International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 7 Issue 4 Ver. VI|| April 2018 || PP 26-30

Assessment of Ground Water Quality of Central Industrial Area of Bhilai- Durg City in Chhattisgarh

Sonal Sharma[1], S.K. Chatterjee[2], K. K Tiwari[3], Deepak Sinha[1]*
[1]*Department Of Chemistry Govt. Nagarjuna PG College Of Science Raipur-492 010, Chhattisgarh India.*
[2]*Principal, N.R.N. Govt Girls College Dhamtari Chhattisgarh India.*
[3]*Prof. Govt PG College Kondagaon Chhattisgarh India.*
Corresponding Author: Deepak Sinha

Abstract:*Ground Water Samples From Hand Pump Were Collected From Different Locations Of Central Industrial Area BhilaiDurg District For Physico-Chemical Studies. Analysis Of Samples For Water Quality Parameters Such As pH,EC, TA,TDS,TH and Cl, F, SO_4,Ca, BOD, DO and Pb, Cr Fe. For Industrial Area Of Bhilai Industrial Area and Analyzed During January 2016 To June 2016. 10 Physicochemical Parameters Were Analyzed And The Result Was Compared With Water Quality Standard Prescribed By ISI 10500-91 In The Present Study. The Concentrations Of EC, TA, TDS, TH, Ca and Pb were Exceeded In Most Of Sample Area In Permissible Limit As Prescribed By ISI 10500-91. It Is Found That Most Of The Water Samples Are Non-Potable For Human Beings Due To High Concentration Of Most Of Parameters.*

Keywords*: Ground Water, Hand -Pump, Physicochemical Analysis, Drinking Water Quality, Water Pollution.*

Date of Submission: 10-04-2018 Date of acceptance: 26-04-2018

I. Introduction

Water,the Most Abundant And Wonderful Natural Sources. ItIs Very Important For Survival Of All Living Organisms. GroundWater Is Generally Considered To Be Much Clear Then Surface Water. Ground Water Is Most Suitable Fresh Water Nearly Balanced Concentration Of The Salt For Human Consumption (Krishnkumaryadav Et Al.2012).The Term Groundwater Is Usually Reserved For The Subsurface Water That Occurs Beneath The Water Table In Soils And Geologic Formation That Are Fully Saturated (S.Thirumala. 2014). Groundwater Is Used For Domestic & Industrial Water Supply & Irrigation All Over The.Theworld, There Has Been A Tremendous Increase In The Demand For Fresh Water Due To Rapid Growth Of Population And The Accelerated Pace Of Industrialization, Once The Groundwater Is Contaminated, Its Quality Cannot Be Restored By Stopping The Pollutantsfrom The Source. (C.R .RamakrishanaiahEt Al.2009).It Is Also Important To Note That Ground Water QualityIs One Of The Most Important Aspects In Water Resource Studies (AckahEt Al 2011).Water Pollution Are Mainly Due To Contamination By Foreign Matter Such As Chemicals, Industrial Or Other Waste Or Sewage, Whichdeteriote The Quality Of The Water And Render It Unfit For Its Intended Use (MadhuEt Al 2013).

