are incorporated into the sewage system to lift the sewage in order to overcome the natural ground barriers and also in to restrict the depth of excavation to an acceptable limit. The intermediate pumping stations help in reducing the depth of excavation to a significant extent but add extra operation and maintenance cost along with the capital investment. However where ground water table is high and construction at higher depth is difficult, provision of intermediate SPS should be thought upon.

The probable treatment options for raw sewage to be evaluated based upon the following criteria:

- ❖ Energy efficient technology and treatment for reuse in non-domestic purposes.
- ❖ Availability of land at desired location.
- ❖ Development in phases, consideration of modular options.
- ❖ Having less foot print and economical.
- ❖ Causing no nuisance and negative environmental impacts.

The conceptualization of treatment will be done after evaluation the various modern efficient techniques which may deemed fit, keeping a note of the above.

10.6 Design of "Vertical" STPs

Small-scale waste-water treatment plants (Waste water Treatment Plants) in the industrial sector have been successfully designed, and there is no reason why this cannot be replicated for sewage treatment. These vertical STPs can be designed in an aesthetic manner providing all the necessary architectural features in such a way that it "merges" with the existing buildings around it (e.g. like an 4-storeyed apartment block with a basement, and the roof used as a "sludge bed". This could work well in areas where "space" is a major constraint, and can be proposed in areas, which are witnessing the development of new residential complexes.

Think "Local"

Developing smaller capacity STPs on the basis of catchments can substantially reduce the extent of collection and conveyance system. These can be effectively used in areas, which has witnessed rapid urbanization or hitherto, the new areas under development.

10.7 Re-cycled Water

The possibility of re-using the treated wastewater (up to almost 30 per cent of the wastewater) for horticulture and in domestic flushing systems would substantially ease the pressure on future demand for water. Also, the disposal of this treated wastewater (in small-scale zone STPs) through existing natural or manmade drains can be carried out in an environmentally sound manner.

The above-mentioned aspects will be studied in detail during the consultancy assignment. In the following section (Section 10), the methodology for carrying out the assignment has been described in detail.

11.0 SEWAGE TREATMENT METHODS

11.1 The Sewage Treatment Process

Sewage treatment means removing impurities so that the remaining wastewater can be safely returned to the river or sea and become part of the natural water cycle again. A sewage treatment works separates solids from liquids by physical processes and purifies the liquid by biological processes. Processes may vary but the following waste stream is typical:

- 1. Preliminary Treatment** - Solids like wood, paper, rags and plastic are removed by screens, washed, dried and taken away for safe disposal at a licensed waste tip. Grit and sand, which would damage pumps, are also removed and disposed of in a similar way.
- 2. Primary Treatment** - The remaining solids are separated from the liquid by passing the sewage through large settlement tanks, where most of the solid material sinks to the bottom. About 70% of solids settle out at this stage and are referred to as sludge. The sludge is used on farms after further treatment called Sludge Treatment.
- 3. Secondary Treatment** – This is a biological process, which relies on naturally occurring micro organisms, act to break down organic material and purify the liquid. In a simple sewage treatment process, micro organisms are encouraged to grow on stones over which the sewage is trickled. The micro organisms, which need oxygen to thrive, feed on the bacteria in the sewage and purify the water. These treatment units are called percolating filters.

This process can be speeded up by blowing air into tanks of sewage where the micro organisms float freely and feed on the bacteria. These treatment units are called Aeration tanks.

Following either form of secondary treatment, the wastewater is settled in tanks to separate the biological sludge from the purified wastewater. Sometimes, extra treatment is needed to give the wastewater a final "polish". This is known as **tertiary treatment**. Various methods may be used, including sand filters, reed beds or grass plots. Disinfection, using ultra violet light to kill bacteria, is another method, and is being used at a number of coastal sewage treatment schemes.

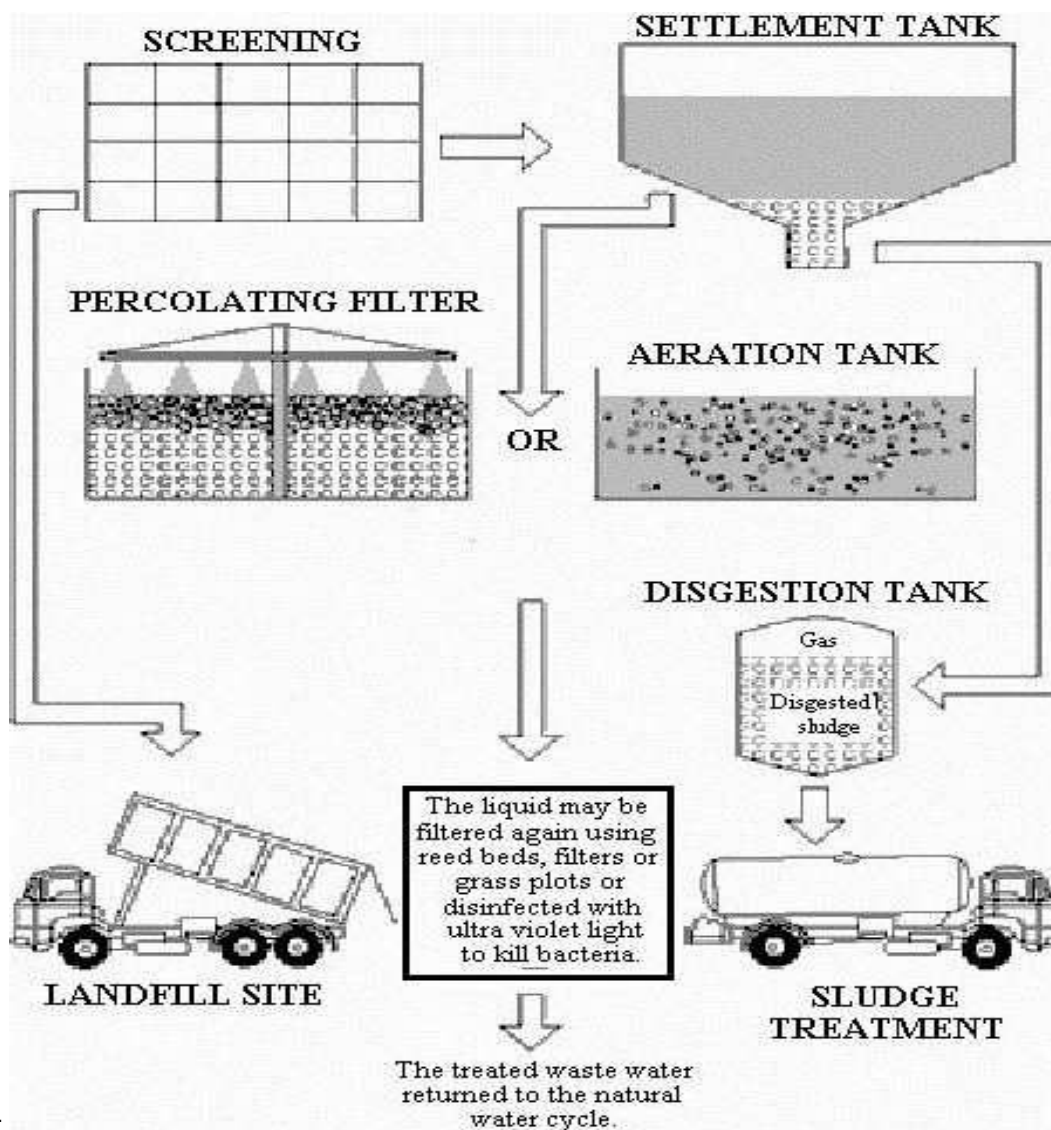
11.2 Sludge Treatment

Sludge is an excellent soil conditioner and is used as a fertilizer on farmland. However, it needs additional treatment to make it suitable. This treatment is called digestion and takes place in large, enclosed tanks. The digestion process is speeded up by heating the sludge to a temperature where naturally occurring

bacteria (micro-organisms) respond to these comfortable conditions and feed on other bacteria. On cooling, the well-fed bacteria die off, and the sludge is suitable for use on agricultural land.

A by-product of the sludge digestion process is methane gas. This can be burned to produce electricity. The electricity can be used to heat more sludge or to provide heat and light for the treatment works. Sometimes more energy is produced than is required. The surplus can be sold to the electricity supply company.

The following diagram is a graphical representation of a typical sewage flow at the treatment



plant.

Typical Layout of Conventional Activated Sludge Treatment System

11.3 Sewage Treatment Technologies

There is a wide spectrum of available technologies for the design of sewage treatment plants. The design of sewage treatment plants (also called "wastewater treatment plants") includes several treatment units, which typically are:

- Pre-treatment: one or more units for the physical separation of gross solids (sand, litter) and floatable (FAT, oil and grease, etc.);
- Biological treatment: one or more types of biological reactors in series;
- Clarification, disinfection and post-treatment of treated wastewater (when required);
- Sludge treatment (some sewage treatment plants do not require sludge treatment);

There exist numerous types of **biological reactors** for sewage treatment. They can be classified according to the process biochemistry, process intensity, operational regime and biomass characteristics:

Table 34: Biological Reactors

Process Biochemistry	Process Intensity	Operational Regime	Biomass Characteristics
<i>Aerobic process</i> (e.g., activated sludge, wastewater maturation ponds, trickling filters, high-rate stabilization ponds)	<i>Intensive reactors</i> (e.g., activated sludge, UASB anaerobic reactors, high-rate trickling filters)	Continuous flow reactors (e.g., continuous flow activated sludge, UASB type anaerobic reactors, trickling filters, stabilization ponds, constructed wetlands, saprophyte ponds)	<i>Suspended biomass reactors</i> (e.g., activated sludge, UASB type anaerobic reactors, stabilization ponds, aerated lagoons)

Process Biochemistry	Process Intensity	Operational Regime	Biomass Characteristics
Anaerobic process (e.g., anaerobic ponds, UASB-Up flow Anaerobic Sludge Blanket reactors)	Super-Intensive reactors (e.g., membrane reactors, activated sludge combined with fixed biomass)	Sequential batch reactors - SBR (e.g., sequential batch activated sludge, sequential batch wastewater reservoirs)	Fixed biomass reactors (or bio-film) (e.g., tickling filters, SAT, constructed wetlands, saprophyte ponds, rock filters, intermittent sand filters)
Facultative process (or mixed) (e.g., facultative ponds, some constructed wetlands, wastewater reservoirs)	Semi-intensive reactors (e.g., anaerobic ponds, low-energy aerated lagoons, low-rate trickling filters, high-rate stabilization ponds)	Pulse reactors (e.g., some types of vertical flow constructed wetlands, intermittent sand filters)	Combined biomass reactors
		Perfectly mixed and plug-flow reactors	

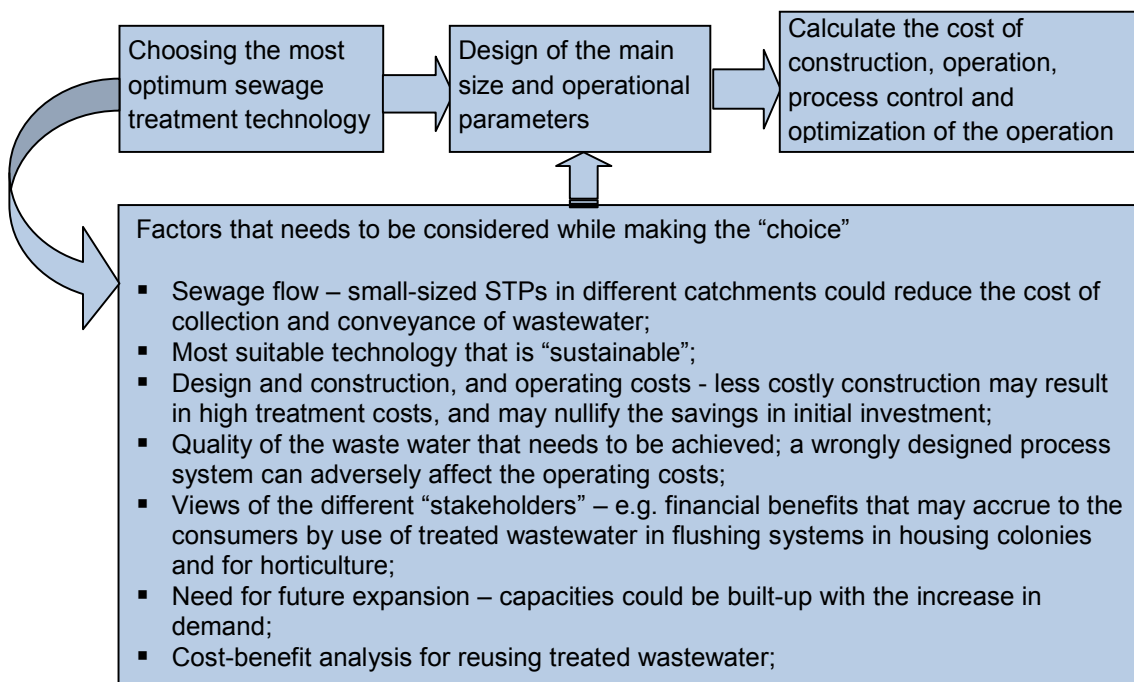
Selecting the best technology for wastewater treatment in a specific project it is not possible to state that one of the above technologies is definitely better than the others. Each one has its advantages and disadvantages regarding construction costs, operational costs, energy use, size, operation simplicity, stability, reliability, etc; each one suits better to different specific conditions. One of the most difficult tasks in the conceptual design of a sewage treatment plant is the selection of the most appropriate technology for the specific conditions of the project.

What the designer has to aim for is obtaining an optimal combination of:

- High public health and environment protection;
- Low construction and operational costs;

A proper conceptual design is a key element for the technical success of the project - good quality waste waters, simple and reliable operation, low costs, and low environmental impact. The present international trend is to move from the design of sewage treatment plants as an isolated event, towards design within the framework of regional environmental planning. The geographic unit defining a region is generally the catchments basin (watershed). Thus, catchments basin planning based on wide public health and environmental considerations is substituting the relatively simple sewage treatment plant design as an engineering practice.

The conceptual design of sewage treatment plants within the catchments basin framework goes beyond the classical engineering profession, and requires the involvement of a multidisciplinary team of professionals. The typical design process is depicted in the chart given below.



11.4 Technology Comparison

Table 35: STP Treatment Technology Comparison

Sr. No	Parameters	Sequential Batch Reactor (SBR) Process	Conventional Activated sludge Process (CASP)
1	Degree of Treatment	Sewage can be treated to low-end recycle quality with this technology. The outlet quality is - BOD < 5 mg/l, COD < 50 mg/l, TSS < 10mg/l, TN < 5 mg/l, TP < 1 mg/l in a single stage of treatment using Batch process. The treated sewage can be easily used for applications like horticulture, farming, toilet flushing, construction water, cooling water for Air Conditioners in large Malls and Theaters etc. There is no odor problem as complete process is aerobic and generates fully digested sludge which is excellent manure and can be directly applied as manure to plants.	Low degree of treatment is achieved with this technology. The outlet quality is - BOD < 30 mg/l, COD < 250 mg/l, TSS < 50 mg/l. There is no in-built provision for removal of Total Nitrogen and Phosphorous. In case Primary Clarifiers are provided, Sludge Digestion is a must which causes problems of odor and high Capital Cost.
2	Space Requirement	This technology uses deep RCC Tanks with Diffused Aeration System which drastically reduces the space requirement.	As, this technology essentially needs Primary and Secondary Clarifiers, minimum 40 -50 % more area is need.
3	Level of Automation	This technology is fully automatic and can be monitored and operated from anywhere in the World using Internet connectivity. All Process Parameters are constantly measured and controlled to provide consistent and utmost treatment using lowest power. The plant can automatically be shut off during LOW / NIL flow conditions and can automatically adjust power consumption proportional to	No automation. All Operations are manual and hence no control on any Process Parameters. The Plant runs continuously at all times including LOW / NIL flow conditions and thus has very high power consumption. There are constant problems of Bulking and Rising

Sr. No	Parameters	Sequential Batch Reactor (SBR) Process	Conventional Activated sludge Process (CASP)
		present flow rate and concentration of pollutant load. This drastically reduces power consumption.	Sludge, Poor Overflow Clarity in Secondary Clarifiers.
4	Capability of Handling variations in Flow	This technology can handle any flow variation from 0 - 250 %. The Control Program is simple Menu Driven and can be changed as many times as required by the Operator at the touch of a button.	This technology cannot handle any flow variation which is expected for any large-scale City Sewage System. Normally 0-250% flow variation is present for any Sewerage Treatment Plant.
5	Ease in Future Augmentation	Adding additional Basins for any future flow can easily augment the capacity of the Plant. The same PLC and Program can be easily adapted to future augmentation	The complete new Facility is required to be constructed for future augmentation.
6	Global Presence/Acceptance	This Technology has been extensively used worldwide since 1970's. Most of the large Municipal Plants worldwide are based on SBR technology. In India, more than 70 Nos. of Plants are under construction out of which 10 Nos. of Plants ranging from 1.35 MLD to 100 MLD capacity have been successfully commissioned and are under O & M.	

11.4.1 Life Cycle Cost

Table 36: Life Cycle Cost Analysis

SL No	Parameters	Unit	Conventional Process (CASP)	Fluidized Bed (FAB)	Sequential Batch Reactor (SBR)
A	Intel design parameters				
1	Biological Oxygen Demand (BOD)	mg/l	200	200	200
2	Chemical Oxygen Demand (BOD)	mg/l	400	400	400
3	Total Suspended Solids (TSS)	mg/l	200	200	200
4	Total Kjeldahl Nitrogen (TKN)	mg/l	45	45	45
5	Total Phosphorous (TP)	mg/l	5	5	5
B	Guaranteed outlet parameters				
1	Biological Oxygen Demand (BOD)	mg/l	<30	<30	<5
2	Chemical Oxygen Demand (BOD)	mg/l	<250	<250	<100
3	Total Suspended Solids (TSS)	mg/l	<50	<50	<10
4	Ammonical Nitrogen (NH ₄ -N)	mg/l	No Treatment	No Treatment	<1
5	Nitrate Nitrogen (NO ₃ -N)	mg/l	No Treatment	No Treatment	<3
6	Total Phosphorous (TP)	mg/l	No Treatment	No Treatment	<1
C	Process Operating Features				

SL No	Parameters	Unit	Conventional Process (CASP)	Fluidized Bed (FAB)	Sequential Batch Reactor (SBR)
1	Process Type		Aerobic, Continuous	Aerobic, Continuous	Aerobic, Batch
2	Automatic Control of Operating Parameters		Not possible	Not Possible	In-built continuous monitoring (Real time) of Process Parameters like rate of Change of Dissolved Oxygen, Temperature, inflow and outflow is automatically done by computer
3	Optimization of operating parameters during Plant Operating		Not possible	Not Possible	All critical Operating parameters like cycle Time, DO Level, Operating Hours of Air Blower, Volume In and Volume Out can be altered to run the plant in the most efficient way.
4	Odour and Fly Problems		Possible due to Biogas Generation & Handling	No fly problems. Possibility of odour in case the sludge is	Nil since the process procedure fully stabilized sludge.

SL No	Parameters	Unit	Conventional Process (CASP)	Fluidized Bed (FAB)	Sequential Batch Reactor (SBR)
				stored at site for a long time as the sludge is not fully established	
5	Capability of Handling Variations		Underperform during variations in Hydraulic as well as Organic Load.	Underperforms during variations in Hydraulic as well as organic load. Needs equalization Tank at upstream to handle Peak flow.	Can handle up to 0-150% variations in Hydraulic and Organic Load by adjusting the critical Operating Parameters like cycle time, DO level, Operating Hours of Air Blowers, Volume In and Volume Out can be altered to run the Plant in the most efficient way.
6	Treatment Efficiency		85-90%. Requires Tertiary Treatment to achieve < 10mg/l BOD. NO treatment for Nitrogen and Phosphorous removal.	85-90%. Requires Tertiary Treatment to achieve < 10mg/l BOD. NO treatment for Nitrogen and Phosphorous removal.	Excellent. As high as 98% of BOD removal can be achieved in single stage. Nitrogen and Phosphorous are also removed.

SL No	Parameters	Unit	Conventional Process (CASP)	Fluidized Bed (FAB)	Sequential Batch Reactor (SBR)
7	Outlet Uuality		Meets Pollution control Board (PCB) Norms	Meets Pollution control Board (PCB) Norms	Excellent Quality as good as Crystal Clear Raw Water. Fully fit for River/Lake Conservation and /or reuse. Far better than pollution control Board (PCB) Norms
8	Material or Construction of Underwater Moving Parts		Mile Steel Construction. Susceptible to Corrosion / Wear and Tear. Thus higher Maintenance and reduced Life Cycle of Equipments.	Mile Steel Construction. Susceptible to Corrosion / Wear and Tear. Thus higher Maintenance and reduced Life Cycle of Equipments.	Superior Stainless Steel Construction to minimize Corrosion / fear and Tear. Thus
9	No. of Moving Parts		High	High	Low
10	Amount of Maintenance		High	High	Low
11	Level of Automation		No Automation. Fully Manual Operation in almost all existing Plants.	No Automation. Fully Manual Operation in almost all existing	Medium Automation

SL No	Parameters	Unit	Conventional Process (CASP)	Fluidized Bed (FAB)	Sequential Batch Reactor (SBR)
				Plants.	

In view of the details and life cycle cost analysis SBR (Sequential Batch Reactor) is recommended for Treatment Plants for Aurangabad excluding the Treatment plant at Zalta

12.0 PROJECT O & M PLANNING

In this detailed project report assessment regarding requirement & planning for long term O & M sustainability has been done. It is planned that maintenance expenditure will be meeting out by income from collection of sewer charges, sale of waste water and one time connection charges from users.

12.1 Institution frame work:

- I. Aurangabad Municipal Corporation would takes up the responsibility of the O&M of the created infrastructure.
- II. A management contract could be envisaged with a competent operator for operating and maintaining the project assets for an initial period of 4-5 years. Under this arrangement, the management agency would be paid a lump sum fee, decided through a competent and transparent bidding mechanism with QCBS methodology as bidding criteria, for taking O&M activity. The performance benchmarks and supervision mechanism is also coupled in the management contract. This would primarily be aimed at enhancing the efficiency of maintenance of collection systems, Sewerage treatment plant and quality of treated recycled water.
- III. In order to improve the service delivery further it is envisaged that the management contract could be extended to billing and collection of revenues from users. The performance would be linked to efficiency of operator in enhancing the benchmarks in sewer management and revenue collection.

12.2 Performance based Contract

- a. An alternative framework for first level private sector participation would be a performance based contract which could be signed with competent contractor who, after the execution of the EPC contract, would also be responsible for operating and maintaining the project assets for an initial period of 5 years or more.
- b. Under this arrangement, the private entity would be contracted through a competent and transparent bidding mechanism with QCBS methodology incorporating both Construction and O&M based variables as bidding parameter. The payment structure would be so designed so as to liquidate about 90% of the EPC/ Construction costs on successful completion whereas the annual O&M charges along with the balance construction costs could be paid as an annual lump sum fee.

- c. The performance benchmarks under this arrangement would be clearly spelt out as part of the bidding documents. This type of arrangement would aim at enhancing the O & M activities, including asset maintenance & renewal, efficiency of maintenance of collection systems, Sewerage treatment plant and quality of treated recycled water. The service delivery improvements would include billing and collection of revenues from users thereby bringing in private sector efficiencies to maximize revenues along with improvement of service levels.
- d. There could be further incentives towards sharing of revenues beyond that are agreed as the performance benchmarks. Of course, under this arrangement the capital expenditure (other than minor repairs) would be the responsibility of the owner of the facility.
- e. These frameworks have been outlined in consideration of the size of the project and current framework within existing government setup in taking up such initiatives. The exact nature of arrangement would be finalized and detailed prior to the procurement process.

12.3 Customer Interface Management

Customer services encompass a broad range of activities

1. The interface with the customer premises to ensure required performances are met and proper responses are given to customer enquiries.
2. Advice customer during emergencies
3. Billing customers
4. Dealing with billing queries
5. Recording and Responding to Customer Complaints
6. Consulting with customers and the Owner for future plans regarding service standards and charges.

12.4 Systems and Procedures for Creating and Updating Customers Database

- a. During the early months of the operation period, a Customer Information System (CIS) will be introduced through which all customer contacts with respect to billing and provision of services can be controlled in coordination with Aurangabad Municipal Corporation.
- b. Information held will include customers name, reference number, mailing address, and telephone number.

12.5 Billing and Accounting

- a. Billing of the sewerage system shall be planned half yearly to achieve the targets.
- b. Manpower for collection of the sewerage tax shall be planned proactively.

12.6 Bill Queries

- a) Enquiries will be performed against charges for previous and current billing periods.
- b) Up-dating and amending of bills in accordance with user defined parameters and rules

12.7 Customer Service

In order to maintain the efficiency and improve customer satisfaction a study will be undertaken of the interfaces between the Operator and his customers. This will be undertaken during the early months of operation and thereafter similar test will be made in order to monitor the improvements in customer service and effectiveness of the steps taken.

12.8 Customer Complaints

Complaints received from the customer regarding chokage/ silting / flooding would be investigated with special reference to the procedures invoked, so as to establish and correct any weakness.

13.0 CAPACITY BUILDING

13.1 TRAINING, OPERATION AND MAINTENANCE REQUIREMENTS:

The comprehensive training shall be provided to the different categories of the operation maintenance staff. Training shall fall into two main types which are “off the job” and “on the job”. “off the job” training shall take place in the class room while “on the job” training shall be carried out on the site of working plant.

13.2 On the Job Training

- ❖ Preparing formal training documentation for distribution to the trainees.
- ❖ Visual aids shall be used where possible to illustrate the points being made and
- ❖ Make the training program instructive to the participants.

13.3 Off the job training

- ❖ Training on the simple process principles involved in the operation of the works;
- ❖ Health and safety
- ❖ Plant safety procedures
- ❖ Process training program for operation and supervisory staff

13.4 Special Training

- ❖ Operation of individual items of plant / equipment and sections of the works
Including automatic operation and manual operation in the event of say automatic Control failure
- ❖ Day to day operation of the work and procedures
- ❖ Comprehensive list of “What if” scenarios dealing with the action to be taken in the event of potential process problems, alarms, plant failures overflows, power failures etc.
- ❖ First line mechanical maintenance
- ❖ Safe procedures to be followed in operating, maintaining and cleaning the plant

13.5 Training program for Electrical Maintenance Staff

- ❖ Configuration, construction and operation of the electrical plant.
- ❖ Electrical maintenance requirements of the works
- ❖ Switching and safety procedures to be followed

- ❖ Safe methods of working
- ❖ Fault finding and repair procedures.

13.6 Training program for Mechanical Maintenance Staff

- ❖ Configuration construction and operation of the plant
- ❖ Control and instrumentation maintenance requirements of the works
- ❖ Fault finding and repair procedures.
- ❖ Safe methods of working
- ❖ Special training on the use of the PC and associated programming software for fault finding on PCL based control systems: if provided.

13.7 Training program for Mechanical Maintenance Staff

- ❖ Routine mechanical maintenance requirement of the work,
- ❖ Lubrication requirements of the works
- ❖ Fault finding, repair and overhaul procedure
- ❖ Safe methods of working
- ❖ Training Program for Sewage Treatment Management Staff:

13.8 Management Techniques

- ❖ Sewage treatment process and pumping station management techniques,
- ❖ Sewage treatment plant cost management
- ❖ Sewage treatment plant laboratory management
- ❖ Safe methods of working in general
- ❖ Safety procedures to be followed in operating, maintaining and cleaning the plant

13.9 Training program for all Trainees:

- ❖ Plant familiarization tour
- ❖ Health and Safety
- ❖ Identify areas where special safety precaution are necessary
- ❖ Job Process Training Program for Operations:

13.10 TRAINING FOR AUTOMATIC OPERATION

- ❖ Operational of individual items of the plant and section of the works including automatic operation and manual operation in the event of say automatic control failure. Illustrate by example the action to be taken in the event of potential process problems, alarms, plant failures overflows power failures etc. (as identified in the “what if” scenario off the job training)
- ❖ Illustrate by example the first line mechanical maintenance.
- ❖ illustrate by example safety procedures to be followed in operation, maintenance and cleaning of the works.

13.11 TRAINING PERSONNEL

The trainers are to be experienced in treatment plant management, operation and maintenance in their relevant discipline and in the training of skilled and unskilled staff.

The training expert shall be fluent in both English and Marathi or the services of an interpreter during the training periods.

