

CHAPTER - I

INTRODUCTION

Mysore City, one of the famous historical and tourist places of South India is situated in the southern part of the Deccan Plateau, at a distance of about 140 Kms. from Bangalore City the state capital. The city has a past population of 7,99,228 as per 2001 census including population of out growth and census town. From ancient times, the city has played a significant role in the history of South India. Mysore was the capital of the “Wodeyar” dynasty, feudatories of the Vijayanagar Empire, who declared their independence in the 16th century and ruled in Mysore until independence. The city is also known as the City of Palaces and the city retains a quaint charm that never fails to enchant. Mysore today, is a pleasant city with an old world charm, contributed by its broad shady avenues, well laid out gardens, fine buildings and a salubrious climate.

The city is a popular tourist destination, offering several attractions ranging from the royal splendor of Mysore Palace and its fabulous Dasara Festival, Jayachamarajendra Zoological Garden, Sri Chamundeshwari Temple, Lalit Mahal Palace, St. Patrick Church, etc. In addition to above, there are number of tourist places around Mysore City i.e. Brindavan Gardens, Ranganathittu Bird Sanctuary, Srirangapattana, Balamuri Falls to name a few. Mysore University, one of the oldest universities of the country is another jewel of the city. The city also houses many educational institutions, health care centers etc. In recent days the state government has projected Mysore City as the second IT city of Karnataka State next only to Bangalore City and has come up with various developmental projects in the city to improve the city’s infrastructure. Many IT giants have already set up their campuses in Mysore City.

The “Dasara” festival is held in October month of every year and is celebrated with pomp and pageantry. The festival celebrates victory of good over evil, marking the slaying of the demon Mahishasura by goddess Chamundeshwari. The palace and the city are lit up for ten days and the entire city wears a festive look. The highlight of the festivities is the “Dasara” procession held on Vijayadashami, the tenth day. It is led by caparisoned elephants carrying an idol of goddess Chamundeshwari seated in a golden howdah (elephant seat). The procession wends its way from the Maharaja’s palace to the torch light parade ground and then returns to the palace. It is estimated that during the “Dasara” festivities the tourist inflow will be as high as 3.50 Lakhs

In the recent past the city has grown considerably with many new residential layouts developed by Mysore Urban Development Authority (MUDA) and other private entrepreneurs. The city population has also grown considerably over the past decade. Though the authorities have made adequate efforts to improve the city’s infrastructure in terms of providing adequate potable water supply, sanitation facilities, good roads, improving overall hygiene of the city, the improvements made are not catching up with the pace of growth.

The water supply situation needs to be improved considerably. Due to inadequate and unplanned distribution network, the water distribution is not uniform with some areas getting excess water and many areas receiving very less quantity of water. At many places the feeder mains have been tapped directly and used as distribution mains. This has aggravated the problems further.

Mysore City Corporation (MCC) has already taken up a new “Water Supply Distribution System Remodeling” project to improve city’s water supply distribution system. The main aim of the above project is to provide equitable and good quantum of potable water to all the areas of Mysore City as per standards. MCC has given the responsibility of planning and implementing the above project to Karnataka Urban Water Supply & Drainage Board (KUWS&DB) which is the nodal agency for executing water supply and drainage projects in Karnataka State.

As the above project will be taken up with the financial assistance from Govt. of India under Jawaharlal Nehru Urban Renewal Mission (JNNURM), the DPR for the project was forwarded to Ministry of Urban Development (MOUD), Govt. of India for approval and the DPR was approved by Govt. of India in the Central Sanctioning and Monitoring Committee meeting held on 08.12.2006.

In the water supply remodeling scheme the problem of only inadequate distribution system has been addressed and augmentation of source to meet future needs of the city has not been included as the same was considered under a different project. A separate DPR for source augmentation was prepared by KUWS&DB considering Kabini River as source of water and submitted to Govt. of India for their approval in the month of August 2006. The DPR for source improvement to Mysore City was reviewed by Central Public Health & Environmental Engineering Organization (CPHEEO), Ministry of Urban Development, Govt. of India and CPHEEO gave their comments on DPR to KUWS&DB vide their Letter No: Q-12045/11/1/NURM/2006-CPHEEO, Dated 26.09.2006. In the above letter it was communicated to modify the DPR as per JNNURM guidelines and meeting the recommendations as given in CPHEEO manual for water supply.

KUWS&DB invited reputed consultants for providing consultancy services for the above scheme in the month of July 2007. On being the successful bidder, the work was awarded to M/s. STUP Consultants P. Ltd., Bangalore. In addition to source improvement, strengthening of existing water supply facilities and preparing a water supply master plan for Mysore City has also been included under the above project. The total consultancy assignment has been split into four heads as given below;

- (a) Strengthening of existing Hongalli, 2nd Stage and Hongalli 3rd Stage water supply system.
- (b) Augmentation of 50.0 MLD supply from Melapura 3rd Phase scheme.
- (c) Augmentation of water supply system with Kabini River as source.
- (d) Master plan of water supply system to Mysore City.

Detailed Project Report (DPR) for each of the above four schemes has been taken up separately and the preparation of DPR for augmentation of source from Kabini River was taken up on priority. On receiving the communication from KUWS&DB, the Consultant’s representatives made a reconnaissance study visit to the project site near Mysore City on 05.11.2007 along with KUWS&DB officials. During the reconnaissance study, visit was made to proposed head works location at Bidargudu Village, Hullahalli Anicut, WTP near Udbur Village, intermediate booster pumping station near Kote Hundi Gate etc. Also reconnaissance survey was made along the proposed raw water pipeline alignment from intake to WTP, raw water pipeline alignment for alternative source from Hullahalli Anicut to Bidargudu Village Cross and clear water pipeline alignment from WTP to intermediate booster pumping station etc. Further visits were made to locations of proposed new Master

Balancing Reservoir's (MBR's) at extended areas and to identify suitable pipeline alignment to connect above MBR's with proposed intermediate booster pumping station.

Subsequently detailed topographical survey was carried out at head works, water treatment plant, intermediate booster pumping station etc. and all along the proposed raw water and clear water pipeline alignments.

Based on the detailed survey and field visits conceptual designs and drawings were prepared for various components of work and the same was discussed in detail with KUWS&DB officials on 12.12.2007. Based on the conceptual designs as finalized during the above discussions the Consultants submitted "Draft Project Report" to KUWS&DB for their review and approval vide their Letter No: 10237/E/YDM/RD/2505, Dated 19.12.2007. The report contained detailed hydraulic calculations, general arrangement drawings for various project components, plan and longitudinal sections along proposed pumping mains and gravity mains etc. The report also contained abstract cost estimates for all the project components.

On 17th and 18th of January visit was made to CPHEEO office at New Delhi and detailed discussions were held with CPHEEO officials regarding "Draft Project Report". The comments / recommendations as given by CPHEEO officials were noted. Subsequently on 31.01.2008, Deputy Advisor, CPHEEO, New Delhi visited various locations of project components. During the above visit, the location of proposed treatment plant was shifted near to intake structure and it was communicated to put a break pressure tank at the ridge point at a distance of about 10.0 Kms. from source. Based on the comments / recommendations as given by CPHEEO for "Draft Project Report" and subsequent changes recommended during site visit of Deputy Advisor, the Consultants modified the report incorporating all the comments and the modified report was submitted to KUWS&DB on 02.03.2008. Subsequent to the above visit was made New Delhi and the modified DRP was appraised to CPHEEO officials during the discussions held between 3rd March to 6th March. During the above discussions CPHEEO officials asked KUWS&DB to modify the cost estimate for some of the components and asked them to present the water supply scheme for final approval before Central Sanctioning & Monitoring Committee (CSMC) of Urban Development Dept., Govt. of India with revised cost estimate. The consultants modified the estimates and the DPR incorporating comments given by CPHEEO and the same was submitted to KUWS&DB / CPHEEO. On 08.03.2008, KUWS&DB appraised the project to CSMC. The Consultants are submitting herewith final "Detailed Project Report" for KUWS&DB's reference.

CHAPTER - II

PROJECT AREA, LOCATION AND SCOPE OF WORK

1.0 PROJECT AREA AND LOCATION:

The project covers an area of 129.0 Km² within MCC limits and 66.0 Km² of extended area covering areas beyond MCC limits but within Comprehensive Development Plant (CDP) limits. The total coverage area within CDP limits is 195.0 Km². The source of water has been identified as Kabini River. The proposed head works is located on Kabini River left bank near Bidargudu Village at a distance of about 20.0 Kms. from Mysore City. The intake structure is located at 12° 7'11.90" N Latitude and 76°36'2.25" E Longitude. The proposed water treatment plant is also located near Bidargudu Village at a distance of about 1.0 Km. from intake point. The break pressure tank is located at 12°11'44.08" N Latitude and 76°35'37.80" E Longitude on ridge point. The intermediate booster pumping station is located near Kote Hundi Gate adjacent to existing sewage pumping station but well away from the pumping station at a distance of about 6.0 Kms. from BPT. The location of pumping station is at 12°14'48.49" N Latitude and 76°36'56.18" E Longitude. The proposed Master Balancing Reservoirs (MBR's) are located at J. P. Nagar, Datagalli and Vijayanagar.

2.0 SCOPE OF WORK:

The scope of work for the "Augmentation of Water Supply System from Kabini River Source" component as specified in the "Terms of Reference (TOR)" is given below;

- i. After detail survey, design and DPR shall be prepared for projected population of 2040 to meet the additional requirement from the source of Kabini River. Existing details available with Board will be furnished to the successful bidder, the same shall be considered while preparing the DPR.
- ii. Design of balancing reservoirs, service reservoirs (OHT / GLSR), pump houses, etc with structural details.
- iii. Compliance to JN-NURM Guidelines, including appraisal to JN-NURM till approval is accorded.
- iv. Drawing should be prepared in AutoCAD 2004 or higher version.
- v. The Consultant shall furnish the draft report and after obtaining the approval, the final report shall be submitted in required number of sets with soft copy.

CHAPTER - III

EXISTING SYSTEM

The details of existing water supply system of Mysore City is described in detail below based on the data collected during field visits. The data collected includes details of source of water, head works, raw water rising mains, water treatment plants, pumping machinery, clear water pumping mains, master balancing reservoirs etc.

