

**WATER QUALITY ASSESMENT USING PHYSICO-CHEMICAL  
CHARACTERISTICS JAKKUR LAKE IN BANGALORE NORTH,  
KARNATAKA, INDIA**

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**Abstract:** *This Publication represents the Physiochemical Characteristics of Jakkur Lake in Bangalore North, Karnataka. Physiochemical Characteristics such as Water Temperature, Turbidity, TDS, pH, DO, Free Carbon dioxide and Total Hardness, Chlorides, Alkalinity, Phosphate and Nitrates were assessed. All Characteristics were within the permissible limit and hence found fit for domestic use.*

**Keywords:** *Perennial, Physico-Chemical Characteristics, Monthly variation, Biological variations.*

## 1. INTRODUCTION

Water Quality is represents the chemical, physical and biological characteristics of water, commonly in respect to its sustain for a chosen use. The fresh water is of invigorating concern for humanity since it is directly connected to human well being. Ground water is a precious natural resource of water supply all over the planet. Its use in agriculture, manufacturing and civilized usage proceed to grow where annual surface water places are absent. The current community, over drafting, rapid urbanisation and increased industrialisation has lead to fast degradation of our society. We all are aware about water has a lot of uses, such as for power generation, drinking, aquaculture, irrigation and domestic purposes.

We are looking for higher standards for drinking and in comparison to that used in agriculture and industries. Water quality standards are put in place to promise the efficient use of water for a designated cause. Water quality assessment is to find the required characteristics of water, following standard methods, to check whether they are in unison with the standard.

Water quality assessment is need mainly for tracking causes. Few important assessment consists:

1. To verify whether the water quality is in accuracy with the standards, and hence, appropriate or not for the designated use.
2. To track the efficiency of a system, working for water quality maintenance
3. To verify whether changing / change of an existing system is needed and to resolve what should take place.

The Jakkur lake is one of the biggest water source in Bengaluru and is especially special because it is a capable model for Water Management in urban areas. This complicated socio-ecological ecosystem is significant. The relationship between nature and mankind.

## 2. STUDY AREA

For the present study, an urban surface water body of Jakkurlake (fig 1) of Bengaluru city was selected. Jakkur is located at latitude 13°04' N and 77 °36' E and is in the North-East corner of Bengaluru city and eastern side of NH-4 covers an area of 18.95 sq.km, the same is seen in SOI topo sheet No. 57G/12.



Fig. 1 Map showing Jakkur Lake

### 3. EXPERIMENTAL METHODS

#### 3.1 WATER SAMPLING PROCEDURE AND ASSESMENT

The water samples were analysed for various parameters in the research lab. chemical and physical features like Temp, pH, Turbidity, TDS , TSS , Electrical Conductivity, Mineral Acidity, Total Hardness, Calcium, Magnesium, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD), Chloride, Iron, Nitrates, Phosphates and Alkalinity have been tracked for the lake water at different points from bore wells.

