Effects of Heavy Metal Contamination in Groundwater at Cherlapally Industrial Area,Hyderabad, Telangana

Ms.K.Deepa,[#1], Dr.D.Jayganesh[*2], Dr.S.Robert Ravi[#3]

[#1] Asst.Professor, Dept.of Civil Engineering, A.R.J College of Engineering and Technology, Mannargudi.

[*2] Asst.Professor, Department of Civil Engineering, University College of Engg. Anna University,Ramanathapuram

[#3]Dean/School of Engg.&Tech., Girijananda Chowdhury University, Guwahati, Assam

Abstract – The present work is carried out for assessing the groundwater quality of Cherlapally industrial area. Two groundwater samples were collected in and around the Cherlapally industrial area for a physicochemical analysis. The present water quality status is calculated by considering the following 13 parameters such as pH, Colour, Turbidity Dissolved Oxygen, Conductivity, Alkalinity, Total dissolved solids, Chlorides, Phosphates, Nitrates, Total Hardness, Calcium Hardness, Magnesium Hardness. The acquired results are compared with BIS 10500: 2012 Drinking Water Specification. The results showed that the ground water with in industrial area has very high content of Total dissolved solids , Conductivity, Colour, DO, chlorides, Phosphates and Mg, Ca and Total Hardness showing that the industrial effluents are causing direct contamination of water, and are also responsible for potential health problems. The results of the study suggest that regular analysis of physicochemical characteristics should be carried out to protect the water resources and to safeguard the groundwater quality in and around Kattedan industrial area.

Keywords: Physicochemical Parameters, Drinking Water, Industrial Area,Cherlapally

I. INTRODUCTION

Water resources are under enormous pressure due to increasing demands for more and better-quality water; demands which are in turn conditioned by social, political and environmental factors. Over the few decades, competition for economic development, associated with rapid growth in population and urbanization, has brought in significant changes in land use, resulting in more demand of water for agriculture, domestic and industrial activities. Water pollution affects drinking water, rivers, lakes and oceans all over the world resulting in threat to human health, Drinking and natural environment. Changing of ground water body quality is influenced by long term of drought, decline in discharge, increase in salinity and waste disposal. Evaluation of groundwater is important to assess its suitability for Drinking. Consumption of groundwater for Drinking purposes depend on type and quantity of dissolved salts. Drinking water quality and quantity have direct and indirect impact on soil characteristics (physical, biological and chemical) especially in arid and semiarid regions that unfortunately depend on Drinking. Therefore, the drinking water quality should be considered as an important tool to avoid dangerous diseases and health risk. Therefore, the control of quality of water is a necessity. Numerous water quality guidelines have been developed by many researchers for using Groundwater.

II. SAMPLING

The quality of water depends on the concentration of different constituents in it. The concentrations of constituents depend on its sources of origin and interventions through living or dead organisms in the path of its flow. Water exists in different forms in the nature viz., ground water, groundwater and wastewater. Ground water may be defined as water available on the earth's ground in sea and also collected as runoffs from rainfall in ponds, lakes, rivers and streams. Groundwater is the inherent water in the earth's crust collected underground by seepage of rainwater and ground water through soil and occupies subterranean permeable layers. Wastewater is the waste produced after using fresh water by different industrial, drinking and domestic activities. It contains various biological, organic and inorganic contaminants that pollute ground and groundwater when discharged without treatment. Understanding water quality requires quantitative knowledge of physical, chemical and biological characteristics and comparing their levels with standards to support for different uses including potable and Drinking use. The physical quality refers to odor and colour, turbidity, temperature, suspended solids, dissolved solids, residue and floatable substances. Chemical quality refers to Ph, conductivity, dissolved oxygen, total organic carbon, hardness and carbon dioxide. It also refers to trace elements viz., arsenic (As), boron (B), cadmium (Cd), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn), organic constituents viz., anionic surfactants, mineral oil, phenol content, hydrocarbons and pesticides and inorganic constituents viz., ammonia (NH), calcium (Ca), chloride (Cl), fluoride (F), iron (Fe), magnesium (Mg), 4 manganese(Mn), nitrate (NO), sodium (Na), sulphate (SO), sulphide (SO),total nitrogen (N) and potassium (K).