14.0 ENVIRONMENTAL IMPACT ASSESSMENT OF THE IMPROVEMENT SCHEMES AND MITIGATION MEASURES

The impact of the schemes during the construction stage as well as operational stage was assessed with respect to land use, air quality, noise quality, vegetation, pedestrian and vehicular safety and convenience, visual intrusion and cultural parameters.

14.1 Impact of the project on air quality:

The model does not take into account the numerous complex aspects of air quality predictions, it should be considered as a qualitative estimate and the figures mentioned are only approximate indications. During the construction stage most of the schemes will result in increased pollution levels in the study area. However the use of steel portal frame structures for the walkways reduces on site construction activities to the minimum. The impacts are likely due to activities related to excavation, drilling, transportation of material to and from the site and increased vehicular emissions caused by traffic congestion due to construction activities. However, this is a short-term impact and can be kept under control by appropriate mitigation measures.

14.2 Impact of the project on noise level:

The use of heavy machinery will increase the noise level in the study area during the construction stage. There will be a marginal improvement in the study area's noise levels due to the reduced acceleration and deceleration made possible by the improved traffic flow, particularly along feeder roads to station & Highway.

Impact on aspects like privacy, safety, light and ventilation, visual obstruction etc of the residential and commercial units:

During construction stage of sewerage network, the commercial areas along the relatively narrow road are likely to be marginally affected in terms of reduced accessibility.

14.3 Air Pollution Mitigation:

A construction management plan should be prepared for each of the schemes by the Project Management Consultant in consultation with the Contractor, incorporating the mitigation measures suggested in the Environmental

Management Plan. Fugitive dust emissions should be contained within the site by barriers. Dust covers shall be made compulsory for transporting materials. Drilling operations should be coupled with dust collectors. All construction debris should be disposed off at the Dumping Ground. Heavy vehicles should not be allowed in the site during peak hours. A traffic management plan should be made for the construction period indicating traffic diversions, parking area and parking time changes, vehicular restrictions and time-related restriction.

14.4 Noise Pollution Mitigation:

Construction activities should not be allowed between 10 pm-7 am. As far as possible, maximum noise producing work should be avoided during peak hours. Localized and stationary noise sources like generators should be encased within temporary noise barriers. Noise generating equipment should have quality mufflers installed. All equipment should be lubricated and maintained in a good condition. To avoid use of mixing plants, ready mix concrete should be used. Proper signage should be provided near the schools, discouraging the use of horns. Heavy vehicles should not be allowed to use on smaller road while laying pipes.

14.5 Mitigation for loss of vegetation:

To compensate for the loss of trees, twice the number of trees removed should be replanted. Trees that are viable to be transplanted should be identified in consultation with the tree authority. Planters along Traffic Road should be planted with shrubs like Lantana and Wedelia Trilocata, which has good dust absorbing properties.

The above mitigative measures are incorporated in the Environmental Management Plan (EMP). The EMP covers all the mitigative measures suggested for the project, responsible agencies and the monitoring and reporting schedules. The Project Implementing Agency (AURANGABAD MUNICIPAL CORPORATION) will get the EMP implemented through the Project Management Consultant (PMC) by incorporating the EMP requirements in the contractual agreement. A Monitoring Panel constituted by AURANGABAD MUNICIPAL CORPORATION with the objective to ensure that the policies related to social and environmental issues are followed. The panel will meet periodically to review the periodical reports, environmental compliance report, etc. submitted by PIAs and PMCs/Contractors.

14.6 Environmental Management Plan

The negative impacts associated with many of the proposed schemes can be mitigated by an appropriate environmental management plan. The mitigation measures during the construction as well as operational stages, recommendations regarding construction and post construction monitoring, their frequency, and the responsible agencies have also been covered in the Environmental Management Plan. The Impact assessment study indicates that the major impacts of the project are on environmental parameters related to air quality, noise quality, and vegetation and visual/aesthetic quality. Certain land use specific impacts like privacy to residential areas, light and ventilation; safety etc has also been identified as also impacts related to pedestrian and vehicular convenience and safe.

14.7 Environmental Management Measures

Generic environmental management measures, project specific measures and monitoring and evaluation of the Environmental Management Plan is critical for ascertaining the effectiveness of mitigating measures in controlling the adverse impacts.

The Environmental Management Measures shall be the part of the tender document and shall be strictly monitored and implemented to reduce the pollution during construction stage.

14.8 Rehabilitation & Resettlement

By the implementation of the project the problem of rehabilitation & resettlement is not to be faced. The Municipal Councils having possession of majority of land required for the project except few pieces of land which are reserved and shall be acquired through the issuance of TDR.

15.0 PROJECT BENEFIT ASSESSMENT

Analysis of secondary and primary data reveals the positive and negative impacts and the mitigation measures. These are as under:

15.1 Positive Impact

Sewerage Project

- ❖ Environment, sanitation improvement
- ❖ Better hygienic condition and health status of people
- ❖ Decrease in morbidity and mortality rate
- ❖ Decrease in expenditure on health treatment
- ❖ Decrease on River pollution
- ❖ Network will prevent pollution on road and near human settlements
- ❖ Sludge use for manure in agriculture
- ❖ Use of waste waters in agriculture, horticulture and industrial purposes
- ❖ Waste water treated used for industrial, agricultural and other purposes will save drinking water
- ❖ Revenue to Aurangabad Municipal Corporation through treated waste water
- ❖ Employment opportunities to unskilled and semi skilled persons during construction and service to a few persons in O&M

15.2 Negative Impact

Sewerage Project

- ❖ Land reservation under Govt., public Garden or park area will have to be utilized for pumping & Sewage treatment plant.
- ❖ Public disruption due to traffic congestion etc. during construction
- ❖ Effective utilization of a sewerage system depends much on a reliable supply of water. Both the central government and local authorities involved have become more aware of the need for more adequate water supply, although the problem of water shortage persists.

15.3 Mitigation measures

Sewerage Project

- ❖ Improvement in Park area
- ❖ Assistance in maintenance of park and recreation activities to users
- ❖ Adequate social safeguard will be taken by diversion traffic temporarily and putting signage for the convenience of transporters
- ❖ Small temporary fencing near densely populated site will avoid accidents. Safety and security to public during construction will be ensured
- ❖ Road and land will be restored to original condition
- ❖ New plantations of trees
- ❖ Access to emergency services- ambulance, police etc to people during construction period
- ❖ Periodic inspections for maintenance and repairs of projects

ANNEXURES

Wardwise Population and Demand Statement for Aurangabad Underground Sewerage Project

Zone no	Name of Ward	Ward no	Area (Ha)	Population 2001 (As per census and fortress report)	Actual Population 2011	Gross Density 2001 pph	Gross Density 2011 pph	% increase in density per Ha per decade	Population			Gross Density			Residential	Commercial	Industrial	Institutional	Public, open spaces and other area	Roads	Total Residential Demand /day (MLD)					Total Other Demand	Total Demand				
									Year 2015	Year 2030	Year 2045	Year 2015	Year 2030	Year 2045							2011	2015	2026	2030	2045		2011	2015	2026	2030	2045
Ward A	Harsul	1	900	9675	24339	21.8	54.84	151.56	26702	37410	51117	60.16539	84.29228	56.796667	225.23	15.22	16.64	54.59	70.52	61.6	2.76	3.03	3.89	4.24	5.8	1.75	4.51	4.78	5.64	5.99	7.55
Ward A	Jadhav Wadi		150	9524	28805																										
Ward B	Mayur Park	2				107.08	323.87	202.46	31601	44274	60496	355.3069	497.79627	403.30667	45.14	3.05	3.34	10.94	14.13	54.79	3.27	3.58	4.6	5.02	6.86	0.69	3.96	4.27	5.29	5.71	7.55
Ward B	Yadavnagar	3	13.1	8911	9610	680.23	733.59	7.84	9639	9898	10115	735.8015	755.57252	772.1374	6.65	0.45	0.49	1.61	2.08	1.82	1.09	1.09	1.11	1.12	1.15	0.05	1.14	1.14	1.16	1.17	1.2
Ward A	Wankhedenagar N-13	4	160	8057	21435	84.92	225.92	166.04	23516	32946	45018	247.8499	347.23862	281.3625	48.15	3.25	3.56	11.67	15.08	13.17	2.43	2.67	3.42	3.74	5.11	0.37	2.8	3.04	3.79	4.11	5.48
Ward A	Asephiya colony, dilras colony	5	180	9060	15690	50.33	87.17	73.2	17213	24116	32952	95.62778	133.97778	183.06667	91.35	6.17	6.75	22.14	28.6	24.98	1.78	1.95	2.5	2.73	3.74	0.71	2.49	2.66	3.21	3.44	4.45
Ward A	Begumpura	6	140	9076	7594	109.32	91.47	-16.33	8331	11672	15949	100.3493	140.59263	113.92143	42.13	2.85	3.11	10.21	13.19	11.52	0.86	0.94	1.21	1.32	1.81	0.33	1.19	1.27	1.54	1.65	2.14
Ward A	Bhavsinghpura	7	150	8862	17654	59.08	117.69	99.2	19368	27135	37077	129.12	180.9	247.18	76.13	5.15	5.63	18.45	23.84	20.82	2	2.2	2.82	3.08	4.2	0.59	2.59	2.79	3.41	3.67	4.79
Ward A	Padegaon	8	1790	8494	22385	8	21.09	163.63	24558	34407	47013	23.13628	32.415093	26.264246	538.69	36.41	39.8	130.56	168.66	147.33	2.54	2.78	3.57	3.9	5.33	4.18	6.72	6.96	7.75	8.08	9.51
Ward A	Shantipura	9	150	8893	10831	59.29	72.21	21.79	11882	16648	22747	79.21333	110.98667	151.64667	76.13	5.15	5.63	18.45	23.84	20.82	1.23	1.35	1.73	1.89	2.58	0.59	1.82	1.94	2.32	2.48	3.17
Ward A	Jainghpura	10	50	8931	9391	178.62	187.82	5.15	10303	14434	19723	206.06	288.68	394.46	25.38	1.72	1.88	6.15	7.95	6.94	1.06	1.17	1.5	1.64	2.24	0.2	1.26	1.37	1.7	1.84	2.44
Ward A	Bhadkalgate	11	88	9465	7821	107.56	88.88	-17.37	8580	12021	16426	97.5	136.60227	186.65909	44.66	3.02	3.3	10.82	13.98	12.21	0.89	0.97	1.25	1.36	1.86	0.35	1.24	1.32	1.6	1.71	2.21
Ward A	Ghati parishar and Asifiya colony	12	84	9388	10462	111.76	124.55	11.44	11478	16080	21972	136.6429	191.42857	261.57143	42.63	2.88	3.15	10.33	13.35	11.66	1.19	1.3	1.67	1.82	2.49	0.33	1.52	1.63	2	2.15	2.82
Ward A	Vishwasnagar	13	189	8297	10358	43.9	54.8	24.83	11363	15921	21754	60.12169	84.238095	115.10053	95.92	6.48	7.09	23.25	30.03	26.23	1.17	1.29	1.65	1.81	2.47	0.74	1.91	2.03	2.39	2.55	3.21
Ward B	Rosabag	14	50.9	9118	8677	179.14	170.47	-4.84	9519	13337	18223	187.0138	262.02358	358.01572	25.83	1.75	1.91	6.26	8.09	7.06	0.98	1.08	1.39	1.51	2.07	0.2	1.18	1.28	1.59	1.71	2.27
Ward B	Swami Vivekanand nagar	15	11.9	8062	7872	677.48	661.51	-2.36	7896	8108	8285	663.5294	681.34454	696.21849	6.04	0.41	0.45	1.46	1.89	1.65	0.89	0.9	0.91	0.92	0.94	0.05	0.94	0.95	0.96	0.97	0.99
Ward B	Mayurnagar, Sudharshan Nagar	16	11.2	8897	9164	794.38	818.21	3	9191	9439	9645	820.625	842.76786	861.16071	5.68	0.38	0.42	1.38	1.78	1.55	1.04	1.04	1.06	1.07	1.09	0.04	1.08	1.08	1.1	1.11	1.13
Ward B	Shrikrishna nagar	17	11.1	9129	9589	822.43	863.87	5.04	9618	9877	10092	866.4865	889.81982	909.18919	5.63	0.38	0.42	1.37	1.76	1.54	1.09	1.09	1.11	1.12	1.14	0.04	1.13	1.13	1.15	1.16	1.18
Ward B	Pawannagar	18	20.1	9083	9781	451.89	486.62	7.69	9810	10074	10295	488.0597	501.19403	512.18905	10.2	0.69	0.75	2.47	3.19	2.79	1.11	1.11	1.13	1.14	1.17	0.08	1.19	1.19	1.21	1.22	1.25
Ward B	Shivneri colony and Mhada colony	19	15.1	8989	8921	595.3	590.79	-0.76	8948	9189	9389	592.5828	608.54305	621.78808	7.66	0.52	0.57	1.86	2.4	2.1	1.01	1.01	1.03	1.04	1.06	0.06	1.07	1.07	1.09	1.1	1.12
Ward B	Ambekarnagar	20	10.8	9124	9419	844.81	872.13	3.23	9447	9702	9913	874.7222	898.33333	917.87037	5.48	0.37	0.41	1.33	1.72	1.5	1.07	1.07	1.09	1.1	1.12	0.04	1.11	1.11	1.13	1.14	1.16
Ward B	Misarwadi	21	266	8456	23184	53.61	146.98	174.17	25434	35635	48691	161.2454	225.91724	183.04887	80.05	5.41	5.92	19.4	25.06	21.89	2.63	2.88	3.7	4.04	5.52	0.62	3.25	3.5	4.32	4.66	6.14
Ward B	Naregaon	22	136	9497	12993	117.76	161.11	36.81	14254	19971	27288	176.747	247.63678	200.64706	40.93	2.77	3.02	9.92	12.81	11.19	1.47	1.62	2.07	2.26	3.09	0.32	1.79	1.94	2.39	2.58	3.41
Ward E	Masnatur and Chikalthanan	23	800	9236	14516	19.47	30.6	57.16	15925	22312	30486	33.56941	47.033008	38.1075	240.75	16.27	17.79	58.35	75.38	65.85	1.65	1.81	2.32	2.53	3.46	1.87	3.52	3.68	4.19	4.4	5.33
Ward B	MIDC Chikalthana	24	758.6	8105	11114	10.68	14.65	37.17	12193	17083	23342	16.07303	22.519114	30.769839	384.99	26.02	28.45	93.31	120.54	105.29	1.26	1.38	1.77	1.94	2.65	2.99	4.25	4.37	4.76	4.93	5.64
Ward B	Ayodhya nagar	25	24.2	8550	11024	353.31	455.54	28.93	12094	16944	23152	499.7521	700.16529	956.69421	12.28	0.83	0.91	2.98	3.85	3.36	1.25	1.37	1.76	1.92	2.63	0.1	1.35	1.47	1.86	2.02	2.73
Ward B	Ganesh nagar	26	56.6	8432	10242	148.98	180.95	21.46	11236	15742	21510	198.5159	278.12721	380.03534	28.72	1.94	2.12	6.96	8.99	7.86	1.16	1.27	1.64	1.79	2.44	0.22	1.38	1.49	1.86	2.01	2.66
Ward D	Shatabdi nagar	27	52	8433	11024	162.17	212	30.73	12094	16944	23152	232.5769	325.84615	445.23077	26.39	1.78	1.95	6.4	8.26	7.22	1.25	1.37	1.76	1.92	2.63	0.2	1.45	1.57	1.96	2.12	2.83
Ward C	Nehru nagar	28	60	8785	12034	146.42	200.57	36.98	13202	18497	25274	220.0333	308.28333	421.23333	30.45	2.06	2.25	7.38	9.53	8.33	1.36	1.5	1.92	2.1	2.87	0.24	1.6	1.74	2.16	2.34	3.11
Ward C	Fazalpur	29	70	8659	13123	123.7	187.47	51.55	14397	20171	27561	205.6714	288.15714	393.72857	35.53	2.4	2.63	8.61	11.12	9.72	1.49	1.63	2.09	2.29	3.13	0.28	1.77	1.91	2.37	2.57	3.41
Ward A	Harshnagar	30	99	8409	8273	84.94	83.57	-1.61	9076	12716	17375	91.67677	128.44444	175.50505	50.24	3.4	3.71	12.18	15.73	13.74	0.94	1.03	1.32	1.44	1.97	0.39	1.33	1.42	1.71	1.83	2.36
Ward A	Lotakaranja	31	120	8794	10242	73.28	85.35	16.47	11236	15742	21510	93.63333	131.18333	179.25	60.9	4.12	4.5	14.76	19.07	16.66	1.16	1.27	1.64	1.79	2.44	0.47	1.63	1.74	2.11	2.26	2.91
Ward A	Kabadipura, Budilane	32	116	8725	11514	75.22	99.26	31.96	12632	17697	24182	108.8966	152.56034	208.46552	58.87	3.98	4.35	14.27	18.43	16.1	1.31	1.43	1.84	2.01	2.74	0.46	1.77	1.89	2.3	2.47	3.2
Ward D	Gulmandi	33	50	8060	10328	161.22	206.56	28.14	11331	15875	21691	226.62	317.5	433.82	25.38	1.72	1.88	6.15	7.95	6.94	1.17	1.28	1.65	1.8	2.46	0.2	1.37	1.48	1.85	2	2.66
Ward A	Khadkeshwar	34	117	8921	10099	76.25	86.32	13.21																							

Zone no	Name of Ward	Ward no	Area (Ha)	Population 2001 (As per census and fortress report)	Actual Population 2011	Gross Density 2001 pph	Gross Density 2011 pph	% increase in density per Ha per decade	Population					Gross Density					Residential	Commercial	Industrial	Institutional	Public, open spaces and other area	Roads	Total Residential Demand /day (MLD)					Total Other Demand	Total Demand				
									Year 2015	Year 2030	Year 2045	Year 2015	Year 2030	Year 2045	2011	2015	2026	2030							2045	2011	2015	2026	2030		2045				
									9581	13423	18341	133.0694	186.43056	254.73611	36.54	2.47	2.7	8.86							11.44	9.99	0.99	1.09	1.39		1.52	2.08	0.28	1.27	1.37
Ward C	Bhavani nagar	57	72	9385	8733	130.35	121.29	-6.95	9581	13423	18341	133.0694	186.43056	254.73611	36.54	2.47	2.7	8.86	11.44	9.99	0.99	1.09	1.39	1.52	2.08	0.28	1.27	1.37	1.67	1.8	2.36				
Ward D	Kailas nagar	58	45	9158	10148	203.51	225.51	10.81	11133	15598	21313	247.4	346.62222	473.62222	22.84	1.54	1.69	5.54	7.15	6.25	1.15	1.26	1.62	1.77	2.42	0.18	1.33	1.44	1.8	1.95	2.6				
Ward D	Ajab nagar, Khokadpura	59	45	9703	8817	215.62	195.93	-9.13	9673	13552	18517	214.9556	301.15556	411.48889	22.84	1.54	1.69	5.54	7.15	6.25	1	1.1	1.41	1.54	2.1	0.18	1.18	1.28	1.59	1.72	2.28				
Ward D	Sillekhana	60	40	8616	8698	215.4	217.45	0.95	9542	13369	18267	238.55	334.225	456.675	20.3	1.37	1.5	4.92	6.36	5.55	0.99	1.08	1.39	1.52	2.07	0.16	1.15	1.24	1.55	1.68	2.23				
Ward D	Samarth nagar	61	90	8708	9127	96.76	101.41	4.81	10013	14029	19168	111.2556	155.87778	212.97778	45.68	3.09	3.38	11.07	14.3	12.49	1.04	1.14	1.46	1.59	2.17	0.35	1.39	1.49	1.81	1.94	2.52				
Ward D	Kotla colony	62	75	8232	8469	109.76	112.92	2.88	9291	13017	17787	123.88	173.56	237.16	38.06	2.57	2.81	9.23	11.92	10.41	0.96	1.05	1.35	1.48	2.02	0.3	1.26	1.35	1.65	1.78	2.32				
Ward D	Kokanwadi	63	50	8850	8557	177	171.14	-3.31	9388	13152	17971	187.76	263.04	359.42	25.38	1.72	1.88	6.15	7.95	6.94	0.97	1.06	1.37	1.49	2.04	0.2	1.17	1.26	1.57	1.69	2.24				
Ward D	Kranti Chowk	64	120	8174	8515	68.12	70.96	4.17	9342	13088	17883	77.85	109.06667	149.025	60.9	4.12	4.5	14.76	19.07	16.66	0.97	1.06	1.36	1.48	2.03	0.47	1.44	1.53	1.83	1.95	2.5				
Ward D	Ramanagar	65	50	8237	9234	164.74	184.68	12.1	10130	14193	19393	202.6	283.86	387.86	25.38	1.72	1.88	6.15	7.95	6.94	1.05	1.15	1.47	1.61	2.2	0.2	1.25	1.35	1.67	1.81	2.4				
Ward F	Shiv Shankar colony	66	80	8382	9963	104.78	124.54	18.86	10930	15314	20924	136.625	191.425	261.55	40.6	2.74	3	9.84	12.71	11.1	1.13	1.24	1.59	1.74	2.37	0.32	1.45	1.56	1.91	2.06	2.69				
Ward F	Buddha nagar, Uttamnagar	67	75	8367	8511	111.56	113.48	1.72	9337	13082	17875	124.4933	174.42667	238.33333	38.06	2.57	2.81	9.23	11.92	10.41	0.97	1.06	1.36	1.48	2.03	0.3	1.27	1.36	1.66	1.78	2.33				
Ward F	Vishnu nagar	68	55	9778	11773	177.78	214.05	20.4	12916	18096	24726	234.8364	329.01818	449.56364	27.91	1.89	2.06	6.77	8.74	7.63	1.34	1.46	1.88	2.05	2.8	0.22	1.56	1.68	2.1	2.27	3.02				
Ward F	Jawahar colony	69	120	8762	10267	73.02	85.56	17.17	11264	15781	21563	93.86667	131.50833	179.69167	60.9	4.12	4.5	14.76	19.07	16.66	1.16	1.28	1.64	1.79	2.45	0.47	1.63	1.75	2.11	2.26	2.92				
Ward E	Vidhya Nagar	70	58	9381	14820	161.74	255.52	57.98	16259	22779	31125	280.3276	392.74138	536.63793	29.44	1.99	2.18	7.13	9.22	8.05	1.68	1.84	2.37	2.58	3.53	0.23	1.91	2.07	2.6	2.81	3.76				
Ward E	Nyaynagar	71	17	8415	10306	495	606.24	22.47	10337	10615	10847	608.0588	624.41176	638.05882	8.63	0.58	0.64	2.09	2.7	2.36	1.17	1.17	1.2	1.2	1.23	0.07	1.24	1.24	1.27	1.27	1.3				
Ward E	N-3, N-4 CIDCO	72	100	8999	10655	89.99	106.55	18.4	11689	16377	22378	116.89	163.77	223.78	50.75	3.43	3.75	12.3	15.89	13.88	1.21	1.33	1.7	1.86	2.54	0.39	1.6	1.72	2.09	2.25	2.93				
Ward E	ST colony N-2 CIDCO	73	100	8083	11007	80.83	110.07	36.17	12075	16918	23117	120.75	169.18	231.17	50.75	3.43	3.75	12.3	15.89	13.88	1.25	1.37	1.76	1.92	2.62	0.39	1.64	1.76	2.15	2.31	3.01				
Ward E	Dyaneshwar colony Mukundwadi	74	110	9182	10894	83.47	99.04	18.65	11951	16744	22879	108.6455	152.21818	207.99091	55.83	3.77	4.13	13.53	17.48	15.27	1.24	1.36	1.74	1.9	2.59	0.43	1.67	1.79	2.17	2.33	3.02				
Ward E	Sanjaynagar Mukundwadi	75	10	9044	9845	904.4	984.5	8.86	9875	10140	10362	987.5	1014	1036.2	5.08	0.34	0.38	1.23	1.59	1.39	1.12	1.12	1.14	1.15	1.18	0.04	1.16	1.16	1.18	1.19	1.22				
Ward E	Ramnagar	76	175	8769	13308	50.11	76.05	51.77	14600	20455	27949	83.42857	116.88571	159.70857	88.81	6	6.56	21.53	27.81	24.29	1.51	1.66	2.12	2.32	3.17	0.69	2.2	2.35	2.81	3.01	3.86				
Ward E	Kamgar colony, Vitthalnagar	77	110	9229	10894	141.49	272.58	92.65	19506	27329	37341	299.0403	418.97228	339.46364	33.1	2.24	2.45	8.02	10.36	9.05	2.02	2.21	2.84	3.1	4.23	0.26	2.28	2.47	3.1	3.36	4.49				
Ward E	Chikalhana	78	140	9795	11114	117.99	133.87	13.46	12193	17083	23342	146.8712	205.77393	166.72857	42.13	2.85	3.11	10.21	13.19	11.52	1.26	1.38	1.77	1.94	2.65	0.33	1.59	1.71	2.1	2.27	2.98				
Ward E	Mukundwadi	79	58	9389	12772	161.88	220.21	36.03	14012	19631	26824	241.5862	338.46552	462.48276	29.44	1.99	2.18	7.13	9.22	8.05	1.45	1.59	2.04	2.23	3.04	0.23	1.68	1.82	2.27	2.46	3.27				
Ward E	Ambika nagar Mukundwadi	80	120	8800	13355	73.33	111.29	51.77	14651	20527	28048	122.0917	171.05833	233.73333	60.9	4.12	4.5	14.76	19.07	16.66	1.51	1.66	2.13	2.33	3.18	0.47	1.98	2.13	2.6	2.8	3.65				
Ward E	Jai bhavani Nagar CIDCO	81	120	8364	19818	69.7	165.15	136.94	21742	30461	41622	181.1833	253.84167	346.85	60.9	4.12	4.5	14.76	19.07	16.66	2.25	2.47	3.16	3.45	4.72	0.47	2.72	2.94	3.63	3.92	5.19				
Ward E	Bharat nagar, Matoshri nagar Garkheda	82	210	8981	23515	42.77	111.98	161.82	25798	36143	49386	122.8476	172.10952	235.17143	106.58	7.2	7.88	25.83	33.37	29.15	2.67	2.93	3.75	4.1	5.6	0.83	3.5	3.76	4.58	4.93	6.43				
Ward E	Pundalik nagar	83	17	8719	10355	512.88	609.12	18.76	10386	10666	10899	610.9412	627.41176	641.11765	8.63	0.58	0.64	2.09	2.7	2.36	1.17	1.18	1.2	1.21	1.24	0.07	1.24	1.25	1.27	1.28	1.31				
Ward E	Kalpataru colony, Balkrishna Nagar	84	50	9201	20061	184.02	401.22	118.03	22008	30835	42132	440.16	616.7	842.64	25.38	1.72	1.88	6.15	7.95	6.94	2.27	2.5	3.2	3.5	4.78	0.2	2.47	2.7	3.4	3.7	4.98				
Ward F	Garkheda	85	170	9079	13306	53.41	78.27	46.55	14598	20452	27945	85.87059	120.30588	164.38235	86.28	5.83	6.38	20.91	27.01	23.6	1.51	1.66	2.12	2.32	3.17	0.67	2.18	2.33	2.79	2.99	3.84				
Ward F	Priyadarshani, Indiranagar	86	110	9018	13574	81.98	123.4	50.52	14892	20864	28508	135.3818	189.67273	259.16364	55.83	3.77	4.13	13.53	17.48	15.27	1.54	1.69	2.17	2.37	3.23	0.43	1.97	2.12	2.6	2.8	3.66				
Ward F	Ulkanagari	87	125	8516	13316	68.13	106.53	56.36	14609	20467	27966	116.872	163.736	223.728	63.44	4.29	4.69	15.38	19.86	17.35	1.51	1.66	2.13	2.32	3.17	0.49	2	2.15	2.62	2.81	3.66				
Ward F	Jai Vishwabharati colony	88	110	8756	17949	79.6	163.17	104.99	19691	27588	37696	179.0091	250.8	342.69091	55.83	3.77	4.13	13.53	17.48	15.27	2.04	2.23	2.87	3.13	4.27	0.43	2.47	2.66	3.3	3.56	4.7				
Ward F	Jyotinagar	89	150	8939	11026	59.59	73.51	23.36	12096	16947	23157	80.64	112.98	154.38	76.13	5.15	5.63	18.45	23.84	20.82	1.25	1.37	1.76	1.92	2.63	0.59	1.84	1.96	2.35	2.51	3.22				
Ward F	Ekantnagar	90	200	9112	10396	45.56	51.98	14.09	11405	15979	21834	57.025	79.895	109.17	101.5	6.86	7.5	24.6	31.78	27.76	1.18	1.29	1.66	1.81	2.48	0.79	1.97	2.08	2.45	2.6	3.27</				

