Study of Ground Water Quality in Industrial Zone of Kakkalur industrial Estate, Thiruvallur, Tamil Nadu.

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ABSTRACT— Water quality of 7 bore wells and 3 lakes water samples representing 10 localities around the Kakkalur industrial Estate, Thiruvallur was studied for a period of four months from November-2014 to February-2015 to assess the suitability of the bore well water for domestic purposes. This study of bore well water and lake water contamination will be of immense help to researcher's and environmental regulators to evolve and initiate mitigative measures. Studies have been carried out to identity the parameters of contamination and their distribution with the help of the existing bore wells and lake water have been analyzed for 11 parameters. The major general contaminants found exceeding standards are hardness, alkalinity, pH, dissolved salts, chlorides, Ca, Mg, SO4, and turbidity. However the bore wells containing the parameters exceeding the limit were found highly isolated presence of chlorides and hardness, thus by initiating measures to be control local stretches. Combination of parameters exceeding limit varied from bore well to lake water and bore well to bore well.

Keywords: Ground water, Physico-chemical parameters, bore wells, lake water, Kakkalu, contamination, Pollution, Quality of water.

INTRODUCTION

Long and sustained industrial activities in any given area can often lead to soil and ground water contamination. Improper waste disposal practices might contaminate the soil and gradually the entire ground water and water bodies in the area, impairing ground water quality for many applications including drinking. The study of ground water and lake water assessment will be of immense help to researchers and evolve by initiating remedial measures. The determination alteration of the naturally occurring physical, thermal, chemical, or biological quality of ground water is called ground water contamination.

This study focuses on how groundwater and lake water used for drinking, cooking, bathing and irrigation becomes contaminated with some chemical parameters. Surface water contaminated by hardness substances, alkalinity, Ca, Mg, turbidity, as a result of human and industrial activities (e.g. Mining) or from natural sources has also been reported in some countries, but it is much less common.

Uncontaminated minerals matter has been subjected to and influenced by environmental factors such as parent minerals, climate, organisms and physic-chemical action of wind, water and sunlight all acting over a period of time. Water differs from parent materials in the physical and chemical properties. In many areas of Tamilnadu, ground water is not suitable for domestic use, forcing villagers to travel 3 to 4 km for water. Much of the ground water is unsuitable can no longer be used.

The primary objective of the present study was to assess the contamination of bore well water and lake water. The data available on ground water and lake water contamination in and around Kakkalur industrial Estate, Thiruvallur. Hence an attempt was made to study the ground water and lake water quality assessment of the in and around Kakkalur industrial Estate area to identify the contaminated bore wells and lake water which are beyond permissible limits for drinking water and also the which are significant contributor for pollution in the area.

Depending on the type and extent of contamination remedial approaches can be evolved. For this purpose a strategy was drawn to collect ground water from the existing bore wells in the designated industrial area, considering all possible sources of contamination various parameters have been selected for analysis.

Description of the study area

Kakkalur industrial Estate located at near Thiruvallur, Tamilnadu. Average recorded rainfall for Thiruvallur city in the last four years. Water facilities are provided by dipping the bore wells as the ground water is the main source for drinking water in this area. Historically ground water has been considered to be safe for drinking hence untreated ground waters supplied to the public. Since few heavy industries are located, it may leads to pollute the ground water. Thus in this present study industrial belt sand its surrounding area has been selected and analyzed the ground water and lake water quality.

Material and Methodology

ISSN 2229-5518

Detailed survey was conducted to identify the number of existing bore wells and few lakes. The survey was conducted by visiting number of houses and identifying the existence of bore wells and lake water.

Sampling method

The samples were collected during the month of November 2014 to February 2015. Water samples from bore wells and lakes were collected in different glass bottles at each point to add necessary preservatives as per standard procedure, then samples were brought to chemistry laboratory with in 24 hrs from the time of collection and analysis.

