GEOLOGICAL INVESTIGATTION OF PERCOLATION TANK

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Abstract: A percolation tank is defined as the area of land where all of the water that is drain off of it goes into the ground water table. Percolation tank are constructed for increasing water table depth below the ground surface. The recharge occurred from the percolation tank has been helped to generate the additional ground water potential to increase the irrigation, the irrigation activity as well as water supply available for the drinking purpose in summer season.

It has been noticed that even after the 65 years of independence there is scarcity of water in many of Indian villages, in these villages water has to be supplied by the tankers. This shows us the importance of percolation tank development and make the village self-sufficient. Thus our Indian farmers entirely depend on the rain water for agriculture purposes instead of finding the measures to conserve the water. The key to increase agriculture output and improve economic condition.

Keywords: - ***Groundwater recharge, Downstream, Water traffic, Rainfall, Irrigation etc.***

1. INTRODUCTION

The **preliminary geological investigation** that construction of Percolation tank may require; the paramount presence an intangible seeming exploration, where the geotechnical contrive & Geologist is asked by the engineers to ascertain the preeminent of numerous promising localities for the suggested erections.

This variety of assignment largely does entail an exhaustive subsurface exploration. It is ordinarily entail to geologic investigation and some test group, field credentials of subsurface state of affairs to succeed general site portrayal, and general comments such as the deepness to astound or proficient soils, consistency of rock, specific gravity of soil, safe bearing capacity of soil, occurrence of resolution voids, animate bonds in stumpy deceitful muddy extents, and/or confirmation of old fill, fragments, or impurity. Theoretical study Inquiries entail workroom testing and generally depend on the portrayal of subsurface settings from boring logs primed by an expert arena engineer and/or geologist.

2. OBJECTIVES

1) Surface surveys.
2) Sub-surface investigation by resistivitymethod.
3) Interpretation.

3. METHODOLOGY

These are necessary to finding out the nature and structure of the rocks immediately below the ground levels. Investigations would consist of proper drilling and resistivity method, maintaining proper record of observations during these methods and collection of specimens, by a qualified agency and the interpretation by an expert engineering geologists or by an engineer specifically trained in engineering geology. Important steps in investigations would be:

1. Surface investigation.
2. Sub-surface investigation by resistivitymethod.
3. Collecting samples and their testing.
4. Interpretation.

4. EXPERIMENTAL WORK

1. It is necessary that the contrive, and if probable the assignment project contrive, demeanors an exploration official visit to the development spot to advance an indebtedness of the, topographic, and environmental landscapes of the location The plan-in finger location official visit is a upright prospect to acquire round:
2. Geologic investigation
3. Position of subversive and above
4. Head-to-head terrestrial use (conservatories, minsters, exploration services, etc.)
5. Right-of-way restraints

6. Conservational topics
7. Grades, ridges, corrosion geographies, & external defrayal
8. Deluge equal

Generally, there are two types of field subsurface investigation methods, best conducted in this order:

- Core drilling method
- Resistivity survey

We are going to perform the resistivity method, so we are discussing them in detail.

RESISTIVITY SURVEY-

The electrical resistivity method is an excellent and standard tool for mineral and ground water exploration and mapping of basement configuration for engineering and military purposes. Self-potential was the first parameter to be observed some time in 1836 by Fox. However, wenner and schlumberger developed their schemes in the early part of the present century. Stefanescu's computation of electric potential due to a point source accelerated the development of the electrical method in general and resistivity depth sounding in particular.

The electrical resistivity method is carried out primarily for two purposes; 1) to observe the lateral variation in resistivity values and 2) to determine the resistivity distribution with depth. The former approach is called resistivity profiling mainly used in mineral exploration, location of dykes, veins, fault zones, fracture zones etc. The second approach is referred to as resistivity depth sounding commonly employed in groundwater exploration, bed rock depth determination and in finding out basement configuration.

The resistivity of naturally occurring rocks and minerals varies over a very wide range. While quartz has a resistivity in order of 10^8 ohm m, the most conducting silver lies on the other end with a resistivity of the order of 10^-8 ohm m. No other physical property has such a vast range. The conductivity of the elements and minerals depends on

The presence of free electrons whereas that of the rocks is primarily due to the moisture content.

TRUE RESISTIVITY=2x3.14xa (V/I)

Where, a = electrode spacing

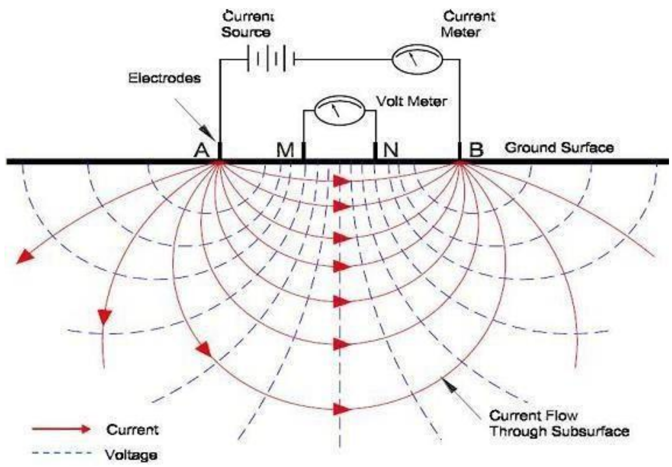
V = potential differenceI = current

Resistivity meter

PRINCIPLE

Groundwater contains various dissolved salts and it is ironically conductive, this enables electric currents to flow into ground. As a result, by calculating the ground resistivity it gives the possibility to the availability of water, taking in consideration the following properties:

A hard rock with no pores or fracture and a dry sand devoid of the water or clay are extremely resistive: several tens thousands ohm m A porous or fractured rock containing free water has a resistivity that depends on resistivity of the water and on the porosityof rock , several tens to several thousand ohm m An impermeable clay layer, containing bound water, has low resistivity: several units to several tens ohm m. Mineral ore bodies such as iron, sulphide etc. have verylow resistivity because of their electric conduction : usually less or much less than 1 ohm m.



