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# GROUND WATER ANALYSIS OF GULBARGA DISTRICT

[1] POOJA D MAVUR, [2]SHARANAMMA, [3] PREETI ARAKERI,[4] SWETHA

[1,2] UG Student Department of Civil Engineering and Technology Sharnbasva University, Kalaburagi, Karnataka

[3,4] Assistant Professor, Department of Civil Engineering and Technology Sharnbasva University, Kalaburagi, Karnataka

***Abstract:*** Study of water quality tells about present status of unstable water for domestic use. Indiscriminate and wasteful water consumption and improper waste disposal practice have led to deterioration of both, surface water and subsurface water. Due to the pressure of human activity, urbanization and industrialization, the ground water sources are degraded gradually. Therefore pure, safe, healthy and odorless drinking water is matter of deep concern. There are many pollutants in ground water due to sewage viz, organic and inorganic pollutants, heavy metals, pesticides, fluoride etc. The purpose was to ascertain the quality of water from these sources. These were analyzed for Acidity, Alkalinity, Chloride, Hardness, pH, Fluoride and Nitrate using standard techniques in laboratory.

***Key points –*** Collection of Sample, Chemical Parameter testing, Health issues etc.

**Introduction:** next to air, the other important requirement for human life to exist is water. it is natures free gift to the human race. It is available in various forms such as rivers, lakes, streams, infiltration galleries, springs, borewells etc. Most of the underground water is used for domestic purpose as well. The importance of water in human life is so much that the development of any city of the world has practically taken place near some source of water supply. It may also further be noted that the water is available in solids, liquid and gas forms. The occurrence of water in all these three forms is basically important for human beings for comfort, luxury and various other necessities of life. In addition to the direct consumption of water at homes and farms, there are many indirect ways in which water affects our daily life. The water plays an important role in the manufacture of essential commodities, generation of electric power, transportation, recreation, industrial activities, etc. Thus the water can be considered as the most important raw material of civilization because of the fact that without water, the man cannot live and industry cannot operate. With our growing population and industrial developments, the demand of water is also increasing day by day and hence, every country has to take preventive measures to avoid careless pollution and contamination of the available water resources. When man fell in short of surface water, the alternate source of water is underground resource. The quality of underground water depends on geological condition of that locality, infiltration water etc. falling in short of surface water has led to the use of underground water. In Gulbarga like city, which receives less rainfall farmers depend upon borewells for irrigation. A majority of extracted groundwater, 70%, is used for agricultural purposes [1].

## I. A STUDY AREA

***Location:***

Gulbarga district lies in the northern part of Karnataka between 16°42' – 17°46' N. latitudes and 76°04' - 77°41' E. longitudes, with a geographical area of 10950 sq. km.The district is bounded by Bidar district in the north, Bijapur district in west, Yadgir district in south and Andhra Pradesh in the east as shown in fig1.

The soil types in the district are deep black, medium black soil, shallow soil and lateritic soil. The deep & medium black soil covers practically the entire district's area, except a small portion towards the northern part of the district. Black soil has been derived from basaltic rocks and varies in colour from medium to deep black. Its thickness varies from 0.5 to 3.6 m. Infiltration rate of shallow, medium and deep black soil is moderate to poor. Infiltration rate of medium black soil recorded in the district is 2.5 cm/hr

Lateritic soil occurs in small extent towards the northern part of the district and its thickness varies from 1.0 to 5.0 m. It has moderate to good infiltration characteristics. [1]

Major ground water bearing formations are granite, gneiss, limestone and vesicular basalt. The Granite and basalt are igneous and volcanic rock respectively. These rock contains fluorine upto 100ppm to 1000ppm. Nitrate does occur naturally in ground water. The main source of recharge to ground water is precipitation, followed by seepage from canals and return flow from irrigation. Deccan Trap basalts, which comprise different flows, fractures & interstitial pore spaces of vesicular zone, are good repositories of ground water. [2]


FIGURE 1: MAP OF KALABURAGI

## II LITERATURE REVIEW

**1A. kistanet al. (2013):** They studied, the Analysis of Ambattur Lake Water Quality with Reference to Physico-Chemical aspects at Chennai, Tamil Nadu. The study was designed to assess the nature and Physico chemical characteristic of water samples collected from in and around Ambattur Lake. The study reveals that Ambattur Lake shows high mineral contents in terms of total dissolved solids, total hardness, Calcium, Magnesium, Nitrate and Chloride.