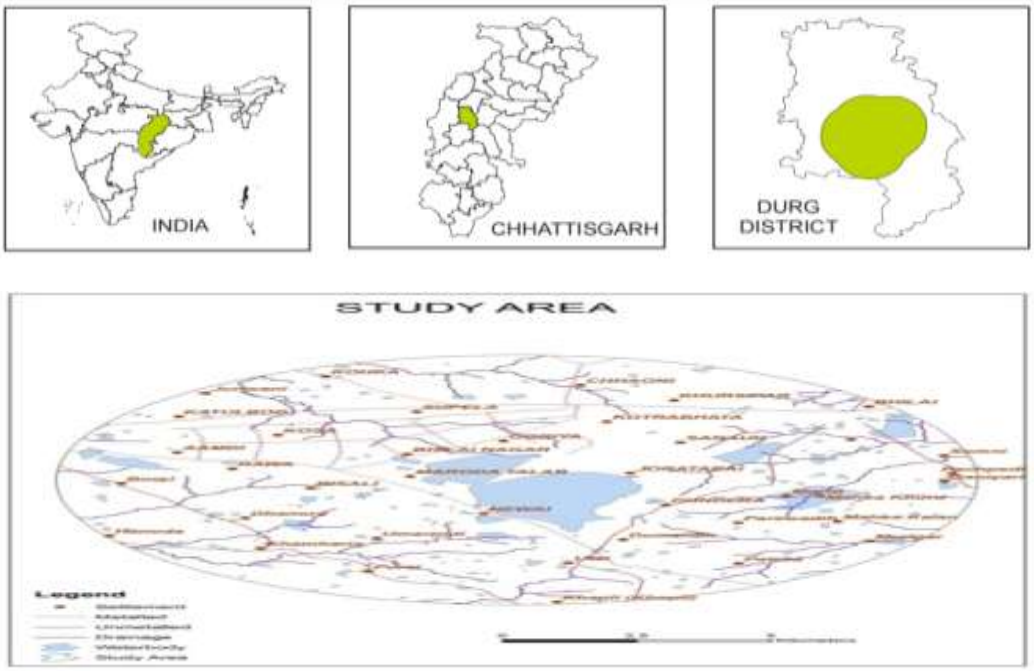
Having A Safe Drinking Water Is An Internationally Accepted Human Right (World Health Organization (WHO 2004). One Of The Ten Targets Of The Millennium Development Goals Report (UN 2006) Is The Proportion Of People Without Sustainable Access Of Safe Drinking Water To Halve By 2015. It Is Therefore Unavoidable To Check The Quality Of Drinking Water At Regular Time Interval As Well As To Find Out Responsible Sources Which Increased Ground Water Pollution. Ground Water Monitoring Of Hand-Pump Is One Of The Important Tool For Evaluating Ground Water Quality(MadhuEt Al 2013).Considering These Aspects Of Hand-Pump Water Pollution The Present Study Of Ground Water Monitoring Was Undertaken To Investigate Physicochemical Characteristics Of Ground Water Sample Of Industrial Area of Bhilai.

II. Material & Methods

(a) Study Area

BhilaiCity is Situated in Durg District, C.G (The Eastern Central Part Of India). The City Is Located Within The 32 Km West From The Raipur City. The Population Of The City Is 1,006,407. The Recorded Temperature Was Ranged From 37 To 21ºC And Annual Rainfall Was 1247.0 mm. This Is City Which Produced Steel In Large Scale. Sampling Sites Were Setup In Bhilai-Durg Area Which Was In Range Of 10 kms Close To Industrial Area.

Map of Study Area



(B) Sample Collection

In Present Study 33 Water Samples Were Collected By A Polyvinyl Chloride 250ml Bottle At Sampling Area.Water Samples Were Collected From These Area Including Effluent (N =3), Surface Water (N= 1) And Ground Water (N=29) During Jan- June, 2016. The Locations Of Sample Area Were Determined By GPS Receiver. The Samples Were Kept In Refrigerator At 4ºC. Collected Sample Were Immediately brought To Laboratory and Preserved for the Further Analysis. Details of ground water sampling location along with their longitude And latitude are Presented InTable -1.

Table1: Ground Water Sampling Location Along With Their Longitude And Latitude Are Presented.

S.No	SAMPLING AREA	SOURCE OF WATER	LATITUDE	LONGITUDE
S1	PURAI	HAND PUMP	N - 21 ˚07' 9.39"	E - 81 ˚20' 45.39 "
S2	RISHALI	HAND PUMP	N - 21 ˚09' 15.15"	E - 81 ˚21' 45.48 "
S3	MUDPAR	HAND PUMP	N - 21 ˚07' 12.54"	E - 81 ˚25' 31.49 "
S4	NEWAI	HAND PUMP	N - 21 ˚09' 05.90"	E - 81 ˚21' 45.28"
S5	PATORA	HAND PUMP	N - 21 ˚06' 38.11"	E - 81 ˚23' 56.75"
S6	KHAMHARIA	HAND PUMP	N - 21 ˚07'44.36"	E - 81 ˚19' 42.39"

(C)**METHODOLOGY**

The Samples Were Analyzed Using Standard Methods Of Analyses To Assess Various Physicochemical Parameters According To APHA &WHO Norms.