Abstract of Zone wise Sewer Pipelines

DIA	Length (m)					Total Design Cummulative Length	Proposed Sewer Length
	Zone I	Zone II,III,IV	ZONE V	Zone VI A & B	Zone Salim ali		
150 mm	125136	162702	20637	36152	6764	351391	70278
200 mm	7680	11916	2115	4606	1176	27494	27494
250 mm	6308	14444	3502	4145	848	29246	29246
300 mm	7720	11941	4408	3800	665	28533	28533
350 mm					250	250	250
400 mm	9257	12176	4930	5893	100	32356	32356
450 mm	1591	2337	0	0	684	4612	4612
500 mm	1114	7730	736	2085	13	11677	11677
600 mm	2972	3090	1575	4373	167	12177	12177
700 mm	2623	3575	334	2882	0	9414	9414
800 mm	567	3144	0	894	0	4605	4605
900 mm	2356	4103	0	3747	0	10206	10206
1000 mm	0	2387	0	17	0	2404	2404
1100 mm	0	2953	0	0	0	2953	2953
1200 mm	1639	2554	0	0	0	4193	4193
1400 mm	4116	320	0	0	0	4435	4435
1600 mm	2264	592	0	0	0	2856	2856
1800 mm	0	2157	0	0	0	2157	2157
2000 mm	272			0		272	272
Total (m)	175613	248120	38237	68593	10667	541231	260118

Abstract of Main Sewers

Sewer	Location		Diameter (mm)														Total Length (m)
	Start point	End Point	400	450	500	600	700	800	900	1000	1100	1400	1500	1600	1800	2000	
A	Bibi-ka-maqbara	Padegaon STP	1552		912		334										2798
B	Himayat Bagh	Golwadi TPS			3655	827	44	954	711				562	2646	2214	396	12009
C	Majnu Hill	Siddarth Garden STP	2252			1177	1053	661		1435	1591	320	521				9010
D	MGM Hospital	Siddarth Garden STP			335		462	455	609	868	993						3722
E	Forest Office	Kham River	1061		228	81	2069	847									4286
F	Saint Francis High School	MIT College	459	195	168	584	346	857	866			5353					8828
K	High Court	Golwadi TPS	871			1491	551		1490								4403
L	N-2 CIDCO	Sukhana River	204		2003	292	1476		1130	11							5116
M	Jadhav wadi	Sukhana River	1211		2147	2590	436	637	1689	1174							9884
			7610	195	9448	7042	6771	4411	6495	3488	2584	5673	1083	2646	2214	396	60056

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD
STATEMENT SHOWING FINANCIAL PATTERN

Year	Expenditure likely to be incurred	GoI(80%)	GoM(10%)	Municipal Corporation Share (10%)
20013-14	7398.81	5919.05	739.88	739.88
2014 -15	18497.03	14797.62	1849.70	1849.70
2015 -16	11098.22	8878.58	1109.82	1109.82
Total	36994.06	29595.25	3699.41	3699.41

Repayment of Loan Amount for Year 20013-14

Long term Planning

Work to be undertaken during the period 20013-14

Repayment of loan from 1-Jan-16

Total Expenditure in

year 7398.81

Loan Share 10%

Loan Amount 739.88

Rate of interest 8% - Guarantee Fee 1% - Interest tax 3%

Total Interest 9.04 say 9

Period of Repayment

20 Moratorium period

3 years

Sr no	Payment Due	Advance Given (in lacs)	Loan Balance (In lacs)	Interest	Principal Amount due (in lacs)	Total Amount due (in lacs)
1	1-Jan-11	739.88				
2	1-Dec-11		739.88	33.29		33.29
3	1-Jan-12		739.88			0
4	1-Dec-12		739.88	33.29		33.29
5	1-Jan-13		739.88			0
6	1-Dec-13		739.88	33.29		33.29
7	1-Jun-14		739.88	33.29	18.5	51.79
8	1-Dec-14		721.4	32.46	18.5	50.96
9	1-Jun-15		702.9	31.63	18.5	50.13
10	1-Dec-15		684.4	30.8	18.5	49.3
11	1-Jun-16		665.9	29.96	18.5	48.46
12	1-Dec-16		647.4	29.13	18.5	47.63
13	1-Jun-17		628.9	28.3	18.5	46.8
14	1-Dec-17		610.4	27.47	18.5	45.97
15	1-Jun-18		591.9	26.63	18.5	45.13
16	1-Dec-18		573.4	25.8	18.5	44.3
17	1-Jun-19		554.9	24.97	18.5	43.47
18	1-Dec-19		536.4	24.14	18.5	42.64
19	1-Jun-20		517.9	23.3	18.5	41.8
20	1-Dec-20		499.4	22.47	18.5	40.97
21	1-Jun-21		480.9	21.64	18.5	40.14
22	1-Dec-21		462.4	20.81	18.5	39.31
23	1-Jun-22		443.9	19.97	18.5	38.47
24	1-Dec-22		425.4	19.14	18.5	37.64
25	1-Jun-23		406.9	18.31	18.5	36.81
26	1-Dec-23		388.4	17.48	18.5	35.98
27	1-Jun-24		369.9	16.64	18.5	35.14
28	1-Dec-24		351.4	15.81	18.5	34.31
29	1-Jun-25		332.9	14.98	18.5	33.48
30	1-Dec-25		314.4	14.15	18.5	32.65
31	1-Jun-26		295.9	13.31	18.5	31.81
32	1-Dec-26		277.4	12.48	18.5	30.98
33	1-Jun-27		258.9	11.65	18.5	30.15
34	1-Dec-27		240.4	10.82	18.5	29.32
35	1-Jun-28		221.9	9.98	18.5	28.48
36	1-Dec-28		203.4	9.15	18.5	27.65
37	1-Jun-29		184.9	8.32	18.5	26.82
38	1-Dec-29		166.4	7.49	18.5	25.99
39	1-Jun-30		147.9	6.65	18.5	25.15
40	1-Dec-30		129.4	5.82	18.5	24.32
41	1-Jun-31		110.9	4.99	18.5	23.49
42	1-Dec-31		92.4	4.16	18.5	22.66
43	1-Jun-32		73.9	3.32	18.5	21.82
44	1-Dec-32		55.4	2.49	18.5	20.99
45	1-Jun-33		36.9	1.66	18.5	20.16
46	1-Dec-33		18.4	0.83	18.5	19.33
	Total	739.88		782.27	740.00	1522.27

Remark - Moratorium Period considered as 3 years from the beginning

Indirect Charge/ Annum 76.11
Total Average Indirect Charges/Year 380.58

Repayment of Loan Amount for Year 2014 -15

Long term Planning

Work to be undertaken during the period 2014 -15

Repayment of loan from 1-Jan-17

Total Expenditure in year 18497.03
 Loan Share 10%
 Loan Amount 1849.70

Rate of interest 8% - Guarantee Fee 1% - Interest tax 3%

Total Interest 9.04 say 9

Period of Repayment 20 Moratorium period 3 years

Sr no	Payment Due	Advance Given (in lacs)	Loan Balance (In lacs)	Interest	Principal Amount due (in lacs)	Total Amount due (in lacs)
1	1-Jan-12	1849.70				
2	1-Dec-12		1849.70	83.24		83.24
3	1-Jan-13		1849.70			0
4	1-Dec-13		1849.70	83.24		83.24
5	1-Jan-14		1849.70			0
6	1-Dec-14		1849.70	83.24		83.24
7	1-Jun-15		1849.70	83.24	46.24	129.48
8	1-Dec-15		1803.5	81.16	46.24	127.4
9	1-Jun-16		1757.2	79.08	46.24	125.32
10	1-Dec-16		1711.0	76.99	46.24	123.23
11	1-Jun-17		1664.7	74.91	46.24	121.15
12	1-Dec-17		1618.5	72.83	46.24	119.07
13	1-Jun-18		1572.3	70.75	46.24	116.99
14	1-Dec-18		1526.0	68.67	46.24	114.91
15	1-Jun-19		1479.8	66.59	46.24	112.83
16	1-Dec-19		1433.5	64.51	46.24	110.75
17	1-Jun-20		1387.3	62.43	46.24	108.67
18	1-Dec-20		1341.1	60.35	46.24	106.59
19	1-Jun-21		1294.8	58.27	46.24	104.51
20	1-Dec-21		1248.6	56.19	46.24	102.43
21	1-Jun-22		1202.3	54.11	46.24	100.35
22	1-Dec-22		1156.1	52.02	46.24	98.26
23	1-Jun-23		1109.9	49.94	46.24	96.18
24	1-Dec-23		1063.6	47.86	46.24	94.1
25	1-Jun-24		1017.4	45.78	46.24	92.02
26	1-Dec-24		971.1	43.7	46.24	89.94
27	1-Jun-25		924.9	41.62	46.24	87.86
28	1-Dec-25		878.7	39.54	46.24	85.78
29	1-Jun-26		832.4	37.46	46.24	83.7
30	1-Dec-26		786.2	35.38	46.24	81.62
31	1-Jun-27		739.9	33.3	46.24	79.54
32	1-Dec-27		693.7	31.22	46.24	77.46
33	1-Jun-28		647.5	29.14	46.24	75.38
34	1-Dec-28		601.2	27.06	46.24	73.3
35	1-Jun-29		555.0	24.97	46.24	71.21
36	1-Dec-29		508.7	22.89	46.24	69.13
37	1-Jun-30		462.5	20.81	46.24	67.05
38	1-Dec-30		416.3	18.73	46.24	64.97
39	1-Jun-31		370.0	16.65	46.24	62.89
40	1-Dec-31		323.8	14.57	46.24	60.81
41	1-Jun-32		277.5	12.49	46.24	58.73
42	1-Dec-32		231.3	10.41	46.24	56.65
43	1-Jun-33		185.1	8.33	46.24	54.57
44	1-Dec-33		138.8	6.25	46.24	52.49
45	1-Jun-34		92.6	4.17	46.24	50.41
46	1-Dec-34		46.3	2.09	46.24	48.33
	Total	1849.70		1956.18	1849.60	3805.78

Remark - Monitoring Period considered as 3 years from the beginning

Indirect Charge/ Annum

190.29

Repayment of Loan Amount for Year 2015 -16

Long term Planning

Work to be undertaken during the period 2015 -16
 Repayment of loan from 1-Jan-18

Total Expenditure in
 year 11098.22
 Loan Share 10%
 Loan Amount 1109.82

Rate of interest 8% - Guarantee Fee 1% - Interest tax 3%

Total Interest 9.04 say 9

Period of Repayment 20 Moratorium period 3 years

Sr no	Payment Due	Advance Given (in lacs)	Loan Balance (In lacs)	Interest	Principal Amount due (in lacs)	Total Amount due (in lacs)
1	1-Jan-13	1109.82				
2	1-Dec-13		1109.82	49.94		49.94
3	1-Jan-14		1109.82			0
4	1-Dec-14		1109.82	49.94		49.94
5	1-Jan-15		1109.82			0
6	1-Dec-15		1109.82	49.94		49.94
7	1-Jun-16		1109.82	49.94	27.75	77.69
8	1-Dec-16		1082.1	48.69	27.75	76.44
9	1-Jun-17		1054.3	47.44	27.75	75.19
10	1-Dec-17		1026.6	46.2	27.75	73.95
11	1-Jun-18		998.8	44.95	27.75	72.7
12	1-Dec-18		971.1	43.7	27.75	71.45
13	1-Jun-19		943.3	42.45	27.75	70.2
14	1-Dec-19		915.6	41.2	27.75	68.95
15	1-Jun-20		887.8	39.95	27.75	67.7
16	1-Dec-20		860.1	38.7	27.75	66.45
17	1-Jun-21		832.3	37.45	27.75	65.2
18	1-Dec-21		804.6	36.21	27.75	63.96
19	1-Jun-22		776.8	34.96	27.75	62.71
20	1-Dec-22		749.1	33.71	27.75	61.46
21	1-Jun-23		721.3	32.46	27.75	60.21
22	1-Dec-23		693.6	31.21	27.75	58.96
23	1-Jun-24		665.8	29.96	27.75	57.71
24	1-Dec-24		638.1	28.71	27.75	56.46
25	1-Jun-25		610.3	27.46	27.75	55.21
26	1-Dec-25		582.6	26.22	27.75	53.97
27	1-Jun-26		554.8	24.97	27.75	52.72
28	1-Dec-26		527.1	23.72	27.75	51.47
29	1-Jun-27		499.3	22.47	27.75	50.22
30	1-Dec-27		471.6	21.22	27.75	48.97
31	1-Jun-28		443.8	19.97	27.75	47.72
32	1-Dec-28		416.1	18.72	27.75	46.47
33	1-Jun-29		388.3	17.47	27.75	45.22
34	1-Dec-29		360.6	16.23	27.75	43.98
35	1-Jun-30		332.8	14.98	27.75	42.73
36	1-Dec-30		305.1	13.73	27.75	41.48
37	1-Jun-31		277.3	12.48	27.75	40.23
38	1-Dec-31		249.6	11.23	27.75	38.98
39	1-Jun-32		221.8	9.98	27.75	37.73
40	1-Dec-32		194.1	8.73	27.75	36.48
41	1-Jun-33		166.3	7.48	27.75	35.23
42	1-Dec-33		138.6	6.24	27.75	33.99
43	1-Jun-34		110.8	4.99	27.75	32.74
44	1-Dec-34		83.1	3.74	27.75	31.49
45	1-Jun-35		55.3	2.49	27.75	30.24
46	1-Dec-35		27.6	1.24	27.75	28.99
	Total	1109.82		1173.47	1110.00	2283.47

Remark - Monitoring Period considered as 3 years from the beginning

Indirect Charge/ Annum 114.17

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

CASH FLOW STATEMENT

Sr. No.	Sub Work	Gross Cost	Year wise expected expenditure		
			Ist Year	IInd Year	IIIrd Year
1	Total Gross Cost of the Project	36,994.06	7,398.81	18,497.03	11,098.22

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

TOTAL ANNUAL O&M CHARGES

Sr. No.	Description	Amount (Rs)
DIRECT CHARGES		
1	Establishment Charges	30,480,000
2	Maintenance and Repairs Charges	12,454,500
3	Energy Charges	88,200,000
4	Chemical Charges	35,412,300
	Total Direct Charges	166,546,800

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

STATMENT SHOWING ANNUAL ESTABLISHMENT CHARGES

Sr no	Establishment	Average Payment/Month	Nos of Personnel Required/Year	Total Amount / Year
1	EE (M &E)	80000	2	1920000
2	Dy	60000	6	4320000
3	Sr Engineer	50000	5	3000000
4	Junior Engineer	40000	12	5760000
5	Pump Operator	25000	18	5400000
6	Fitters	25000	21	6300000
7	Helpers	15000	21	3780000
	Total		85	30,480,000.00

Staff Requirement for Mechanical and Electrical

Sr no	Particulars	Pump House	EE (M&E)	Dy Mech	Dy Ele	Sr Engineer	Pump Operators	Helpers
1	Padegaon	1	1	1	1	0.5	3	
2	Zalta	1				1	3	2
3	Banewadi	1				1	3	3
4	Golwadi	1				2	3	4
5	Ward no 98	1				0.25	3	
6	Siddarth Garden	1				0.25	3	
			1	1	1	5	18	9

Staff Requirement for Civil

Sr no	Particulars	Details	EE (Civil)	Dy Engineer (Civil)	Junior Engineer	Fitter	Helpers
1	Collection Network	544 Kms	1	2	6	12	4
2	Outfall Sewers	71 Kms		1	3	6	4
3	Treatment Plants	7 nos		1	3	3	4
			1	4	12	21	12

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD
STATEMENT SHOWING ANNUAL M & R CHARGES

S.N.	Sub Work	Gross cost	90% of Gross Cost	% of M & R	Annual M & R Charges	Life in Years	Depriciation factor	Annual Depreciation Charges
					(3x6)			
1	2	4	5	6	7	8	9	10
1	A] Zone I - Sewer F and K	7170	6453	0.0003	1.61	30	0.033	212.949
	B] Zone II,III,IV - Sewer B,C,D,E	10179	9161	0.0003	2.29	30	0.033	302.313
	C] Zone V - Sewer A	1990	1791	0.0003	0.45	30	0.033	59.103
	D] Zone VIA and VI B- Sewer L & M	3683	3314	0.0003	0.83	30	0.033	109.362
	E] Zone Salim Ali STP	660	594	0.0003	0.15	30	0.033	19.602
2	Construction of Sewage Treatment Plant.		0		0.00			0
	a) STP for Kham River Catchment at Nakshatrawadi	5684	5115	0.005	25.58	33	0.03	153.45
	b) STP for Kham River Catchment at Banewadi	1511	1360	0.005	6.80	33	0.03	40.8
	c) STP for Kham River Catchment at Siddartha Garden	268	241	0.005	1.21	33	0.03	7.23
	d) STP for Kham River Catchment at Padegaon	616	555	0.005	2.78	33	0.03	16.65
	e) STP for Shukna River Catchment at Zalta	1200	1080	0.005	5.40	33	0.03	32.4
3	Refurbishment of Existing Conventional STP of CIDCO to SBR	1015	914	0.005	4.57	33	0.03	27.42
4	Terminal Pumping Station		0		0.00			0
	a) SPS at STP for Kham River Catchment at Golwadi		0		0.00			0
	Civil	202.65	182	0.0005	0.09	50	0.02	3.64
	Mechanical and Electrical	942.23	848	0.0025	2.12	15	0.07	59.36
	b) SPS at STP for Kham River Catchment at Banewadi	0.00	0		0.00			0
	Civil	42.20	38	0.0005	0.02	50	0.02	0.76

S.N.	Sub Work	Gross cost	90% of Gross Cost	% of M & R	Annual M & R Charges	Life in Years	Depriciati on factor	Annual Depreciation Charges
					(3x6)			
	Mechanical and Electrical	166.53	150	0.0025	0.38	15	0.07	10.5
	c)SPS at STP for Kham River Catchment at Siddarth Garden	0.00	0		0.00			0
	Civil	3.86	3	0.0005	0.00	50	0.02	0.06
	Mechanical and Electrical	62.73	56	0.0025	0.14	15	0.07	3.92
	d) SPS at STP for Kham River Catchment at Padegaon	0	0		0.00			0
	Civil	24.7982543	22	0.0005	0.01	50	0.02	0.44
	Mechanical and Electrical	127.886081	115	0.0025	0.29	15	0.07	8.05
	e) STP for Shukna River Catchment at Zalta	0	0		0.00			0
	Civil	77.2960766	70	0.0005	0.04	50	0.02	1.4
	Mechanical and Electrical	175.71	158	0.0025	0.40	15	0.07	11.06
	f) STP at CIDCO		0		0.00			0
	Civil	34.15	31	0.0005	0.02	50	0.02	0.62
	Mechanical and Electrical	157.24	142	0.0025	0.36	15	0.07	9.94
5	Intermediate Pumping Station at Ward no 98 near junction of 5 nallas		0		0.00			0
	Civil	28.62	26	0.0005	0.01	50	0.02	0.52
	Mechanical and Electrical	75.70	68	0.0025	0.17	15	0.07	4.76
6	Rising Main from Golwadi SPS to Nakshatrawadi and ward no 98 to STP	529.17	476	0.0003	0.12	30	0.033	15.708
	Total (Lacs)	36627.79			55.80			1112.02

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD
STATEMENT SHOWING ENERGY CHARGES

STATEMENT SHOWING ENERGY CHARGES - SEWERAGE TREATMENT PLANT

Sr. No.	Particulars	Nos	Capacity (MLD)	Rate/MLD	Amount (Rs)
1	Padegaon	1	13	450000	5,850,000.00
2	Zalta	1	23	450000	10,350,000.00
3	Banewadi	1	30	450000	13,500,000.00
4	Kanchanwadi	1	100	450000	45,000,000.00
5	Siddarth Garden	1	4.5	450000	2,025,000.00
6	Salim Ali	1	5.5	450000	2,475,000.00
7	CIDCO	1	20	450000	9,000,000.00
	TOTAL	7	196	450000	88,200,000.00

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD
STATEMENT SHOWING CHEMICAL CHARGES

Sr. No.	Chemical	Criteria	Requirement		Rate	Unit	Amount (Rs)
			Daily	Yearly			
1	Naocl	Average Chlorine dose of 3 mg/l	588	214620	15	Kg	3219300
2	Dewatering Polymer	@ 1.50 Kg/Ton of Dry Solids	294	107310	300	No	32193000
					Total Cost		35,412,300.00

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Sadhana Suradkar

Designation:

Ward no: 88

Phone no: 2349977

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
01	Shivraj colony	Drainage waterline is old & houses are low lying, due to that reason Drainage water goes in the houses		line to be laid newly. and chambers to checked and to be deeper or increase the height.
02.	Sauvathi park, Disha nagari,	There is no Drainage line in the area.		need to lay new drainage line to connect mainline.
03.	Shrinarnagar	water comes in the house		
04.	Shahnoorwadi Shambhagar Shivnagar	open drain is small, drainage water flows on Road, and Road are flooded in rainy season.		Drain to be widened and deepen

Issues/Suggestion/Remarks

- ① The small dam (Kolhapuri) to be constructed in nallah, so the water table of the area can be increase, so water to borewell will be available in summer seasons..

Sadhana Suradkar
सौ. साधना गणेश सुरडकर
"नगरसेविका", जयविश्वभारती कॉलनी,
वार्ड क्र. 88, महानगरपालिका, औरंगाबाद

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Mpn. Banshi Jadhav

Designation: corporator

Ward no: 01 Harsool Area.

Phone no: 9420379104

Sr.no	Area/Landmark	Sewerage Probiems	Manhole no	Remarks
①	Phule Nagar Chetna Nagar	6" pipe. — —		All lines are choke up to be changed.
	Radhaswami colony M.N.P school	6" pipe.		more places NO pipeline NO pipeline
	Sudhir hamruni Nagar Talev patisar			NO draine line. Newly provided
	Raj Nagar. Fatima Nagar.	6" pipeline.		all lines are choke up.
	Siddi mata temple Phulambadi Jamun jetti Road maske wadi			NO pipeline —do—
	waghule gali			main sewer line 6" line those are not match. Choke up problem

Issues/Suggestion/Remarks

- M.N.P. school No pipe line. (Mohanagar fatiker school)
- All drainage lines are choke up should be changed.
- Aavahade Gali → 6" pipe line. -daily Choke up to be changed.

बन्सी ग्यानु. जाधव
शिवसेना न्हासेवक
वार्ड क्र. १, हर्सुल, सभाजीनगर

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Shri. Rajgaurav Wankhede.

Designation: Cooperator

Ward no: 03.

Phone no: 9423777885

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
①	Navjivan colony K-sector.	6" pipe line.		existing. 6" pipe line all line are choke up change in feature.
	F-sector G-sector H-sector			
②	Jadhav Nagar	continuous choke up.		

Issues/Suggestion/Remarks

— Existing pipe line 6" - last 20 years,
— The line should be changed -



राजगौरव हरादास वानखेडे
नगरसेवक वार्ड क्र. ०३
वाडवनागर, औरंगाबाद

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: माधव रंजितकर Designation:

Ward no: कांती चौक Phone no:

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
1)	Main Sewer from Zambad Estate Tower			Lepto Raethi
2)	MSEB Substation - Pannalal Nagar - Sishuriker - Bijlee Nagar - Raethi			

Issues/Suggestion/Remarks

Total 1729

For M. R. Kulkarni
श्री रेणुकादास (राजु) वैद्य
नगरसेवक वार्ड क्र. ६४
कांती चौक, संभाजीनगर

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: जगदीश सिख

Designation:

Ward no: (3E) राजाबाजार

Phone no: 2326077, 9823062273

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
1)	वीनातील धर्मशाला - संतुलित बाणपती - अचरे हनुमान, चौराहा, से चौक	अचरे हनुमान, चौराहा, से चौक	अचरे हनुमान	Chulage card sitting
2)	नंदोल्लो विधा - कुवाडपल्ली - आधवमंजी, मोठा - मोती	आधवमंजी, मोठा - मोती	कांटेवा	
3)	किराज चावणी - चौराहा - चौक	चौराहा - चौक	अचरे हनुमान	अचरे हनुमान
4)	धावणी मो.मळा, सफाईवाडी, खांडाखुवा, अंठुरी	खांडाखुवा, अंठुरी	अचरे हनुमान	अचरे हनुमान
5)	ठांवी फुलका ते सिरी चौक.			

Issues/Suggestion/Remarks

Above lines are recommended for replacement:

जगदीश कन्व्हेयान्शु सिख
नगर सेवक
म.न.प. वॉर्ड क्र. ३९, राजाबाजार,
सभा.जो.नगर (अ.रंगबाद.)

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan


Name of Person: Mr. Dwijvijay Sherkhane . Designation: Corporation

Ward no: 82 Phone no: 9923388221

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
1)	Bharat Nagar	No drainage line		No existing drainage line newly proposed.
2)	Ganesh Nagar	— do —		— do —
3)	Moti Nagar	— do —		— do —
4)	Durgesh Nagar	— do —		— do —
5)	Vishrambi Nagar	50% drainage line to be laid & 50% not.		SWR pipeline to be laid 50% newly 50% proposed.
6)	Anand Nagar	No drainage line		Newly proposed.
7)	Hanuman Nagar			SWR pipeline to be laid.

Issues/Suggestion/Remarks

≡ Vishrambi Nagar - SWR pipe line newly proposed 50% Area 50% are no drainage line


द्विज्विजय संभाजी शेखाने
शिवसेना नगरसेवक
वार्ड क्र. ८२, भारतनगर, पातोश्रीनगर
म.न.पा संभाजीनगर (औरंगाबाद)

Meeting with Various Stakeholders

29/3/11.

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhilyan

Name of Person: Mr. Prahlad Nimgasakar Designation: corporator

Ward no: 86, Kabra Nagar Garkheda Phone no:

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
1)	Gaikwad	choke up	Broken -	To be change
2)	Wahab	Regular choke up		To be change
3)	Pohie Kashid	Regular choke up		To be change
4)	Ashok Gaikwad	Regular choke up		—n—
5)	Taktode	Regular choke up		—n—
6)	Taher Patel	Regular choke up		—n—

Issues/Suggestion/Remarks

Exisiting 4" & 6" drainage line -
The Exisiting drainage line should be changed
of whole ward.


प्रल्हाद गणपतराव निमगांकार
नगरसेवक वार्ड 86
इंदिरानगर, गारखेडा, औरंगाबाद

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation


Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Shri Ture Trimbak saheb, Designation: corporator

Ward no: 66, Shivshankar colony
Balaji nagar Phone no:

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
01	Shivshankar colony & Balaji nagar	the drainage line is 20 years old and not per design so always choke and laid by people and other		needs the new line as per design and needs to connect to main sewer line
02	shindhi colony	line is very old (50 years) and around 15 feet down, it line chokes, all the time, as all areas, load come to one line only and line goes under houses in balaji nagar		needs new line as per design or to be divide in two or three lines. Needs to be connect internal house to be connect to new line

Issues/Suggestion/Remarks


 न्यांबक मणपतराव तुपे
 शिवसेना - नगरसेवक (वार्ड क्र. ६६)
 शिवसंकर कॉलनी, महानगरपालिका
 संभाजीनगर (औरंगाबाद)

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

02 FEB 2011

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Shri Babasaheb MUNDÉ

Designation: Corporation


Ward no: 81, Jai Bhavani nagar

Phone no:

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
01	Jai Bhavani nagar	There is no proper Drainage line in the colony		need to be lay new Drainage line
02	Survey no 69, 68, 25, 25/2, 70	— 71 —		— 11 —
03	Timpatti colony	— 11 —		— 11 —
04	Seeham No 13 chdco	old line is 4" & very old		needs to design new line, and new line is to laid.

Issues/Suggestion/Remarks

All Jai Bhavani nagar ward No-81 - the Drainage line is to be design newly and to be laid fit as per new design.


 श्री बाळासाहेब दि. मुंडे
 नगरसेवक वार्ड क्र. ८१
 जयभवानीनगर (संभाजीनगर) अ. नगर.

