Karnataka Urban Water Supply & Drainage Board

# Detailed Project Report

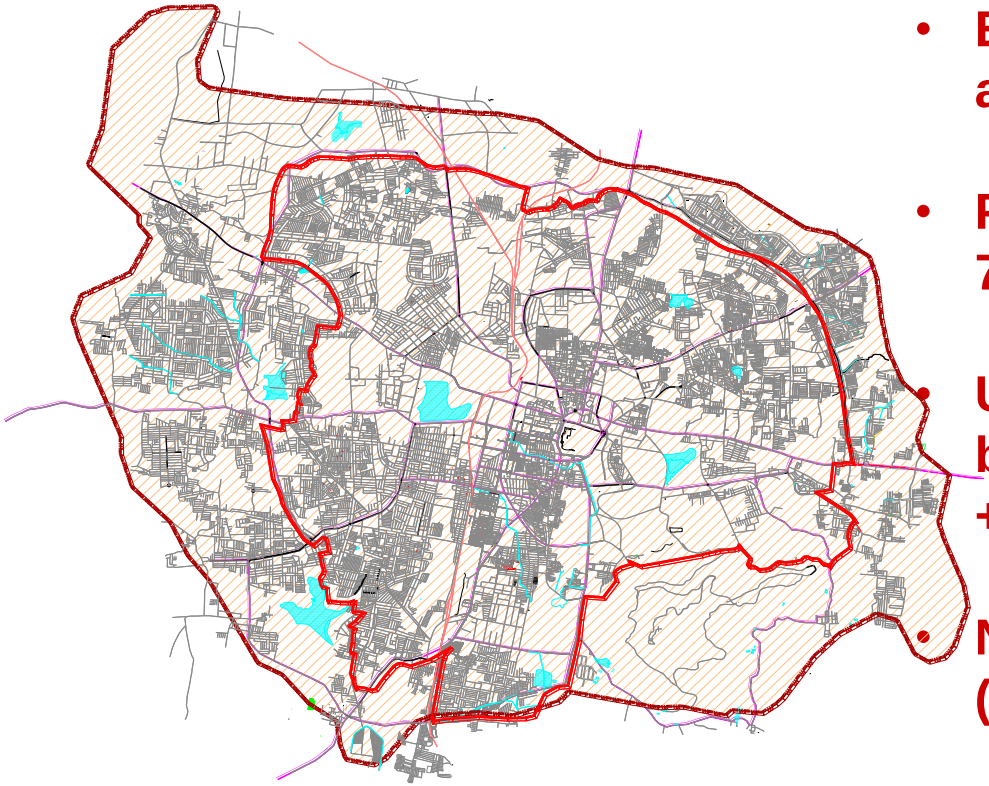
on

## Comprehensive Underground Sewerage Scheme

for

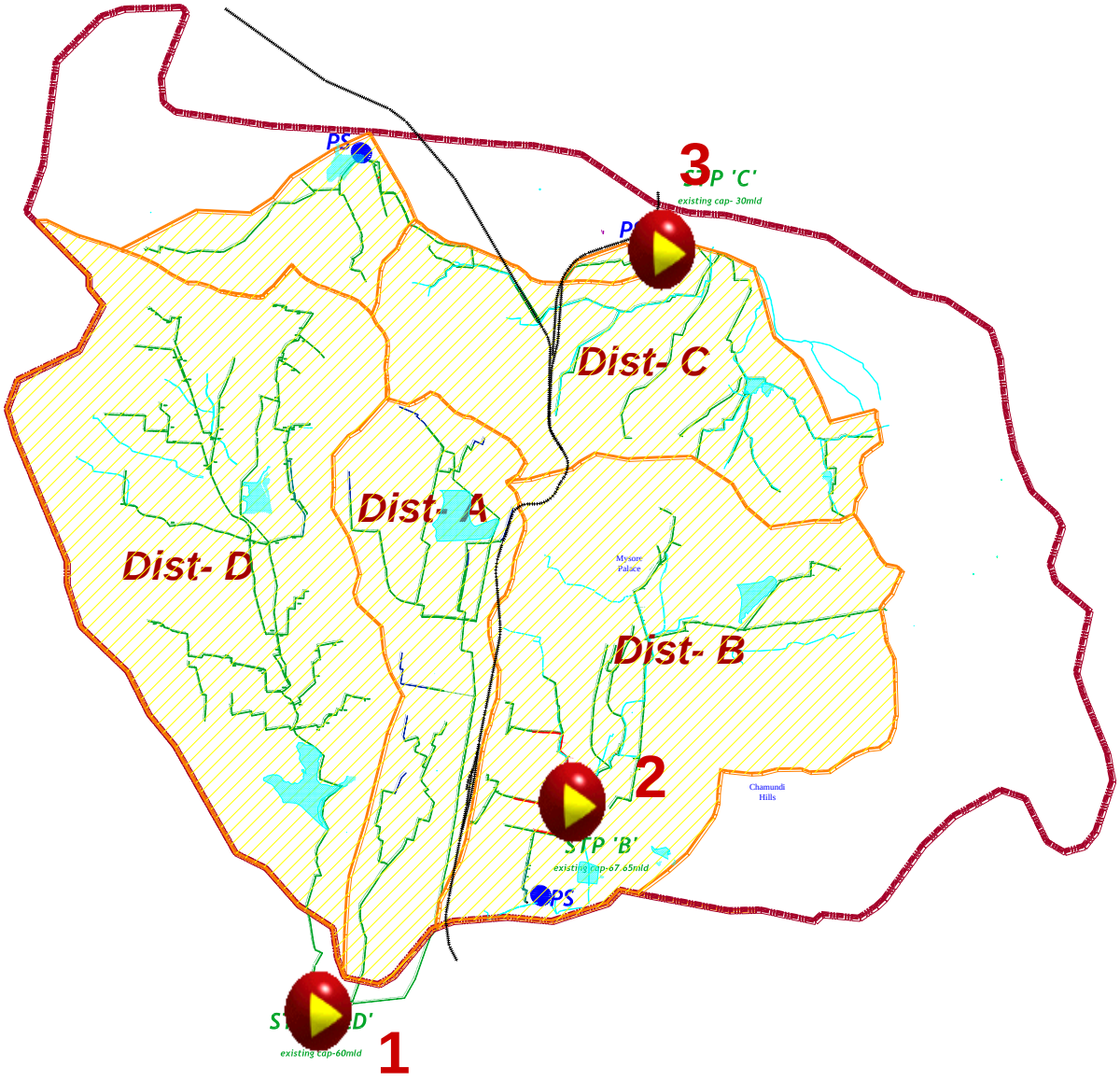
# Mysore City

# MYSORE UGDS – CITY PROFILE



- Extent of project area : 152.31 sqkm
- Population (2001): 773889
- Undulated Terrain between +710 - +790m MSL
- No. of wards :65 (MCC)
- Total length of streets: 2300 km

# MYSORE UGDS – EXISTING SEWERAGE SYSTEM




- Trunks : 53.36 km
- Laterals: 1560 km
- Area connected with system: 70%
- Treatment plants:3 nos.

1 STP A&D : 60 MLD

2 STP B : 67.65 MLD

3 STP C : 30 MLD

Total treatment capacity : 157.65 MLD

(Facultative Aerated Lagoons)

## Issues and Problems

- The proposed project is a Comprehensive and to be integrated with existing system

- The proposed system is not only for Municipal Corporation Limits it also to be taken care of Urban Sprawl / MUDA Area ;

- Identification of Missing links in the system under each drainage district.

- Rehabilitation, Strengthening and Improvement of existing sewerage system .

- Rehabilitation of existing sewage treatment plant for safe disposal., and possible options for Decentralizing the STPs as per site conditions.

- Development of techniques in operation and maintenance of sewerage system**.**

- Possible options for Recycle and Re-use of treated effluent and cost recovery.

- Preparation of detailed estimations and abstract for the proposals.