1.0 SOURCES OF SUPPLY, HEAD WORKS AND WATER TREATMENT PLANTS

Mysore City receives water from mainly Cauvery River source with head works located at various locations down stream of Krishnarajasagara Reservoir (KRS). Presently three different schemes are in operation from Cauvery River source with head works located near Belagola, Hongalli and Melapura villages. The details of each of the above three schemes is described in details below;

1.1 WATER SUPPLY SCHEME FROM HEAD WORKS AT BELAGOLA VILLAGE

The 1st Stage water supply scheme to Mysore City was commissioned in the year 1896 from Devarayana Canal which is a branch canal of KRS reservoir with head works near Belagola village. The Belagola water supply scheme has been implemented in three phases. The capacity of Phase - 1 WSS is 4.55 MLD (1.00 MGD), Phase - 2 is 11.37 MLD (2.50 MGD) and Phase - 3 is 36.32 MLD (8.00 MGD). The total capacity of Belagola water supply scheme from above three phases is about 52.24 MLD (11.50 MGD). Belagola head works is located at a distance of about 9.0 Kms. from the city.

Devarayana Canal is an irrigation canal and water from this source is available only during canal flow periods. The pipeline which feeds raw water to existing head works at Belagola from canal is damaged at many locations for drawing water for irrigating agricultural fields all along the pipeline alignment. As the above source is very old and not dependable with water availability not guaranteed through out the year, the scheme has been discarded and not included in the "Remodeling Scheme" to assess future source requirement.

The raw water drawl is done from Balamuri cross regulator through RCC gravity main connecting to sump at Belagola pump house. At Belagola two separate pumping stations have been provided for pumping raw water to existing treatment plants at Vanivilas Water Works in Yadavagiri area. The old water treatment plant is of 1.00 MGD capacity and capacity of additional filters constructed by M/s. Jewel Filter Company, London is 2.50 MGD. The details of existing water supply system from Belagola source is given below;

- Year of commissioning of Phase - 1 : 1896 (1.00 MGD)
- Year of commissioning of Phase - 2 : 1924 (2.50 MGD)
- Year of commissioning of Phase - 3 : 1998 (8.00 MGD)
- Raw water drawl pipe from : 900 mm Dia. RCC, 3.55 Kms. long
Devarayana Canal to pump station

- Old water treatment plant : 2 Nos. settling tanks, 3.40 MG each

Hand wash filters - 2 Nos., 18' x 12'
with each 0.50 MGD capacity

Rake wash filters - 6 Nos., with each
0.432 MGD capacity

Clear Water Reservoir - 1.00 MG

- New water treatment plant : Cascade Aerator 36.30 MLD capacity
3 Nos. of trays

Flocculator - 36.30 MLD capacity
13.0 m Dia.

Clariflocculator - 36.30 MLD capacity
73.0 m x 53.0 m, 5.80 m Depth

Filter House - 52.00 MLD capacity
9.30 m x 6.20 m, 8 Nos. of Beds

Clear Water Reservoir - 1.00 MG
New Tank 27.0 m Dia x 3.0 m Depth

Out of the two water treatment plants at Vanivilas Water Works, i.e. old WTP's built in the year 1896 & 1924 and New WTP built in the year 1998, the filter beds of old WTP's i.e. hand wash filters and jewel filters are in dilapidated condition and are not in operation. Hence in Phase - 3 WTP scheme commissioned in the year 1998, the new filter beds have been designed for the total capacity of three phases i.e. 52.00 MLD.

At Belagola head works presently three sets of pumping machineries are working with 1 No. of 820 H.P (422 LPS), 1 No. of 400 H.P (158 LPS) and 1 No. of 280 H.P (106 LPS). Each of the above pump is having 1 No. of standby pump of similar capacity. The total installed capacity of above three working pumps is 686 LPS i.e. 59.27 MLD.

The satellite image of existing WTP at Vanivilas Water Works is shown in **Plate - 1**. The photographs taken during field visits to various existing works executed under Belagola Water Supply Scheme is given in **Plate - 2**.

1.2 WATER SUPPLY SCHEME FROM HEAD WORKS AT HONGALLI VILLAGE

The 2nd Stage water supply scheme to Mysore City was commissioned in the year 1959 from Cauvery River with head works near Hongalli Village. The Hongalli head works is located at a distance of about 14.0 Kms. from the city. The design capacity of 2nd Stage water supply scheme is 36.37 MLD (8.0 MGD). In addition to above, in the year 1979 one more water supply scheme was commissioned from the same source named 3rd Stage water supply scheme. The design capacity of 3rd Stage water supply scheme is 54.55 MLD (12.0 MGD). Hence the combined total capacity of 2nd and 3rd Stage water supply schemes from Hongalli source is 90.92 MLD (20.0 MGD).

The raw water is drawn from KRS reservoir Right Bank Low Level Canal. Two separate intake arrangements have been made with each feeding to 2nd and 3rd Stage water supply schemes. In addition to above, one more intake arrangement is made to draw water from Cauvery River itself directly during emergency period by constructing an intake structure and pumping station near the river bank. During emergency period when there is no water in RBLL canal, raw water from this pumping station is directly pumped to existing treatment plants of 2nd and 3rd Stage scheme.

At Hongalli Water Works two treatment plants are in operation with 2nd Stage WTP of 36.37 MLD (8.0 MGD) capacity and 3rd Stage WTP of 40.00 MLD (8.8 MGD) capacity. Though the capacity of 3rd Stage WTP is 40.00 MLD, the treatment plant is presently operated at 54.55 MLD (12.0 MGD) with overloading.

The details of existing water supply system from Hongalli is given below;

2nd Stage Water Supply Scheme:

- Year of commissioning of Stage - 2 : 1959 (8.00 MGD)
- Water treatment plant : Flocculator - 4.00 MGD, 2 Nos.
12.20 m Dia. x 3.0 m Water Depth

Clarifier - 8.00 MGD capacity
36.6 m Dia. x 3.7 m Water Depth

Filter House - 8.00 MGD capacity
2 x 7.3 m x 5.2 m, 4 Nos. of Beds

Clear Water Reservoir - 3.0 L. G
2 x 18.3 m x 12.2 m x 3.7 m Depth

3rd Stage Water Supply Scheme:

- Year of commissioning of Stage - 3 : 1979 (12.00 MGD)
- Water treatment plant : Clariflocculator - 20.00 MLD, 2 Nos.
Flocculator : 13.1 m Dia.
Clarifier : 32.91 m Dia.
3.52 m Side Depth

Filter House - 10.00 MLD, 4 Nos.
10.36 m x 9.73 m Twin Section

Clear Water Reservoir - 18.0 L. L
30.0 m x 20.0 m x 3.5 m Depth

The pipeline diameter from emergency pump house connecting to 2nd Stage WTP is 600 mm Dia. CI and that connecting to 3rd Stage WTP is 630 mm HDPE.

At Hongalli head works presently two sets of pumping machineries are working with 1 No. of 1000 H.P (383 LPS, 2nd Stage) and 1 No. of 1000 H.P (662 LPS, 3rd Stage). Each of the above pump set is having 1 No. of standby pump of similar capacity. The total installed capacity of above two working pumps is 1045 LPS i.e. 90.29 MLD.

The satellite image of existing WTP's at Hongalli Water Works is shown in **Plate - 3**. The photographs taken during field visits to various existing works executed under Hongalli Water Supply Scheme is given in **Plate - 4**.

1.3 WATER SUPPLY SCHEME FROM HEAD WORKS AT MELAPURA VILLAGE

The 4th Stage water supply scheme to Mysore City was commissioned from Cauvery River with head works near Melapura Village. The Phase - 1 of the above water supply scheme was commissioned in the year 2002 and Phase - 2 was commissioned in the year 2006. The Melapura head works is located at a distance of about 15.0 Kms. from the city. The design capacity of each phase of 4th Stage water supply scheme is 50.00 MLD. Hence the combined total capacity of Phase - 1 and Phase - 2 water supply schemes from Melapura source is 100.00 MLD. Though the present drawl from Melapura WSS is 100.00 MLD, the scheme is originally designed for 150.00 MLD capacity. The components such as intake structure, raw water pipeline and treated water pipeline are designed for 150.00 MLD capacity. Under each phase of above WSS new pumping machinery and WTP's have been provided. There is scope to increase the capacity by additional module of 50.00 MLD by installing new pumps and constructing additional treatment plant.

The raw water is drawn directly from Cauvery River by constructing an intake structure on right bank of the river. From head works near Melapura Village raw water is directly pumped to existing water treatment plants located at Ramanahalli Village through vertical turbine pumps. The pipeline from head works to WTP is 1100 mm diameter MS pipe and covers a distance of about 6.5 Kms.

At Ramanahalli Water Works two treatment plants are in operation with both Phase - 1 and Phase - 2 WTP's of capacity 50.00 MLD each.

The details of existing water supply system from Melapura is given below;

Phase - 1 Water Supply Scheme:

- Year of commissioning of Phase - 1 : 2002 (50.00 MLD)
- Water treatment plant : Cascade Aerator - 150.0 MLD
13.70 m Dia., 3 Nos. of Trays

Flash Mixer - 50.0 MLD Capacity
2.75 m x 2.75 m x 4.15 m Depth

Flocculator - 50.0 MLD Capacity
18.3 m Dia. x 5.7 m Depth

Clarifier - 50.0 MLD Capacity
46.4 m Dia. x 4.5 m Depth

Filter House - 50.0 MLD Capacity
43.13 m x 20.05 m Size
9.3 m x 6.2 m, 8 Nos. of Beds

Clear Water Reservoir - 30.0 L. L
2 x 25.0 m x 20.0 m x 3.0 m Depth

Phase - 2 Water Supply Scheme:

- Year of commissioning of Phase - 2 : 2006 (50.00 MLD)
- Water treatment plant : Cascade Aerator - 150.0 MGD
13.70 m Dia., 3 Nos. of Trays

Flash Mixer - 50.0 MLD Capacity

Flocculator - 50.0 MLD Capacity
18.3 m Dia. x 5.7 m Depth

Clarifier - 50.0 MLD Capacity
46.4 m Dia. x 4.5 m Depth

Filter House - 50.0 MLD Capacity
9.3 m x 6.2 m, 8 Nos. of Beds

At Melapura head works presently two sets of pumping machineries are working with 1 No. of 1000 H.P (578 LPS, Phase - 1) and 1 No. of 1000 H.P (578 LPS, Phase - 2). Each of the above pump is having 1 No. of standby pump of similar capacity. The total installed capacity of above two working pumps is 1156 LPS i.e. 100.00 MLD. The Phase - 2 pumps are newly installed and commissioned in the year 2006.

