# Design & Integration of Water Supply for Dholera SIR

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*Abstract*— This research focus on the efficient design and integration of underground utilities, specifically stormwater management and water supply systems, are critical components of modern urban infrastructure. As urbanization continues to accelerate, the proper management of these utilities becomes paramount to ensure sustainable and resilient urban environments. This master's thesis delves into the complicated area of designing and integrating stormwater and water supply systems within the below ground situation. The research aims to address the complex challenges faced in harmonizing these vital utilities while considering factors such as infrastructure lifespan, environmental impact, cost-effectiveness, and societal well-being. Through comprehensive analysis, advanced modeling, and real-world case studies, this thesis seeks to contribute to the existing knowledge by providing innovative insights and practical solutions that can guide urban planners, engineers, and policymakers in their pursuit of creating smart and livable cities.

***Key words:*** Design & Integration, Utilities, Water Supply & Storm Water, Smart City

## I. INTRODUCTION

This research focus on the efficient design and integration of underground utilities, specifically stormwater management and water supply systems, are critical components of modern urban infrastructure. As urbanization continues to accelerate, the proper management of these utilities becomes paramount to ensure sustainable and resilient urban environments. This master's thesis delves into the complicated area of designing and integrating stormwater and water supply systems within the below ground situation. The research aims to address the complex challenges faced in harmonizing these vital utilities while considering factors such as infrastructure lifespan, environmental impact, cost-effectiveness, and societal well-being. Through comprehensive analysis, advanced modeling, and real-world case studies, this thesis seeks to contribute to the existing knowledge by providing innovative insights and practical solutions that can guide urban planners, engineers, and policymakers in their pursuit of creating smart and livable cities.

### *A. About Dholera SIR*

Dholera Special Investment Region (SIR) is a significant infrastructure and industrial development project located in the state of Gujarat, India. It is one of the most ambitious and extensive planned urbanization projects in the country. Dholera SIR is greenfield industrial smart city planned & located approximately 100km southwest of Ahmedabad. It is envisioned as India's most attractive location for manufacturing & industrial development. The Government of Gujarat has created a legislative framework for the formation of Special Investment Region (SIR) under Act 2009 for which a regional development authority, DSIR has been established.

*1) Geographical Condition:-*

The region is primarily characterized by its flat and low-lying terrain. It is situated on the eastern side of the Gulf of Khambhat and is part of the coastal plains of Gujarat. Dholera experiences a typical tropical climate. The fertile alluvial plains created by the deposition of sediment carried by rivers have made the region agriculturally productive. It has a hot and dry climate during the summer months, with temperatures often exceeding 40 degrees Celsius. The region experiences a monsoon season from June to September, bringing heavy rainfall. Winters are relatively mild and pleasant.

*2) Water Management Study:-*

Dholera Special Investment Region (SIR) in Gujarat, India, places significant importance on water management due to its arid climate and the need to support a growing population and industrial activities. The region's water management strategy involves a combination of measures to ensure a sustainable and efficient use of water resources. Rainwater harvesting as a fundamental part of its water management strategy. This involves the collection, storage, and utilization of rainwater, primarily for recharging groundwater and supporting non- potable uses in the city. Various structures like check dams, weirs, and rooftop rainwater harvesting systems are implemented for this purpose. The city's water distribution system is designed to be efficient, reducing leakage and losses. Modern infrastructure and technologies are employed to ensure water reaches its destination with minimal wastage. Regular monitoring of water quality is a critical aspect of water management. This ensures that water supplied for various uses meets the necessary safety and quality standards. Overall, Dholera SIR's approach to water management is comprehensive, aiming to ensure a sustainable and efficient water supply for its residents, industries, and businesses while also minimizing environmental impacts. This approach is essential for the long-term success and sustainability of the city.

*3) Groundwater Details:-*

Dholera is situated in the state of Gujarat in India, which is to be developed as a smart city under the Delhi-Mumbai Industrial Corridor (DMIC) Project. With the aim of developing Dholera as a smart city, the industrial activity is connoted to triple over the next five years spurting the demand for water, one of the most basic necessities for any industry to flourish. Moreover,

demand of electric power is implied to skyrocket. Dholera is one of the most water scarce areas in Gujarat with just 260 m3 surface water resources per capita (State Environmental Report, 2016). The surface water comes from four west flowing rivers namely Sukhbhadar, Lilka, Bhogavo and Keri which flow into the Gulf of Khambhat and transverse through the DSIR area. However, neither of the mentioned rivers are perennial i.e. they remain dry for about nine months of the year nor do they provide significant supply and are full of silt. The current water needs of Dholera, like that of most of Gujarat, are satiated by water supply from the Narmada canal. The water demand for the proposed DSIR will be 947 million litres per day (MLD) out of which residential and industrial water demand will be 298 and 491 MLD respectively. A portion of this industrial grade water is proposed to be procured from treated wastewater by Ahmedabad Municipal Corporation (AMC) and water from Narmada Canal is proposed to fulfill the irrigation water demand for the DSIR. Building a canal to Dholera requires a lot of investment – about Rs 4500 crore (694 million dollars). Officials have made it clear that water for industrial and domestic use for Dholera SIR is not available and all of the Narmada water has already been allocated to other areas of Gujarat.

