

# Design of Stormwater Drainage (Hatkeshwar Circle, Ahmedabad)

Darshan S. Patel<sup>1</sup> Ishan A. Gor<sup>2</sup> Deep Soni<sup>3</sup>

<sup>1,2</sup>UG Student <sup>3</sup>Lecturer

<sup>1,2,3</sup>Department of Civil Engineering

<sup>1,2,3</sup>Silver Oak College of Engineering & Technology, Gota, Ahmedabad, Gujarat-382481, India

**Abstract**— In India throughout time of year the waterlogging of stormwater may be a major facet to trot out. The dearth of providing smart system may be a major supply of waterlogging on roads, canals etc. that end in flooding of that specific space inflicting issues like road blockage and traffic issue throughout its peak hours. Urbanization causes it, because of its impermeable structure development across cities. Countless rupees spend on the development of stormwater drains in mega cities to stop flooding throughout rains. The area that we've study for our project is Hatkeshwar circle, C.T.M., Ahmedabad. This can be one amongst the prime place in Ahmedabad. This present work of suggestion of drainage designing is done through past year rainfall data and it is based on different software like, Google Earth pro, Surfer, GPS Visualizer, Quickgrid & SWMM(Storm-Water Management Model), to design complete drainage work to finish the problem of water-logging due to stromwater at Hatkeshwar, C.T.M., Ahmedabad, Gujarat.

**Keywords:** Storm-water, Water-logging, Rainfall data, Flooding, Surfer, GPS Visualizer, Quickgrid & SWMM

## I. INTRODUCTION

Stormwater refers to the runoff of water from urban surfaces generated by rainfall or melting snow. An effective management of stormwater assumes more and more importance, the retrofitting of existing infrastructure becomes critical. Stormwater retrofit programs are essential to correct existing situations and to effectively manage stormwater. Urban stormwater management is one of the prominent basic infrastructure facilities growing fast in India. The fast infrastructure development has not included the proper drainage system. These critical issues must be addressed in parallel to any infrastructure development plan and a comprehensive plan on urban drainage and sanitation must be organized and implemented accordingly. Moreover, these issues become even more important for such cities having natural water bodies like lakes/ or ponds.

Ahmedabad is from rapidly growing cities, in which there is large amount of population, Hatkeshwar is area one of them. During rainfall in Hatkeshwar area lots of problems are created. It includes, risk of human life, damaging to buildings, loss of livestock, disrupt transport, stop communication and some time it creates electricity problems. This is some main effective problem which causes regular life. And after rainfall problems face like, waterlogging, huge amount of waste are deposited, difficulties creates in simple life etc.

Ahmedabad city is the major city of Gujarat, which attracts people from the different place of Gujarat for different activities like business, education, job etc. This leads to very high traffic to and from Ahmedabad. Hatkeshwar area of the Ahmedabad is one of the prime locations. The total population of this area is about 96000

people. In this area the local bus depot is situated and it is a main place for different business activities. It is also the area from where the roadleading to different cities passes from the Ahmedabad city. It is the most waterlogged area in Ahmedabad city during the high rainfall.

We are worked on this problem to gives best solution for people of local community and travellers. The drainage system which is design by us in SWMM software. For designing drainage work for stormwater, we collect rainfall data from SWDC(State Water Data Centre)-Gandhinagar. First of all we select area of Hatkeshwar to find it's longitude, latitude from Google Earth pro software. We was finding altitude from GPS visualizer. After getting all this data, the elevation profile are taken for further work. Finally, the designing of drainage for stormwater was started and it completed successfully.

## II. OBJECTIVES & SCOPE OF WORK:

### A. Objectives:

- 1) To study the existing drainage conditions study area.
- 2) To prepare Stormwater Management plan and design by SWMM software.
- 3) To contribute effort that aim at improving the waterlog area of Hatkeshwar.

### B. Scope of work:

- 1) To analyse and collection of rainfall data of Hatkeshwar.
- 2) To prepared contour map of study area.
- 3) Identification of better alternative as a solution by SWMM software.

## III. LITERATURE REVIEW

### A. Innovation In Storm Water Management In Gandhinagar:

After all data collection and analysis to define the problem in the given study area and provide Best Management Practice for Prevents the impacts of the Stormwater. To provide sustainable, economic and safe practice. This Strategy used as per BMPs guideline, to improve urban Green Infrastructure and utilize the resources. In this study to planning of store the Stormwater in Underground tank and use the water in dry season for irrigation of garden. The storage tank is useful in dry season. The sedimentation control structure is provided at the entrance of manhole. This structure easy and effective solution of the sedimentation problem. The Permeable paving parking area suggested at the GH 5 to GH 4 Commercial Area. This practice control impact of Stormwater and use the Stormwater.