#### 3.2 SAMPLING POINTS

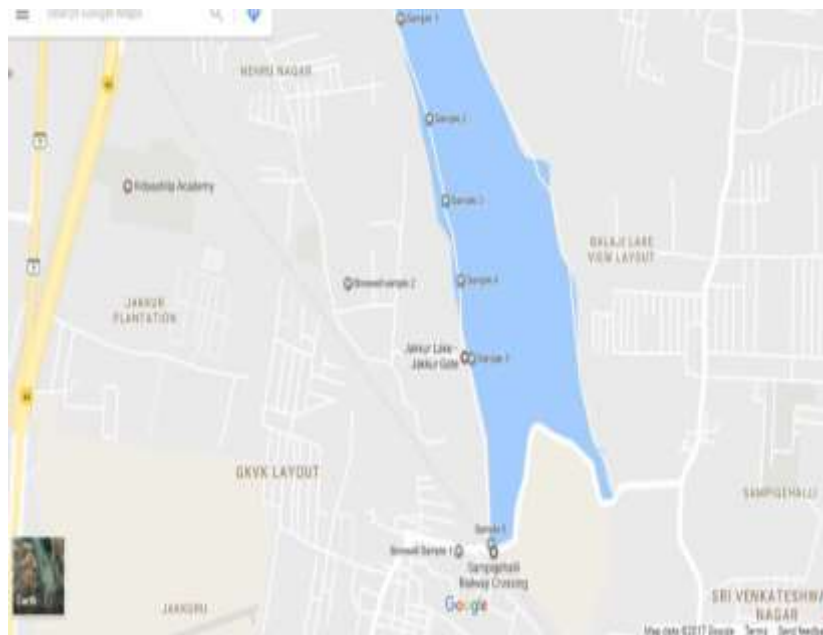


Fig.2 Map showing the sampling locations

### 4. MATERIALS AND METHODS

The Water Samples from Jakkur Lake were collected from different locations .The Water samples were immediately carried to Laboratory for the measurement of various Physical and chemical features like Temperature, pH, Turbidity, TDS , TSS , Electrical Conductivity, Mineral Acidity, Total Hardness, Calcium, Magnesium, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD), Chloride, Iron, Nitrates, Phosphates and Alkalinity .

### 5. RESULTS AND DISCUSSION

The six samples obtained from the lake at the following six locations (map coordinates) were tested for pH, Temperature, Conductivity, Acidity, Alkalinity, Total Solids, Hardness and various salts and the result obtained are illustrated in the Charts below with Characteristics on Y- axis and sample numbers on X – axis.

### 5.1 SAMPLES FROM LAKE:

Sample 1: Location (13°05'29.4"N 77°36'25.3"E)  
Sample 2: Location (13°05'20.9"N 77°36'29.1"E)  
Sample 3: Location (13°05'14.1"N 77°36'31.3"E)  
Sample 4: Location (13°05'07.4"N 77°36'33.2"E)  
Sample 5: Location (13°05'00.7"N 77°36'34.7"E)  
Sample 6: Location (13°04'45.1"N 77°36'37.2"E)

#### 5.1.1 TEMPERATURE

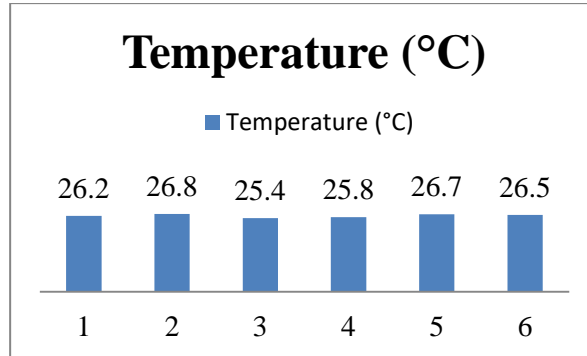


Fig. 3 Variation of temperature at various points of lake

#### 5.1.2 pH VALUE

The pH is a calculated for the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. It has no direct adverse affect on human health, however, a low value, below 4.0 will produce sour taste and higher value above 8.5 shows alkaline taste. A pH value between 6.5 to 8.5 is commonly acceptable as per ISI standards. In the samples collected from lake varies between 8.3 to 8.6.

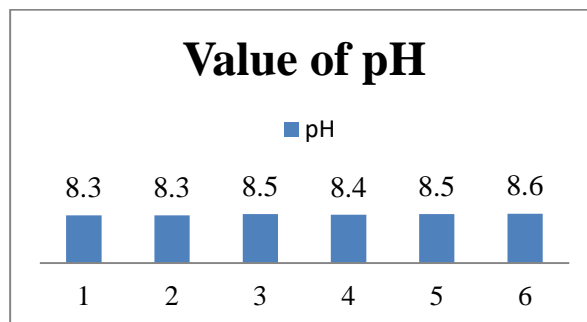


Fig.4 Variation of pH at various points of lake

#### 5.1.3 TURBIDITY

Calculations of Turbidity reflects the transparency in water. It is caused by the substances present in water in suspension. The limit for Turbidity according to (BIS 1998): Desirable limits 5 NTU and Permissible limit of 10 NTU. In the samples obtained from lake water is found to be highly turbid in the range of (18.3 NTU - 36.13 NTU).

