Design of water distribution network using water gems software

ASSIT. Prof R R Bhosale[1], Mr. Hritik Balwadkar[2], Mr. Hrishikesh Dusane[3], Mr. Hrushikesh Deshmukh[4]

Mr. Rutvik Hulawale[5]

[1]*Professor, Dept. of Civil Engineering, JSPMs Rajarshi shahu college of Engineering*
[2,3,4,5]*Student, Dept. of Civil Engineering, JSPMs Rajarshi shahu college of Engineering*

---***---

Abstract - The main aim of this project is to design the water distribution network of a village kusgaon using water gems software. Water distribution network play vital role in conserving and furnishing desirable life quality to the public, of which reliability of supply is the major component. For the design of WDN the, study of present population, population forecast of three decades is consider, daily water demand is calculated. Water distribution network is design with an objective of minimizing the overall cost while meeting the water demand conditions at acceptable pressure. Also autocad software has been used to draw detailed plan .

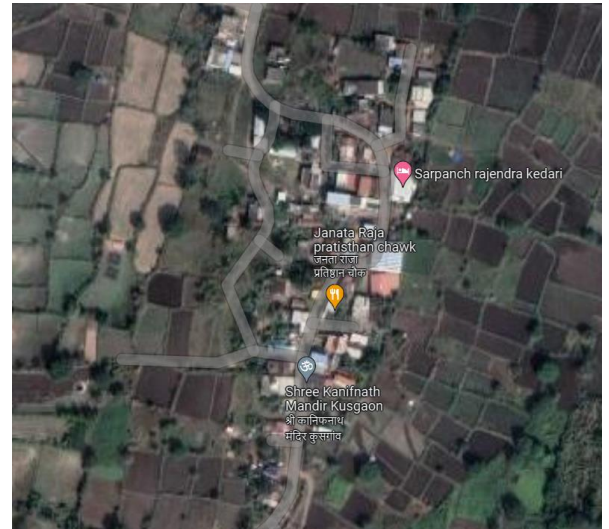*Key Words***:** *water gems software, water supply network, WDN.*

Fig.1

1. INTRODUCTION

Water is one of the most natural resource and crucial for sustaining life but water demand is increasing day by day. This increase in demand can be fulfilled by designing the water distribution network. For design of water distribution network water-gems software is being used.

A water distribution network consist of different elements like pipes, valves, pumps, tanks and reservoirs. It is a hydraulic infrastructure.it is also necessary to design a good network ensuring sufficient head.

Water GEMS software is used for design and analysis of water supply network. The advantage of this software is that expansion of existing water supply network can be done. Water GEMS software gives optimal results of all type of network. The property of Water GEMS software is that, it can be used to accurately simulate network before it has been erected or modified. While simulation of network the problems can be quickly identified and corrected so as to avoid big error.

2. Study Area

Kusgaon P M village is located in Mawal tehsil of Pune district in Maharashtra, India. Geo positioned at Lat:- 18° 36'50.6"N Long:- 73°39'22.38"E.The elevation is about 612m above MSL. The average temperature of kusgaon pawan mawal is 33˚ C in hottest month and 18˚ C in coldest month. The average annual rain fall of village is 722 mm.

3. Overview of water gems software

OpenFlows WaterGems is Bentley software which provides you various tools for intelligent planning for system reliability, optimized operation for efficiency**,** Reliable asset renewal decision support for system sustainability.

The software helps in improving the knowledge of how infrastructure acts as a system, how it reacts to functional strategies, and how it should grow as population and demands increase.

From fire flow and water quality simulations, to criticality and energy cost analysis, Open Flows Water GEMS has everything you need in a flexible multi-platform environment.
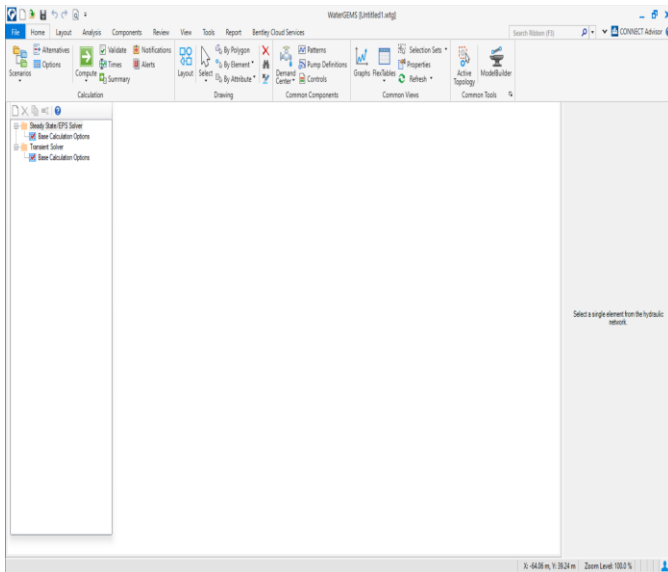
Fig:-2

4. Demand Calculations

3.1 population growth demand calculation.