- Preparation of Detailed Project Report ( DPR ) and assisting the KUWS&D Board in preparing the bid documents .

- Providing 100 % connection and coverage system.

# MYSORE UGDS – EXISTING SEWERAGE SYSTEM

***Disturbed MH at Bamboo bazar***

***SWD with sewage flow at RMC Market***

# MYSORE UGDS – EXISTING SEWERAGE SYSTEM

***Sewer line bypassed with a pipe laid to connect to the drain at Pathaleeswara nagar***

***Damaged Manhole to let sewage into SWD at Kumbarkoppal***

# MYSORE UGDS – EXISTING SEWERAGE SYSTEM

***Sewage water flowing out from Manhole in Mysore University area***

***Last MH of the locality after which sewage let into SWD at Bannimantap Ph2***

# MYSORE UGDS – EXISTING SEWERAGE SYSTEM

***Damaged Sewer at Paduvarahalli***

***Damaged manhole letting sewage into SWD at Hebbal II- Stage 1***

- Identifications and findings

➢ District A & D (Rayankere STP catchment)

-In Paduvarahalli the branches connecting to the main line in Valmiki Road are all damaged and become defunct and they are let out in the nearby SWD running in the open land.

-In Jayalakshmipuram II stage the branch line is not connecting to the main sewer line because of the difference in the levels and it is disposed directly into the open land nearby.

-In BEML layout at one point i.e., at 9th block 9th cross the branch is not connected to any main and it just left in the open ground.

- District B (Vidyaranyapuram STP catchment)

  -The sewer line passing through the Lingayath Smashan (Burial Ground) in Vidyaranyapuram leading to the main sewer towards STP ‘B’ is damaged and to be replaced.

  -The sewage from Itekeguda, Manasarovar area passing through Doddu Kere Maidan is entering into a big storm water drain and it is not connected to any sewer main. The manholes in the Doddu Kere Maidan are completely damaged and overflowing.

  -Ghousianagar – Insufficient capacity sewer network. Also the sewer network is not connected to main sewer instead let into SWD network.

- District C (Kesere STP catchment)

  -The sewer passing through the RMC market in Bamboo Bazaar is completely damaged causing the market into hazardous place and the sewage enters into SWD as the existing following sewer line is defunct.
  Areas located near Muslim burial ground in C V Road are not linked to the main sewer as the main sewer alignment is in burial ground is defunct as such the sewage is entering into the SWD

# Need for the Project

Identification & Providing of sewers in Missing links and Uncovered area in the system under each drainage district ..

Extension and improvement of Sewerage net work system in Newly developed and uncovered areas

Missing links in sewer net work system to be connected to the Proposed sewer main so that the sewage flows can be conveyed to the nearby STP.

Sewage in some part of the areas in each drainage district being discharged into the Storm water drain / open nallas. Transfer of storm water drain connections to the proposed Sewer mains/ branch mains & finally into the STP.

Modification of STPs & Construction of new STP's

Rehabilitation, Strengthening and Improvement of existing sewerage system .

Providing 100% coverage and connection with sewerage system to the residence of Mysore Project areas.

## Population growth Pattern

| Year | Population | Decadal Increase | Percentage increase between consecutive decades |
|---|---|---|---|
| 1911 | 71000 | | |
| | | 13000 | 18.31% |
| 1921 | 84000 | | |
| | | 23000 | 27.38% |
| 1931 | 107000 | | |
| | | 43000 | 40.19% |
| 1941 | 150000 | | |
| | | 94000 | 62.67% |
| 1951 | 244000 | | |
| | | 10000 | 4.10% |
| 1961 | 254000 | | |
| | | 101685 | 40.03% |
| 1971 | 355685 | | |
| | | 120761 | 33.95% |
| 1981 | 476446 | | |
| | | 129343 | 27.15% |
| 1991 | 605789 | | |
| | | 168100 | 27.75% |
| 2001 | 773889 | | |