The satellite images of existing head works at Melapura and WTP's at Ramanahalli Water Works is shown in **Plate - 5**. The photographs taken during field visits to various existing works executed under Melapura Water Supply Scheme is given in **Plate - 6**.

2.0 RAW WATER AND TREATED WATER PUMPING MAINS AND BALANCING RESERVOIRS

As discussed above, water is drawn from three different locations from Cauvery River source for supplying potable water to Mysore City. The existing schemes have been implemented under four different stages. The details of rising mains from head works / existing water treatment plants and details of existing balancing reservoirs is given below;

2.1 RAW WATER AND TREATED WATER RISING MAINS

All the existing head works are located away from city proper and raw water / treated water is conveyed by pumping to existing WTP's / balancing reservoirs located inside the city. The details of rising mains from each of the water supply scheme is discussed in detail below;

2.1.1 Rising Mains from Head Works at Belagola Village

The raw water from Phase - 1 and Phase - 2 works of 1st Stage Belagola WSS is pumped through two parallel CI pipelines of 350 mm Dia. and 400 mm Dia. up to Chamundi Coffee Curing Works junction covering a distance of about 4.50 Kms. From this point onwards the two parallel pipelines are combined into a single pipeline of 600 mm Dia. CI and this pipeline discharges raw water to existing settling tanks at Vanivilas Water Works. The length of 600 mm Dia. combined pipeline is about 4.50 Kms.

In addition to above rising mains, a separate pumping main is provided from Phase - 3 works of 750 mm diameter connecting to treatment plant at Vanivilas Water Works. The above pipeline is made of MS material for the initial length of about 2.0 Kms. and there after is made of PSC material for a length of about 7.0 Kms.

2.1.2 Rising Mains from Head Works at Hongalli Village

The treated water from Hongalli 2nd Stage water supply scheme is pumped to High Level Reservoir (HLR) located at Yadavagiri through 600 mm Dia CI pumping main covering a distance of about 14.0 Kms. The treated water from Hongalli 3rd Stage water supply scheme is pumped to sump of intermediate booster pumping station located near Vikrant Tyre Factory through 750 mm Dia CI pumping main covering a distance of about 7.50 Kms. The capacity of sump located at booster pumping station is 12.0 Lakh Litres. From booster pumping station treated water is further pumped to Central Storage Reservoir (CSR) located at Vijayanagar area through 750 mm Dia CI pumping main covering a distance of about 5.00 Kms.

At booster pumping station presently two pumps are installed with 1 No. working and 1 No. as standby. The capacity of each pump is 720 H.P (662 LPS).

2.1.3 Rising Mains from Head Works at Melapura Village

As discussed earlier, raw water from Melapura head works is pumped to existing water treatment plants located at Ramanahalli Village through 1100 mm Dia. MS pipeline covering a distance of about 6.5 Kms. At Ramanahalli Water Works, two separate treatment plants are provided under Phase - 1 and Phase - 2 with each plant having a design capacity of 50.0 MLD. The treated water from Melapura Phase - 1 and Phase - 2 schemes is pumped to balancing reservoirs at Devanoor and German Press through 1100 mm Dia MS / PSC pumping main covering a distance of

about 6.0 Kms. The initial stretch of pipeline covering a distance of about 1.0 Kms. is made of MS material and the balance stretch covering a length of about 5.0 Kms. is made of PSC material.

At Ramanahalli water works clear water pumping station, presently four pumps are installed with 2 Nos. working and 2 Nos. as standby. The capacity of each pump is 604 H.P (578 LPS). The Phase - 2 pumps are newly installed and commissioned in the year 2006.

2.2 MASTER BALANCING RESERVOIRS

The treated water from three sources as above is finally conveyed to existing Master Balancing Reservoirs. There are in all six major balancing reservoirs existing inside Mysore City. The balancing reservoirs are fed from one of the existing schemes. The details of existing master balancing reservoirs is shown in **Table - 3.1** below.

TABLE - 3.1

DETAILS OF EXISTING BALANCING RESERVOIRS

Sl. No.	Balancing Reservoir Location	Type	Capacity (MG)	Capacity (ML)	Source of Supply
1	Yadavagiri Reservoir (HLR)	GLSR	5.00	22.73	Hongalli 2 nd Stage
2	Central Storage Reservoir	GLSR	12.00	54.55	Hongalli 3 rd Stage
3	German Press Reservoir	GLSR	3.70	16.87	Melapura Phase - 1 & Phase - 2
4	Kuvempunagar Reservoir	GLSR	2.50	11.37	Hongalli 3 rd Stage
5	Devanur Reservoir	GLSR	2.50	11.37	Melapura Phase - 1 & Phase - 2
6	Vanivilas Reservoir	GLSR	2.00	9.09	Belagola
Total Capacity =			27.70	125.98	

As shown above, the total capacity of existing balancing reservoirs including recently built Melapura Phase - 2 reservoir of 5.50 ML capacity is 125.98 ML. Out of 6 MBR's CSR and HLR are in dilapidated condition and require major rehabilitation / reconstruction. The Kuvempunagar MBR is supplied from CSR through 750 mm CI / 600 / 450 PSC pipeline. The photographs of existing MBR's taken up during field visits is given in **Plate - 7**.

The treated water from above 6 Nos. of Master Balancing Reservoirs (MBR's) is further distributed to 30 Nos. of existing service reservoirs with capacities varying from 1.50 Lakh Litres to 15.00 Lakh Litres. The total capacity of existing service reservoirs including existing GLSR's at Vijayanagar 2nd Stage and Nachanahalli is 204.00 Lakh Litres. In addition to supply from above service reservoirs, many parts of the city are being supplied directly from MBR's by tapping the feeder mains.

3.0 TOTAL CAPACITY OF DEPENDABLE SOURCES

As discussed above, the total capacity of Belagola source is 52.24 MLD (11.50 MGD), capacity from Hongalli source is 90.92 MLD (20.0 MGD) and capacity from Melapura source is 100.0 MLD. The Belagola source is very old and not dependable with water availability is not guaranteed through out the year. Hence this scheme has been discarded and not included in the "Remodeling Scheme" also. The present availability of dependable water from Hongalli and Melapura sources is 190.92 MLD only.

CHAPTER - IV

TOPOGRAPHICAL SURVEY

On finalization of location of head works, water treatment plant, intermediate booster pumping station, proposed new Master Balancing Reservoirs (MBR's) and raw water and clear water pipeline alignment from source up to point of final discharge, detailed topographical survey was conducted covering all the components of the project. The methodology adopted for the topographical survey is explained briefly in following paragraphs.

4.1 Surveying Instruments Used:

The topographical survey was carried out using latest available surveying instruments having high degree of precision. All the survey instruments were calibrated properly using standard calibration procedures as recommended by the instrument manufacturer before start of actual work at site. The instruments mainly used during the study are listed below;

- Total Station
- Auto Level

The Total Stations used for the survey include models TC1800 and TC703 of Leica, Switzerland make, which are the latest models available to date and are have high degree of accuracy.

4.2 Bench Marks:

All the survey work has been conducted with reference to GTS levels by carrying out levels from already established Temporary Bench Marks (TBM's).

4.3 Advantages with Latest Total Stations:

- i) The Total Station instruments used for the survey are with high degree of accuracy and the instruments are equipped with inbuilt digital data processing capabilities. The instruments not only measure the angles and distances digitally but also have the capability of processing the data. The instruments have the memory capacity to store up to one week's survey data. The accuracy level in angular measurement is one second and in linear measurement is 2 mm to 3 mm.
- ii) The survey data stored in the Total Station instruments can be transferred automatically to desktop computers and the data can be processed in the computer to convert the same to AutoCAD drawings. Hence the chances of manual errors while data transferring are eliminated completely. Since the data is in digital format, data handling and conversion is very easy and the same data can be used for GIS applications also.

4.4 Intake Structure and Pumping Station near Bidargudu Village:

- Reduced levels were taken across Kabini River at five locations to generate river bed profile at these locations spaced at 40.0 m intervals. The width considered for generating bed profile was up to high flood level on either side of the river bank.
- High flood level data was collected from field and the same was marked at field with reduced level.
- Block level survey was carried out for proposed intake structure cum pumping station location by taking reduced levels at 5.0 m intervals and contour maps were prepared at 1.0 m contour interval.

4.5 Pipeline Alignment from Intake Structure to Water Treatment Plant (WTP) and WTP to Intermediate Booster Pumping Station:

- Pipeline alignment survey was carried out from intake structure to water treatment plant (WTP) and WTP to intermediate booster pumping station including corridor survey by taking reduced levels at 15.0 m intervals along the alignment. The cross sections were taken at each 15.0 m spacing along the alignment with reduced levels at 1.0 m intervals for a width of 5.0 m on either side of centerline of pipeline.
- At head works and near Doora Village, the proposed pipeline alignment crosses Rampura Canal and Varuna Canal respectively. At these locations the cross section details of canal were generated showing canal bed level, top level, bottom width, top width, water level, bund slope etc.
- At all the crossings of streams, nallahs, culverts, CD works etc., sectional details have been generated showing bed level, top level, bottom width, top width, water level, bund / cutting slope, number of vents / pipes, size of vents / pipes etc.

4.6 Pipeline Alignment from Intermediate Booster Pumping Station at Kote Hundi Gate to Existing / Proposed MBR's:

- The location of proposed new MBR's have been identified on peak ridge points at three locations on extended areas on western side of Mysore City. The GIS contour map prepared by Karnataka Remote Sensing Agency (KRSA) using reliable satellite data was made available by KUWS&DB to the Consultants during preparation of "Water Supply Remodeling Scheme". This data has been used for preparing longitudinal sections of clear water pipeline alignment from intermediate booster pumping station connecting to proposed and existing service MBR's. The longitudinal section has been generated at 30.0 m intervals.