**B. Storm Water Drainage Design (Case Study Vijayawada):**

Rational method has been successfully used for the estimation of storm wise discharge in Vijayawada city with good coefficient of determination 0.871. Diligent efforts are required to estimate these parameters in order to reach the value of runoff coefficient. In the present study care has been taken to determine the value of runoff coefficient. It was noted that the existing sections are not sufficient in most of the places to accommodate the runoff. The inundation of the study area is also may be the blockage of the drains in various points. Hence periodical maintenance of existing drains is essential.

**IV. DETAILS OF STUDY AREA**

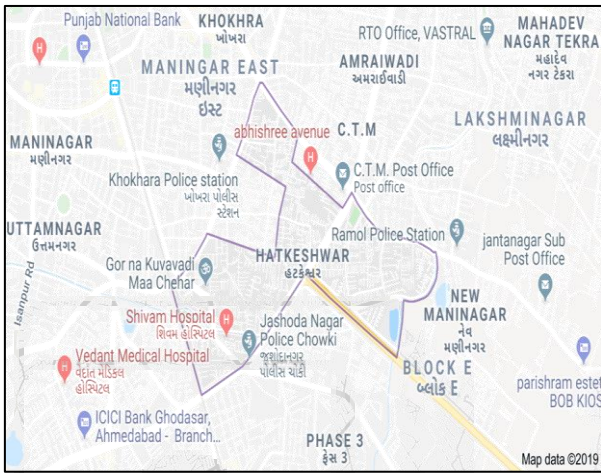


Fig. 1: Map of study area

Elevation / Altitude	52 meters. Above seal level
Hatkeshwar circle latitude	22.999
Hatkeshwar circle longitude	72.6248
Locality	Ahmedabad
Sublocality	Amraiwadi hatkeshwar circle, C.T.M.
State	Gujarat
Pincode	380026

Table 1: Details of area

**V. RAINFALL DATA OF AHMEDABAD RAIN GAUGE STATION**

Sr. No.	YEAR	AVG. RAINFALL (per Hr. in mm.)	AVG. RAINFALL (per day in mm.)
1	2003	6.101672	146.440128
2	2004	5.595332	134.287968
3	2005	11.299877	271.197048
4	2006	8.697575	208.7418
5	2007	6.194224	148.661376
6	2008	4.768925	114.4542
7	2009	3.343627	80.247048
8	2010	7.76111	186.26664
9	2011	4.933355	118.40052
10	2012	4.627614	111.062736
11	2013	7.234265	173.62236
12	2014	6.204738	148.913712

13	2015	3.935893	94.461432
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Table 2: Rainfall data

**VI. METHODOLOGY**

**A. Steps in using SWMM:**

- 1) Specify a default set of options and object properties to use.
- 2) Draw a network representation of the physical components of the study area.
- 3) Edit the properties of the objects that make up the system.
- 4) Select a set of analysis options.
- 5) Run a simulation.
- 6) View the results of the simulation.
- 7) Setting Object Properties.
- 8) Property editor window.
- 9) Time series editor.
- 10) Simulation options dialog.
- 11) Viewing the Status Report.
- 12) Summary Result.
- 13) Viewing Results on the Map.
- 14) Water profile plot dialog.

**1) DEM Tools:**

A digital elevation model is a 3D CG presentation of a terrain's surface-commonly of a planet, moon, or asteroid-created from a terrain's elevation data. DEMs are used often in geographic information systems and are the most common basis for digitally produced relief maps.

**2) Elevation profile:**

It provides elevation details at any chosen point along a path that you draw. Create a path using Earth's Path tool, and then display the Elevation Profile. Earth also displays the elevation of the location of your cursor on the map, in the lower right corner

