Chapter 2

Study Area

2.1 Study Profile

The study area stipulated by the Hon'ble High Court covers the stretch from Trimbakeshwar, the origin for river Godavari till the Nandur Madhyameshwar weir which is supposed to be a wet land area. **Figure 2.1** depicts the study area covering Godavari River upto Nandur Madhyameshwar dam which is approximately 60 km stretch.

a) Trimbak City

Trimbak is a taluka situated in Nashik District in the state of Maharashtra at a distance of 28 km from Nashik- Jawahar road. Trimbak is located at 19°56'0"N 73°33'0"E at an elevation of 720 metres (2362 feet). Trimbakeshwar town is an ancient Hindu Pilgrim centre located at the origin of the Godavari River. The Godavari River, the longest river in peninsular India, is considered sacred within Hinduism. It originates from Bramhagiri Mountains at Trimbakeshwar and ultimately meets the sea near Rajahmudry. The Lord Shiva temple at Trimbakeshwar was built by Nanasaheb Peshwa and is worshipped by recitations Rudra, Maha Rudra or Ati Rudra puja. Trimbak falls under 'C' class Municipal council. Trimbak had a population of 9804 (2001) and has grown to 12,056 in 2011. Males constitute 52% of the population and females 48%. Trimbak has an average literacy rate of 79%, higher than the national average of 59.5%: Out of the total population of 2011 11% is under age group of 6 years. The floating population of the city is considered to be 20,000. Trimbakeshwar is considered as the most sacred town in India. The Hindu belief is that those who visit Trimbakeshwar attain salvation or Moksha. This place is believed to be the holiest and ideal place to do Shraddha ceremony, a Hindu ritual for the salvation of the soul. Rituals like Ganga Pujan, Ganga Bhet, Deh Shuddhi Prayaschitta, Tarpan Shraddha, Vayan, Dasha Dana, Gopradan etc. are performed in Trimbakeshwar. The serene ambiance and the pleasant climate make the town of Trimbakeshwar a hot spot for nature loving tourists apart from Hindu pilgrims. It is dedicated to Lord Shiva and is one of the twelve Jyotirlingas.

b) Godavari River

Godavari river rises in the Sahyadris near Trimbakeshwar, about 80 km from the shore of Arabian sea, at an elevation of 1067m in the Nashik district of Maharashtra. The river travels a distance of about 1465 km flowing through six states of Central India like Maharashtra, Andhra Pradesh Madhya Pradesh, Chattisgarh, Orisa Karnataka etc. and extends for over 9.5% of the total geographical area of India (Ref: Hydrology and Water Resources Information System).

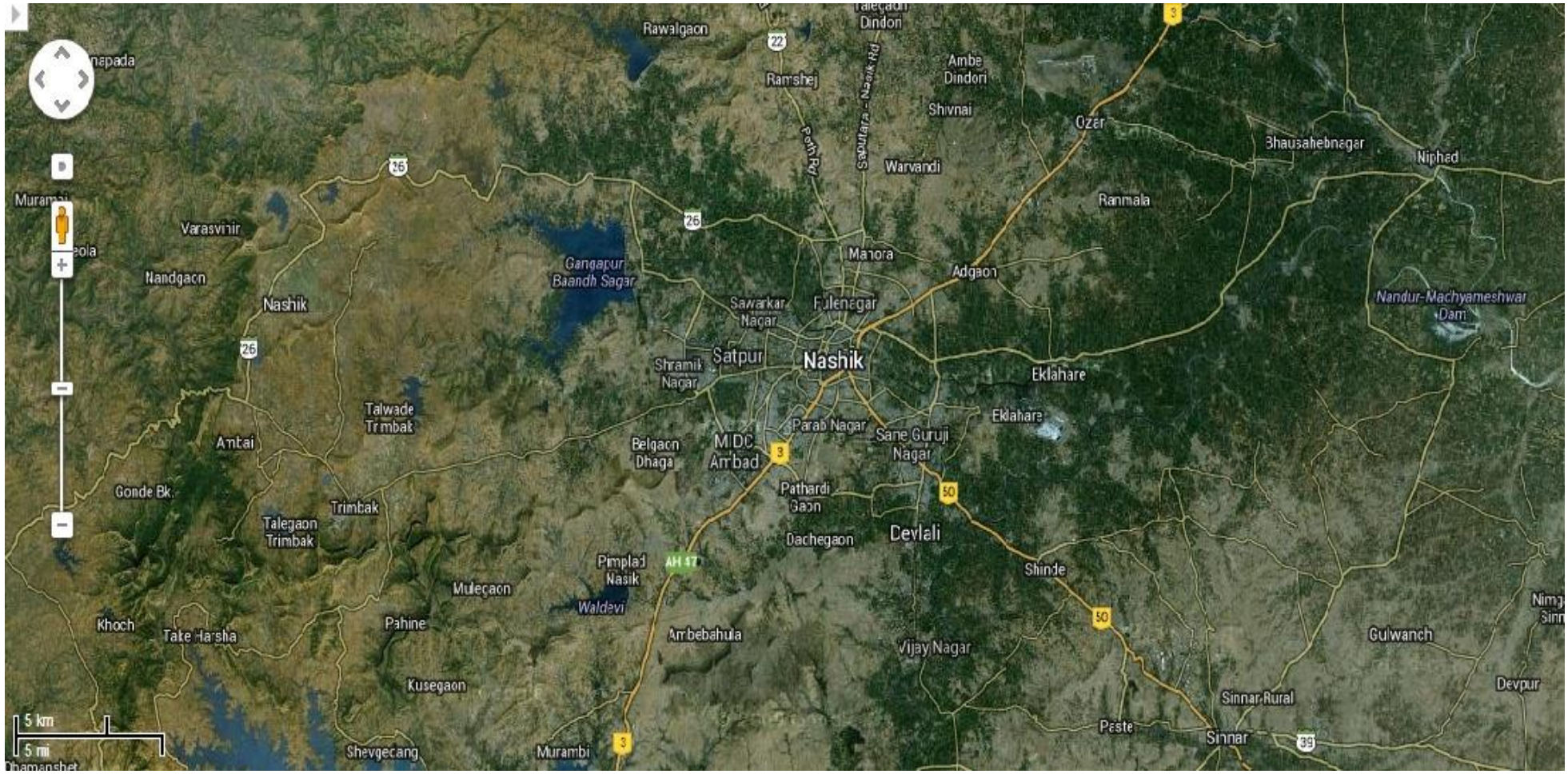


Figure 2.1 : Study Area Covering a Stretch of Godavari River from Trimbakeshwar upto Nandur Madhyameshwar

Major tributaries of the river are Pravara, Manjira, Purna, Maner, Pranhita, Indravathi and Sabari with the drainage area of 152,199 km^2. Nearly 350 major/medium dams and barrages are constructed in the Godavari river basin by the year 2012 which is the highest among all the river basins in India. The Indravati, Pravara, Wardha, Wainganga, Kanhan, Pench, and Painganga rivers in Maharashtra pour a huge quantity of water into Godavari River System. There are few small rivers which pour water into river Godavari at Trimbak. These rivers mainly include Kashyapi river, Gautami river, Dev river, Undhol river.

River Godavari is very important for the economic development of Nashik region in Maharashtra. The river water is profoundly used for agriculture, as it is the only available water source. Over half of the river basin (18.6 million ha), is categorized as cultivable land. Major quantity of river water is drawn for irrigation. Downstream Trimbakeshwar, a big dam is constructed called Gangapur dam which is completed in 1957. This dam at Gangapur with a catchment area of 357.40 sq.km and submergence area of 2231 ha. provides drinking water to the residents of Nashik. It also supplies water to industrial zone at Satpur and Ambad, the thermal power station located downstream at Eklahare which supplies power to the town. Two canals viz. left bank (62.4 km) and right bank (30.4 km) from Gangapur dam provide water for irrigation.

The Godavari River is sacred to Hindus and has several temples built on its banks. One of the twelve Jyotirlingas and ancient temple of Lord Shiva is situated in Trimbakeshwar, situated at a distance of 29 kms. from Nashik. Every twelve years, Sinhastha Kumbh Mela is held on the banks of the Godavari River in Nashik. It has been held as a special place of pilgrimage for many thousands of years.

b1) Dams on Godavari River in Study Region of Nashik and Their Capacity

In the study area, upstream of Gangapur dam there are two other dams constructed for water storage viz. Kashyapi and Gautami-Godavari dam. Due to silt deposition in the reservoir area, the storage capacity of the Gangapur Dam has gradually reduced. The right side canal running towards Nashik is also closed due to the high civilization in the area. For these two reasons, the Kashypi Dam was constructed.

Kashypi Dam, is an earth fill dam on Kashyapi river a tributary of Godavari near Rajapur, Nashik, it is constructed on u/s side of Gangapur Dam. The height of the dam above lowest foundation is 41.75 m (137.0 ft) while the length is 1,291 m (4,236 ft). The volume content is 2,761 km^3 (662 cu mi) and gross storage capacity is 52,690.00 km^3 (12,641.00 cu mi).

Gautami Godavari Dam : Gautami Godavari Dam is constructed on U/S side of Gangapur Dam on river Gautami tributary of Godavari at near village Beze Tal. Trimbakeshwar, Dist. Nashik. Gross storage of Dam is 1879 mcft. Total Length of dam including spillway is 910 m and maximum height of Dam is 59.38 m. There is no water available in Kashyapi and Gautami-Godavari dams during summer.

Gangapur Dam: Downstream of these two dams is the Gangapur Dam. The dam is near village Gangawadi and is 10 Km. from Nashik city. This is an earthen dam constructed from 1954 to 1963. The total catchment area of the dam is 357.4 Sq.km. The total dam length is 3810 m. and maximum height of the dam is 36.57m. The total gross storage of the dam is 215.88 MCM (7624 mcft) and total live storage is 203.76 MCM (7200 mcft). The length of the waste weir is 102 m. There are total 9 radial gates of size (9.15x6.10 m.) having the discharge capacity of 2294 cumecs (81013 cusecs). The dam has two canals, the left bank canal is 64 Km. long and right bank canal is 30 Km. long. The total irrigable area of this dam is 15960 Ha.

Due to deposition of silt, storage capacity of Gangapur Dam has reduced to 5630 mcft, also due to increase in residential zone (civilization) in command area of Nashik, Right Bank canal is closed. Since 1998, that land is given to Nashik Municipal Corporation for laying pipeline for drinking water from Gangapur Dam. The water from Gangapur Dam is used for irrigation through Nashik Left Bank canal. Dam water is used for drinking purpose of Nashik Municipal Corporation M.I.D.C. Satpur /Ambad. Thermal Power station Eklhare and recently reused water received after Nashik Municipal Corporation treatment is given to India Bull's Realtech Co.Ltd. (IRC) for their Thermal power plant at Sinnar. The water use of IRC has not started yet. *(Ref: Nashik Irrigation Dept. web Site).*

Nandur Madhmeshwar Dam: The main objective to build the Nandur Madhmeshwar Dam is to provide water for irrigation in Nashik, Ahmednagar and Aurangabad districts of Maharashtra state. Nandur Madhmeshwar , a dam was constructed in 1907-13 across the river Godavari just below the confluence of Kadwa and Godavari rivers at Nandur Madhameshwar. The water released from Gangapur and Darana water reservoirs is stored at Nandur Madhameshwar and subsequently released from here through canals for irrigation. Silts and organic matter that are carried away with water flow are accumulated in the lake due to which islands and shallow water ponds are created.