# Population projections with various analytical methods

Table 1.6: Projections made with different methods

| Projection method | 2011 | 2013 | 2028 | 2043 | |
|---|---|---|---|---|---|
| | | | | | |
| Arithmetic mean method | 9 20 550 | 9 47 212 | 11 47 177 | 13 47 142 | |
| Geometric mean method | 9 20 550 | 9 68 166 | 14 13 241 | 20 62 922 | |
| Incremental Increase method | 9 20 550 | 9 48 562 | 11 72 982 | 14 22 702 | |
| Yearly variation method | 9 20 550 | 9 74 985 | 13 83 248 | 17 91 510 | |
| Semilog (Analytical) method | 9 20 550 | 10 02 833 | 14 33 435 | 20 50 560 | |

It is observed that the projections through **Geometric Mean method** tally with the city development Trend observed in the above table.

# Population Projections

## Sewerage District wise population projections

| Zone | Area (Sq km) | 2011 | | 2013 | | 2028 | | 2043 | |
|---|---|---|---|---|---|---|---|---|---|
| | | density per Sqkm | population | density per Sqkm | projected population | density per Sqkm | projected population | density per Sqkm | projected population |
| Distict A | 16.22 | 7145 | 115887 | 7529 | 122113 | 15363 | 249187 | 19504 | 316348 |
| Distict B | 32.83 | 7534 | 247339 | 7939 | 260626 | 13674 | 448923 | 16884 | 554302 |
| Distict C | 22.34 | 12303 | 274847 | 12965 | 289648 | 14406 | 321831 | 20167 | 450530 |
| Distict D | 31.63 | 4797 | 151734 | 5054 | 159849 | 6665 | 210810 | 12819 | 405466 |
| Distict E | 13.52 | 3080 | 41645 | 3246 | 43883 | 4730 | 63948 | 7643 | 103332 |
| Distict F | 4.99 | 3822 | 19073 | 4028 | 20098 | 5012 | 25008 | 10570 | 52746 |
| Distict G | 11.24 | 2847 | 32003 | 3000 | 33723 | 4372 | 49142 | 9349 | 105087 |
| Other | 19.53 | 1947 | 38022 | 2051 | 40060 | 2286 | 44651 | 3850 | 75189 |
| **Total city** | **152.31** | **6044** | **920550** | **6369** | **970000** | **9280** | **1413500** | **13545** | **2063000** |

# MYSORE UGDS – POPULATION PROJECTIONS

| | year | projected population | sewage generated |
|---|---|---|---|
| Base year | - 2013 | 9 70 000 | 120.35 MLD |
| Intermediate year | - 2028 | 14 13 500 | 177.16 MLD |
| Ultimate year | - 2043 | 20 63 000 | 257.26 MLD |

