



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 4, Issue 2)

Available online at: [www.ijariit.com](http://www.ijariit.com)

## Study on groundwater structure

Dev Ashish Sahu

[devashish960@gmail.com](mailto:devashish960@gmail.com)

Bhilai Institute of Technology, Raipur, Chhattisgarh

Amit Thakur

[amit\\_thakur744@bitraipur.ac.in](mailto:amit_thakur744@bitraipur.ac.in)

Bhilai Institute of Technology, Raipur, Chhattisgarh

Jayant Navrange

[jayantur13@gmail.com](mailto:jayantur13@gmail.com)

Bhilai Institute of Technology, Raipur, Chhattisgarh

Kanhaiya Cherkhiya

[kcherkhiya@gmail.com](mailto:kcherkhiya@gmail.com)

Bhilai Institute of Technology, Raipur, Chhattisgarh

P. Sai Shekhar

[shekhar.96naidu@gmail.com](mailto:shekhar.96naidu@gmail.com)

Bhilai Institute of Technology, Raipur, Chhattisgarh

### ABSTRACT

*Ground water resources are the principal source of drinking water for about all the states in India. Groundwater resources in every districts of chhattishgarh are under increasing stress as there is a rapid growth in their usage. Water managers need more timely and accurate data to access ground-water conditions to manage adverse situations such as drought and loss of pumpage in agriculture and domestic water supply. Currently groundwater researchers use stand-alone data logging equipment which is labor intensive and the method is not easily scalable if the number of logging locations increases. The aim of this paper is to provide a better understanding of water condition as safe, critical, semi critical, over exploited in districts of chhattishgarh.*

**Keywords:** Groundwater, Water structure, Chhattisgarh water survey, Water census, Groundwater census.

### 1. INTRODUCTION

The State of Chhattisgarh lies between North Latitude 17°47' to 24°06' and East Longitude 80°14' to 84°24'. Central Ground Water Board, North Central Chhattisgarh Region, Raipur is carrying out ground water regime monitoring in the State. The State covers a geographical area of 1,37,360sq. km. Nearly 65.90 % of the total area is covered by tribals and hence it is said as tribal dominated State<sup>[1]</sup>. Water has a decisive role to play in every aspect of our existence. Chhattisgarh state is very fast transgressing from agricultural civilization to industrial civilization, the need for water has only increased. The problems with our water supply are not going to go away and how we find and use water has become one of the most critical questions to the future of Chhattisgarh state. Groundwater problems emerge slowly and

incrementally, as the cumulative effect of many individual impacts of abstractions and contamination sources manifest themselves.

Groundwater is a critical resource in India, accounting for over 65% of irrigation water and 85% of drinking water supplies. However, on current trends it is estimated that 60% of groundwater sources will be in a critical state of degradation within the next twenty years. In the most seriously affected north-western states, recent satellite measurements indicate an average decline of 33 cm per year from 2002 to 2008<sup>[2]</sup>. Local observations of annual water table decline exceeding 4 metres are common throughout India<sup>[2]</sup>.

The Groundwater organization established in the state during 1970s to Monitoring & Effective groundwater resource management requires an optimum balancing of the increasing demands of water and land users with the long-term maintenance of the complex natural resource and to Develop and disseminate technologies, monitor and implement national and state policies for the scientific and sustainable development and management of groundwater resources, To collect, evaluate, interpret, process and disseminate data on water level and water quality, To carry out periodic ground water assessment in order to regulate the ground water use and guide ground water developmental activities on scientific lines to ensure sustainability of ground water resources, on a long-term basis. Demarcate the various zones to identify the feasibility of groundwater availability in the state and appropriate unconventional methodology to improve the sustainability of groundwater structures.

Central Ground Water Board, North Central Chhattisgarh Region, Raipur monitors the water levels in the State four times a year through a network of 1088 number of observation

wells(both dug wells and piezometers). Water quality is also assessed once in a year. The generated data from these observation wells are compiled, analyzed and presented in the form of reports from time to time and circulated to various Central and State Government Departments. The present report embodies data and information collected during monitoring in the year 2014-15<sup>[3]</sup>.

## **2. ACTIVITIES**

### **A. Ground Water Resources Assessment**

Ground water resource assessment for all 146-blocks of the State has been done as per Ground Water Estimation Committee (GEC-1997) norms of Govt. of India.