Analyses

The Physico-chemical Parameters of the water samples were analyzed in triplicate by adopting standard procedures from manual of the American Public Health Association (APHA, 1998)[1]. The water samples were analyzed for the following Physico-Chemical Parameters.

RESULT AND DISCUSSION

The population in the area has increased more than three-fold within a span of two decades, because of the rapid growth in industrial activity, employment, transport facilities and educational facilities. Groundwater is the prime source of domestic water and its quality is getting degraded due to increasing industrialization and population [2]. The present communication is focused on the study of temporal changes in the groundwater quality to assess the intensity of pollution activity on it in the different industrial surrounding areas [3].

Table-1 water quality analysis in Indusrial areas of Kakkalur, Thiruvallur.

S.No	Parameter	Sample S-1	Sample S-2	Sample S-3	Sample S4	Sample S5	Sample S6	Sample S7	Sample S8	Sample S9	Sample S10
1	Ph	8.8	7.9	7.1	7.71	7.6	7.1	8.1	6.2	7.4	8.9
2	Chlorides	377	250	210	410	215	290	149	110	180	450
3	Total hardness	455	288	116	198	110	240	390	280	165	420
4	Calicium hardness	138	118	102	169	31	141	155	149	98	126
5	Magnesium hardness	22	71	12	25	35	97	153	45	63	167
6	Total solids	1800	1080	780	600	600	1000	1500	1400	900	1600
7	Total dissolved Solids	800	420	430	570	410	300	1300	600	800	1200
8	Total suspended Solids	930	550	400	700	590	600	1200	1100	600	900
9	Iron	0.6	0.02	0.01	0.031	0.022	0.07	0.32	0.82	0.01	0.7
10	Sulphates	26.0	3.4	5	6	8	9	31	14	15	31
11	Dissolved Oxygen	6.2	6.4	5.6	6.1	7.1	6.9	6.1	6.1	6.4	6.6

Except pH all unites in mg/l

SAMPLE LOCATIONS: S1 = Thanneer kulam lake, S2 = Thanneer kulam, S3 = V.M.Nagar, S4 = Ma.Po.Si. Nagar, S-5 = Hari Ram nagar, S-6 = Varadharajanagar, S-7 = Putlur lake, S-8 = Kakkalur bus stop residential area, S-9= DRBCC school road, S-10= Kakkalur lake.

The observed pH value ranging from 6.2 to 8.9 shows that quality of water samples were slightly alkaline (Table-1). These values are maximum permissible limit prescribes WHO standards. If pH increases the permissible level it may promote corrosion of plumbing systems and fixtures [4]. Study area it was observed that chloride content exceed than the permissible limit. The site points exceeded were S1 Sample area (377 mg/l), S4 Sample area (410 mg/l), S6 Sample area (290 mg/l), S10 Sample area (450 mg/l).

When chloride concentration of 250mg/l is present along with sodium ions, a salty taste can observed [5]. The salty taste may be absent in waters in absence of sodium ions, even concentration of chlorides is high as 1000mg/l. Chloride is present in all natural water at greatly varying concentrations depend on the geo-chemical conditions. Chlorides in natural waters can be attributed to leaching of chloride containing rock and soil , discharges of effluents from chemical industries ,ice creams plant effluents, edible oil mill operations , sewage disposal , irrigation drainage, contamination, from refuge leachates and sea water intrusion in coastal regions[6].

As per the analysis report it was observed that hardness was exceeding the limits. Such areas are S1 Sample area (455 mg/l), S10 Sample area (420mg/l), S7 Sample area(390 mg/l), Hardness is measure of the ability of water to cause precipitation of insoluble calcium and magnesium salts of higher fatty acids from soap solutions, the principle hardness causing cations are calcium, magnesium, manganese ion associated with bicarbonates, carbonates, chlorides, and sulphates [7].