## Issues addressed

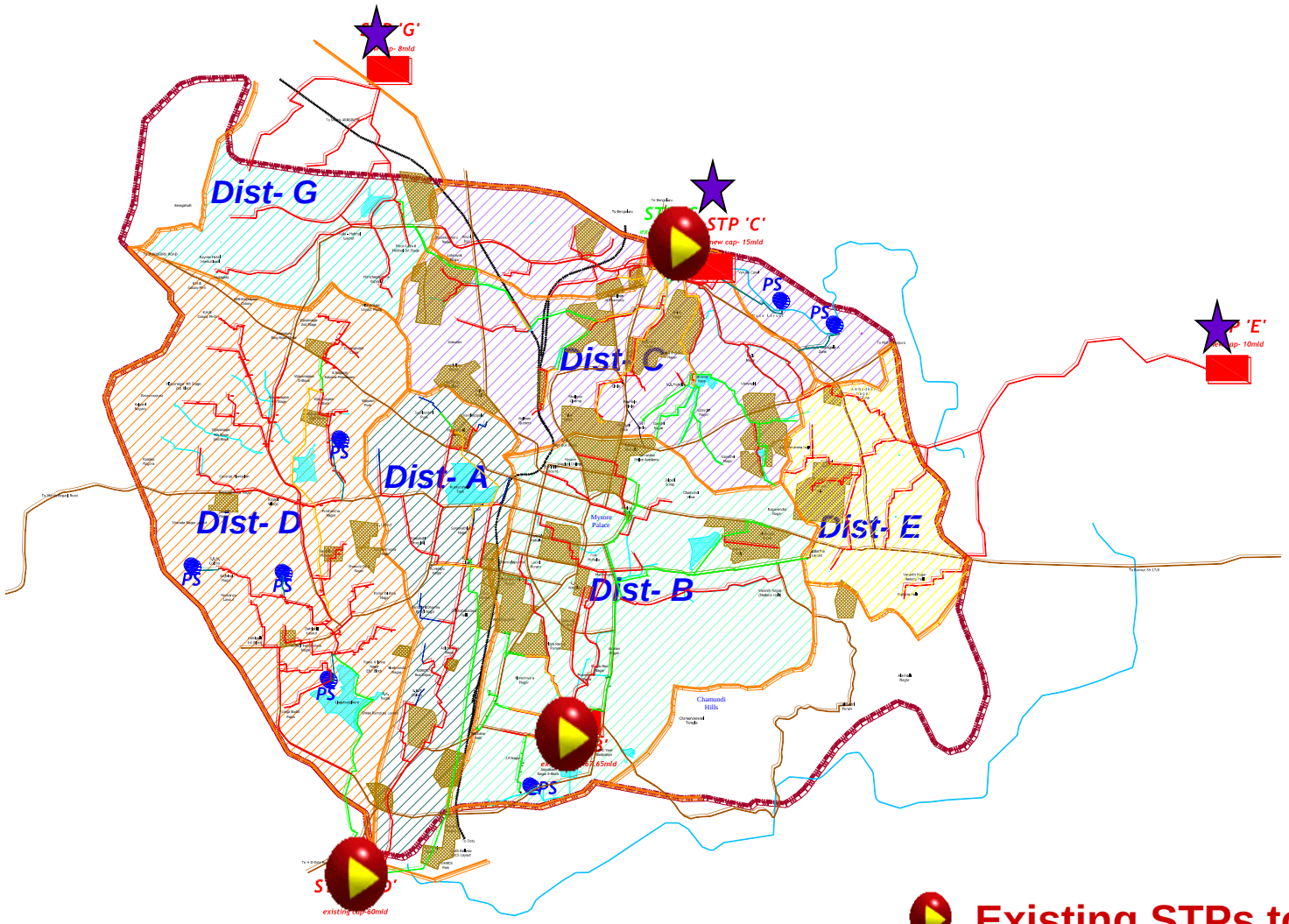
- Proposed project is a Comprehensive and to be integrated with existing system
- Identification of Missing links in the system under each drainage district.
- Rehabilitation, Strengthening and Improvement of existing sewerage system .
- Rehabilitation of existing sewage treatment plant for safe disposal and possible options for Decentralizing the STPs as per site conditions.

contd..

## Issues addressed

- Development of techniques in operation and maintenance of sewerage system.
- Providing 100 % connection and coverage system.
- Rejuvenation of city lakes by coverage of upstream areas with UGD.
- 2 nos.of existing pumping stations have been omitted which are found not necessary as per new alignment.

# MYSORE UGDS – PROPOSALS




Existing STPs to be refurbished

New STPs – Capacity 33MLD

## Proposed network

| Sewerage District | Trunks | Laterals |
|---|---|---|
| District A | 18.79 | 38.54 |
| District B | 23.94 | 102.29 |
| District C | 29.30 | 91.49 |
| District D | 27.23 | 94.54 |
| District E | 11.43 | 63.13 |
| District G | 18.95 | 59.88 |
| **Total lengths** | **143.80 km** | **449.87 km** |

**Total length of Missing links : 57 km**

**Total length of rehabilitation : 36 km**

## STPs - refurbishing

| | |
|---|---|
| at Rayanekere for District A&D | 60 MLD |
| at Vidyaranyapuram for District B | 68 MLD |
| at Kesare for District C | 30 MLD |

**Refurbishing of STPs includes replacement of Mechanical screens, introduction of mechanical degritters with raking classsifiers, optimization of aerators, raising and lining of bunds, chlorination, introduction of SCADA for flow measurements, online sampling and laboratory facility etc.**

# MYSORE UGDS – PROPOSALS

## STPs - new

| | |
|---|---|
| at Kesare for District C | 15 MLD |
| near Infosys for District G | 8 MLD |
| in Bannuru Road for District E | 10 MLD |

**Technology proposed for treatment is Sequential Batch Reactor (SBR) which is proven to be cost effective with better effluent characteristics.**

## House service connections

Making new house service connections
and remaking damaged HSCs
during execution -59367 Nos.