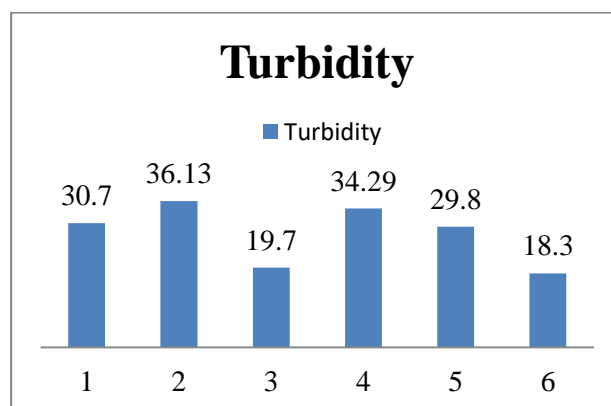


Fig.5 Variation of turbidity at various points of lake

#### 5.1.4 ELECTRICAL CONDUCTIVITY

Conductivity is a measure of water's ability to transfer electrical flow. This capability is directly related to the concentration of ions in the water. These conductive ions come from dissolved salts and inorganic materials such as alkalis, chlorides, sulfides and carbonate compounds. According to BIS (1998) the desirable limit is 1000  $\mu\text{S}/\text{cm}$  and permissible limit is 2000  $\mu\text{S}/\text{cm}$ . The water samples from the lake are well within the permissible limits ranging from 1113  $\mu\text{S}/\text{cm}$  – 1277  $\mu\text{S}/\text{cm}$ .

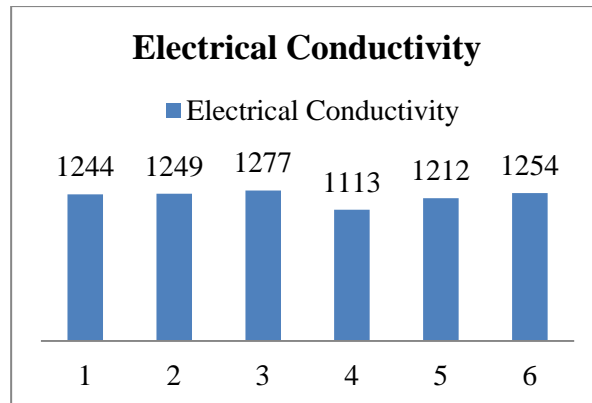


Fig.6 Variation of Electrical Conductivity at various points of lake

#### 5.1.5 MINERAL ACIDITY

Mineral acidity refers to the of mineral acids. Acidity is the ability of water to neutralize bases. A mineral acid is any inorganic acids. The samples obtained from lake have Zero mineral Acidity.

#### 5.1.6 ALKALINITY

Alkalinity refers to the capability of water to neutralize acid. This is really an expression of buffering capacity. A buffer is a solution to which an acid can be added without changing the concentration of available  $\text{H}^+$  ions (without changing the pH) appreciably. According to BIS (1998) desirable limit is 200 and permissible limit is 600. The samples obtained from lakes are well within the permissible limit (340 – 370).

