

Ground Water Quality Assessment of Waluj Industrial Area, Aurangabad (MS), India

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Abstract:

The constant deprivation of the water quality of central Maharashtra’s aquifer is of pronounced concern for different authorities and agencies involved in the water sector in the Maharashtra, India. The industrial ground water quality is single of the most important conditions to determine its suitability for human beings and irrigation. The research paper presents the ground water quality of Waluj Industrial Area in Aurangabad district, Maharashtra. It is one of the main polluted industrial areas which is under group’s category, receives all domestic and industrial waste water. In order to estimate quality of groundwater in the study region, ground water samples from different nine locations were collected and analyzed for various parameters. Physical and chemical parameters of groundwater such as Temperature, pH, TDS, TH, calcium (Ca²⁺), Magnesium (Mg+) sodium(Na+), potassium (K+), dissolved oxygen, COD and BOD were determined. It is found that average temp. 24.97, pH 8.55, TDS-443.75 mg/lit., dissolved oxygen 11.33 mg/lit.,Ca 16.04 mg/lit.,Mg18.30 mg/lit.,Na17.25 mg/lit., K1.22 mg/lit., BOD 11.67 mg/lit., COD162.62 mg/lit.and Total hardness was 124.62 mg/litre respectively. The estimated results revealed that some parameters found in high concentration. Most of the Physico-chemical parameters in the groundwater samples have higher value than the World Health Organization.

Keywords — Physico-chemical, groundwater, high concentration, and pollution.

I. INTRODUCTION

The groundwater contamination is one of the most solemn troubles at the global level in the last few years (Umar *et al.*, 2009). Groundwater in numerous zones, particularly in the arid and semi-arid regions, is a sufficient supply of water. Groundwater quality based upon the quality of recharged water, atmospheric rainfall, in land surface water and on sub-surfaces various geochemical processes. Temporal alterations in the mechanism of the recharged water, hydrologic and artificial components may cause periodic changes in groundwater quality (Vasanthavigar *et al.*, 2010). Water pollution not only affects physico-chemical and biological water quality parameters but also threatens human health, socio-economic

development, and prosperity (Milovanovic, 2007). The quality of groundwater has particularly gained immense attention since water of high quality is needed for domestic and irrigation requirements. Ground water is an incredibly crucial natural resource for the development of economy plus secure provision of potable water supply in both rural and urban environments (Foster *et al.*, 2002; Ghezelsflo and Ardalan, 2012; Wakode *et al.*, 2014). At the present time groundwater contamination has become one of the most serious problems throughout at the global level. Industrialization, urbanization, and agricultural processes affected the quantity and quality of groundwater (Jat *et al.*, 2009; Tiwari *et al.*, 2015; Rubia and Jhariya, 2015; Khan and Jhariya, 2016). Water pollution severely affected on economic

development, human health and social dimensions (Milovanovic 2007; Wakode *et al.*, 2014; Tiwari *et al.*, 2015). Recently it has been recognized that the quality of groundwater is approximately equal to the importance as the surface water quality (Todd 1976; Jhariya *et al.*, 2012). The current recognition may be clear about the partial natural resources and competing requirements. The main purpose of the present research study was to assess the quality of groundwater for the portability purpose.

II. MATERIAL AND METHOD

Aurangabad is one of the well-known industrial and fastest growing city and which is well known for its Industrial auto cluster. The temperature observed in summer max 43°C and min. 28°C and winter temperature max 32°C to 5°C. The sources of irrigation are streams, percolation tanks and wells in study area. Ground water plays a chief role for irrigation as well as domestic uses. The Study area covers the Aurangabad Waluj area which lies between 74 to 76 degree east longitude and longitude 19 to 20 degree north. Kham River, which is one of the chief tributaries of the Godavari River, receives all domestic and industrial waste water from the Aurangabad city and MIDC Waluj. Assessment was carried out for nine sampling spots, in MIDC Waluj Aurangabad. Water samples were collected in 1000 ml plastic bottles in good quality screw-capped, well labelled, tightly packed bottles and transported immediately to the laboratory and stored at 4°C for chemical analysis. The sampling bottles were thoroughly rinsed two or three times, using the groundwater to be sampled.

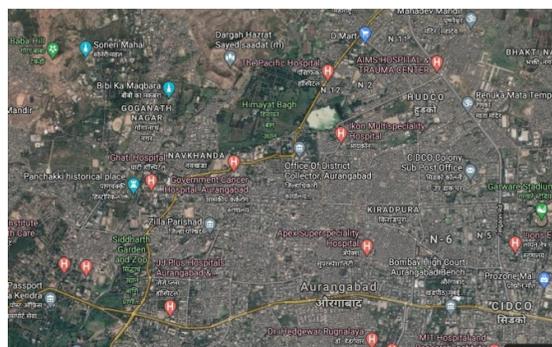


Fig.(1): Satellite map showing location of Aurangabad city and study area (Source: Google map).