Field procedure

Electric current from one electrode to other flows by application of external voltage at two points at ground surface through metallic electrodes. In direct (DC) resistivity method non –polarizing electrodes are used to measure potential difference to eliminate contact polarization. In the field procedures a copperimmersed in saturated

Copper sulphate solution in porous pot has been usedas a non-polarizing electrode and potential is measured at two points arranged between two current electrodes.

Electrical profiling and electrical depth sounding are two survey procedures to delineate horizontal distribution of electrical resistivity and electrical coring or vertical distribution of electrical resistivity respectively.

Occurrence of ground water

Ground water under phreatic condition occurs in the soft mantle of weathered rock, alluvium and laterite overlying the hard rock. Under this soft mantle, ground water is mostly in semi-confined state in the fissures, fractures, cracks, and joints. (Deolankar 1980) In basaltic terrain the lava flow junctions and red boles sandwiched between two layers of lava flows, also provide additional porosity. The ratio of the volume of water stored under semi-confined condition within the body of the hard rock, to the volume of water in the overlying phreatic aquifer depends on local conditions in the mini-watershed. Dug-cum-bored wells tap water from the phreatic aquifer and also from the network of fissures, joints and fractures in the underlying hard rock.

Table:1

Depth (m)	Current	Potential meter	1/R	Difference of 1/R	Ohm
1	100	1.12	0.86	_	_
2	100	1.10	0.90	0.04	157
3	100	1.09	0.93	0.03	209.33
5	100	0.81	1.23	0.30	41.87
7	100	0.52	1.92	0.69	18.20
10	100	0.52	1.92	0	INF
12	100	0.44	2.27	0.35	35.88
15	100	0.40	2.50	0.23	81.90
20	100	0.35	2.85	0.35	89.71
25	100	0.33	3.03	0.18	174.44
30	100	0.28	3.57	0.54	58.14
35	100	0.27	3.70	0.13	241.54

Presentation of interpreted data

The processing of electrical profiling data yields apparent resistivity for the different electrode separations which, in turn, corresponds to lateral resistivity distribution at different depths. This data can be presented as resistivity contours. Low and high resistivity zones are correlated with local geological setting for a semi-quantitative interpretation for potential zones for groundwater.

In case of electrical depths sounding one obtains depth

Wise distribution of resistivity in different layers, and the resistivity values are correlated with local geology for meaningful interpretation. These data can be presented in different ways:

1. Contouring of the basement topography
2. Contouring of the thickness of the different earth layer

Test Spot – siddheshwar temple(karad)

This is equivalent to isopatch maps. This provides a means to assess the aquifer potential. The resistivity contours corresponding to different electrode separations provide overall view of the lateral and

Vertical variations in lithology of survey area. The Resistivity variations along different traverses can be plotted and correlated with the lithology. Three-dimensional view of the surface, the lower half-space and the aquifer zones based on resistivity values can also be presented.

Extension use of electrical resistivity method for groundwater exploration is because of direct relation between electrical conductivity and groundwater, simple field operations and improved interpretation techniques. Depth of the occurrence of groundwater and location of well sites can be determined more Precisely by electrical resistivity. However, these studies besides mapping and delineation of potential areas on small and regional scales help geologists for the determination of hydraulic characteristics of aquifers characterization of lineaments to locate groundwater potential zones, flow pattern of groundwater, estimation of natural recharge.

RESULTS & DISCUSSIONS

Formula for calculating Resistivity = 2x3.14x (depth) Water prospective:-

- 0-20(R) : loose soil
- 20-25(R) :sand, kankar, highly weathered basalt
- 25-24(R) :fractured rock (pours)
- 45-55(R) :jointed hard rock
- 55-INF(R) :compact basalt

Sr. No.	Depth (m)	Formula	RESISTIVITY
1	1	2x3.14x1	6.28
2	2	2x3.14x2	12.56
3	3	2x3.14x3	18.84
4	5	2x3.14x5	31.40
5	7	2x3.14x7	43.96
6	10	2x3.14x10	62.80
7	12	2x3.14x12	75.36
8	15	2x3.14x15	94.20
9	20	2x3.14x20	125.60
10	25	2x3.14x25	157
11	30	2x3.14x30	188.40
12	35	2x3.14x35	219.80

DISCUSSION

Below the10 meter there is jointed hard rock and compact basalt so the tank was initially proposed as a percolation tank, but actual purpose is partially fulfilled. The barrier constructed on the existing ground has deposition of alluvium soil, weathered rock, loose soil and sheet jointed rock. Water from the base of the barrier flows down through this layer instead of percolating in ground. Reservoir should be excavated upto 12 mts on upstream side of barrier tank to serve the reservoir as hanging percolation tank.

CONCLUSION

We conduct surface survey, in that we found that site is topographically suitable for percolation tank By resistivity method we can find out there are loose soilSand, kunkar, highly weathered basalt fractured rock (pours) jointed hard rock available below the ground in specific depth interval.

The tank was initially proposed as a percolation tank, but actual purpose is partially fulfilled.

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