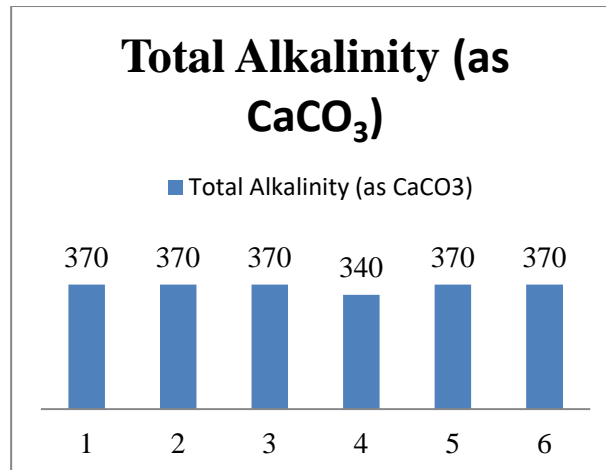


Fig. 7 Variation of alkalinity at various points of lake

#### 5.1.7 TOTAL SOLIDS

It can be defined as the material residue left in a vessel after evaporation of a sample and its subsequent drying in an oven at 103 to 105°C for one hour. **Total Dissolved Solids (TDS)** are the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water, expressed in units of mg per unit volume of water ( $\text{mg}/\text{l}$ ) **Total suspended solids (TSS)** include all particles suspended in water which will not pass through a filter. Suspended solids are present in sanitary wastewater and many types of industrial wastewater. According to BIS (1998) the TDS has its desirable limit as 500  $\text{mg}/\text{l}$  and permissible limit as 2000  $\text{mg}/\text{l}$ . The samples obtained are well within the permissible limit.