This resulted in the biological enriched conditions by which aquatic vegetation has been stabilized. Thus the site has turned into good wetland habitat aptly described as '*Bharatpur of Maharashtra*". Bird Sanctuary is located in Niphad Tehsil of Nashik district in Western Maharashtra. Nandur Madhmeshwar is nice place for birding, but it not gives better opportunities for photography,

because the area of back water in Nandur Madhmeshwar is very vast so if birds get disturb then they fly inside the lake.

Weirs on river Godavari from Gangapur Dam to Nandur Madhyameshwar Weir:

According to the information sought from the Water Resources Department (WRD, Nashik), there are in total four weirs built on River Godavari from Gangapur dam to NandurMadhyameshwar. These are as follows.

Sr. no	Name of the weir	Design details
1	Anandvalli weir	Storage : 7MCFT Height : 1.50m Gated length : 120m
2	Victoria bridge Bandhara	Not available
3	Nashik Thermal power station at Eklaharewier at Odha	Total length : 125.28m Storage : 69MCFT Gated length : 52.72m No.of drum gate : 02 Non gated length: 72.57m Service gate : 02
4	NandurMadhyameshwar	Not available

The above mentioned weirs are mainly built for the purpose of irrigation. The importance and benefits of weir can be understood from the availability of water in the river.

The presence of these weirs is leading to stagnant water conditions in the river. Such conditions were observed at Anandvalli weir during the visit of NEERI officials in the month of December 2013. The stagnancy of the water results in further deterioration of the water quality and growth of Water Hyacinth. Hence to maintain the water quality in the area of weirs, sufficient flow should be maintained to avoid stagnant water conditions.

Fig: River Godavari at Anandvalli Bridge

c) Agglomeration of Towns and Villages

A large number of villages and cities are located on the bank of river Godavari upstream and downstream of Nashik. The list of these towns and villages within the study zone are listed in **Table 2.1.**

Table 2.1 : City/Towns/ Villages Along the Bank of Godavari River under Study Area

Sr.	Name of the Town	Population (2001)	Class of the City
1.	Trimbak	12056*	Class – V
2.	Gangapur	22325	Class – III
3.	Nashik City	1,480,769*	Class – I
4.	Talwade Trimbak	1773	Village
5.	Beze	1119	Village
6.	Shilapur	1691	Village
7.	Odha	2645	Village
8.	Lakhalgaon	3840	Village
9.	Chehedikhurd	885	Village
10.	Lalpadi	807	Village
11.	Darnasangavi	1642	Village
12.	ShimpiTakli	1616	Village
13.	Chatori	5479	Village
14.	Saikheda	7199	Village
15.	Chandori	12098	Class – III
16.	Shingave	4940	Village
17.	Karanjgaon	5568	Village
18.	Nandur Madhyameshwar	3733	Village
19.	Niphad	9274	Class – V

* Census, 2011

d) Nashik City

Nashik, the fourth-largest city in Maharashtra, is the District headquarters of Nashik District. It is an important node of the industrial triangle with Pune and Mumbai. It is 180 Km from Mumbai, the financial capital of Maharashtra. It is famous for grapes, vineyards and is also an important pilgrim centre. Nashik forms north west part of Maharashtra with diverse landscape made up of Deccan trap, plateau, hills, linear ridges and alluvial plains. The main rivers flowing in the district is Godavari and its tributaries Kashyapi, Darna, Girna, Kadwa and Nasardi (Nandini), Mula, Prawara, Panjarakan, Gomai etc. Nashik city is an important and famous ancient city of Maharashtra. The banks or the Ghats of the river Godavari are considered to be sacred. People take holy dip in the "Kundas" (Ponds) constructed on the river banks. Panchavati is one of the densely populated areas of Nashik where Ramkund is a unique place of religious importance at all the times, especially in the "Kumbhamela".

Demographic Information of Nashik : Nashik is located at 565 m elevation from the mean sea level on western edge of the Deccan Plateau which is a volcanic formation in northern Maharashtra. The River Godavari originates 24 km (15 miles) from Nashik at Trimbakeshwar and flows along the northern boundary of the city through the old residential settlement in the city.

The total land area of the city is about 259.13 km^2 (100.05 sq mi) which makes it the third largest urban area of Maharashtra after Mumbai Metropolitan Region and the Pune and Pimpri Chinchwad Urban Region (together as second).

Information on Land Use in Nashik City

Sr.	Category	Total/Percentage Area
1	Gross Total Area of Nashik	259.13 sq. km
2	Developed Area	52.84%
3	No Development Zone*	44.14%
4	Industrial Zone	(1350 Hect.) 7.31 %
5	Vacant land /Water bodies	3.56%

*Also Includes Agricultural farms,
Source: CDP for Nashik, (2005) Ch.4

According to the Census of India, 2011, Nashik had a population of 1,480,769. Males constitute 54% and females 46% of the population. Nashik had an average literacy rate of 74%, higher than the national average of 64%; male literacy was 80%, and female literacy was 66%. In Nashik, 14% of the population is under 6 years of age. The projected population of Nashik urban agglomeration, which includes abutting urban areas like Deolali) as on 11 November 2012 is **1,562,769**.

Nashik city covers many holi places like Someshwar Temple, Navsha Ganapati temple, Laxmankund, Ram Kund, Dutondya Kapaleshwar Maruti Temple, Chakradhar Swami temple, Shri. KalaRam Parnakuti temple, Sita Gumpha, Tapovan etc. Lacs of devotees visit these places every day. Mass bathing, asthi visarjan and dashkriya vidhi adds pollutants to the river. Areas like Sawarkar Nagar, Asarambapu Ashram, Nashik Boat club, Kusumagraj Udhyan, Goda park, Gandhi Talav, Gangevarcha Bhaji Bazaar, Hindu Smashan Bhumi at the banks of Godavari river also contribute significant pollution through waste discharges.

Nashik has been the educational hub of North Maharashtra. The city has two state-run universities, the Yashwantrao Chavan Maharashtra Open University and the Maharashtra University of Health Sciences. Colleges in Nashik are affiliated to Pune University. Pune university has announced setting up of an additional campus in Nashik which is to be located on Dindori road and spread over 100 acres of land. Today the city houses a large number of private and governmental

educational institutions offering higher education in Medicine, Engineering and Technology, Architecture, Pharmacy, Military Management among others. Bhonsala Military School is the oldest residential school in Nashik.

Geology: The region near Trimbak is mountainous and rocky. The geology in Nashik city has disintegrated basalt of argillaceous nature with various shades from gray to black The soil in Nashik is primarily black, containing high alumina and carbonates of calcium and magnesium. which is very fertile and favorable for Agriculture. Nashik is famous for grapes, onions, and tomatoes. Nashik was famous for its table grapes for a very long time. Also Known As Wine Capital of India, In early 1925, the "Table Grape revolution" was started in Ojhar, a small town near Nashik. Today, Table grapes are being exported to Europe, the Middle East, and Asia.

Industrial zones: There are two industrial estates namely Satpur having 1600 Acres and 750 no. of units and Ambad having 1400 Acres area with 850 nos. of units. Till 2014 there was there was no common effluent treatment plant (CETP) in this region for the combined treatment of effluent generated from small scale units of water polluting industries. It was reported by MPCB official that individual treatment schemes are constructed by the respective water polluting industries The M.I.D.C. has not provided any underground drainage system for collection of industrial and domestic waste water. It is the need of the hour to provide common effluent treatment plant in these industrial areas. Hence recently an initiative has been taken up for the construction of CETP at MIDC for 1 MLD capacity **(Annexure 4)** and the land has been approved by the competent authorities. There is no common hazardous waste dumping site identified in the area.

In addition to the these industrial zones, variety of major water intensive industries have come up like India Bulls, The Eklahare Thermal Power Plant is also located at the downstream of Nashik and its water requirement is met by releases from Gangapur dam on River Godavari, managed by Irrigation department.

2.2 Infrastructural Facilities for the Study Region

a) Trimbakeshwar Water Supply Scheme for Trimbak City: The source for water supply to Trimbak city is Amboli dam at a distance of 11 km from Trimbakeshwar. The capacity of the dam is 129.37 ML/ft^2. The water reservation for the city is 26 MCFT. Two VT water lubricated pumps (50 HP) carry water from Jackwell to WTP through MS pipe.

b) Water Treatment and Distribution: A water treatment plant of 2.4 MLD capacity is treating the water supplied from Amboli Jackwell through conventional processes. The treated water is distributed to the city through existing Elevated Service Reservoir (ESR) of capacity 6 LL and a newly constructed ESR of capacity 32.20 LL in Nilparvat area. Besides this one Sistern of capacity 10,000 L with Stand post is provided to supply water to the city. Two Centrifugal Pumps of power 25 HP, head 31 m and discharging capacity 87,480 LPH is provided to pump water from WTP to ESR. The water is carried through a pipeline of 150 mm dia CIDF material having length 60m. Water Pump shaft is provided at a height of 21 m from the ground level to carry water to elevated area. A number of Sisterns of capacity 10,000 L each and Standposts are provided to supply water to Ashram **(Table 2.2)**. The water losses of this plant are 15%.

Table 2.2: Existing Water Reservoirs in Trimbak Feeding to Trimbak City

Water Reservoir Type	Capacity (L)
ESR 1	600000
ESR 2	3200000
Sistern	10000

Details of Sistern Provided for Ashram and Akhada

Sr.	Ashram	Sr.	Ashram
1	Shree Dashnam Akhada	10	Mahanirvani Akhada
2	Avahan Akhada	11	Nathpanthi
3	Agni	12	Janardan Swami Sansthan
4	Atal Akhada	13	Gajanan Maharaj Sansthan
5	Nirmal Akhada	14	Swami Samarth Kendra
6	Anand Akhada	15	Shrisant Nivruttinath Mandir
7	Juna Adaseen Akhada	16	Shakiya Vishramgruha
8	Nava Adaseen Akhada	17	Bandhkam Khate Karyala
9	Niranjani Akhada		

Note: Each Ashram was provided with one cistern of 10000 litres capacity

Water to the consumers is supplied at a rate of 70 LPCD. In critical months of summer, the water is supplied every alternate day or even after 2 days for one hour duration. The municipal council of Trimbakeshwar, has proposed to acquire a five-acre plot of land for the implementation of an Rs. 64 crore proposed water supply scheme through the state's water supply and sanitation department - Maharashtra Jeevan Pradhikaran. The council intends to get funds for the project through the Maharashtra Sujal Nirmal Abhiyaan (MSNA). This scheme is proposed for the forthcoming “Kumbhmela”*

** Information Source:*
Mr. N M Nagare chief officer of the Trimbakeshwar Municipal Council (TMC)

c) Sewerage and Sanitation

In the year 1991-92, a 1200mm dia RCC pipe was laid in order to carry storm water to river Godavari. However water clogging problem took place due to accumulation of waste in the course of time. Hence later on the pipe was replaced by RCC slab at river Godavari. Accordingly pipe line at the confluence of Neelganga nalla and Mhatar Ahola nalla were replaced by RCC slab. However, to tackle the problem of pollution, sewerage system is designed and the sewage is diverted to the sump well by constructing RCC Box and channel which will carry sewage from different localities and wards. The details of diversion of sewage via RCC box are presented in **Table 2.3**.

