Evaluation of Groundwater Quality of Bulandshahr City

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ABSTRACT: The study is aimed at assessing the water quality index for drinking purposes of ground water of Bulandshahr city, U.P. Ground water quality has been determined by collecting 15 samples from different parts of Bulandshahr city. For calculating parameters such as pH, alkalinity, Total Hardness, TDS, Conductivity, Chloride, were considered
No sample was found as excellent for drinking, although 1 sample out of all was found to be of good quality for drinking. More samples were declared poor for drinking purposes and 31.81 % samples were very poor for drinking purposes. This unsuitability of water quality of these samples is attributed to two factors i.e. large amount of waste water being discharged freely and over extraction of ground water by these industries. After analyzing the correlation between the parameters it was found that TDS showed a very strong relationship with conductivity and turbidity. The analysis revealed that the water of Bulandshahr is not good for drinking, thus it needed a pre-treatment before consumption and over extraction of ground water must be checked so as to curb the quality of ground water.

Keywords: Water Quality, Chloride, TDS, , Alkalinity

1. INTRODUCTION

Water is one of the biggest needs of human life. It comprises 71% of the earth's total area, out of which only 2.5 % is fresh water, which is termed as fit for human use and rest is saline water. Water gets itself helpful in each type of life, for example, drinking, showering, horticulture, assembling and development exercises, and so on. In this way, for smooth running of these structures the nature of water should be an imperative factor. Presently the fundamental issue today with the water is that, how might we make the water fit for drinking and different purposes? Water on earth is either found on surface of earth which is called Surface Water or is found underneath the surface of the earth known as Ground Water. Ground water constitutes 97% of worldwide crisp water. Groundwater is the water exhibit underneath the surface of the earth in the dirt pores or in the layers display in spaces between the stones. At the point when rain tumbles to the ground, the water does not quit moving. Some of it streams along the land surface to streams or lakes, some is utilized by plants, some vanishes and comes back to the environment, and some saturates the ground. Some of the researchers worked on this type of the study such as **A. Ashfaq et al. (2014) [1]** analyzed the water quality of Agra city for the evaluation of the current status of physico-chemical contaminants in groundwater. Groundwater samples were obtained from fifteen different sampling stations in Agra city. The procedure for analysis was followed as per standard methods of analysis of water and wastewater. All the parameters were found to lie well within the prescribed standard limits and water was termed as fit for drinking. **S. Thirumala (2014) [12]** analyzed ground water quality in Davangere city (Karnataka). Five different sampling stations were selected for analysis of pH, alkalinity, hardness, turbidity, sulphate, chloride, fluorides, dissolved solids and conductivity and it was seen that the groundwater quality of Davangere city was moderately contaminated and impact to health hazards. **M. Tiwari et al. (2015) [13]** studied water qualities at different areas of Hamirpur District (U.P.). Physico-chemical parameters were investigated such as TDS, pH, fluoride, nitrate, chloride, sulphate, hardness and alkalinity. Test result were found that most of the water samples were found to have total dissolved solids, alkalinity and hardness values more than their permissible level. **R.F. Inamdar et al. (2015) [2]** investigated water quality variables of ground water were assessed from Peerwadi open well of Uran Beach, Dist– Raigad, Navi Mumbai Various physico-chemical parameters assessed included pH, Temperature, Total solids (TS), Total dissolved solids (TDS), Total suspended solids (TSS), Conductance, Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Carbon dioxide (CO2), Chemical oxygen demand (COD), Salinity, Chloride, Alkalinity, Total hardness, Calcium hardness and Magnesium hardness. The study revealed that except the high values of chlorides and salinity, values of other physico-chemical variables were within the guideline values of WHO Standard for potable water. The quality of water from Peerwadi open well of Uran Beach was found to be safe and utilizable for drinking and other purposes. In this paper collected the samples then tested these samples and concludes the suitability for drinking of water.

2. STUDY AREA

2.1 Bulandshahr City

Bulandshahr city is district headquarter of Bulandshahr district in the state of Uttar Pradesh. It is an agricultural city, well connected by roads and railways. Bulandshahr lies between latitude 28º 24' and 28º24'48.7"north and Longitude is 77º49'and 77º 53' east. The Bulandshahr city is spread over an area of about 36.7km^2. The City is 237.44 meters above sea level. The average temperature is 25ºC in Bulandshahr. Precipitation here averages 826 mm annually (www.climatedata.org).

