Peer Reviewed International Research Journal of Geography
Maharashtra Bhugolshastra Sanshodhan Patrika
ISSN : 0971-6785 {Impact Factor 3.687 (IIFS)} Vol. 35, No.1, Jan-Jun. 2018.pp 9-14

GROUNDWATER MANAGEMENT ASPECTS: "A CASE STUDY WITH REFERENCE TOGIRJA DAM IN WATERSHED GP-3" OF AURANGABAD DISTRICT, MAHARASHTRA STATE, INDIA

Pramod B. Pathrikar

Abstract

The area under investigation stretch along Girja River in Khultabad Taluka of Aurangabad district. The thickness and the extent of basaltic flow throw the focus on availability of ground water. Deccan basaltic flow the ground water occurrence depends mainly on the factors like jointing pattern and variation of thickness and lateral extent of different flows.

The conservation structures are key structures practically in all watershed development schemes. They are required for creating storages of water for irrigation, drinking industry water supply. A dam or conservation structure prevents the flow of water on the surface. But if water is to be stored it has also to be seen that there is no flow below the sub-surface either. This means that the foundation rocks must be taken to prevent loss of water through them. Also to avoid the disastrous effects of dam failure, safety and stability of a dam have to be assured. These will depend among other things on the strength and soundness of foundation rocks, which in turn, will depend on the nature and structure of these rocks. An analysis of dam failures of the past has shown that failure to recognize or to treat properly defects in foundation rocks was responsible for the failure. Detailed geological investigations have therefore to be carried out for obtaining the necessary information about rocks at the dam site and over the reservoir area. To select the site for water conservation and watershed structure drainage pattern of river basin also play important role.

Keywords: *Geological Study, Alluvium, Aquifer, hydrothermally*

Introduction:

Watershed management is the process of creating and implementing plans, programmes, and projects to sustain and enhance watershed functions that affect the plant, animal, and human communities within a watershed boundary. Features of a watershed that agencies seek to manage include water supply, water quality, drainage, runoff, water rights, and the overall planning and utilization of watersheds. Landowners, land use agencies, storm water management experts, environmental specialists, water use purveyors and communities all can play an integral part in the management of a watershed.

Comprehensive land development procedures attract special attention in many countries which enable soil and water conservation, better and productive land use and optimum and effective use of available water resources. It is possible to achieve its goals, by considering all lands, their potential capabilities for development and reclamation, their possible contribution to food, fuel and timber production, their hydrology irrigation and water supply, and susceptibility to floods, drought and other natural hazards such as erosion or deposition. Most of these factors are related to the nature of the drainage basin and the extent to which the improvement facilities are coordinated within its boundaries. Area development can be implemented within any boundary selected by its planners, but planning of physical improvements, infrastructure or the mobilization of the human resources restrictions unless carried out within "natural" boundaries a large watershed or its independent tributaries.

The Girja dam constructed on the basaltic terrain which the geology and hydrology are discussed on the chapter no two and three. But the geology of dam can be discussed on the flows wise. Along the major course of the river, exposures of fresh hard unjointed amygdaloidal basalt rocks are occurring. At two places along the banks of the river at canal and vertical cut are seen in the canal the