Table 2.3 : Sewerage System for Collection and Transportation of Sewage to STP

Name of Nalla	RCC box Channel Details	Location of Discharge	Other Arrangements
Confluence of Neelganga and Mhatar Ahola nalla	(6m wide and 1.25 m height)	sump well of STP	-An RCC column slab -Slope provided -Proper ventilation, like manholes (60cmx60cm)
Laxmi Narayan Chowk	(1.50x1.50 m).	sump well of STP	-An over flowing weir
Kushavart Tirth to Mhatar Ahola Nullah.	RCC Box channel (1.5mx1.5m)	sump well of STP	
Anand Akhada	RCC box (length: 59.70 m)	sump well of STP	
Panchali	300 mm dia pipeline of length 72.05 m	Godavari	-An overflow weir.

During 2003, during Sinhastha Kumbhmela, a sewage treatment plant is constructed with MBR technology. The plant is located at the back side of the Shiva Temple with a capacity of 1.0 mld. The design of the plant was provided by IIT, Mumbai and the plant was constructed by MJP. The flow diagram is presented in **Figure 2.2**.

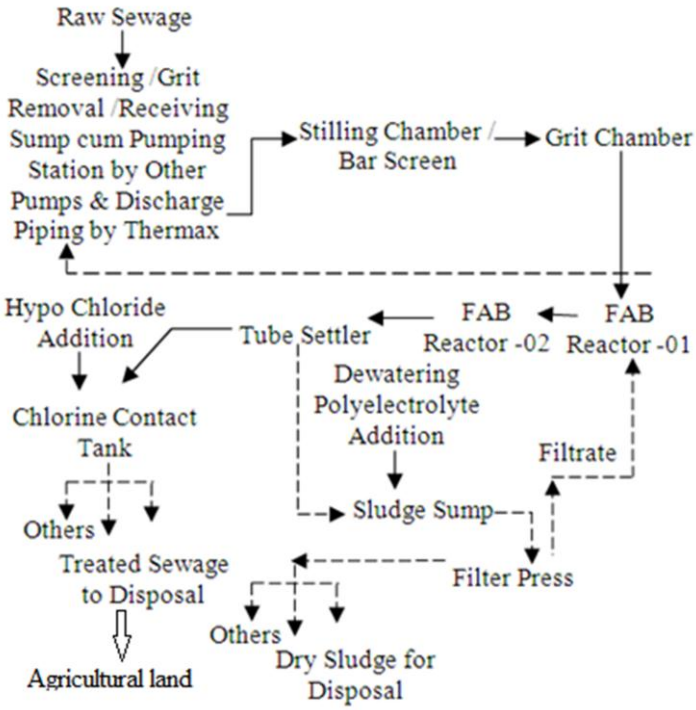


Figure 2.2 : Sewage Treatment Plant at Trimbak

d) Between Trimbakeshwar and Nashik City

A couple of villages with population less than 5,000 are located and no organized wastewater disposal into Godavari river is reported. Gangapur which is Class III city having population more than Trimbakeshwar is mainly well known for existence of Gangapur dam, a source of domestic water supply for Nashik city and water requirement for industrial zones at Satpur and Ambad areas. This dam also provides water for irrigation through well constructed cannels and meets the requirement Eklahare Thermal Power Plant downstream of Nashik during non monsoon months.

2.3 Nashik City

a) Water Supply Status

According to the Environmental Status report of Nashik prepared by Nashik Municipal Corporation, the estimated population of Nashik city is 15 lacs in the year 2011 (Census figure is 1,480,769). The average supply of drinking water to a citizen is 150 -175 LPCD. Adequate water is supplied in morning and evening.

Water Supply System: NMC's present water supply is a combination of various water supply schemes planned and executed for the 3 erstwhile towns (Nashik, Nashik road and Deolali) and 23 villages that have been amalgamated into NMC. A direct pipeline scheme executed in 2001. Water supply to the Ambad and Satpur industrial areas which are within NMC limits is provided by MIDC from its own water works sourced. Drinking water needs of Satpur town adjoining Satpur Industrial estate were being met by taking bulk supply of water from MIDC. Snapshot of Nashik city water supply system and sewage pumping stations is given in **Figure 2.3 a&b.**

Source, Treatment Facilities, Storage and Distribution System : Nashik city receives piped water from two sources namely Gangapur Dam head works on river Godavari, which supplies almost 1.6 million residents of NMC area and Head works on the river Darna, that pumps about 25 MLD of raw water which serves Nashik Road area.

i) Head at Gangapur Dam: From Gangapur dam raw water is pumped and supplied to Bara Banglow, Pachawati, Gandhi Nagar, Nashik road water treatment plant and Shivaji Nagar filtration plant. After conventional treatment, chlorinated water is supplied to citizens of Nashik.

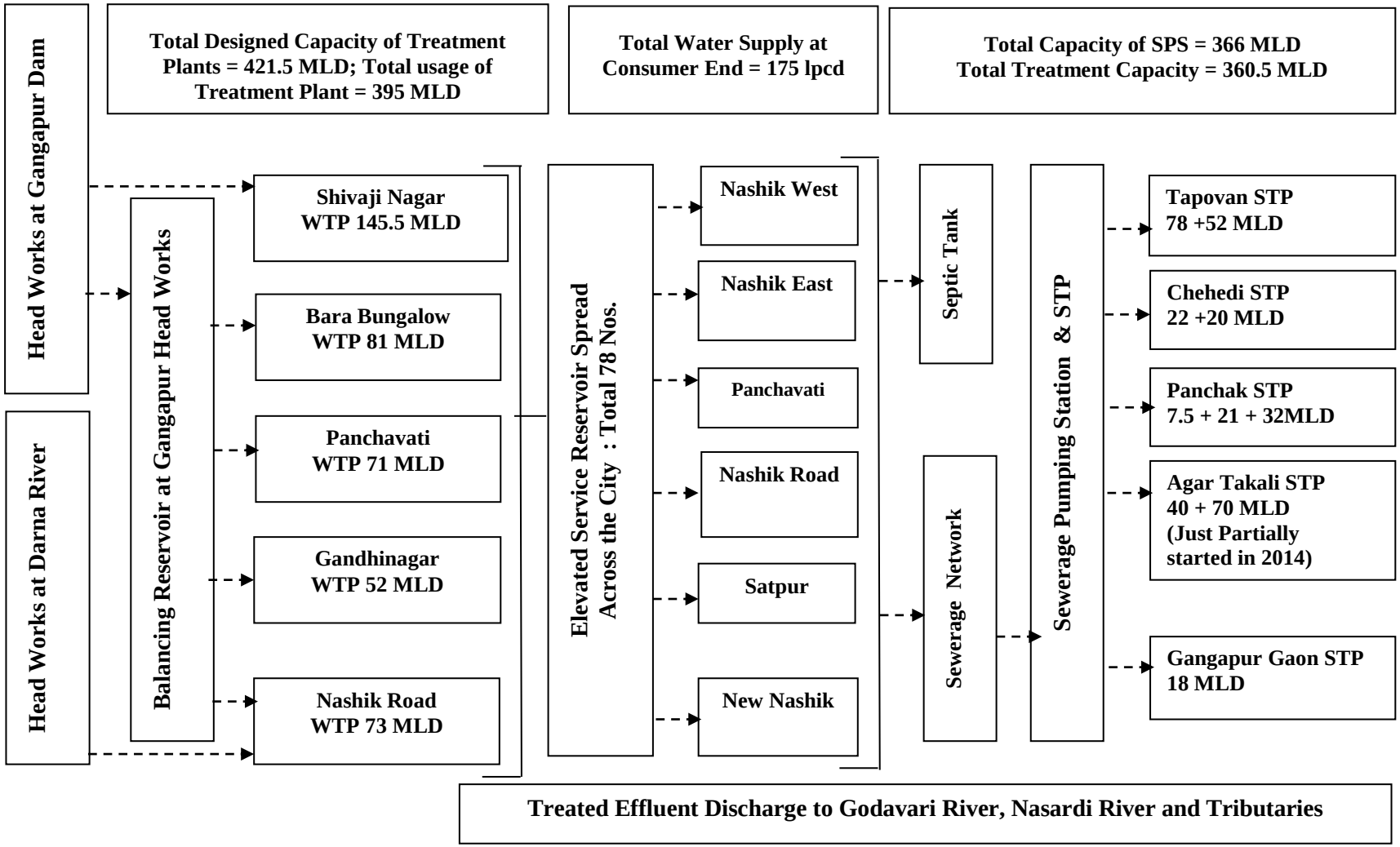


Figure 2.3a: Water Supply Scheme to Nashik

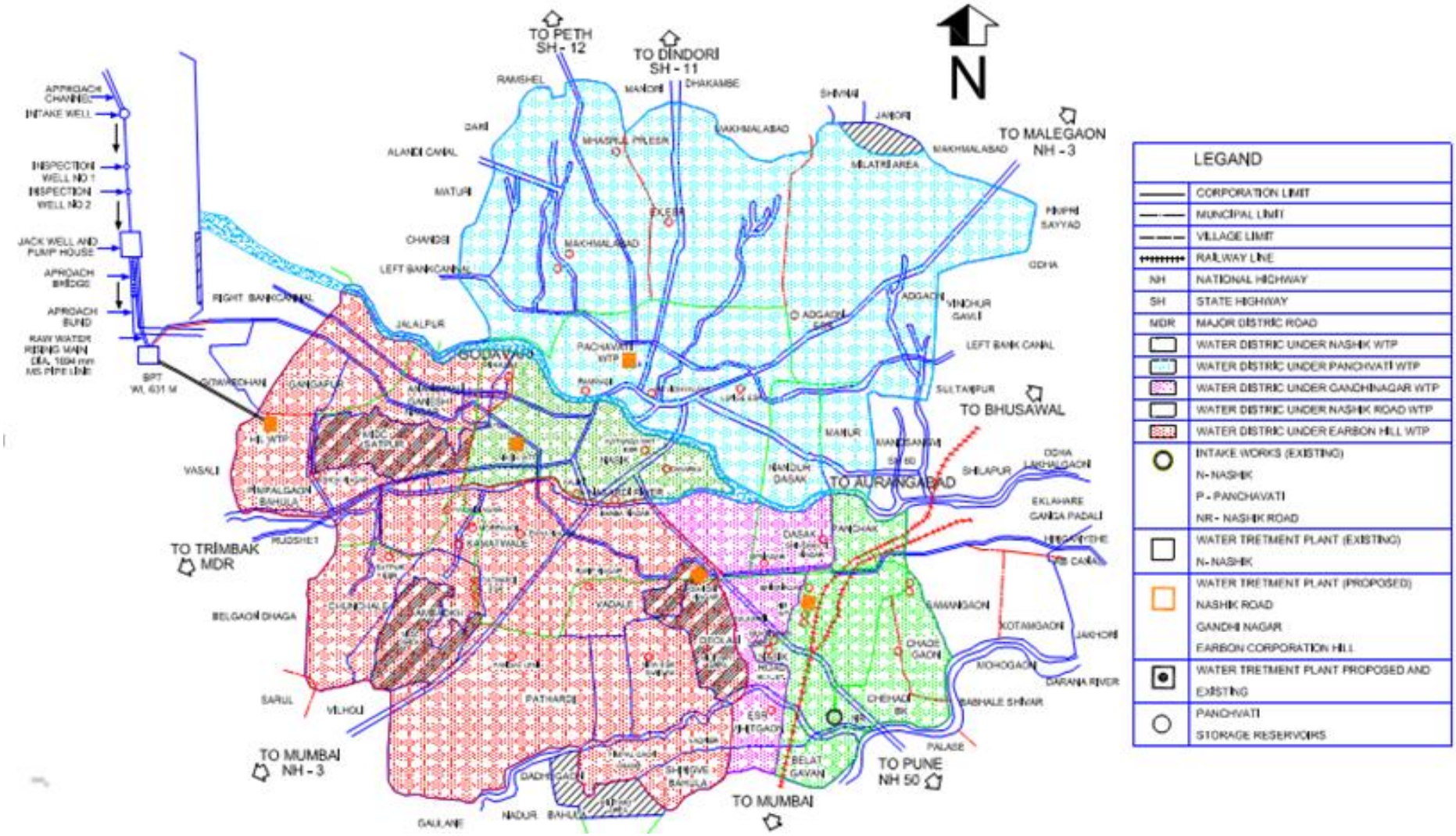


Figure 2.3b : Water Supply Scheme to Nashik

b) Head works in Mukane Dam on Darna River at Chehadi village, Nashik Road : From Darna river about 30 mld of raw water is pumped and supplied to Nashik Road filtration plant. One other source is from Darna dam which is about 28 km from Nashik city is dam was constructed in the year 1934 with storage capacity of 7149 mcft. Presently NMC is having reservation of 350 mcft. in this storage. The NMC has constructing one weir with gates on river Darna near village Chehedi with storage capacity of 144 mcft.