2.2 Sampling

15 samples of groundwater were collected from hand pumps and bore wells which drew water from the groundwater. Samples were collected in pre washed Plastic bottles of 5L capacity. Sampling network is also an important part of an analysis, so the sampling was done in such a way that the whole town was covered evenly in the study. The samples were collected from various hand pumps such as govt. hand pumps, bore wells etc.

2.3 Sampling Locations

Sampling was done from 15 different locations across Bulandshahr from different type of source. List of sampling locations and Sampling Map is given below in the Table 1 and Figure 1.

Table 1: Sampling location in the Bulandshar city

SAMPLE NO	SAMPLE TYPE	SAMPLE LOCATION
1	Govt. Hand Pump	Tehsil (Bulandshahr)
2	Govt. Hand Pump	Bus Stand
3	Govt. Hand Pump	Delhi Public School
4	Bore Well	Bhoor Chauraha
5	Govt. Hand Pump	Godsend School
6	Bore Well	Sneha Garden
7	Bore Well	Awas Vikas Colony
8	Govt. Hand Pump	Aggarwal Bhawan
9	Bore Well	Vaashu Dairy
10	Govt. Hand Pump	Krishi Utpadan Mandi Samiti
11	Bore Well	SK Company, Maruti Centre
12	Govt. Hand Pump	Bulandshahr Railway Station
13	Govt. Hand Pump	Kala Aam
14	Govt. Hand Pump	Numaish Ground
15	Bore Well	DM Residence

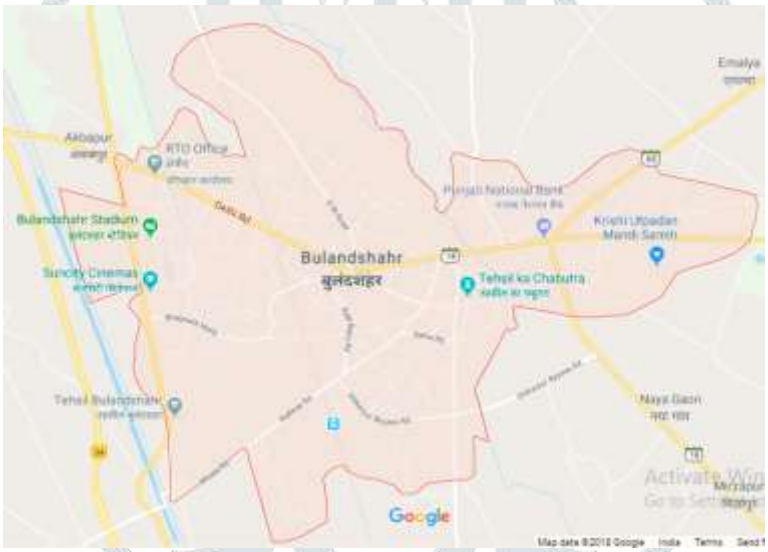

Figure 1: Graphical map of Bulandshar city

3. RESULT AND DISCUSSION

In Bulandshahr most of the wastewater from the industry goes directly into the natural streams such as lakes, canals, river streams etc. The contaminants in the water slowly reach the aquifer, thus making the groundwater unfit for drinking and other purposes. 15 samples from different part of Bulandshar district were analyzed for their physico-chemical parameters such as pH, Acidity, Alkalinity, Hardness, Total Dissolved Solids and Chloride as shown in Table 2.