III. CRITERIA AND STANDARDS

Water quality requirements for different uses of water are scientifically termed as criteria and the permissible level of contaminants in water for different uses without any negative impact on environment and society are termed as Standards. These are legally enforced levels set up by a governmental or any international agency that have been arrived at after consideration of water quality criteria and the economic, social and political consequences of possible regulatory action.Assessment of water quality is important for knowing the suitability of ground water for various purposes. Mankind has taken it for granted and doesn't take care in 3 preserving the quality of water. It is feared that the reduction in biodiversity is a direct consequence of pollution and change in climate. The explosive increase in population and the lack of supply make water one of the world's most valuable resources. Increasing water stress is already constraining socioeconomic growth in various countries. The rising consciousness of the public of this situation and its consequences leads to thinking again of policy makers.Control of water pollution has reached primary importance in development and a number of developing countries. The prevention of pollution at source, the precautionary principle and the prior licensing of wastewater discharges by competent authorities have become key elements of successful policies for preventing, controlling and reducing inputs of hazardous substances, nutrients and other water pollutants from point sources into aquatic ecosystems. A major advantage of the water

quality objectives, approaches to water resources management is that it focuses on solving problems caused by conflicts between the various demands placed on water resources,
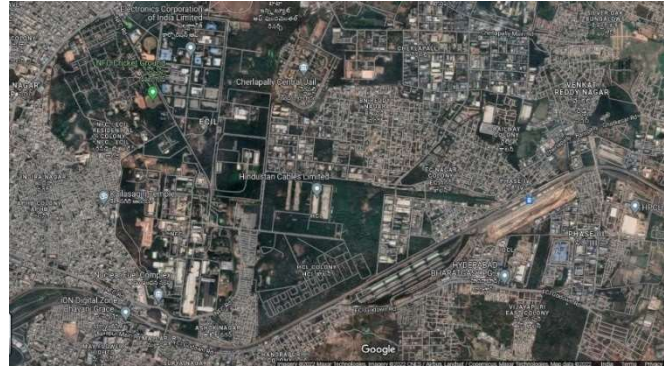

particularly in relation to their ability to assimilate pollution. The water quality objective approach is sensitive not just to the effects of an individual discharge, but to the combined effects of the whole range of different discharges into a water body. This Industrial area is a lake located in cherlapally, cherlapally industrial area is completely surrounded by micro, small and medium scale industries of 535 units. The highest and lowest elevation in the study ranges from 570 to 520m above MSL. Location Cherlapally, Telangana, India Coordinates   17.45660544107604, 78.59552848909337. Ground area 5 km^2

Sample 1 is collected from industry located in cherlapally it is surrounded by many small scale and large scale industries Location Cherlapally, Telangana, India Coordinates 17°27'19.0"N 78°35'40.8"E as below.
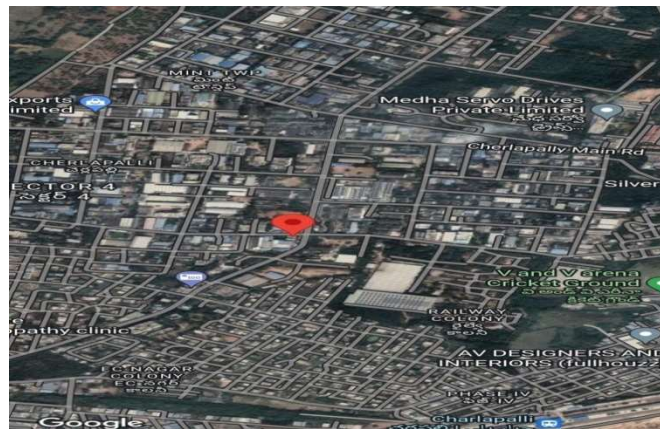
Sample 2 is collected from industry located in the cherlapally industrial area Location cherlapally, Telangana, India Coordinates   17.424705°N 78.697135°E as below.
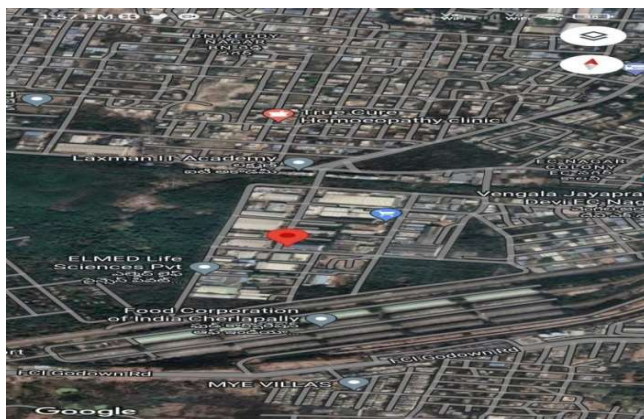
III WATER QUALITY TESTING

To compare the samples with water quality standards few physiochemicaL parameter as below.