4.7 Preparation of Drawings:

Based on the field topographical survey conducted as above detailed drawings were prepared in AutoCAD 2007 version with 1 : 1000 scale. In the drawings both alignment plans as well as longitudinal sections have been shown. All along the alignment following details have been incorporated given;

- Road name, type of road (Mud, Bitumen, Concrete Road, Cart Track, WBM, Foot Path etc.)
- Culvert details i.e. type of culvert (pipe, box culvert etc.), length, width, bottom level, chainage, cross section etc.
- Details of kilometer guide stone
- Road embankment, sloping direction, type of pitching or turfing etc.
- Road side drain details with width and depth
- Canal / River crossing details with bed levels at regular intervals, flow direction, type of bridge, HFL of river etc.
- Trees, electric poles, underground electrical lines, telephone poles, OFC lines etc.
- At crossings of major structures like canal intake, canal crossings, bridge, culverts etc, photographs shall be taken.

The topographical survey details as generated along the pipeline alignment and intake structure is shown in enclosed **Drawing No: SD - 01 (3 Sheets)**. The details of cross sections taken inside Kabini River is shown in enclosed **Drawing No: SD - 02**.

CHAPTER - V

POPULATION PROJECTION AND WATER DEMAND

1.0 POPULATION PROJECTION:

1.1 Past Population Data

Population data for the past four decades from the year 1971 to 2001 was collected from the Census Department to ascertain the future population. The details of past population as collected for different years is shown in **Table - 5.1**.

**TABLE - 5.1
PAST POPULATION DATA FOR MYSORE CITY**

Sl. No.	Year	Population	Percent Growth Rate Per Decade (%)
1.	1971	3,55,685	-----
2.	1981	4,76,446	33.95
3.	1991	6,05,789	27.15
4.	2001	7,99,228	31.93
Average Percent Growth =			31.01 %

Source: Office of "The Directorate of Census", Bangalore

Note:

The past population as given above for the year 2001 i.e. 7,99,228 includes population in MCC area (7,55,379), population of out growth - OG (31,800) and population of census town (12,049). A copy of relevant pages of "Census of India 2001" book showing past population of Mysore City for the year 2001 is given in enclosed **Annexure - 1**. The list of extensions included under out growth and census town is given in **Table - 5.2** below.

**TABLE - 5.2
LIST OF OUT GROWTH AND CENSUS TOWN**

Sl. No.	Name of Extension	2001 Population
A) Out Growth		
1.	Hinkal	12132
2.	Hutagalli	6554
3.	Sriramapura	6085
4.	Alanahalli	3682
5.	Chamundi betta	1393
6.	Lingambudi	658
7.	Satagalli	600
8.	Metagalli	508
9.	Datagalli	188
Sub Total =		31800
B) Census Town		
1.	Balvata	5707
2.	Bhogadi	4815
3.	Hebbalu	1527
Sub Total =		12049
Total Population of OG + CT =		43849

1.2 Project Design Year

The project base year has been considered as 2009 with a gestation period of two years. The scheme has been designed for a period of 30 years as per CPHEEO manual guidelines. The ultimate design year considered is 2039 and intermediate year considered as 2024. The population projection and water demand calculations for the future years have been carried out accordingly.

1.3 Projected Population

The projected population for the ultimate year (2039) was calculated using different population projection methods available such as Arithmetic Progression Method, Geometric Progression Method, Incremental Increase Method, National Average Growth Rate Method, Average Growth Rate Method and State Urban Growth Rate Method. The details of projected populations for project intermediate year (2024) and ultimate year (2039) as worked out based on different methods is shown in **Table - 5.3**.

As seen in above table, the population for the year 2039 based on Arithmetic Progression and Incremental Increase methods varies from about 13.60 Lakhs to 16.90 Lakhs. However the values obtained from Geometric Progression Method, State Urban Growth Rate Method, Average Growth Rate Method and Graphical Trend Method give values exceeding 20.00 Lakhs. Mysore City has witness tremendous population growth after 2001, due to establishment of new industries, information technology parks, new educational institutions, tourist inflow etc. As the city is being connected to state capital Bangalore through a new dedicated express highway, it is estimated that the city will grow at a much faster pace due to large scale population migration. In view of all the above factors, a population growth rate of 31.01 % per decade as per Average Growth Rate of Mysore City for the past four decades has been considered for arriving at the projected population.

The projected population for “Water Supply Distribution System Remodeling” scheme which is already approved has also been arrived based on Average Growth Rate Method only. The projected population considered for intermediate year i.e. (2024) is 15.00 Lakhs and the projected population considered for ultimate year i.e. 2039 is 22.50 Lakhs.

1.4 Floating Population

In addition to resident population, the city is visited by large number of tourists every day and during peak tourist seasons the floating population increases beyond 3.50 Lakhs. Baseline data has been collected from various tourism authorities to assess the average floating population visiting Mysore City. Based on the above data an average tourist population of 1.50 Lakh has been considered as floating population for the ultimate year (2039) and 1.25 Lakhs has been considered for the intermediate year (2024).

1.5 En-route Villages Population

The source for the present augmentation scheme is identified as Kabini River with head works located near Bidargudu Village at a distance of about 20.0 Kms. from Mysore City. All along the length of the pipeline alignment from head works to city number of en-route villages exist. As per Govt. of Karnataka, Rural Development Dept., ordinance, all the villages within a radial distance of 3.0 Kms. from the city water pipeline alignment shall be provided with potable water supply.

Based on field studies and topo-maps it has been established that about 17 Nos. of villages have to be provided with drinking under the present scheme. The past population of all the villages for the year 2001 has been collected from census department and projected populations have been worked out considering a decadal growth rate of 12.0% as per National Average Growth Rate Method. The projected population for en-route villages for the ultimate year (2039) is 57,084 and for the intermediate year (2024) 48,180. The detailed list of villages covered under the scheme with past and projected populations for different years is given in **Table - 5.4**.

2.0 WATER DEMAND:

On arriving at the projected populations for different years, water demand has been calculated for different requirements. Mysore City comes under City Corporation category in terms of urban governing body. Hence as per CPHEEO manual guidelines a per capita net supply rate of 135 LPCD has been considered for working out the water demand for domestic use. The per capital supply rate for floating population has been considered as 25 LPCD as per norms. In addition to above, Mysore City also houses large numbers of hotels, lodges, institutions, hospitals, offices, IT parks etc. The water requirement to meet above demand has been calculated separately based on extensive field data collection and data available with MCC. Based on the above demand assessment study it has been arrived that present (2009) net water requirement for above uses 15.00 MLD. Considering 10% increase per decade the net water demand worked out for intermediate year (2024) is 18.00 MLD and ultimate year (2039) is 21.60 MLD. The details of water demand as arrived for institutions and hospitals is given in **Table - 5.5** enclosed. The data collected for the same is given in **Annexure - 2** enclosed.

As per accepted norms transmission and distribution losses at the rate of 15% of the net water supply has been considered for all the above demands. The total gross water demand for the above three requirements for the ultimate year i.e. 2039 works out to 377.38 MLD and for the intermediate year i.e. 2024 works out to 257.07 MLD.

The above water demand is for domestic requirement of the city only. In addition to above demands, there is additional water demand to meet fire fighting and industrial requirements. The industrial demand has been obtained from Karnataka Industrial Areas Development Board (KIADB) and based on the data given by KIADB a net industrial demand of 27.28 MLD (6.0 MGD) has been considered for the year 2024 and a net demand of 31.82 MLD (7.0 MGD) has been considered for the year 2039. The fire fighting demand has been considered based on the formulae given in CPHEEO manual and the same works out to 4.00 MLD for the year 2024 and 5.82 MLD for the year 2039. The net water requirement of en-route villages at a per capita supply rate of 55 LPCD which is the standard norm works out to 2.65 MLD for the year 2024 and 3.14 MLD for the year 2039. Considering transmission and distribution losses at the rate of 15% of the net water supply, the total gross water demand for the above three requirements for the ultimate year i.e. 2039 works out to 46.90 MLD and for the intermediate year i.e. 2024 works out to 39.02 MLD. The details of water demand as obtained from KIADB for industrial requirement is given in **Annexure - 3** enclosed.

The total gross water requirement at source point considering all the above water demands is **424.28** MLD for the year 2039 and **296.09** MLD for the year 2024. The detailed calculations for working out gross water demand for both intermediate and ultimate years for different requirements is shown in **Table - 5.6** enclosed.

As discussed earlier, the total assured dependable quantity of water source available is 190.92 MLD. The design capacity of Melapura scheme is 150.0 MLD and the scheme has been implemented in phases with Phase - I & Phase - II of each 50.0 MLD capacity. Hence Phase - III of the scheme has to be taken up immediately by installing additional pumps at source and clear water pump house and constructing a new WTP of 50.0 MLD capacity at Ramanahalli. As discussed, the above component has been taken up under separate head and a separate DPR for the same has been prepared and submitted to KUWS&DB. On implementation of the Phase - III Melapura scheme, the total available quantity of water will be 240.92 MLD. Hence at source point there will be a shortage of 55.17 MLD for the intermediate year (2024) and 183.36 MLD for the ultimate year (2039).

Hence it has been proposed to develop Kabini source in three phases with Phase - I of 56.0 MLD, Phase - II of 64.0 MLD and Phase - III of 64.0 MLD. The Phase - I works shall be taken up immediately so as to complete the works by year 2009 and Phase - II works will be taken up in the year 2024. The Phase - III works shall be completed by the year 2031 to meet ultimate year requirement up to year 2039.

