UNDERGROUND WATER QUALITY AT SAMBHAL, UTTAR PRADESH, INDIA

Navneet Kumar[1], Ashutosh Dixit[2]

[1]*College of Engineering, Teerthanker Mahaveer University, Moradabad, (India)*

[2]*IFTM University, Moradabad, (India)*

ABSTRACT

Underground water samples at five different water sites of public places were collected and analyzed for different water quality parameters following standard methods of sampling and estimation. The water quality index has been calculated for all the sites using the data of all parameters and WHO drinking water standards. The calculated data reveals that the underground water at Sambhal, Moradabad is severely polluted invariably at all the sites of study. The present study suggests that people exposed to this water are prone to health hazards of polluted drinking water.

Key Words: Water Quality, Water Quality Index, Unit Weight, Quality Rating.

I. INTRODUCTION

It is the duty of scientists to test the available water in any locality in and around any residential area. As a part of society, it is a must. Attention on water pollution and its management has become a need of hour because of far reaching impact on human health[1,5].

Sambhal is head quarter of tehsil previously a part of Moradabad district now of Sambhal district itself. It is 38 Km from district Moradabad, 52 Km from Gajraula and about 90 Km from J.P. Nagar. The total area of Sambhal Tehsil is 45 Km^2 with total population of more than 3 lacs. It is famous for mentha production and seeng work. Silver foil making is also prominent.

II. EXPERIMENTAL

Underground water samples of ten sites of India Mark-II (IM2) hand pump of public places at Sambhal were collected and analyzed quantitatively following standard methods of sampling and estimation[6]. The estimated parameters are pH, Turbidity, Conductivity, Alkalinity, Total Solids, Total Dissolved Solids, Total Hardness, Calcium, Magnesium, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Free CO_2, Chloride and Fluoride.

A brief description of sampling sites is presented in Table 1. Water quality index for all sites was calculated using the data of estimated parameters and WHO[7] standards by the methods prepared by Horton[8] and modified by Tiwari and Mishra[9]. The standard assumptions are: WQI < 50: fit for human consumption; WQI > 80: excessively polluted and WQI. 100: severely polluted.

Table 1: Details of Sampling Sites

S.No.	Site No. & Name	Location of site	Apparent water quality	Usage
1	I, Veterinary Hospital	6.0 km East from tehsil	Pale yellow on standing, odorless	Drinking & Bathing
2	II, Sambhal Block	0.5 km South to site no. I	Colorless, odorless	Drinking & Bathing
3	III, Roadways	5.0 km South-West from tehsil	Colorless, odorless	Drinking & Bathing
4	IV, Samudayik Swasthya Kendra	4.5 km East from tehsil	Colorless, odorless	Drinking & Bathing
5	V, District Court	5.0 km North-East from tehsil	Pale yellow on standing, odorless	Drinking & Bathing

Table 2: Site-Wise Estimated Values of Water Quality Parameters

S.No.	Parameter	Site no. I	Site no. II	Site no. III	Site no. IV	Site no. V
1	pH	8.16	8.20	7.95	7.97	8.03
2	Turbidity (NTU)	4.55	5.40	4.85	3.24	3.20
3	Conductivity (µS/cm)	0.755	0.832	0.551	0.470	0.712
4	Alkalinity (mg/lit)	240	176	260	168	256
5	Total Solids	1100	1250	1050	870	1210
6	Total Dissolved Solids	819	875	795	610	871
7	Total Hardness	508	560	656	576	492
8	Calcium	136	184	204	196	192
9	Magnesium	372	376	454	380	300
10	Dissolved Oxygen	2.11	2.0	2.25	2.45	2.22
11	Biological Oxygen Demand	31.20	28.10	29.20	26.10	31.85
12	Chemical Oxygen Demand	52	61	49	31	48
13	Free CO_2	88	149.6	198	268.4	171.6
14	Chloride	53.98	89.97	101.96	148.95	82.97
15	Fluoride	1.20	1.14	1.0	0.81	1.10

Table 3: Parameters, WHO Standards and Their Assigned Unit Weights (Wn)