There are 5 treatment plants in the city viz. Shivajinagar, Bara Bungalow, Panchvati, Gandhinagar and Nashik road WTP **(Table 2.4 and Figure 2.4)**. These five water treatment plants have total design capacity of 421.5 mld and currently 395 mld water is being produced. Water from Gangapur dam head works is pumped through two raw water rising main pipelines. One pipeline carries water to Shivaji Nagar WTP and the treated water is then supplied to CIDCO and Satpur area. Another pipeline takes water to the remaining four WTPs. From the Darna head works, water is pumped and supplied to the Nashik Road WTP.

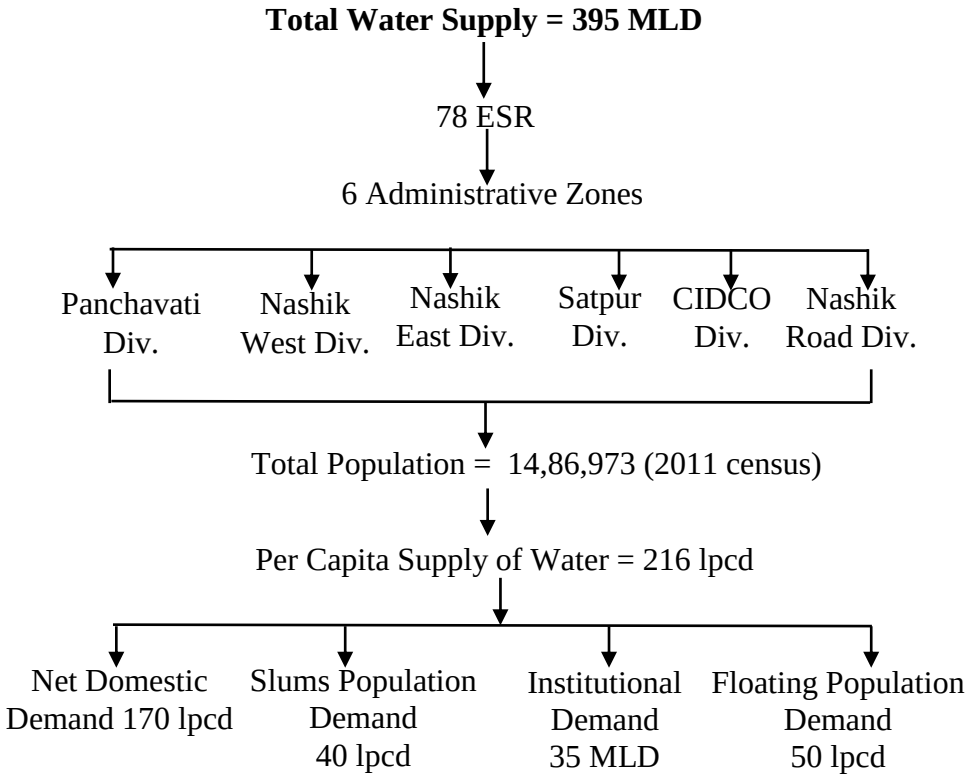
Table 2.4 : Information on Water Treatment Plants in Nashik

Sr.	Location	Design Capacity (MLD)	Actual Used Capacity (MLD)
1	Shivaji Nagar	145.5	125
2	Bara Bungalow(Nashik)	81	92
3	Panchavati	71	90
4	Gandhinagar	52	35
5	Nashik Road	72	53
	Total	**421.5**	**395**

Source: Water Supply Department, NMC, Nashik (From CDP 2012)

Treatment Technology: The raw water is treated through conventional treatment processes like aeration, coagulation, flocculation, sedimentation, rapid gravity sand filtration and disinfection by chlorine. There are 7 booster pumping stations viz. Kalika, Gopalnagar, Dwarka, Budhwar Peth, Patherdy, Chunchale and Borgarh pumping station. After treatment, water is pumped to 81 Elevated Service Reservoirs (ESRs) spread across 6 zones of the city from where water is distributed to end users by gravity through the distribution network.

According to the ESR report and "Water Supply Information Booklet 2012 -2013" of NMC Nashik, 99.8% of the total population extensively uses surface water i.e. piped water supply. Only 0.2% is depending on ground water supply which is available in the form of bore well. In the light of increasing water demand, 1202 wells have been procured by NMC. Out of these hand pumps are fitted on 918 wells and 284 power pumps are fitted on bore wells.



Source: CDP/CSP/ESR documents for Nashik city prepared by NMC.

Figure 2.4 : Water Supply in Nashik

In NMC area, almost 25% of usable water is lost due to either leakage in public taps, or faults connections or leakage in supply pipes and reservoirs. The information on public bore wells is presented in the following **Table 2.5**.

Table 2.5 : Details of the Bore Wells Available in Nashik

Sr.	Area	No. of Bore wells	Hand Pumps	Power Pumps
1	Nashik Road	339	291	48
2	CIDCO	303	234	69
3	Satpur	144	113	31
4	Panchavati	210	148	62
5	East Nashik	119	79	40
6	West Nashik	87	53	34
Total		1202	918	284

Source : ESR 2011(pp35)

Zone-wise elevated service reservoirs for details of zone wise ESRs (Capacity units are lakh litres) is given in **Table 2.6**.

Table 2.6 : Information on Elevated Service Reservoirs in Nashik City

Sr.	Zone	Number of ESRs	Capacity (Lakh litres)
1	Nashik East	9	157.7
2	Nashik West	14	179.77
3	Panchavati	16	238
4	Satpur	10	133.5
5	Nashik Road	14	233.7
6	New Nashik	18	332.5
	Total	81	1135.2

Source: Water Supply Department, NMC, Nashik (From CDP 2012)

Distribution network coverage is of 2000 km indicates that there are 1,50,000 connections are provided out of which 95% are metered. The piped network is a combination of pipelines (ranging from 50 to 450 mm diameter) installed at different points in time. (The demography and land use of Nashik indicates 52% of developed residential area. 18% slum are partially covered through PSPs through the distribution network.

Water supply is intermittent and within a fixed time schedule for every zone and sub zone. The citizens get water every day for a period of 2- 4 Hrs. The gross per capita supply works at 175 lpcd based on the quantity of water taken at the source level, which is higher than the 135-150 lpcd. Discussions with NMC officials suggest that about 10% of the population is not covered by municipal water supply, particularly in some wards on the outskirts of Nashik city or in select slum pockets.

The supply is also not extended in some areas in CIDCO and Satpur division and a few flood prone areas which have a population of about 2000 people.

2.3.1 Waste from Water Treatment Plants

The quantity of backwash water and desludging operation ranges from 2 to 3%. The frequency of backwashing is less due to excellent raw water quality. About 10 MLD water is wasted as WTP waste from all the five treatment plants. This liquid waste is not reutilized or recycled within the plant but joins nallas nearby. Recently the pipe line of these wastes has been diverted to the pumping stations for sewage. The information on waste Disposal practices for Water Treatment Plants adopted earlier and modifications made is summarized in **Table 2.7**.

Table 2.7 : Waste Disposal Practices for Water Treatment Plants

Water Treatment Plants (WTP)	Supply (MLD)	Earlier Method of Disposal of WTP Waste	Modified Method of Disposal of WTP Waste
Nashik Bara Bungalow WTP	81.0	Forest nursery	Now connected to Nasardi PS going to Agartakli used for jogging track plantation
Panchavati Tapovan WTP	71.0	Either river or used for agriculture	Through sewer line to STP
Nashik Road WTP	73.0	Nasardi	PS to Panchak
Shivajinagar Hill WTP	145.5	Bulk plantation	PS to Panchak
Gandhinagar WTP	52.0	Nasardi	PS to Agar Takli
Total	**422.5**		

Discussions with Mr.Dhanait (Ex.Engg. Mechanical, WSSD)

Information on Water Supply Distribution through PSPs and HCS to Residents of Nashik

The total quantity of water treated in five WTPs is about 390 mld. About 20% losses occur during distribution. So total water quantity available for distribution is 310 mld. The treated water is supplied through HCs to the residents in developed areas at the rate of 175 lpcd. The population of Nashik city as per 2011 census is 1,480,769. There are number of PSPs in slum areas. The population living in slum is about 18% *(Revised draft CDP 2012)*. The water is supplied at 40 lpcd with no metering system. Since Nashik city is pilgrim place around 50,000 people visit the city every day. The water to this floating population is supplied at 35 -50 lpcd.

Water Tariff : NMC is collecting water charges from different groups. The water rates decided are as under:

Domestic:	Rs. 5/kilo litre
Non –Domestic:	Rs. 22/kilo litre
Commercial/construction	Rs. 27.50/kilo litre

Metering is completed for developed domestic and industrial connections

Water Quality Surveillance: NMC does not test water quality at source or at WTP level but Nashik District Laboratory (NDL) tests water at the consumer end daily for residual chlorine and coli form bacteria. About 40 samples are tested every day for its quality in District Laboratory. NDL data for 2001-02 to 2009-10 shows that, except for few samples piped water supply is of good quality: less than 4% of all samples tested were found to be unfit for human consumption. The information on the Turbidity for Raw and finished water and details about water quality surveillance results are presented in **Annexure 5.**

Connections and User Charges : NMC estimates that, there were 172,875 water connections in Nashik city in 2012, comprising domestic, non-domestic, commercial and industrial connections. Metered connections (172,875) account for 98% of the total connections (175,348). Public stand posts and connections to NMC and other public utilities are 2,473 in number which are unmetered connections and are not counted in the water charges.

Other Proposed/ On-going Schemes and Projects : In order to cater to the water supply requirement during Sinhastha 2015 for an expected population of 18 lakh people, Nashik Municipal Corporation has estimated 567 MLD of water requirement. Based on the estimation NMC has prepared a proposal for water supply under Sinhastha 2015, worth Rs 151.2 Cr. The proposal is yet to be finalised.

2.3.2 Storm Water Drainage System

In Nashik Municipal Corporation area there is no comprehensive storm water drainage system available except for few chronic spots for the city. The ground slopes are steep in certain areas (Panchavati area), especially near the Godavari and its tributaries. The average low-lying ground level is 569 m. and the highest ground elevation is at 700 m. The old city is located at low-lying areas while the developed areas are mostly on higher grounds. There are 3 main River basins in corporation area as under – 1) The Godavari River flows west to East across approx. 18 kms of the central area of the city. Nearly 8 nallas meet the river Godavari in this stretch 2) The river Nasardi also flows west to east and joins the Godavari on the south bank at Takli. 3) The river Darna flows at the South – Eastern boundary of NMC, and its tributary Valdevi flows from the North – West to South – East and meets it near Chehedi. The Nasardi and Waldevi (which meets Darna river) are the tributaries of river Godavari. The drainage pattern lies within the respective ridges of the catchment area.