Meeting with Various Stakeholders

Client: Aurangabad Municipal Corporation

Project: Maharashtra Suvarna Jayanti Nagaruttan Mahabhiyan

Name of Person: Smt. TOTALA PREETI madam, Designation: Corporation

Ward no: 33, Gulmandi Phone no:

Sr.no	Area/Landmark	Sewerage Problems	Manhole no	Remarks
01	Gulmandi	pipe line is very old (45 years) and due to mice (Rat) all pipeline is broken.		needs new line as per design considering the increasing in the population.

Issues/Suggestion/Remarks


नगरसेविका
सौ. प्रिती संतोष तोतला
वार्ड क्र. ३३, गुलमंडी,
संभाजी नगर.

WATER QUALITY LABORATORY LEVEL-II, AURANGABAD.	
WQL/SAL/ES/01	Rev No. 00 Rev Date . 01/03/2009
	Page No. 1
WWW.MAHHP.ORG	Email -sidhp.aurangabad@mahhp.org

ISO-9001:2008 CERTIFIED

No.WQLAB L-II/ABD/S3/01

28/02/2011

To,
Fortrees Infrastructure,
Aurangabad.



Subject:- Analysis Report

Ref:- Your Letter No.....Dated:- 28-01-11

Sir/Madam,

Please find Sample Analysis Report for the sample submitted alongwith desired parameters

Water Analysis Report

1.Nature of Sample: Sewrage Water (Holy Cross School Bridge)

2.Date of Sampling: 27-01-11


3. Date of receipt of Sample: 25-01-11

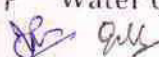
4. Sample Collected By: Bhagwan Lahane

Sr. No.	Parameters	Results	Units
Physiochemical Analysis			
1	Colour	50	Hazen
2	Odour	Unpleasent	--
3	Temperature	23.0	⁰ C
4	pH	7.3	--
5	Dissolved Oxygen	0	mg/L
6	Total Dissolved Solids	810	mg/L
7	Total Suspended Solids	18	mg/L
8	Total Solids	828	mg/L
9	Turbidity	15	NTU
10	Alkalinity	520	mg/L
11	Chloride	124	mg/L
12	BOD	120	mg/l.
13	COD	464	mg/L
14	Sulfate(as SO4)	57	mg/l.
15	Ammonia	1.35	mg/l.
16	Kjeldhal Nitorgen	28.8	mg/L
17	Orthophosphorous	2.82	mg/l.
18	Total Phosphorous	4.54	mg/l.

Yours faithfully,

OC signed
by Govt Analyst


Government Analyst
Water Quality Lab Level-II, Aurangabad



WATER QUALITY LABORATORY LEVEL -II, AURANGABAD.	
Form No. 00 Rev Date: 01/03/2009	
Page No: 1	
Email: sdehp.aurangabad @mahahp.org	

ISO-9001:2008 CERTIFIED

No.WQLAB L-II/ABD/ 53/02

25/02/2011

To,
Fortrees Infrastructure,
Aurangabad.



Subject:- Analysis Report

Ref:- Your Letter No.....Dated:- 28-01-11

Sir/Madam,

Please find Sample Analysis Report for the sample submitted alongwith desired parameters

Water Analysis Report

1.Nature of Sample: Sewrage Water (Chikalthana Bazar Bridge)

2.Date of Sampling: 27-01-11

3. Date of receipt of Sample: 25-01-11

4. Sample Collected By: Bhagwan Lahane

Sr. No.	Parameters	Results	Units
Physiochemical Analysis			
1	Colour	55	Hazen
2	Odour	Unpleasant	--
3	Temperature	23	⁰ C
4	pH	7.4	--
5	Dissolved Oxygen	0	mg/L
6	Total Dissolved Solids	1482	mg/L
7	Total Suspended Solids	22	mg/L
8	Total Solids	1504	mg/L
9	Turbidity	21	NTU
10	Alkalinity	650	mg/L
11	Chloride	350	mg/L
12	BOD	35	mg/L
13	COD	151	mg/L
14	Sulfate(as SO4)	134	mg/L
15	Ammonia	1.34	mg/L
16	Kjeldhal Nitorgen	52.1	mg/L
17	Orthophosphorous	3.92	mg/L
18	Total Phosphorous	5.22	mg/L

Yours faithfully,

OC Signed by
Govt Analyst

Q. S. S. S.
for Government Analyst

Water Quality Lab Level-II, Aurangabad

WATER QUALITY LABORATORY LEVEL -II, AURANGABAD.	
QWL/LS/01	Rev No: 00 Rev Date: 01/03/2009
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ISO-9001:2008 CERTIFIED

No. WQLAB L-II/ABD/53109

25/02/2011

To,
Fortrees Infrastructure,
Aurangabad.



Subject:- Analysis Report

Ref:- Your Letter No..... Dated:- 28-01-11

Sir/Madam,

Please find Sample Analysis Report for the sample submitted alongwith desired parameters

Water Analysis Report

1. Nature of Sample: Sewrage Water (CIDCO STP Outlet of Clarifier)

2. Date of Sampling: 27-01-11

3. Date of receipt of Sample: 25-01-11

4. Sample Collected By: Bhagwan Lahane

Sr. No.	Parameters	Results	Units
Physiochemical Analysis			
1	Colour	45	Hazen
2	Odour	Unpleasant	--
3	Temperature	23.1	°C
4	pH	7.9	--
5	Dissolved Oxygen	0	mg/L
6	Total Dissolved Solids	980	mg/L
7	Total Suspended Solids	26	mg/L
8	Total Solids	1006	mg/L
9	Turbidity	18	NTU
10	Alkalinity	620	mg/L
11	Chloride	240	mg/L
12	BOD	40	mg/L
13	COD	141	mg/L
14	Sulfate(as SO4)	90	mg/L
15	Ammonia	1.41	mg/L
16	Kjeldhal Nitrogen	36.6	mg/L
17	Orthophosphorous	7.16	mg/L
18	Total Phosphorous	16.21	mg/L

Yours faithfully,

A. S. Arora

for Government Analyst
Water Quality Lab Level-II, Aurangabad

OC Signed by
R. A.

ESTIMATES

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

RECAPITULATION COST

Sr. No.	Particulars	Revised Amount for UIDSSMT as per MJP DSR 2012-13(in Rs. Lacs)	Revised Amount for UIDSSMT as per MJP DSR 2012-13(in Rs. Lacs)
1	Collection System		
	A] Zone I - Sewer F and K	6,483.58	7,170.07
	B] Zone II,III,IV - Sewer B,C,D,E	8,211.94	10,179.10
	C] Zone V - Sewer A	2,728.60	1,989.88
	D] Zone VIA and VI B- Sewer L & M	4,108.38	3,682.72
	E] Zone Salim Ali STP	685.34	660.40
2	Construction of Sewage Treatment Plant.		
	a) STP for Kham River Catchment at Nakshatrawadi	6,770.30	5,683.79
	b) STP for Kham River Catchment at Banewadi	2,430.30	1,511.42
	c) STP for Kham River Catchment at Siddartha Garden	599.41	268.07
	d) STP for Kham River Catchment at Padegaon	1,259.32	616.13
	e) STP for Shukna River Catchment at Zalta	2,023.56	1,200.17
3	Refurbishment of Existing Conventional STP of CIDCO to SBR	1,302.24	1,015.26
4	Terminal Pumping Station		
	a) SPS at STP for Kham River Catchment at Golwadi	1040.38	1,144.88
	b) SPS at STP for Kham River Catchment at Banewadi	187.75	208.73
	c)SPS at STP for Kham River Catchment at Siddarth Garden	71.82	66.59
	d) SPS at STP for Kham River Catchment at Padegaon	147.42	152.68
	e) STP for Shukna River Catchment at Zalta	197.57	253.01
	f) STP at CIDCO	157.24	191.39
5	Intermediate Pumping Station at Ward no 98 near junction of 5 nallas	86.79	104.32
6	Rising Main from Golwadi SPS to Nakshatrawadi and ward no 98 to STP	587.40	529.17
	Total (Lacs)	39079.34	36627.79
	Add 1% for Labour Welfare/Upkar	390.79	366.28
	Add 2% for Establishment, Tools and Plants	0.00	0
	Add 2.4% for Consultancy Charges	0.00	0
	ADD 0.25 % Technical Scrutiny Charges	0.00	0
	ADD 12% Service Tax	0.00	0
	Total (Lacs)	39470.13	36994.06

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

ABSTRACT OF COLLECTION SYSTEM FOR SEWERAGE ZONE NO 1

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)	
1	MJP12-13 Section E, Item No 1, Page no 33	Excavation for foundation/ pipe trenches in all types of soils, soft murum including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	5150.90	Cum	140.80	725246.02	
		1.5 to 3 m	35546.25	Cum	154.00	5474122.55	
		3 to 4.5 m	7715.43	Cum	167.20	1290020.47	
		4.5 to 6.0 m	563.91	Cum	180.40	101729.29	
		6 to 7.5 m	0.00	Cum	193.60	0.00	
2	MJP12-13 Section E, Page no 33 Item No 2,	Excavation for foundation/ pipe trenches in in hard murum and boulders,W.B.M.road including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	3090.54	cum	157.72	487433.31	
		1.5 to 3 m	25390.18	cum	170.67	4333214.86	
		3 to 4.5 m	19288.58	cum	183.61	3541615.41	
		4.5 to 6 m	1691.73	cum	196.56	332524.51	
		6 to 7.5 m	0.00	cum	209.51	0.00	
3	MJP12-13, Item No 8, Pg-34	Excavation for foundation/ pipe trenches in slush muddy/ Marshy/ Slushy / Soil use of poclain, labour for dewatering during execution including removing the excation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, preparing the bed by cleaning the mud,labour required for execution for shuttering shall be paid seperately.					
		a	0 to 1.5 m	515.09	cum	343.20	176778.72
		b	1.5 to 3 m	0.00	cum	366.30	0.00
		c	3 to 4.5 m	0.00	cum	389.40	0.00
		d	4.5 to 6 m	563.91	cum	412.50	232612.70
		6 to 7.5 m	0.00	cum	435.60	0.00	
4	MJP12-13, Item No 5, Pg-33	Excavation for foundation/ pipes trenches by all mean in soft rock & old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50M beyond area & lift as below, stacking as directed by Engineer-in -charge, normal dewatering,preparation of bed for foundation & excluding backfilling,etc. complete					
		0 to 1.5 m	1030.18	cum	493.90	508805.41	
		1.5 to 3 m	15234.11	cum	517.00	7876033.46	
		3 to 4.5 m	19288.58	cum	540.10	10417764.00	
		4.5 to 6.0 m	2819.55	cum	563.20	1587969.39	
		6 to 7.5 m	0.00	cum	586.30	0.00	
5	MJP12-13, Item No 7, Pg-34	Excavation in laterite rock masses mechanically including lift upto 1.5m including trimming & travelling bed, removing the excavated material upto a distance of 50m beyond the area as lift as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling,etc.complete					
		0 to 1.5 m	515.09	cum	856.90	441380.19	
		1.5 to 3 m	25390.18	cum	880.00	22343357.34	
		3 to 4.5 m	30861.73	cum	903.10	27871231.76	
		4.5 to 6 m	5639.10	cum	926.20	5222930.56	
		6.0 to 7.5 m	39877.07	cum	949.30	37855307.15	
6	MJP12-13, Item No 2, Pg-40	Providing & Laying in situ cement concrete of Grade M20 Bedding	176.47	cum	5155.50	909809.13	
7	MJP12-13, Item No 19, Pg-36	Filling in plinth and floors/ trenches with excavated stuff for bedding in 15cm to 20cm layer including watering & compaction etc.complete.	22811.11	cum	63.00	1437100.14	

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
8	PWD DSR,2012 Bd-W ITEM-51 PG-110	Dismantling RCC concrete work including bracing concrete by chiseling, welding etc. including cutting the reinforcement, stacking the serviceable material and the debris separately up to a distance of 50 meter or spreading the debris as directed etc. complete	1000	Cum	393.225	393225
9	MJP 12-13, Section E Item No 20, Pg-37	Open Timbering in Trenches of depth more than 1.5 m for shoring and strutting including all timber works including walling, struts, open polling boards/horizontal sheeting, runners, etc. complete as directed by Engineer In-Charge.				
		Lift 0 - 1.5 m non water logged	21719	Sqm	212.10	4606495.39
		Lift 1.5 - 3.0 m non water logged	70489	Sqm	238.35	16800955.47
		Lift 3.0 - 4.5 m non water logged	15360	Sqm	264.60	4064171.86
		Lift 4.5-6.0 m non water logged	2180	Sqm	290.85	634131.06
		Lift 6.0 - 7.5 m non water logged	3836	Sqm	312.85	1200011.85
10		Dewatering				
	MJP12-13, Item No 14, Pg-35	Dewatering the excavated trenches and pools of water in the building trenches pipelines, as well works by using pumps and other devices including disposing off water to safe distance as directed by engineer-in-charge (including cost of machinery, labour, fuel) etc. complete.	25238.70	bhp/hr	63	1590038.1
11		Transportation of earth				
	MJP12-13, Statement VI, Pg-19	Transportation charges including loading & unloading excavated material for a lead beyond initial lead up to 10km average rate	44964.28	cum	336.76	15142171.79
	MJP DSR 12-13, Item no 3 Page no 90	Providing and Supplying in standard length Polyethylene (PE) pipes for non pressure underground drainage and sewerage with smooth internal and corrugated (profiled) external surface with Antirodent property conforming to ISO-21138-3:2007 with necessary jointing material like mechanical connector, e.t hread/insert joint/quick release coupler/compression fitting joint/or flanged joint including gallo local and central taxes, transportation and freight charges, inspection charges, loading and unloading charges, conveyance to the departmental stores/site and stacking the same in closed shade duly protecting from sun rays and rain setc complete				
a		200 mm	7680	RMT	457.60	3514139.20
b		250 mm	6308	RMT	873.60	5510406.72
c		315 mm	7719	RMT	1098.24	8477644.03
	MJP DSR 12-13, Item no 4 Page no 92	Lowering, Laying and jointing HDPE Double Wall Corrugated Pipes for on pressure Underground drainage and Sewerage applications and special also following class and diameter including cost of conveyance from stores to site of works including cost of all labour material except Oring coupler giving satisfactory hydraulic testing as per relevant ISO etc complete				
a		200 mm	7680	RMT	40.95	314475.53
b		250 mm	6308	RMT	51.45	324531.17
c		300 mm	7719	RMT	63.00	486315.90
		Providing and Laying Pipes (RCC NP2 pipe)				
12	MJP DSR 12-13, Item no 1 Page no 71	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
a		150 mm	23375	RMT	368.16	8605887.26
b		400 mm	5167	RMT	984.88	5088874.96
c		450 mm	572	RMT	1154.40	660316.80
d		500 mm	842.00	RMT	1348.88	1135756.96
		900 mm				
			29956.40			
13		Providing and Laying Pipes (RCC NP3 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP III				
a		150 mm	1591	RMT	434.72	691639.52
b		400 mm	1508	RMT	1826	2753969.92
c		450 mm	206	RMT	2172	446464.51
d		500 mm	147	RMT	2412	355493.42
e		600 mm	2137	RMT	3178	6791898.88
f		700 mm	2623	RMT	4319	11329051.76
g		800 mm	567	RMT	5146	2917736.64
h		900 mm	1974	RMT	5944	11732072.04
i		1000 mm	0	RMT	7272	0.00
j		1100 mm	0	RMT	8413	0.00
k		1200 mm	1639	RMT	9870	16176274.40
l		1400 mm	3976	RMT	11860	47153624.13
m		1600 mm	1902	RMT	17283	32871733.44
n		1800 mm	0	RMT	22860	0.00
			18269.70			
14		Providing and Laying Pipes (RCC NP4 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP IV				
a		150 mm	61	RMT	497.12	30175.18
b		400 mm	2582	RMT	1917	4948971.04
c		450 MM	814	RMT	2261	1839517.06
d		500 mm	124	RMT	2762	343070.21
e		600 mm	835	RMT	3379	2822783.18
f		700 mm	0	RMT	5056	0.00
g		800 mm	0	RMT	5775	0.00
h		900 mm	382	RMT	6764	2582556.29
i		1000 mm	0	RMT	9575	0.00
j		1100 mm	0	RMT	10388	0.00
k		1200 mm	0	RMT	10434	0.00
l		1400 mm	140	RMT	16293	2280969.60
m		1600 mm	362	RMT	20312	7344905.98
n		2000 mm	272	RMT	27845	7568260.13
		Total NP3 pipes	5571.10			
16	MJP 12-13, Item No 2, Pg- 72	Lowering laying and jointing in proper grade and alignment R.C.C. pipes with spigot socketed RCC pipes in C.M.1:1 preparation or socketed RCC pipes with rubber joints (excluding cost of rubber ring) including cost of conveyance from stores to site of work, cost of jointing material, labour, giving hydraulic testing etc. complete as directed by engineer-in charge (For all class of pipes.) as per IS-783-1985				
a		150 mm	25027.10	RMT	58.80	1471593.48
e		400 mm	9257.00	RMT	162.75	1506576.75
f		450 MM	1591.20	RMT	194.25	309090.60
g		500 mm	1113.60	RMT	213.15	237363.84
h		600 mm	2972.40	RMT	266.70	792739.08
i		700 mm	2623.00	RMT	303.45	795949.35
j		800 mm	567.00	RMT	350.70	198846.90
k		900 mm	2355.70	RMT	387.45	912715.97
l		1000 mm	0.00	RMT	424.20	0.00
m		1100 mm	0.00	RMT	574.35	0.00
n		1200 mm	1639.00	RMT	611.10	1001592.90
o		1400 mm	4115.80	RMT	684.60	2817676.68
p		1600 mm	2263.60	RMT	758.10	1716035.16
q		2000 mm	271.80	RMT	831.60	226028.88
			53797.20			
17		Providing and Laying Pipes (DI K9 pipe)	77638.00			

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
	MJP 12-13, Item No 3, Pg-65	Providing D I K9 grade Pipe, with internal cement mortar lining including all taxes. insurance. railway freight, unloading from railway wagon. loading into truck, transport to departmental stores site, unloading- stacking etc complete. (IS 8329-2000 latest Version)				
a		150 mm	501.00	RMT	1350.96	676830.96
b		200 mm	154.00	RMT	1832.48	282201.92
c		250 mm	126.00	RMT	2392.00	301392.00
d		300 mm	154.00	RMT	3021.20	465264.80
e		400 mm	185.00	RMT	4603.04	851562.40
f		500 mm	32.00	RMT	6214.00	198848.00
g		600 mm	22.00	RMT	8110.96	178441.12
h		700 mm	59.00	RMT	10876.32	641702.88
i		750 mm	52.00	RMT	12310.48	640144.96
j		800 mm	11.00	RMT	13601.12	149612.32
k		900 mm	0.00	RMT	16655.60	0.00
l		1000 mm	0.00	RMT	19864.00	0.00
18	MJP 12-13, Item No 2, Pg-65	Lowering laying and jointing in proper grade with SBR rubber gaskets D.I K7 pipes with MS specials of following diameter in proper position, grade and alignment as directed by Engineer-In-charge including conveyance of materials from stores to site of work, including cost of jointing materials and rubber rings labour, giving hydraulic testing etc. complete as directed by engineer-in-charge				
		Only SBR Rubber Ring gaskets to be used as per IS-5382 and IS-12820				
a		150 mm	501.00	RMT	82.950	41557.95
b		200 mm	154.00	RMT	109.200	16816.80
c		250 mm	126.00	RMT	141.750	17860.50
d		300 mm	154.00	RMT	159.600	24578.40
e		400 mm	185.00	RMT	241.500	44677.50
f		500 mm	32.00	RMT	294.000	9408.00
g		600 mm	22.00	RMT	391.650	8616.30
h		700 mm	59.00	RMT	551.250	32523.75
i		750 mm	52.00	RMT	602.700	31340.40
j		800 mm	11.00	RMT	707.700	7784.70
k		900 mm	0.00	RMT	888.300	0.00
l		1000 mm	0.00	RMT	1077.300	0.00
19		Manholes				
a-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.0 m dia and up to a depth of 3.5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	301	No.	56262.15	16907901.96
		rebate for every decrease in depth of 50 cm or part thereof (MJP SOR 10-11 Item 9)	150	50cm depth	5626.22	-845395.10
a-2	MJP DSR 12-13, Section XX, Item No. 6, Page no 179	Providing and constructing on sewer.BBM manhole 1.2 m dia at bottom and 0.5 m dia at top and up to a depth of 2.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	1724	No.	21025.20	36240716.74
		rebate for every decrease in depth of 50 cm or part thereof	1034	50cm depth	2875.95	-2974330.50
b-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.2 m dia and up to a depth of 5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	76	No.	144531.36	10912117.83

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		rebate for every decrease in depth of 50 cm or part thereof	38	50 cm depth	14453.14	-545605.89
b-2	MJP DSR 12-13, Section XX, Item No. 7 Page no 179	Providing and constructing on sewer.BBM manhole 1.5 m dia at bottom and 0.5 m dia at top and up to a depth of 2 to 5.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	192	No.	58791.60	8551746.00
		rebate for every decrease in depth of 50 cm or part thereof	96	50 cm depth	5913.60	-567409.92
c-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.5 m dia and up to a depth of 9 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	42	No.	302462.87	12733686.74
		rebate for every decrease in depth of 50 cm or part thereof	21	50 cm depth	30246.29	-636684.34
c-2	MJP DSR 12-13, Section XX, Item No. 8, Page no 180	Providing and constructing on sewer.BBM manhole 2.0 m dia at bottom and 0.5 m dia at top and up to a depth of 5 to 9.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	109	No.	126352.80	13759819.92
		rebate for every decrease in depth of 50 cm or part thereof	54	50 cm depth	7468.65	-406667.99
20		Drainage Drops				
a	MJP12-13 Item No 10 to 16, Page no 181	Providing 150mm dia S.W. or R.C.C.pipes in vertical drop arrangement including providing 150 dia S.W. R.C.C. pipe fixed in B.B.mosanary of manhole at the required level including providing 150 mm dia double tee, 150 mm dia right angle bend, encasing in BB masonry 1:4 proportion all around the pipe, double tee, bend up to the foundation of manhole jointing, cutting filleting including neat cement rendering plugging the opening with jungle wood knob complete as directed by Engineer-in-charge (0.60M depth)			1913.10	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	4	50 cm depth	663.60	2654.40
b		As above but 200 mm dia pipes and depth 0.60M	0	No.	2532.60	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	794.85	0.00
c		As above but 250 mm dia pipes and depth 0.60M	0	No.	3051.30	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	4	50 cm depth	989.10	3956.40
d		As above but 300 mm dia pipes and depth 0.60M	0	No.	3715.95	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1077.30	0.00
e		As above but 400 mm dia pipes and depth 0.60M	0	No.	5037.90	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1492.05	0.00
f		As above but 500 mm dia pipes and depth 0.60M	0	No.	6793.50	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1959.30	0.00
g		As above but 600 mm dia pipes and depth 0.60M	0	No.	8850.45	0.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	2155.65	0.00
21		RCC				

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
	MJP12-13, Item No 2, Pg-45	Providing and laying insitu Cement concrete of trap/granite/ quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including dewatering, formwork, compaction finishing & curing etc, complete.(By weigh batching and mix design for M-250 and M-300 only.) Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree etc cement is permitted) (excluding M.S. or Tor reinforcement)				
		For RCC M-250 grade	200.00	cum	5719.35	1143870.00
		STEEL REINFORCEMENT				
22	MJP12-13, Item No 8, Pg-49	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles caps ,footing foundations, slabs, beams, columns,canopies,staircases,newls ,chajjas lintels,pardies,copings ,fins arches ,etc. as per detailed designs, drawings and schedules including cutting bending ,hooking the bars, binding with wires or tack welding and supporting as required etc.complete. (including cost of binding wire)				
			20.00	MT	61122.60	1222452.00
		House Service Connection				
23	Rate Analysis	Providing making under ground drainage service connection to consumer including all material & labour with considering four properties & one inspection chamber	10186.00	Nos	10811.00	110120846.00
26		Refilling in trenches				
A	MJP 12-13, Item No 17, Pg-40	Refilling the trenches with approved excavated stuff with soft materials first over pipeline & then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging etc.complete.	195207.82	cum	62.92	12281695.43
27	RA	Road restoration	111524.48	Sqm	730.00	81412869.96
28	MJP 12-13, Item No 8, Pg-188	Providing and fixing RCC ventilation shaft, making connection to manhole etc. complete as directed by EIC.	351.23	Nos	9185.40	3226154.97
29	MJP 12-13, Item No 10, Pg-46	Making cross connection to existing distribution main of any type including excavation, breaking and removing exiting pipes, lowering, laying of specials and pipes in their position, refilling, closing the water supply in that area, dewatering and restarting the water supply, etc. complete as directed by Engineer-in-charge for following diameters of existing pipeline, irrespective of diameter of branch line (the number of joints involved will be paid separately depending upon the nature of joints and required pipes, valves and specials will be supplied free of cost at stores).				
		80 mm	300.00	No	1433.25	429975.00
		100 mm	200.00	No	1634.85	326970.00
		125 mm	60.00	No	1799.70	107982.00
		150 mm	150.00	No	2058.00	308700.00
		200 mm	10.00	No	2160.90	21609.00
		250 mm	10.00	No	2568.30	25683.00
		300 mm	10.00	No	3126.90	31269.00
		350 mm	10.00	No	3816.75	38167.50
		400 mm	10.00	No	4453.05	44530.50
		450 mm	10.00	No	6186.60	61866.00
		500 mm	10.00	No	6333.60	63336.00
30	MJP 12-13, Item No 11, Page no 47	Dismantling dead pipeline of M.S./R.C.C./ C.I./ P.S.C. and G.I./ A. C. / P. V. C. / S. W. / H. D. P. E. pipe including cost of necessary excavation and refilling of trenches, breaking the joints, lifting the pipes and stacking to the place as directed by Engineer-in-charge with all leads and lifts including cleaning the surface, etc. complete.				
		80 mm	300.00	No	128.10	38430.00
		100 mm	200.00	No	140.70	28140.00
		125 mm	60.00	No	143.85	8631.00
		150 mm	150.00	No	147.00	22050.00
		200 mm	10.00	No	161.70	1617.00
		250 mm	10.00	No	178.50	1785.00
		300 mm	10.00	No	194.25	1942.50

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		350 mm	10.00	No	216.30	2163.00
		400 mm	10.00	No	237.30	2373.00
		450 mm	10.00	No	269.85	2698.50
		500 mm	10.00	No	282.45	2824.50
31	RA	Shifting of Existing Utilities Length considered upto 400 mm	55.99	Km	12527.00	701413.04
		Total Cost				696,123,628.16
		Add 3% Contengencies				20,883,708.84
		Total Cost				717,007,337.01

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

ABSTRACT OF COLLECTION SYSTEM FOR SEWERAGE ZONE NO 2, 3 & 4

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
1	MJP12-13 Section E, Item No 1,	Excavation for foundation/ pipe trenches in all types of soils, soft murum including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.				
		0 to 1.5 m	19357.71	Cum	140.80	2725565.83
		1.5 to 3 m	50040.86	Cum	154.00	7706291.70
		3 to 4.5 m	8617.27	Cum	167.20	1440806.91
		4.5 to 6.0 m	4254.84	Cum	180.40	767572.40
		6 to 7.5 m	0.00	Cum	193.60	0.00
2	MJP12-13 Section E, Item No 2,	Excavation for foundation/ pipe trenches in in hard murum and boulders,W.B.M.road including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.				
		0 to 1.5 m	6452.57	cum	177.10	1142750.26
		1.5 to 3 m	35743.47	cum	190.30	6801981.96
		3 to 4.5 m	21543.17	cum	203.50	4384034.19
		4.5 to 6 m	6382.25	cum	216.70	1383034.42
		6 to 7.5 m	0.00	cum	229.90	0.00
3	MJP12-13, Item No 10, Pg-37	Excavation for foundation/ pipe trenches in slush muddy/ Marshy/ Slushy / Soil use of poelain, labour for dewatering during execution including removing the excation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, preparing the bed by cleaning the mud,labour required for execution for shuttering shall be paid seperately.				
		a	0 to 1.5 m	1613.14	cum	343.20
4	MJP12-13, Item No 5, Pg-36	Excavation for foundation/ pipes trenches by all mean in soft rock & old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50M beyond area & lift as below, stacking as directed by Engineer-in -charge, normal dewatering,prepration of bed for foundation & excluding backfilling,etc. complete				
		0 to 1.5 m	3226.29	cum	493.90	1593462.31
		1.5 to 3 m	21446.08	cum	517.00	11087623.77
		3 to 4.5 m	21543.17	cum	540.10	11635463.72
		4.5 to 6.0 m	10637.09	cum	563.20	5990808.98
		6 to 7.5 m	0.00	cum	586.30	0.00
5	MJP12-13, Item No 9, Pg-37	Excavation in laterite rock masses mechanically including lift upto 1.5m including trimming & travelling bed, removing the excavated material upto a distance of 50m beyond the area as lift as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling,etc.complete				
		0 to 1.5 m	1613.14	cum	856.90	1382301.94
		1.5 to 3 m	35743.47	cum	880.00	31454251.82
		3 to 4.5 m	34469.06	cum	903.10	31129012.51
		4.5 to 6 m	21274.18	cum	926.20	19704145.17
		6.0 to 7.5 m	1657.63	cum	949.30	1573584.36
6	MJP12-13, Item No 19, Pg-40	Providing & Laying in situ cement concrete of Grade M15 Bedding	261.19	cum	5155.50	1346573.81
7	MJP12-13, Item No 19, Pg-40	Filling in plinth and floors/ trenches with excavated stuff for bedding in 15cm to 20cm layer including watering & compaction etc.complete.	32401.57	cum	63.00	2041298.67
8	PWD DSR,2012 Bd-W ITEM- 51 PG-110	Dismantling RCC concrete work including braking concrete by chiseling, welding etc. including cutting the reinforcement, stacking the serviceable material and the debris separately up to a distance of 50 meter or spreading the debris as directed etc. complete	1000	Cum	393.225	393225