The parameters like temperature, pH were measured on the field by using Thermometer and pH was measured by using pocket digital pH-meter while other parameters such as, total dissolved solids, total hardness, calcium, chloride, magnesium, sodium, sulphates, phosphate, dissolved oxygen and biological oxygen demand were estimated in the laboratory in accordance with standard methods of water chemical analysis (APHA 1992).

III. RESULTS AND DISCUSSION

The present investigation was carried out for the assessment of Physico-chemical parameters. The estimated parameters have been tabulated in the Table no.1 and graphically presented in figure no.1. Saxena and Sharma (2017) measured physical and chemical parameters to know the water quality and found results within the standard limits (Saxena and Sharma, 2017). Temperature is one of the crucial physical factors which have significant influence on ground water quality. The analysed result for temperature was found in between 22.7 to 27.3. The average temp was 24.97. Smaller water bodies react quickly with the change in the atmospheric temperature. There is a very close interrelationship between the temperature of atmosphere and water due to the depth of water table and due to the presence of small amounts of nutrients which are directly or indirectly correlated. The differences in atmospheric temperature and water temperature especially in winter are under the influence of high specific heat of the water and winter overturn

condition of reservoir. It influences aquatic life and concentration of dissolved gases such as CO₂, O₂ and chemical solutes. Rise in temperature of the water leads to enhance the rate of chemical reaction in water which reduces the solubility of gases and amplifies the tastes and odours.

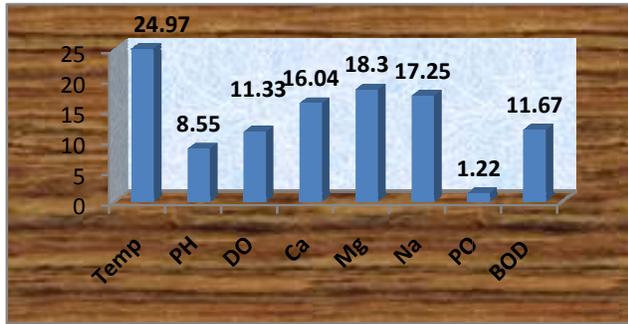


Fig 1: The graphical presentation of Ground water samples at study area.

The graphical presentation based on reading shown in the graph no.1 all the parameters were found within the limit whereas TDS, COD and TH parameters found without limit.

pH is one of the crucial physical factors which have important to influence quality of ground water. The average pH was 8.5. In the study area the pH of ground water lies in the range of 7.9 to 9.3. pH values have the positive correlation with electrical conductance and the total alkalinity (Gupta, 2004). There is no sample occur in the locality of MIDC area whose pH is less than 7, all the sample are viewing alkaline range. Pure water is generally colourless, tasteless and having no odour and it is referred as universal solvent. However, water from all the natural sources which contain some impurities in the gaseous, liquid and solid phases (Patil and Prasad, 2021). TDS is also one of the vital physical factors which contain large count on ground water quality. The solid component present in water is of two types, first is Suspended solid and second is dissolved solid. The total amount of solids dissolved comprises volatile dissolved solid and mostly fixed dissolved solid in water (Patil and Prasad, 2021).

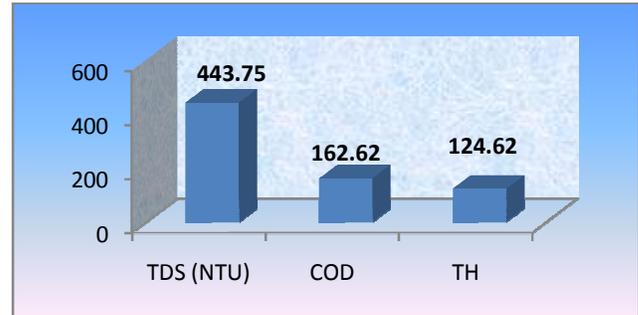


Fig 2: The graphical presentation of Ground water samples at study area.