2.3.3 Sewerage System in Nashik

a) Master Plan, 2009

Preamble : Old Nashik town on right bank of Godavari had a system of brick / stone masonry drains covered with stone slabs, for conveying sullage and storm water to the river. The known first sewerage in Nashik city was built in 1895, from Tiwari Mahal up to river Godavari. Under the "Nashik underground drainage scheme- Part 1" executed during 1955-68 by Nashik municipal council, intercepting sewers were laid on both banks of Godavari. The sewage was pumped from a pumping station at Ganeshwadi on left bank into distributaries of Gangapur left canal. In view of Sinhastha fair in the year 1991 and to arrest flow of sullage and sewage into drains and Godavari river, Maharashtra Water Supply & Sewerage Board executed an emergency scheme. The scheme

envisaged augmenting intercepting sewers of various diameters on both banks of river and enhancing capacity of existing Ganeshwadi pumping station to deal with increased flow.

The existing sewerage system of Nashik comprises of, works carried out under UGD Phase I (1998 -2003). This scheme was implemented for a residential area and commissioned in 2004. Godavari Action plan and current works under UGD Phase II - JnURNM followed subsequently. With a 100 % grant under Nation River Action Plan from the Central Government, Nashik Corporation executed Sewerage Pumping Station and Sewage Treatment Plant works in Nashik under Godavari Action plan. Further Augmentation of sewerage infrastructure is done under JNNURM package I and Package II. The information on Sewerage system covered under various schemes is presented in the **Table 2.8 and Annexure 6a &b**.

Table 2.8 : Sewerage Infrastructure Augmentation under Various Schemes

Sr.	Scheme	Sewer Length	SPS	STP
Pre JnNURM				
1.	UGD, Phase 1 ***Approved in 1998, Commissioned in 2004***	Intercepting -45 km Trunk – 85 km Branch -600 km	Kapila -7.5 MLD	Panchak (7.5 MLD)
2.	Godavari Action Plan ***Approved in 2001; Commissioned in 2005***	Pumping station to STP -8 km	Old Ganeshwadi -25 ML New Ganeshwadi -45 ML Takali -21 ML Chahedi – 50 ML **Total (141 ML)**	Tapovan – 78 MLD Chehedi – 22 MLD **Total (100 MLD)**
Post JnNURM				
1.	JnURAM UGD, Phase II-Package 1 ***Under JnNURM***	Trunk -25 km Branch – 200 km	Kapila -52 ML Agar Takali – 210 ML Chadegaon – 1 ML New Panchak – 11 ML Nandur Dasak – 36.5 ML **Total (310.5 ML)**	Tapovan – 52 MLD Agar Takali -210 MLD Chadegaon – 20 ML Panchak – 21 MLD **Total (163 MLD)**
2.	JnURAM UGD, Phase II Package 2 ***Under JnNURM***	Trunk -34 km Branch – 50 km	Chikhali Naka – 25 ML Nasardi Sangam – 40 ML Bhadrakali – 14 ML Manur – 55 ML Untwadi – 28 ML Gangapur – 4.5 ML **Total (166.5 ML)**	Agar Takali -40 MLD Panchak – 32 MLD Gangapur – 18 MLD **Total (90 MLD)**

Source : Note on UGD Schemes, Sewerage Department, Nashik
Draft Revised City Development Plan, 2012

2.3.4 Impact of Onsite Sanitation System: Septic Tanks

Areas that are not connected to sewerage network have septic tanks. NMC officials estimate that about 80-85% (#) of septic tanks and other individual pit latrines are connected to NMC sewerage network. Septic tanks are cleaned by the NMC on demand from citizens. At present, NMC has 6 vehicles, one for each of the 6 zones. The charges are Rs. 500 for apartments and Rs. 300 for individual bungalow. However, data on frequency of cleaning is unavailable. As per NMC estimates, septic tanks are cleaned once a year on an average. The primary household survey carried out under City Sanitation Plan (2011) by NMC indicated that 18% had toilets connected to septic tanks. Of this, 91% said that the septic tank cleaning is done by NMC after paying the requisite amount in the ward office. Only 5% of respondents surveyed said that they get the septic tanks cleaned themselves.

*[*Draft Revised City Development Plan 2012 , #Nashik City Sanitation Plan, 2011 (pp34)]*

2.3.5 Sewerage System of Nashik

The population of Nashik is 1,480,769 (2011 Census). As per Master plan, based on topography of Nashik, the area is divided into seven sewerage zones **(Figure 2.5 and 2.6)**. Currently, there are 108 wards under NMC. The total area of Nashik city is around 25910 Ha of which the residential area is 10240 Ha which is covered under the project of underground sewerage scheme. The sewerage facility is provided for approximately 5538 Ha from above mentioned 10240 Ha.

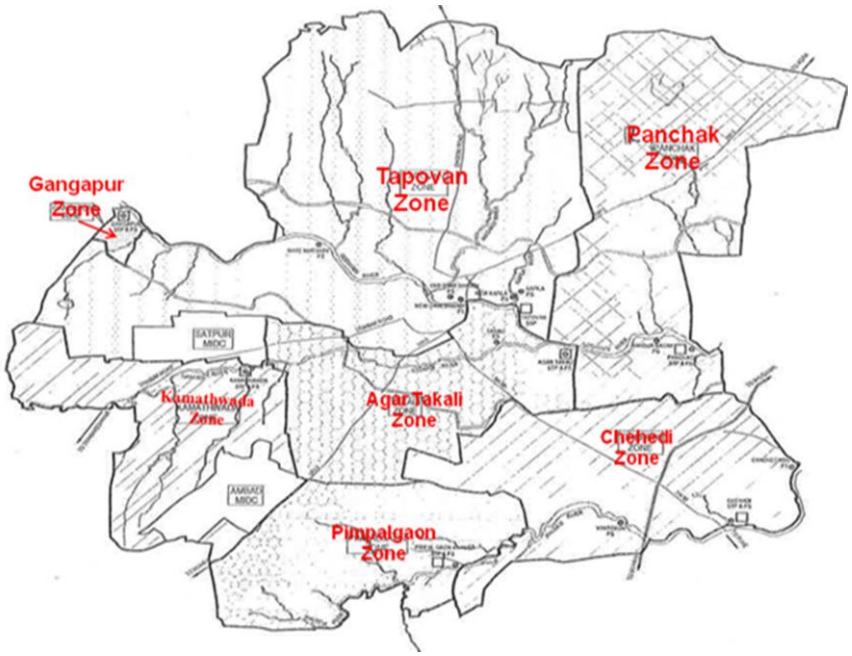


Figure 2.5 : Service Zones of Sewerage System for Nashik City

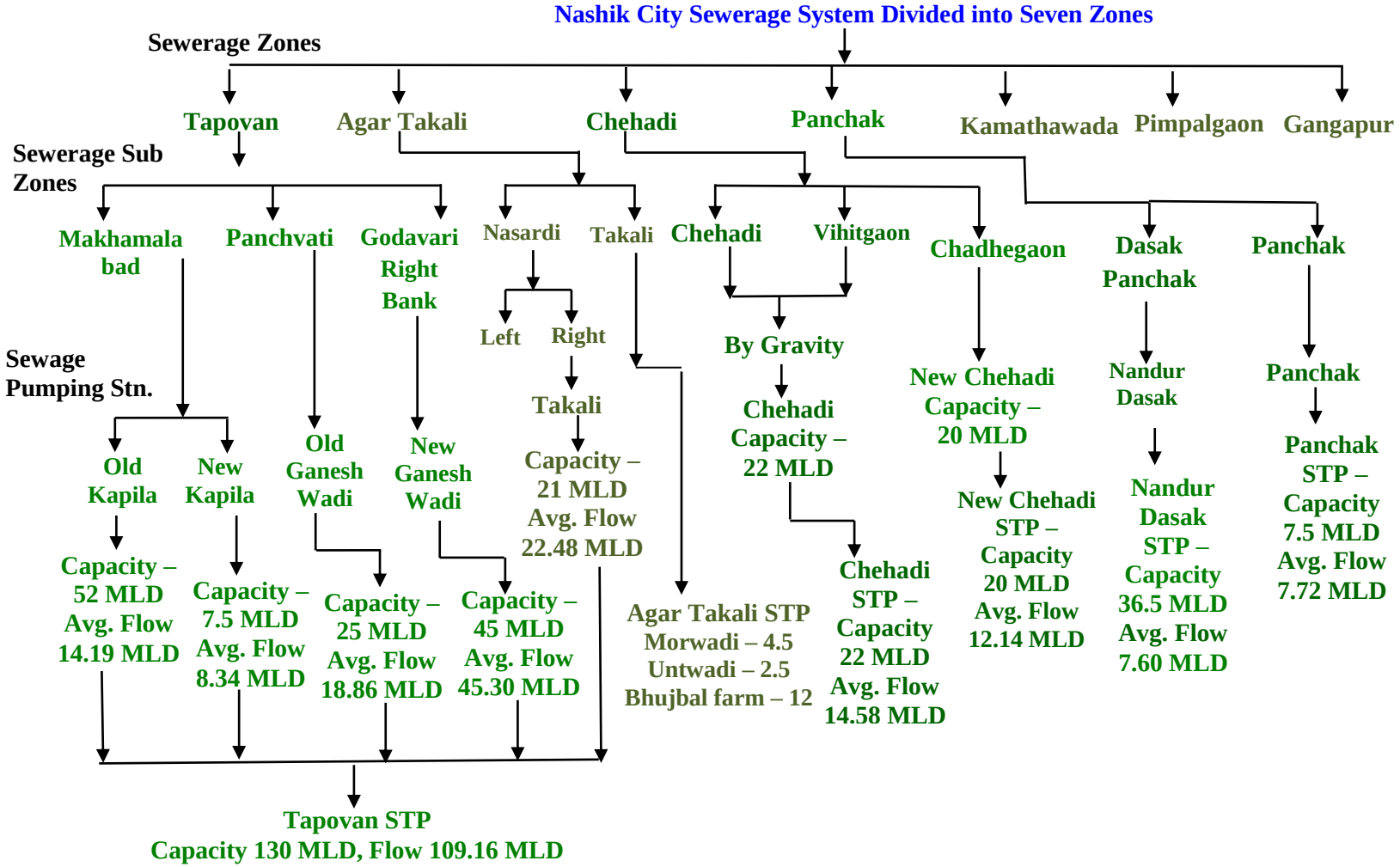


Figure 2.6: Flow Chart of Nashik City Sewerage System

Sewerage system infrastructure that conveys sewage encompasses receiving drains, manholes, pumping stations, storm overflows, screening chambers, etc. Sewerage system ends at the entry to a sewage treatment plant or at the point of discharge into the environment for the disposal without treatment. As per the information incorporated in ESR of Nashik city 2011 the Sewerage and Sewage scheme is not yet completed for hundred percent coverage.