**2. Qureshimatva UMI, Maurya RRI, Gamit SB1. Patel RD2 and Solanki HAI :** The present study was carried out to determine various physico-chemical parameters and water quality index of the western part of Ahmedabad District to examine the quality of water for public consumption, recreation and other purposes. This study deals with the influence of environmental factors as well as domestic activities in the water quality in the related area.

**3. Umerfaruq M et al. (2015)**: The author worked on study of physico-chemical parameters of water in 171 Bibilake, Ahmedabad, Gujrat reveals the Temperature, turbidity, nutrients, hardness, alkalinity, dissolved oxygen, etc. are some of the important factors that determines the growth of living organisms in the water body. The comparison of statistics with the standard values of W.H.O guidelines (1998) revealed the high level of turbidity, total dissolved solids, pH, hardness, alkalinity and phosphate in the water content. The accumulation of these pollutants poses a dangerous threat to both aquatic and human lives.

**4. Shweta tyagi ,bhavtosh sharma, prashant singh, rajendra dobhal:** Have studied the water quality index (WQI) is valuable and unique rating to depict the overall water quality status in a single term that is helpful for the selection of appropriate treatment technique to meet the concerned issues. However, WQI depicts the composite influence of different water quality parameters and communicates water quality information to the public and legislative decision makers. In spite of absence of a globally accepted composite index of water quality, some countries have used and are using aggregated water quality data in the development of water quality indices.

## III OBJECTIVES

Survey and selection of water samples from same region which mainly includes ground water.

1. Dividing the city into four different zones, and collecting the water sample from each zone for laboratory study.
2. To study the chemical parameters of groundwater.
3. Comparing the chemical parameters with BIS values.
4. Concluding the study by giving its effect on human health.

## IV METHODLOGY

### STAGES INVOLVED IN METHODOLOGY OF OUR PROJECT

The methodology of our project consists of several stages which are explained below:

- Selection and study area
- Selection of sampling points.
- Sampling of groundwater from selected sampling points.
- Transportation of collected water samples to the laboratory.
- Selection of required volume of water sample.
- Analysis of various chemical parameters.
- Enumeration of results.
- Discussion and conclusion.
- The method used in laboratory by titration methods.

### SELECTION OF STUDY AREA

In this phase, under the guidance of our guide we selected the study area, the area taken into consideration for the chemical analysis of groundwater quality.

Then we decided the twelve no of locations from north, south, east and west side locations. we collected the 3 samples from each zones at a distance of 100m from each point.

- In North zone, zone 1 samples are collected from Brhampur Colony, KBN Nagar and Sedam road.
- In south zone, zone 2 samples are collected from Ganesh Nagar, Basavanagar and Sarvodaya Colony.
- In East zone, zone 3 samples are collected from Chittapur Road, Malgatti Road and Sangameshwar Colony.
- In West zone, zone 4 samples are collected from Shanti Nagar, Pragathi Colony, and Basava Colony.