The analysed result for TDS values of ground water were in the range of 420 to 465 NTU. The average of TDS was 443.7. In the study area under analysis, the TDS values indicating that there is substantial deviation from values. The TDS values of the water samples collected from Bore wells and dug wells in the MIDC area indicate that the pollution intensity is restrained in the area. DO is one of the key chemical factor which have a very important power on ground water quality. The analysed result for dissolved oxygen was found in between 8.2 to 12.6. The average dissolved oxygen was 11.33. Ca is one of the fundamental chemical factors which have major force on ground water quality. The analysed result for Ca was found in between 11.69 to 19.99. The average Ca was 16.04. Mg is one of the vital chemical factors which have major pressure on ground water quality. The analysed result for Mg was found in between 14.27 to 21.62. The averages of Mg was 18.30. Virtually all of the sodium found in water and food stuff is most rapidly absorbed from the gastrointestinal tract of the human being. When it combines with hydroxyl radical, it results in corrosion of boilers under specific conditions and it adds to the solid content of water (Patil and Prasad, 2021). Na is one of the elementary chemical factors which have important power on ground water quality. The analysed result for Na were found in between 14.27 to 21.6. The averages Na was 17.25. K is one

of the crucial chemical factors which have significant influence on ground water quality. The analysed result for K was found in between 0.1 to 1.8 .The average K was 1.22. BOD is one of the crucial chemical factors which have major influence on ground water quality. The analysed result for BOD was found in between 6.3 to 14.4 .The averages BOD was 11.67. COD is single one of the vital chemical factors which have important pressure on ground water quality. The analysed results for COD were found in between 125 to 223.The average COD was 162.6. Total Hardness is one of the essential chemical factors which contain major influence on ground water quality. Basically, hardness of water is having the great value based at the origin of the source of river and reduces gradually along low lying streams. It is owing to water flows through the rocks and mountains, different inorganic salts get easily dissolved in it. As the river water flows downstream, these major salts gradually get adsorbed in the bed of river (Patil and Prasad, 2021). The analysed result for TH were found in between 89 to 143.The average TH was 124.62.In the present investigation, Total Hardness in ground water lies in the range of 89 to 143 mg/l. The checking of TH shows that concentration of samples was above desirable limit and above maximum permissible limit in some samples. The physico-chemical parameters are important for assessing the water quality. The main purpose of analysing the physical, chemical and toxicological characteristics of water was to determine its pollution status. In fact, the final status of a water body is conditioned and the status of water is the result of interaction of these factors.

IV.CONCLUSIONS

Water is one of the most crucial inorganic chemical compounds present on the earth planet. A well designed laboratory study was carried out to assess the physicochemical characteristics of ground water samples of Waluj MIDC area, at Aurangabad. The main objective of present research work was to know the water quality of the study area. The analysis of Physical and chemical parameters of groundwater like Temperature, pH,

TDS, TH, calcium (Ca²⁺), Magnesium (Mg⁺) sodium(Na⁺), potassium (K⁺), DO, COD and BOD were determined. It is found that average temp. 24.97, pH 8.55, TDS-443.75 mg/lit., dissolved oxygen 1.33 mg/lit.,Ca 16.04 mg/lit.,Mg18.30 mg/lit.,Na17.25 mg/lit., K1.22 mg/lit., BOD 11.67 mg/lit., COD162.62 mg/lit. and Total hardness was 124.62 mg/lit., respectively. The estimated results revealed that some parameters found in high concentration. It is further stated that there should be wise use of ground water for drinking purpose so as to avoid the detrimental effects on the individuals resides in the industrial zones. The study suggests that the groundwater of the area is contaminated due to the anthropogenic activities, and water quality status monitoring programme should be needed.

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Sr.no.	Temp	PH	TDS (NTU)	DO	Ca	Mg	Na	PO	BOD ppm	COD mg/l	TH
1	27 °	8.5	420	10.0	11.52	21.62	15.52	1.1	6.3	158	137
2	25.5	9.3	465	8.2	11.69	16.34	16.22	1.8	14.4	200	143
3	24	8.4	437	10.5	14.31	17.94	16.80	0.1	11.3	157	130
4	26	8.61	450	12.0	19.99	18.32	15.02	0.8	9.5	125	140
5	23.1	8.2	434	11.5	18.62	16.32	17.02	1.4	11.5	158	135
6	25	9.1	453	12.6	19.34	14.39	18.05	1.2	12.3	130	129
7	26.2	7.9	429	12.3	13.87	16.69	19.07	1.5	8.5	150	111
8	22.7	8.6	443	11.4	15.87	20.36	21.60	1.7	13.4	158	89
9	27.3	8.3	439	12.2	14.68	26.08	14.27	1.3	12.5	223	120
Average	24.97	8.55	443.75	11.33	16.04	18.30	17.25	1.22	11.67	162.62	124.62
Max.	27.3	9.3	465	12.6	19.99	26.08	21.6	1.8	14.4	223	143
Min.	22.7	7.9	429	8.2	11.69	14.39	14.27	0.1	8.5	125	89