Suspended solids or matter in surface water may consist in inorganic or organic matter [8]. These materials are after natural contaminants resulting from erosive action of water flowing over land surface. Ground water contains negligible quantity of suspended solids and these being filtered out by soil start a through mechanical straining action.

The amount of total solids in surface water`increase with input of natural and manmade contamination. As per the analysis report it was observed that, suspended solids were exceeded the limits range from 600 mg/l to 1200 mg/l (Table-1).

The assessment was reported that the concentration of sulphates also exceeded the permissible limits range from 6 mg/l to 31 mg/l (Table-1). High level of sulphates in water can cause dehydration and diarrhea and may also cause corrosion

effect on plumbing.

As per the study report it was observed that Iron concentration not exceeded the limit which is very healthy for human health. (0.01 mg/l- 0.82 mg/l) (Table-1). Iron is mostly a naturally derived metallic pollutant which areas its origin in waters mainly to the sources derived from soil and crocks. The corrosion of pipes, pumps and other such structures can also raise the concentration of iron in the distribution systems. Large quantities of iron can leach out from soil by run-off especially in acidic conditions such and associated with acid mine drainage and degradation of excessive organic matter accumulated in the soil [9].

Iron in ground water remains mostly as a predominate from due to general lack of oxygen, but such iron rich ground waters when brought to the surface , the ferrous is quickly converted to ferric resulting in the formation of ferric in the presence of iron is substantial quantities render the water unsuitable for food processing making beverages, dying bleaching , manufacturing ice and many other items, the limit of iron in drinking water (0.1mg/l) is not because of the health consideration but due to its aesthetic and taste significance [10].

From this analysis the observed total dissolved solid values are exceeding limits in Sample areas such as S1: 1800 mg/l, S7: 1500 mg/l, S10: 1600, compared to WHO stand values[11].

The dissolved oxygen of the water samples were in permissible limit, range from 5.6 mg/l to 7.1 mg/l.

CONCLUSIONS

This study emphasizes the need for regular groundwater quality monitoring to assess pollution activity. The quantity of water in around the industrial belt reached already alarming stage causing health effects as per the analysis report.

The major industries nearby sampling point should supply protected drinking water to the people surrounded by industries or they have to rehabilitate people from that point since they are mainly responsible for creation of pollution.

The groundwater quality problems are mainly due to i) contamination by geogenic and man-made sources. A large number of industrial activities are taking place in urban areas, especially in populated areas. The wastes generated by industrial activities in urban areas get mixed with domestic wastes and pollute the groundwater.

DRINKING WATER QUALITY STANDARDS

S.No	parameters	Indian Standards		ICMR		WHO	
		P	E	P	E	P	E
	PHISICAL PARAMETETES						
1	Colour	10	50	5	25	5	20
2	Taste & Odour	Unobjectionable		Unobjectionable		Unobjectionable	
3	Turbidity	10	25	5	25	5	25
4	PH	6.5-8.5	6.5-9.2	7-8.5	6.5-9.2	7-8.5	6.5-9.2
	CHEMICAL(Mg/L or PPM)						
5	Total Solids	-	-	-	-	500	1500
6	Total Hardness	300	600	300	600	-	-
7	Calcium	75	200	75	200	75	200
8	Magnesium	30	100	50	150	50	150
9	Iron	0.3	1.0	0.3	1.0	0.3	1.0
10	Manganese	0.1	0.5	0.1	0.5	0.1	0.5
11	Chlorides	250	1000	250	1000	200	600
12	Sulphates	150	400	200	400	200	400

ACKNOWLEDGMENT

The author's wish to record deep sense of gratitude to Dr.P.Chinnadurai. M.A.Ph.D, Secretary of Panimalar institute of technology and Mr. C. Sakthi Kumar M.E, director of Panimalar Institute of Technology. The author also wish to thanks to Dr.T. Jayanthi, Principal of Panimalar Institute of Technology, Chennai, Tamil Nadu.

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