CHAPTER - VI

SYSTEM DESIGN CRITERIA

The system design criteria adopted for designing various components of proposed water supply scheme is as given below;

- Design capacity - 184.00 MLD (Ultimate Year - 2039)
56.00 MLD (Intermediate Year - 2024)
- Design capacity for intake channel, intake structure, pump house, raw water / treated water transmission mains, WTP aerator, clear water sump, intermediate booster pumping station, master balancing reservoirs and other civil works etc. - 184.00 MLD (Ultimate Year - 2039)
- Design capacity for mechanical and electrical works and WTP - 56.00 MLD (Intermediate Year - 2024)
- Number of hours of pumping - 23.5 Hours in a day
- Approach velocity in inlet channel - 0.30 m / sec
- Number of pumps at intake and intermediate booster pumping station for ultimate year (2039) - 6 Nos. (4 Working + 2 Standby) (50% standby)
- Number of pumps at intake and intermediate booster pumping station for intermediate year (2024) - 3 Nos. (2 Working + 1 Standby) (50% standby)
- Number of pumps at online booster Pumping station for 2024 & 2039 - 3 Nos. (2 Working + 1 Standby) (50% standby)
- Type of raw water pumps - Deep well turbine centrifugal
- Type of clear water pumps - Horizontal split case centrifugal
- Pipe Material for transmission mains - up to 400 mm Dia. DI, Class K9
450 mm and above MS lined
- Design "C" value for transmission mains - 140 (MS / DI)
- Water Treatment Plant Units - Cascade Aerator, Flash Mixing Tank, Flocculation Tank, Tube Settler, Rapid Sand Filters and Chlorination
- Capacity of clear water sump at WTP - 30 minutes ultimate year demand

**Augmentation of Water Source to Mysore City
from Kabini River**

**Karnataka Urban Water Supply and
Drainage Board (KUWS&DB)**

- Capacity of break pressure tank at Udbur - 30 minutes ultimate year demand
- Capacity of clear water sump at intermediate booster pump station - 30 minutes ultimate year demand
- Capacity of new MBR's - One day demand of ultimate year (2039)

Note:

Though the capacity of new MBR's is considered as one day storage, in cost estimate, the proportionate cost of MBR's with 1/3 of intermediate water demand has only been considered as commented by CPHEEO. The balance cost shall be shared by MUDA.

CHAPTER - VII

PROJECT PROPOSAL

Based on the system design criteria as specified in Chapter - VI, detailed hydraulic design and engineering design of the proposed water supply system has been carried out. The details of proposed system components considered under the above scheme are described in detail below;

7.1 Location of Intake Structure:

During the reconnaissance field visits various alternative sites for locating the proposed intake structure on the bank of Kabini River were studied with respect to their suitability. Near Hullahalli village up stream of Bidargudu village, the state irrigation authorities have constructed a weir across Kabini River to draw water to Rampura Canal which irrigates agricultural land all along river path beyond Nanjanagudu Town. The above weir is constructed exclusively for irrigation purpose. Based on the preliminary discussions held earlier with concerned officials during the conceptualization of the project, the authorities did not permit drawing water from upstream of Hullahalli weir for supplying to Mysore City and water has to be drawn from only down stream of the weir. Locating an intake structure just down stream of Hullahalli weir will not be of any advantage. Also the Hullahalli weir is located at a distance of about 10.0 Kms. from Bidargudu village and this will add to additional capital expenditure and energy costs. The alternative site identified for constructing intake structure near Bidargudu village is nearest available point from Mysore City and has got good access road up to intake structure. Also even during peak summer months, good quantum of water is available in the river as water will be continuously let out from Kabini Dam located upstream. The identified location of intake structure is at a distance of about 20.0 Kms. from Mysore City.

The location details of head works, water treatment plant, break pressure tank, intermediate booster pumping station, new MBR's and alignment details of proposed raw water and treated water pipelines is shown in enclosed **Figure - 1**.

7.2 Intake Structure at Bidargudu Village:

The proposed intake structure is located at left bank of Kabini River near Bidargudu village. At the proposed intake location the minimum bed level of river is (+) 650.00 m and the river bank level is (+) 655.00 m. To draw water from the river even during peak summer months when the water level in the river reaches minimum level, an RCC approach channel has been proposed connecting intake structure to river up to minimum bed level. The length of approach channel proposed is 62.50 m. The approach channel is provided with a stop log arrangement to isolate the intake structure from river during maintenance. Based on velocity criteria, the size of approach channel has been arrived as 8.0 m wide and 2.00 m depth. The bed level of intake channel has been lowered by 1.0 m for a length of 25.0 m which will act as silt trap. The alignment of intake channel has been kept inclined to river bed such that silt will not enter the channel.

The total number of pumps proposed to meet ultimate year demand of 184.00 MLD is 6 Nos. with 4 Nos. as working and 2 Nos. as standby (50% standby). The number of pumps proposed to meet intermediate year demand of 56.00 MLD is 3 Nos. with 2 Nos. as working and 1 No. as standby (50% standby). The intake structure has been provided with 6 Nos. of individual compartments so as to house one pump each. The size of each intake chamber considered is 4.50 m x 4.50 m. The approach channel is flared at intake end to provide a bell mouth entry to intake wells. At the entry to each intake chamber trash racks have been

provided to prevent floating matter entering the well. In order to facilitate isolation of each intake chamber during maintenance stop log arrangement has been provided at the entry for each chamber.

The minimum drawal level in river is considered as (+) 651.00 m. Considering a minimum submergence depth for VT pumps as 1.50 m and minimum clearance from pump suction to bed of intake well as 1.50 m, the invert level of proposed intake well has been kept as (+) 648.00 m. Based on field data collection the high flood level in river at the intake location is assessed as (+) 660.00 m. The floor level of the pump delivery chamber is kept as (+) 661.00 m i.e. 1.0 m above HFL. The level of motor floor above delivery chamber is kept as (+) 664.50 m. In order to house 6 Nos. of motors, the size of motor floor considered is 28.00 m x 8.00 m with 8.0 m height up to EOT crane corbel top. A maintenance area of size 4.50 m x 8.00 m and a control room of size 4.50 m x 8.00 m have been considered placed on either side of the motor area. Adjacent to motor floor a room of size 6.00 m x 32.30 m and 4.50 m height up to HOT crane corbel top has been provided to house the MCC panels and electrical installations. The total number of pumps proposed for ultimate year is 6 Nos. with each having a capacity of 1957.45 m³ / Hour and 35.0 m head. The power rating of each motor will be about 350 H.P. The total number of pumps proposed for intermediate year is 3 Nos. with each having a capacity of 1191.49 m³ / Hour and 33.0 m head. The power rating of each motor will be about 200 H.P.

The formation level around the intake structure shall be raised to (+) 660.50 m to prevent flooding in the area. A permanent motorable approach road has been proposed from existing village road connecting to intake structure.

The layout plan of proposed intake structure is shown in enclosed **Drawing No: SD - 03** and the general arrangement details of intake structure giving plans and sections is shown in **Drawing No: SD - 04**. The sectional details of proposed road and fencing details at intake is shown in enclosed **Drawing No: SD - 05** and **Drawing No: SD - 06** respectively. The sectional details of proposed compound wall and site grading works at intake is shown in enclosed **Drawing No: SD - 07** and **Drawing No: SD - 08** respectively.

A store room of size 12.0 m x 4.0 m x 4.0 m height has been provided to store the spares, tools, tackles, etc. The general arrangement details of proposed store room is shown in enclosed **Drawing No: SD - 09**.

7.3 Raw Water Rising Main from Intake Structure to WTP:

Raw water from intake structure shall be pumped to proposed water treatment plant located near Bidargudu village. The pipeline has been designed to meet ultimate year requirement of 184.00 MLD. The diameter of rising main has been decided by carrying out detailed techno-economic analysis considering cost of pipeline, pumps, electrical works and capitalized cost of energy charges. The reduced ground level at proposed WTP location is (+) 673.00 m and the top level of cascade aerator has been kept at (+) 680.00 m. Hence the static head between source to WTP is 29.00 m. The distance of WTP from source point is about 850 m. Based on detailed techno-economic analysis the diameter of raw water rising main has been calculated as 1219 mm (OD) and the pipeline shall be of mild steel with internal cement mortar lining and external guniting.

The pipeline crosses Rampur Canal at CH: 165 m. At this location structural steel pipe bridge has been provided. The pipeline has been provided with air valves, scour valves and control line valves. At all the horizontal and vertical bends RCC thrust blocks have been provided. At road crossing / nallah crossings / drain crossings the pipeline shall be encased in concrete.

The plan and longitudinal section along the proposed raw water rising main from intake structure to WTP is shown in **Drawing No: SD - 10 (2 Sheets)**. The techno-economic analysis for arriving at the pipe diameter for above pumping main is shown in **Annexure - 4**.

7.4 Water Treatment Plant:

The proposed water treatment plant is located close to intake structure near Bidargudu village. The design capacity of WTP has been considered as 56.00 MLD to meet Phase - I requirement and additional units will be added in future to meet ultimate demand of 184.00 MLD. The cascade aerator and raw water channel up to flash mixer have been designed for ultimate year requirement of 184.00 MLD only. The treatment units considered include Cascade Aerator, Flash Mixing Tank, Flocculation Tanks, Tube Settler Tanks, Rapid Sand Filters and Chlorination. The number and sizes of various units proposed is given below;

- Cascade Aerator - 12.60 m Dia., 4 steps of 0.75 m each
- Flash Mixing Tank - 2.75 m x 2.75 m x 3.00 m water depth
- Flocculation Tanks - 6 Nos., of 7.75 m x 9.00 m x 3.00 m water depth
- Tube Settler Tanks - 6 Nos., of 7.75 m x 7.75 m x 3.00 m water depth
- Rapid Sand Filters - 10 Nos., of 9.30 m x 6.00 m size
- Wash Water Tank - 10.00 Lakh Liters Capacity, 9.0 m Staging
- Clear water sump - 2 compartments, each 23.00 m x 29.0 m x 3.0 m WD

The location details of proposed WTP near Bidargudu village is shown in **Drawing No: SD - 11** and the layout plan of WTP including proposed future expansion is shown in enclosed **Drawing No: SD - 12**. The general arrangement details of cascade aerator & flash mixer, flocculation tanks & tube settling tanks, filter house and clear water storage tank is shown in **Drawing No: SD - 13, SD - 14, SD - 15** and **SD - 16** respectively. The sectional details of proposed road is shown in enclosed **Drawing No: SD - 17**.

