International Journal of Geology, Earth and Environmental Sciences ISSN: 2277-2081 (Online)
An Online International Journal Available at http://www.cibtech.org/jgee.htm
2012 Vol. 2 (1) January-April, pp.131-139 / Sanjeev et al.
Research Article

GROUNDWATER IMPOUNDMENT IN THE RESERVOIR AND ITS IMPACT ON THE COMMAND AREA- A CASE STUDY IN SHIRUR VILLAGE, BELGAUM DISTRICT, KARNATAKA

[*]Latha Sanjeev[1], Pushpa Iyengar[2] , Ushamalini G[3]
[1]JNTU, Hyderabad.Andhra Pradesh.
[2]Department of Chemistry, Acharya Institute of Technology, Bangalore.
[3]Department of Microbiology, Goverment Science College, Bangalore.
[*]Author of Correspondence

ABSTRACT
The study with the objective of impact assessment of a typical reservoir storage in groundwater system and quality has been programmed in three phases as per the climatic conditions, such as premonsoon, monsoon and monsoon during the period 2006 to 2009, in four different taluks of Belgaum district from different tubewells and open wells, which are being extensively used for drinking and other domestic purposes. A total of 50 sampling sites were identified from around 30 villages, and repeat samples were collected for three different seasons and were analysed for physicochemical and biological parameters, and using these results Water Quality Index was assessed and the results of three different seasons during the study period was compared. A seasonal variation was observed in the results i.e., the post monsoon samples showed lesser values of WQI, in comparison with the premonsoon season, and also the premonsoon 2009 samples showed lesser values of WQI when compared with the premonsoon 2006 samples. This may be possibly attributed to the dilution factor contributed by rains which occurred in the region, besides the water storage in the first phase of the reservoir.

***Key Words**: Groundwater, Physicochemical Parameters, WQI, Impoundment*

INTRODUCTION

The quality of groundwater is the result of all the processes and reactions that act on the water from the moment it is condensed as rain to the time it is discharged by a well or spring. It also varies from place to place due to local geological features and depth of the water table. Groundwater has certain unique features, which renders it particularly suitable for public water supply. It has excellent natural quality and is generally free from pathogens, colour and turbidity and can be consumed directly without treatment. Groundwater is widely distributed in nature and it can be frequently developed incrementally at points near the location of water demand, thus eliminating the need for large scale storage, treatment and distribution system. Back (1960) and Schoeller (1962) have established certain broad relationships between the chemical composition and flow distribution.

Study area

The area selected for the present study is the command and catchment area of Markandeya river Shirur village, Gokak taluk, Belgaum District, Karnataka. The study area is situated in the northern part of Karnataka State, having borders with Goa and Maharashtra States and is geographically located between latitude 16 º 2'0'' N and longitude 74º38'30'' E and covered on SOI Toposheet No 47/12. The site map of the study area is shown in Fig 1

MATERIALS AND METHODS

A total of 50 samples were collected, from around 30 villages. Samples were collected in plastic cans of 2- litre capacity for physical and chemical analysis. Various water quality parameters viz., pH, turbidity, Electrical conductivity, TDS, alkalinity, Chlorides, Total hardness, Calcium hardness, Magnesium hardness, Nitrates, Sulphate, Iron, Fluoride, Sodium, Potassium, Ammonia nitrogen were determined

employing standard methods of analyses (APHA, 1995) .The comparison of values in different seasons is shown in table 5

WATER QUALITY INDEX (WQI)

The water quality indices for the entire study area comprising 50 locations have been computed for both pre and post monsoon season of 2006 till 2009 using the ground water quality data. A water quality index (WQI) may be defined as a rating reflecting the composite influence of a number of quality of water (Tiwari and Mishra 1985). (Table 5)

Water Depth

Water levels were recorded using piezometers all through the season for three different years and findings were tabulated and observations showed that recharge of wells and borewells have taken place with the impoundment of water in the reservoir as well as due to heavy rains received by the area. Results are tabulated in tables 1, 2, 3 and 4