## II. NEED OF THE STUDY

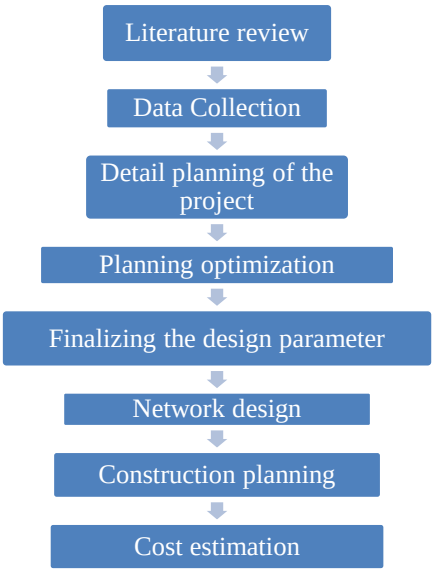
Dholera SIR is being developed to act as a benchmark for all the smart cities for India. The development is being carried out in phases. The water network which is operational has got potable water being supplied through Ahmedabad Municipal Corporation & Narmada Canal. There are many developments that are coming up in the Dholera SIR as it grows – these developments have Industries, offices and they require treated water for potable, Irrigation & construction purposes. As per the current practice half of the underdeveloped structures are being served using treated water and other half have got irrigation water. Placing lines as per the requirements of developers create hassle in the pre-planned utility spaces, which in turn creates hurdles for proposed infrastructures. To solve this issue, it is proposed to establish a huge rising main which has the sufficient capacity to cater the future demand of the potable water demand. The water demand for irrigation, industrial & construction purpose will be sufficed from recycled water which is generated from the wastewater treatment.

### *A. Scope of Work*

To plan the project of "design and construction of water supply network" using WaterGEMS & project management software and find out optimum time for project completion- to merge it with the development of the city. To design the water supply network of the area including the components of the water supply network coordinated with the existing infrastructure.
The scope of the study will include:

- Project Planning
- Demand finalization
- Study of the existing network.
- Distribution network design
- Cost analysis

### *B. Study Outline*




### *C. Present Condition*

The potable water is transported from the Narmada Main Canal via huge rising main. Then is connected with the central Water Treatment Plant. This treated water will be stored in various overhead tank planned in different zones. The water distribution network is planned in line with current road network which is approved in town planning scheme. Approx 75 km distribution network executed in phase-I. The same water will be used for industrial purpose & irrigation also for some extent. The demand of irrigation & construction will be sufficed from recycled water from wastewater.

## III. FUTURE SCOPE

The present network can further be studied for suitability of the demand – weather the available network design criteria are enough to carry the required water or not. If not, then network can be redesigned, and proper pipe diameters can be provided For the issue of the network being laid randomly, a proper water supply network of the whole smart city can be suggested in the area designated corridor. All the required connection for construction activities can be supplied from the main line. This will reduce the cost of the service provider i.e., Dholera SIR and will also reduce the chances of the clashes of water supply network with other network services. Proper design of the network will help in maintain the quality and the quantity of water being supplied and will also help in proper billing of water to the developers. This will also reduce the instances of no pressure to low pressure into far away areas as the design will be considered for the same.

Further part of this paper will also provide a construction schedule for the whole work so that it does not exceeds the timeline of laying the planned network. This will be a temporary arrangement with the clause to reclaim the laid network and place it in the utility tunnel once it is constructed.

## IV. CONCLUSION

Water constitutes an integral part of any city's infrastructure and is considered as one the basic needs. Dholera SIR is being the model smart city and the first operational smart city in India the state of water supply network can be streamlined from the present state. The present situation of the network is an outcome if the Dholera SIR administration commitment to provide services to the developers/investors in the Dholera SIR. There is a need of change in the administration approval of the connections also. To improve and optimize the water network in the city, a fully functional water supply network must be laid in the utility space/corridor.

Further ahead for the expansion of the city there should be enough provision of the water supply utility corridor in the master plan itself. The master plan itself should be developed keeping in mind the phased development of the city and the commitment to the developers.

## REFERENCE

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