Currently, the Easement Act, 1882 provides every landowner with the right to collect and dispose, within his own limits, all water under the land and on the surface.<sup>12</sup> This makes it difficult to regulate extraction of ground water as it is owned by the person to whom the land belongs. This gives landowners significant power over ground water.<sup>[4]</sup>

The Model Bills and National Water Policy address the governance of ground water under the public trust doctrine. The concept of public trust doctrine ensures that resources meant for public use cannot be converted into private ownership.<sup>13</sup> Government being the trustee has the responsibility to protect and preserve this natural resource for and on behalf of the beneficiaries, that is, the people<sup>[5]</sup>.

### **B. Ground Water Table Monitoring**

This is being carried out regularly at 781 locations four times in a year i.e. pre-monsoon, -monsoon, post-monsoon and winter period for quantitative study of ground water potential.

### **C. Ground Water Quality Monitoring**

Sample collection and its analysis are being done once in a year during pre-monsoon period at 781 locations. Out of 781 locations, 237 stations are earmarked as trend stations to conduct water quality study three more times in a year .

Primary uses include water for agriculture, non-agriculture based livelihoods and municipal water supply and secondary use includes water for commercial activities. The Bill also seeks to implement the principle of subsidiarity which involves giving communities the power to regulate groundwater at the aquifer level.<sup>[6]</sup> For example, an aquifer situated entirely within a village will be under the direct control of the Gram Panchayat.

### **D. Feasibility of Tube Well**

This organization has technical know-how for identification of feasible sites for Tube wells. The Water Resources Department has assigned the job for identification of feasible sites. Vertical electrical sounding tests are being conducted and the results are communicated to concern Department/Person. The Ground Water Survey undertakes deposit works of various agencies for such feasibility studies and Tube well sites.

### **E. Geographical Information System(GIS)**

Under Hydrology Project Phase-I, digitization of GIS data sets such as land use, geomorphology, drainage, administrative boundary, settlements, transportation networks, soil, & hydrological boundary for the entire State have been completed. These are utilized for determining the zoning of ground water table and ground water quality linking the GIS layers with Hydrological Information system<sup>[7]</sup>.

### **F. Preparation of Hydro-geological Block Patterns**

The hydrological data collected from various parts of the state are analyzed at the State Ground Water Data Processing Centre. Incorporating these data and latest ground water norms, Hydro-geological Reports of different Districts, and Blocks are being prepared. These reports serve as the reference manuals for ground water resource planning.

### **G. Deposit Works**

The Water Samples analysis and resistivity works of other agencies on deposit of estimated amount. Besides analysis of water samples has been done as per rates approved by the Government.

### **H. Ground water draft**

The amount of ground water extracted from the ground resources with the help of pumping unit is called ground water draft. The gross ground water draft would include the ground water extraction from all existing ground water structures<sup>[8]</sup>.

### **I. Ground water contamination**

Ground water contamination is the presence of certain pollutants in ground water that are in excess of the limits prescribed for drinking water.<sup>[9]</sup> The commonly observed contaminants include arsenic, fluoride, nitrate and iron, which are geogenic in nature. Other contaminants include bacteria, phosphates and heavy metals which are a result of human activities including domestic sewage, agricultural practices and industrial effluents.<sup>[10]</sup> The sources of contamination include pollution by landfills, septic tanks, leaky underground gas tanks, and from overuse of fertilizers and pesticides. It has been pointed out that nearly 60% of all districts in the country have issues related to either availability of ground water, or quality of ground water, or both.<sup>[11]</sup>

## **3. ESTIMATION**

The ground water potential of the State as per latest assessment is 13.68BCM, out of which 60% i.e 10.67 BCM is safe and usable. The ground water development in our State is restricted to the shallow aquifer zone, within 50 m depth and mostly through both in public and private sector. The shallow ground water structures include dug wells and bore wells in hard rock areas and dug wells, shallow tube wells and filter point tube wells in alluvial terrain. The medium tube wells are also constructed in alluvial areas down to an average depth 40-50m. The present level of ground water exploration in the state is 20% and there is a further scope for future<sup>[12]</sup>.