Table2: Methods Used For Estimation Of Physicochemical Parameters

S.NO	PARAMETERS	METHOD
1	PH	PH Meter
2	TDS	EDTA Titration Method
3	TH	EDTA Titration Method
4	TA	Titration Method
5	SO_4	Spectrophotometer
6	Ca	UV-VIS NIR Spectrophotometer
7	F	UV-VIS NIR Spectrophotometer
8	Cl	Silver Nitrate Titration
9	Fe ,Cr , Pb	AAS
10	BOD	Titration Method
11	DO	Titration Method

III. Result And Discussion

The Average Results Of The Physic-Chemical Parameters For Water Samples Are Presented In Table -3. All Values are In mg/l Except pH And EC.

S.No	**Parameters**	**Sampling Points**						ISI 10500-91
		S1	S2	S3	S4	S5	S6	
1	pH	6.9	7.2	7.0	6.83	6.9	6.95	7.0-8.5
2	EC	430	400	670	700	600	410	250
3	Total Alkalinity	310	170	290	240	250	280	200
4	Total Dissolved Solids	720	648	624	744	546	984	500
5	Total Hardness	170	320	180	340	200	286	300
6	Calcium	168	160	252	185	236	140	75
7	Lead	0.07	0.07	0.08	0.08	0.09	0.05	0.01
8	Chromium	0.01	0.07	0.06	0.02	0.02	0.02	0.05
9	Iron	0.17	1.04	0.50	0.15	0.59	0.23	0.3- 1
10	Fluoride	0.3	0.30	0.4	1.63	0.26	0.11	0.6 -1.2
11	Chloride	120	50	50	40	80	140	250 -1000
12	Sulphate	85	130	30	80	50	46	150 – 400
13	BOD	0.006	0.002	0.002	0.01	0.001	0.001	5
14	DO	0.47	0.95	0.45	1.04	0.57	0.8	5

pH

It Relates With The Acidity Or Alkalinity Of The Water. A Sample Is Considered To Be Acidic If The pH Is Below 7.0. Meanwhile, It Is Alkaline If The pH Is Higher Than 7.0. The pH Values of All The Drinking Water Samples Were Found To Be In The Range Between 6.83and 7.2, This Indicates That The pH Value For The Sample Area Is Within Permissible Limit Of ISI 10500-91.

EC

The Conductance Value For Sample Area Was In The Range Of 400 To 700. The Range Of Conductance Indicates That The Value Of Conductance For Sample Water Was Not In Permissible Limit Of ISI 10500-91, Which Indicate Contamination Level Of Water In Study Area.

Total Alkalinity

The Alkalinity Of Water Can Be Described As Its Capacity To Neutralize Acid. The Alkalinity Values For Water Samples Were Found To Be In The Range Between 170mg/l To 310 mg/l. This Indicates That The Alkalinity Value For The Sample Area Was Not In Permissible Limit Of ISI 10500-91.

Total Dissolved Solid

TDS Are The Inorganic Matters And Small Amounts Of Organic Matter, Which Are Present As Solution In Water. It Contains Anything Present In Water Other Than The Pure Water Molecules. High TDS Generally Indicate Hard Water. In The Present Study Result Showed That The Of The Water Samples Fall Into The Range From A Minimum 546 mg/l& Maximum 984 mg/l And All The Water Sample Concentration Exceed From Desirable Limit ISI 10500-91.

Total Hardness

Mainly Groundwater Hardness Is Due To Presence Of Bicarbonates, Carbonates, Sulphates And Chlorides Of Calcium And Magnesium. In The Present Study Result Showed That The TH Of The Water Samples Fall Into The Range From A Minimum 170mg/l& Maximum 340mg/l. It Has Been Observed That All The Water Sample Concentration In S2 And S4 Exceeds From Desirable Limit Of ISI 10500-91 But They All Have Found Within Permissible Limit.