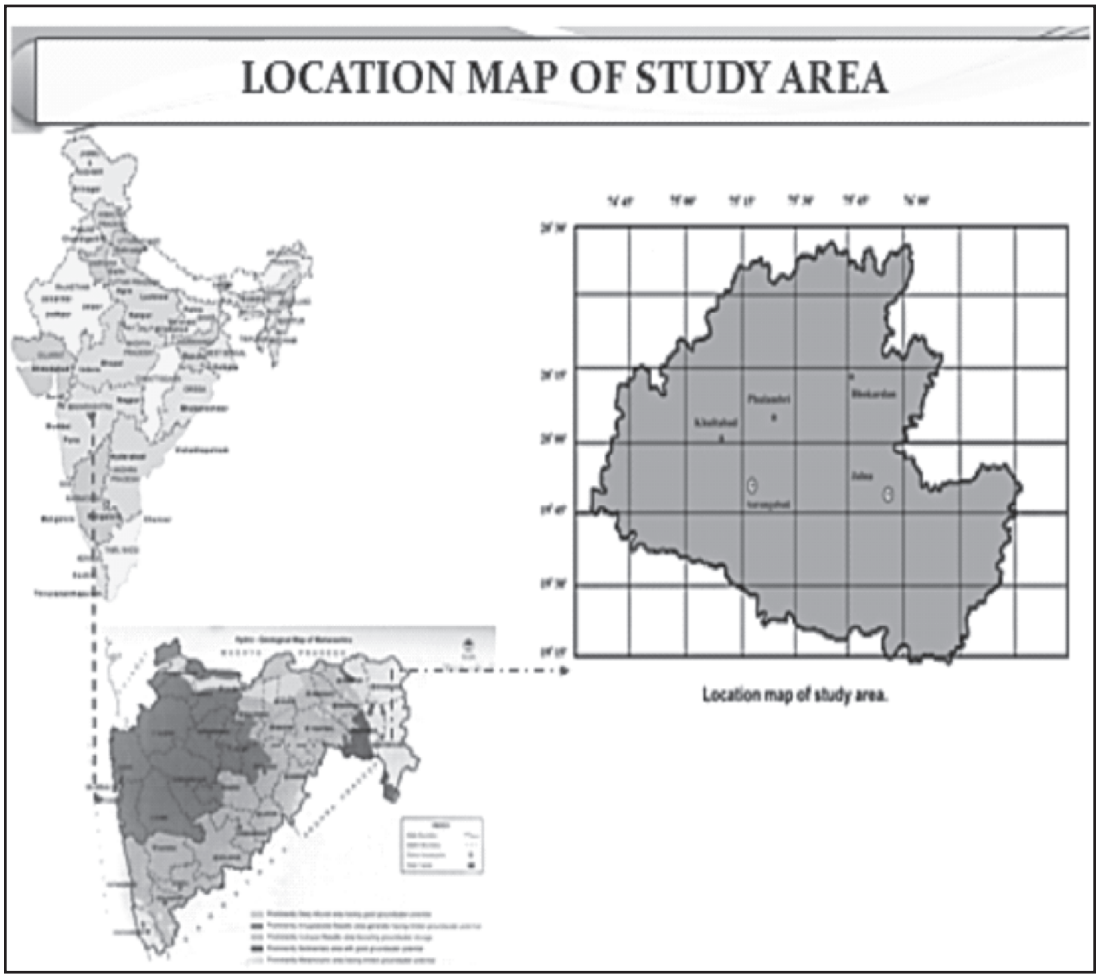
major part of the dam are cover with water and that's why the flows are trapped on the well section. The dam having maximum capacity of water storage.

About the problem

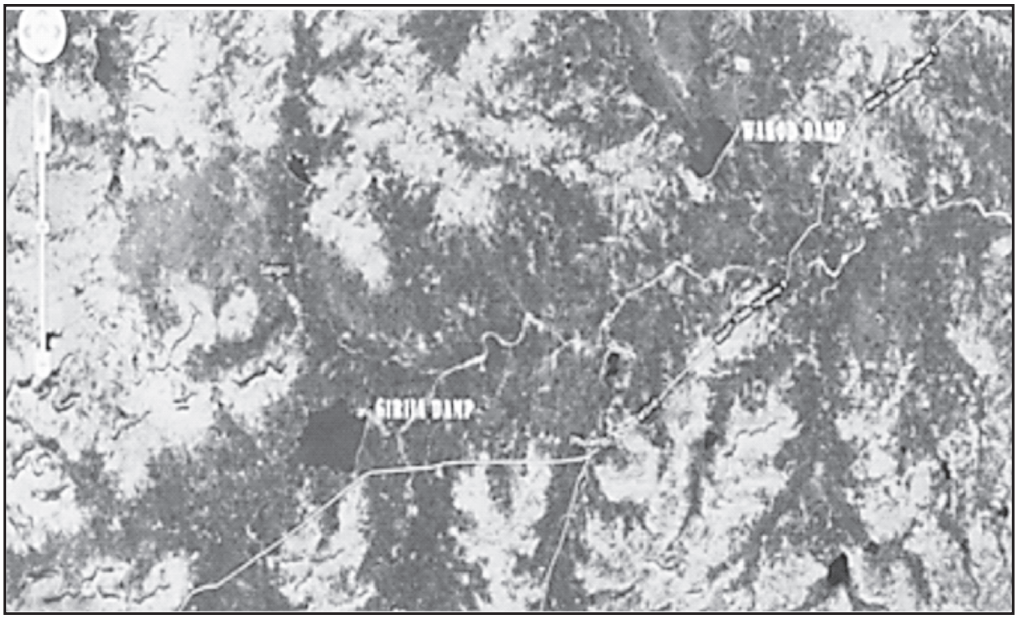
This area faces water scarcity problem due to erratic rainfall and change in geohydrological characters of strata which is mainly different types of basaltic flows. The water bearing characters of Alluvium as well as Basaltic flows are different place to place. In the alluvium the different layers of clay, sandy beds play important role in ground water occurrence. The thickness and the extent of basaltic flow throw the focus on availability of ground water. In Deccan Trap area the ground water occurrence mainly depends on the factors like jointing pattern; topographic variation, thickness and lateral extent of different flows.