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
9	MJP 12-13, Section E Item No 20, Pg-40	Open Timbering in Trenches of depth more than 1.5 m for shoring and strutting including all timber works including walling, struts, open polling boards/horizontal sheeting, runners, etc. complete as directed by Engineer In-Charge.				
		Lift 0 - 1.5 m non water logged	44760	Sqm	212.10	9493650.59
		Lift 1.5 - 3.0 m non water logged	73061	Sqm	238.35	17414095.95
		Lift 3.0 - 4.5 m non water logged	16286	Sqm	264.60	4309371.34
		Lift 4.5-6.0 m non water logged	4580	Sqm	290.85	1332209.30
					312.85	
10		Dewatering				
	MJP12-13, Item No 16, Pg-39	Dewatering the excavated trenches and pools of water in the building trenches pipelines, as well works by using pumps and other devices including disposing off water to safe distance as directed by engineer-in-charge (including cost of machinery, labour, fuel) etc. complete.	42849.50	bhp/hr	63	2699518.5
11		Transportation of earth				
	MJP12-13, Statement VI, Pg-21	Transportation charges including loading & unloading excavated material for a lead beyond initial lead up to 10km average rate	61246.02	cum	336.76	20625208.68
12	MJP DSR 12-13 Page no 90	Providing and Supplying instandard length Polyethylene(PE) pipes form on pressure underground drainage and sewerage with smooth internal and corrugated (profiled) external surface with Anti rodent property confirming to ISO-21138-3:2007 with necessary jointing material like mechanical connector i.e.thread/insertjoint/quick release coupler /compression fitting joint/orflanged joint including all local and central taxes, transportation and freight charges, inspection charges, loading and unloading charges, conveyance to the departmental stores /site and stacking the same inclosed shadedulyprotectingfromsunrays an drains etc complete				
a		200 mm	11916	RMT	457.60	5452807.36
b		250 mm	14444	RMT	873.60	12617841.60
c		315 mm	11940	RMT	1098.24	13112765.95
12	MJP DSR 12-13 Page no 92	Lowering, Laying and jointing HDPE Double Wall Corrugated Pipes form on pressure Underground drainage and Sewerage applications and specials of following class and diameter including cost of conveyance from stores to site of works including cost of all labour material except O ring coupler giving satisfactory hydraulic testing as pe rrelevant ISO etc complete				
a		200 mm	11916	RMT	40.95	487964.30
b		250 mm	14444	RMT	51.45	743118.08
c		300 mm	11940	RMT	63.00	752207.40
		Providing and Laying Pipes (RCC NP2 pipe)				
14	MJP DSR 12-13, Item no 1 Page no 71	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
a		150 mm	30357	RMT	368.16	11176380.38
b		400 mm	10093.80	RMT	984.88	9941181.74
c		450 mm	628.80	RMT	1154.40	725886.72
d		500 mm	6148.50	RMT	1348.88	8293588.68
15		Providing and Laying Pipes (RCC NP3 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP III				
a		150 mm	1957.38	RMT	434.72	850912.23
b		400 mm	2069	RMT	1826	3777577.44
c		450 mm	1482	RMT	2172	3218844.10
d		500 mm	429	RMT	2412	1034403.86

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
e		600 mm	3090	RMT	3178	9820761.60
f		700 mm	3086	RMT	4319	13327076.67
g		800 mm	2616	RMT	5146	13463270.50
h		900 mm	3928	RMT	5944	23348838.24
i		1000 mm	1676	RMT	7272	12188062.85
j		1100 mm	2122	RMT	8413	17847246.04
k		1200 mm	1451	RMT	9870	14322763.52
l		1400 mm	24	RMT	11860	288201.89
m		1600 mm	101	RMT	17283	1742098.18
n		1800 mm	783	RMT	22860	17906425.99
16		Providing and Laying Pipes (RCC NP4 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP IV				
a		150 mm	226	RMT	497.12	112130.39
b		200 mm	0	RMT	457.60	0.00
c		250 mm	0	RMT	873.60	0.00
d		300 mm	0	RMT	1098.24	0.00
e		400 mm	14	RMT	1917	26259.06
f		450 MM	226	RMT	2261	510750.86
g		500 mm	1153	RMT	2762	3183481.60
h		600 mm	0	RMT	3379	0.00
i		700 mm	490	RMT	5056	2476158.26
j		800 mm	528	RMT	5775	3046953.31
k		900 mm	175	RMT	6764	1183728.00
l		1000 mm	711	RMT	9575	6810896.66
m		1100 mm	831	RMT	10388	8636184.13
n		1200 mm	1102	RMT	10434	11501750.94
o		1400 mm	295	RMT	16293	4811216.59
p		1600 mm	492	RMT	20312	9983465.96
q		1800 mm	1374	RMT	27845	38256190.54
17	MJP 12-13, Item No 2, Pg- 72	Lowering laying and jointing in proper grade and alignment R.C.C. pipes with spigot socketed RCC pipes in C.M.1:1 preparation or socketed RCC pipes with rubber joints (excluding cost of rubber ring) including cost of conveyance from stores to site of work, cost of jointing material, labour, giving hydraulic testing etc. complete as directed by engineer in charge. (For all class of				
a		150 mm	32540.34	RMT	58.80	1913371.99
b		200 mm	0.00	RMT	40.95	0.00
c		250 mm	0.00	RMT	51.45	0.00
d		300 mm	0.00	RMT	63.00	0.00
e		400 mm	12176.00	RMT	162.75	1981644.00
f		450 MM	2337.00		194.25	453962.25
g		500 mm	7729.90	RMT	213.15	1647628.19
h		600 mm	3090.00	RMT	266.70	824103.00
i		700 mm	3575.30	RMT	303.45	1084924.79
j		800 mm	3143.90	RMT	350.70	1102565.73
k		900 mm	4103.40	RMT	387.45	1589862.33
l		1000 mm	2387.40	RMT	424.20	1012735.08
m		1100 mm	2952.90	RMT	574.35	1695998.12
n		1200 mm	2553.50	RMT	611.10	1560443.85
o		1400 mm	319.60	RMT	684.60	218798.16
p		1600 mm	592.30	RMT	758.10	449022.63
q		1800 mm	2157.20	RMT	831.60	1793927.52
18		Providing and Laying Pipes (DI K9 pipe)				
	MJP 12-13, Item No 3, Pg-65	Providing DI K-9 grade Pipe, with internal cement mortar lining including all taxes. insurance. railway freight, unloading from railway wagon. loading into truck, transport to departmental stores site, unloading- stacking etc complete. (IS 8329-2000 latest Version)				
a		150 mm	651.00	RMT	1350.96	879474.96
b		200 mm	238.00	RMT	1832.48	436130.24
c		250 mm	289.00	RMT	2392.00	691288.00
d		300 mm	239.00	RMT	3021.20	722066.80
e		400 mm	244.00	RMT	4603.04	1123141.76

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
f		500 mm	47.00	RMT	6214.00	292058.00
g		600 mm	155.00	RMT	8110.96	1257198.80
h		700 mm	62.00	RMT	10876.32	674331.84
i		750 mm	72.00	RMT	12310.48	886354.56
j		800 mm	63.00	RMT	13601.12	856870.56
k		900 mm	82.00	RMT	16655.60	1365759.20
l		1000 mm	48.00	RMT	19864.00	953472.00
19	MJP 12-13, Item No 2, Pg-65	Lowering laying and jointing in proper grade with SBR rubber gaskets D.I K7 pipes with MS specials of following diameter in proper position, grade and alignment as directed by Engineer-In-charge including conveyance of materials from stores to site of work, including cost of jointing materials and rubber rings labour, giving hydraulic testing etc. complete as directed by engineer in charge.				
		Only SBR Rubber Ring gaskets to be used as per IS-5382 and IS-12820				
a		150 mm	651.00	RMT	82.950	54000.45
b		200 mm	238.00	RMT	109.200	25989.60
c		250 mm	289.00	RMT	141.750	40965.75
d		300 mm	239.00	RMT	159.600	38144.40
e		400 mm	244.00	RMT	241.500	58926.00
f		500 mm	47.00	RMT	294.000	13818.00
g		600 mm	155.00	RMT	391.650	60705.75
h		700 mm	62.00	RMT	551.250	34177.50
i		750 mm	72.00	RMT	602.700	43394.40
j		800 mm	63.00	RMT	707.700	44585.10
k		900 mm	82.00	RMT	888.300	72840.60
l		1000 mm	48.00	RMT	1077.300	51710.40
20		Manholes				
a-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.0 m dia and up to a depth of 3.5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	461	No.	56262.15	25936852.14
		rebate for every decrease in depth of 50 cm or part thereof (MJP SOR 10-11 Item 9)	46	50cm depth	5626.22	-259368.52
a-2	MJP DSR 12-13, Section XX, Item No. 6, Page no 179	Providing and constructing on sewer.BBM manhole 1.2 m dia at bottom and 0.5 m dia at top and up to a depth of 2.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	3168	No.	21025.20	66607833.60
		rebate for every decrease in depth of 50 cm or part thereof	1901	50cm depth	2875.95	-5466605.76
b-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.2 m dia and up to a depth of 5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	90	No.	144531.36	12964463.17
		rebate for every decrease in depth of 50 cm or part thereof	45	50 cm depth	14453.14	-648223.16

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
b-2	MJP DSR 12-13, Section XX, Item No. 7 Page no 179	Providing and constructing on sewer.BBM manhole 1.5 m dia at bottom and 0.5 m dia at top and up to a depth of 2 to 5.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	429	No.	58791.60	8551746.00
		rebate for every decrease in depth of 50 cm or part thereof	215	50 cm depth	5913.60	-1269354.24
c-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.5 m dia and up to a depth of 9 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	37	No.	302462.87	11281864.98
		rebate for every decrease in depth of 50 cm or part thereof	19	50 cm depth	30246.29	-564093.25
c-2	MJP DSR 12-13, Section XX, Item No. 8, Page no 180	Providing and constructing on sewer.BBM manhole 2.0 m dia at bottom and 0.5 m dia at top and up to a depth of 5 to 9.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	66	No.	126352.80	8301378.96
		rebate for every decrease in depth of 50 cm or part thereof	33	50 cm depth	7468.65	-245345.15
21		Drainage Drops				
a	MJP12-13 Item No 10 to 16, Page no 181	Providing 150mm dia S.W. or R.C.C.pipes in vertical drop arrangement including providing 150 dia S.W. R.C.C. pipe fixed in B.B.mosanary of manhole at the required level including providing 150 mm dia double tee, 150 mm dia right angle bend, encasing in BB masonry 1:4 proportion all around the pipe, double tee, bend up to the foundation of manhole jointing, cutting filleting including neat cement rendering plugging the opening with jungle wood knob complete as directed by Engineer-in-charge (0.60M depth)	453	No.	1913.10	867273.55
		Extra for every 0.5 depth beyond initial depth of 0.60 M	15	50 cm depth	663.60	9779.11
b		As above but 200 mm dia pipes and depth 0.60M	65	No.	2532.60	163877.55
		Extra for every 0.5 depth beyond initial depth of 0.60 M	11	50 cm depth	794.85	8664.54
c		As above but 250 mm dia pipes and depth 0.60M	36	No.	3051.30	109354.53
		Extra for every 0.5 depth beyond initial depth of 0.60 M	6	50 cm depth	989.10	5992.95
d		As above but 300 mm dia pipes and depth 0.60M	27	No.	3715.95	100271.90
		Extra for every 0.5 depth beyond initial depth of 0.60 M	5	50 cm depth	1077.30	4886.67
e		As above but 400 mm dia pipes and depth 0.60M	29	No.	5037.90	148524.18
		Extra for every 0.5 depth beyond initial depth of 0.60 M	7	50 cm depth	1492.05	10328.89
f		As above but 500 mm dia pipes and depth 0.60M	6	No.	6793.50	42530.89

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		Extra for every 0.5 depth beyond initial depth of 0.60 M	7	50 cm depth	1959.30	14106.39
9		As above but 600 mm dia pipes and depth 0.60M	23	No.	8850.45	200344.04
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	2155.65	0.00
22		RCC				
	MJP12-13, Item No 2, Pg-45	Providing and laying insitu Cement concrete of trap/granite/ quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including dewatering, formwork, compaction finishing & curing etc, complete.(By weigh batching and mix design for M-250 and M-300 only.) Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree etc cement is permitted) (excluding M.S. or Tor reinforcement)				
		For RCC M-250 grade	200.00	cum	5719.35	1143870.00
		STEEL REINFORCEMENT				
23	MJP12-13, Item No 8, Pg-49	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles caps ,footing foundations, slabs, beams, columns,canopies,staircases,newls ,chajjas lintels,pardies,copings ,fins arches ,etc. as per detailed designs, drawings and schedules including cutting bending ,hooking the bars, binding with wires or tack welding and supporting as required etc.complete. (including cost of binding wire)				
			20.00	MT	61122.60	1222452.00
		House Service Connection				
24	Rate Analysis	Providing making under ground drainage service connection to consumer including all material & labour with considering four properties & one inspection chamber	18689.00	Nos	10811.00	202046779.00
24	MJP 12-13, Item No 17, Pg-40	Refilling in trenches				
A		Refilling the trenches with approved excavated stuff with soft materials first over pipeline & then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging etc.complete.	244369.36	cum	62.92	15374742.37
25	RA	Road restoration	160728.25	Sqm	730.00	117331624.47
26	MJP 12-13, Item No 8, Pg-188	Providing and fixing RCC ventilation shaft, making connection to manhole etc. complete as directed by EIC.	496.00	Nos	9185.40	4555958.40
27	MJP 12-13, Item No 10, Pg-46	Making cross connection to existing distribution main of any type including excavation, breaking and removing exiting pipes, lowering, laying of specials and pipes in their position, refilling, closing the water supply in that area, dewatering and restarting the water supply, etc. complete as directed by Engineer-in-charge for following diameters of existing pipeline, irrespective of diameter of branch line (the number of joints involved will be paid separately depending upon the nature of joints and required pipes, valves and specials will be supplied free of cost at stores).				
		80 mm	300.00	No	1433.25	429975.00
		100 mm	200.00	No	1634.85	326970.00
		125 mm	60.00	No	1799.70	107982.00
		150 mm	150.00	No	2058.00	308700.00
		200 mm	10.00	No	2160.90	21609.00
		250 mm	10.00	No	2568.30	25683.00
		300 mm	10.00	No	3126.90	31269.00
		350 mm	10.00	No	3816.75	38167.50
		400 mm	10.00	No	4453.05	44530.50
		450 mm	10.00	No	6186.60	61866.00
		500 mm	10.00	No	6333.60	63336.00

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
28	MJP 12-13, Item No 11, Page no 47	Dismantling dead pipeline of M.S./R.C.C./ C.I./ P.S.C. and G.I./ A. C. / P. V. C. / S. W. / H. D. P. E. pipe including cost of necessary excavation and refilling of trenches, breaking the joints, lifting the pipes and stacking to the place as directed by Engineer-in-charge with all leads and lifts including cleaning the surface, etc. complete.				
		80 mm	300.00	No	128.10	38430.00
		100 mm	200.00	No	140.70	28140.00
		125 mm	60.00	No	143.85	8631.00
		150 mm	150.00	No	147.00	22050.00
		200 mm	10.00	No	161.70	1617.00
		250 mm	10.00	No	178.50	1785.00
		300 mm	10.00	No	194.25	1942.50
		350 mm	10.00	No	216.30	2163.00
		400 mm	10.00	No	237.30	2373.00
		450 mm	10.00	No	269.85	2698.50
		500 mm	10.00	No	282.45	2824.50
29	Rate Analysis	Shifting of Existing Utilities Length considered upto 400 mm	83.02	Km	12527.00	1039949.45
		Total Cost				988,262,460.72
		Add 3% Contengencies				29647873.82
		Total Cost				1,017,910,334.54

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY, MAHARASHTRA

ABSTRACT OF COLLECTION SYSTEM FOR SEWERAGE ZONE NO 5

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)	
1	MJP12-13 Section E, Item No 1, Page no 33	Excavation for foundation/ pipe trenches in all types of soils, soft murum including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	2054.21	Cum	140.80	289232.91	
		1.5 to 3 m	6658.34	Cum	154.00	1025384.81	
		3 to 4.5 m	777.44	Cum	167.20	129987.22	
		4.5 to 6.0 m	162.47	Cum	180.40	29309.66	
		6 to 7.5 m	0.00	Cum	193.60	0.00	
2	MJP12-13 Section E, Page no 33 Item No 2,	Excavation for foundation/ pipe trenches in in hard murum and boulders,W.B.M.road including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	684.74	cum	177.10	121266.92	
		1.5 to 3 m	5548.62	cum	190.30	1055902.22	
		3 to 4.5 m	3887.18	cum	203.50	791040.64	
		4.5 to 6 m	487.41	cum	216.70	105621.99	
		6 to 7.5 m	0.00	cum	229.90	0.00	
3	MJP12-13, Item No 8, Pg-34	Excavation for foundation/ pipe trenches in slush muddy/ Marshy/ Slushy / Soil use of poclain, labour for dewatering during execution including removing the excation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, preparing the bed by cleaning the mud,labour required for execution for shuttering shall be paid seperately.					
		a	0 to 1.5 m	171.18	cum	343.20	58750.43
		b	1.5 to 3 m	1109.72	cum	366.30	406491.84
		c	3 to 4.5 m	777.44	cum	389.40	302733.39
		d	4.5 to 6 m	162.47	cum	412.50	67019.03
		6 to 7.5 m	0.00	cum	435.60	0.00	
4	MJP12-13, Item No 5, Pg-33	Excavation for foundation/ pipes trenches by all mean in soft rock & old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50M beyond area & lift as below, stacking as directed by Engineer-in -charge, normal dewatering,prepration of bed for foundation & excluding backfilling,etc. complete					
		0 to 1.5 m	342.37	cum	493.90	169095.80	
		1.5 to 3 m	3329.17	cum	517.00	1721181.65	
		3 to 4.5 m	3887.18	cum	540.10	2099464.61	
		4.5 to 6.0 m	812.35	cum	563.20	457516.58	
		6 to 7.5 m	0.00	cum	586.30	0.00	
5	MJP12-13, Item No 7, Pg-34	Excavation in laterite rock masses mechanically including lift upto 1.5m including trimming & travelling bed, removing the excavated material upto a distance of 50m beyond the area as lift as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling,etc.complete					
		0 to 1.5 m	171.18	cum	856.90	146687.78	
		1.5 to 3 m	5548.62	cum	880.00	4882784.83	
		3 to 4.5 m	6219.48	cum	903.10	5616816.11	
		4.5 to 6 m	1624.70	cum	926.20	1504800.61	
		6.0 to 7.5 m	32036.36	cum	949.30	30412119.75	
6	MJP12-13, Item No 2, Pg-40	Providing & Laying in situ cement concrete of Grade M15 Bedding	40.06	cum	5155.50	206544.28	
7	MJP12-13, Item No 19, Pg-36	Filling in plinth and floors/ trenches with excavated stuff for bedding in 15cm to 20cm layer including watering & compaction etc.complete.	4782.12	cum	63.00	301273.32	
8	PWD DSR,2012 Bd-W ITEM- 51 PG-110	Dismantling RCC concrete work including braking concrete by chiseling, welding etc. including cutting the reinforcement, stacking the serviceable material and the debris separately up to a distance of 50 meter or spreading the debris as directed etc. complete	200	Cum	393.225	78645	

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
9	MJP 12-13, Section E Item No 20, Pg-37	Open Timbering in Trenches of depth more than 1.5 m for shoring and strutting including all timber works including walling, struts, open polling boards/horizontal sheeting, runners, etc. complete as directed by Engineer In-Charge.				
		Lift 0 - 1.5 m non water logged	29162	Sqm	212.10	6185345.04
		Lift 1.5 - 3.0 m non water logged	15258	Sqm	238.35	3636744.30
		Lift 3.0 - 4.5 m non water logged	2698	Sqm	264.60	713848.46
		Lift 4.5-6.0 m non water logged	2410	Sqm	290.85	700832.16
		Lift 6.0 - 7.5 m non water logged	0	Sqm	312.85	0.00
10		Dewatering				
	MJP12-13, Item No 14, Pg-35	Dewatering the excavated trenches and pools of water in the building trenches pipelines, as well works by using pumps and other devices including disposing off water to safe distance as directed by engineer-in-charge (including cost of machinery, labour, fuel) etc. complete.	8800.05	bhp/hr	63	554403.15
11		Transportation of earth				
	MJP12-13, Statement VI, Pg-19	Transportation charges including loading & unloading excavated material for a lead beyond 5 km up to 10km average rate	6918.17	cum	336.76	2329763.20
	MJP DSR 12-13, Item no 3 Page no 90	Providing and Supplying in standard length Polyethylene (PE) pipes for non pressure underground drainage and sewerage with smooth internal and corrugated (profiled) external surface with Antirodent property conforming to ISO-21138-3:2007 with necessary jointing material like mechanical connector, e.t head/insert joint/quick release coupler/compression fitting joint/or flange joint including all local and central taxes, transportation and freight charges, inspection charges, loading and unloading charges, conveyance to the departmental stores/site and stacking the same in closed shed duly protecting from sun rays and rain etc complete				
a		200 mm	2115.40	RMT	457.60	968007.04
b		250 mm	3501.60	RMT	873.60	3058997.76
c		315 mm	4407.50	RMT	1098.24	4840492.80
	MJP DSR 12-13, Item no 4 Page no 92	Lowering, Laying and jointing HDPE Double Wall Corrugated Pipes for on pressure Underground drainage and Sewerage applications and special also following class and diameter including cost of conveyance from stores to site of works including cost of all labour material except Oring coupled giving satisfactory hydraulic testing as per relevant ISO etc complete				
a		200 mm	2115.40	RMT	40.95	86625.63
b		250 mm	3501.60	RMT	51.45	180157.32
c		300 mm	4407.50	RMT	63.00	277672.50
		Providing and Laying Pipes (RCC NP2 pipe)				
12	MJP DSR 12-13, Item no 1 Page no 71	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
a		150 mm	3341	RMT	368.16	1229948.93
b		400 mm	2223	RMT	984.88	2189388.24
c		450 mm	0	RMT	1154.40	0.00
d		500 mm	0	RMT	1348.88	0.00
13		Providing and Laying Pipes (RCC NP3 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP III				
a		150 mm	513.50	RMT	434.72	223228.72
b		400 mm	1685	RMT	1826	3077214.40
c		450 mm	0	RMT	2172	0.00
d		500 mm	375	RMT	2412	903445.30

Sr. No	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
14		Providing and Laying Pipes (RCC NP4 pipe)				
	MJP DSR 12-13, Item no 1 Page no 72	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP IV				
a		150 mm	273	RMT	497.12	135793.30
e		400 mm	1022	RMT	1917	1959462.86
f		450 mm	0		2261	0.00
g		500 mm	361	RMT	2762	997168.64
h		600 mm	1575	RMT	3379	5321186.21
i		700 mm	334	RMT	5056	1689369.97
15	MJP 12-13, Item No 2, Pg- 72	Lowering laying and jointing in proper grade and alignment R.C.C. pipes with spigot socketed RCC pipes in C.M.1:1 preparation or socketed RCC pipes with rubber joints (excluding cost of rubber ring) including cost of conveyance from stores to site of work, cost of jointing material, labour, giving hydraulic testing etc. complete as directed by engineer-in charge (For all class of pipes.) as per IS-783-1985				
a		150 mm	4127.46	RMT	58.80	242694.65
e		400 mm	4930.30	RMT	162.75	802406.33
f		450 mm	0.00		194.25	0.00
g		500 mm	735.60	RMT	213.15	156793.14
h		600 mm	1574.80	RMT	266.70	419999.16
		700 mm	334.10	RMT	303.45	101382.65
16		Providing and Laying Pipes (DI K9 pipe)				
	MJP 12-13, Item No 3, Pg-65	Providing D I K-9 grade Pipe, with internal cement mortar lining including all taxes. insurance. railway freight, unloading from railway wagon. loading into truck, transport to departmental stores site, unloading- stacking etc complete. (IS 8329-2000 latest Version)				
a		150 mm	83.00	RMT	1350.96	112129.68
b		200 mm	42.00	RMT	1832.48	76964.16
c		250 mm	70.00	RMT	2392.00	167440.00
d		300 mm	88.00	RMT	3021.20	265865.60
e		400 mm	99.00	RMT	4603.04	455700.96
f		500 mm	0.00	RMT	6214.00	0.00
g		600 mm	15.00	RMT	8110.96	121664.40
h		700 mm	31.00	RMT	10876.32	337165.92
i		750 mm	7.00	RMT	12310.48	86173.36
j		800 mm	0.00	RMT	13601.12	0.00
k		900 mm	0.00	RMT	16655.60	0.00
l		1000 mm	0.00	RMT	19864.00	0.00
18	MJP 12-13, Item No 2, Pg-65	Lowering laying and jointing in proper grade with SBR rubber gaskets D.I K7 pipes with MS specials of following diameter in proper position, grade and alignment as directed by Engineer-In-charge including conveyance of materials from stores to site of work, including cost of jointing materials and rubber rings labour, giving hydraulic testing etc. complete as directed by engineer-in charge				
		Only SBR Rubber Ring gaskets to be used as per IS-5382 ans IS-12820				
a		150 mm	83.00	RMT	82.950	6884.85
b		200 mm	42.00	RMT	109.200	4586.40
c		250 mm	70.00	RMT	141.750	9922.50
d		300 mm	88.00	RMT	159.600	14044.80
e		400 mm	99.00	RMT	241.500	23908.50
f		500 mm	0.00	RMT	294.000	0.00
g		600 mm	15.00	RMT	391.650	5874.75
h		700 mm	31.00	RMT	551.250	17088.75
i		750 mm	7.00	RMT	602.700	4218.90
j		800 mm	0.00	RMT	707.700	0.00
k		900 mm	0.00	RMT	888.300	0.00
l		1000 mm	0.00	RMT	1077.300	0.00
19		Manholes				

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
a-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.0 m dia and up to a depth of 3.5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	155	No.	56262.15	8709381.15
		rebate for every decrease in depth of 50 cm or part thereof (MJP SOR 10-11 Item 9)	77	50cm depth	5626.22	-435469.06
a-2	MJP DSR 12-13, Section XX, Item No. 6, Page no 179	Providing and constructing on sewer.BBM manhole 1.2 m dia at bottom and 0.5 m dia at top and up to a depth of 2.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	490	No.	21025.20	10310758.08
		rebate for every decrease in depth of 50 cm or part thereof	294	50cm depth	2875.95	-846219.53
b-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.2 m dia and up to a depth of 5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	14	No.	144531.36	2066798.48
		rebate for every decrease in depth of 50 cm or part thereof	7	50 cm depth	14453.14	-103339.92
b-2	MJP DSR 10-11, Section XX, Item No. 7	Providing and constructing on sewer.BBM manhole 1.5 m dia at bottom and 0.5 m dia at top and up to a depth of 2 to 5.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	20	No.	58791.60	8551746.00
		rebate for every decrease in depth of 50 cm or part thereof	10	50 cm depth	5913.60	-60023.04
c-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.5 m dia and up to a depth of 9 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	17	No.	302462.87	5232607.62
		rebate for every decrease in depth of 50 cm or part thereof	9	50 cm depth	30246.29	-261630.38
c-2	MJP DSR 12-13, Section XX, Item No. 7 Page no 179	Providing and constructing on sewer.BBM manhole 2.0 m dia at bottom and 0.5 m dia at top and up to a depth of 5 to 9.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	129	No.	126352.80	16261605.36
		rebate for every decrease in depth of 50 cm or part thereof	64	50 cm depth	7468.65	-480607.63
20		Drainage Drops				

