WATER DISTRIBUTION NETWORK BY USING WATERGEMS SOFTWARE

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Abstract: Water is essential element required for the sustenance of life. Demand for drinking is increasing on continual basis with corresponding increasing population. This ever increasing demand can be fulfilled by designing efficient water distribution networks based on advance computing systems include modern hydraulic modeling and designing softwares . In present study water distribution network of Bakori region of Wagholi is designed which is located at district Pune, State Maharashtra, India. For the design of Bakori Phata water distribution network, study of present population, population of the three decades, daily water demand, flow characteristics and also survey of the village is done with help of digital GPS .Water distribution network for the villages is analyzed and designed with help of Bentleys WATERGEMS software. Water distribution network systems are designed to deliver water from a source in the adequate quantity, quality and at satisfactory pressure to all individual consumers. Water distribution network are designed with an objective of minimizing the overall cost while meeting the water demand requirements at adequate pressures. The system is a pipeline network consisting of one source node and several demand nodes is considered to find its optimal geometrical layout which delivers known demands from source to consumers over a long period of time.

I INTRODUCTION

Water is essential for all living things, also it play important role in socio-economic development of a country. Water distribution network is necessary infrastructure for supply of water. For the present study of design of water distribution network of Pune districts Wagholi region which is located at Pune - Ahmednagar highway, covers an area of about 2879.96 hectare. Wagholi is considered as developing area. Wagholi takes many efforts to provide and reliable services to the citizens. Water supply is major part of it. It provides sufficient quality to the every citizen at optimal cost but quantity is not satisfactory. As per collected data From governmental organization quantity of water supplied to the consumers is not satisfactory as per our survey Bakori Phata area receives water by tankers and bore wells. Although area is well planned there are certain problem reported by consumer and in order to tackle these problems we decided to design the water distribution network by Bentleys WaterGEMS software hence it will be helpful to Grampanchayat in future to laid pipe line and all essential elements of distribution network of water supply scheme in Bakori Phata area BJS, Wagholi.

Bentley Systems, Incorporated, is an American-based software development company that develops, manufactures, licenses, sells and supports computer software and services for the design, construction, and operation of infrastructure. The company's software serves the building, plant, civil, and geospatial markets in the areas of architecture, engineering, construction (AEC) and operations. Their software products are used to design, engineer, build, and operate large constructed assets such as roadways, railways, bridges, buildings, industrial plants, power plants, and utility networks. The company re-invests 20% of their revenues in research and development Water GEMS provides full geo database integration, so you can create, display, edit, run, map, and analyze hydraulic models from a geospatial environment.

II. PROBLEM STATEMENT

Water is one of the most important natural resource and water scarcity is the most challenging issue at a global level. The water is most crucial for sustaining life and is required for almost all the activities of humankind, i.e., industrial use, domestic use, for irrigation; to meet the growing food and fiber needs, power generation, navigation, recreation, and also required for animal consumption.

1) This project is being implemented to improve the water supply system, to minimize the leakage, and to optimize the water availability to consumers.

2) It was also intended to check the capability of existing water supply system component and optimizing the cost of project.

3) The existing system of water supply is facing problems like a higher rate of leakage, poor maintenance, poor customer service, and poor quality of water with different.

III. IMPORTANCE OF WATER DISTRIBUTION SYSTEM

In the design of water supply distribution system, its being recognized that consumption varies with the season, month, day, and hours. As far as design of distribution system is concerned it is the hourly variation in consumption that matters the fluctuations in consumption is accounted for by considering the peak rate of consumption

The variation in the demand will be more pronounced in the case of smaller population and will gradually even out with the increasing population this is so because increase in large population different habits and customs of several groups tends to minimize the variation in the demand pattern. The product, delivered to the point of consumption, is called potable water if it meets the water quality standards required for human consumption. The water in the supply network is maintained at positive pressure to ensure that water reaches all parts of the network, that a sufficient flow is available at every take-off point and to ensure that untreated water in the ground cannot enter the network. The water is typically pressurized by pumps that pump water into storage tanks constructed at the highest local point in the network. One network may have several such service reservoirs. In small domestic systems, the water may be pressurized by a pressure vessel or even by an underground cistern (the latter however does need additional pressurizing). This eliminates the need of a water-tower or any other heightened water reserve to supply the water pressure.