The remaining work for installation of underground Sewerage is in progress and about to be completed by the end of March 2015. However at STPs at Gangapur and Pimplgaon Khamb will be commenced after land acquisition. The targeted date was not achieved due to certain problems of land acquisition. The untreated sewage is generally let out in river Godavari and its tributaries like Nasardi, Waldevi. The untreated sewage is generally let out in river Godavari and its tributaries like Nasardi, Valdevi. Out of 25,910 ha of total area of the NMC, only 10,430 ha is covered under the project of underground sewerage scheme. The length of all types of sewer lines amounts to 1745 km. Total length of intercepting sewer line of approximately 45 km., total length of trunk sewer line approximately 84 km., total length of branch sewer line of approximately 600 km. are constructed during implementation of sewerage scheme *(NMC 2011 ENV Status Report).*

2.3.5.1 Underground Sewerage System

Intercepting sewers were laid on both banks of Godavari, terminating in a pumping station at Ganeshwadi on left bank of the river. The sewage is pumped from this pumping station through 750 mm dia. rising main about 3.3 km length in to a distributor of Gangapur left canal.

Since olden days, brick masonry sewers are existing in gaothan area of Nashik city. These sewers collect the waste water from households as also the storm water run-off. These old sewers are joined to the piped sewerage system created later. Due to inadequate capacities of these sewers, during monsoon, the storm water mixed with sewage runs off to join the river. It is necessary to provide separate system of sewers for exclusive collection of sewage for old gaothan area & join it to the main sewer system.

There are some old sewers laid along banks of Godavari prior to phase 1 works. These sewers need rehabilitation. NMC has commenced the hydrostatic modeling of these sewers (2005-2006) and have completed the work. Regular monitoring and maintenance of these sewers should be undertaken periodically.

As per CDP of Nashik Municipal Corporation under JNNURM report the phase 1 project is designed to cover populated area of city including Nashik city, Satpur, Nashik road-Deolali, Dasak Panchak. Considering population projections made earlier by various consultants & agencies, WAPCOS projected population of Nashik city as 16.77 lakh in the year 2021. Corresponding population allocated to project area is 12.16 lakh. Draft development plan of NMC prepared wrt. year 2005 population (13.5 lakh). The Govt. of Maharashtra accorded Administrative Approval to Phase 1 project excluding the part to be under taken as Godavari Action Plan vide GR BhuGaYo /1095/1400/ Prakra 144 / Pa 17 dated 27 April, 1998. The said works are completed.

After Augmentation and implementation of various schemes, the overall consolidated Sewerage infrastructure with in Nashik city is presented below.

In Nashik, there are 149120 no. of sewerage connections and 37280 no. of non-residential connections which are connected to sewers. In Nashik there are many properties which have septic tank facility and some of these are further connected to sewerage network. Despite laying and expanding its sewerage network, the Town Planning Department, NMC still mandates provision of a septic tank and does not grant building permissions without it.

However, the data on number of septic tanks and septic tanks connected to sewerage system is not available with NMC. Only limited data is available for the year 2009. NMC estimates that almost 60% of the properties within NMC have septic tanks that are connected to sewerage network, with the settling and percolation of sewage in septic tanks reducing the load on sewage treatment plants (STPs). This has resulted in the quality of wastewater reaching STPs with low BOD load.

2.3.5.2 Drainage Basins and Sewerage Zones

Three major rivers, cutting across NMC area, running from west to east, are Godavari, Nasardi and Waldevi. Nasardi is tributary of Godavari meeting in the Corporation limits. River Waldevi runs on southern outskirts and merges in to river Darna, the tributary of river Godavari, near Chehedi beyond NMC limit. The project area is thus divided in three drainage basins, namely, Godavari, Nasardi & Waldevi which are further divided into various water sheds on the basis of topography and convenience of collection of sewage flow. Each of the water sheds has its own intercepting sewer **(Table 2.9)**.

Table 2.9 : Network and Pumping Stations for Nashik City based on River Drainage Basins

Godavari Drainage Basin		
○ Godavari left bank sewerage shed A served by existing LB intercepting sewer ○ Sewerage shed B on left bank of Godavari with sewer along Waghadi nalla	Sewerage Zone- I	Ganesh Wadi
○ Godavari right bank sewerage shed served by right bank sewer ○ Saharanpur intercepting relief sewer shed to cater for the area south of Saharanpur road	Sewerage Zone- II	Ganesh Wadi
○ Sewerage shed D gravitating to pumping station near Tapovan STP	Sewerage Zone- IV	Pumping station at STP
○ Sewerage shed C gravitating to pumping station at junction of rivers Kapila& Godavari	Sewerage Zone - V	Pumping station at jn. of Kapila and Godavari
○ Dasak Panchak sewerage shed gravitating to a point near Panchakgaothan	Sewerage Zone - VI	Pumping station at Panchak
Nasardi Drainage Basin		
○ Nasardi left bank sewerage shed gravitating to right bank intercepting sewer ○ Nasardi right bank sewerage shed gravitating to a point near Takli village	Sewerage Zone- III	Takli pumping station
Waldevi Drainage Basin		
○ Nashik Road Deolali sewerage shed draining to Waldevi pumping station near Chehedi	Sewerage Zone-VII	Nashik Road pumping station

Source: CDP (2005-06)

Seven sewerage zones are defined on the basis of topography and convenience of collection of sewage flow by gravity. The seven sewerage zones as per the Master plan are as follows:

1. Tapovan sewerage zone
2. Agar takli sewerage zone
3. Chehadi sewerage zone
4. Panchak sewerage zone
5. Kamathwada zone
6. Pimpalgaon Khamb zone
7. Gangapur zone

Out of these seven zones, four zones viz. Tapovan, Chehadi, Panchak and Agartakli comprise of the core area of the city and the other three zones comprise of fringe areas in the city. The information of each sewerage zone with respect to sub-zone, dimension of sewer, pumping stations and trunk sewers is summarized in the **Table 2.10**.

Table 2.10 : Details of Sewerage Zone

Sr.	Sewerage Zone (1)	Sub-Sewerage Zone (2)	Dimension of Sewer (3)	Sewage Pumping Station (4)	Trunk Sewers (5)
Tapovan					
1.	Tapovan	Makha-malabad	Length: 86,664m, Diam.: 200 to 700mm	1. New Kapila 2. Old Kapila	1. Kapila left bank sewer: 3511m long, dia. 400-700mm 2. Kapila Right bank sewer: 3210m long, dia. 250-400m
	Makhmalabad Relief Sewer	Proposed to augment the existing trunk and branch sewer			
		Panchavati/ Godavari Left Bank	Length: 34,460m, Diam. 300-1000mm	Old Ganeshwadi	1. Two gravity trunk main sewers collect the sewage from left bank from sewers along Ramwadi nalla, Makhmalabad road sewer, sewer along Aruna nalla and Ramkund sewer 2. Separate trunk main along Waghadi river
		Godavari Right Bank	Length: 1,24,180m, Diam.500-1400mm	New Ganeshwadi	Collects sewage from right bank main sewers viz. sewers along Gangapur Nalla, Shivajinagar Nalla, MIDC Nalla, Anand wall nalla, Mate Nursery area, Mahatma Nagar and Nearby Area, Intermediate Pumping Station Near Mate Farm, Sahadev Society, Old PS Road, Old Gangapur Nalla, Medical College Road, Malharkhan Nalla and Gharpureghat Nalla. Excess sewage from Old Ganeshwadi PS overflows and comes into New Ganeshwadi PS *(Master plan, ch.5)*

Table 2.10 (Contd..) : Details of Sewerage Zone

Sr.	Sewerage Zone (1)	Sub- Sewerage Zone (2)	Dimension of Sewer (3)	Sewage Pumping Station (4)	Trunk Sewers (5)
Tapovan (Contd..)					
1.		Godavari Right Bank Relief Sewer	Proposed to adequate the existing trunk sewer lines along the Godavari right bank		
				Chikhali Nalla PS (Proposed)	The sewage from these wards is diverted to Gangapur Road PS from where it goes to Makhmalabad PS and then Tapovan STP
				Gangapur Road PS (Existing)	
				Chopda Nalla PS (Omitted)	

Sr.	Sewerage Zone (1)	Sub-Sewerage Zone (2)	Dimension of Sewer (3)	Sewage Pumping Station (4)	Trunk Sewers (5)
Panchak					
2.	Panchak	Dasak Panchak	Length: 34,080 m, Diam: 200-800 mm	Nadur Dasak	---
		Panchak	Length: 24,780 m, Diam: 200-800 mm	Panchak	---
	Kamathwada	---	Length : 50,164 m, Diam : 200- 600 mm	---	---
	Pimpal-gaon Khamb (STP proposed on the banks of river Waldevi)	---	Length: 18,340 m, Diam : 200- 800mm	---	---
	Gangapur (STP proposed on the banks of river Godavari)	---	Length: 5,564 m, Diam : 200-400 mm	---	---

Sr.	Sewerage Zone (1)	Sub-Sewerage Zone (2)	Dimension of Sewer (3)	Sewage Pumping Station (4)	Trunk Sewers (5)
Chehadi Sewerage Zone					
3.	Chehadi	Chehadi (Consists of Nashik Road and Deolali Area)	Length: 51,224m, Diam.: 200-1200mm	Chehadi PS	Chehadi trunk main carries sewage from Nashik Road and Deolali area.
		Vihitgaon (Almost 50% part is Unsewered)	Length: 7840m, Diam. 200-400mm	Chehadi PS (by gravity)	Sewage from Vihitgaon area and Chadegaon area has been taken by gravity to the Chehadi PS
		Chadhegaon (Area having 100% proposed network)			

Table 2.10 (Contd..) : Details of Sewerage Zone

Sr.	Sewerage Zone (1)	Sub-Sewerage Zone (2)	Dimension of Sewer (3)	Sewage Pumping Station (4)	Trunk Sewers (5)
4.	Agar Takali	Nasardi		Takali PS (sewage from Satpur area)	Nasardi Left Bank, Length: 6289m, diam. 700-800mm, trunk main carries sewage from five main branches NL1, NL2, NL3, NL4, NL5, NL6 and NL7.
				Takali PS	Nasardi Right Bank, Length: 3746m, diam. 700-1200mm, trunk main carries sewage from five main branches NR1, NR2, NR3, NR4, NR5, and NR6
		Takali	Length: 1,23,496m, Diam. 150-1200mm	Agar Takali PS	Trunk main carries sewage from Bhujbal Farm, Untwadi and Morewadi area

2.3.6 Pumping Stations

Existing Pumping Stations at Nashik: There are nine existing pumping stations which carry domestic waste water to the four treatment plants. The details of existing and proposed pumping stations, sewage treatment plant details, flows recorded are presented in the **Table 2.11**.