The Standing Committee on Water Resources examined the subject 'Review of ground water scenario, need for a comprehensive policy and measures to address problems in the country with particular reference to (i) dark blocks, and (ii) contamination of underground water by certain industries' and submitted their report in December 2015. The Committee's recommendations are summarised in the annexure to the note. Committees usually review the action taken by the government on their recommendations, a few months after the report is released.<sup>[13]</sup>

The Committee on Estimates 2014-15 that reviewed the occurrence of high arsenic content in ground water observed that 68 districts in 10 states are affected by high arsenic contamination in groundwater.<sup>11</sup> These states are Haryana, Punjab, Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, West Bengal, Assam, Manipur and Karnataka.<sup>[14]</sup>

Field data and water quality samples are collected in the groundwater Hydrograph stations. The water samples are brought to the water quality laboratories. The water samples collected are analysed in one WQ labs (Level-II) attached to Bilaspur division and another one WQ lab (level-II+) at Raipur.

Sl. No.	Assessment Unit/ District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial water supply	Existing Gross Ground Water Draft for All uses	Allocation for domestic, and industrial requirement upto next 25 years	Net Ground Water Availability for future irrigation development
1	Bastar	181706	8665	3007	11673	4223	168818
2	Bilaspur	66505	18128	4610	22738	7661	40716
3	Dantewara	175503	2490	1650	4139	2265	170748
4	Dhamtari	37182	13540	1641	15181	2424	21218
5	Durg	77658	44319	6473	50792	9126	24213
6	Janjgir Champa	46925	12061	3047	15108	4393	30470
7	Jashpur	87401	14592	1692	16284	2230	70579
8	Kanker	90987	6871	1521	8392	2317	81799
9	Kawardha	26310	7741	1333	9075	1776	16793
10	Korba	46554	3992	2363	6355	3588	38974
11	Koriya	31220	3909	1350	5259	1898	25412
12	Mahasamund	78070	16415	1933	18348	2344	59311
13	Raigarh	63919	13165	2927	16092	4225	46529
14	Raipur	138949	22329	6989	29318	10175	106443
15	Rajnandgaon	65138	16851	2961	19811	4213	44074
16	Surguja	154455	26326	4639	30965	7302	120827
	State Total (ha m)	1368482	231394	48136	279530	70160	1066924
	State Total (BCM)	13.68	2.31	0.48	2.80	0.70	10.67

#### 4. DEPTH OF WATER LEVEL

##### A. May 2014

In general, the depth to water level ranges up to 10 mbgl in approximately 79 % of the observation wells in the state. Deeper water levels ranging between 10 and 20 mbgl occur only in 19 % of the observation wells and mostly in parts of Bilaspur, Durg, Janjgir - Champa, Korba, Koriya, Raigarh, Raipur and Surguja districts. The deepest water level of 25.20 m bgl was monitored in Dhamdha observation well (Shallow piezometer) of Durg district. 23 number of wells (approximately 4 % of the monitored wells) in the state are showing water levels between 0 - 2 m bgl in Bilaspur, Mahasamund, Dhamtari, Durg, Raigarh, Raipur and Janjgir Champa districts. Water levels in the range of 2 - 5 m bgl are recorded in about 125 of the observation wells monitored. The highest percentages of wells in this range are in Durg (38.30%), Koriya (33.33%), Raipur (33.33%), Bilaspur (29.28%), Kawardha (25%) and Raigarh (25%) districts. Nearly 52.06 % of observation wells are exhibiting water level in the range of 5 - 10 mbgl in all the districts of the state. The district wise frequency distribution of different ranges of depth to water level are furnished in Annexure - I and II. District wise distribution of percentage of observation wells at different ranges of depth to water level as observed in May 2014 are given in and represented on a map and appended the wells and depth to water level range up to 10 mbgl is observed in

approximately 50% of the wells in the state. Deeper water levels ranging between 10 and 20 mbgl occur only in 1.15% of the observation wells and mostly in parts of Bilaspur, Durg, Kawardha and Dhamtari districts.

The deepest water level of 27.10mbgl was monitored in Dhamtari observation well (piezometer) of Dhamtari district. 32 numbers of wells (approximately 5.26% of the monitored wells) in the state are showing water levels between 0-2m bgl in almost all the districts of Chhattisgarh State except Bastar, Kanker, Kawardha & Mahasamund. Water levels in the range of 2-5 m bgl are recorded in about 207 of the observation wells monitored. The highest percentages of wells in this range are in Raipur (56.45%), Kanker (53.85%), Korba (40.91%), Kawardha (40.00%), Koriya (38.89%), Durg (38.46%), Mahasamund (37.04%), Bastar (36.00%) and Bilaspur (35.21%) districts. Nearly 50% of observation wells are exhibiting water level in the range of 5-10 mbgl in most of the districts of the state<sup>[5]</sup>. The district wise frequency distribution of different ranges of depth to water level are furnished in Annexure-I and II. The district wise frequency distributions of different ranges of depth to water level are furnished in Different ranges of depth to water table as observed in January 2015 are represented on a map and appended as figure 4.1.