These systems are usually owned and maintained by local governments, such as cities, or other public entities, but are occasionally operated by a commercial enterprise (see water privatization). Water supply networks are part of the master planning of communities, counties, and municipalities. Their planning and design requires the expertise of city planners and civil engineers, who must consider many factors, such as location, current demand, future growth, leakage, pressure, pipe size, pressure loss, firefighting flows, etc. — using pipe network analysis and other tools. As water passes through the distribution system, the water quality can degrade by chemical reactions and biological processes. Corrosion of metal pipe materials in the distribution system can cause the release of metals into the water with undesirable aesthetic and health effects.

Release of iron from unlined iron pipes can result in customer reports of "red water" at the tap . Release of copper from copper pipes can result in customer reports of "blue water" and/or a metallic taste. Release of lead can occur from the solder used to join copper pipe together or from brass fixtures. Copper and lead levels at the consumer's tap are regulated to protect consumer health. Utilities will often adjust the chemistry of the water before distribution to minimize its corrosiveness. The simplest adjustment involves control of pH and alkalinity to produce water that tends to passive corrosion by depositing a layer of calcium carbonate. Corrosion inhibitors are often added to reduce release of metals into the water. Common corrosion inhibitors added to the water are phosphates and silicates.

Maintenance of a biologically safe drinking water is another goal in water distribution. Typically, a chlorine based disinfectant, such as sodium hypochlorite or mono chloramine is added to the water as it leaves the treatment plant. Booster stations can be placed within the distribution system to ensure that all areas of the distribution system have adequate sustained levels of disinfection.

IV METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques methodology does not set out to provide solutions – it is, therefore, not the same as a method. Instead, a methodology offers the theoretical underpinning for understanding which method, set of methods, or best practices can be applied to specific case, for example, to calculate a specific result.

WaterGEMS provides you with a comprehensive yet easy-to-use decision-support tool for water distribution networks. Follow image is WaterGEMS window.

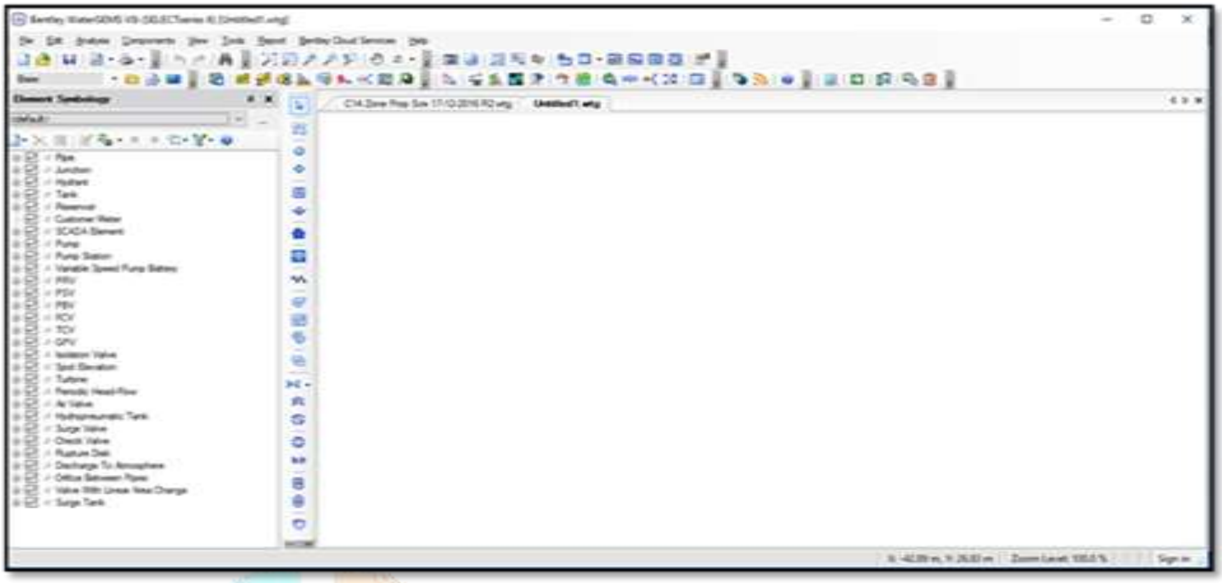

fig-1 watergems window

As per our study we have selected Bakori area, below shown image of area selected.