Table 2.11 : Information on the Existing Pumping Stations for Carrying Domestic Wastewater in Nashik

Sr.	Pumping Station	Sewerage Zone	Status	Location	Cap. (MLD)	Sewage collection	Av. Flow (MLD)	
							2012 -13	2013 -14
1	Old Ganesh Wadi	Tapovan	Constructed	Godavari Left bank	25	Catchment area of Old Ganeshwadi	19.8	20.16
2	New Ganesh Wadi	Tapovan	Constructed	Godavari Left & Right Bank	45	Catchment area of New Ganeshwadi	36.6	47.3
3	Takali	Tapovan	Constructed	Kathegalli	21	Catchment area of Takali	19.4	22.6
4	Kapila	Tapovan	Constructed	Junction of Godavari and Kapila	7.5	Constructed to handle flow during Kumbhamela	10.7	7.8

Table 2.11 (Contd..) :
Information on the Existing Pumping Stations for Carrying Domestic Wastewater in Nashik

Sr.	Pumping Station	Sewerage Zone	Status	Location	Cap. (MLD)	Sewage collection	Av. Flow (MLD)	
							2012 -13	2013 -14
5	New Kapila	Tapovan	Constructed	Survey no. 329(P) of Nashik	52	Godavari left bank relief sewer and Kapila right sewer	17.9	20.5
6	Chehadi	Chehadi	Constructed	In the STP premises	22	Flow from Chehadi	15.8	15.0
7	Panchak	Panchak	Constructed	Near existing STP	7.5	Flow from Panchak	-	7.3
8	Nandur Dasak	Panchak	Constructed	Survey No. of Dasak 98(P)	36.5	Flow from Panchak zone	9.4	14.4
9	Agar Takli	Agar Takli	Constructed (70MLD)	In the STP premises	210	Nasardi relief sewer, from CIDCO line and some part of Panchak	-	13.6

Information on proposed pumping stations for carrying domestic wastewater in Nashik and particulars of existing and proposed sewage treatment plants at Nashik is presented in **Table 2.12 and 2.13**.

The above mentioned pumping stations carry domestic wastewater from 108 wards existing within Nashik city. Monthly average pumping details (2012 to 2014) for Nashik city Sewerage system is depicted in **Table 2.14** and percent coverage of each ward vis-à-vis the sewerage zones given in **Annexure 7.**

Table 2.12 : Information on Proposed Pumping Stations for Carrying Domestic Wastewater in Nashik

Sr.	Pumping Station	Sewerage Zone	Avg. design capacity MLD (for 2026)	Location	Sewage collection	Sewage discharge point
1.	Mate nursery (Cancelled)	Makhamalabad	2	Near GRB along Anandvalli nalla	Flow from d/s area of GRB sewer near Anandwalli Gaothan	Sewage will be discharged into manhole of GRB sewer at Anandvalli gaothan chowk area
2.	Makhamalabad STP SPS	Makhamalabad	7		Makhamalabad area	Proposed Makhamalabad STP
3.	Makhamalabad nalla	Makhamalabad	4	Near bridge	Makhamalabad area	Proposed Makhamalabad STP
4.	Nasardi Sangam (will be commissioned in 3-4 months)	Agar Takli	40	Junction of Nasardi and Godavari river	Excess flow from GRB and from the area along the trunk sewer	Agar Takli STP
5.	Bhadrakali (under construction)	Agar Takli	14	Khadkali, Shalimar Chowk	Excess flow from Saharanpur relief sewer	Proposed Nasardi Sangam PS by gravity sewer
6.	Chadegaon (commissioned)	Chehadi	2	Survey no. of Chadegaon 2 (P)	Intermediate PS, flow from Chehadi area	To nearby manhole from where it will go to Chehadi PS by gravity
7.	Manur	Panchak	55	----	North side area along Godavari river in Panchak zone	Proposed STP (32 MLD)
8.	Untwadi (commissioned)	Agar Takli	28		Satpur division	Relief sewer at Morwadi area

*As per note handed over on 20th June 2014 by Mr. H.K.Pathe, Sr. Engr. NMC, Nashik

Table 2.12 (Contd..) : Information on Proposed Pumping Stations for Carrying Domestic Wastewater in Nashik

Sr.	Pumping Station	Sewerage Zone	Avg. design capacity MLD (for 2026)	Location	Sewage collection	Sewage discharge point
9.	Kamathwada	Kamathwada	36.5	Survey no. of Satpur 110,112 (P), 113 to 118	Satpur division	Proposed STP
10.	Pimpalgaon Khamb	Pimpalgaon Khamb	32/57*	Survey no. of Pimpalgaon 2(P), 3(P), 63(P), 133(P)	Pimpalgaon division	Proposed STP
11.	Gangapur	Gangapur	3/25*	Survey no. of Gangapur 2,3(P)	Gangapur area	Proposed STP
12.	Chikhali nalla	Tapovan	15/25*	Junction of Chikhali nalla and GRB in the survey no. of Anandvalli 54(P) and 55(P). U/s of Chopda nalla PS	Flow from GRB line	Proposed STP at Gangapur

*As per note handed over on 20th June 2014 by Sewerage Dept. NMC

Table 2.13: Particulars of Existing and proposed Sewage treatment Plants at Nashik

Sr.	Location	Scheme	Technology	Date of Commissioning	Capacity MLD	Total Capacity MLD	Avg. Flow MLD (Nov.2013-March.2014)
2.	Tapovan STP	Godavari Action Plan	UASB followed by FAL	2003	78	130	79
4.	Tapovan STP (New)	JNNURM Package I	UASB followed by FAL	Aug-10	52		49
3.	Chehedi STP	Godavari Action Plan	UASB followed by FAL	2006	22	42	22
6.	Chehedi STP (New)	JNNURM Package I	ASP	Feb-12	20		3
1.	Panchak STP	UGSS	ASP	2003	7.5	28.5	7.5
5.	Panchak STP (New)	JNNURM Package I	ASP	May-12	21		--
7.	Agar Takli STP	JNNURM Package I	ASP	2013	70	70	54
Total Treatment Capacity					**270.5**	270.5	214.5
8.	Agar Takli STP New started in April 2014	JNNURM Package II	UASB followed by MBBR	Under Construction	40	NA	NA
9.	Panchak STP (New)	JNNURM Package II	UASB followed by MBBR	Under Construction	32	NA	NA
10.	Gangapur STP	JNNURM Package II	Not finalized	Land acquisition in progress	18	NA	NA
11	Pimpalgaon Khamb	JNNURM Package II	Not finalized	Land acquisition	32	NA	NA
Total Treatment Capacity					**122**		

(Source: Mechanical Department and Sewerage Master Plan Report, 2009, Nashik Municipal Corporation
*As per note handed over on 20th June 2014 by Sewerage Treatment Plant, NMC

2.3.7 Existing Status of Sewage Treatment Facilities and Recent Works Undertaken by NMC

The information summarize above on the existing sewerage system was as per the Master Plan Document, 2009 and supplementary information provided by NMC during 2013-14. The latest situation on the existing sewerage network and proposed STPs was provided by NMC and the same is presented **Table 2.14** *(Ref. Sewerage Dept., NMC).*

Nashik city population was observed to be 6.50 Lakhs in 1991, 10.77 Lakhs in 2001, and 14.85Lakhs in 2011. The population in near future is estimated to be 31.75 Lakhs in 2026 And 52.50 Lakhs in 2041.

- In order to collect and treat the vast sewage generated in the city, NMC has implemented total of 1745 km of sewer lines which includes the main sewer, trunk sewer and branch sewers.
- At present, there are 7 Sewage Pumping Stations with total capacity of 225 MLD and 4 Sewage treatment Plants with a combined capacity of 270.50 MLD to collect and treat the sewage generated.
- The wastewater is treated to the discharge limits mentioned by MPCB and eventually disposed in the river for irrigation use.
- Proposed Sewage Treatment plant under Package 1 and 2, for year 2021/2026 with total capacity of 72 MLD is under construction. Also 18 MLD STP, which would be constructed at Gangapur is currently under land acquisition process.

Table 2.14:

a) Existing Sewage Treatment Plants

Sr.	Location	Capacity [MLD]	Expected Sewage [2014] in MLD	Actual Sewage Received [March 2014] in MLD
1.	Tapovan	130	101.23	124
2.	Chehedi	42	29.09	25
3.	Panchak	28.50	38.81	21
4.	Agar Takli	70.00	92.60	54
Total		270.50	261.73	224

b) Proposed Sewage Treatment Plants

Sr.	Location	Capacity [MLD]	Current Status
1.	Agar Takli	70 40	Trial run in process. Pumping started from 28/12/2013. Expected to start by March 2015
2.	Panchak	32	Expected to start by March 2015.
3.	Gangapur [yet to be started]	18	Land acquisition under process. Construction will be completed after 24 months after possession of land.
Total		160	

Ref. Sewerage Dept., NMC

c) Proposed Sewage Treatment Plant: STP & Sewage Pumping Station[SPS]

Sr.	Location	Capacity [MLD]	Current Status of land acquisition
1.	Pimpalgao Khamb [STP]	32	Land acquisition in progress.
2.	Pimpalgao Khamb [SPS]	57	Land acquisition in progress.
3.	Gangapur Road Old SPS	25	Process underway

In order to prevent the pollution of the 19 km long stretch of river Godavari that runs in the NMC area, Underground sewerage network on the right bank and left bank of river has been undertaken. Following work is undertaken to combat the increasing sewage generation of the city.

Satpur Area:

- At Gangapur, 18 MLD of Sewage treatment plant would be constructed. 25 MLD Sewage pumping Station would be constructed at Chikhli nalla.
- Main sewer line connecting Anandvalli nalla with Aasram bapu Pool has been undertaken.
- Sewage from Amrut garden nalla to be diverted to the main sewer line.
- Annual repairing and maintenance the main sewer lines constructed at the right and left bank of Nasardi river in Satpur region.

Nashik West Area:

- Sewage Pumping Station of 25 MLD capacity is being constructed at Old Gangapur Pumping Station along with rising mains.
- Sewage Pumping Station of 14 MLD capacity is being constructed at Bhadrakali.
- Annual repairing and maintenance of the main sewer lines present on the Right bank of Godavari River.

New Nashik Area:

- Sewage Pumping Station of 28 MLD capacity is commissioned at Untwadi.
- Khutwad nagar nalla, on the right bank of the river Nasardi, is connected to Nasardi trunk sewer which is diverted to the main sewer line on the left bank.
- Annual repairing and maintenance of the main sewer lines present on the Right bank and Left bank of Nasardi river is being undertaken.
- Annual repairing and maintenance of the main sewer lines present on the banks of Waldevi river.

Nashik East Area:

- Construction of 70 MLD STP at Agartakli is completed and remaining 40 MLD is in progress.
- Sewage from Lingayat colony and other areas of Bajrangwadi joining the Bajrangwadi nalla to be diverted.
- Main sewer lines on the right bank of Godavari River in Nashik east to be repaired annually.
- Main sewer lines present on the both banks of Nasardi River in Nashik east, to be repaired annually.

Nashik Road Area:

- Construction of 32 MLD STP at Panchak and SPS at Manur.
- Construction of 32 MLD STP and 55 MLD SPS at Pimpalgaon Khamb.
- Diversion of sewage from Sundar nagar, Gandhi dham, Matangwada present on the left bank of Waldevi river to the main sewer line on right bank.
- Diversion of sewage from Rama bai Ambedkar nagar, Phule nagar area present on the left bank of Waldevi river to the main sewer line on right bank.
- Sewage from Chadegaon to be diverted to STP at Chehdi.
- Construction of main sewer line on the bank of Waldei river at Wadner.
- Annual repairing and maintenance of the main sewer line on the right bank of Godavari River in Nashik road area.
- Annual repairing and maintenance of the main sewer lines on both banks of Waldevi river in Nashik road area.
- Diversion and collection of sewage from 3 different nallas present in the Panchavati area to the left bank of river Godavari.
- Construction of main sewer line on banks of Waghadi river connecting Bhukusa paper mil upto Mhasarulgao.
- Annual repairing and maintenance of the main sewer lines on the left bank of Godavari river is in progress.

Since lots of problem regarding sewerage system as a whole, either for leakages, overflows or non connection to sewer lines, a study was taken up for hydraulic assessment for sewerage system for a limited stretch of 16 kms.