Loction studay area:

The Girja dam is constructed in GP-3 watershed in Khultabd taluka of Aurangabad district it come under the toposheet No 46 P/8 and having maximum elevation in watershed GP-3 is 865 m. and minimum of 650 m.with latitude 20004'50 longitude is 75011'15 and altitude 903.m.



Location map of study area.



Girja Dam

Official Name	Girja dam	**Location**	Tq. Khultabad
Opening Date	1986	**Type of dam**	Earth fill
Height	19.1 m.(63 fit.)	**Length**	3,060 m.(10,040 fit.)
Volume	$70Km_3$(5,090 cu ml)	**Capacity**	$21,230Km^3$(299 Sq. ml.)
Longitude	$20^0$05'30"	**Latitude**	$75^0$19'40"
Capacity	21.230 hector	**Irrigated Area**	2820heater

Geology of Girja dam:

The Geology of area commonly depend on Basaltic flows they are commonly occurs in the studay area are the,

1. Compact Basalts (Aa Flow)
2. Amygdaloidal Basalt and Vesicular Basalt (Pahoehoe flow):
3. Tachylytic Basalt (Red bole)
4. Volcanic Breccia
5. Alluvial

In the study area the flows are demarked as:

Flow No. 1:

The flow is not exposed on the surface. However it can be traced in the well section as seen in the well locate near the dam. It is thick extensive compact porphyritic basalt with small plagioclase

phenocryst. Plagioclases are scattered throughout the flow. Bottom portion of this flow is not visible in these well sections but the middle portion shows closely spaced jointing. Top portion of the flow is hydrothermally altered and amygdaloidal, showing red colour. This portion is deeply weathered and has developed closely spaced sheet jointing. Observed thickness of the flow is 12 meter. Thickness of top portion is about 5 meters. This flow observed as bed rock at Girja dam.

Flow No. 2 :

It is black compact porphyritic basalt with small sized plagioclase phenocryst. The flow shows moderate to broadly spaced joints. Broad vertical joints are very prominent. It has suffered moderate weathering. In the bottom portion vertical joints spacing is broad. Top portion of the flow is hydrothermally altered amygdaloidal basalt and hence is not suitable for heavy percolation of water. Thickness of the flow is 18 meters. The top portion is 6 meter thick.

Flow No. 3:

It is thicker, irregular, porphyritic amygdaloidal basalt. With small to medium sized amygdales filled with silica and zeolites. The flow is free from jointing. However, in the bottom portion showing flow junction where percentage of amygdales percentage is less, broadly spaced vertical and oblique joints are developed. The flow shows variation in weathering at some places. In the well section it shows deep weathering. While at other places as in well the weathering appears moderate. This flow has a thickness of 12 m. to 4 m. is hydrothermally altered red amygdaloidal basalt. Major portion of this flow which is moderately weathered, is exposed in the river bed and is available for field observation.