Figure 1: Location map of study area

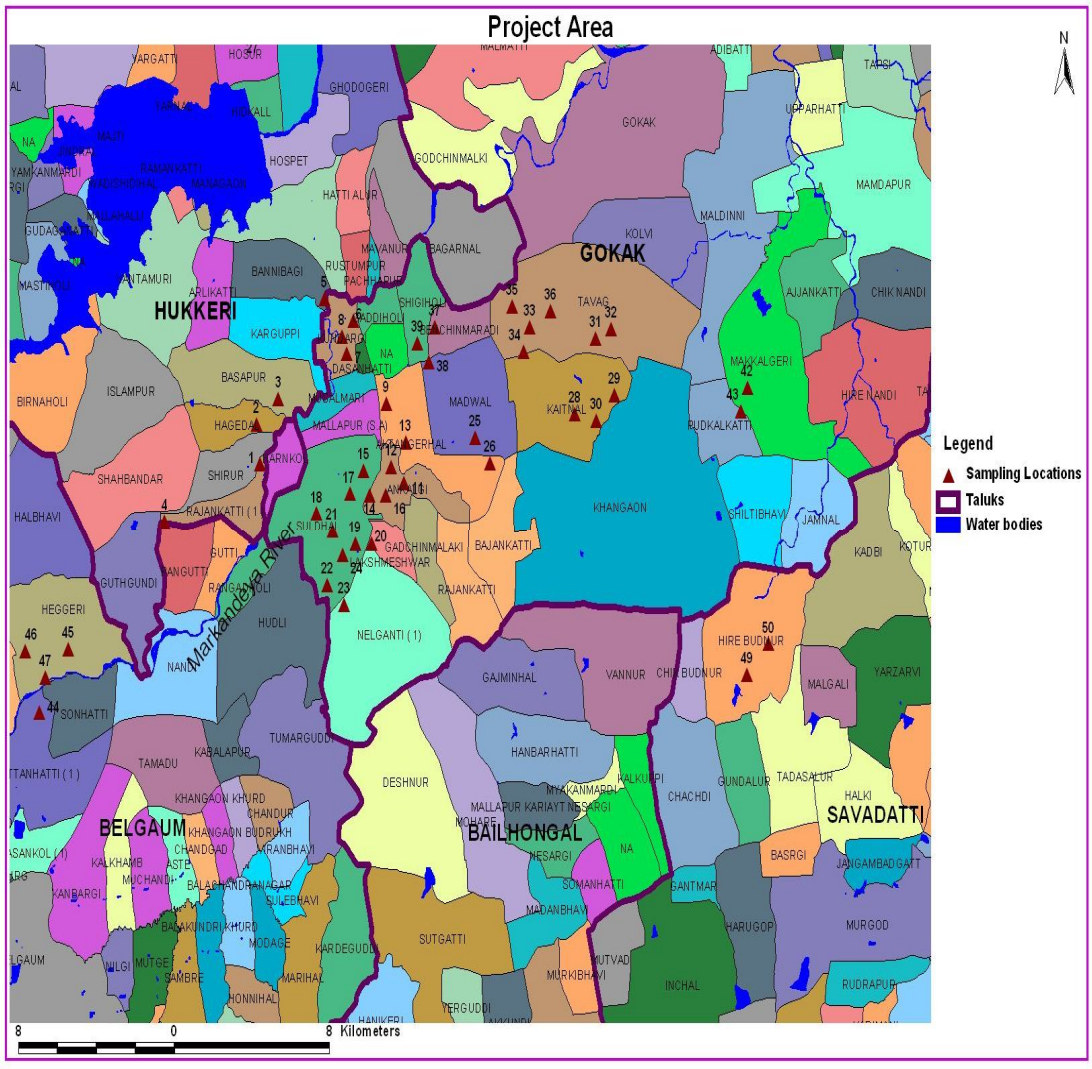

Table 1: Water level recorded in premonsoon 2006

Sample No.s	Approximate Well depth	Approximate water depth	Yield(inches)
1	210	95	2
2	200	90	2
3	200	120	2 1/2
4	150	85	1 1/2
5	120	90	2 1/2
6	150	120	3
7	132	100	3 1/2
8	160	140	2
9	240	160	1
10	140	90	2 1/2
11	360	180	1
12	310	260	2 1/2
13	300	250	2 1/2
14	320	170	2
15	270	`	2
16	250	200	2
17	260	70	3 1/2
18	50	48	1 1/2
19	150	120	1 1/2
20	270	120	2 1/2
21	300	90	2 1/2
22	300	100	1 1/2
23	400	260	2 1/2
24	500	250	2 1/2
25	200	160	3
26	250	420	3
27	250	300	2
28	290	200	3
29	50	40	NA
30	50	40	NA
31	330	240	2
32	670	80	2
33	450	85	2
34	200	100	2
35	300	140	2
36	200	170	2
37	280	180	2 1/2
38	300	190	2
39	240	160	2 1/2
40	300	180	2 1/2
41	300	170	2
42	300	200	2

