

SELECTION OF ALIGNMENT FOR FEEDER CANAL FROM PILLAIPALLY FLOOD FLOW CANAL TO WANKAMAMIDI TANK IN NALGONDA DISTRICT

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Abstract

Selection of alignment for a canal is critical in terms of cost and execution time. Several alignments may be possible between the source and destination of a canal, but command area and cost of work is more important. Canal works costs include the cost of earthwork both for embankment and cuttings.

This paper presents the study of Flood Flow Canal from Pillaipally Anicut to the Minor Irrigation Tanks of Bhudan Pochampally, Chotuppal, Ramannapet and Chityal Mandals in Nalgonda District. With the use of Toposheets and Satellite Image (CartoDEM), various thematic layers such as watershed, streams, contours are prepared. ArcGIS 10.2 desktop software and Google Maps API is used for data preparation, analysis and planning for canal alignment of feeder canal to Wankamamidi Tank.

Keywords: Canal, Remote Sensing, Alignment using GIS, Feeder Canal, Tank Irrigation

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1. INTRODUCTION

In Telangana State, tank irrigation which was an important source has lost its significance with a decline from 39% (1955) to 14% (2005). The reasons for decline to tank irrigation are attributed to inadequate rainfall, upstream abstractions and poor condition of feeder channels besides urbanization. The government of Telangana State seriously working on restoration of all the tanks and providing water grid to fulfill the water supply requirement.

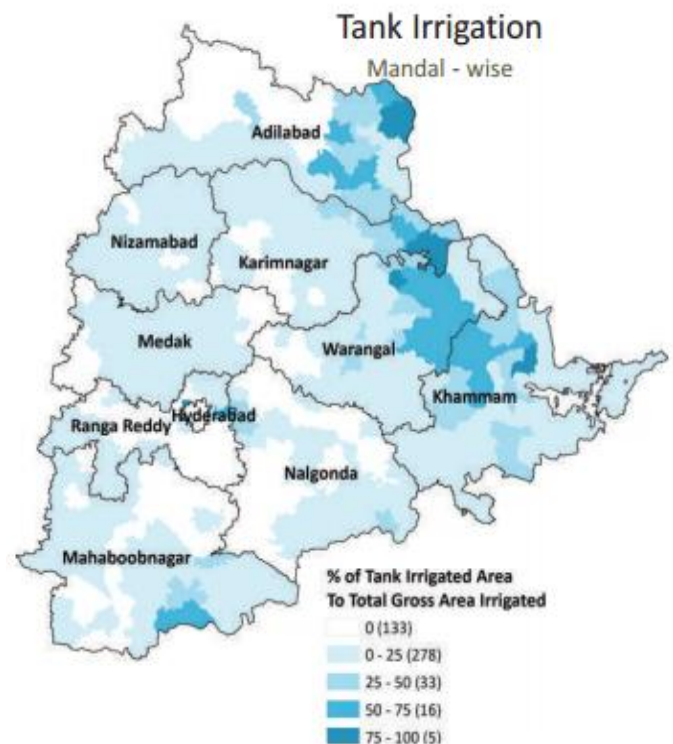


Fig 1 Tank Irrigation in Telangana State (Source: <http://www.telangana.gov.in>)

2. STUDY AREA

Pillaipally Minor Irrigation project is commenced in the year of 2008 with an aim to feed Minor Irrigation Tanks in Bhudan Pochampally, Choutuppal, Rammannapet and Chityal Mandals of Nalgonda District in Telangana State. The canal is located at 15.8500°N, 77.2667°E.



Fig 2 Pillaipally Flood Flow Canal

Salient Features of Project:

- ✓ To feed water to nearby 30 tanks
- ✓ Approx. length of 66 Km
- ✓ Ayacut of 3123 Hectares
- ✓ Estimated Cost of Rs. 23.58 Crores

3. IRRIGATION CANAL SYSTEM

A canal is an artificial channel, generally trapezoidal in shape constructed on the ground to carry water to the fields either from the river or from a tank or a reservoir.