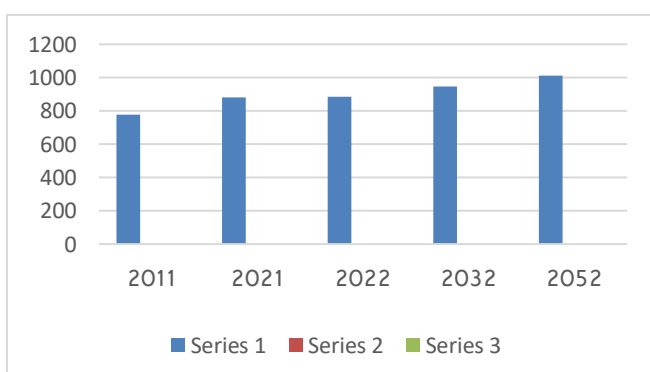| Census Year	1991	2001	2011	Decadal growth rate
Population	839	940	1112	4.56%

4.56% the growth rate is consider for the projection.

Table:-1 population calculation

3.2 population forecasting

	As per Census		Projected population		
	2011	2021	2022	2032	2042
Population	1112	1344	1334	1477	1610

Table:-2 population forecasting

3.3 demand calculation

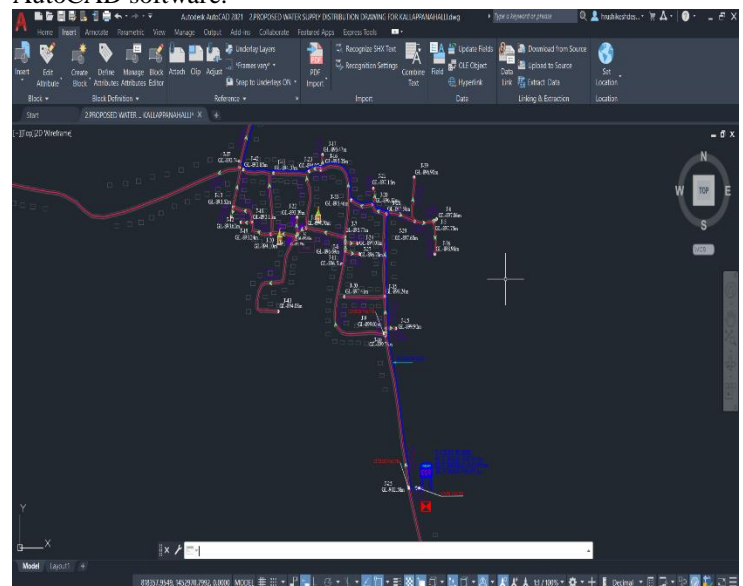| Year	Present	Intermediate	Ultimate	Proposal
	2022	2032	2042	
Population	1344	1477	1610	
Water Demand in Ltr/ Day	67200	73850	80500	
a. Raw Water Demand including losses at 15% for the ultimate year				92575
TOTAL DEMAND			92575 Liters	
Required storage capacity as per two filling			46288	
Existing storage capacity			50000	
Total required storage capacity			**-**	
Since the habitation has existing OHT of capacity 50000 liters is sufficient				

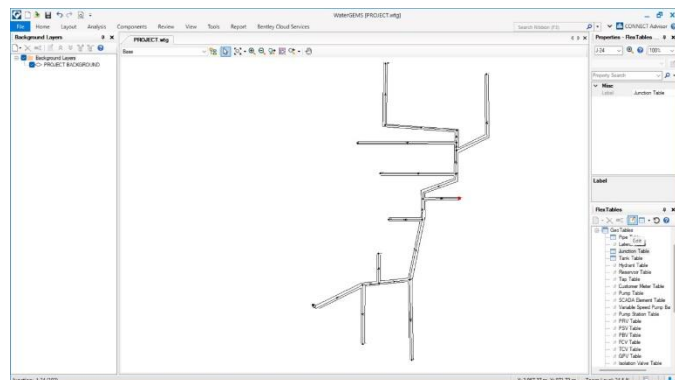Table:-3 demand calculation

5.Methodology

1. Selection of area
2. Data collection
3. Data analysis
4. Modelling using software
5. Result

6. Design

The topographic survey of village has been drawn in AutoCAD software.

The topographic survey was then imported in water gems software and the design of distribution network was design with the appropriate data .