43	300	170	2
44	30	20	NA
45	220	120	2
46	300	200	2
47	50	20	NA
48	200	20	3
49	360	280	3
50	45	25	NA

Table 2: Water level recorded in premonsoon 2007

Sample No.s	**Approximate Well depth**	**Approximate water depth**	**Yield(inches)**
1	210	95	2
2	200	90	2
3	200	120	2.5
4	150	85	1.5
5	120	90	2.5
6	150	120	3
7	132	100	3.5
8	160	140	2
9	240	160	1
10	140	90	2.5
11	360	180	1
12	310	260	2.5
13	300	250	2.5
14	320	170	2
15	270	160	2
16	250	200	2
17	260	70	3.5
18	50	48	1.5
19	150	120	1.5
20	270	120	2.5
21	300	90	2.5
22	300	100	1.5
23	400	260	2.5
24	500	250	2.5
25	200	160	3
26	250	420	3
27	250	300	2
28	290	200	3
29	50	40	NA
30	50	40	NA
31	330	240	2
32	670	80	2
33	450	85	2
34	200	100	2

35	300	140	2
36	200	170	2
37	280	180	2.5
38	300	190	2
39	240	160	2.5
40	300	180	2.5
41	300	170	2
42	300	200	2
43	300	170	2
44	30	20	NA
45	220	120	2
46	300	200	2
47	50	20	NA
48	200	20	3
49	280	3	
50	25	NA	

Table 3: Water level recorded in premonsoon 2008

Sample No.s	Approximate Well depth	Approximate water depth	Yield(inches)
1	210	97	2.5
2	200	93	2.5
3	200	125	2.5
4	150	90	1.5
5	120	92	2.5
6	150	125	3
7	132	103	3.5
8	160	141	2.5
9	240	162	1
10	140	91	2.5
11	360	182	1
12	310	260	2.5
13	300	251	2.5
14	320	172	2.5
15	270	162	2.5
16	250	200	2.5
17	260	73	3.5
18	50	49	1.5
19	150	122	1.5
20	270	122	2.5
21	300	95	2.5
22	300	101	1.5
23	400	251	2.5
24	500	251	2.5
25	200	162	3
26	250	422	3

27	250	301	2
28	290	201	3
29	50	45	2.5
30	50	45	2.5
31	330	241	2.5
32	670	82	2.5
33	450	86	2.5
34	200	102	2.5
35	300	141	2.5
36	200	171	2.5
37	280	182	2.5
38	300	195	2
39	240	164	2.5
40	300	171	2.5
41	300	171	2.5
42	300	202	2.5
43	300	172	2.5
44	30	122	2.5
45	220	122	2.5
46	300	201	2.5
47	50	22	2.5
48	200	22	3
49	360	281	3
50	45	28	2.5

Table 4: Water level recorded in premonsoon 2009

Sample No.s	**Approximate Well depth**	**Approximate water depth**	**Yield(inches)**
1	210	101	3
2	200	97	3
3	200	128	3
4	150	96	1.5
5	120	94	3
6	150	129	3
7	132	103	3.5
8	160	142	2.5
9	240	164	2
10	140	94	2.5
11	360	183	1
12	310	262	2.5
13	300	253	3
14	320	174	2.5
15	270	164	2.5
16	250	203	3
17	260	74	3.5
18	50	50	1.5
19	150	123	2.5

20	270	124	2.5
21	300	98	3
22	300	105	2.5
23	400	255	2.5
24	500	254	2.5
25	200	163	3
26	250	424	3
27	250	305	2
28	290	205	3
29	50	48	2.5
30	50	49	2.5
31	330	245	2.5
32	670	85	2.5
33	450	88	2.5
34	200	105	2.5
35	300	145	2.5
36	200	175	2.5
37	280	184	2.5
38	300	196	2
39	240	166	2.5
40	300	175	2.5
41	300	175	2.5
42	300	204	2.5
43	300	174	2.5
44	30	125	2.5
45	220	125	2.5
46	300	204	2.5
47	50	26	2.5
48	200	26	3
49	360	285	3
50	45	30	2.5

Table 5: Comparison of physico-chemical parameters of the water samples in pre and post monsoon

SL.No.	TDSpre-2006	TDSpre2009	Ca-pre2006	Ca-pre2009	THpre2006	TH-pre2009	F^--pre2006	F^--pre2009	WQI-pre2006	WQI-pre2009
1	607	500	231	217	351	298	1.2	0.84	62.69	63
2	556	500	178.5	164.5	213	165	1.9	1.4	29	29
3	936	789	399	385	622	569	2.14	2.01	316.22	316
4	644	580	220.5	206.5	278	218	1.8	1.45	79.96	80
5	1555	1478	157.5	143.5	281	227	1.7	1.75	76.12	76
6	2010	1947	500	486	1194	1139	1.5	1.23	88.47	88
7	1236	1174	483	469	769	706	1.9	1.72	55	55
8	985	920	157.5	143.5	226	168	1.8	1.71	23.62	24
9	1017	958	430	416	601	547	2	1.16	80.78	81