Classification of Canals (based on Alignment)

- Contour Canal
- Ridge or Watershed Canal
- Side Slope Canal

Contour Canal:

Contour channels follow a contour, except for giving the required longitudinal slope to the canal. Since the river slope is much steeper than the canal bed slope, the canal encompasses more and more area between itself and the river. A contour canal irrigates only on one side because the area on the other side is higher

Watershed or Ridge Canal:

The dividing ridge line between the catchment areas of two streams (drains) is called the watershed or ridge canal. Thus between two major streams, there is the main watershed (ridge line), which divides the drainage area of the two streams, as shown in figure below.

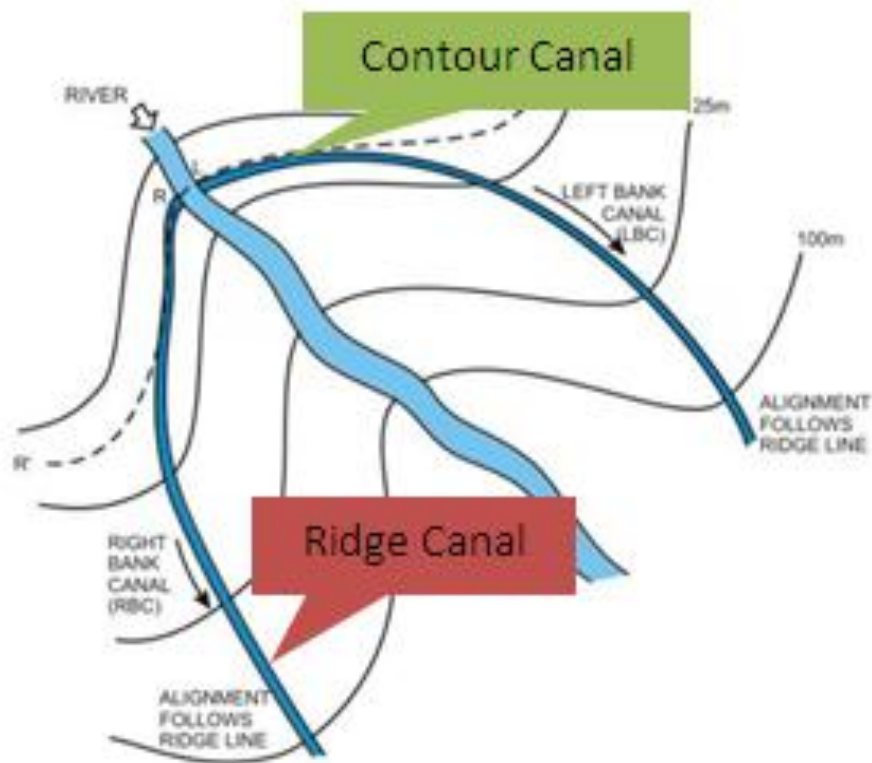


Fig 3 Contour Canal vs Ridge Canal

Aligning a canal (main canal or branch canal or distributory) on the ridge ensures gravity irrigation on both sides of the canal. Since the drainage flows away from the ridge, no drainage can cross a canal aligned on the ridge. Thus, a canal aligned on the watershed saves the cost of construction of cross drainage works

Side Slope Canal

A side slope canal is that which is aligned at right angles to the contours; i.e. along the side slopes. Since such a canal runs parallel to the natural drainage flow, it usually does not intercept drainage channels, thus avoiding the construction of cross drainage structures.

Canal Alignment Guidelines:

- While many factors play a role in fixing canal alignment, one important consideration is to have an alignment which runs mostly along the watershed (the ridge line dividing the catchment of two drainages). This ensures that the channel can provide flow irrigation to its command and does not have to cross too much drainage, thereby reducing the number of cross drainage works.
- Avoid too many curves, populated areas and other important structures.