fig-2 selected area (Bakori area)

We have selected bakori area and we have calculated reduced level of this area by using GoogleEarth.

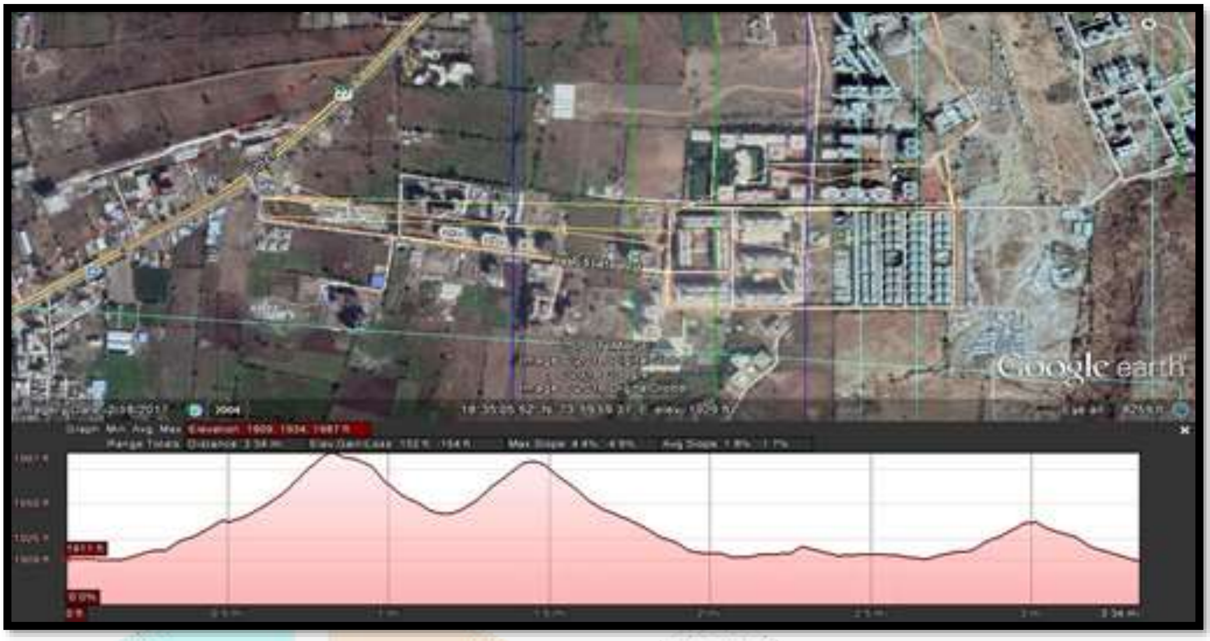

fig-3 reduced levels

V RESULT AND DISCUSSION

To proceed for the work to be carried out, we have carried out following steps like firstly we discussed with various experts related to the field of water supply then for watergems software work discussed with the software trainers & we have attended hands on training conducted by RSCOE at Tathawade Pune, for collecting data of water demand visited to people residing nearby selected area and collected data of demand of water,

We were directed by the guide about the proper way for the better result of project. Work carried is analyzed and results were discussed to give suggestions for feasible outcomes.

As shown in fig no.4 New pipe line network of selected area, nodes, junctions, tank, pump etc.