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
a	MJP12-13 Item No 10 to 16, Page no 181	Providing 150mm dia S.W. or R.C.C.pipes in vertical drop arrangement including providing 150 dia S.W. R.C.C. pipe fixed in B.B.mosanary of manhole at the required level including providing 150 mm dia double tee, 150 mm dia right angle bend, encasing in BB masonry 1:4 proportion all around the pipe, double tee, bend up to the foundation of manhole jointing, cutting filleting including neat cement rendering plugging the opening with jungle wood knob complete as directed by Engineer-in-charge (0.60M depth)	38	No.	1913.10	72169.10
		Extra for every 0.5 depth beyond initial depth of 0.60 M	5	50 cm depth	663.60	3247.27
b		As above but 200 mm dia pipes and depth 0.60M	5	No.	2532.60	13636.87
		Extra for every 0.5 depth beyond initial depth of 0.60 M	1	50 cm depth	794.85	721.01
c		As above but 250 mm dia pipes and depth 0.60M	3	No.	3051.30	9099.80
		Extra for every 0.5 depth beyond initial depth of 0.60 M	4	50 cm depth	989.10	4125.87
d		As above but 300 mm dia pipes and depth 0.60M	2	No.	3715.95	8344.00
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1077.30	406.64
e		As above but 400 mm dia pipes and depth 0.60M	2	No.	5037.90	12359.26
		Extra for every 0.5 depth beyond initial depth of 0.60 M	1	50 cm depth	1492.05	859.51
f		As above but 500 mm dia pipes and depth 0.60M	1	No.	6793.50	3539.16
		Extra for every 0.5 depth beyond initial depth of 0.60 M	1	50 cm depth	1959.30	1173.85
g		As above but 600 mm dia pipes and depth 0.60M	2	No.	8850.45	16671.38
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	2155.65	0.00
21		RCC				
	MJP12-13, Item No 2, Pg-45	Providing and laying insitu Cement concrete of trap/granite/ quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including dewatering, formwork, compaction finishing & curing etc, complete.(By weigh batching and mix design for M-250 and M-300 only.) Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree etc cement is permitted) (excluding M.S. or Tor reinforcement)				
		For RCC M-250 grade	200.00	cum	5719.35	1143870.00
		STEEL REINFORCEMENT				
22	MJP12-13, Item No 8, Pg-49	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles caps ,footing foundations, slabs, beams, columns,canopies,staircases,newls ,chajjas lintels,parties,copings ,fins arches ,etc. as per detailed designs, drawings and schedules including cutting bending ,hooking the bars, binding with wires or tack welding and supporting as required etc.complete. (including cost of binding wire)				
			20.00	MT	61122.60	1222452.00
		House Service Connection				
23	Rate Analysis	Providing and constructing Brick Masonry Inspection chamber 90x45 cm and 45 to 90 cm in depth including 1:4:8 cement concrete foundation, 1:2:4 cement concrete channels, brick masonry, plastering from inside and outside as required in cement mortar 1:3 and airtight RCC lid with frame fixed in cement concrete 1:2:4, curing etc. complete	2009.00	Nos	10811.00	21719299.00
26		Refilling in trenches				
A	MJP 12-13, Item No 17, Pg-40	Refilling the trenches with approved excavated stuff with soft materials first over pipeline & then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging etc.complete.	71940.87	cum	62.92	4526231.89
27		Road restoration	22107.53	Sqm	730.00	16138500.33
28	MJP 12-13, Item No 8, Pg-188	Providing and fixing RCC ventilation shaft, making connection to manhole etc. complete as directed by EIC.	100.00	Nos	8662.50	866250.00

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
29	MJP 12-13, Item No 10, Pg-46	Making cross connection to existing distribution main of any type including excavation, breaking and removing exiting pipes, lowering, laying of specials and pipes in their position, refilling, closing the water supply in that area, dewatering and restarting the water supply, etc. complete as directed by Engineer-in-charge for following diameters of existing pipeline, irrespective of diameter of branch line (the number of joints involved will be paid separately depending upon the nature of joints and required pipes, valves and specials will be supplied free of cost at stores).				
		80 mm	300.00	No	1433.25	429975.00
		100 mm	200.00	No	1634.85	326970.00
		125 mm	60.00	No	1799.70	107982.00
		150 mm	150.00	No	2058.00	308700.00
		200 mm	10.00	No	2160.90	21609.00
		250 mm	10.00	No	2568.30	25683.00
		300 mm	10.00	No	3126.90	31269.00
		350 mm	10.00	No	3816.75	38167.50
		400 mm	10.00	No	4453.05	44530.50
		450 mm	10.00	No	6186.60	61866.00
		500 mm	10.00	No	6333.60	63336.00
30		Dismantling dead pipeline of M.S./R.C.C./ C.I./ P.S.C. and G.I./ A. C. / P. V. C. / S. W. / H. D. P. E. pipe including cost of necessary excavation and refilling of trenches, breaking the joints, lifting the pipes and stacking to the place as directed by Engineer-in-charge with all leads and lifts including cleaning the surface, etc. complete.				
		80 mm	300.00	No	128.10	38430.00
		100 mm	200.00	No	140.70	28140.00
		125 mm	60.00	No	143.85	8631.00
		150 mm	150.00	No	147.00	22050.00
		200 mm	10.00	No	161.70	1617.00
		250 mm	10.00	No	178.50	1785.00
		300 mm	10.00	No	194.25	1942.50
		350 mm	10.00	No	216.30	2163.00
		400 mm	10.00	No	237.30	2373.00
		450 mm	10.00	No	269.85	2698.50
		500 mm	10.00	No	282.45	2824.50
31		Shifting of Existing Utilities	19.08	Km	12527.00	239043.72
		Total Cost				193,192,027.05
		Add 3% Contengencies				5795760.81
		Total Cost				198,987,787.86

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

ABSTRACT OF COLLECTION SYSTEM FOR SEWERAGE ZONE NO 6

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)	
1	MJP12-13 Section E, Item No 1,	Excavation for foundation/ pipe trenches in all types of soils, soft murum including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
			0 to 1.5 m	8621.91	Cum	140.80	1213965.42
			1.5 to 3 m	22173.11	Cum	154.00	3414658.46
			3 to 4.5 m	27.72	Cum	167.20	4635.19
			4.5 to 6.0 m	3392.85	Cum	180.40	612069.38
			6 to 7.5 m	0.00	Cum	193.60	0.00
2	MJP12-13 Section E, Item No 2,	Excavation for foundation/ pipe trenches in in hard murum and boulders,W.B.M.road including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
			0 to 1.5 m	2873.97	cum	177.10	508980.29
			1.5 to 3 m	15837.93	cum	190.30	3013958.74
			3 to 4.5 m	69.31	cum	203.50	14103.77
			4.5 to 6 m	5089.27	cum	216.70	1102844.53
			6 to 7.5 m	0.00	cum	229.90	0.00
3	MJP12-13, Item No 10, Pg-37	Excavation for foundation/ pipe trenches in slush muddy/ Marshy/ Slushy / Soil use of poelain, labour for dewatering during execution including removing the excation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, preparing the bed by cleaning the mud,labour required for execution for shuttering shall be paid seperately.					
			a	0 to 1.5 m	718.49	cum	343.20
4	MJP12-13, Item No 5, Pg-36	Excavation for foundation/ pipes trenches by all mean in soft rock & old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50M beyond area & lift as below, stacking as directed by Engineer-in -charge, normal dewatering,prepration of bed for foundation & excluding backfilling,etc. complete					
			0 to 1.5 m	1436.99	cum	493.90	709727.18
			1.5 to 3 m	9502.76	cum	517.00	4912926.97
			3 to 4.5 m	69.31	cum	540.10	37432.17
			4.5 to 6.0 m	8482.11	cum	563.20	4777126.89
			6 to 7.5 m	0.00	cum	586.30	0.00
5	MJP12-13, Item No 9, Pg-37	Excavation in laterite rock masses mechanically including lift upto 1.5m including trimming & travelling bed, removing the excavated material upto a distance of 50m beyond the area as lift as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling,etc.complete					
			0 to 1.5 m	718.49	cum	856.90	615676.47
			1.5 to 3 m	15837.93	cum	880.00	13937381.47
			3 to 4.5 m	110.89	cum	903.10	100144.40
			4.5 to 6 m	16964.23	cum	926.20	15712268.90
			6.0 to 7.5 m	804.13	cum	949.30	763358.71
6	MJP12-13, Item No 19, Pg-40	Providing & Laying in situ cement concrete of Grade M15 Bedding	167.96	cum	5400.78	907136.61	
7	MJP12-13, Item No 19, Pg-40	Filling in plinth and floors/ trenches with excavated stuff for bedding in 15cm to 20cm layer including watering & compaction etc.complete.	9218.80	cum	62.92	580009.84	
8	PWD DSR,2012 Bd-W ITEM- 51 PG-110	Dismantling RCC concrete work including braking concrete by chiseling, welding etc. including cutting the reinforcement, stacking the serviceable material and the debris separately up to a distance of 50 meter or spreading the debris as directed etc. complete	1000	Cum	393.225	393225	

Sr. No	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
9	MJP 12-13, Section E Item No 20, Pg-40	Open Timbering in Trenches of depth more than 1.5 m for shoring and strutting including all timber works including walling, struts, open polling boards/horizontal sheeting, runners, etc. complete as directed by Engineer In-Charge.				
		Lift 0 - 1.5 m non water logged	11417	Sqm	212.10	2421587.03
		Lift 1.5 - 3.0 m non water logged	28162	Sqm	238.35	6712400.29
		Lift 3.0 - 4.5 m non water logged	5081	Sqm	264.60	1344537.47
		Lift 4.5-6.0 m non water logged	1205	Sqm	290.85	350396.36
					312.85	
10		Dewatering				
	MJP12-13, Item No 16, Pg-39	Dewatering the excavated trenches and pools of water in the building trenches pipelines, as well works by using pumps and other devices including disposing off water to safe distance as directed by engineer-in-charge (including cost of machinery, labour, fuel) etc. complete.	16220.30	bhp/hr	63	1021878.9
11		Transportation of earth				
	MJP12-13, Statement VI, Pg-21	Transportation charges including loading & unloading excavated material for a lead beyond initial lead up to 10km average rate	16678.48	cum	336.76	5616644.62
12	MJP DSR 12-13 Page no 90	Providing and Supplying instandard length Polyethylene(PE) pipes form on pressure underground drainage and sewerage with smooth internal and corrugated (profiled) external surface with Anti rodent property confirming to ISO-21138-3:2007 with necessary jointing material like mechanical connector i.e.thread/insertjoint/quick release coupler /compression fitting joint/orflanged joint including all local and central taxes, transportation and freight charges, inspection charges, loading and unloading charges, conveyance to the departmental stores /site and stacking the same inclosed shadedulyprotectingfromsunrays an drains etc complete				
a		200 mm	4606	RMT	457.60	2107888.64
b		250 mm	4145	RMT	873.60	3620897.28
c		315 mm	3800	RMT	1098.24	4173092.35
12	MJP DSR 12-13 Page no 92	Lowering, Laying and jointing HDPE Double Wall Corrugated Pipes form on pressure Underground drainage and Sewerage applications and specials of following class and diameter including cost of conveyance from stores to site of works including cost of all labour material except O ring coupler giving satisfactory hydraulic testing as pe rrelevant ISO etc complete				
a		200 mm	4606	RMT	40.95	188632.08
b		250 mm	4145	RMT	51.45	213249.96
c		300 mm	3800	RMT	63.00	239387.40
		Providing and Laying Pipes (RCC NP2 pipe)				
14		Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
a		150 mm	6761	RMT	368.16	2489218.12
b		400 mm	5392.40	RMT	984.88	5310866.91
c		450 mm	0.00	RMT	1154.40	0.00
d		500 mm	1081.10	RMT	1348.88	1458274.17
15		Providing and Laying Pipes (RCC NP3 pipe)				
	MJP 12-13, Item No 1-e, Pg-94	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP III				
a		150 mm	448.52	RMT	434.72	194980.61
b		400 mm	278	RMT	1826	508425.22
c		450 mm	0	RMT	2172	0.00
d		500 mm	1003	RMT	2412	2419959.98

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
e		600 mm	3256	RMT	3178	10348667.26
f		700 mm	2314	RMT	4319	9993147.94
g		800 mm	831	RMT	5146	4274201.15
h		900 mm	3393	RMT	5944	20167229.16
i		1000 mm	0	RMT	7272	0.00
j		1100 mm	0	RMT	8413	0.00
k		1200 mm	0	RMT	9870	0.00
l		1400 mm	0	RMT	11860	0.00
m		1600 mm	0	RMT	17283	0.00
n		1800 mm	0	RMT	22860	0.00
16		Providing and Laying Pipes (RCC NP4 pipe)				
	MJP 12-13, Item No 1-f, Pg-95	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP IV				
a		150 mm	21	RMT	497.12	10300.33
e		400 mm	222	RMT	1917	425703.51
f		450 MM	0	RMT	2261	0.00
g		500 mm	0	RMT	2762	0.00
h		600 mm	1117	RMT	3379	3775312.01
i		700 mm	568	RMT	5056	2872080.64
j		800 mm	64	RMT	5775	367875.14
k		900 mm	354	RMT	6764	2391806.98
l		1000 mm	17	RMT	9575	157992.12
m		1100 mm	0	RMT	10388	0.00
n		1200 mm	0	RMT	10434	0.00
o		1400 mm	0	RMT	16293	0.00
p		1600 mm	0	RMT	20312	0.00
q		1800 mm	0	RMT	27845	0.00
17		Lowering laying and jointing in proper grade and alignment R.C.C. pipes with spigot socketed RCC pipes in C.M.1:1 preparation or socketed RCC pipes with rubber joints (excluding cost of rubber ring) including cost of conveyance from stores to site of work, cost of jointing material, labour, giving hydraulic testing etc. complete as directed by engineer in charge. (For all class of				
	MJP 12-13, Item No 2, Pg-96					
a		150 mm	7230.48	RMT	58.80	425152.22
e		400 mm	5892.90	RMT	162.75	959069.48
f		450 MM	0.00		194.25	0.00
g		500 mm	2084.50	RMT	213.15	444311.18
h		600 mm	4373.40	RMT	266.70	1166385.78
i		700 mm	2881.70	RMT	303.45	874451.87
j		800 mm	894.30	RMT	350.70	313631.01
k		900 mm	3746.70	RMT	387.45	1451658.92
l		1000 mm	16.50	RMT	424.20	6999.30
m		1100 mm	0.00	RMT	574.35	0.00
n		1200 mm	0.00	RMT	611.10	0.00
o		1400 mm	0.00	RMT	684.60	0.00
p		1600 mm	0.00	RMT	758.10	0.00
q		1800 mm	0.00	RMT	831.60	0.00
18		Providing and Laying Pipes (DI K9 pipe)				
	MJP 12-13, Item No 3, Pg-65	Providing D I K-9 grade Pipe, with internal cement mortar lining including all taxes. insurance. railway freight, unloading from railway wagon. loading into truck, transport to departmental stores site, unloading- stacking etc complete. (IS 8329-2000 latest Version)				
a		150 mm	145.00	RMT	1491.36	216247.20
b		200 mm	92.00	RMT	1759.68	161890.56
c		250 mm	83.00	RMT	2331.68	193529.44
d		300 mm	76.00	RMT	2939.04	223367.04
e		400 mm	118.00	RMT	4308.72	508428.96
f		500 mm	0.00	RMT	6093.36	0.00
g		600 mm	42.00	RMT	8025.68	337078.56
h		700 mm	87.00	RMT	10825.36	941806.32
i		750 mm	58.00	RMT	12580.88	729691.04
j		800 mm	18.00	RMT	14548.56	261874.08
k		900 mm	75.00	RMT	17450.16	1308762.00
l		1000 mm	0.00	RMT	20431.84	0.00

Sr. No	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
19	MJP 12-13,	Lowering laying and jointing in proper grade with SBR rubber gaskets D.I K9 pipes with MS specials of following diameter in proper position, grade and alignment as directed by Engineer-In-charge including conveyance of materials from stores to site of work, including cost of jointing materials and rubber rings labour, giving hydraulic testing etc. complete as directed by engineer-in-charge				
		Only SBR Rubber Ring gaskets to be used as per IS-5382 and IS-12820				
a		150 mm	145.00	RMT	82.950	12027.75
b		200 mm	92.00	RMT	109.200	10046.40
c		250 mm	83.00	RMT	141.750	11765.25
d		300 mm	76.00	RMT	159.600	12129.60
e		400 mm	118.00	RMT	241.500	28497.00
f		500 mm	0.00	RMT	294.000	0.00
g		600 mm	42.00	RMT	391.650	16449.30
h		700 mm	87.00	RMT	551.250	47958.75
i		750 mm	58.00	RMT	602.700	34956.60
j		800 mm	18.00	RMT	707.700	12738.60
k		900 mm	75.00	RMT	888.300	66622.50
l		1000 mm	0.00	RMT	1077.300	0.00
20		Manholes				
a-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.0 m dia and up to a depth of 3.5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	270	No.	56262.15	15190781.08
		rebate for every decrease in depth of 50 cm or part thereof (MJP SOR 10-11 Item 9)	135	50cm depth	5626.22	-759539.05
a-2	MJP DSR 12-13, Section XX, Item No. 6	Providing and constructing on sewer.BBM manhole 1.2 m dia at bottom and 0.5 m dia at top and up to a depth of 2.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	1451	No.	21025.20	30507565.20
		rebate for every decrease in depth of 50 cm or part thereof	871	50cm depth	2875.95	-2503802.07
b-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.2 m dia and up to a depth of 5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	60	No.	144531.36	8671881.72
		rebate for every decrease in depth of 50 cm or part thereof	30	50 cm depth	14453.14	-433594.09
b-2	MJP DSR 12-13, Section XX, Item No. 7	Providing and constructing on sewer.BBM manhole 1.5 m dia at bottom and 0.5 m dia at top and up to a depth of 2 to 5.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	122	No.	58791.60	8551746.00
		rebate for every decrease in depth of 50 cm or part thereof	61	50 cm depth	5913.60	-360729.60

Sr. No	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
c-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.5 m dia and up to a depth of 9 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	45	No.	302462.87	13610829.06
		rebate for every decrease in depth of 50 cm or part thereof	23	50 cm depth	30246.29	-680541.45
c-2	MJP DSR 12-13, Section XX, Item No. 8	Providing and constructing on sewer.BBM manhole 2.0 m dia at bottom and 0.5 m dia at top and up to a depth of 5 to 9.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	10	No.	126352.80	1263528.00
		rebate for every decrease in depth of 50 cm or part thereof	5	50 cm depth	7468.65	-37343.25
21		Drainage Drops				
a	MJP12-13, Item No 10 to 16, Pg-	Providing 150mm dia S.W. or R.C.C.pipes in vertical drop arrangement including providing 150 dia S.W. R.C.C. pipe fixed in B.B.mosanary of manhole at the required level including providing 150 mm dia double tee, 150 mm dia right angle bend, encasing in BB masonry 1:4 proportion all around the pipe, double tee, bend up to the foundation of manhole jointing, cutting filleting including neat cement rendering plugging the opening with jungle wood knob complete as directed by Engineer-in-charge (0.60M depth)	195	No.	1913.10	373054.50
		Extra for every 0.5 depth beyond initial depth of 0.60 M	9	50 cm depth	663.60	5972.40
b		As above but 200 mm dia pipes and depth 0.60M	28	No.	2532.60	70912.80
		Extra for every 0.5 depth beyond initial depth of 0.60 M	5	50 cm depth	794.85	3974.25
c		As above but 250 mm dia pipes and depth 0.60M	15	No.	3051.30	45769.50
		Extra for every 0.5 depth beyond initial depth of 0.60 M	5	50 cm depth	989.10	4945.50
d		As above but 300 mm dia pipes and depth 0.60M	12	No.	3715.95	44591.40
		Extra for every 0.5 depth beyond initial depth of 0.60 M	2	50 cm depth	1077.30	2154.60
e		As above but 400 mm dia pipes and depth 0.60M	13	No.	5037.90	65492.70
		Extra for every 0.5 depth beyond initial depth of 0.60 M	3	50 cm depth	1492.05	4476.15
f		As above but 500 mm dia pipes and depth 0.60M	3	No.	6793.50	20380.50
		Extra for every 0.5 depth beyond initial depth of 0.60 M	3	50 cm depth	1959.30	5877.90
g		As above but 600 mm dia pipes and depth 0.60M	10	No.	8850.45	88504.50
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	2155.65	0.00
22		RCC				
	MJP12-13, Item No 2, Pg-45	Providing and laying insitu Cement concrete of trap/granite/ quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including dewatering, formwork, compaction finishing & curing etc, complete.(By weigh batching and mix design for M-250 and M-300 only.) Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree etc cement is permitted) (excluding M.S. or Tor reinforcement)	200.00	cum	5719.35	1143870.00
		For RCC M-250 grade				
		STEEL REINFORCEMENT				

Sr. No	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
23	MJP12-13, Item No 8, Pg-49	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles caps ,footing foundations, slabs, beams, columns,canopies,staircases,newls ,chajjas lintels ,pardies,copings ,fins arches ,etc. as per detailed designs, drawings and schedules including cutting bending ,hooking the bars, binding with wires or tack welding and supporting as required etc.complete. (including cost of binding wire)	20.00	MT	61122.60	1222452.00
		House Service Connection				
24	MJP RA	Providing making under ground drainage service connection to consumer including all material & labour with considering four properties & one inspection chamber	7869.00	Nos	10811.00	85071759.00
24		Refilling in trenches				
A	MJP 12-13, Item No 17, Pg-40	Refilling the trenches with approved excavated stuff with soft materials first over pipeline & then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging etc.complete.	96052.92	cum	62.92	6043265.56
25	MJP RA	Road restoration	37839.04	Sqm	730.00	27622500.95
26	MFR	Providing and fixing RCC ventilation shaft, making connection to manhole etc. complete as directed by EIC.	137.00	Nos	9185.40	1258399.80
27		Making cross connection to existing distribution main of any type including excavation, breaking and removing exiting pipes, lowering, laying of specials and pipes in their position, refilling, closing the water supply in that area, dewatering and restarting the water supply, etc. complete as directed by Engineer-in-charge for following diameters of existing pipeline, irrespective of diameter of branch line (the number of joints involved will be paid separately depending upon the nature of joints and required pipes, valves and specials will be supplied free of cost at stores).				
		80 mm	300.00	No	1433.25	429975.00
		100 mm	200.00	No	1634.85	326970.00
		125 mm	60.00	No	1799.70	107982.00
		150 mm	150.00	No	2058.00	308700.00
		200 mm	10.00	No	2160.90	21609.00
		250 mm	10.00	No	2568.30	25683.00
		300 mm	10.00	No	3126.90	31269.00
		350 mm	10.00	No	3816.75	38167.50
		400 mm	10.00	No	4453.05	44530.50
		450 mm	10.00	No	6186.60	61866.00
		500 mm	10.00	No	6333.60	63336.00
28		Dismantling dead pipeline of M.S./R.C.C./ C.I./ P.S.C. and G.I./ A. C. / P. V. C. / S. W. / H. D. P. E. pipe including cost of necessary excavation and refilling of trenches, breaking the joints, lifting the pipes and stacking to the place as directed by Engineer-in-charge with all leads and lifts including cleaning the surface, etc. complete.				
		80 mm	300.00	No	128.10	38430.00
		100 mm	200.00	No	140.70	28140.00
		125 mm	60.00	No	143.85	8631.00
		150 mm	150.00	No	147.00	22050.00
		200 mm	10.00	No	161.70	1617.00
		250 mm	10.00	No	178.50	1785.00
		300 mm	10.00	No	194.25	1942.50
		350 mm	10.00	No	216.30	2163.00
		400 mm	10.00	No	237.30	2373.00
		450 mm	10.00	No	269.85	2698.50
		500 mm	10.00	No	282.45	2824.50
29		Shifting of Existing Utilities Length considered upto 400 mm	25.67	Km	12527.00	321622.96
		Total Cost				357,545,878.48
		Add 3% Contingencies				10726376.35
		Total Cost				368,272,254.83

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD CITY

ABSTRACT OF COLLECTION SYSTEM FOR SEWERAGE ZONE NO SALIM ALI STP

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)	
1	MJP12-13 Section E, Item No 1,	Excavation for foundation/ pipe trenches in all types of soils, soft murum including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	1927.18	Cum	140.80	271346.68	
		1.5 to 3 m	2924.50	Cum	154.00	450373.65	
		3 to 4.5 m	191.37	Cum	167.20	31996.95	
		4.5 to 6.0 m	181.93	Cum	180.40	32820.36	
		6 to 7.5 m	0.00	Cum	193.60	0.00	
2	MJP12-13 Section E, Item No 2,	Excavation for foundation/ pipe trenches in in hard murum and boulders,W.B.M.road including removing the excavation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, normal dewatering, preparing the bed for foundation and excluding backfilling, etc complete.					
		0 to 1.5 m	642.39	cum	157.72	101316.89	
		1.5 to 3 m	2437.09	cum	170.67	415925.43	
		3 to 4.5 m	956.85	cum	183.61	175688.50	
		4.5 to 6 m	545.79	cum	196.56	107280.54	
		6 to 7.5 m	0.00	cum	209.51	0.00	
3	MJP12-13, Item No 10, Pg-37	Excavation for foundation/ pipe trenches in slush muddy/ Marshy/ Slushy / Soil use of poelain, labour for dewatering during execution including removing the excation material up to a distance of 50 meter and lift as below, stacking and spreading as directed, preparing the bed by cleaning the mud,labour required for execution for shuttering shall be paid seperately.					
		a	0 to 1.5 m	160.60	cum	343.20	55117.29
		b	1.5 to 3 m	487.42	cum	366.30	178540.98
		c	3 to 4.5 m	191.37	cum	389.40	74519.21
		d	4.5 to 6 m	181.93	cum	412.50	75046.55
			6 to 7.5 m	0.00	cum	435.60	0.00
4	MJP12-13, Item No 5, Pg-36	Excavation for foundation/ pipes trenches by all mean in soft rock & old cement and lime masonry foundation asphalt road including removing the excavated material upto a distance of 50M beyond area & lift as below, stacking as directed by Engineer-in -charge, normal dewatering,prepration of bed for foundation & excluding backfilling,etc. complete					
		0 to 1.5 m	321.20	cum	493.90	158638.88	
		1.5 to 3 m	1462.25	cum	517.00	755984.35	
		3 to 4.5 m	956.85	cum	540.10	516792.79	
		4.5 to 6.0 m	909.66	cum	563.20	512317.77	
		6 to 7.5 m	0.00	cum	586.30	0.00	
5	MJP12-13, Item No 9, Pg-37	Excavation in laterite rock masses mechanically including lift upto 1.5m including trimming & travelling bed, removing the excavated material upto a distance of 50m beyond the area as lift as below, stacking as directed by Engineer-in-charge, normal dewatering, excluding backfilling,etc.complete					
		0 to 1.5 m	160.60	cum	856.90	137616.58	
		1.5 to 3 m	2437.09	cum	880.00	2144636.45	
		3 to 4.5 m	1530.95	cum	903.10	1382604.92	
		4.5 to 6 m	1819.31	cum	926.20	1685045.15	
		6.0 to 7.5 m	1013.99	cum	949.30	962582.61	
6	MJP12-13, Item No 19, Pg-40	Providing & Laying in situ cement concrete of Grade M15 Bedding	50.00	cum	5155.50	257775.00	
7	MJP12-13, Item No 19, Pg-40	Filling in plinth and floors/ trenches with excavated stuff for bedding in 15cm to 20cm layer including watering & compaction etc.complete.	1301.25	cum	63.00	81978.75	
8	PWD DSR,2012 Bd-W ITEM- 51 PG-110	Dismantling RCC concrete work including braking concrete by chiseling, welding etc. including cutting the reinforcement, stacking the serviceable material and the debris separately up to a distance of 50 meter or spreading the debris as directed etc. complete	250	Cum	393.225	98306.25	