# MYSORE UGDS – DESIGN PARAMETERS ADOPTED

- Design period : Ultimate 30 years & Prospective 15 years
- Per capita Water Supply :135 LPCD
- Per Capita Sewage : 80% of (135LPCD+10% from Ground water source & 5% infiltration)
- Peak Factor : Varies from 2.0 to 2.25 & 3.0.
- Minimumm Velocity : 0.6 m/s
- Maximum Velocity : 2.5 m/s
- d/D Ratio : 0.8
- Pipe Material : Upto 200mm dia – SWG
  for 250 & 300 mm dia – RCC NP2
  above 350 mm – RCC NP3 S/S with SRC
- Hydraulic formula : Mannings
- Min. depth of manhole : 1.0m.
- Manholes : conventional / partially pre-fabricated,

# MYSORE UGDS – ENVIRONMENTAL & ECONOMIC ASPECTS

**before UGDS:**

- Raw sewage being used for Irrigation leads to health hazards,
- Effect on Ground water quality.
- Odour & Mosquito nuisance
- Public resentment

**after UGDS:**

- Improvement of Health and productivity .
- Eco friendly atmosphere
- Increase in income due to increased irrigation / paragrass cultivation
- Income from recycled and reuse of treated effluent for industries.
- sludge utilization as manure for horticulture purpose
- MCC / MUDA benefits by charging cess on treated water released for irrigation.

# MYSORE UGDS – O&M Revenue Projections

| year | Monthly service charges | | | New connection charges | | | Annual |
|---|---|---|---|---|---|---|---|
| | No. of connections | Annual weighted avg tariff | Annual Revenue (Rs in lakhs) | No. of connections | Tariff rate | Annual Revenue (Rs in lakhs) | Total Revenue (Rs in lakhs) |
| 2011-12 | 142000 | 200 | 284.00 | 21930 | 2000 | 438.60 | 722.60 |
| 2012-13 | 146790 | 200 | 293.58 | 26720 | 2000 | 534.40 | 827.98 |
| 2013-14 | 151580 | 200 | 303.16 | 26720 | 2000 | 534.40 | 837.56 |
| 2014-15 | 156370 | 200 | 312.74 | 4790 | 2000 | 95.80 | 408.54 |
| 2015-16 | 161160 | 200 | 322.32 | 4790 | 2000 | 95.80 | 418.12 |
| 2016-17 | 165950 | 260 | 431.47 | 4790 | 2600 | 124.54 | 556.01 |
| 2017-18 | 170740 | 260 | 443.92 | 4790 | 2600 | 124.54 | 568.46 |
| 2018-19 | 175530 | 260 | 456.38 | 4790 | 2600 | 124.54 | 580.92 |
| 2019-20 | 180320 | 260 | 468.83 | 4790 | 2600 | 124.54 | 593.37 |
| 2020-21 | 185110 | 260 | 481.29 | 4790 | 2600 | 124.54 | 605.83 |
| 2021-22 | 189900 | 338 | 641.86 | 4790 | 3380 | 161.90 | 803.76 |
| 2022-23 | 194690 | 338 | 658.05 | 4790 | 3380 | 161.90 | 819.95 |
| 2023-24 | 199480 | 338 | 674.24 | 4790 | 3380 | 161.90 | 836.14 |
| 2024-25 | 204270 | 338 | 690.43 | 4790 | 3380 | 161.90 | 852.33 |
| 2025-26 | 209060 | 338 | 706.62 | 4790 | 3380 | 161.90 | 868.52 |
| | | | | | | | **10300.11** |