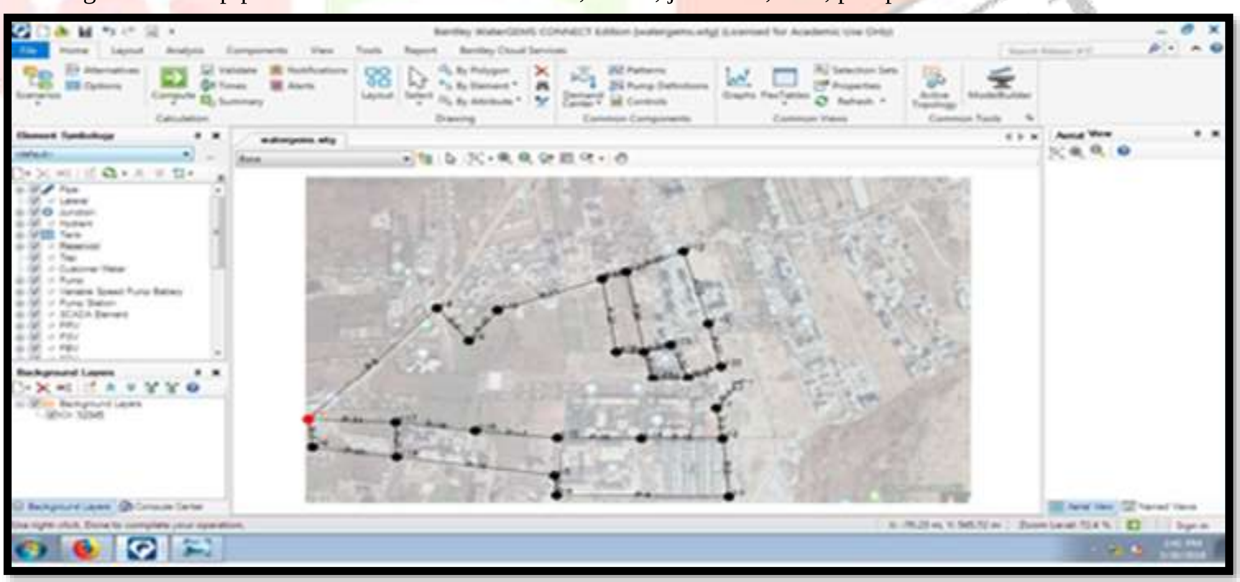

fig-4 pipe line network

As shown in fig no.5 length, diameter, elevation, etc. these are inputs, and get result.