At WTP location staff quarters has been provided for housing operation and maintenance staff and a separate toilet block has been provided for the premises. Also a store room of size 12.0 m x 4.0 m x 4.0 m height has been provided to store the spares, tools, tackles, etc. The details of proposed staff quarters, toilet block and store room at WTP premises is shown in enclosed **Drawing No: SD - 18, SD - 19** and **SD - 20** respectively. The sectional details of proposed compound wall is shown in enclosed **Drawing No: SD - 21**.

7.5 Clear Water Pumping Station inside WTP Premises:

The clear water from WTP shall be supplied to Mysore City through pumping. The pumping station has been designed for ultimate year flow of 172.00 MLD excluding WTP losses. The pumping station is located adjacent to proposed clear water reservoir and the size of pumping station proposed is 20.00 m x 55.00 m and 8.00 m height up to EOT crane corbel top. The pumping station is provided with 6 Nos. of horizontal split case pumps such that 4 Nos. will be in operation and 2 Nos. (50%) will be in standby.

A maintenance area / control room of size 8.00 m x 20.00 m has been considered adjacent to pump house. Adjacent to pump / motor area a room of size 6.00 m x 63.00 m and 4.50 m height up to HOT crane corbel top has been provided to house the MCC panels and electrical installations.

At ultimate year 6 Nos. of pumps will be provided with each having a capacity of 1829.79 m³ / Hour and 107.0 m head. The power rating of each motor will be about 975 H.P. The total number of pumps proposed for intermediate year is 3 Nos. with each having a capacity of 1085.11 m³ / Hour and 86.0 m head. The power rating of each motor will be about 500 H.P.

7.6 Clear Water Pumping Main from WTP to Break Pressure Tank:

During the field reconnaissance study visit along the pipeline alignment from source to Mysore City it was noticed that the ground level rises up to Kelahalli village cross with peak point near Udbur village. After above point the ground profile slopes downwards up to Kote Hundi Gate. Hence it has been proposed to construct a Break Pressure Tank (BPT) at the ridge point such that water can be conveyed by gravity up to Kote Hundi Gate. The treated water from WTP shall be pumped to proposed BPT. The pipeline has been designed to meet ultimate year requirement of 172.00 MLD which is exclusive of en-route village demand and water treatment plant losses.

The diameter of rising main has been decided by carrying out detailed techno-economic analysis considering cost of pipeline, pumps, electrical works and capitalized cost of energy charges. The minimum water level in proposed clear water reservoir is (+) 669.5. The reduced ground level at proposed BPT location is (+) 746.00 m and the top water level in BPT is considered as (+) 749.00 m. Hence the static head between minimum water level in clear water reservoir of WTP to maximum water level of BPT is 79.50 m. The distance of BPT from WTP is about 9.30 Kms. Based on detailed techno-economic analysis the diameter of raw water rising main is arrived as 1168 mm (OD).

The pipeline shall be of mild steel with internal cement mortar lining and external guniting. At chainage CH: 3750 m the pipeline crosses Varuna Canal and pipeline crosses a major storm water drain near the canal. At these locations pipe bridges have been provided. The pipeline has been provided with air valves, scour valves and control line valves. At all the horizontal and vertical bends RCC thrust blocks have been provided. At road crossing / nallah crossings / drain crossings the pipeline shall be encased in concrete.

The plan and longitudinal section along the proposed clear water rising main from WTP to BPT is shown in **Drawing No: SD - 22**. The techno-economic analysis for arriving at the pipe diameter for above pumping main is shown in **Annexure - 5**.

7.7 Break Pressure Tank near Udbur Village:

The break pressure tank is located near Udbur village on ridge point. The capacity of BPT has been kept as 3690 m³ with 22.00 m x 39.00 m x 4.30 m useful depth of water. The reduced ground level at proposed BPT location is (+) 746.00 m and the top water level in BPT is considered as (+) 749.00 m. A dead storage depth of 0.50 and a free board of 0.50 m have been considered. An RCC staircase of 1.20 m width is provided for accessing the tank top. The tank is provided with inlet pipe, overflow pipe and scour pipes as necessary. The tank shall be in RCC construction with covered roof. The location details of proposed break pressure tank is shown in **Drawing No: SD - 23** and the general arrangement details of break pressure tank is shown in **Drawing No: SD - 24**.

7.8 Clear Water Gravity Main from BPT to Intermediate Booster Pumping Station:

Clear water from BPT shall be conveyed by gravity to proposed intermediate booster pumping station near Kote Hundi Gate. The pipeline has been designed to meet ultimate year requirement of 172.00 MLD which is exclusive of en-route village demand and water treatment plant losses. The reduced ground level at proposed pumping station location is (+) 715.00 m and maximum water level of booster sump is kept at (+) 717.50 m. The diameter of gravity main has been decided based on available head between BPT and pumping station sump excluding minor losses. The net available head between two points is 21.70 m. Based on hydraulic calculations the diameter of gravity main has been fixed as 1168 mm (OD) MS with internal cement mortar lining and external guniting. The distance of booster pumping station from BPT is 6.05 Kms.

The pipeline has been provided with air valves, scour valves and control line valves. At all the horizontal and vertical bends RCC thrust blocks have been provided. At road crossing / nallah crossings / drain crossings the pipeline shall be encased in concrete.

The plan and longitudinal section along the proposed clear water gravity main from WTP to intermediate booster pumping station near Kote Hundi Gate is shown in **Drawing No: SD - 25**.

7.9 Intermediate Booster Pumping Station near Kote Hundi Gate:

The intermediate booster pumping station is located near Kote Hundi Gate. The pumping station has been designed for ultimate year flow of 172.00 MLD. The clear water from BPT will be received in a booster sump having 3710.0 m³ capacity. The size of tank proposed is 17.50 m x 26.5 m x 4.00 m water depth. A dead storage depth of 0.50 and a free board of 0.50 m have been considered. An RCC staircase of 1.20 m width is provided for accessing the tank top. The tank is provided with inlet pipe, overflow pipe and scour pipes as necessary.

The pumping station is located adjacent to the tank and the size of pumping station proposed is 20.00 m x 55.00 m and 8.00 m height up to EOT crane corbel top. The pumping station is provided with 6 Nos. of horizontal split case pumps such that 4 Nos. will be in operation and 2 Nos. (50%) will be in standby.

A maintenance area / control room of size 8.00 m x 20.00 m has been considered adjacent to pump house. Adjacent to pump / motor area a room of size 6.00 m x 63.00 m and 4.50 m height up to HOT crane corbel top has been provided to house the MCC panels and electrical installations. Treated water from above booster pumping station shall be conveyed to existing / proposed MBR's by pumping.

The layout plan of proposed intermediate booster pumping station is shown in enclosed **Drawing No: SD - 26** and the general arrangement details of pumping station giving plans and sections is shown in **Drawing No: SD - 27**. The location details of proposed intermediate sump at booster pumping station location is shown in enclosed **Drawing No: SD - 28** and the general arrangement details of sump shown in **Drawing No: SD - 29**.

7.10 Distribution of Treated Water to Master Balancing Reservoirs:

Under "Remodeling of Water Distribution System" project, water demand for all the existing MBR's has been arrived based on detailed population density and water demand analysis. Under the above project, the entire city limits has been divided into six (6) command zones with each zone feeding cluster of service reservoirs. Ballal Circle zone is added as a new

command zone feeding nearby service reservoirs from Kuvempunagar MBR and HLR MBR. The water demands as arrived for MBR's has been modified considering revised projected population and water demand and the same is shown in **Table - 7.1** below.

TABLE - 7.1

WATER DEMAND FOR MBR's / COMMAND ZONES

Sl. No.	MBR / Command Zone	Water Demand	
		Year 2024 (MLD)	Year 2039 (MLD)
1	Central Storage Reservoir (CSR)	114.31	157.92
2	High Level Reservoir (HLR)	28.22	41.35
3	Kuvempunagar Reservoir	29.69	42.70
4	German Press Reservoir	33.01	48.38
5	Devanoor Reservoir	27.80	42.39
6	Ballal Circle Pumping Station	33.26	48.75
Total Water Demand =		266.29	381.49

The requirement as given above includes water demand for resident population within MCC limits, water demand for floating population, water requirement for institutional and hospital demand, industrial demand and fire fighting demand. The above water demands are excluding WTP losses of 5%. The water requirement of Out Growth and Census Town has been included in proposed new Master Balancing Reservoirs at extended areas of Mysore City. The net water requirement for above demand excluding WTP losses is 12.09 MLD for the year 2024 and 18.14 MLD for the year 2039. The water requirement of en-route villages shall be met directly from proposed clear water reservoir of WTP. To meet the water requirement of extended areas of Mysore City outside MCC limits but within CDP area, 3 Nos. of new MBR's have been proposed with one number each at J. P. Nagar, Datagalli and Vijayanagar.

Water demand for above 3 Nos. of MBR's has been arrived based on proportionate area basis. The total water demand for Out Growth and Census Town has been distributed to above 3 Nos. of MBR's. The command area of J. P. Nagar MBR is 5.80 Km², Datagalli MBR is 6.5 Km² and command area of Vijayanagar MBR is 29.0 Km². The contributing demand of OG & CT for J. P. Nagar MBR is 2.54 MLD, Datagalli MBR is 2.90 MLD and for Vijayanagar MBR is 12.70 MLD. The capacity of new MBR's considered is to meet one day requirement. Though the capacity is considered as one day, in cost estimate, the proportionate cost of MBR with 1/3 of intermediate water demand has been considered. The balance cost shall be met by MUDA. The final projected water demands and capacity of the three new MBR's is given in **Table - 7.2** below.

TABLE - 7.2

WATER DEMAND FOR NEW MBR's

Sl. No.	MBR Location	Water Demand		Capacity (ML)
		Year 2024 (MLD)	Year 2039 (MLD)	
1	J. P. Nagar	1.69	2.54	3.0
2	Datagalli	1.93	2.90	3.0
3	Vijayanagar	8.47	12.70	13.0
Total Water Demand =		12.09	18.14	19.00

The location details of existing and proposed MBR's / Command Zones including water demand and capacity of MBR is shown in enclosed **Drawing No: SD - 30**.

On arriving at the projected water demands for different existing / proposed MBR's / Command Zones, the available sources have been re allocated among the MBR's / Command Zones to meet intermediate and ultimate year requirement. The quantity of water available from existing sources i.e. Hongalli is 90.92 MLD and that available from Melapura is 150.0 MLD (including Phase - III). Water availability from Kabini River after WTP losses for the intermediate year is 50.30 MLD and for the ultimate year is 171.37 MLD.