Table 2: Test results of the samples

Sampling Site/parameters	Alkalinity (mg/l)	Acidity (mg/l)	Hardness (mg/l)	pH	Total Dissolved Solids (mg/l)	Chloride (mg/l)
1	284	8	364	6.8	440	89.55
2	368	16	304	6.8	320	29.98
3	288	8	196	6.9	320	65.96
4	280	16	412	6.8	370	69.96
5	252	12	232	6.9	300	23.98

6	312	16	312	7.0	410	65.96
7	364	4	232	6.6	390	75.96
8	332	8	288	7.0	510	115.94
9	328	12	600	6.7	960	269.86
10	572	24	312	6.6	780	117.94
11	564	12	432	7.0	1150	223.88
12	372	28	328	6.8	470	87.95
13	410	12	204	7.0	530	97.95
14	464	8	376	6.6	810	93.95
15	444	14	384	6.9	720	121.93

Perusal of the summarized data shown in the table 2 indicates that levels of some parameters at some location are exceeding the limit posing as a threat to groundwater. Alkalinity is found to be in limits except at Nazimpura. Hardness is exceeding from the limits at Vaashu Dairy and IP College. pH is found to be in limits. TDS is found to be high at SK & Company and at Vaashu Dairy. Chloride was found to be in limits but showed highest values at Vaashu Dairy and IP College. Calcium concentration was approximate to exceed the limits at Vaashu Dairy and SK & Company. It is the direct function of the TDS which tells the dissolved solids in a sample, which is concerning factor.. Table 3 shows the drinking water standards as specified by Indian Standards [3], [4].

Table 3: Acceptable and permissible limits of the Samples as per BIS

S.No	Physical Parameter	Acceptable Limit	Permissible Limit
1	TDS (mg/l)	500	2000
2	Turbidity (NTU)	1	5
3	Conductivity (uS/cm)	1500	3000
4	Total Hardness(mg/l)	200	600
5	Chloride(mg/l)	250	1000
6	pH	6.5	8.5
7	Total Alkalinity(mg/l)	200	600

3.1 Alkalinity

The alkalinity of water is a measure of its capacity to neutralize acids. The alkalinity of natural water is due to the salts of weak or strong bases. Large amount of alkalinity imparts bitter taste to the drinking water. All the samples had exceeding permissible limit i.e. above 200 mg/l. The graphical representations of Alkalinity of all the samples are as shown in Figure 2.

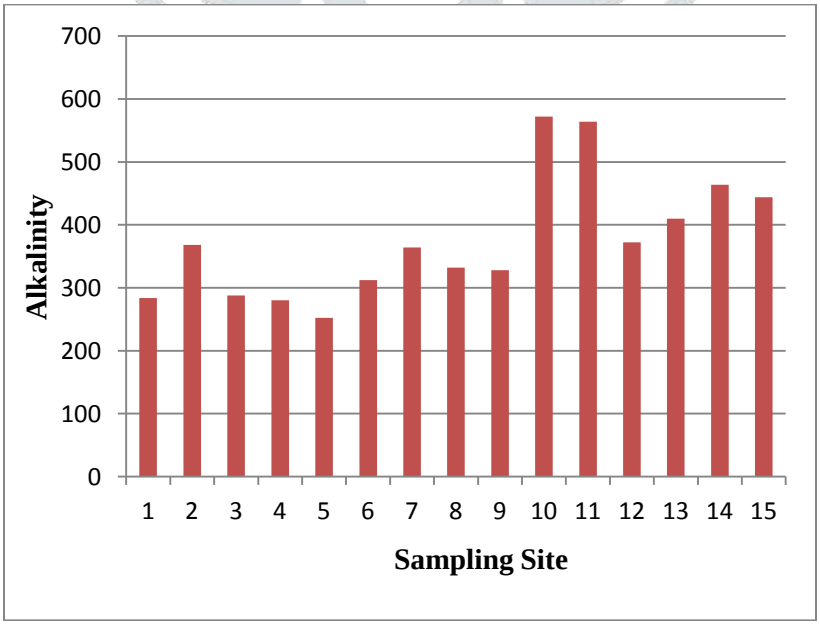

Figure 2: Graphical representation of Alkalinity of the Samples

3.2 Acidity

Acidity is defined as the capacity of water to neutralize bases. Acidity is also defined as the solution containing both strong acid and weak acid. Acids contribute to corrosiveness and influence chemical reaction rates, chemical speciation and biological processes. High values of acidity were found at Krishi Utpadan Mandi Samiti, Bulandshahr Railway Station. The graphical representations of acidity of all the samples are as shown in Figure 3.

