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- Water Management Consultants
- Townships Infrastructure Services Consultant
- Project Management Consultant

UNITY CONSULTANTS PVT. LTD.
WATER MANAGEMENT CONSULTANTS
(An ISO 9001:2008 COMPANY)

Ref: UCPL/17/SEW/511/Ltr/39 **Date: 29nd Sept 2017**

247

To,

The Public Health Engineer (PHE)
Solapur Municipal Corporation,
Solapur-413007 (M.S).

Subject: **Preparation of DPR for providing Sewerage scheme for Newly developed and Un-sewer pockets in old area of Solapur City - Submission of Final DPR**

Reference: 1.Work order No. 588 dated 24-10-2013

2. Your office Marathi letter No 1002 dated 25th February 2013
3. Our letter No. UCPL/14/SEW/511/Ltr./004 dated 7th March. 2014.
4. Our letter No. UCPL/14/SEW/511/Ltr./21 dated 15th Dec 2014

Dear Sir,

We are submitting the Final DPR for the above work amounting to Rs. **180.24 Crore** approved during the meeting held on 19-09-2017 in the Mantralay along with necessary estimates, designs & general report etc. for your information and record.

The General Report & Drawings are under preparation and same will be submitted to your office shortly.

Thanking You,

Regards,

For Unity Consultants. Pvt. Ltd

For [signature]

S.H.POL

Encl. i) Vol. No. 1 – General Report

ii) Vol. No. 2 – Design

iii) Vol. No.3-Estimates

सार्व. आरोग्य अभियंता
आवक क्र./सा.आ.अ./ज.नी. ११६९
दिनांक १० /१०

UNITY CONSULTANTS PVT. LTD. AN ISO 9001-2008 COMPANY Water Management Consultants PUNE

Time limit

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EXECUTIVE SUMMARY [180.24 Cr]

1. Essential Features

Solapur is situated on the south-eastern border of Maharashtra State adjoining Karnataka. Solapur Municipal Corporation (SMC), established on 1st May 1964. The total population as per census of the year 2011 is 951118. The jurisdiction of the Municipal Corporation extends over an area of **180.33** square km after the inclusion of 13 fringe villages (145.57 sq. km.) into the corporation limit in the Year 1992. The City is further subdivided in to 98 Wards and 13 Zones.

Solapur being located on an important junction of the North–South railway line is a good base for industries. There are approximately 98 medium and 8,986 smaller industries and also known for its market in oilseeds.

2. Water Supply

The water is supplied to the city from three main sources:

Source	Ekrukh Scheme	Bhima River Scheme	Ujjani Scheme	Total Supply
MLD	10	55	55	120

There are 42 storage reservoirs at 34 places of total capacity 96.66ML in the city. SMC has nearly 324.41km of distribution line, pipe line ranging from 80-700 mm dia. There is a 218 km transmission line, its pipeline ranging from1200- 250 mm dia.

3. Sewerage System

3.1. Existing Scheme

Solapur can be broadly classified in to two main areas-the old city and the urbanizing areas. The whole area is divided in to 13 Sewerage Zones, out of which sewerage system for Zone No. 1 to 6 of 281.3 km long network of sewer (ranging from 150mm to1950mm. dia.) was completed in all the sewerage districts according to the need of the area. Waste water collected from this network was conveyed to Degaon STP (54MLD) for treatment and after treatment the same was proposed to discharge in to the local Nallah. However at present this STP is now not in operation for want of major repairs as it was difficult for SMC to bear the O&M cost for want of funds.

3.2. Sanctioned Scheme (under execution)

In order to cover the pockets of unsewer portion in the earlier zones and new sewer lines in Zone No. VII & VIII Sewerage Scheme costing to Rs. 160.43Cr was approved by the State Govt. on 23-02-2011 under Maharashtra Suvarna Jayanti Nagarothan Mahaabhiyan. In this scheme two pumping stations 9.7 Lakh liters & 8.3 Lakh liters are proposed at Nehru nagar & Kumthe

respectively. Two STPs of 12.50 MLD & 75 MLD are proposed at Kumthe and Degaon respectively. The work is progress but not yet completed.