- o pH
- o Electrical Conductivity
- o Total Dissolved Solids
- o Sodium
- o Calcium
- o Magnesium
- o Boron

The pH value is a measure of the acidity or alkalinity of a solution. It is expressed as the negative logarithm of hydrogen ion concentration of the solution.

The Electrical conductivity of the water is its ability to conduct electricity. It is determined by measuring the conductivity of water at 250 C. The unit of specific conductivity is micro siemens per cm (μs/cm) or micro-mhos per cm (μmhos/cm).

Total dissolved solids (TDS) is a measure of the dissolved combined content of all inorganic and organic substances present in a liquid in molecular, ionized, or micro-granular suspended form. TDS is sometimes referred to as parts per million (ppm).

Sodium

Calcium and Magnesium

Boron

IV. RESULTS

Cherlapally groundwater sample 1

Parameter	Sample 1	IS 10500-2012
F	1.5	1
Cl	338	250
Br	0.17	3MG
No3	15	45
Po4	Nd	0.5
So4	114	200
pH	7.17	6.5-8.5
TDS	1101ppm	50-150
Temp	23.9c	20C
Conductivity	1.42mS	200-800ms/cm

Cherlapally groundwater Sample 2

Parameter	Sample 2	IS 10500-2012
F	1.1	1
Cl	431	250
Br	0.36	3MG
No3	13	45
Po4	Nd	0.5
So4	151	200
pH	6.98	6.5-8.5
TDS	1323ppm	50-150
Temp	24.1c	20C
Conductivity	1.77ms	200-800ms/cm

Report of ICP-OES:

Cherlapally groundwater Sample 1

Parameters	Sample 1	IS 10500-2012
Al	Nd	0.03
As	Nd	0.01
B	Nd	0.5
Ca	175	75
Cd	Nd	0.003
Co	Nd	0.5
Cr	Nd	0.05
Cu	Nd	0.05
Fe	Nd	0.3
Hg	Nd	0.001
K	4.6	2.5
Mg	56.13	30
Mn	Nd	0.1
Na	43	25
Ni	Nd	0.02
Pb	Nd	0.01
Si	3.01	5-25mg
Zn	Nd	5

Cherlapally groundwater sample 2

Parameters	Sample 2	IS 10500-2012
Al	Nd	0.03
As	Nd	0.01
B	Nd	0.5
Ca	330	75
Cd	Nd	0.003
Co	Nd	0.5
Cr	0.03	0.05
Cu	Nd	0.05
Fe	Nd	0.3
Hg	Nd	0.001
K	3.33	2.5
Mg	52.16	30
Mn	Nd	0.1
Na	27	25
Ni	Nd	0.02
Pb	Nd	0.01

Si	3.71	5-25mg
Zn	Nd	5

V.CONCLUSION

- The ground water within industrial area has very high content of Total dissolved solids , Conductivity, Colour, DO, chlorides, Phosphates and Mg, Ca showing that the industrial effluents are causing direct contamination of water, and are also responsible for potential health problems.
- The obtained results are not within the BIS standards of drinking water indicating poor.
- Ground Water quality in the study area. Improper and untreated disposal of domestic sewage, Industrial wastewater, and other anthropogenic actions are the major causes for pollution of Groundwater in the cherlapally Industrial area.
- Treatment units must be installed at effluent outlets in Industries to reduce intensityof pollutants.
- Cl and TDS are excess in both the locations.
- Excess content of these elements results in Stomachaches, vomiting, and diarrhea and it can also cause dry, itchy skin.
- Severe chlorine poisoning can be far worse.
- The Water Refiner represents the latest advance in water softeners as it softens hardwater while also removing chlorine and other impurities.
- Ca and Mg contents are high in both the locations.
- Calcium can leave crystal-like deposits that eventually harden and turn into stones.
- Hypercalcemia affects the central nervous system, and can disrupt the electricalimpulses that govern your heartbeat.

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