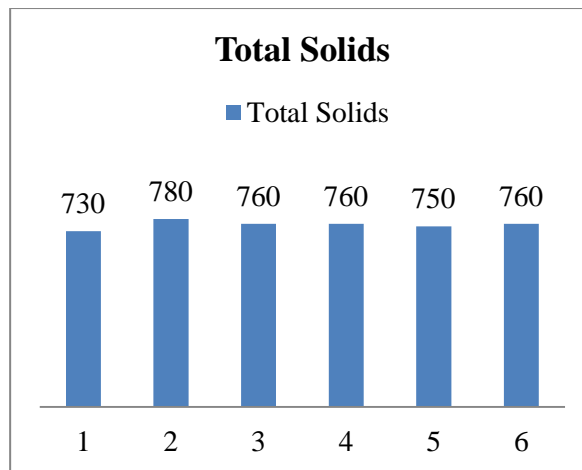


Fig.8 Variation of Total Solids at different points of lake

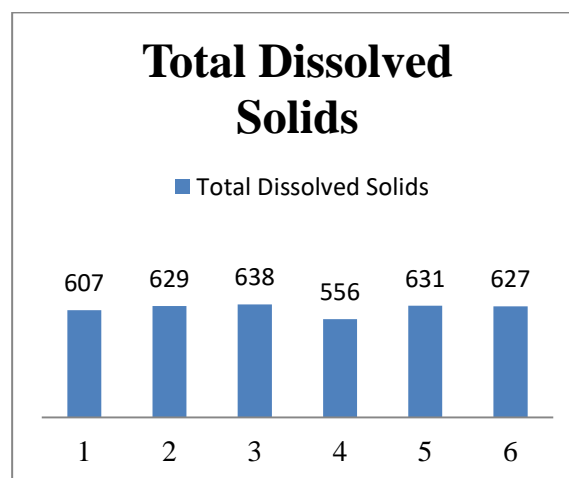


Fig.9 Variation of Total Dissolved Solids at different points of lake

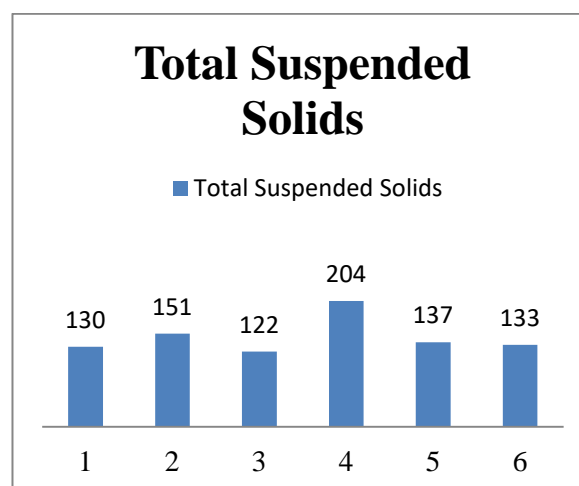
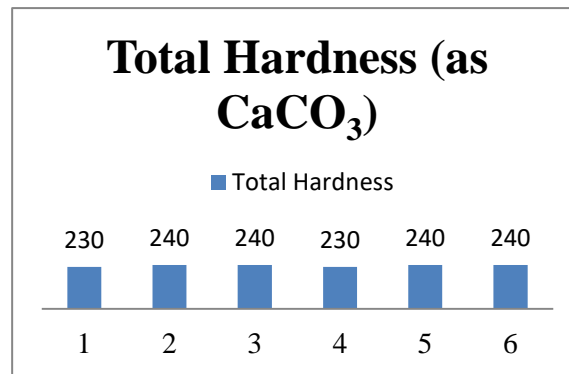


Fig.10 Variation of Total Suspended Solids at different points of lake

### 5.1.8 TOTAL HARDNESS

There are two types of water hardness they are Temporary and permanent hardness. Total hardness is defined as the sum of calcium hardness and magnesium hardness. Hard water contains dissolved magnesium and calcium ions. These make it more difficult for the water to form lather with soap. Temporary hardness is caused by dissolved calcium hydrogen carbonate (which is removed by boiling). Permanent hardness is caused by dissolved calcium sulfate (which is not

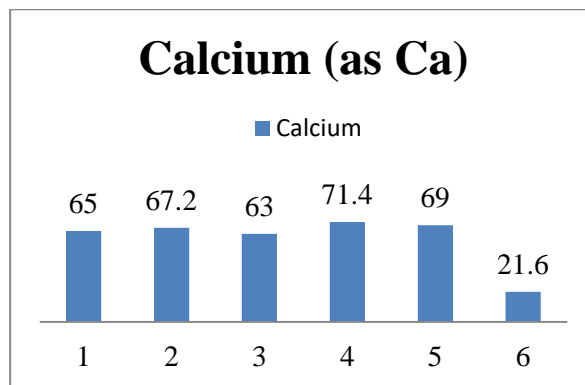
removed by boiling). According to BIS (1998) the total hardness desirable limit is 300 mg/l and permissible limit is 600 mg/l. The samples are well within the permissible limit.



**Fig.11 Variation of Total Hardness at different points of lake**

### 5.1.9 CALCIUM

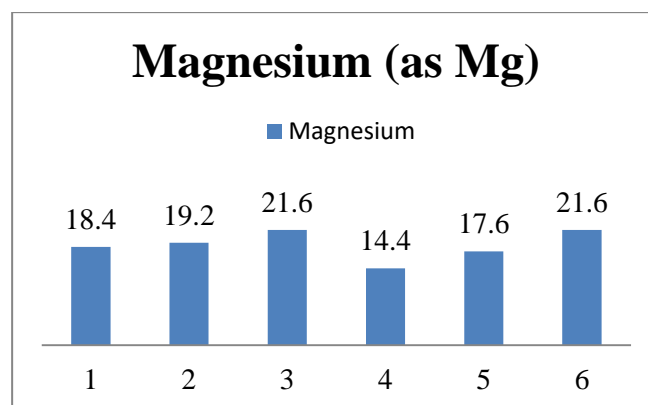
According to BIS (1998) the Calcium ions desirable limit is 75 mg/l and permissible limit is 200mg/l. The samples collected from the lake are under desirable limit.



**Fig.12 Variation of Calcium ions at different points of lake**

### 5.2 MAGNESIUM

According to BIS (1998) the magnesium desirable limit is 30 mg/l and permissible limit is 100 mg/l. The samples are well within the desirable limit.