# MYSORE UGDS – O&M Expenditure Projections

| year | O&M of STPs | | | | pumping cost | | | Esatblishment for net work O&M @Rs 15000 per 1000 population | Total O&M costs (Rs in lakhs) |
|---|---|---|---|---|---|---|---|---|---|
| | FAL process STPs | | SBR Process STPs | | | | | | |
| | sewage (MLD) | Annual O&M costs per MLD | sewage treated (MLD) | Annual O&M costs (Rs in lakhs) | sewage pumped MLD | 1000 KWh | amount (@Rs 5per KWh ) | | |
| 2011-12 | 105.0 | 229.95 | 21.00 | 103.48 | 79.52 | 2628 | 131.40 | 152.52 | **617.35** |
| 2012-13 | 108.5 | 237.62 | 21.79 | 107.37 | 82.64 | 2732 | 143.42 | 165.92 | **654.33** |
| 2013-14 | 112.0 | 245.28 | 22.58 | 111.26 | 85.76 | 2836 | 156.32 | 180.29 | **693.15** |
| 2014-15 | 115.5 | 252.95 | 23.37 | 115.16 | 88.88 | 2940 | 170.15 | 195.67 | **733.92** |
| 2015-16 | 119.0 | 260.61 | 24.16 | 119.05 | 92.00 | 3043 | 184.97 | 212.14 | **776.76** |
| 2016-17 | 122.5 | 268.28 | 24.95 | 122.94 | 95.12 | 3147 | 200.84 | 229.77 | **821.83** |
| 2017-18 | 126.0 | 275.94 | 25.74 | 126.83 | 98.24 | 3251 | 217.84 | 248.63 | **869.25** |
| 2018-19 | 129.5 | 283.61 | 26.53 | 130.73 | 101.36 | 3355 | 236.04 | 268.80 | **919.18** |
| 2019-20 | 133.0 | 291.27 | 27.32 | 134.62 | 104.48 | 3459 | 255.52 | 290.37 | **971.78** |
| 2020-21 | 136.5 | 298.94 | 28.11 | 138.51 | 107.60 | 3563 | 276.35 | 313.43 | **1027.22** |
| 2021-22 | 140.0 | 306.60 | 28.90 | 142.40 | 110.72 | 3667 | 298.63 | 338.06 | **1085.69** |
| 2022-23 | 143.5 | 314.27 | 29.69 | 146.30 | 113.84 | 3770 | 322.44 | 364.37 | **1147.38** |
| 2023-24 | 147.0 | 321.93 | 30.48 | 150.19 | 116.96 | 3874 | 347.89 | 392.47 | **1212.48** |
| 2024-25 | 150.5 | 329.60 | 31.27 | 154.08 | 120.08 | 3978 | 375.07 | 422.47 | **1281.22** |
| 2025-26 | 154.0 | 337.26 | 32.06 | 157.98 | 123.20 | 4082 | 404.10 | 454.49 | **1353.83** |
| | | | | | | | | | **14165.37** |

| S.No. | Description of work | Length (km)/ capacity(mld)/ no. | Amount (in lakhs) |
|---|---|---|---|
| 1 | Conducting Of Detailed Field Survey For Ugd System Of Existing Network & Missing Links, Along With Preparation Of Designs For Laterals / Trunks / Outfallsewer /Stp's Etc & Drawings Based On Captured Data. | 1.00 | 143.46 |
| 2 | Cost of trunk sewers of various diameter, including construction of manholes, in all the Districts of Mysore City Corporation | | |
| | District A | 18.79 | 1381.00 |
| | District B | 23.94 | 1337.70 |
| | District C | 29.30 | 1631.50 |
| | District D | 32.42 | 2333.00 |
| | District E | 11.43 | 879.50 |
| | District G | 18.95 | 998.00 |
| | catchment 4 | 8.97 | 909.80 |
| 3 | **Cost of Laterals in various Districts of different diamters including construction of manholes of various depths in all the Districts of Mysore City Corporation** | | |
| | District A | 38.54 | 897.60 |
| | District B | 102.29 | 2377.00 |
| | District C | 91.49 | 2154.90 |
| | District D | 94.54 | 2182.00 |
| | District E | 63.13 | 1467.90 |
| | District G | 59.88 | 1415.90 |
| 4 | Construction of new STPs and Refurbishment of existing STPs including all pumps, mechnical & electrical equipments | | |
| | District A&D Refurbishing of existing FAL process STP | 60 | 785.00 |
| | District B Refurbishing of existing FAL process STP to SBR technology | 67.65 | 2430.00 |
| | District C Refurbishing of existing FAL process STP | 30 | 455.00 |
| | District C new SBR process STP | 15 | 1450.00 |
| | District E new ASP process STP | 10 | 675.00 |
| | District G new SBR process STP | 8 | 965.00 |