S.No.	Parameters	WHO Standard	Unit Weight (Wn)
1	pH	8.0	0.023597
2	Turbidity (NTU)	5.0	0.037755
3	Conductivity (µS/cm)	0.300	0.629247
4	Alkalinity (mg/lit)	100.0	0.001888
5	Total Solids(mg/lit)	500.0	0.000377
6	Total Dissolved Solids(mg/lit)	500.0	0.000377
7	Total Hardness(mg/lit)	100.0	0.001887
8	Calcium(mg/lit)	100.0	0.001887
9	Magnesium(mg/lit)	30.0	0.006292
10	Dissolved Oxygen(mg/lit)	5.0	0.037755
11	Biological Oxygen Demand(mg/lit)	6.0	0.031462
12	Chemical Oxygen Demand(mg/lit)	10.0	0.018877
13	Free CO_2(mg/lit)	10.0	0.018877
14	Chloride(mg/lit)	200.0	0.000944
15	Fluoride(mg/lit)	1.0	0.188774

Table 4: Site-Wise Calculated Values of Water Quality Index

S.No.	Number and Name of Site	Water Quality Index (WQI)
1	I, Veterinary Hospital	216
2	II, Sambhal Block	231
3	III, Roadways	166
4	IV, Samudayik Swasthya Kendra	147
5	V, District Court	204

III. RESULTS AND DISCUSSION

The estimated values of water quality parameters for different sites are listed in Table 2. The parameters with their WHO standards and assigned unit weight (Wn) are given in Table 3. The calculated values of WQI are presented in Table 4. Critical analysis of data and its comparison with WHO standards and assumptions for WQI reveal following facts regarding the underground water quality at public places of Sambhal, Moradabad during the period of study.

Estimated values of different parameters indicate very clearly that their values are much higher than prescribed WHO drinking water standards and water is polluted and unfit for human consumption and other domestic purposes.

The calculated water quality index ranges from 147 to 231. Highest pollution is observed at site no. II and it is lowest at site no. III, however, it is still severely polluted. The water is found to be polluted at all other sites of study.

IV. CONCLUSION

It may be concluded that underground water at study area of Sambhal, Moradabad is severely polluted as indicated both by estimated values of parameters and calculated values of WQI and it is matter of great concern. People exposed to this water are prone to health hazards of polluted drinking water and underground water pollution management is urgently needed in the area of study. It may also be added that WQI is once again proved to be a fruitful tool for mathematical and collective assessment of water quality.

REFERENCES

[1] Mohan A, Singh R.K, Pandey Kirti, Kumar V and Jain V., Assessment of water quality in industrial zone of Moradabad: Physico-chemical parameters and water quality index, Ind. J. Env. Protection, 27 (11), 2007, 1031-1035.

[2] Pradhan, S. K. , Patnaik, D. and Rout, S. P., Ground water quality index for ground water around a phosphatic fertilizer plant. Indian J. Env. Prot., 21(4), 2001, 355-358.

[3] Caleb Adwangashi Tabwassah and Gabriel Ike Obiefun, Geophysical and geotechnical investigation of cham failed dam project, Ne Nigeria, Research Journal of Recent Sciences, 1(2), 2012, 1-18.

[4] Freeda. D and Rani. Gnana, Hydrochemistry of ground water of Thirumanur area, Tamilnandu (India), Journal of Environ. Science & Engg., 48(3), 2006, 199-102.

[5] D.K. Sinha, S.Saxena and R. Saxena, Ramganga river water pollution at Moradabad-A physico-chemical study. Indian J. Env. Prot., 24 (1), 2004, 49-52.

[6] APHA, Standard Methods for Examination of Water and Waste Water, (19th Ed., AWWA, WPCF, Washington D.C. 1995).

[7] W.H.O., International Standards for Drinking Water, (Health organization, Geneva 1971).

[8] R.K. Horton, An index number system for rating water quality. J. Water Poll. Cont. Fed., 37, 1965, 300.

[9] T.N. Tiwari and M. Mishra, A preliminary assignment of water quality index of major Indian Rivers, Indian J. Env. Prot., 5 (4), 1985, 276-279.