3.3. Proposed Scheme

There is no existing sewerage system in the outside area comprising **of Zone IX to XIII** (which are on account of merging of fringe villages). The waste water joins the river without any treatment causing the pollution to the river and hence sewerage system with sewage treatment plant is proposed for these zones in scheme.

The population projection was finalized by MJP during scrutiny of the project is as under

Sewerage Zones		Population Projection		
	2011	2020	2035	2050
Finalized by MJP	951117	1073523	1270231	1465028

Population Projection in various Zones

Sr. No.	Sewerage Zones	Population			
		2011	2020	2035	2050
1.	Zone I,II,IV	233489	222662	234712	262978
2.	Zone III,V,VI	333119	343408	380289	415612
3.	Zone VII	42771	70602	120574	146634
4.	Zone VIII	93474	70566	101250	128863
5.	Zone IX,X,XI,XII,XIII	248264	366285	433406	510941
	Total	**951117**	**1073523**	**1270231**	**1465028**

Table 1: Total Waste Water Generation in the City

Year	Population	Requirement of water at 135 lpcd	Floating requirement in MLD	Total Demand in MLD	Waste Water at 80% of WS in MLD	Infiltration at10% in MLD	Total Waste Water in MLD
2011	951558						
2017	1033298	139.50	2.32	141.82	113.46	5.67	119.13
2020	**1073524**	144.93	2.42	147.34	117.87	5.89	123.77
2035	**1270231**	171.48	2.86	174.34	139.47	6.97	146.44
2040	1334970	180.22	3.00	183.22	146.58	7.33	153.91
2050	**1465028**	197.78	3.30	201.08	160.86	8.04	168.90

Sewage Generation as per CPHEEO Norms	
Rate of water supply in urban area	135 lpcd (litres per capita per day)
Rate of water supply for floating population	45 lpcd
Waste Water Generation	80 % of water supply
Floating Population	At 5% of total population
Infiltration considered- 5% of sewage generation	(5.40+1.80)=7.20 lpcd

Table 2: Waste Water Generation in MLD for each Zone along with SPS/STP

one	Area	Sewage flow in MLD			Capacity of STP required in MLD	Capacity of STP under execution in MLD	Balance In MLD	STP now proposed MLD	Location
		2020	2035	2050					
I.	Old City Area	1.94	2.16	2.35	70.89	75.00 at Degaon	-	-	
II.		20.46	21.34	24.04					
III.		12.81	13.91	15.37					
IV.		3.27	3.55	3.89					
V.		13.97	15.67	17.10					
VI.		12.82	14.25	15.39					
	Sub Total	**65.26**	**70.89**	**78.15**	**70.89**	**75.00**			
VII.	Extended Area	8.14	13.90	16.86	14.51	15.00 at Nehru Nagar		-	
VIII.		8.14	11.67	14.81	12.18	12.50 at Kumthe		-	
	Sub Total	**16.28**	**25.57**	**31.67**	**26.69**	**27.50**			
IX.		16.81	19.56	23.16	20.49	-	19.56	**20.00**	Desai Nagar
X.		13.35	15.40	18.05	15.40	Land available at Zone X	15.40	**15.50**	Zone No X
XI.		5.69	6.48	7.63	15.00		15.0	15.00*	*Proposed in Phase III
XII.		3.75	5.11	6.22					
XIII.		2.62	3.41	3.81					
	Sub Total	**42.23**	**49.97**	**58.86**	**49.97**		**49.96**	**35.50**	
Total Zone I to XIII		**123.77**	**146.43**	**168.68**	**146.43**	**102.50**	**52.71**	**35.5+15.=50.50**	