The details of source allocation for different existing / proposed MBR's / Command Zones for the intermediate year and ultimate year is given in **Table - 7.3** enclosed.

The key plan of proposed source distribution for intermediate year and ultimate year is shown in **Figure - 2 and Figure - 3** respectively.

7.11 Clear Water Feeder Mains from Intermediate Booster Pumping Station to Master Balancing Reservoirs:

Based on the source allocation as above, clear water feeder main network from Kabini River has been designed for the ultimate year requirement. The existing CSR MBR and proposed Vijayanagar MBR are located at relatively higher elevations with reduced levels above 790.0 m. Hence it has been proposed to provide an online booster pumping system for the branch line conveying water to above two MBR's. This has resulted in considerable energy savings. The design calculations for above feeder main network is given in **Annexure - 6**. The feeder main design has been re-checked with UNDP Branch software also and the details of the same is given in **Annexure - 7**.

The pump capacity required at main intermediate booster pumping station for the year 2039 is 725 HP (4 + 2) and that required at online booster pumping station is 550 HP with 3 Nos. of pumps (2 Nos. working + 1 Nos. standby). The pump capacity required at intermediate booster pumping station for the year 2024 is 325 HP (2 + 1) and that required at online booster pumping station is 200 HP with 3 Nos. of pumps (2 Nos. working + 1 Nos. standby).

The plan and longitudinal section along of proposed clear water feeder mains from intermediate booster pumping station near Kote Hundi Gate to existing and proposed MBR's is shown in **Drawing Nos: SD - 31 to SD - 40**.

The key plan of proposed feeder main network is shown in **Figure - 4**. The key plan of proposed water supply scheme from Kabini River is shown in **Figure - 5**.

Detailed design calculations for the complete water supply system is given in **Annexure - 8**.

The location and general arrangement details of proposed pipe bridge across Rampura Canal near intake is shown in **Drawing Nos: SD - 41** and **SD - 42** respectively. The general arrangement details of proposed pipe bridges across main storm water drain at Chainage : 3210 m, bridge across Varuna Canal and pipe bridges across main storm water drain at Chainage : 4600 m near IBPS is shown in **Drawing Nos: SD - 43, SD - 44** and **SD - 45** respectively.

The details of proposed coffer dam at intake structure during construction period is given in enclosed **Drawing No: SD - 46**. The details of clear water channel of WTP connecting to treated water sump is shown in **Drawing No: SD - 47**.

The general arrangement details of proposed new MBR's at J. P. Nagar & Dattagalli and Vijayanagar is shown in **Drawing Nos: SD - 48** and **SD - 49** respectively. The details of proposed valve chambers is shown in **Drawing No: SD - 50** and the GA of proposed 10.0 Lakh Liters capacity backwash water tank of WTP is shown in **Drawing No: SD - 51**. The general arrangement details of proposed online booster pumping station at Vijayanagar is shown in **Drawing No: SD - 52**.

CHAPTER - VIII

ABSTRACT COST ESTIMATE

1.0 BASE COST:

Detailed cost estimate has been prepared for all the components of the work proposed under the above water supply scheme considering rates for various items of work as per latest Department "Schedule of Rates". The estimate cost for electromechanical works has been worked out considering market rates. The abstract estimate for proposed water supply scheme from Kabini River is given in **Table - 8.1** below.

TABLE - 8.1
ABSTRACT COST ESTIMATE FOR WATER SUPPLY SCHEME TO
MYSORE CITY FROM KABINI RIVER

Sl. No.	Project Component	Estimated Amount (Rs. Lakhs)
A) ESTIMATED COST FOR CIVIL WORKS		
a)	PROPOSED INTAKE STRUCTURE NEAR BIDARGUDU VILLAGE	
1	INTAKE STRUCTURE	350.26
2	SITE GRADING FOR INTAKE STRUCTURE LOCATION	72.34
3	STORE ROOM AT INTAKE STRUCTURE	6.30
4	COMPOUND WALL FOR INTAKE STRUCTURE PREMISES	21.44
5	CONSTRUCTION OF ROADS AND CD WORKS	8.01
6	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS	0.64
	SUB TOTAL =	458.99
b)	RAW WATER PUMPING MAIN FROM INTAKE STRUCTURE TO WTP	
1	1219 MM O.D. (1175 MM I.D) RAW WATER PUMPING MAIN FROM INTAKE STRUCTURE TO PROPOSED WATER TREATMENT PLANT	185.67
2	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	5.97
3	CONSTRUCTION OF STEEL STRUCTURE PIPE BRIDGE ACROSS RAMPURA CANAL FOR RAW WATER PUMPING MAIN	15.14
	SUB TOTAL =	206.78
c)	WORKS AT WATER TREATMENT PLANT PREMISES	
1	CASCADE AERATOR OF WTP	33.94
2	RAW WATER CHANNEL AND FLASH MIXING TANK OF WTP	21.63
3	FLOCCULATION TANKS AND TUBE SETTLING TANKS OF WTP	99.70
4	FILTER HOUSE OF WTP	197.91
5	CLEAR WATER CHANNEL FROM FILTER HOUSE TO CLEAR WATER SUMP	24.06
6	CHEMICAL BUILDING FOR WTP	89.85
7	10.0 LAKH LITRES CAPACITY, 9.0 M STAGING BACKWASH TANK	50.70
8	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS AT WTP	4.78
9	STORE ROOM AT WTP	6.22
10	STAFF QUARTERS AT INTAKE STRUCTURE NEAR BIDARGUDU	33.60
11	COMPOUND WALL FOR WTP PREMISES	40.11
12	CONSTRUCTION OF ROADS AND DRAINS FOR WTP PREMISES	87.52
13	CONSTRUCTION OF CLEAR WATER SUMP AT WTP PREMISES	157.70
14	CONSTRUCTION OF CLEAR WATER PUMP HOUSE AT WTP PREMISES	213.87
	SUB TOTAL =	1061.59

Sl. No.	Project Component	Estimated Amount (Rs. Lakhs)
d) CLEAR WATER PUMPING MAIN FROM WTP TO BPT		
1	1168 MM O.D. (1124 MM I.D) CLEAR WATER PUMPING MAIN FROM WTP TO PROPOSED BREAK PRESSURE TANK NEAR UDBUR	1568.79
2	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	19.06
3	CONSTRUCTION OF RCC PIPE BRIDGE ACROSS VARUNA CANAL FOR CLEAR WATER PUMPING MAIN	2.63
SUB TOTAL =		1590.48
e) BREAK PRESSURE TANK NEAR UDBUR VILLAGE		
1	CONSTRUCTION OF BREAK PRESSURE TANK NEAR UDBUR VILLAGE	110.14
2	CONSTRUCTION OF COMPOUND WALL FOR BREAK PRESSURE TANK PREMISES NEAR UDBUR VILLAGE	12.15
3	CONSTRUCTION OF ROADS AND DRAINS FOR BREAK PRESSURE TANK PREMISES NEAR UDBUR VILLAGE	1.30
SUB TOTAL =		123.59
f) CLEAR WATER GRAVITY MAIN FROM BPT TO IBPS		
1	1168 MM O.D. (1124 MM I.D) CLEAR WATER GRAVITY MAIN FROM BREAK PRESSURE TANK TO PROPOSED INTERMEDIATE BOOSTER PUMPING STATION NEAR UDBUR	1027.22
2	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	14.49
3	CONSTRUCTION OF RCC PIPE BRIDGE ACROSS DRAIN NEAR VARUNA CANAL FOR CLEAR WATER PUMPING MAIN	2.64
4	CONSTRUCTION OF STEEL STRUCTURE PIPE BRIDGE ACROSS STORM WATER DRAIN NEAR KOTE HUNDI GATE FOR CLEAR WATER GRAVITY MAIN	15.14
SUB TOTAL =		1059.49
g) INTERMEDIATE BOOSTER SUMP AND PUMPING STATION		
1	CONSTRUCTION OF BOOSTER SUMP AT IBPS NEAR KOTE HUNDI GATE	155.60
2	CONSTRUCTION OF INTERMEDIATE BOOSTER PUMP HOUSE	213.87
3	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS AT IBPS	0.64
4	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	2.67
5	COMPOUND WALL AT INTERMEDIATE BOOSTER PUMPING STATION	19.02
6	CONSTRUCTION OF ROADS AND DRAINS FOR IBPS PREMISES	25.14
SUB TOTAL =		416.94
h) CLEAR WATER FEEDER MAINS		
1	1168 MM O.D. (1124 MM I.D) CLEAR WATER FEEDER MAIN FROM IBPS TO RING ROAD JUNCTION	223.82
2	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	7.88
3	200 MM DIA. DI CLEAR WATER FEEDER MAIN FROM RING ROAD JUNCTION TO J. P. NAGAR MBR	44.95
4	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS	1.91
5	1168 MM O.D. (1124 MM I.D) CLEAR WATER FEEDER MAIN FROM RING ROAD JUNCTION TO DATTAGALLI MBR JUNCTION	720.89
6	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	7.88
7	200 MM DIA. DI CLEAR WATER FEEDER MAIN FROM DATAGALLI MBR JUNCTION TO DATAGALLI MBR	21.14
8	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS	1.28
9	1168 MM O.D. (1124 MM I.D) CLEAR WATER FEEDER MAIN FROM DATTAGALLI MBR JUNCTION TO KUVEMPUNAGAR MBR JUNCTION	231.88