Calcium

The Concentration Of Calcium Ranges From A Minimum 140mg/l And Maximum Of 252mg/lAnd All The Water Samples Concentration Exceed The Safe Limit Of Standard Set By The ISI 10500-91.

Lead

The Toxic Effect Of Lead Is Very Well Known For Living Being So That Firm Limits On Its Presence In Raw And Finished Drinking Waters Must Be Compulsory. The Concentration Of Lead Ranges From A Minimum Of 0.07mg/l And Maximum Of 0.09mg/l And Most Of Water Samples Analyzed Concentration Was Exceeding The Levels Of Lead In The Water Samples. This May Suggest That The Important Decision Should Be Taken For Lead Contamination.

Chromium

The Concentration Of Chromium Ranges From A Minimum 0.01mg/l And Maximum Of 0.07mg/l And All The Water Samples Analyzed Have Concentration Within The Safe Limit Of Standard Set By The ISI 10500-91 Except S2 And S3.

Iron

The Concentration Of Iron Ranges From A Minimum Of 0.17 mg/l And Maximum Of 1.04mg/l And All The Water Samples Analyzed Have Concentration Within The Safe Limit Of Standard Set By The ISI 10500-91 Except S4.

Chloride

In Present Study, The Results Of Chlorides In All Sampling Sites Ranged From 40mg/l.The Chloride Value For Sampling Sites Was Within The Permissible Limited Of Drinking Water Quality Of ISI 10500-91.

Fluoride

In This Study The Measured Value Of Fluoride Of The Water Samples Were Ranged From 0.11 To 1.63mg/l. The Measured Value Of Fluoride In Sampling Site Was Within Permissible Limit Except S4 As Compared To The Levels Of ISI 10500-91.

Sulphate

The Concentration Of Sulphate In Water Sample Was In Ranges From A Minimum of 30 mg/l And Maximum Of 130mg/lThe Water Samples Analyzed Have Concentration Within The Safe Limit Of Standard Set By The ISI 10500-91.

BOD

The Concentration Of BOD Ranges From A Minimum 0.001mg/l and Maximum of 0.01mg/l And All The Water Samples Analyzed Have Concentration Within The Safe Limit Of Standard Set By The ISI 10500-91.

DO

The Concentration Of DO Ranges From A Minimum 0.45mg/l and Maximumof 1.04 mg/l And All The Water Samples Analyzed Have Concentration Within The Safe Limit Of Standard Set By The ISI 10500-91.

IV. Conclusion

Ground Water Samples From Hand Pump Were Collected From Different Locations Of Central Industrial Area BhilaiDurgDistrict For Physico-Chemico Studies. Analysis Of Samples For Water Quality Parameters Such As pH, EC, TA, TDS,TH And Cl, F, SO_4, Ca, BOD And DO For Industrial Area Of BhilaiIndustrial Area And Analyzed During January 2016 To June 2016. 10 Physicochemical Parameters Were Analyzed And The Result Was Compared With Water Quality Standard Prescribed By ISI 10500-91 In The Present Study. The Concentrations Of EC,TA,TDS, TH, CaAnd PbWere Exceeded In Most Of Sample Area In Permissible Limit As Prescribed By ISI 10500-91. It Is Found That Most Of The Water Samples Are Non-Potable For Human Beings Due To High Concentration Of Most Of Parameters.Therefore, Most Of The Water Samples Are Non-Potable For Human Beings Due High Concentration Of One Parameters Or The Other. Hence, It Can Be Concluded That Consumption Of Ground Water In The Industrial Area Of BhilaiDurg Dist. Needs To Be Redressed By Proper Treatment Before It Is Consumed By Living Beings As Well As For Other Purpose.

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. "International Journal of Engineering Science Invention (IJESI), vol. 07, no. 04, 2018, pp26-30