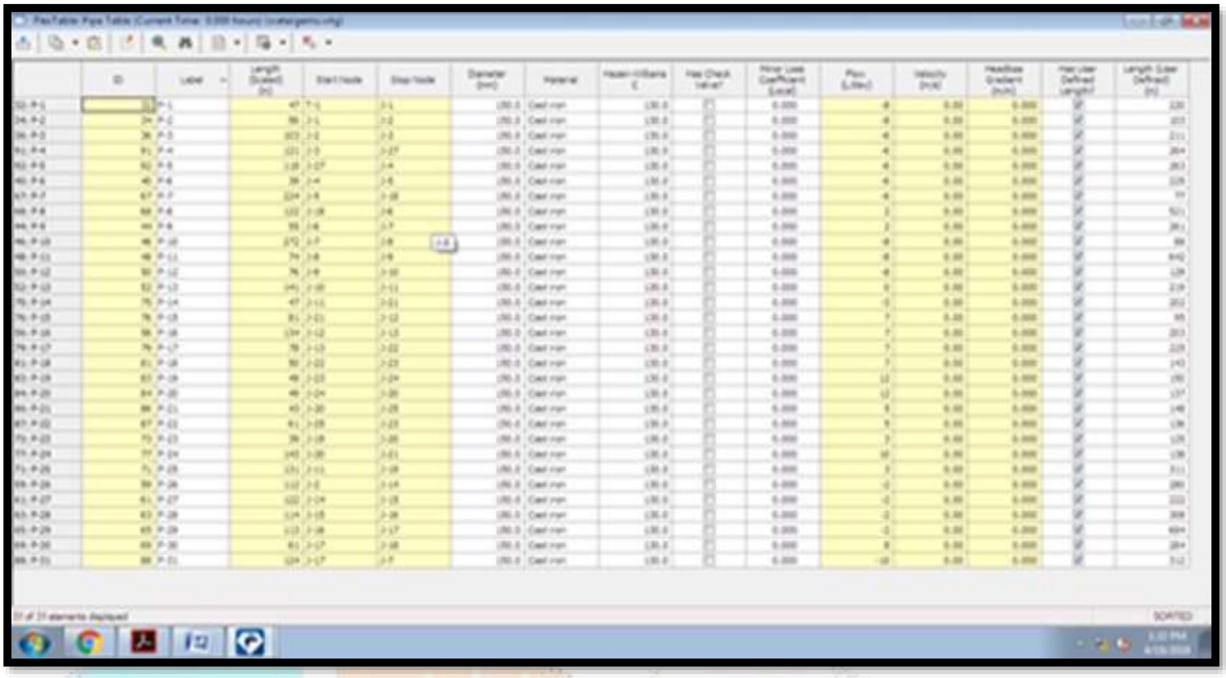

Fig-5 input table

As shown in fig no. 6 result of water distribution in Bakori area by color coding.

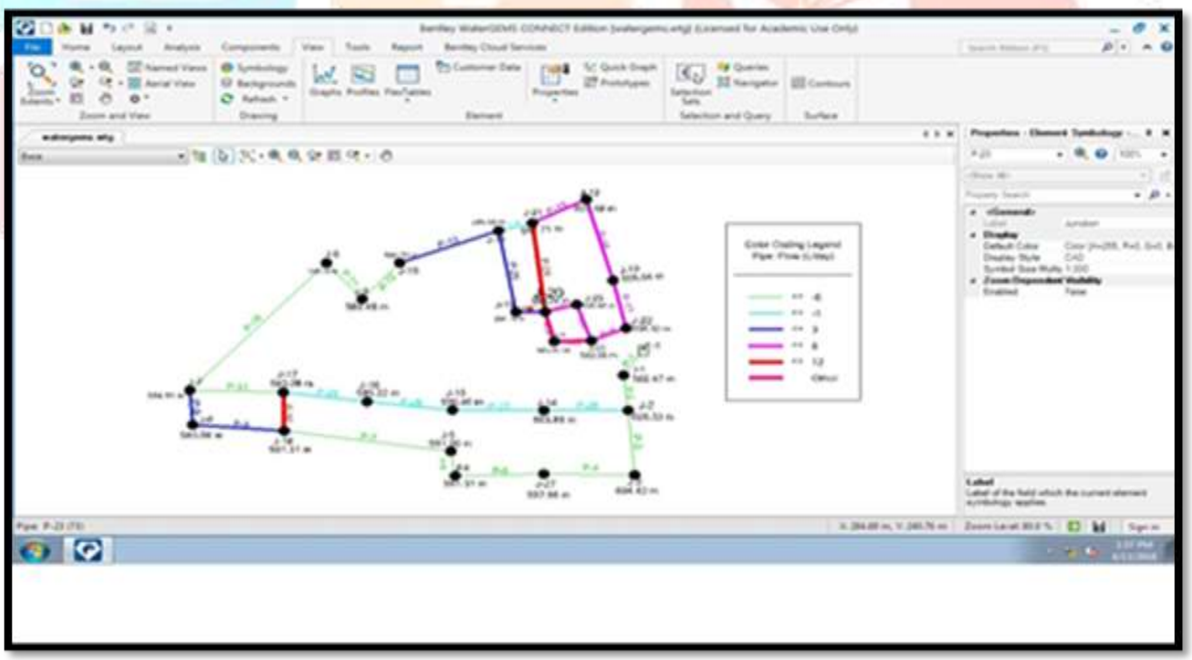

fig-6 color coding of pipe and node

VI CONCLUSION

The purpose of present study is to design water distribution network for Bakori region. In this study it is observed that storage capacity of ESR located at Wagheshwar which is not satisfactory so by considering demand of water for Bakori region design of new water distribution network is necessary to install, so proposed network is planned and need to execute for effective distribution with sufficient pressure.

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