**Fig. 13 Variation of Total Hardness at different points of lake**

### 5.2.1 BIOLOGICAL OXYGEN DEMAND

Biochemical Oxygen Demand (BOD) refers to the amount of oxygen that would be consumed if all the organics in one liter of water were oxidized by bacteria and protozoa. If BOD is found to be 1 – 2 mg/l then there will not be much organic waste present in the water supply. If BOD is found to be between 3 – 5 mg/l then it is moderately clean. If it is 6 – 9 mg/l then the water is somewhat polluted. If BOD is found to be more than 100 mg/l then the water is highly polluted and contains organic waste. The BOD of a water let out by the treatment plants should be less than 5 mg/l. The samples collected from the lake indicate that the water is highly polluted

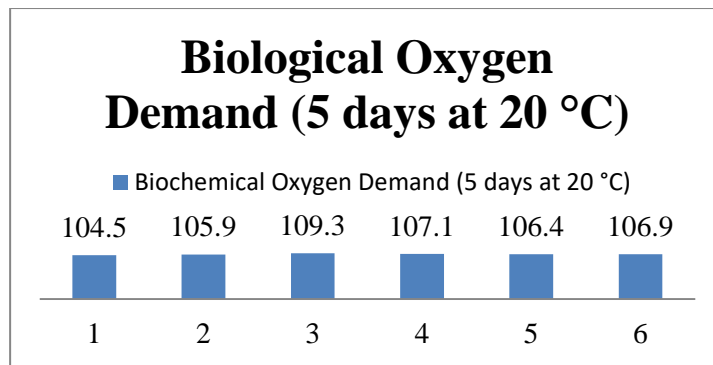


Fig.14 Variation of Total Hardness at different points of lake

### 5.2.2 CHEMICAL OXYGEN DEMAND

Chemical Oxygen Demand (COD) is a measurement of the oxygen required to oxidize soluble and particulate organic matter in water. According to BIS (1998) the permissible limit is 250 mg/l. The samples obtained from lake are within the permissible limit except for sample number 4 with 256 mg/l.

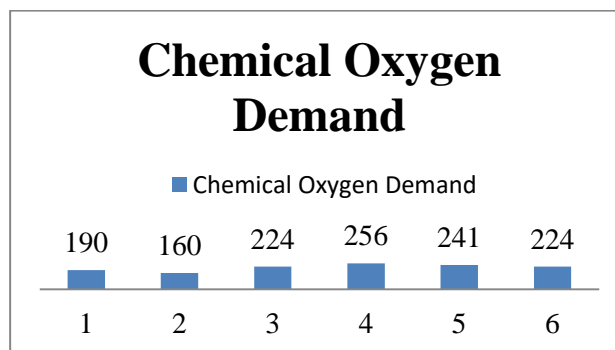


Fig.15 Variation of Chemical Oxygen Demand at different points of lake

### 5.2.3 CHLORIDES

According to BIS (1998) the desirable limit is 250 mg/l and the permissible limit is 1000 mg/l. beyond this limit taste corrosion and palatability are affected. The samples obtained from lake are under desirable limit.

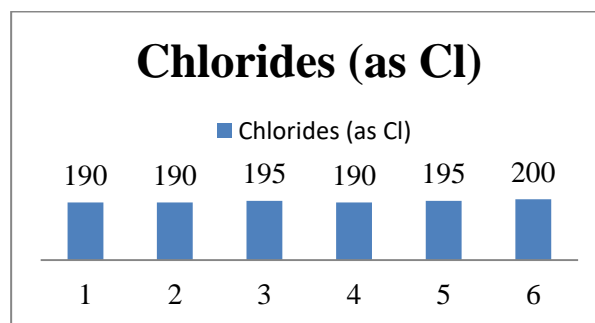


Fig.16 Variation of Chlorides at different points of lake

### 5.2.4 IRON

According to BIS (1998) the desirable limit is 0.3 mg/l and permissible limit is 1.0 mg/l. Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria. The samples obtained from lake are well within the desirable limit.