Table 3: Sewage Treatment Plants with their Location & Capacities

Under Execution			Now Proposed			Phase III
Sr. No.	Location	STP (MLD)	Sr. No.	Location	STP (MLD)	STP (MLD)
1.	Degaon	75.00	1.	Zone X	15.50	
2.	Nehru Nagar	15.00	2.	Desai Nagar IX	20.00	
3.	Kumthe	12.50	3.	Zone, XI,XII & XIII	-	15.00
	Total (3 Nos.)	**102.50**		**Total (2 Nos.)**	**35.5**	**15.00**

Note:- The part of waste water from Zone No XI,XII & XIII can be diverted to STP at Degaon as initially there will be less flow coming to STP at Degaon.

The DPR costing Rs 250.00 Cr was prepared and submitted to MJP for technical clearance during which the population projection was redone and the following modifications were incorporated

Table 4: Components of the Proposed & Approved Sewerage System

Sr. No.	Description of Components	Proposed Cost Rs. in Lakh	Approved Cost Rs. in lakh	Remark
A.	**Sewerage Zone IX**			
1.	Collection & Conveyance System (Length 146.27Km)	6095.39	3933.52	Due to change in design
2.	Sewage Pumping Station at Desai Nagar	130.29	157.67	Adding Automation
3.	Pumping Machinery	216.13	185.44	Due to change in design
4.	Pumping Main (600 mm DI of Length 150meter)	22.89	24.73	-
5.	Sewage Treatment Plant (20.50MLD)	1393.08	1044.53	Capacity reduction from 20.5MLD to20MLD
6.	Sump for Tanker Feed Treated Effluent	0	81.73	Additional
7.	Property Connections(29155Nos)	0	2199.31	Additional
	Sub Total for Zone No IX	**7857.78**	**7626.93**	
B.	**Sewerage Zone X**			
1.	Collection & Conveyance System (Length 119.75Km)	4792.55	3334.61	Due to change in Network design
2.	Sewage Pumping Stations at Hyderabad Road	125.74	153.03	Adding Automation
3.	Pumping Machinery	175.92	168.52	Due to change in design
4.	Pumping Main (500 mm DI of Length 150meter)	17.73	18.80	
5.	Sewage Treatment Plant (16.50MLD)	1180.32	868.46	Capacity reduction from 16.5MLD to15.50MLD
6.	Property Connections(23167Nos)		1747.60	Additional
	Sub Total for Zone No X	**6292.26**	**6291.02**	
C.	**Remaining Area**			

Sr. No.	Description of Components	Proposed Cost Rs. in Lakh	Approved Cost Rs. in lakh	Remark
1.	Sewerage Zone XI Length (57.65Km)	2571.87	0	Deleted
2.	Sewerage Zone XII Length (54.02Km)	2364.75	0	Deleted
3.	Sewerage Zone XIII Length (28.67 Km)	1821.59	0	Deleted
4.	Trunk Main for Sewerage Zone I to IV & VI (25.86Km)	2002.86	1564.52*	As per Design
5.	Trunk Main for Sewerage Zone XI, XII, XII		1926.71*	Additional
6.	Property Connections (5738Nos)	0	432.83	Additional
7.	Nallah Interception	0	141.83	Additional
8.	Miscellaneous (Road & Railway Crossing)	0	40.00	Additional
	Sub Total	**8761.07**	**4105.89**	
D.	**Recycling of Treated water 10 MLD**	**1360.55**	**0**	
	Net Cost Rs. in Lakh	**24271.66**	**18023.84**	
	Add 3% for Physical Contingencies	**728.15**	**0**	
	Gross Cost of Project in Rs. Lakh	**24999.81**	**18023.84**	
	Cost Rs. in Crore	**250.00**	**180.24**	

3.4. Fund Allocation

The total outlay for AMRUT is Rs. 50,000 Crore for five years from **FY 2015-16 to FY 2019-20** and the Mission will be operated as a Centrally Sponsored Scheme. The AMRUT may be continued thereafter in the light of an evaluation done by the MoUD and incorporating learning in the Mission.