District	No. of Wells Analyzed	Depth to Water Table (mbgl)	No. / Percentage of Wells Showing Depth to Water Table (mbgl) in the Range of								
			Min	Max	0.0-2.0	2.0-5.0	5-10.0	10.0-20.0	20.0-40.0		
BASTAR	17	2.46	15.28	0	23.53%	4	52.94%	9	23.53%	4	0
BILASPUR	71	0.70	22.31	5	7.04%	21	29.58%	32	45.07%	11	2.82%
DHAMTARI	24	1.32	20.50	2	8.33%	4	16.67%	13	54.17%	3	8.34%
DURG	47	1.11	25.20	3	6.38%	18	38.30%	14	29.79%	8	4.851%
JANJGIR - CHAMPA	45	1.05	20.90	3	6.67%	8	17.78%	23	51.11%	10	2.22%
JASHPUR	46	2.75	15.05	0	0	9	19.57%	33	71.74%	4	8.70%
KANKER	3	5.47	8.24	0	0	3	100.00%	0	0	0	0
KAWARDHA	12	4.27	20.60	0	25.00%	3	41.67%	5	25.00%	3	8.33%
KORBA	50	1.75	15.83	1	2.00%	6	12%	35	70.00%	8	16.00%
KORIYA	12	0.80	12.80	1	8.33%	4	33.33%	4	33.33%	3	25.00%
MAHASAMUND	31	0.73	25.20	3	9.68%	4	12.90%	15	48.39%	6	19.35%
RAIGARH	68	1.40	23.50	2	2.94%	17	25.00%	34	50.00%	14	1.47%
RAIPUR	60	1.37	24.00	2	3.33%	20	33.33%	25	41.67%	12	1.67%
RAJNANDGAON	25	1.80	10.77	1	4.00%	3	12.00%	18	72.00%	3	12.00%
SURGUJA	46	2.65	19.27	0	8.70%	4	8.70%	27	58.70%	15	32.61%
Total	557	0.70	25.20	23	4.13%	125	22.44%	290	52.06%	104	18.6%

Fig4.1 district wise distribution of percentage of water wells in may 2014

##### B. August 2014

In general, the depth to water level range up to 5 mbgl is observed in approximately 89% of the wells and depth to water level range up to 10 mbgl is observed in approximately 8% of the wells in the state. Deeper water levels ranging between 10 and 20 mbgl occur only in 3% of the observation wells and mostly in parts of Bilaspur, Durg, Dhamtari, Kawardha, Jashpur, Korba, Mahasamund and Surguja districts. The deepest water level of 22.30 m bgl was monitored in Ganiyari observation well (Shallow piezometer) of Bilaspur district. 338 numbers of wells (approximately 56% of the monitored wells) in the state are showing water levels between 0 - 2 m bgl in almost all the districts of Chhattisgarh State. Water levels in the range of 2 - 5 m bgl are recorded in about 195 of the observation wells monitored. The highest percentages of wells in this range are in Koriya (58.62%), Surguja(53.57%), Korba

(44.44%), Kawardha (43.75%), Mahasamund (37.93%) and Bilaspur (37.66%) districts. Nearly 8% of observation wells are exhibiting water level in the range of 5 - 10 mbgl in most of the districts of the state. The district wise frequency distribution of different ranges of depth to water level are furnished in Annexure - I and II. District wise distribution of percentage of observation wells at different ranges of depth to water level as observed in August 2014 are given in and represented on a map and appended as figure 4.2.