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
9	MJP 12-13, Section E Item No 20, Pg-40	Open Timbering in Trenches of depth more than 1.5 m for shoring and strutting including all timber works including walling, struts, open polling boards/horizontal sheeting, runners, etc. complete as directed by Engineer In-Charge.				
		Lift 0 - 1.5 m non water logged	14111	Sqm	212.10	2992909.92
		Lift 1.5 - 3.0 m non water logged	5925	Sqm	238.35	1412291.83
		Lift 3.0 - 4.5 m non water logged	1391	Sqm	264.60	368070.18
		Lift 4.5-6.0 m non water logged	1569	Sqm	290.85	456421.31
			0		312.85	
10		Dewatering				
	MJP12-13, Item No 16, Pg-39	Dewatering the excavated trenches and pools of water in the building trenches pipelines, as well works by using pumps and other devices including disposing off water to safe distance as directed by engineer-in-charge (including cost of machinery, labour, fuel) etc. complete.	12859.50	bhp/hr	63	810148.5
11		Transportation of earth				
	MJP12-13, Statement VI, Pg-21	Transportation charges including loading & unloading excavated material for a lead beyond initial lead up to 10km average rate	1771.91	cum	336.76	596708.58
12	MJP DSR 12-13 Page no 90	Providing and Supplying instandard length Polyethylene(PE) pipes forn on pressure underground drainage and sewerage with smooth internal and corrugated (profiled) external surface with Anti rodent property confirmingt o ISO-21138-3:2007 with necessary jointing material like mechanical connector i.e.thread/insertjoint/quick release coupler /compression fitting joint/orflanged joint including all local and central taxes, transportation and freight charges, inspection charges, loading and unloading charges, conveyance to the departmental stores /site and stacking the same inclosed shadedulyprotectingfromsunrays an drains etc complete				
a		200 mm	1176	RMT	457.60	538192.51
b		250 mm	848	RMT	873.60	740716.70
c		315 mm	665	RMT	1098.24	730812.83
12	MJP DSR 12-13 Page no 92	Lowering, Laying and jointing HDPE Double Wall Corrugated Pipes forn on pressure Underground drainage and Sewerage applications and specials of following class and diameter including cost of conveyance from stores to site of works including cost of all labour material except O ring coupler giving satisfactory hydraulic testing as pe relevant ISO etc complete				
a		200 mm	1176	RMT	40.95	48162.11
b		250 mm	848	RMT	51.45	43623.94
c		300 mm	665	RMT	63.00	41922.72
14		Providing and Laying Pipes (RCC NP2 pipe)				
		Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
a		150 mm	1103	RMT	368.16	406062.81
b		400 mm	0.00	RMT	984.88	0.00
c		450 mm	0.00	RMT	1154.40	0.00
d		500 mm	0.00	RMT	1348.88	0.00
15		Providing and Laying Pipes (RCC NP3 pipe)				
	MJP 12-13, Item No 1-e, Pg-94	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP III				
a		150 mm	250.00	RMT	434.72	108680.00
		200 mm	0.00	RMT	457.60	0.00
		250 mm	0.00	RMT	873.60	0.00

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
b		400 mm	250	RMT	1826	456560.00
c		450 mm	288	RMT	2172	624963.46
d		500 mm	0	RMT	2412	0.00
e		600 mm	167	RMT	3178	530384.69
16		Providing and Laying Pipes (RCC NP4 pipe)				
	MJP 12-13, Item No 1-f, Pg-95	Providing ISI standard RCC pipes in standard lengths of following class and diameter suitable for rubber ring joints, including all taxes (central and local), inspection charges, transport to stores-sites, unloading and stacking etc complete				
		one rubber ring should be supplied with each full length socketed pipe, cost including in rates below				
		Class NP IV				
a		150 mm	0	RMT	497.12	0.00
e		400 mm	100	RMT	1917	191672.00
f		450 MM	396	RMT	2261	896425.42
g		500 mm	13	RMT	2762	34528.00
h		600 mm	167	RMT	3379	563880.84
17	MJP 12-13, Item No 2, Pg-96	Lowering laying and jointing in proper grade and alignment R.C.C. pipes with spigot socketed RCC pipes in C.M.1:1 preparation or socketed RCC pipes with rubber joints (excluding cost of rubber ring) including cost of conveyance from stores to site of work, cost of jointing material, labour, giving hydraulic testing etc. complete as directed by engineer in charge. (For all class of				
a		150 mm	1352.95	RMT	58.80	79553.58
e		400 mm	350.00	RMT	162.75	56962.50
f		450 MM	684.28		194.25	132921.39
g		500 mm	12.50	RMT	213.15	2664.38
h		600 mm	333.76	RMT	266.70	89013.79
18		Providing and Laying Pipes (DI K9 pipe)				
	MJP 12-13, Item No 3, Pg-65	Providing D I K-9 grade Pipe, with internal cement mortar lining including all taxes. insurance. railway freight, unloading from railway wagon. loading into truck, transport to departmental stores site, unloading- stacking etc complete. (IS 8329-2000 latest Version)				
a		150 mm	270.59	RMT	1350.96	365556.81
b		200 mm	17.00	RMT	1832.48	31152.16
c		250 mm	14.00	RMT	2392.00	33488.00
d		300 mm	25.00	RMT	3021.20	75530.00
e		400 mm	19.00	RMT	4603.04	87457.76
f		500 mm	0.00	RMT	6214.00	0.00
g		600 mm	10.00	RMT	8110.96	81109.60
19	MJP 12-13,	Lowering laying and jointing in proper grade with SBR rubber gaskets D.I K7 pipes with MS specials of following diameter in proper position, grade and alignment as directed by Enginner-In-charge including conveyance of materails from stores to site of work, including cost of jointing materails and rubber rings labour, giving hydraulic testing etc. complete as directed by engineer in charge				
		Only SBR Rubber Ring gaskets to be used as per IS-5382 ans IS-12820				
a		150 mm	270.59	RMT	82.950	22445.47
b		200 mm	17.00	RMT	109.200	1856.40
c		250 mm	14.00	RMT	141.750	1984.50
d		300 mm	25.00	RMT	159.600	3990.00
e		400 mm	19.00	RMT	241.500	4588.50
f		500 mm	0.00	RMT	294.000	0.00
g		600 mm	10.00	RMT	391.650	3916.50
20		Manholes				
a-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.0 m dia and up to a depth of 3.5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	53	No.	56262.15	2998772.71

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		rebate for every decrease in depth of 50 cm or part thereof (MJP SOR 10-11 Item 9)	27	50cm depth	5626.22	-149938.64
a-2	MJP DSR 12-13, Section XX, Item No. 6	Providing and constructing on sewer.BBM manhole 1.2 m dia at bottom and 0.5 m dia at top and up to a depth of 2.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	113	No.	21025.20	2365335.00
		rebate for every decrease in depth of 50 cm or part thereof	68	50cm depth	2875.95	-194126.63
b-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.2 m dia and up to a depth of 5 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	7	No.	144531.36	953906.99
		rebate for every decrease in depth of 50 cm or part thereof	3	50 cm depth	14453.14	-47695.35
b-2	MJP DSR 12-13, Section XX, Item No. 7	Providing and constructing on sewer.BBM manhole 1.5 m dia at bottom and 0.5 m dia at top and up to a depth of 2 to 5.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	11	No.	58791.60	8551746.00
		rebate for every decrease in depth of 50 cm or part thereof	6	50 cm depth	5913.60	-33116.16
c-1	RA	Providing and constructing on sewer.R.C.C circular manhole 2.5 m dia and up to a depth of 9 M of Reinforced Cement Concrete (M-20) including excavation, concrete, steel reinforcement and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge. (AS Per Rate Analysis)	5	No.	302462.87	1451821.77
		rebate for every decrease in depth of 50 cm or part thereof	2	50 cm depth	30246.29	-72591.09
c-2	MJP DSR 12-13, Section XX, Item No. 8	Providing and constructing on sewer.BBM manhole 2.0 m dia at bottom and 0.5 m dia at top and up to a depth of 5 to 9.0 M in CM 1:4 proportion excluding excavation including foundation concrete 250 mm thick and haunches and channels in C.C.1:2:4 proportion, finishing channel, in smooth rendering, providing C.I dapuri type steps each weighing 5.5 kg., 1:2:4 coping and providing and fixing approved make and quality SFRC frame and cover of 56 cm dia etc., complete as directed by engineer- in-charge.	25	No.	126352.80	3184090.56
		rebate for every decrease in depth of 50 cm or part thereof	13	50 cm depth	7468.65	-94104.99
21		Drainage Drops				
a	MJP12-13, Item No 10 to 16, Pg-	Providing 150mm dia S.W. or R.C.C.pipes in vertical drop arrangement including providing 150 dia S.W. R.C.C. pipe fixed in B.B.mosanary of manhole at the required level including providing 150 mm dia double tee, 150 mm dia right angle bend, encasing in BB masonry 1:4 proportion all around the pipe, double tee, bend up to the foundation of manhole jointing, cutting filleting including neat cement rendering plugging the opening with jungle wood knob complete as directed by Engineer-in-charge (0.60M depth)	20	No.	1913.10	37328.85
		Extra for every 0.5 depth beyond initial depth of 0.60 M	4	50 cm depth	663.60	2961.06

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
b		As above but 200 mm dia pipes and depth 0.60M	3	No.	2532.60	7053.55
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	794.85	372.94
c		As above but 250 mm dia pipes and depth 0.60M	2	No.	3051.30	4706.79
		Extra for every 0.5 depth beyond initial depth of 0.60 M	4	50 cm depth	989.10	4044.06
d		As above but 300 mm dia pipes and depth 0.60M	1	No.	3715.95	4315.86
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1077.30	210.33
e		As above but 400 mm dia pipes and depth 0.60M	1	No.	5037.90	6392.72
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1492.05	444.57
f		As above but 500 mm dia pipes and depth 0.60M	0	No.	6793.50	1830.60
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	1959.30	607.16
g		As above but 600 mm dia pipes and depth 0.60M	1	No.	8850.45	8623.13
		Extra for every 0.5 depth beyond initial depth of 0.60 M	0	50 cm depth	2155.65	0.00
22		RCC				
	MJP12-13, Item No 2, Pg-45	Providing and laying insitu Cement concrete of trap/granite/ quartzite / gneiss metal for RCC work in foundation like raft, grillage, strip foundation and footing of RCC columns and steel stanchions including dewatering, formwork, compaction finishing & curing etc, complete.(By weigh batching and mix design for M-250 and M-300 only.) Use of L&T, A.C.C., Ambuja, Birla Gold, Manikgad, Rajashree etc cement is permitted) (excluding M.S. or Tor reinforcement)				
		For RCC M-250 grade	50.00	cum	5719.35	285967.50
		STEEL REINFORCEMENT				
23	MJP12-13, Item No 8, Pg-49	Providing and fixing in position steel bar reinforcement of various diameters for RCC piles caps ,footing foundations, slabs, beams, columns,canopies, staircases, newls ,chajjas lintels, pardies, copings ,fins arches ,etc. as per detailed designs, drawings and schedules including cutting bending ,hooking the bars, binding with wires or tack welding and supporting as required etc.complete. (including cost of binding wire)				
			10.00	MT	61122.60	611226.00
		House Service Connection				
24	MJP RA	Providing making under ground drainage service connection to consumer including all material & labour with considering four properties & one inspection chamber	956.00	Nos	10811.00	10335316.00
24		Refilling in trenches				
A	MJP 12-13, Item No 17, Pg-40	Refilling the trenches with approved excavated stuff with soft materials first over pipeline & then hard material in 15 cm layers with all leads and lifts including consolidation, surcharging etc.complete.	19668.40	cum	62.92	1237456.99
25	MJP RA	Road restoration	8540.93	Sqm	730.00	6234878.90
26	MFR	Providing and fixing RCC ventilation shaft, making connection to manhole etc. complete as directed by EIC.	50.00	Nos	9185.40	459270.00
27		Making cross connection to existing distribution main of any type including excavation, breaking and removing exiting pipes, lowering, laying of specials and pipes in their position, refilling, closing the water supply in that area, dewatering and restarting the water supply, etc. complete as directed by Engineer-in-charge for following diameters of existing pipeline, irrespective of diameter of branch line (the number of joints involved will be paid separately depending upon the nature of joints and required pipes, valves and specials will be supplied free of cost at stores).				
		80 mm	300.00	No	1433.25	429975.00
		100 mm	200.00	No	1634.85	326970.00
		125 mm	60.00	No	1799.70	107982.00

Sr. No.	Reference	Description	Quantity	Unit	Rate	Amount (Rs.)
		150 mm	150.00	No	2058.00	308700.00
		200 mm	10.00	No	2160.90	21609.00
		250 mm	10.00	No	2568.30	25683.00
		300 mm	10.00	No	3126.90	31269.00
		350 mm	10.00	No	3816.75	38167.50
		400 mm	10.00	No	4453.05	44530.50
		450 mm	10.00	No	6186.60	61866.00
		500 mm	10.00	No	6333.60	63336.00
28		Dismantling dead pipeline of M.S./R.C.C./ C.I./ P.S.C. and G.I./ A. C. / P. V. C. / S. W. / H. D. P. E. pipe including cost of necessary excavation and refilling of trenches, breaking the joints, lifting the pipes and stacking to the place as directed by Engineer-in-charge with all leads and lifts including cleaning the surface, etc. complete.				
		80 mm	300.00	No	128.10	38430.00
		100 mm	200.00	No	140.70	28140.00
		125 mm	60.00	No	143.85	8631.00
		150 mm	150.00	No	147.00	22050.00
		200 mm	10.00	No	161.70	1617.00
		250 mm	10.00	No	178.50	1785.00
		300 mm	10.00	No	194.25	1942.50
		350 mm	10.00	No	216.30	2163.00
		400 mm	10.00	No	237.30	2373.00
		450 mm	10.00	No	269.85	2698.50
		500 mm	10.00	No	282.45	2824.50
29		Shifting of Existing Utilities Length considered upto 400 mm	4.39	Km	12527.00	55010.47
		Total Cost				64,116,442.38
		Add 3% Contingencies				1923493.27
		Total Cost				66,039,935.65

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION AT Ward 98

ABSTRACT OF PUMPING STATIONS AT STP

Sr. No.	PS	Total Cost in Rs	Civil	Mechanical	Electrical
1	Banewadi	20,873,292	4,220,048	8,713,591	7,939,653
2	Siddharth Garden	6,658,982	385,566	3,538,857	2,734,559
3	Padegaon	15,268,434	2,479,825	6,631,612	6,156,996
4	Golwadi	114,487,836	20,264,855	57,672,360	36,550,621
5	Zalta	25,300,923	7,729,608	8,964,159	8,607,156
6	Ward no 98	10,432,080	2,861,941	4,293,150	3,276,989
7	Cidco	19,139,022	3,414,695	9,835,758	5,888,569
		212,160,567	41,356,538	99,649,487	71,154,543

AURANGABAD MUNICIPAL CORPORATION
UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD
ABSTRACT FOR PUMPING STATION AT BANEWADI

Sr no	Description	Amount (Rs)
1	Civil Works	4,220,048
2	Mechanical Works	8,713,591
3	Electrical Works	7,939,653
	Total Cost (Rs)	20,873,292

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION AT BANEWADI- CIVIL

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
1	(DSR-I-1/P-112)	Designing (aesthetically), and constructing RCC ground service reservoirs / RCC sump in M-250 mix. Of required capacity including excavation in all types of strata, foundation concrete, container walls, bottom slab top RCC roof slab / or dome, 20 mm thick cement plaster with water proofing compound in CM 1:3 proportion. To inside face of the container, including epoxy paint from inside including refilling and disposing of surplus stuff within lead of 50 M, all labour and material charges, for laying and jointing of pipe assembly for inlet, outlet washout, over flow and bypass arrangement consisting of C.I./M.S. D/F. pipes, specials and valves of given diameters. providing and fixing accessories such as M.S. ladder inside and outside, C.I. Manhole frame and cover, at top slab, B.B. masonry chamber for all valves, ventilating shafts, including giving satisfactory hydraulic test and water tightness test as per IS code and providing three coat of cement paints to all expose surface of structure including roof surface etc. Complete as per design data, criteria, obligatory requirements and detailed specifications. Anti-termite treatment shall be given for under ground portion of the structure.				
		Note :				
1)		The design shall be in accordance with various relevant I.S. specification (I.S.456/2000, I.S. 875- 1987, I.S. 3370-1965 or revised				
2)		Only M.S bars grade I confirming to I.S. 432 Part_1 or high yield strength deformed bars confirming to I.S. 1786 or I.S. 1139 shall be used grade II M.S. bars shall not be used				
3)		Entire structure shall be in M-250 only.				

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
4)		The scope of pipe assembly work shall be upto 5 Meter beyond outside face of the wall, cost of pipes valves and specials is not included in the rate but labour cost for laying and jointing is included				
5)		The G.S.R./ Sump above 15 lakh liter capacity shall be in two compartment				
6)		The job includes designing the structure for uplift pressure and dewatering if required during entire execution and disposal of surplus excavated stuff within a lead of 50 Meter as directed by Engineer-in-charge. If up lifts are considered in design then these rates shall be increased by 7.5%				
7)		G.S.R. outlets shall be with bell mouth of approved pattern in bottom slab and cost of designing bell mouth is included in the rate. Sump well includes cost of suction pit required at bottom.				
8)		For pipe diameters upto 300mm only CI specials shall be used. For pipe diameters above 300mm M.S. pipes and specials of thickness minimum 10mm shall be used with proper anticorrosive epoxy treatment from inside and outside				
9)		Cost of pump house is not included in these rates.				
10)		Above rates are applicable for seismic zones- 2,3, and 4				
11)		75% part rate shall be payable for reinforcement, concrete and plastering items of all types of G.S.R's and sump till satisfactory hydraulic testing for water tightness test is given ; and till that work shall be treated as incomplete.				
=		Note:- Condition from Sr. No.1 to 11 shall be from a part and parcel of tender and must be included in the Draft tender papers for work of RCC GSRs and sump.				

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
11)		Staging shall have to be designed with stresses of M -150 concrete but actual construction shall be done in M-200 concrete with sections worked out with M-150 Design.				
12)		These rates are including cost of uplift pressure if any and entire dewatering during execution.				
13)		All conditions given in the member secretary's circular No. MJP/TS-1/350/1668 dated 2/8/97 shall be strictly followed and additional cost if ay due to these conditions is included in the rates mentioned below.				
14)		75% part rate shall be payable for reinforcement concrete and plastering items of containers of ESRs till satisfactory hydraulic testing for water tightness is given and till that work shall be treated as incomplete.				
15)		The rates are applicable for staging height of 12 m 2% of these rates shall be increased or decreased or per meter variation in this staging height, VIZ : difference between G.L. and L.W.L. in the container.				
		Note : Conditions from Sr. No. 1 to 15 shall form a part and partial of tender and must be included in the draft trander papers for work of R.C.C. E.S.R.s.				
a.		Sewage Pumping Station at Banewadi	132.7322896	7.25	962309	
				Say (Litres)	1,000,000	
		Cost of 10,00,000 Litres				4,085,235
		Total Cost				4,085,235
		Add 10% for Pump House				408,524
		Add For Contingency @3%				134812.755
		Total Cost				4,220,048

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION AT BANEWADI - MECHANICAL

Sr. No	Ref no	Item Description	Qty.	Unit	Rate (Rs)	Amount (Rs)
		MECHANICAL				
1	Quotation	Providing, Installing, Testing, Commissioning of non clog Submersible Sewage Pumps , as specified below. Capacity - 630.00 m3/Hrs. Pump Head in mWC- 20 mtr. Efficiency of the pumps 75% Required Motor rating HP- 80 Solid Handling size – 100mm Sp Gravity – 1.05 MOC Casing – CI IS 210 Gr. FG 220 Impeller – CI IS 210 Gr. FG 220 Shaft and Sleeve – SS 316 Motor Parts – CI IS 210 Gr. FG 220 Fastners – BHT Steel Guide Pipe – Carban Steel Lifting Chain – Carban Steel Mech. Seal – Motor Side – Carban / Crome Steel - Pump Side – SiC V/s SiC	6	No	456963	2741778
2	MJP DSR10-11.pg no.155,item no 3b vii	Butterfly Valve Providing,double flanged short body pattern type manually operated Butterfly Valve PN 1.6 rating with bypass arrangement having body,disc and end cover in graded cast iron to IS 210 Gr.CF 200 generally confirming in IS-13095-1991,Synthetic rubber faced ring secured on disc by retaining ring with stainless steel screw stub shaft of stainless steel screw stub shaft of stainless steel riding in teflon bearing excluding C.C. foundation/Structural steel support. Size : 750 mm	1	No	248612	248612
3	MJP DSR10-11.pg no.148,item no 1© xi	NRV Providing & supplying ISI mark CI D/F Reflux valve(non return valve) PN 1.6 rating without bypass arrangement,as per IS 5312 Part I (1984), including all taxes,inspection charges,transportation etc. complete. Size :750 mm	1	No	461733	461733
4	MJP DSR10-11.pg no.155,item no 4 x	Lowering,laying & jointing in position following C.I.D/F Reflex valves,Butterfly valves & Sluice valves including cost of all labour jointing material,including nut bolts & giving satisfactory hydraulic testing etc. complete Size : 750 mm	2	No	10558	21116
5	MJP DSR10-11.pg no.151,item no 2©,vii	SLUICE VALVE Providing double flange Sluice Valve PN 1.6 rating without bypass arrangement,confirming for IS-2906/14846 including worn gear arrangements as per test pressure stainless steel spindle,caps including all taxes transportation etc. complete. Size -400 mm	6	No	108695	652168.80
6	MJP DSR10-11.pg no.154,item no 3b vii	Butterfly Valve Providing,double flanged short body pattern type manually operated Butterfly Valve PN 1.6 rating with bypass arrangement having body,disc and end cover in graded cast iron to IS 210 Gr.CF 200 generally confirming in IS-13095-1991,Synthetic rubber faced ring secured on disc by retaining ring with stainless steel screw stub shaft of stainless steel screw stub shaft of stainless steel riding in teflon bearing excluding C.C. foundation/Structural steel support. Size : 400 mm	6	No	78998.84	473993.04
7	MJP DSR10-11.pg no.147,item no 1© vii	NRV Providing & supplying ISI mark CI D/F Reflux valve(non return valve) PN 1.6 rating without bypass arrangement,as per IS 5312 Part I (1984), including all taxes,inspection charges,transportation etc. complete. Size :400 mm	6	No	118182.16	709092.96
8	MJP DSR10-11, pg no.155,item no 4 vii	Lowering,laying & jointing in position following C.I.D/F Reflex valves,Butterfly valves & Sluice valves including cost of all labour jointing material,including nut bolts & giving satisfactory hydraulic testing etc. complete Size : 350	18	No	5636.40	101455.20
9	Electro Mechanical MJP DSR11-12 pg no.16	Providing , Erecting Tripple Spur Gear Chain Pulley Block with Travelling Trolley suitable for 3T Capacity with 6 m lift complete With load chain and hand chain suitable for above lift, Tested to 50% overload as per IS 3832 Carrying ISI Mark	1	No	69130	69130.00

Sr. No	Ref no	Item Description	Qty.	Unit	Rate (Rs)	Amount (Rs)
10	MIDC DSR 2009-10, Pg. No-147	Providing and erecting Cast Iron Sluice Gates manufactured & tested as per IS3042-1965. Gates to be provided with brass seats and spindle of MS bright bar of required height to enable to operate the gate from operating slab of intake structure including GM nut bolts SS304 hardware, necessary wedges to be provided to achieve leak tightness, including operational wheel headstock, foundation material, labour etc. complete including taxes & duties, as per detailed specification & as directed by Engineer In charge. Size -1000*1000 mm	1	No	268565.00	268565.00
11	Market Rate	Providing, installing a SS Screens alongwith the channel guide, & railing accessories as per detailed specifications & as directed by Engineer.	300	kg.	800.00	240000.00
12	MJP DSR 11-12, Item no-11, Pg. No-	Providing and supplying ISI standard welded DIDF pipe including all taxes (central & local) railway freight, insurance, unloading from railway wagon, loading into truck transport to store / site, unloading, stacking etc. complete as directed by Engineer -in-charge. (for 2.75 m bare pipe) 400 mm Dia for Delivery lines 750 mm Dia for Rising Main	120 10	mtrs mtrs	7110.07 11952.94	853208.40 119529.40
13	MJP DSR Electrmehanical 10-11, pg no.9, Item No. PM11-2	Providing, installing, testing & commissioning of 150 mm dia bourden type Pressure Gauges complete with siphon U tube, isolating cock, C-class heavy duty 15 mm GI Pipe & brought out on wall for observation at place directed by engineer. Range 0 to 15 kg/Cm ² . as per detailed specifications & as directed by Engineer.	6	No.	751.10	4506.60
14	MJP Electro-mech DSR 11-12, Section-17, Item No-4, Pg No-91-97	Ultrasonic Flowmeter Providing, Installing & giving satisfactory test and trial of ultrasonic Insertion fixed type flowmeter working on conditions and specifications, calibration, inspection, testing, training, guarantees, and manufacturers test certificate along with mandatory accessories given below complete with detailed specifications and as directed by engineer incharge 750 mm Dia for Rising Main Providing, laying and jointing with test & trial of SENSOR/TRANSMITTER CABLE: - Providing, Laying and jointing with test and trail of sensor / transmitter cable 4 x 0.38 mm PVC cable common, braided copper shield etc. as per detailed specification. Conduit Pipe: - Providing conduit pipe (PVC/HDPE Plumbing) 32 mm dia. With suitable rating.- Suitable conduit duct for routeing of cable with suitable digging, laying & concealing the duct. PANEL CABINET :- Fixing of flow meter transmitter to internal walls of binding /inside suitable designed panel cabinet with proper locking arrangement with glass window on front door for seeing reading of flow transmitter and data logger without opening of panel cabinet	1 100 100 2	No Mtrs Mtrs No	325000.00 230.00 18.00 26500.00	325000.00 23000.00 1800.00 53000.00
15	MJP DSR 11-12, item no- XIII, Sec-E-2, Pg No-	Excavation for foundation in earth, soils of all types sand, gravel & soft murum including removing the excavated material upto a distance of 50m and lift 1.5m. stacking & spreading as directed, dewatering, preparing die bed for the foundation and necessary back filling, ramming, watering (including shoring and strutting), etc. complete	6	Cum	156.22	937.32
16	MJP DSR 11-12, item no- XXI, F, Pg No-	Providing and constructing B.B. masonry Valve Chamber with 15 cm. thick 1:3:6 proportion PCC bedding, excluding B.B. masonry in CM. 1:5 proportion precast RCC frame and cover, etc. complete As Above of 1.2 x 1.2 M Internal Size and depth upto 1.5 M with precast RCC Slab Cover.	2	No	13007.50	26015.00
17	MJP Pune DSR 11-12, Section. F, Item no-5, Pg. No-	Providing Structural steel work in rolled sections like joints, channels, angles, tees ect. As per detailed design and drawing including fix in position without connecting plates, braces ect. And one coat of anticorrosive paint and over it two coats of oil painting, of approved quality and shade, complete.	1.5	MT	61496.40	92244.60
18	MJP Pune DSR 11-12, Item no- 10, Pg. No-	DI Specials- Providing and supplying ISI standard DI specials and fitting with sealing rubber gasket of SBR complete with cast iron follower gland MS nut bolts coated or otherwise protected from rusting and suitable for DI pipes including cost of labour, materials and transportation to store/ site loading and unloading including all taxes etc. complete as per IS 9523 80 to 300 mm Dia 350mm to above Dia	0 5847.1	kg kg	111.28 135.2	0 790527.92
19	MJP DSR 11-12, Item No-2, Pg 45	RCC	5	cum	5992.14	29960.7

Sr. No	Ref no	Item Description	Qty.	Unit	Rate (Rs)	Amount (Rs)
20	MJP DSR10-11,pg no.160,item no 9b i	Providing & supplying Kinetic Double Orifice type air valves PN1.6 rating combined with screw down isolating sluice valve etc complete Size :100mm	6	No.	25404.08	152424.48
		Sub Total			TOTAL:	8459797.30
		Contengencis @ 3%				253793.92
		Grant Total				8713591.22

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION 1 AT BANEWADI - ELECTRICAL