3.5. Funding Pattern

The funding pattern of projects indicating the share of Central Government/State Government/ ULBs/private sector is given below:

Sr. No.	Population of the Mission City	GoI Share	GoM Share	ULB Share
1.	Less Than 10 Lac	50 %	25 %	25 %
2.	More than 10 Lac	33.33%	16.67%	50%

3.6. Project Fund

The project fund will be divided among States/UTs at the beginning of each year. An equitable formula will be used to distribute the annual budgetary allocation in which equal (50:50) weightage is given to the urban population of each State/UT (Census 2011) and the number of statutory towns in the State/UT. As the number of statutory towns are notified by States/UTs and will change during the Mission period, the formula will take into account changes in this number every year. The

amount of project fund allocated will be informed to the States/UTs at the appropriate time. The Central Assistance (CA) for the projects will be in three installments of 20:40:40 of the approved cost.

Table 5: Financial Pattern (Rs. in lakh)

Year	Months	Anticipated Expenditure	GOI (50%)	GoM (25%)	SMC (25%)
2017-18	6	1700.00	850.0	425.0	212.5
2018-19	12	5000.00	2500.0	1250.0	1250.0
2019-20	12	4200.00	2100.0	1050.0	1050.0
2020-21	9	7123.84	3561.9	1781.0	425.0
Total	**39**	**18023.8**	**9011.9**	**4506.0**	**2937.50**

Table 6: Annual O&M Charges (Year 2020-21) (Rs. in lakh)

Sr. No.	Sub Work	M&R	Man Power	Energy	Chemical	Total
1.	DIRECT CHARGES	139.15	138.97	164.46	11.00	453.58
	%	31%	31%	36%	2%	100%
2.	INDIRECT CHARGES					
	Depreciation					43.58
	Repayment of loan at 25% of share in 15 year and interest at the rate of 10% per annum					279.93
	Total Rs. in lakh					**797.02**

3.7. Project Cost Analysis

The project Net cost analysis has been worked out for the amount of **Rs.18023.24 lakh**

Cost Per Capita

The cost per capita has been worked out considering for the Base year and projected population for the intermediate stage year and ultimate stage year.

A. Zone wise Cost

Particulars	Zone IX			Zone X			Zone XI,XII,XIII		
Year	2020	2035	2050	2020	2035	2050	2020	2035	2050
Population	145773	169673	201051	145773	169673	201051	104678	130155	153221
Cost Rs. in Lakh	9191.45			6291.02			2541.37		
Cost in Rs.	919145000			629102000			254137000		
Capital Per Capita Cost	6305	5417	4572	4316	3708	3129	2428	1953	1659

B. Total Project Cost

Particulars	Zone IX		
Year	2020	2035	2050
Population	396224	469501	555323
Cost Rs. in Lakh	18023.84		
Cost in Rs.	1802384000		
Capital Cost Per capita	4549	3839	3246

3.8. Cost as per Km of Sewer Length

The cost per length of sewer in km has been worked out considering the total length of collection and conveyance system in whole project area.

Project Cost		Total Length in Km	Cost per Km in Rs. Lakh	Cost per meter in Rs.
Rs. in Lakh	In Rs.			
18023.84	1802384000	297.31	61	6062

3.9. Costs per Hectare

Project Cost Rs. in lakh	Total Project Area (hectare)	Cost per Hectare Rs. in Lakh
18023.84	9435.45	1.91

3.10. Per Capita O&M Cost

Item	Year	Intermediate Stage	Ultimate Stage
Year	2020	2035	2050
Population	396224	555323	555323
Per Capita Cost	**4549**	**3246**	**3246**
O&M Expenditure Rs. in Lakh	447.8	874.78	931.21
Per Capita O&M Cost in Rs.	**113**	**158**	**168**