Flow No. 4 :

This flow is black compact porphyritic basalt with medium sized plagioclase phenocryst. Jointing in this flow is inconsistent. However vertical and oblique joints are prominent. It shows rough and rugged topography. This is due to irregular fracture surfaces developed along the plagioclase phenocryst.

Hydrology of Girja Dam:

Ground water occurs in the open spaces such as joints, fractures etc. The capacity of basalt to hold groundwater depends upon permeability of rock which in turn depends on joint spacing and joint pattern. If joints are closely spaced then rock is highly permeable and can hold large quantity of water. But if the joints are broadly spaced permeability is less and as the rock such hold small quantity of water. These joints become tight at certain depth hence do not allow further percolation of water.

Top portion of compact basalt flows up to certain depth is always hydrothermally altered, red vesicular and amygdaloidal. This portion is unjointed when fresh. But due to heavy weathering sheet jointing is developed in it. On the other hand amygdaloidal basalt is free from jointing. It is susceptible to weathering if it contains mineral chlorophaeite. Due to weathering it always develops sheet jointing through which heavy percolation is possible only up to shallow depth. Top portion of amygdaloidal basalt is red and hydrothermally altered. It is very hard and tough when fresh. Hence possibility of percolation in it depends on thickness of weathered zone.

Water bearing characters of Flow No. 1:

In the well section this flow is of compact basalt showing closely spaced jointing. Bottom portion of the flow is not available for observation. The wells taken in this flow are high yielding indicating heavy percolation. The wells taken in this flow are high yielding indicating heavy percolation of water through closely spaced jointing. The top portion of this flow is highly weathered and sheet jointing is developed in it show cancer deposit of zeolite vain in top portion.

As mentioned earlier the jointing in this flow becomes broader and tighter at depth. Hence percolation takes place up to a limited depth.

Water bearing characters of Flow No. 2:

This is black, compact porphyritic basalt showing broadly spaced jointing with prominent vertical joints. Percolation of water takes place through these vertical joints. Leaching and weathering has taken place along the joint planes.

Top portion of this flow is hydrothermally altered and amygdaloidal. It is exposed along the surface limited percolation of water takes place through this flow.

Water bearing characters of Flow No. 3:

This flow is thicker, irregular and amygdaloidal without jointing. However at certain place amygdale percentage is less and they are scattered in which closely spaced mutually perpendicular joints have developed through which limited water percolates. The mineral chlorophaeite occurring in the flow helps in quick weathering hence in some part of the flow where concentration of the chlorophaeite is more, deep weathering is observed.

The well section at such places shows moderate percolation of water. The percolation of water in this flow is mainly through sheet jointing developed due to weathering. No percolation is going to take place where fresh rock is exposed.

Water bearing characters of Flow No. 4:

As mentioned earlier this is black, compact, porphyritic basalt very small portion of this flow is going to submerge in the water. This flow shows broadly spaced jointing in which vertical and oblique joints are prominent. The percolation will occur through these joints.

Conclusion:

In the lower area of watershed GP-3 there is Girja dam constructed because of these dam water percolation in to the well but as compared to the top portion of these watershed having a problem of water scarcity in the lower area water table at high level. This variation of occurrence of groundwater is due to the variation in hydrological property of basaltic flows. Therefore the top area of watershed require to repairs of the K.T. weirs, small bunds in series may be constructed and the watershed fall in hill area there is need to nala band gully plugs to be constructed to improve the groundwater potential for irrigation and drinking purposes.

1. The soil conservation and water spreading techniques will have the necessary in watershed GP-3 impact on the groundwater recharge.
2. The new structure can take according to geological formation in total watershed across the river basin.
3. Rainfall is the main source of recharge to groundwater. Therefore, it is recommended that surplus monsoon that flows out of the sub basin has to be changed to groundwater reservoir.
4. The farm ponds (in command and non-command) mostly in heavy soils will achieve twin objective of water harvesting and drainage improvement and hence in command area also this activity needs to be promoted.
5. Contour bunds and gully plugs are important and low cost treatments for soil and water conservation. With little economic assistance, even very poor farmers can treat their fields. If proper maintenance is done, they are very effective for improvement of land fertility. Better results can be achieved through ridge to valley treatment. This process can be adopted only if more time is spent with those farmers whose fields are located in the same watershed. They have to be convinced about the benefits of SWC (Structure of Water Conservation) work and ultimately watershed development. Village institutions can be a common platform to discuss these aspects where people are given an equal chance to participate in developmental issues.