## SAMPLING OF GROUNDWATER FROM SELECTED SAMPLING POINTS

In this phase of our project, sampling of groundwater was undertaken from the 12 selected sampling points as shown in T-1 located in the above mentioned 4 zones.as shown in Fig 4

**Table-1 Sampling Points**

| SI No | Sample No | Location |
|---|---|---|
| 1 | S1 | Bhrampur |
| 2 | S2 | KBN Colony |
| 3 | S3 | Sedam Road |
| 4 | S4 | Ganesh Nagar |
| 5 | S5 | Basava Colony |
| 6 | S6 | Sarvodaya Colony |
| 7 | S7 | Chittapur |
| 8 | S8 | Malagatti |
| 9 | S9 | Sangmeshwar colony |
| 10 | S10 | Shanti nagar |
| 11 | S11 | Basava Colony |
| 12 | S12 | Pragati colony |

FIGURE 2 Sampling bottles

Water from various zones of Gulbarga District were collected in plastic bottles. Before sampling, bottle was soaked in HCl and rinsed with double distilled water. Necks of the bottle were tightly sealed as shown in fig 2.

**Chemical tests:**

1. Chloride
2. Total hardness
3. Acidity
4. Alkalinity
5. Fluoride
6. Nitrate

**CHEMICAL TESTS** For analysis all the chemicals used where A R grade Double distilled water was used for the preparation of reagent and solution. pH was measured by digital pH meter method. Total hardness of water was estimated by complexometric titration with EDTA. Chlorides content was determined volumetrically by AgNO3 titrimetric method of phenolphthalein indicator. And the results obtained were compared with BIS standards as listed in table-2

**Table-2 (BIS Standard)**

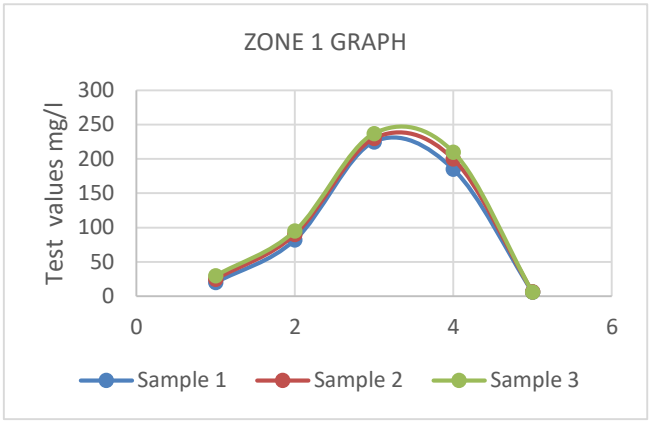
| SI NO | Parameter | BIS limits (mg/l) |
|---|---|---|
| 1 | Acidity | 20-60 |
| 2 | Alkalinity | 20-200 |
| 3 | Chloride Test | 250-600 |
| 4 | Hardness test | 100-200 |
| 5 | pH | 6.5-8.5 |
| 6 | Fluoride | 0.5-1.5 |
| 7 | Nitrate | 45 |

## VI. RESULTS AND DISCUSSIONS

**Chemical parameters of zone-1**

**TABLE -3 (Zone 1)**

| Tests | Sample 1 | Sample 2 | Sample 3 |
|---|---|---|---|
| Acidity test(mg/l) | 20 | 25 | 30 |
| Alkalinity test(mg/l) | 82 | 90 | 95 |
| Chloride test(mg/l) | 225 | 230 | 237 |
| Hardness test(mg/l) | 185 | 200 | 210 |
| PH | 6 | 6.5 | 6 |
| Fluoride | 0.1 | 0.2 | 0.15 |
| Nitrate | 30 | 30.2 | 31.2 |



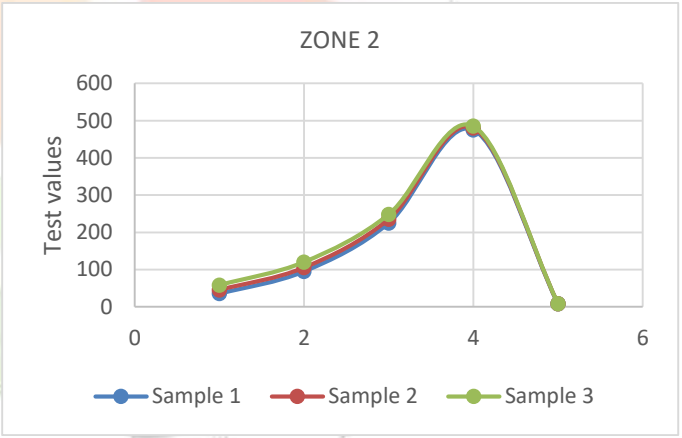

GRAPH 1

From T-3 we can infer that, in Zone 1Alkalinity is slightly higher in this region. All the other parameters are in the range of BIS limits and hence fit for drinking.