Sl. No.	Project Component	Estimated Amount (Rs. Lakhs)
10	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	3.31
11	965 MM O.D. (921 MM I.D) CLEAR WATER FEEDER MAIN FROM KUVEMPUNAGAR MBR JUNCTION TO KUVEMPUNAGAR MBR	240.17
12	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	4.96
13	914 MM O.D. (870 MM I.D) CLEAR WATER FEEDER MAIN FROM KUVEMPUNAGAR MBR JUNCTION TO ONLINE BOOSTER PUMPING STATION	507.61
14	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	6.55
15	914 MM O.D. (870 MM I.D) CLEAR WATER FEEDER MAIN FROM ONLINE BOOSTER PUMPING STATION TO VIJAYANAGAR MBR JUNCTION	231.88
16	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	4.96
17	457 MM O.D. (415.6 MM I.D) CLEAR WATER FEEDER MAIN FROM VIJAYANAGAR MBR JUNCTION TO VIJAYANAGAR MBR	135.69
18	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS	1.91
19	864 MM O.D. (820 MM I.D) CLEAR WATER FEEDER MAIN FROM VIJAYANAGAR MBR JUNCTION TO CENTRAL STORAGE RESERVOIR (CSR)	414.01
20	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	7.57
	SUB TOTAL =	2820.25
i)	NEW MASTER BALANCING RESERVOIRS	
1	CONSTRUCTION OF 30.0 LAKH LITERS CAPACITY MBR AT J. P. NAGAR (Only JN-NURM component of 20% of the estimated cost has been considered)	17.29
2	CONSTRUCTION OF COMPOUND WALL FOR 30.0 LAKH LITERS CAPACITY MBR AT J. P. NAGAR (Only JN-NURM component of 20% of the estimated cost has been considered)	2.60
3	CONSTRUCTION OF ROADS AND DRAINS FOR 30.0 LAKH LITERS CAPACITY MBR AT J. P. NAGAR (Only JN-NURM component of 20% of the estimated cost has been considered)	0.25
4	CONSTRUCTION OF 30.0 LAKH LITERS CAPACITY MBR AT DATTAGALLI (Only JN-NURM component of 23.33% of the estimated cost has been considered)	20.14
5	CONSTRUCTION OF COMPOUND WALL FOR 30.0 LAKH LITERS CAPACITY MBR AT DATTAGALLI (Only JN-NURM component of 23.33% of the estimated cost has been considered)	2.83
6	CONSTRUCTION OF ROADS AND DRAINS FOR 30.0 LAKH LITERS CAPACITY MBR AT DATTAGALLI (Only JN-NURM component of 23.33% of the estimated cost has been considered)	0.30
7	CONSTRUCTION OF 65.0 L.L. x 2 Nos. CIRCULAR MBR's AT VIJAYANAGAR (Only JN-NURM component of 22.31% of the estimated cost has been considered)	59.00
8	COMPOUND WALL AT VIJAYANAGAR MBR (Only JN-NURM component of 22.31% of the estimated cost has been considered)	3.59
9	CONSTRUCTION OF ROAD AND CD AT VIJAYANAGAR MBR PREMISES (Only JN-NURM component of 22.31% of the estimated cost has been considered)	1.49
	SUB TOTAL =	107.49
j)	ONLINE BOOSTER PUMPING STATION	
1	CONSTRUCTION OF ONLINE BOOSTER PUMPING STATION NEAR VIJAYANAGAR	14.16
2	1.20 M x 1.20 M x 2.00 M DEEP RCC VALVE CHAMBERS	0.64

Sl. No.	Project Component	Estimated Amount (Rs. Lakhs)
3	CONSTRUCTION OF 3.0 M X 3.0 M RCC VALVE CHAMBER	2.67
4	CONSTRUCTION OF COMPOUND WALL	5.79
5	CONSTRUCTION OF ROADS AND DRAINS FOR OBPS PREMISES	1.60
6	MCC ROOM AT ONLINE BOOSTR PUMPING STATION	6.22
	SUB TOTAL =	31.08
	TOTAL ESTIMATED COST OF CIVIL WORKS =	7876.68
B) ESTIMATED COST FOR MECHANICAL WORKS		
1	MECHANICAL WORKS FOR PROPOSED INTAKE STRUCTURE NEAR BIDARGUDU	180.17
2	MECHANICAL WORKS FOR PROPOSED CLEAR WATER PUMPING STATION AT WTP NEAR BIDARGUDU	349.10
3	MECHANICAL WORKS FOR PROPOSED INTERMEDIATE BOOSTER PUMPING STATION NEAR KOTE HUNDI GATE	256.75
4	MECHANICAL WORKS FOR PROPOSED ONLINE BOOSTER PUMPING STATION AT VIJAYANAGAR	243.25
5	MECHANICAL WORKS FOR PROPOSED WATER TREATMENT PLANT NEAR BIDARGUDU	263.60
	TOTAL ESTIMATED COST OF MECHANICAL WORKS =	1292.87
C) ESTIMATED COST FOR ELECTRICAL WORKS		
1	ELECTRICAL WORKS FOR PROPOSED INTAKE STRUCTURE NEAR BIDARGUDU	167.98
2	ELECTRICAL WORKS FOR PROPOSED CLEAR WATER PUMPING STATION AT WTP NEAR BIDARGUDU	284.58
3	ELECTRICAL WORKS FOR PROPOSED INTERMEDIATE BOOSTER PUMPING STATION NEAR KOTE HUNDI GATE	286.31
4	ELECTRICAL WORKS FOR PROPOSED ONLINE BOOSTER PUMPING STATION AT VIJAYANAGAR	159.98
5	ELECTRICAL WORKS FOR PROPOSED WATER TREATMENT PLANT NEAR BIDARGUDU	5.47
6	11 / 33 KV EXPRESS FEEDER MAIN FROM MAIN SUB STATION TO ALL THE PUMPING STATION COVERING A TOTAL LENGTH OF 40.0 KMS.	100.00
	TOTAL ESTIMATED COST OF ELECTRICAL WORKS =	1004.32
D) ESTIMATED COST FOR INSTRUMENTATION AND CONTROL SYSTEM WORKS		
1	INSTRUMENTATION AND CONTROL SYSTEM WORKS INCLUDING SCADA SYSTE, TELEMETRY, ONLINE MONITORING OF ALL THE PARAMETERS FROM MASTER CONTROL CENTER AT MYSORE ETC. COMPLETE.	340.13
	TOTAL ESTIMATED COST OF I & C WORKS =	340.13
	TOTAL ESTIMATED COST OF THE PROJECT =	10514.00
	CONTINGENCIES AT 3% AS PER JNNURM GUIDELINES =	315.42
	GRAND TOTAL OF ESTIMATED COST =	10829.42
	ADMINISTRATIVE CHARGES AT 0.5% AS APPROVED BY JNNURM =	52.57
	GRAND TOTAL OF ESTIMATED COST =	10881.99

2.0 OPERATION AND MAINTENANCE COST

Operation and maintenance cost has been worked out for the ultimate year for the proposed water supply scheme from Kabini River. The O & M cost as worked out for year 2024 is shown in **Table - 8.2** and that for year 2039 is shown in **Table - 8.3** below.

TABLE - 8.2

**O & M COST FOR PROPOSED WATER SUPPLY SCHEME
FROM KABINI RIVER (YEAR 2039)**

Sl. No.	Item Description	Details	O & M Cost per Year (Rs. Lakhs)
1.	Raw water pumps at proposed intake structure near Bidargudu village	350 H.P, 4 Nos. of pumps, 23.5 hours operation at 261.1 BKW = 8958341 KWH per Year @ Rs. 4.00 / KWH	358.50
2.	Clear water pumps at proposed clear water pumping station inside WTP	950 H.P, 4 Nos. of pumps, 23.5 hours operation at 708.7 BKW = 24315497 KWH per Year @ Rs. 4.00 / KWH	973.00
3.	Clear water pumps at proposed intermediate booster pumping station near Kote Hundi Gate	725 H.P, 4 Nos. of pumps, 23.5 hours operation at 540.85 BKW = 18556563 KWH per Year @ Rs. 4.00 / KWH	742.50
4.	Clear water pumps at proposed online booster pumping station near Vijayanagar	550 H.P, 2 Nos. of pumps, 23.5 hours operation at 410.3 BKW = 14077393 KWH per Year @ Rs. 4.00 / KWH	563.50
5.	Establishment charges including staff, manpower etc	-----	50.00
6.	Annual civil, mechanical and electrical maintenance and repair cost (M & R)	0.50 % of estimated cost of civil, mechanical and electrical works excluding pipeline works (5820.00 Lakhs)	30.00
7.	Operation and maintenance of WTP including chemicals, energy etc.	1.00 Rs. per KLD for 185.00 MLD	675.25
Total O & M Cost for =			3392.75
Quantity of water supplied / year from Kabini River at 184.0 MLD excluding losses @ 15% (KLD) =			58400000
O&M Cost Rs. per KLD of water supplied from Kabini River (2039)=			5.81

TABLE - 8.3

**O & M COST FOR PROPOSED WATER SUPPLY SCHEME
FROM KABINI RIVER (YEAR 2024)**

Sl. No.	Item Description	Details	O & M Cost per Year (Rs. Lakhs)
1.	Raw water pumps at proposed intake structure near Bidargudu village	175 H.P, 1 No. of working pump, 23.5 hours operation at 149.2 BKW = 1279763 KWH per Year @ Rs. 4.00 / KWH	102.38
2.	Clear water pumps at proposed clear water pumping station inside WTP	500 H.P, 2 Nos. of pumps, 23.5 hours operation at 373.0 BKW = 6398815 KWH per Year @ Rs. 4.00 / KWH	255.95
3.	Clear water pumps at proposed intermediate booster pumping station near Kote Hundi Gate	325 H.P, 2 Nos. of pumps, 23.5 hours operation at 242.45 BKW = 4159230 KWH per Year @ Rs. 4.00 / KWH	166.37
4.	Clear water pumps at proposed online booster pumping station near Vijayanagar	200 H.P, 2 Nos. of pumps, 23.5 hours operation at 149.2 BKW = 2559526 KWH per Year @ Rs. 4.00 / KWH	102.38
5.	Establishment charges including staff, manpower etc	-----	40.00
6.	Annual civil, mechanical and electrical maintenance and repair cost (M & R)	0.50 % of estimated cost of civil, mechanical and electrical works excluding pipeline works (5820.00 Lakhs)	30.00
7.	Operation and maintenance of WTP including chemicals, energy etc.	1.00 Rs. per KLD for 56.00 MLD	204.40
Total O & M Cost for =			901.48
Quantity of water supplied / year from Kabini River at 56.0 MLD excluding losses @ 15% (KLD) =			17773913
O&M Cost Rs. per KLD of water supplied from Kabini River (2024)=			5.07