District	No. of Wells Analysed	Depth to Water Table (mbgl)	No. / Percentage of Wells Showing Depth to Water Table (mbgl) in the Range of						
			Min	Max	0.0-2.0	2.0-5.0	5.0-10.0	10.0-20.0	20.0-40.0
BASTAR	18	0.55	7.13	13	3	2	0	0	0
BILASPUR	77	0.81	22.30	34	29	8	5	1	1
DHAMTARI	31	0.05	12.93	23	5	2	1	0	0
DURG	46	0.63	17.56	34	6	4	2	0	0
JANIGIR - CHAMPA	46	0.25	6.80	29	15	2	0	0	0
JASHPUR	47	0.10	12.69	26	16	4	1	0	0
KANKER	4	0.76	3.64	3	1	0	0	0	0
KAWARDHA	16	0.55	19.44	5	7	0	4	0	0
KORBA	54	0.18	13.47	27	24	2	1	0	0
KORIYA	29	0.05	4.99	12	17	0	0	0	0
MAHASAMUND	29	0.25	16.10	14	11	3	1	0	0
RAIGARH	55	1.00	8.79	30	18	7	0	0	0
RAIPUR	62	0.70	5.80	56	4	1	0	0	0
RAJNANDGAON	30	0.25	6.97	16	8	6	0	0	0
SURGUJA	56	0.27	11.36	16	30	7	3	0	0
Total	600	1.00	22.30	338	195	48	18	1	0

Fig4.2 district wise distribution of percentage of water wells in august 2014

C. November 2014

In general, the depth to water level range up to 5 mbgl is observed in approximately 79 % of the wells and depth to water level range up to 10 mbgl is observed in approximately 17 % of the wells in the state. Deeper water levels ranging between 10 and 20 mbgl occur only in 4 % of the observation wells and mostly in parts of Bilaspur, Durg, Kawardha and Surguja districts. The deepest water level of 19.70 m bgl was monitored in Ganiyari observation well (Shallow piezometer) of Bilaspur district. 155 numbers of wells (approximately 25 % of the monitored wells) in the state are showing water levels between 0 - 2 m bgl in almost all the districts of Chhattisgarh State. Water levels in the range of 2 - 5 m bgl are recorded in about 332 of the observation wells monitored. The highest percentages of wells in this range are in Bastar (85.71%), Jashpur (68.29%), Kanker (66.67%), Kawardha ( 62.50 %), Korba ( 62.26 %), Raipur (62.03%), Koriya ( 59 . 09 %), Mahasamund ( 57.58 %) and Bilaspur ( 52.86 %) districts. Nearly 17 % of observation wells are exhibiting water level in the range of 5 - 10 mbgl in most of the districts of the state. The district wise frequency distribution of different ranges of depth to water level are furnished in Annexure - I and II. District wise distribution of percentage of observation wells at different ranges of depth to water level as observed in November 2014.

District	No. of Wells Analysed	Depth to Water Table (mbgl)	No. / Percentage of Wells Showing Depth to Water Table (mbgl) in the Range of						
			Min	Max	0.0-2.0	2.0-5.0	5.0-10.0	10.0-20.0	20.0-40.0
BASTAR	14	2.35	5.84	0	12	2	0	0	
BILASPUR	70	0.20	19.70	20	37	8	0	0	
DHAMTARI	30	0.69	15.25	11	12	6	0	0	
DURG	54	0.18	15.59	23	20	8	0	0	
JANIGIR - CHAMPA	45	0.88	7.40	42.59%	37.04%	14.81%	0	0	
JASHPUR	41	0.45	7.01	2	28	11	0	0	
KANKER	3	2.51	5.77	0	2	1	0	0	
KAWARDHA	16	1.10	14.94	2	10	0	0	0	
KORBA	53	0.40	13.47	15	33	4	0	0	
KORIYA	22	0.55	7.85	4	13	5	0	0	
MAHASAMUND	33	0.50	14.23	6	19	7	0	0	
RAIGARH	70	0.75	17.08	16	35	18	0	0	
RAIPUR	79	0.26	13.97	23	49	6	0	0	
RAJNANDGAON	30	0.78	6.69	12	14	4	0	0	
SURGUJA	60	1.36	13.51	3	26	23	0	0	
Total	620	0.18	19.70	155	332	25	0	0	