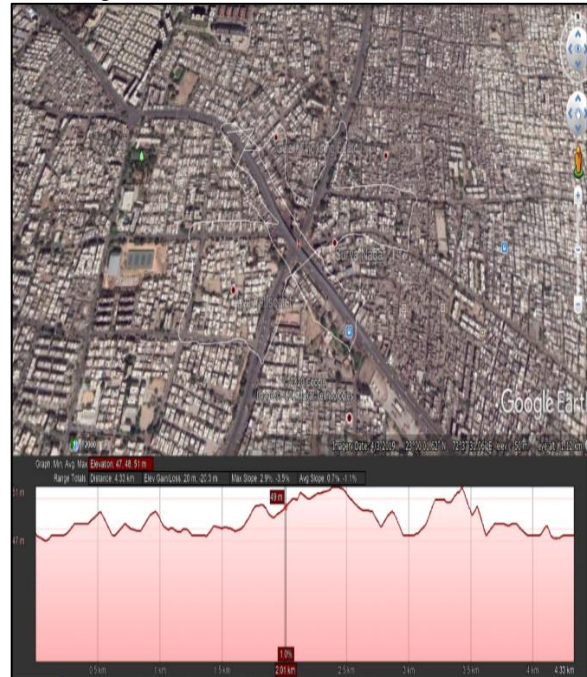


Fig. 2: Elevation profile of selected area

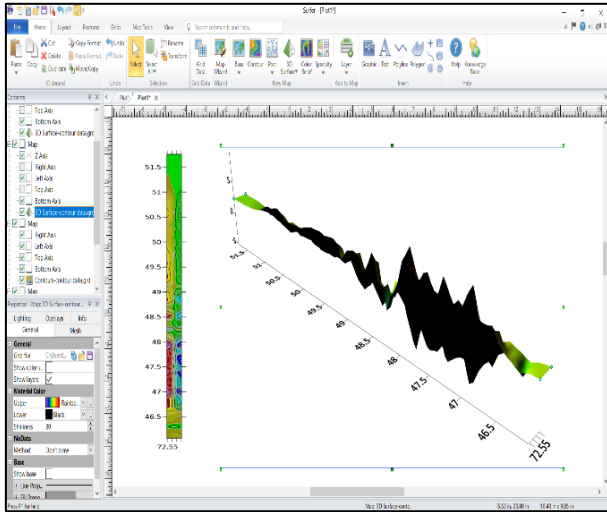


Fig. 3: Contour map in Surfer

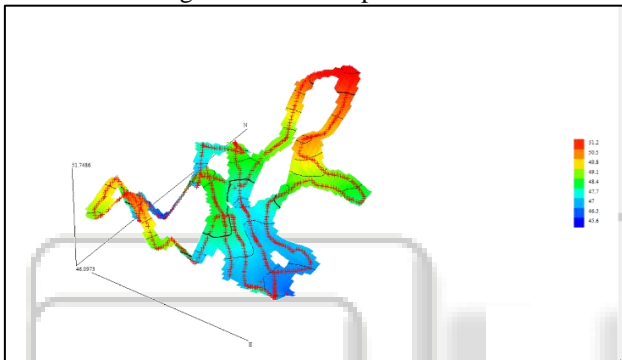


Fig. 4: 3D coloured view contour map

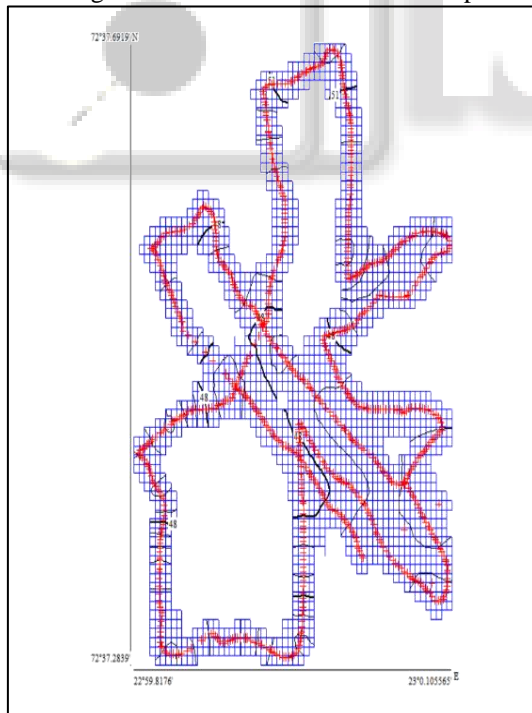


Fig. 5: Contour view with longitude & latitude

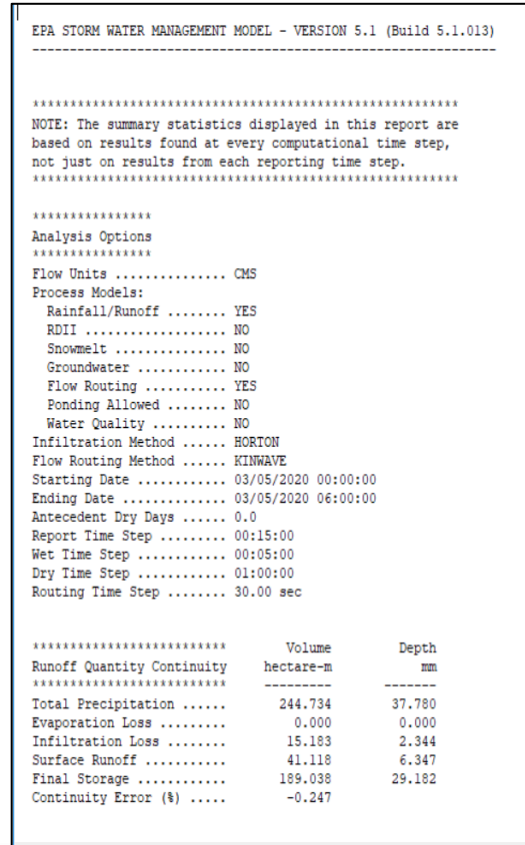


Fig. 6: Status of report page1

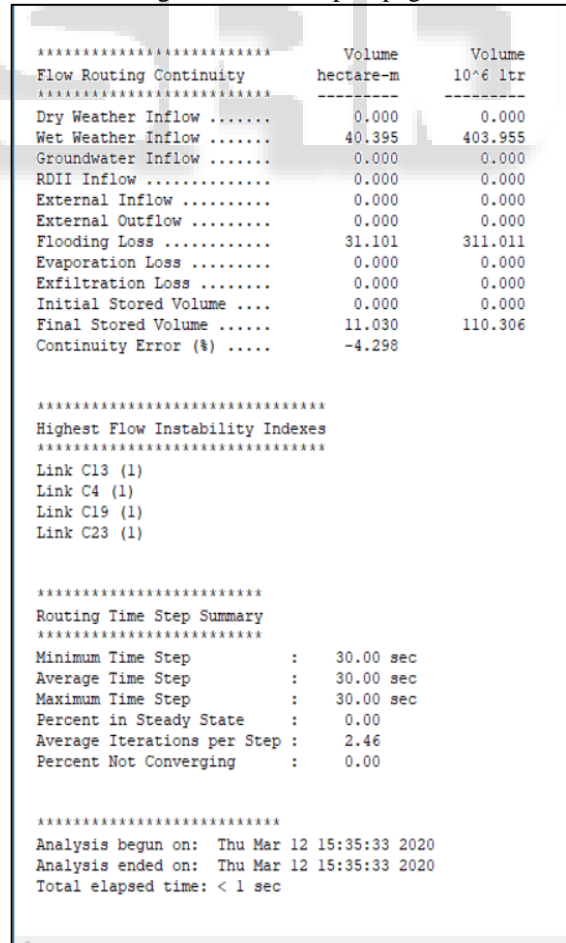


Fig. 7: Status of report page2

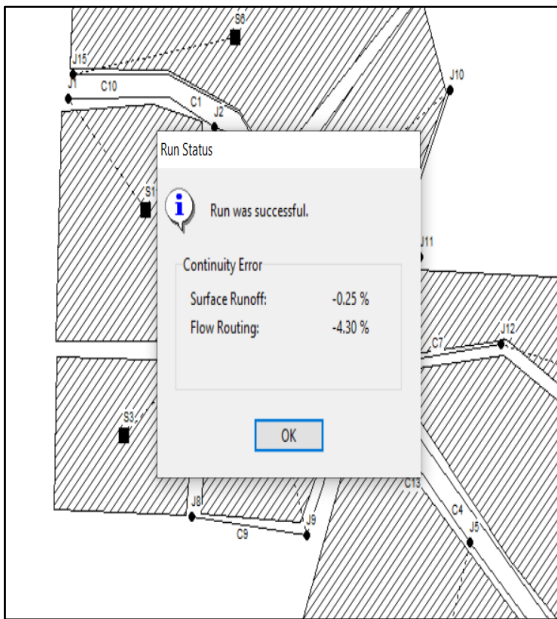


Fig. 8: Status of successful run program

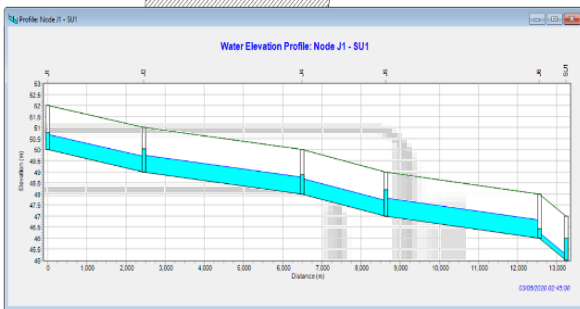


Fig. 9: Water elevation profile from J1 to SU1

Land use	Total area( sq km.)	% of total area	Coefficient	Average rainfall intensity(mm /hr.)	Total runoff (m <sup>3</sup> /hr.)
Residential & commercial	58.3	90	0.4	6.2	144.58
Road area	6.47	10	0.4	6.2	16.04

Table 3: total runoff data

## VII. CONCLUSION

- 1) Finally, the work has shown that the design of storm water drainage using SWMM (Stormwater Management Model) software in Hatkeshwar area.
- 2) All parameters (like, rainfall intensity, coefficient etc.) are consider perfect
- 3) This works at Hatkeshwar circle give defence during rainfall against waterlogging, blockage of transportation etc.
- 4) In this designing of Hatkeshwar circle, we provide 9 catchment areas for best output in SWMM software.
- 5) In this design, it does not required any pumping stations in SWMM software.
- 6) Finally, stormwater are collect in storage tank without any problem.

## REFERENCES

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