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2.3.8 Nallas in Nashik City

The geology of the Nashik city is like a saucer towards the Godavari River. Naturally there are number of natural drains due to the slope within the water shed. Within river basin of Godavari and Nasardi large number of nallas are carrying pollutants, thereby deteriorating the water quality. These nallas were earlier the natural streams carrying rainwater during monsoon and sub-soil water during non monsoon season. Due to developmental activities these drains are indiscriminately used to dispose the liquid and sometimes solid wastes. This has resulted in conversion of natural fresh water drains into nallas. It is obvious that without any treatment of nallas carrying wastewater the pollutants spoil the water quality of the Godavari river and deteriorate it. The work of diversion of nallas has been undertaken by NMC and work has been completed at many places. However, during diversion the care should be taken by STPs and SPSs should not be overloaded.

There are seventeen nallas flowing through Nashik city on east and eight nallas on west bank of river Godavari. During non monsoon months, the fresh water flow gets reduced and most of the nallas carry sewage, wash waters, storm water and industrial wastewater. These nallas directly pour the contaminants to the Godavari River. The information of nallas of right and left bank are presented below :

Total Nallas Evaluated in the Study Area

River Godavari		Nasardi
Right Bank	**Left Bank**	
Gangapur / Bardan Phata	Gandharwadi	Indranagar
Someshwar 1./2	Kusumagraj Udyan	MSEB
Chikhali	Ramwadi	Kutwat Nagar
Anandvalli	Aruna	Bhujbal farm
Forest Nursery	Waghadi	Chinchula
Chopada	Kapila	Torna Nagar
Saraswati/Bhoi	Kapila sangam	Kamath wada
		Bajrangwadi

In order to study the impact of nalla discharges on river water quality specific sampling was conducted wherein the samples were collected from river stretches in the upstream and downstream region of confluence of the particular nalla. Following nalla viz. Someshwar, Chikali, Chopada and Forest Nursery were covered during the study, because collection of samples from bridges was feasible which represent sample after proper mixing. The information of sample description and sample code is presented in the following Chapter.

River Nasardi starts at Trimbak road and joins river Godavari at right bank, downstream of Tapovan about 3 km below Nashik. The following nallas joining Nasardi River were also evaluated during the study period.

2.3.9 Sanitation in Slum Area

As per data provided by Slum Department of Nashik Municipal corporation, there are 168 slums in Nashik out of which 49 slums are either on the Government land or NMC land. The information on the location of slums in different zones is presented in the **Table 2.15**.

Table 2.15 : **Zone wise Number of Slums in Nashik City**

Sr.	Zone	No of Slums	On Govt. Land	On Private Land
1	New Nashik	19	6	13
2	Nashik west	16	1	14
3	Nashik East	25	2	20
4	Nashik Road	44	10	34
5	Panchavati	46	7	28
6	Satpur	18	7	10
	Total	168	33	119

Under the Integrated rehabilitation project for the urban poor staying in slums on public purpose lands and ecologically dangerous locations, NMC identified 8 locations for relocations. Out of these, two locations were deleted and 4800 dwelling units are cancelled. NMC plans to construct 11,200 dwelling units with basic amenities under BSUP. 2710 dwelling units out of the 11,200 units were entirely completed till the quarter ending March, 2012. The CSP report (2011) summarized the status of availability of amenities in the slums.

Toilet blocks: There are 74 toilet blocks in 51 slums of which 15 blocks are maintained on a "pay and use basis" mostly by private companies and the rest are maintained by NMC. The average toilet to person ratio is 1:61; normal ratio adopted by certain municipal corporation of mega cities is 1:50 (for number of seat and persons using it), which is fairly high when compared to the standard norms. The physical condition of 51 blocks was average, 21 were very poor and only two privately maintained toilet blocks in Koliwada slum of Panchavati ward were well maintained.

In nine out of 51 slums, mostly located in the heart of the city, open defecation around toilet blocks was observed due to poor status of the toilets. Moreover, the persons per toilet ratio are also higher than the average of 1:61. The normal ratio adopted in mega cities is 1:50 for number of seats and persons using it. The ratio is extremely high (1:330) in Kazichigadhi, the largest slum covered in this survey. In 22 out of 51 slums (43%), the ratio is 50 persons or less per toilet block.

Water for toilets: 36 toilet blocks are exclusively dependent on common water tanks provided by NMC from which people scoop water in pails for flushing. In 26 toilet blocks, people have to carry water for flushing.

Access to sewerage system: Though the city has a fairly extensive sewerage network and 62 slums are in the vicinity of sewer lines, many of the slums are not connected to the network.

Availability of Electricity supply: Electricity for lighting is available for 39 out of 74 toilet blocks (53%). However there are very few toilet blocks (13.5%) that have electricity available for pumping water to the overhead tanks.

Solid Waste Management in Slum Area: Most slums have specific dumping places identified by the residents for disposal of domestic solid waste. The residents regularly dump their garbage at these places. Such practice is due to different reasons such as inadequate frequency of ghanta gadi, accessibility to interiors of the slum not possible, vehicles don't stay long enough etc. **Figure 2.7** exhibits the area facing open defecation.

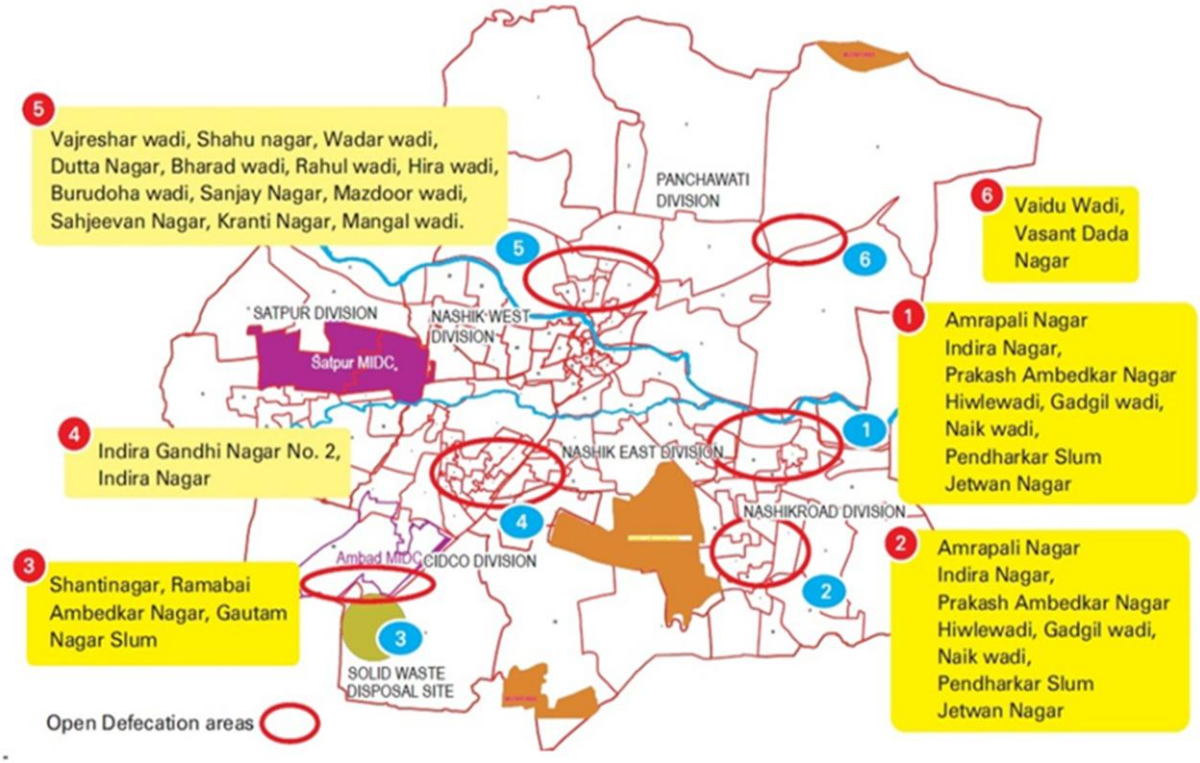
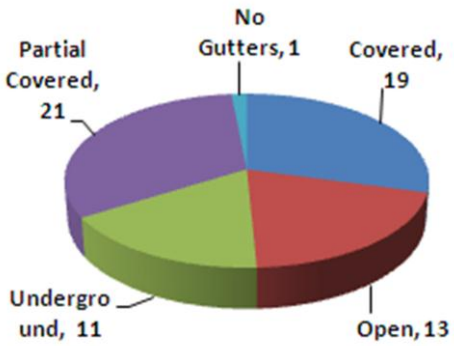


Figure 2.7 : Open Defecation and Public Toilet

Drainage System: According to NMC 19 out of 65 slums are fully covered with gutter and 11 slums have underground gutters. But the physical condition reveals that only five slums have reported kuchha gutter while 42 are fully covered. These gutters however flood frequently especially in monsoon. The main cause of flooding of this gutter is inadequate gradient.



Slums having Various type of Gutter

2.3.10 Domestic Solid Waste Management System for Nashik City

The domestic solid waste generated in Nashik City is collected with the operation of 'door to door' system and hence there are no dust bins placed in residential localities. The efficiency of domestic solid waste collection is quite effective and stand by vehicles like Ghantagadi are available in case of any mechanical failure of machinery. The segregation of wood, paper, plastics is carried out by the employees appointed on Ghantagadis and the rag pickers at solid waste management site.

On an average, about 350 MT of domestic solid waste is generated daily from Nashik Municipal corporation area. It mainly comprises of wet garbage, dry garbage, inert material including sand, silt and others plastic, rags etc. In the year 2001, a compost plant with 300 MT capacity has been established at Pathardi which is 15 Km South of the city by Nashik Municipal Corporation. Privatization of whole solid waste management system is in process. Tenders have already been called for the same.

2.3.11 Industrial Zone

Industrial estate NICE (Nashik Industrial Co-operative Estate) was formed in the co-operative sector in 1962. In the same year, Maharashtra, State Government also responded by declaring MIDC (Maharashtra Industrial Development Corporation) Industrial Estate at Satpur village, 7 km from Nashik. The Nashik district has other MIDC estates at Malegaon, Dindori, Vinchur and Surgana. Hindustan Aeronautics Limited established unit for production of MIG fighters at Ozar, a village 20 km from Nashik. In 1967 SICOM (State Investment Corporation of Maharashtra) adapted Nashik as its growth center. All these events brought Nashik on the industrial map of India. The industries that came to Nashik was mostly engineering, electrical, and pharmaceutical like Glenmark, Vital Healthcare and small scale electroplating. About 70 to 80 small scale electroplating industries are the major water polluting industries. MICO (German multinational) and ABB (Swedish multinational) established their production units. Crompton Greaves, MICO, VIP, CIAT, Mahindra & Mahindra etc are other important industries. This led to saturation of

Satpur MIDC area. Hence MIDC acquired the land measuring 5231 hectares for establishment of new industrial area at Ambad.

At present there are two major industrial estates in Nashik: Satpur MIDC and Ambad MIDC area. Total 3000 industries are housed in Satpur and Ambad MIDC areas. The type of industries in these MIDC zones are mainly of engineering kind involved in manufacturing of automobiles, tyres etc. The water supply for Satpur MIDC area is from Gangapur Dam and the quantity of water supplied is 3.65 millionM^3.The effluent generated in Satpur MIDC area is likely to meet river through Chikhli nalla or underground seepage from land application whereas effluent from Ambad MIDC area meets Nasardi river which eventually meets River Godavari downstream Tapovan near Dasak bridge. The list of water polluting industries, electroplating industries present in Satpur MIDC area is presented in **Annexure 8.**