10	903	846	252	238	478	416	1.22	1.2	44.5	45
11	786	726	252	238	354	295	1.26	1.21	13.17	13
12	851	795	315	301	458	394	1.12	0.99	77	77
13	715	652	178.5	164.5	326	269	1.3	1.23	13.7	14
14	657	600	241.5	227.5	317	253	1.6	1.42	154	52
15	726	666	262.5	248.5	372	317	1.2	1.41	253	88
16	785	724	199.5	185.5	311	258	1.5	1.41	46.1	46
17	626	562	157.5	143.5	259	197	1.4	1.3	10.67	11
18	786	726	325.5	311.5	538	476	1.01	0.98	35.67	36
19	750	690	273	259	376	318	1.06	1.01	41.17	41
20	900	840	262.5	248.5	456	396	1.05	0.89	47	17
21	850	788	273	259	412	349	1.06	1.01	17.13	17
22	900	842	283.5	269.5	479	417	1.09	1.03	196.79	197
23	980	921	315	301	468	409	1.5	1.42	127.05	127
24	800	734	273	259	414	358	1.8	1.72	44	44
25	550	491	147	133	256	197	1.9	1.8	56	18
26	660	600	168	154	283	226	1.01	0.97	12.86	13
27	400	338	73.5	59.5	119	62	1.05	0.99	25.64	26
28	550	491	115.5	101.5	225	165	1.3	1.06	252.34	252
29	900	812	315	301	534	478	1.4	1.04	241	241
30	710	649	210	196	348	288	1.02	0.98	85.8	86
31	650	583	189	175	219	180	1.02	0.99	69.07	69
32	480	419	84	70	137	79	1.8	1.52	79.43	79
33	2020	1940	630	616	1301	1249	1.7	1.57	92.64	93
34	1900	1842	420	406	830	778	1.05	0.99	51	51
35	1000	936	262.5	248.5	533	476	1.04	0.98	21.63	22
36	800	729	252	238	442	388	1.06	1.01	72.06	72
37	660	591	199.5	185.5	367	309	1.05	0.99	43.34	43
38	980	913	304.5	290.5	601	547	1.8	1.41	83	15
39	1020	912	357	343	828	769	1.05	1.01	143	79
40	2010	1951	189	175	501	448	1.11	1.06	120	13
41	790	712	231	217	423	367	1.4	1.07	153.11	153
42	1360	1296	231	217	471	419	1.6	1.07	274.66	275
43	1782	1711	493.5	479.5	1030	978	1.7	1.46	51	51
44	770	701	115.5	101.5	274	219	1.5	1.41	26	26
45	730	658	157.5	143.5	271	220	1.42	1.35	40.45	40
46	660	598	115.6	101.6	354	298	1.61	1.55	51	51
47	780	711	189	175	332	279	1.72	1.62	56.62	57

48	760	699	157.6	143.6	381	326	1.01	0.89	18.53	19
49	820	699	157.6	143.6	296	238	1.08	1.01	13.93	14
50	1020	946	367.6	353.6	834	779	1.08	1.01	51	51

RESULTS AND DISCUSSIONS

A close study of all the parameters analysed and water quality index arrived at, reveals some interesting information about the quality of ground water in three different seasons over a gap of three and a half years. In the first place the oerall quality of the groundwater in the study area is reflected in the average value of WQI which is found to be 82.4 in pre monsoon 2006 while it is gone down to 70.9 in pre monsoon 2009. This implies that the groundwater of the study area in the premonsoon season had higher concentration of almost all the parameters when compared to the post-monsoon samples. Regarding the water depth status, observations showed that recharge of wells and borewells have taken place with the impoundment of water in the reservoir as well as due to heavy rains received by the area, and the four borewells which were dry also had got recharged in the premonsoon 2009 study.

REFERENCES

APHA (2002). Standard methods for the examination of water and wastewater. 20thedition, American Public and Health Association, Washington D.C, New York, USA.

Back W (1960). "Origin of hydro chemical facies and groundwater in Atlantic coastal plain", Report, XXI International Geologists Congress, Nordend, **1** 87.

Tiwari TN and Mishra Manorama (1985). A Priliminary assignment of water quality index to major Indian rivers. *Indian Journal of Environmental Protection,* **5**(4) 276-279.

Schoceller H (1962). Qualitative evaluation of ground water resources. *Water resources series* – 33, UNESCO 44-52.