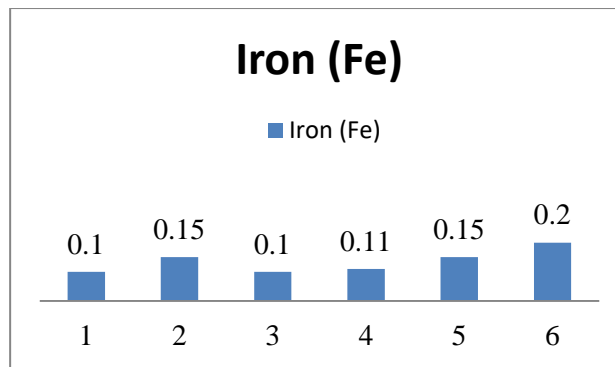


Fig.17 Variation of Iron at different points of lake

### 5.2.5 NITRATES

According to BIS (1998) the desirable limit is 45 mg/l and there is no relaxation. Beyond this value it indicates pollution. The samples obtained from lake are well within the desirable limit.

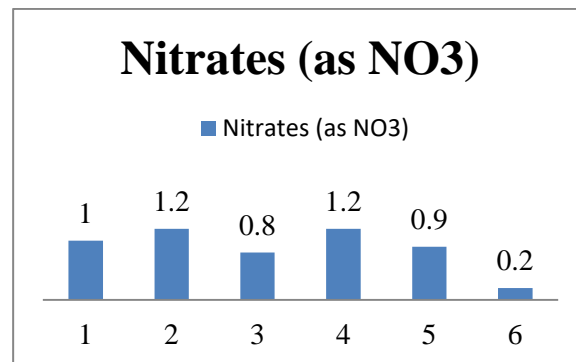


Fig.18 Variation of Nitrates at different points of lake

### 5.2.6 PHOSPHATES

According to BIS (1998) the desirable limit is 0.3 mg/l and there is no relaxation. The samples obtained from lake are well within the desirable limit except the sample number 6.

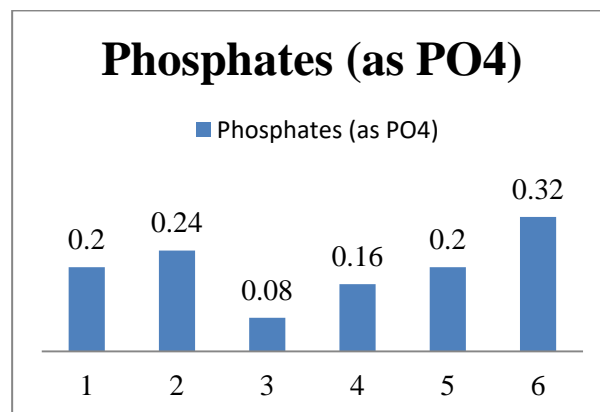


Fig.19 Variation of Phosphates at different points of lake

## 6. CONCLUSION

The samples were collected from lake and bore wells, after the conduction of tests and obtaining the values of various characteristics of all the samples, the average physical, chemical and biological characteristics of water vary from the usual water quality standards. The samples collected from lake have following average values such as pH at 8.4, turbidity - 28.15 mg/l, mineral acidity-0, alkalinity-365 mg/l, total solids-756.6 mg/l, hardness- 236.6 mg/l, calcium-59.5 mg/l, magnesium- 18.8 mg/l, BOD-106.8 mg/l, COD-215.6 mg/l, Chlorides-193.3 mg/l, Iron-2.1 mg/l, Nitrate-0.9 mg/l and Phosphate-0.2 mg/l.

Hence, according to the results obtained, the lake water is found to be highly turbid with even greater BOD and COD values than the permissible limits. Calcium, magnesium and chloride are found to be under the limit. Other characteristics which include pH, alkalinity, total solids, hardness, iron and nitrate are found to be within the acceptable limits. The water collected from the bore well were well within the permissible limit and hence found fit for domestic use.



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