| | | | |
|---|---|---|---|
| **5** | **Providing pumping installations including rising mains, pumpsets, pump houses etc** | | |
| | District B | 1 | 172.20 |
| | District C | 2 | 126.68 |
| | District D | 4 | 327.64 |
| 6 | Providing new House service connections after developing sewer net work including restoration damaged HSCs including missing HSC's during project period @ Rs 2710 per HSC | 59367 | 1608.85 |
| 7 | Estimate For The Work Of Additional Outfall Sewer Lines At Various Places | 8 | 1339.40 |
| 8 | Providing sewer lines with trenchless technology / pipe jacking system where open excavation is not possible and at deep cuts/ railway crossings/ important road intersections | 920 | 1380.00 |
| **9** | **Provision towards Public toilets** | | **30.00** |
| 10 | Provision for Sewer cleaning equipment | | 300.00 |
| | | Sub-Total | 32154.02 |
| 11 | Provisions for tender premium @ 6 % per annum for 2 years | | 3858.48 |
| 12 | ETP @ 12 % | | 3858.48 |
| 13 | Contingencies @ 3 % | | 964.62 |
| 14 | Miscellaneous & rounding off including deposits to various departments etc., | | 14.40 |
| | | Grand Total | 40850.00 |
| | | Say Rs | 408.50 Crores |

# MYSORE UGDS – PROJECT IMPLEMENTATION

**Total Project Cost : Rs. 408.50 Crores**

**Project Implementation Period : 2.5 years (30 months)**

**Funding pattern & Cash flow :**

Rs. In Crores

| Contribution by | Sharing % | 2013 – 2014 1st year | 2014 – 2015 2nd year | 2015 – 2016 3rd year |
|---|---|---|---|---|
| Govt. of India (MOUD) (JnNURM) | 80% | 130.72 | 130.72 | 65.36 |
| Govt. of Karnataka | 10% | 16.34 | 16.34 | 8.17 |
| Mysore City Corporation | 10% | 16.34 | 16.34 | 8.17 |
| Total | | 163.40 | 163.40 | 81.70 |

## Advantages of the proposed Scheme

The proposed sewerage scheme consisting of under ground sewage collection mains and decentralized and individual STPs is having the following apparent advantages:

- Since the entire project area has been divided into 7 zones, the scheme can be implemented piecemeal in accordance with the available budgets. Functionality of one zone does not affect any other zone.
- The alignment of trunk sewers along the storm water drains with provision of pathways/ inspection paths will ease out the maintenance problems so far sewerage sector faced. Since the trunk sewers run at the lowest levels of the localities there would be no sewage flows in storm water drains.

- The design of trunks and laterals make use of the available ground gradients in a big way and is most economical.
- Provision is made in the design to take care to integrate the entire net work into one comprehensive scheme.
- The scheme does not envisage disposal of the treated effluent on the downstream side, thereby eliminating interference with the downstream designs and O/M procedures.
- It is proposed to utilize the treated effluent for recreational purposes and for maintenance of green belts in the municipal area
- The provision of advanced technology treatment plants, will minimize the cost of pumping and supports the natural gradient of the terrain.


Thank you