- The alignment should be such that the cutting and filling of earth or rock should be balanced, as far as possible.
- The alignment should be such that the canal crosses the natural stream at its narrowest point in the vicinity

4. DATA & SOFTWARE

Data used:

- Topo sheets (Survey of India) of scale 1:50000
- CartoDEM – a Digital Elevation Model Satellite Image downloaded from ISRO's Bhuvan website

Software:

- ArcGIS 10.2 Desktop Software – for Data Preparation
- Google Maps API – for Analysis and Planning on Web
- Google Fusion Tables – to store map data online

5. METHODOLOGY

The following procedure is followed to prepare the required thematic maps such as watershed map, streams map, canal map, and Contours map.

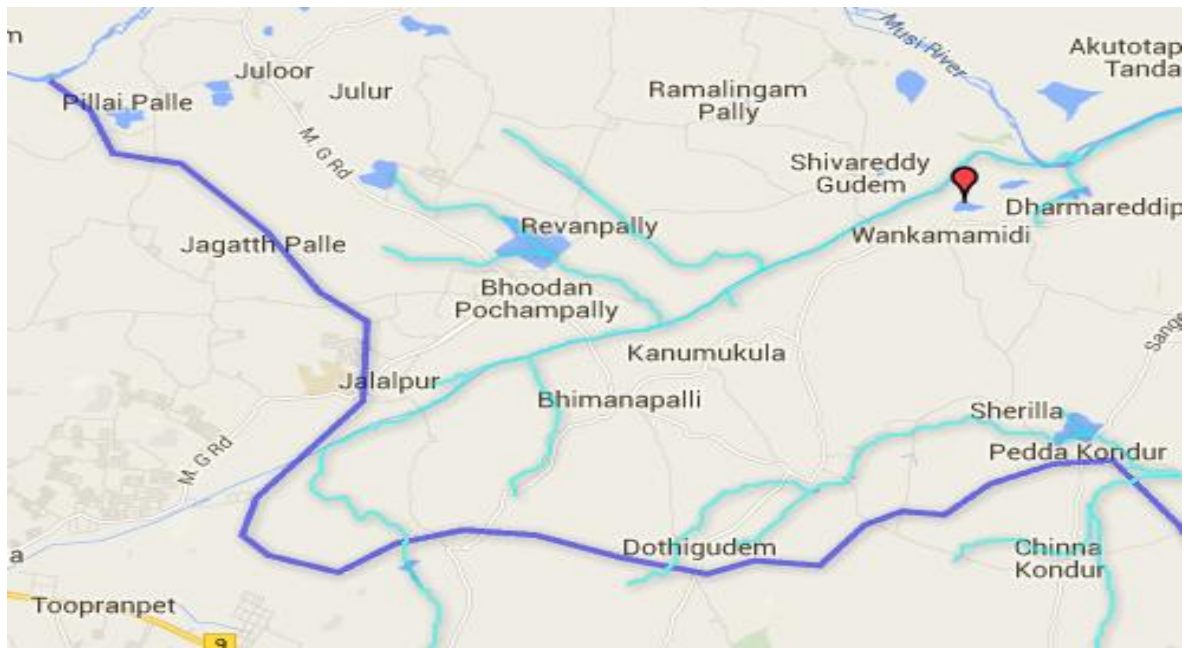


Fig 4 Pillaipally Canal

Procedure:

- Toposheet showing the newly constructed canal route is collected from Irrigation Department and same was geo-referenced with ArcGIS 10.2 desktop software.
- After geo-referencing, a canal map layer is digitized.
- With the help of Spatial Analyst (Hydrology tools), a watershed and stream maps are created by following watershed delineation procedure.
- Contour map with 10m contour interval is prepared using Surface tools
- After preparation of necessary thematic layers the same were uploaded to Google Fusion Tables which is most compatible data to work with Google Maps API
- Finally, a web application is created to view the entire prepared layer over Google Maps to analyze and identify the suitable alignment of ridge canal from Pillaipally Canal to Wankamamidi Tank.