Sr. No.	Reference	Description	Qty	UOM	Rates	Amount
		Item No. 1 :- L.T. Control Panel Board				
		Designing, Providing , Erecting, Testing & Commissioning with Satisfactory Test & Trial of Various Panel Boards as per Detailed specifications.				
		A) L.T.Main Control Panel Board				
	As per PANEL RA enclosed	Designing, Providing , Erecting,Main L. T. Control Panel Board comprises of 800 Amp. MCCB for Incoming & 200 Amp. MCCB for outgoing as per Detailed specification enclosed.	1	each	347642.501	347643
		B) Soft starter				
	MJP EM CSR 2012-13, PG 53, LG-6-3	Supply erecting, commissioning electrical soft star starter of three wire system to operate on 380/440 Volts 3 phase 50 Hz consisting of, 1) Main contactor AC- 3 Duty and 1.5 times of full load current rating; 2) Suitable Thyresters, 3) Ammeter with selector switch & CTs, 4) Motor Protection relay with protection CTs for Protection against a) SinglePhasing (Current Sensing) b) under voltage and over voltage c) Over current relay having IDMT characteristic. of rating suitable for 75 HP pumps	6	each	160334.9	962009
1		Item No. 2 :- Transformer				
	MJP E/M DSR 2012-13, pg 29 TR 1-7	Suppling & erecting approved make of 400 kVA 50 c/s oil immersed and naturally cooled indoor /outdoor type , copper wound transfoemer with delta conn. on HV side & star conn. on LV side with additional neutral brought out in load side , voltage rating 11/0.433 vV with tapping of +/- 2.5 % -5 % ,continuously rated for full load with standered accessories complete with test certificate with losses below 715 watts at no load , 5000 watts at full load asp er IS 2026. and approved by engineering incharge.	1	each	508277.1	508277
	PWD DSR 12-13 Pg 79, 6-4-1	Item No- 3 :- H T Metering Kiosk: Supplying ,erecting testing (By Licencee) , commissioning cubical comprising 11kV HT metering resin cast CTs, PTs, as per lincencees requirement. DO fuse set, AB Switch 200-400 A capacity duly interconnected with use of suitable insulators by mainteninig adequate clearences as per IS, complete housed in the encloser made up of MS structure ans fibre glass 3 mm thick with gearbox & handle brought out for operating GOD, suitable door openings, locking arrangement as per approved design by Engineering incharge.	1	Each	171328.689	171329
	As per SS 400 KVA - RA enclosed	Item No- 4 :- H.T. sub station Providing, supplying and erecting 11 Kv/ 0.433 Kv H T Substation as per Detailed specification.	1	Each	1723603.38	1723603
2		Item No. 5 :-Cables				
3		1. 1 kv Aluminum PVC armoured cable from MSEB Supply to AMF panel & DG to AMF Panel to L.T.panel				
4	MJP E/M DSR 12-13 Pg. 61 Item CB 5-9	3.5 Core 240 Sq. MM Aluminium Armoured Cable	120	Rmt	1934	232080
	MJP E/M DSR 12-13 Pg. 61 Item CB 5-3	3.5 core x 50 sqmm	50	Rmt	478.2	23910

Sr. No.	Reference	Description	Qty	UOM	Rates	Amount
5	MJP E/M DSR 12-13 Pg. 61 Item CB 5-2	3.5 core x 35 sqmm	50	Rmt	379	18950
	MJP E/M DSR 12-13 Pg. 62 Item CB 6-3	4 Core 10 Sq. MM Aluminium Armoured Cable	50	Rmt	222	11100
	MJP E/M DSR 12-13 Pg. 63 Item CB7-2-2	3 Core 2.5 Sq. MM CU UnArmoured Cable	50	Rmt	217.2	10860
		HT CABLE				
	MJP E/M DSR 12-13 Pg. 65 Item CB 11-4	11 kv XLPE cable 3 core x 95 sqmm	100	Rmt	1037.7	103770
	MJP E/M DSR 12-13 Pg. 71 Item CB 25-2	Indoor termination kit 11 kv	2	Each	8552.9	17106
	MJP E/M DSR 12-13 Pg. 71 Item CB 26-2	Out door termination kit 11 kv	2	Each	12702.9	25406
	PWD DSR 2012-13, Item no- CW-16-1-2, Pg. No-148	Item No. 6 :- Cable Trench - Making the trench in hard murum/ tar road of suitable width and depth for laying provided L.T. Cable of 10 sq mm complete as per detailed specifications.	100	m	80	8000
PWD DSR 2012-13, Item no- CW-16-1-3, Pg. No-148	Making the trench in hard murum/ tar road of suitable width and depth for laying provided L.T. Cable of 25 sq mm & above covered with half round hume pipe complete as per detailed specifications.	100	m	240	24000	
MJP E/M DSR 2010-11, Item no- CB 34-2 Pg No-74	Item No. 7 :- Cable Tray - Providing, fabricating and fixing G.I. perforated cable tray for cables as per requirement and specifications - 200 x 20 mm	100	Mtr	169	16900	
6		Item No. 8 :- Capacitor				
		Providing Erecting Individual Mixed dia electric type Capacitor of required capacity for each Submersible Pumpset				
7	PWD DSR 12-13 Pg. 56, 4-4-8	supply & erecting 150 kVAR 440 V three phase 50 cycles thyrester switched Micro APFC passive filter panel consisting of (25 x4 +15x1 +10x2) steps of APP type capacitor units confirming to IS: 13585 (part -1) with harmonic filter reactors suitable for 150 KW load as per specifications.	1		341590	341590
		Item No. 9 :-Earthing Strip GI				
	PWD DSR 12-13 Page No 106 Item No.9-1-1	Item no- 10 :-GI Earthing - Supplying & erecting GI earth plate size 60x 60x6 cms complete with all materials, testing & recording results as per specifications . As per IS 3043-1987 & as directed by engineering incharge.	10	each	1955	19550
8	PWD DSR 12-13 Page No 106 Item No.9-1-2	Item no- 10 :-Copper Earthing - Supplying & erecting copper earth plate size 30 x 30 x 0.6 cms complete with all materials, testing & recording results as per specifications . As per IS 3043-1987 & as directed by engineering incharge.	10	Each	3144	31440
		Item No. 11 :-Earthing Strip				
	PWD DSR 10-11 Page No 85 Item No.9-2-3	Providing erecting GI earth strip	200	Kg	99	19800
9		Providing, erecting CU earth strip	100	Kg	617	61700
10		Item No. 12 :- Pipe type earthing				
	PWD DSR 10-11 Page No 85 Item No.9-1-1	Providing erecting pipe type earthing with double earthing to the all equipments as per Detailed specifications.	6	Each	742	4452

Sr. No.	Reference	Description	Qty	UOM	Rates	Amount
	As per RA enclosed	Item No. 13 :- Tools Providing Tools as per Detailed specification enclosed.	1	Lot	63641.00	63641
		Item No. 14 :- In door lighting				
11	As per RA enclosed	The lighting shall comprise fluoresent - 4 nos Bulkhead fitting - 3 nos D.B. - 2 nos Suitable size conductors with fuses,switches including H.G.conduit etc.	1	Job	12680.00	12680
12		Item No. 15 :- Area lighting				
	As per RA enclosed	The area lighting shall comprise 250 w mercury vapour lamps with and mounted on tubular swivelled pole 7 m high including ballast, condensor,fuse reflector,cable and control switch etc out of the two lams.one shall be in the substation yard and the second lamp shall be erected for area lighting.	1	Job	38736.16	38736
13	PWD DSR 12-13 11-1-19	Item No. 16 :- Diesel Generating Set Supplying Errecting diesel generating set 350 KVA capacity with AMF Panel as per Detailed specification with water cooled engine set including inspection charges .	1	Each	2542802	2542802
		Total Net Cost				7,341,334
		Total Net Cost				7,341,334
		Add for Work in Municipal Corporation Area @ 5% on the above sub total A				367,066.69
		Total				7,708,400.53
		Add for Contengency @ 3%				231,252.02
		Total Gross Cost				7,939,652.54

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION AT SIDDARTH GARDEN

Sr no	Description	Amount (Rs)
1	Civil Works	385,566
2	Mechanical Works	3,538,857
3	Electrical Works	2,734,559
	Total Cost (Rs)	6,658,982

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION SIDDARTH GARDEN- CIVIL

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
1	(DSR-I-1/P-112)	Designing (aesthetically), and constructing RCC ground service reservoirs / RCC sump in M-250 mix. Of required capacity including excavation in all types of strata, foundation concrete, container walls, bottom slab top RCC roof slab / or dome, 20 mm thick cement plaster with water proofing compound in CM 1:3 proportion. To inside face of the container, including epoxy paint from inside including refilling and disposing of surplus stuff within lead of 50 M, all labour and material charges, for laying and jointing of pipe assembly for inlet, outlet washout, over flow and bye-pass arrangement consisting of C.I./M.S. D/F. pipes, specials and valves of given diameters. providing and fixing accessories such as M.S. ladder inside and outside, C.I. Manhole frame and cover, at top slab, B.B. masonry chamber for all valves, ventilating shafts, including giving satisfactory hydraulic test and water tightness test as per IS code and providing three coat of cement paints to all expose surface of structure including roof surface etc. Complete as per design data, criteria, obligatory requirements and detailed specifications. Anti-				
		Note :				
1)		The design shall be in accordance with various relevant I.S. specification (I.S.456/2000, I.S. 875- 1987, I.S. 3370-1965 or revised				
2)		Only M.S bars grade I conforming to I.S. 432 Part_] or high yield strength deformed bars conforming to I.S. 1786 or I.S. 1139 shall be used grade II M.S. bars shall not be used				
3)		Entire structure shall be in M-250 only.				
4)		The scope of pipe assembly work shall be upto 5 Meter beyond outside face of the wall, cost of pipes valves and specials is not included in the rate but labour cost for laying and jointing is included				
5)		The G.S.R./ Sump above 15 lakh liter capacity shall be in two compartment				

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
6)		The job includes designing the struttre for uplift preseure and dewatering if require duing entire execution and disposal of surplus excavated stuff with in lead of 50 Meter as directed by Engineer-in-charge. If up lifts considered in design then these rate shall be increased by 7.5%				
7)		G.S.R. outlets shall be with bell mouth of approved pattern in bottom slab and cost of designing bell mouth is included in the rate Sump well includes cost of suction pit required at bottom.				
8)		For pipes diameters upto 300mm only CI specials shall be used. For pipe diameters above 300mm M.S. pipes and specials of thickness minimum 10mm shall be used with proper anticorrosive epoxy treatment from inside and outside				
9)		Cost of pump house is not included in these rates.				
10)		Above rstes are applicable for seismic zones- 2,3, and 4				
11)		75% part rate shall be payable for reinforcement, concrete and plastering item of all types of G.S.R's and sump till satisfactory hydraulic testing for water tightness test is given ; and till that work shall be treated as incomplete.				
=		Note:- Condition from Sr. No.1 to 11 shall from a part and parcel of tender and must be included in the Draft tender papers for work of RCC GSRs and sump.				
11)		Staging shall have to be designed with stresses of M -150 concrete but actual construction shall be done in M-200 concrete with sections worked out with M-150 Design.				
12)		These rates are including cost of uplift pressure if any and entire dewatering during execution.				
13)		All conditions given in the member secretary's circular No. MJP/TS-1/350/1668 dated 2/8/97 shall be strictly followed and additional cost if ay due to these conditions is included in the rates mentioned below.				

Sr. No	Ref no	Item Description	Qty.	Rate (Rs)	Unit	Amount (Rs)
14)		75% part rate shall be payable for reinforcement concrete and plastering items of containers of ESRs till satisfactory hydraulic testing for water tightness is given and till that work shall be treated as incomplete.				
15)		The rates are applicable for staging height of 12 m 2% of these rates shall be increased or decreased or per meter variation in this staging height, VIZ : difference between G.L. and L.W.L. in the container.				
		Note : Conditions from Sr. No. 1 to 15 shall form a part and partial of tender and must be included in the draft tranfer papers for work of R.C.C. E.S.R.s.				
a.		Sewage Pumping Station at Siddarth Garden of Capacity	28.27	8.8	248814	
				Say (Litres)	250,000	
		Cost of 2,00,00 Litres				1,340,955
		Add for 50000	50000	4.16		218,400
		Total cost				1,559,355
		Add 10% for Over Head Pump House				155,936
		Total Cost				374,336
		Contengencis @ 3%				11230.07
		Grant Total				385565.57

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION AT SIDDARTH GARDEN - MECHANICAL

Sr. No	Ref no	Item Description	Qty.	Unit	Rate (Rs)	Amount (Rs)
		MECHANICAL				
1	Quotation	Providing, Installing, Testing, Commissioning of non clog Submersible Sewage Pumps , as specified below. Capacity - 190.00 m3/Hrs. Pump Head in mWC- 20 mtr. Efficiency of the pumps 75% Required Motor rating HP-25 Solid Handling size – 100mm Sp Gravity – 1.05 MOC Casing – CI IS 210 Gr. FG 220 Impeller – CF8M Shaft and Sleeve – SS 316 Motor Parts – CI IS 210 Gr. FG 220 Fastners – BHT Steel Guide Pipe – Carban Steel Lifting Chain – Carban Steel Mech. Seal – Motor Side – Carban / Crome Steel	3	No	250106	750319
2	MJP DSR11-12,pg no.147,item no 3b ii	Butterfly Valve Providing,double flanged short body pattern type manually operated Butterfly Valve PN 1.6 rating with bypass arrangement having body,disc and end cover in graded cast iron to IS 210 Gr.CF 200 generally confirming in IS-13095-1991,Synthetic rubber faced ring secured on disc by retaining ring with stainless steel screw stub shaft of stainless steel screw stub shaft of stainless steel riding in teflon bearing excluding C.C. foundation/Structural steel support. Size : 300 mm for Comman Header	1	No	36156	36156
3	MJP DSR11-12,pg no.147,item no 1© ii	NRV Providing & supplying ISI mark CI D/F Reflex valve(non return valve) PN 1.6 rating without bypass arrangement,as per IS 5312 Part I (1984), including all taxes,inspection charges,transportation etc. complete. Size :300 mm for Comman Header	1	No	59377	59377
4	MJP DSR11-12,pg no.155,item no 4 x	Lowering,laying & jointing in position following C.I.D/F Reflex valves,Butterfly valves & Sluice valves including cost of all labour jointing material,including nut bolts & giving satisfactory hydraulic testing etc. complete Size : 200mm	2	No	3384	6767
5	MJP DSR11-12,pg no.152,item no 2©.iv	SLUICE VALVE Providing double flange Sluice Valve PN 1.6 rating without bypass arrangement,confirming for IS-2906/14846 including worn gear arrangements as per test pressure stainless steel spindle,caps including all taxes transportation etc. complete. Size -200 mm	3	No	26270	78810.27
6	MJP DSR11-12,pg no.155,item no 3b ii	Butterfly Valve Providing,double flanged short body pattern type manually operated Butterfly Valve PN 1.6 rating with bypass arrangement having body,disc and end cover in graded cast iron to IS 210 Gr.CF 200 generally confirming in IS-13095-1991,Synthetic rubber faced ring secured on disc by retaining ring with stainless steel screw stub shaft of stainless steel screw stub shaft of stainless steel riding in teflon bearing excluding C.C. foundation/Structural steel support. Size : 200 mm	3	No	18286	54857.52
7	MJP DSR11-12,pg no.147,item no 1© ii	NRV Providing & supplying ISI mark CI D/F Reflex valve(non return valve) PN 1.6 rating without bypass arrangement,as per IS 5312 Part I (1984), including all taxes,inspection charges,transportation etc. complete. Size :200 mm	3	No	26470	79408.68
8	MJP DSR11-12, pg no.155,item no 4 vii	Lowering,laying & jointing in position following C.I.D/F Reflex valves,Butterfly valves & Sluice valves including cost of all labour jointing material,including nut bolts & giving satisfactory hydraulic testing etc. complete Size : 200	9	No	3384	30452.40
9	Electro Mechanical MJP DSR11-12 pg no.16	Providing , Erecting Tripple Spur GearChain Pulley Block with Travelling Trolley suitable for 2T Capacity with 6 m lift complete With load chain and hand chain suitable for above lift, Tested to 50% overload as per IS-3832 Carving ISI Mark	1	No	54674	54674.00

Sr. No	Ref no	Item Description	Qty.	Unit	Rate (Rs)	Amount (Rs)
10	MIDC DSR 2009-10, Pg. No-147	Providing and erecting Cast Iron Sluice Gates manufactured & tested as per IS3042-1965. Gates to be provided with brass seats and spindle of MS bright bar of required height to enable to operate the gate from operating slab of intake structure including GM nut bolts SS304 hardware, necessary wedges to be provided to achieve leak tightness, including operational wheel headstock, foundation material, labour etc. complete including taxes & duties, as per detailed specification & as directed by Engineer In charge. Size	1	No	268565.00	268565.00
11	Market Rate	Providing, installing a SS Screens alongwith the channel guide, & railing accessories as per detailed specifications & as directed by Engineer	300	kg.	800.00	240000.00
12	MJP DSR 11-12, Item no-11, Pg. No-	Providing and supplying ISI standard welded DIDF pipe including all taxes (central & local) railway freight, insurance, unloading from railway wagon, loading into truck transport to store / site, unloading, stacking etc. complete as directed by Engineer -in- charge. (for 2.75 m bare pipe)				
		200 mm Dia for Delivery lines	80	mtrs	3529.42	282353.60
		300 mm Dia for Rising Main	10	mtrs	6028.79	60287.90
13	MJP DSR Electrmehanic al 11-12, pg no.9, Item No. PM11-2	Providing, installing, testing & commissioning of 150 mm dia bourden type Pressure Gauges complete with siphon U tube, isolating cock, C-class heavy duty 15 mm GI Pipe & brought out on wall for observation at place directed by engineer. Range 0 to 15 kg/Cm ² . as per detailed specifications & as directed by Engineer.	5	No.	747.00	3735.00
14	MJP Electro-mech DSR 11-12, Section-17, Item No-4, Pg No-91-97	Ultrasonic Flowmeter Providing, Installing & giving satisfactory test and trial of ultrasonic Insertion fixed type flowmeter working on conditions and specifications, calibration, inspection, testing, training, guarantees, and manufacturers test certificate along with mandatory accessories given below complete with detailed specifications and as directed by engineer incharge	1	No	325000.00	325000.00
		300 mm Dia for Rising Main				
		Providing, laying and jointing with test & trial of SENSOR/TRANSMITTER CABLE: - Providing, Laying and jointing with test and trail of sensor / transmitter cable 4 x 0.38 mm PVC cable common, braided copper shield etc. as per detailed specification	100	Mtrs	230.00	23000.00
		Conduit Pipe: - Providing conduit pipe (PVC/HDPE Plumbing) 32 mm dia. With suitable rating. - Suitable conduit duct for routing of cable with suitable digging, laying & concealing the duct	100	Mtrs	18.00	1800.00
		PANEL CABINET :- Fixing of flow meter transmitter to internal walls of binding /inside suitable designed panel cabinet with proper locking arrangement with glass window on front door for seeing reading of flow transmitter and data logger without opening of panel cabinet	2	No	26500.00	53000.00
15	MJP DSR 11-12, item no- XIII, Sec-E-2, Pg No-	Excavation for foundation in earth, soils of all types sand, gravel & soft murum including removing the excavated material upto a distance of 50m and lift 1.5m. stacking & spreading as directed, dewatering, preparing die bed for the foundation and necessary back filling, ramming, watering (including shoring and strutting), etc. complete	6	Cum	156.22	937.32
16	MJP DSR 11-12, item no- XXI, F, Pg No-	Providing and constructing B.B. masonry Valve Chamber with 15 cm. thick 1:3:6 proportion PCC bedding, excluding B.B. masonry in CM. 1:5 proportion precast RCC frame and cover, etc. complete				
		As Above of 1.2 x 1.2 M Internal Size and depth upto 1.5 M with precast RCC Slab Cover	2	No	12652.75	25305.50
17	MJP DSR 11-12, Section. F, Item no-5, Pg. No-	Providing Structural steel work in rolled sections like joints, channels, angles, tees ect. As per detailed design and drawing including fix in position without connecting plates, braces ect. And one coat of anticorrosive paint and over it two coats of oil painting, of approved quality and shade, complete.	2	MT	59739.36	119478.72
18	MJP Pune DSR 11-12, Item no- 10, Pg. No-	DI Specials- Providing and supplying ISI standard DI specials and fitting with sealing rubber gasket of SBR complete with cast iron follower gland MS nut bolts coated or otherwise protected from rusting and suitable for DI pipes including cost of labour, materials and transportation to store/ site loading and unloading including all taxes etc. complete as per IS 9522				
		80 to 300 mm Dia	0	kg	109.14	0
		350mm to above Dia	5847.1	kg	132.6	775325.46
19	MJP DSR 11-12, Item No-2, Pg 45	RCC	5	cum	5992.14	29960.7
20	MJP DSR 11-12, pg no.160, item no 9b i	Providing & supplying Kinetic Double Orifice type air valves PN1.6 rating combined with screw down isolating sluice valve etc complete Size :100mm	3	No.	25404.08	76212.24
		Sub Total			TOTAL:	3,435,783.31
		Contengencis @ 3%				103073.50
		Grant Total				3538856.81

AURANGABAD MUNICIPAL CORPORATION

UNDERGROUND SEWERAGE SYSTEM FOR AURANGABAD

ABSTRACT FOR PUMPING STATION SIDDARTH GARDEN - ELECTRICAL

Sr. No.	Reference	Description	Qty	Unit	Rates	Amount
1		L.T. Control Panel Board				
		Designing, Providing, Erecting, Testing & Commissioning with Satisfactory Test & Trial of Various Panel Boards as per Detailed specifications.				
		A) L.T.Main Control Panel Board				
	As per PANEL RA enclosed	Designing, Providing, Erecting, Main L. T. Control Panel Board comprises of 250 Amp. MCCB for Incoming & 63 Amp. MCCB for outgoing as per Detailed specification enclosed.	1	each	119111.116	119111
		B) Soft starter				
	MJP EM CSR 2011-12, PG 53, LG-6-1	Supply erecting, commissioning electrical soft star starter of three wire system to operate on 380/440 Volts 3 phase 50 Hz consisting of, 1) Main contactor AC- 3 Duty and 1.5 times of full load current rating; 2) Suitable Thyresters, 3) Ammeter with selector switch & CTs, 4) Motor Protection relay with protection CTs for Protection against a) Single Phasing (Current Sensing) b) under voltage and over voltage c) Over current relay having IDMT characteristic. of rating suitable for 30 HP pumps	3	each	94916.9	284751
		Transformer				
2	MJP E/M DSR 2011-12, pg 29 TR 1-3	Supplying & erecting approved make of 160 kVA 50 c/s oil immersed and naturally cooled indoor /outdoor type, copper wound transformer with delta conn. on HV side & star conn. on LV side with additional neutral brought out in load side, voltage rating 11/0.433 vV with tapping of +/- 2.5% -5% , continuously rated for full load with standard accessories complete with test certificate with losses below 260 watts at no load, 1760 watts at full load as per IS 2026. and approved by engineering incharge.	1	each	265914.1	265914
3	PWD DSR 11-12 Pg 79, 6-4-1	H T Metering Kiosk: Supplying, erecting testing (By Licencee), commissioning cubical comprising 11kV HT metering resin cast CTs, PTs, as per licencees requirement. DO fuse set, AB Switch 200-400 A capacity duly interconnected with use of suitable insulators by maintaining adequate clearances as per IS, complete housed in the enclosure made up of MS structure and fibre glass 3 mm thick with gearbox & handle brought out for operating GOD, suitable door openings, locking arrangement as per approved design by Engineering incharge.	1	Each	170956	170956
4	As per SS 315 KVA - RA enclosed	H.T. sub station Providing, supplying and erecting 11 Kv/ 0.433 Kv H T Substation as per Detailed specification.	1	Each	616667.74	616668
5		Cables				
		1. 1 kv Aluminum PVC armoured cable from MSEB Supply to AMF panel & DG to AMF Panel to L.T. panel				
	MJP E/M DSR 11-	3.5 Core 240 Sq. MM Aluminium Armoured Cable	120	Rmt	1934	232080
	MJP E/M DSR 11-	3.5 core x 50 sqmm	50	Rmt	478.2	23910
	MJP E/M DSR 11-	3.5 core x 35 sqmm	50	Rmt	379	18950
	MJP E/M DSR 11-	4 Core 10 Sq. MM Aluminium Armoured Cable	50	Rmt	222	11100
	MJP E/M DSR 11-	3 Core 2.5 Sq. MM CU UnArmoured Cable	50	Rmt	217.2	10860
6		HT CABLE				
	MJP E/M DSR 11-	11 kv XLPE cable 3 core x 95 sqmm	100	Rmt	1037.7	103770
	MJP E/M DSR 11-	Indoor termination kit 11 kv	2	Each	8552.9	17106
	MJP E/M DSR 11-	Out door termination kit 11 kv	2	Each	12702.9	25406
7	PWD DSR 2011-12, Item no- CW-16-1-2, Pg. No-148	Cable Trench - Making the trench in hard murum/ tar road of suitable width and depth for laying provided L.T. Cable of 10 sq mm complete as per detailed specifications.	100	m	80	8000

Sr. No.	Reference	Description	Qty	Unit	Rates	Amount
8	PWD DSR 2011-12, Item no- CW-16-1-3, Pg. No-148	Making the trench in hard murum/ tar road of suitable width and depth for laying provided L.T. Cable of 25 sq mm & above covered with half round hume pipe complete as per detailed specifications.	100	m	240	24000
9	MJP E/M DSR 2010-11, Item no- CB 34-2 Pg No-74	Cable Tray - Providing, fabricating and fixing G.I. perforated cable tray for cables as per requirement and specifications - 200 x 20 mm	100	Mtr	169	16900
10		Capacitor				
		Providing Erecting Individual Mixed dia electric type Capacitor of required capacity for each Submersible Pumpset				
11	PWD DSR 11-12 Pg. 56, 4-4-4	supply & erecting 30 kVAR 440 V three phase 50 cycles thyrester switched Micro APFC passive filter panel consisting of (10x3) steps of APP type capacitor units confirming to IS: 13585 (part -1) with harmonic filter reactors suitable for 50 KW load as per specifications.	1	no	172976	172976
		Earthing Strip GI				
12	PWD DSR 11-12 Page No 106 Item No.9-1-1	GI Earthing - Supplying & erecting GI earth plate size 60x 60x6 cms complete with all materials, testing & recording results as per specifications . As per IS 3043-1987 & as directed by engineering incharge.	10	each	1955	19550
13	PWD DSR 11-12 Page No 106 Item No.9-1-2	Copper Earthing - Supplying & erecting copper earth plate size 30 x 30 x 0.6 cms complete with all materials, testing & recording results as per specifications . As per IS 3043-1987 & as directed by engineering incharge.	10	Each	3144	31440
		Earthing Strip				
14	PWD DSR 10-11 Page No 85 Item No.9-2-3	Providing erectimng GI earth strip	200	Kg	99	19800
15		Providing, erecting CU earth strip	100	Kg	617	61700
16	PWD DSR 10-11 Page No 85 Item No.9-1-1	Pipe type earthing				
		Providing erecting pipe type earthing with double earthing to the all equipments as per Detailed specifications.	6	Each	742	4452
17	As per RA enclosed	Tools Providing Tools as per Detailed specification enclosed.	1	Lot	63641.00	63641
18	As per RA enclosed	In door lighting The lighting shall comprise fleuorescent - 4 nos Bulkhead fitting - 3 nos D.B. - 2 nos Suitable size conductors with fuses,switches including H.G.conduit etc.	1	Job	12680.00	12680
19	As per RA enclosed	Area lighting The area lighting shall comprise 2 250 w mercury vapour lamps with and mounted on tubular swivelled pole 7 m high including ballast, condensor,fuse reflector,cable and control switch etc out of the two lams.one shall be in the substation yard and the second lamp shall be erected for area lighting.	1	Job	38736.16	38736
20	PWD DSR Pg-108 Item No. 10-1-2	Diesel Generating Set Supplying Erecting diesel generating set 100 KVA capacity with AMF Panel as per Detailed specification with water cooled engine set including inspection charges .	1	Each	154031	154031
		Total Part (Rs)				2,528,487
		Sub total 1				2,528,487
		Add for Work in Municipal Corporation Area @ 5% on the above sub total A				126,424.37
		Sub total 2				2,654,911.79
		Add for Contengency @ 3%				79,647.35
		Total Cost				2,734,559.15