**Chemical parameters of zone-2**

**Table 4 (Zone 2)**

| SI no | TESTS | Sample 1 | Sample 2 | Sample 3 |
|---|---|---|---|---|
| 1 | Acidity test(mg/l) | 35 | 45 | 58 |
| 2 | Alkalinity test(mg/l) | 95 | 105 | 120 |
| 3 | Chloride test(mg/l) | 224.93 | 235 | 248 |
| 4 | Hardness test(mg/l) | 475 | 480 | 485 |
| 5 | PH | 8 | 8 | 8 |
| 6 | Fluoride (mg/l) | 1.9 | 2.1 | 2.13 |
| 7 | Nitrate (mg/l) | 31.2 | 32.03 | 30.11 |



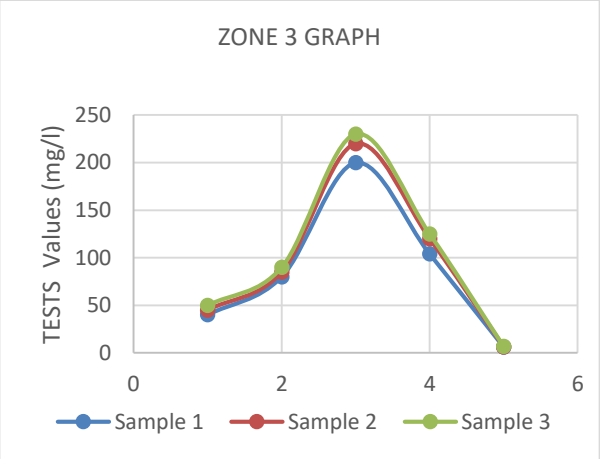

Graph-2

From T-4, in Zone 2, hardness of underground water is very high about 485mg/l and prove to be unfit for drinking. Fluoride content in this region is higher than the permissible value.

**Chemical parameters of zone-2**

**Table-5 (Zone 3)**

| SI NO | Tests | Sample 1 | Sample 2 | Sample 3 |
|---|---|---|---|---|
| 1 | Acidity test(mg/l) | 40 | 45 | 50 |
| 2 | Alkalinity test(mg/l) | 80 | 85 | 90 |
| 3 | Chloride test(mg/l) | 200 | 220 | 230 |
| 4 | Hardness test(mg/l) | 104 | 120 | 125 |
| 5 | PH | 6 | 6.2 | 6.8 |
| 6 | Fluoride (mg/l) | 1.8 | 1.7 | 1.9 |
| 7 | Nitrate (mg/l) | 47 | 48 | 4 |

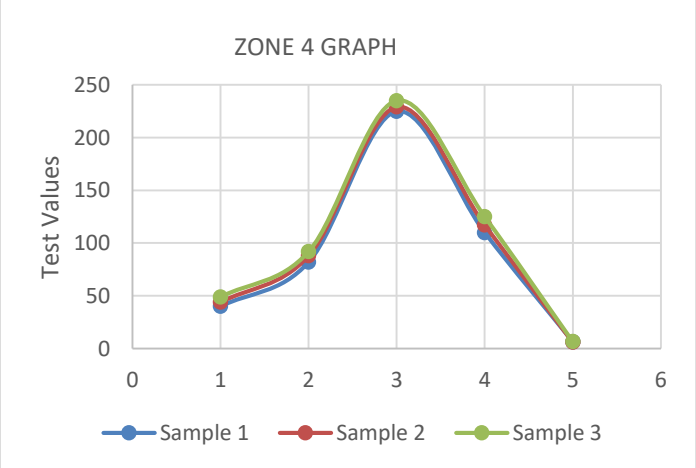



**Graph-3**

From T-5,in this zone-3,we have absorbed the higher value of fluoride and nitrate Concentration above the permissible limit