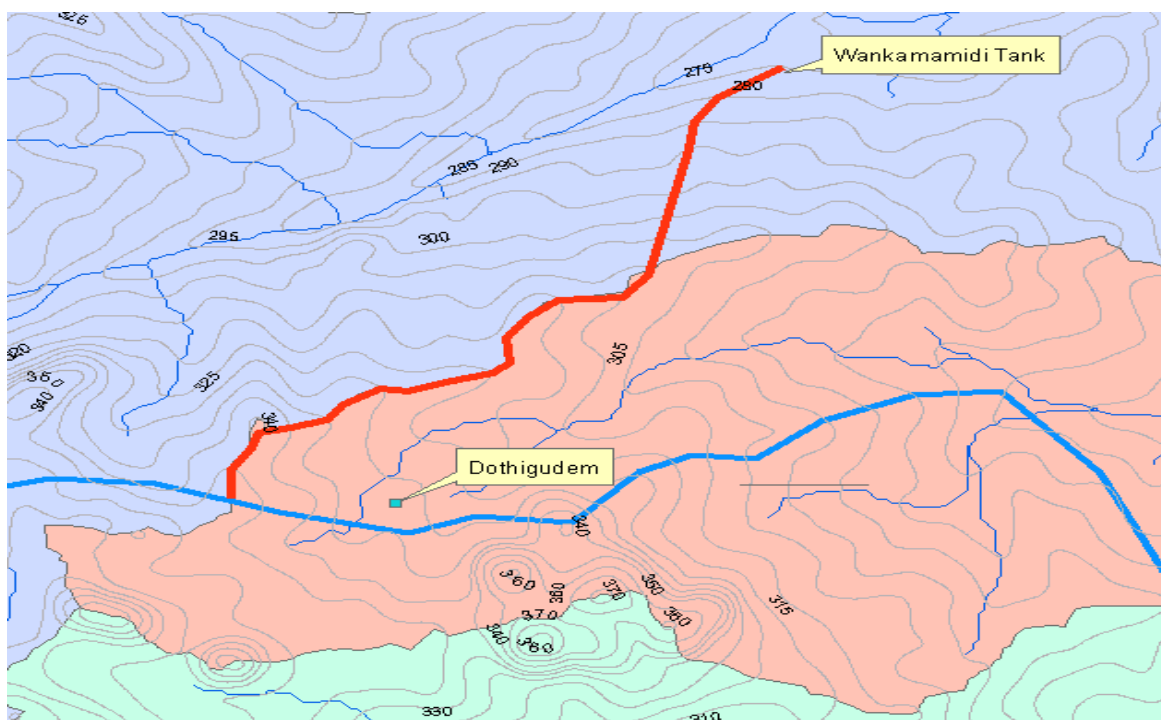


Fig 5 Proposed Feeder Canal to Wankamamidi Tank

6. CONCLUSION

Application of Remote Sensing and GIS is highly useful in study and planning of alignment of canals network system. In this study, alignment of a feeder canal is prepared to supply water to Wankamamidi Tank of a capacity of 200 hectares from Pillaipally Flood Flow Canal (near Dothigudem village).

Details of Proposed Canal:

- Total Length: 9 km
- Relief: 65m (410m - 345m)
- Gradient: 1 in 138 (Average)
- Road Crossings: 5 (Major)

REFERENCES

- [1] N.Bhaskara Rao et al., Study on Nagarjunasagar to Somasila link canal alignment and its impact on environment using IRS-P6, AWiFS data, J. Ind. Geophys. Union (April 2011) Vol.15, No.2, pp.113-124
- [2] Jayachandra Kannemadugu and D. Punyasheshudu, GPS based surveying for mapping of canal alignment in GIS environment – a case study of a branch canal of Alimineti Madhava Reddy Project, Nalgonda District, Andhra Pradesh, India.
- [3] Peter A Burrough and Rachael A. Mc Donnell (2000), Principles of Geographical Information systems. Oxford University Press.
- [4] P.S. Roy and V.V.Rao, Remote Sensing and GIS – Water Management.
- [5] CWC India, Manual on Irrigation and Power Channels, 1984