Fig4.3 district wise distribution of percentage of water wells in November 2014

D. May 2015

In general, the depth to water level range up to 5 mbgl is observed in approximately 34.04 % of the wells and depth to water level range up to 10 mbgl is observed in approximately 50 % of the wells in the state. Deeper water levels ranging between 10 and 20 mbgl occur only in 1.15 % of the observation wells and mostly in parts of Bilaspur, Durg, Kawardha and Dhamtari districts. The deepest water level of 27.10 m bgl was monitored in Dhamtari observation well (piezometer) of Dhamtari district. 32 numbers of wells (approximately 5.26 % of the monitored wells) in the state are showing water levels between 0 - 2 m bgl in almost all the districts of Chhattisgarh State except Bastar, Kanker, Kawardha & Mahasamund. Water levels in the range of 2 - 5 m bgl are recorded in about 207 of the observation wells monitored. The highest percentages of wells in this range are in Raipur (56.45%), Kanker (53.85%), Korba ( 40.91 %), Kawardha ( 40.00%), Koriya ( 38.89%), Durg (38.46%), Mahasamund(37.04%), Bastar (36.00%) and Bilaspur ( 35.21 %) districts. Nearly 50 % of observation wells are exhibiting water level in the range of 5 - 10 mbgl in most of the districts of the state. The district wise frequency distribution of different ranges of depth to water level are furnished in Annexure - I and II. The district wise frequency distributions of different ranges of depth to water level are furnished. Different ranges of depth to water table as observed in January 2015 are represented on a map and appended as figure 4.4<sup>[15]</sup>.

SN	District	The district wise distribution of Hydrograph Network Stations in Chhattisgarh along with no. of network stations monitored/not monitored / new well establishment in January 2015															
		No. of GW monitoring wells as on 21.11.2015			No. of wells established in January 2015			No. of monitoring wells as on 11.01.2015			No. of wells monitored in January 2015			No. of wells not monitored in January 2015		Reasons for non monitoring of wells	
		DW	PZ	Total	DW	PZ	Total	DW	PZ	Total	DW	PZ	DW	PZ	Dug well	Piezometers	
1	Bastar	42	14	56	0	0	42	14	56	27	5	15	9	Navalite Affected Area	Navalite Affected Area		
2	Bilaspur	78	17	95	3	0	81	17	98	68	15	13	2	Internal Lock Jam/ Filled up	Internal Lock Jam/ Filled up		
3	Dhamtari	29	12	41	0	0	29	12	41	20	7	9	5	Navalite Affected Area	Navalite Affected Area		
4	Durg	72	25	97	0	0	72	25	97	67	12	5	13	Internal Lock Jam/ Filled up	Internal Lock Jam/ Filled up		
5	Janjgir- Champa	42	14	56	0	0	42	14	56	39	13	3	1	Internal Lock Jam/ Filled up	Internal Lock Jam/ Filled up		
6	Jashpur	61	11	72	0	0	61	11	72	51	8	10	3	Navalite Affected Area	Navalite Affected Area		
7	Kanker	20	3	23	0	0	20	3	23	15	2	5	1	Navalite Affected Area	Navalite Affected Area		
8	Kawardha	15	10	25	0	0	15	10	25	13	7	2	3	Navalite Affected Area	Navalite Affected Area		
9	Korba	65	30	95	3	0	68	30	98	56	18	12	12	Internal Lock Jam/ Filled up	Internal Lock Jam/ Filled up		
10	Koriya	34	6	40	0	0	34	6	40	21	5	13	1	Navalite Affected Area	Navalite Affected Area		
11	Mahasamund	27	20	47	0	0	27	20	47	21	12	6	8	Internal Lock Jam/ Filled up	Internal Lock Jam/ Filled up		
12	Raigarh	104	30	134	0	0	104	30	134	77	15	27	15	Navalite Affected Area	Navalite Affected Area		
13	Raipur	95	42	137	0	0	95	42	137	71	15	24	27	Navalite Affected Area	Navalite Affected Area		
14	Rajnandgaon	57	8	65	0	0	57	8	65	40	5	17	3	Navalite Affected Area	Navalite Affected Area		
15	Surguja	78	21	99	0	0	78	21	99	65	13	13	8	Navalite Affected Area	Navalite Affected Area		
	Total	819	263	1082	6	0	825	263	1088	651	152	174	111				

Fig.4.4 district wise distribution of percentage of water wells in May 2015

### 5. WATER QUALITY TESTING RATES

Testing of Water Sample for 26 parameters including required chemicals, glass ware and equipments<sup>[16]</sup>

(Rates effective from 01.08.10)