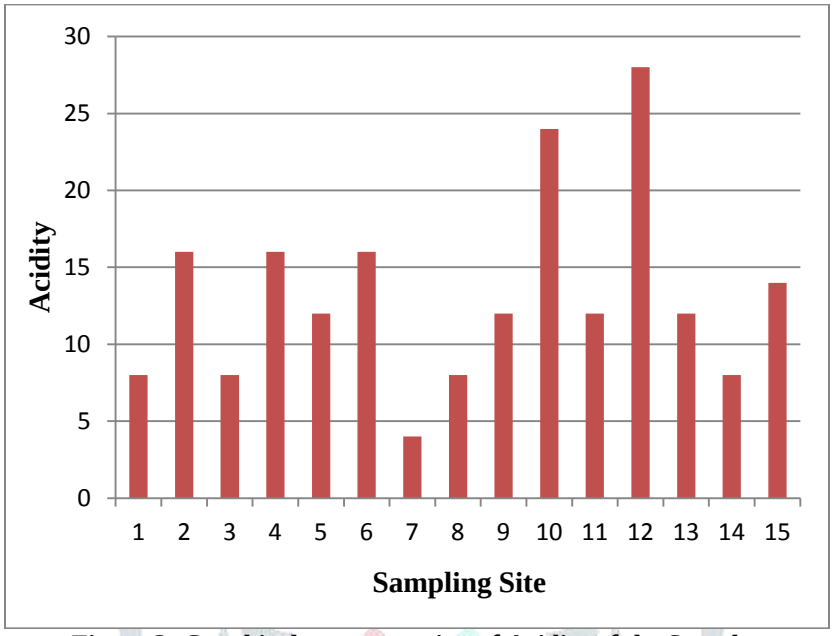

Figure 3: Graphical representation of Acidity of the Samples

3.3 Chloride

The presence of chloride in natural waters can be attributed to dissolution of salt deposits, discharges of effluents from chemical industries, oil well operations and seawater intrusion in coastal areas. Samples from Vaashu Dairy showed exceeded the acceptable value, but all were within the maximum permitted value. The graphical representations of chloride of all the samples are as shown in Figure 4.

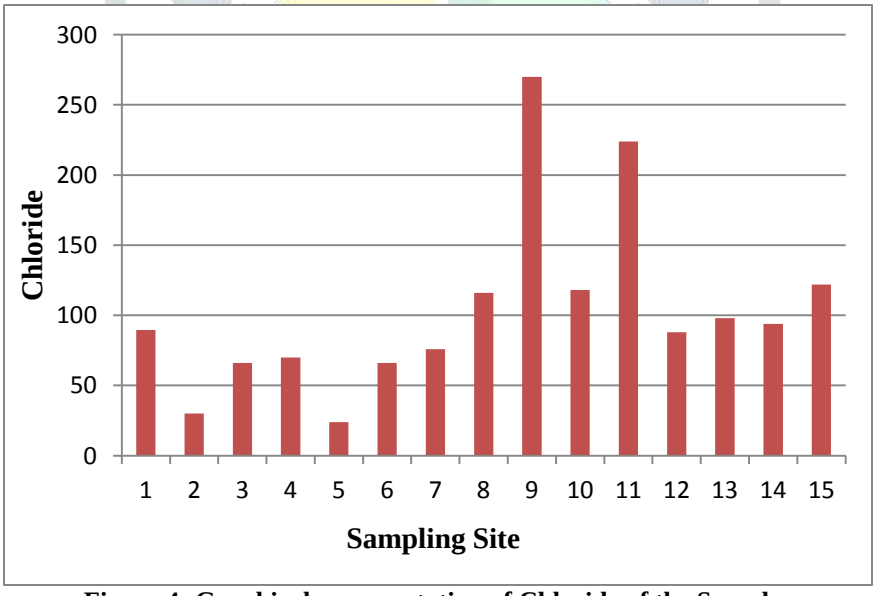

Figure 4: Graphical representation of Chloride of the Samples

4. CONCLUSION

The following conclusions were drawn based on the water quality parameters analyzed from the samples collected from Bulandshahr city:

- No samples were declared unfit for human drinking use. Only one sample from all samples was declared as good for drinking. More samples were declared as poor for drinking purposes.
- The analysis revealed that the water of Bulandshahr is not good for drinking, thus it needed a pre-treatment before consumption. Also the over extraction of ground water must be checked so as to curb the quality of ground water.

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