7. Result

Label	Diameter (mm)	Flow (L/s)	Velocity (m/s)	Length (Scaled) (m)	Unit head (m)
P-3	160	2.250	0.13	38	0.002
P-4	160	2.250	0.11	110	0.001
P-5	160	1.950	0.10	308	0.001
P-6	160	1.650	0.08	23	0.001
P-7	160	1.350	0.07	80	0.000
P-8	160	1.050	0.05	20	0.000
P-9	160	0.750	0.04	10	0.000
P-10	160	0.450	0.02	20	0.002
P-27	160	-2.850	0.14	183	0.000
P-29	160	0.150	0.01	164	0.000
P-30	160	0.150	0.01	155	0.000
P-31	160	0.150	0.01	120	0.000
P-32	160	0.150	0.01	108	0.000
P-33	160	0.150	0.01	26	0.000
P-34	160	0.150	0.01	77	0.000
P-35	160	0.150	0.01	65	0.000
P-36	160	0.150	0.01	88	0.000
P-37	160	0.300	0.01	100	0.000
P-38	160	0.150	0.01	131	0.000

Table5:- results of each pipe

Label	Elevation (m)	Demand (L/s)	Pressure (m H2O)
J-1	648	0.15	186
J-2	647	0.15	195
J-3	646	0.15	205
J-4	644	0.15	224
J-5	644	0.15	224
J-6	642	0.15	244
J-7	642	0.15	244
J-8	642	0.15	244
J-9	642	0.15	244
J-21	652	0.15	147
J-22	648	0.15	185
J-23	641	0.15	254
J-24	640	0.15	264
J-25	643	0.15	234
J-26	642	0.15	244
J-27	641	0.15	254
J-28	640	0.15	263
J-29	640	0.15	263

Table 4:- results of each junction

8. Conclusion

The main aim of the project was to design a water distribution network.in this study it was observed that the storage capacity of reservoir is sufficient enough but new water distribution network is necessary to install. Later on the model is optimized for cost.

During modelling few challenges were being faced like input of data, design accurately, what exact output is need in project.

9.Acknowledgement

REFERENCES

1. Dilip Babubhai Paneria, "Analyzing the existing water distribution system of Surat using Bentlys Watergems", International Journal Of Advance Research in Engineering, Science Management.

2. Prof. A.G.Chaudhari, "Experimental investigation by WaterGEMS software for redesign of water distribution system of Bhavani Mata ESR", International Journal Of Advance Research in Engineering, Science Management.vol.no.6, issue no.03, march 2017.

3. Shinde Parmanand Bhaskar, "Feasibility Analysis of Water Distribution System for Yavatmal City using Water Gems Software", International Journal Of Innovative Research in Science, Engineering and Techomolgy.vol.6,issue7,july 217.

4. A.Gheisi, M.forsyth, "Water distribution systems reliability", International Journal Of Technical Research and Application.www.ijtra.com vol3,issue-5(sep-oct 2015), pp. 174-178.

5. Mandar G. Joshi, Nitin P. Sonaje. "A review of modeling and application of water distribution network softwares".

6. Sajedkhan S. Pathan, Dr. U.J.Kahalekar, "Optimal design of water distribution network by using WaterGEMS", IJPRET,2015;vol3(8):308-319.

7. Sajedkhan S. Pathan., Dr. U.J.Kahalekar, "Design of Optimal Water Supply Network and Its Water Quality Analysis by using WaterGEMS", Internation Journal Of Science and Research(IJSR)ISSN (Online): 2319-7064.

8. A.E.Adeniran and M.A. Oyelowo, "An EPANET analysis of WDN of the university of Lagos, Nigeria", Journal of Engineering Research, volume 18 no. 2 june 2013.

9. Sumithra R.P.,Nethaji Mariappan V.E., Joshua Amaranath, "Feasibility analysis and design of WDS for Tiruunelveli Corporation using loop and water gems software's" International Journal on Applied Bioengineering, vol. 7 no. 1 january 2013.

10. Prashant Virjibhai Vaghela,Sejal S. Bhagat, "Analysis of existing water distribution network by using WaterGEMS a case study of Rajkot city", International Journal of Advance Research in Engineering, Science Management.

11.E -reference- www.bentley.co

BIOGRAPHIES

Prof. R R Bhosale

Assistant Professor at JSPM's Rajarshi Shahu college of Engineering Pune.
M.E-CIVIL()

Mr. Hritik T Balwadkar

Studying final year of B.E-civil at JSPM's Rajarshi Shahu College of Engineering Pune.

Mr. Hrishikesh J Dusane

Studying final year of B.E-civil at JSPM's Rajarshi Shahu College of Engineering Pune.

Mr. Hrushikesh D Deshmukh

Studying final year of B.E-civil at JSPM's Rajarshi Shahu College of Engineering Pune.

Mr. Rutvik R Hulawale

Studying final year of B.E-civil at JSPM's Rajarshi Shahu College of Engineering Pune.