Item No.	Item	Unit	Rate (in rupees)
1	Electrical conductivity	Per Sample	76
2	Total dissolved solid	Per Sample	123
3	PH	Per Sample	76
4	Sodium	Per Sample	243
5	Potassium	Per Sample	243
6	Turbidity	Per Sample	72
7	Sulphate	Per Sample	172
8	C.O.D.	Per Sample	404
9	Nitrate(NO3)	Per Sample	248
10	Flouride	Per Sample	188
11	Nitrite(NO2)	Per Sample	251
12	Phosphate	Per Sample	253
13	Silicate	Per Sample	260
14	B.O.D	Per Sample	630
15	Total Suspended Solid	Per Sample	123
16	Dissolved Oxygen	Per Sample	105
17	Free Carbon Dioxide	Per Sample	125
18	Carbonate	Per Sample	125
19	Bicarbonate	Per Sample	126
20	Total Hardness	Per Sample	128
21	Calcium	Per Sample	126
22	Magnesium	Per Sample	435
23	Chloride	Per Sample	127
24	Coliform Faecal	Per Sample	422
25	Coliform Total	Per Sample	532

### 6. CONCLUSION

Owing to the accelerated growth of population, agricultural and drinking water uses are increasing in alarming rate leading to over withdrawal of groundwater. The ground water is being used through various groundwater structures and census of groundwater structures will provide actual groundwater abstraction which otherwise calculated based on norms. Roles: Data Provider: Public Health Engineering Department.

Consumer: Groundwater users including farmers Solution: Census of groundwater structures is pre-requisite for planners and water managers. Create mass awareness desired outcome.

### 7. REFERENCES

- [1] Smt.Mausumi Sahoo, Scientist ‘B’ under the guidance of Shri C. Paul Prabhakar,Regional Director in “GROUND WATER YEAR BOOK OF CHHATTISGARH 2014-15”.
- [2] GoI (2010), Groundwater Scenario of India 2009–10, Central Ground Water Board, Ministry of Water Resources: <http://www.cgwb.gov.in/documents/GroundWaterYearBook%202009-10.pdf>.
- [3] Smt.Mausumi Sahoo, Scientist ‘B’ under the guidance of Shri C. Paul Prabhakar, Regional Director in “GROUND WATER YEAR BOOK OF CHHATTISGARH 2015-16”.
- [4] Section 7 (g), Indian Easement Act, 1882.
- [5] Water Rights and Principles of Water Resource Management, Chhatrapati Singh, N.M. Tripathi, 1991.
- [6] Sixth Report of the Second Administrative Reforms Commission, Department of Administrative Reforms & Public Grievances, Ministry of Personnel, Public Grievances, and Pensions, Government of India, <http://arc.gov.in/6-1.pdf>.
- [7] Rubia Khan and D. C. Jhariya “JOURNAL GEOLOGICAL SOCIETY OF INDIA” Vol.90, July 2017, pp.69-76.
- [8] Amit Kumar, Shikha Anand, Manish Kumar and Ravish Chandra. 2017. Groundwater Assessment: A Case Study in Patna and Gaya District of Bihar, India. Int.J.Curr.Microbiol.App.Sci. 6(12): 184-195.
- [9] Lok Sabha Unstarred Question No. 2157, Ministry of Water Resource, River Development and Ganga Rejuvenation, answered on March 10, 2015, <http://164.100.47.132/LssNew/psearch/QResult16.aspx?qref=14305>.
- [10] 12th Five Year Plan, Planning Commission, 2013 [http://planningcommission.gov.in/plans/planrel/fiveyr/12h/pdf/12fyp\\_vol1.pdf](http://planningcommission.gov.in/plans/planrel/fiveyr/12h/pdf/12fyp_vol1.pdf).
- [11] Roopal Suhag “overview of ground water in india”, February 2016.
- [12] Shri M.K. Mishra, Sr.TD & State Informatics Officer on March 2011 'Net Ground Water Availability for Future Irrigation Development'.
- [13] Occurrence of High Arsenic Content in Ground Water, Committee on Estimates (2014-15), December2014, [http://wrmin.nic.in/writereaddata/16\\_Estimates\\_on\\_arsenic.pdf](http://wrmin.nic.in/writereaddata/16_Estimates_on_arsenic.pdf).
- [14] Webpage on Ministry of Water Resources,River Development and Ganga Rejuvenation.[Online].Available:<http://www.cgwb.gov.in/Ann-Reports.html>
- [15] webpage on Central Ground Water Board.[Online].Available: <http://www.cgwb.gov.in/Ann-Reports.html>
- [16] Government of Chhattishgarh Water Resource Department website.[Online].Available:<http://www.cgwrdd.in/water-resource/ground-water-status.html>