References

* A.V. Tejankar Study Of Deccan Trap Flows In Toranmal Ghat Section, Dist Dhule (M.S.) 2002.

* Kulkarni, P.S., Study of Deccan Trap Basalt Flows in Aurangabad District Ph.D. Thesis, Marathwada University. Aurangabad. 1984,
* Karmarkar B.M., Kulkarni S.R. and Marathe S.S. "Basalt Geology and Recharge by Percolation Tanks", Second International Synopsis on artificial Recharge, 1994. American Society of Civil Engineers.
* Pramod Pathrikar"EFFECT OF GEOHYDROLOGICAL CHARACTER ON DEVELOPMENT OF WATERSHED: A CASE STUDY"Publish in National Refereed Journal of Multidisciplinary Studies New Voices, Vol. I, Issue-IV, ISSN 2231-3249. Dec. 2011
* Pramod Pathrikar"GEOLOGICAL AND HYDROLOGICAL STUDY OF PHULMBRI TALUKA AURNGABAD DISTRICT"INDIAN STREAMS RESEARCH JOURNAL ISSN:2230-7850
* Pramod Pathrikar"GEOLOGICAL STUDY OF MAHIASMAL GHATS OF KHULTABAD TALUK DISTRICT AURNGABAD" Indian streams research journal ISSSN2230-7850Impact Factor 0.2105 Vol.III Issue.vii/aug-2013 "
* Pramod Pathrikar"ROLE OF REMOTE SENSING IN GEOLOGYCAL STUDY OF SANJUL VILLAGE AT GP-08 WATERSHED" Indian Streams Research Journal ISSN 2230-7850 Volume-4 | Issue-4 | May-2014 Available online at www.isrj.net Impact Factor 0.2105
* Pramod Pathrikar"GEOLOGY OF HARD ROCK AQUIFER AND ROLE OF SOIL IN RECHARGING AQUIFER IN PURNA RIVER BASIN,AURANGABAD (M.S) INDIA"International Multidisciplinary Research Journal Golden Research Thoughts Vol 3 Issue 12 June 2014 ISSN No :2231-5063 Impact Factor : 2.2052(UIF)
* Director, WALMI, "Crop Water Requirements", Publication No. 30 Fourth edition, Water and Land Management Institute, Aurangabad-5, 1994.
* Govt. of India, Ministry of water Resource, Annual Report, 2001-02.
* Govt. of Maharashtra, Report of 2nd Maharashtra water and Irrigation Commission.
* Govt. of Maharashtra, Water Resources Department Report on Water Audit of Irrigation Project in Maharashtra 2005-06, 2007.
* P.W.D., Handbook, Chapter 6, Engineering Geology, Govt. of Maharashtra.pp 105-220.

Nilesh Kale, Jyotiram More: Hybrid Classification Of Land Use Land Cover In Change Detection Of Upper Ghod Basin In Pune (Maharashtra) Using Remote Sensing Techniques.Impact Factor 1.906Peer Review International Journal of Maharashtra Bhugolshastra Sansodhan PatrikaJan-Jun 2015 Vol- 32, No. 1PP- 9-17108ISSN (print/online): 0971- 6785.URL/DOI: http://www.mbppune.org/index

* Sunil Thakare, Jyotiram More: –Delineation And Mapping Of Saline Lands Using GIS A Study Of NiphadTahsil, Dist- Nashik. Impact Factor 1.906Peer Review International Journal of Maharashtra Bhugolshastra Sansodhan PatrikaJan-Jun 2015 Vol- 32, No. 1, PP- 90-96108ISSN (print/online): 0971- 6785.URL/DOI: http://www.mbppune.org/index

***Pramod B. Pathrikar**
Head Dept. of Geology
Rajarshi Shahu collage
Pathri Tq. Phulmbri Dist. Aurangabad