**Table-6 (Zone-4)**

| SI NO | Tests | Sample 1 | Sample 2 | Sample 3 |
|---|---|---|---|---|
| 1 | Acidity test(mg/l) | 40 | 44 | 49 |
| 2 | Alkalinity test(mg/l) | 82 | 88 | 92 |
| 3 | Chloride test(mg/l) | 224.93 | 229 | 235 |
| 4 | Hardness test(mg/l) | 110 | 117 | 125 |
| 5 | PH | 6.5 | 6 | 6.6 |
| 6 | Fluoride (mg/l) | 1.5 | 1.2 | 1.25 |
| 7. | Nitrate (mg/l) | 31.2 | 30 | 30.15 |



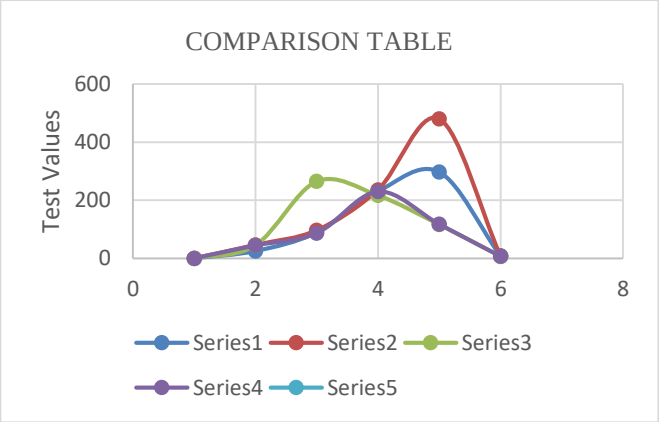

GRAPH 4

From the T-6 we can infer that in zone 4 all the parameters are found to be within the permissible limit.

**COMPARISON TABLE**

**Table 7**

| SI NO | Tests | Zone I | Zone II | Zone III | Zone IV |
|---|---|---|---|---|---|
| 1 | Acidity Test (mg/l) | 25 | 46 | 45 | 44.33 |
| 2 | Alkalinity Test(mg/l) | 89 | 96.66 | 265 | 86.66 |
| 3 | Chloride Test(mg/l) | 230.66 | 235.97 | 216.66 | 229.64 |
| 4 | Hardness Test(mg/l) | 297.5 | 480 | 116.3 | 117.33 |
| 5 | PH | 7.5 | 8 | 6.5 | 6.8 |
| 6 | Fluoride (mg/l) | 0.15 | 2.04 | 1.8 | 1.31 |
| 7 | Nitrate (mg/l) | 30.46 | 31.11 | 47.33 | 30.45 |




GRAPH 5

From T-7, by comparing the test values of all the zones we have come to the conclusion that, zone 2 and zone zone 3 regions underground water have more hardness and high fluoride content. Nitrate concentration is more in Zone 3 region.

## CONCLUSION

The analysis of groundwater from zone 1, zone 2, zone 3 and zone 4, we have concluded that zone 2 and Zone 3 have the high hardness compared to the other zones. NE and SW regions of Gulbarga district have basalt and Genies rock, which are Igneous and volcanic rock in origin. Fluoride concentration is high in this soil. Hence, fluoride concentration is high in groundwater also. Excess of Hardness, Nitrogen and Fluoride has to be treated before using it for drinking purpose. If not treated has serious health issues as mentioned in table-8

| SI NO | MINERALS | HEALTH EFFECT |
|---|---|---|
| 1 | Hardness | Kidney stones |
| 2 | Fluoride | Fluorosis |
| 3 | Nitrate | Methemoglobinemia |

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