3.11. Sensitivity Analysis

Table 7: Revenue and Expenditure (Rs. in lakh)

Year	Excluding Repayment of loan					Including of Repayment of loan			
		REVENUE				EXPENDITURE			
	O&M Expenditure	Sewerage Benefit Tax	Sale of water at Rs1 per KL	Total Revenue (3+4+5)	Surplus (+)Deficit (-)	Repayment of loan	Depreciation	Total O&M Cost (2+9+10)	Surplus (+)Deficit(-)
2020	447.78	808.76	18.25	827.01	379.23	279.93	43.58	771.30	55.71
2021	467.71	818.64	18.25	836.89	369.18	279.93	43.58	791.22	45.66
2022	490.38	905.06	18.25	923.31	432.93	279.93	43.58	813.89	109.42
2023	511.58	915.85	18.25	934.10	422.52	279.93	43.58	835.10	99.00
2024	534.56	926.64	18.25	944.89	410.33	279.93	43.58	858.08	86.81

A) Benefit Cost Ratio

The Benefit Cost ratio based on the discounting factor of 10% is worked out to **1.59** after considering cost of power generation. This will be further increased if more recycled water is sold for irrigation purposes after enhancing rates for sale of water.

B) IEC Strategy for Sustainability of Scheme

The project has to be publicized through the mass media, including local newspapers, radio stations, and TV channels so that the public will be aware of the benefits that will be derived from the project.

C) Capacity Building

In order to train the operative and supervising staff training is required in the form of In house or visiting the field site and operating the equipment or actual carrying out testing in laboratory for which module will be chalked out.

D) Financial Internal Rate of Return (FIRR)

The financial analysis is carried out with the assumptions as mentioned in Annexure and accordingly IRR on project investment (post tax) is worked out and separately attached. The IRR calculation shows that the rate is arrived at **8.45%** is found to be reasonable considering a period of 15 years for sewerage schemes. This will be further increased if more recycled water is sold for irrigation purposes.

E) Monitoring and Evaluation

The Executing Agency and the Implementing agencies will take full responsibility for the internal monitoring to ensure that the project complies with requirements.

An independent monitoring agency will be engaged by the Executing Agency through competitive tendering to undertake supervision, monitoring, and evaluation for the project if found essential.

F) Economic Assessment

The total project cost is estimated at **Rs.18023.84 Lakh.** The benefit of the project will raise the people's living standards by maintaining good service level, improving the sanitation system improving the health of the people and assuring the good services to the cantonment area and fringe villages.

SALIENT FEATURES

1.	Name of the project	Preparation of DPR for Providing Sewerage scheme for Newly Developed and un sewer pockets of Solapur city.
2.	State & District	Maharashtra, Solapur
3.	Project area	Solapur Municipal Corporation Solapur
4.		13 fringe villages included in the year 1992
5.	Area	178.57 Sq. km. or 17857 Hectare
6.	No. of wards	98 Nos.
7.	Population - As per 2011 census	9,51,118
8.	Density of population per Sq. km.	5274
9.	Number of properties (Households)	190600
10.	Floating population (daily)	19,400
11.	Geographic Information	Flat terrain undulating where the low table land and small hills of Karmala and Madha Taluka's act as a water shed between Sina and Bhima rivers.
12.	Geographical Location	$17^0\ 40^0$ North (Latitude)
13.		$75^0\ 54^0$ East (Longitude)
	Elevation	460 t0 480 m above Mean Sea level
14.	Temperature	The climate is tropical and in summer the maximum temperature is 42°C and minimum is 28°C. In winter the maximum temperature is 27°C and minimum is13°C.
15.	Rainfall & Humidity	The average rainfall for the city is 760 mm with ave.45 rainy days. The humidity is in the range of 51 to 82 percent. The average evaporation rate is 7.6 mm/day.
16.	No. of water Supply Zones & their Area	**1** | **2** | **3** | **4** | **5** | **6** | **Total**
17.	Area in Hectares	**32.73** | **25.74** | **12.51** | **24.86** | **41.45** | **41.28** | **178.57**
18.	Literacy Rate	57.05%
19.	Slum	158 Notified and 62 non-notified
20.	Slum population	2,18,283 (23% of total population)
21.	Literacy rate	72.47%
22.	Road length	137.40 km
23.	Seismic Zone	Zone III (Moderate damage risk zone)
24.	Nearest Source of water	Bhima River
25.	Connectivity (Road)	550 km away from Mumbai & 300 km away from Hyderabad.
26.		The National Highway No.9, connecting Pune to Hyderabad passé through the city.

27.		The National Highway No.13, which originates in Solapur goes upto Hubli that falls on the Mumbai-Bangalore National Highway.
28.	Rail	Solapur is a main junction on the Mumbai-Chennai, Mumbai-Hyderabad road-gauge line and is also a terminal point of the Solapur- Gadag- Hubli meter –gauge line.
29.	Source of water supply	1. Ekrukh Scheme 10 MLD 2. Bhima River Scheme 55 MLD 3. Ujjani Scheme 55 MLD
30.	Distribution of Water Supply	The existing network is old as such to improve storage capacity and distribution network, the scheme costing Rs. 72.0 Crore is approved by the State Govt. on 17-09-2007. Further in order to augment the present source the scheme based on Ujjani source is prepared to satisfy the water demand for the prospective population of the Year 2046. The whole project cost of Rs. 1240.56 Cr is divided in to two phases as per priority of works. Phase 1 Rs. 694.88 Phase 2 Rs. 545.68
31.	Sewerage Scheme	The existing Sewerage Scheme was executed in 1968 covers the area of 23.23 sq. km prior to merging of 13 fringe villages. There after project of Improvement estimated to **Rs. 160.44 Crore** was approved by Govt. and scheme is now under execution. In this scheme out of 13 sewerage zones, only 3 zones such as Zone No 6, 7 and 8 are considered whereas 5 Zones, No. 9 to 13 the area of fringe villages are however not covered. In the proposed scheme, the sewerage system for the peripheral area falling under zone of 9 to 13 are considered with two numbers of STP s in Zone No IX and X and the sewage from Zone XI to XII will be taken to STP of 75MLD at Degaon which is under completion stage till capacity is exhausted for which in phase III separate STP is proposed at Degaon only

32.	**Sewage Treatment plants**	**Zone No IX**		**Zone No X**		**Zone No X to XIII**	
33.	Stages with Year	2035	2050	2035	2050	2035	2050
34.	Capacity in MLD	20.00	20.+3.16	15.50	15.50+2.55	15.00	15+2.66

35.	Land requirement in Ha	0.35	0.43	0.27	0.33	0.35	0.43
36.	Location of Land	Desai Nagar		MHADA		Degaon	
37.	Availability of Land	SMC		SMC		SMC	
38.	Type of process	Any Modern technology that satisfy outlet parameter as per MPCB norms					
39.	**Design Parameters of Sewage**	**Inlet**		**Outlet**		**MPCB Norms**	
40.	pH	6-8		6-8		5.5-9.0	
41.	TSS (mg/l)	250-550		10		10	
42.	BOD (mg/l)	150-250		10		10	
43.	COD (mg/l)	300-700		50		50	
44.	Oil & Grease(mg/l)	15-35		10		10	
45.	Fecal Coli Form (MPN /100ml)	$1x10^7$		230/100ml		230/100ml	
46.	Residual chlorine			0.25 mg/l			
47.	NH_4-N			< 2 mg/l			
48.	Dissolved P			< 2 mg/l			
49.	Treatment process proposed	Technology satisfies the criteria fixed by the MPCB for discharging the treated waste water in the natural body.					