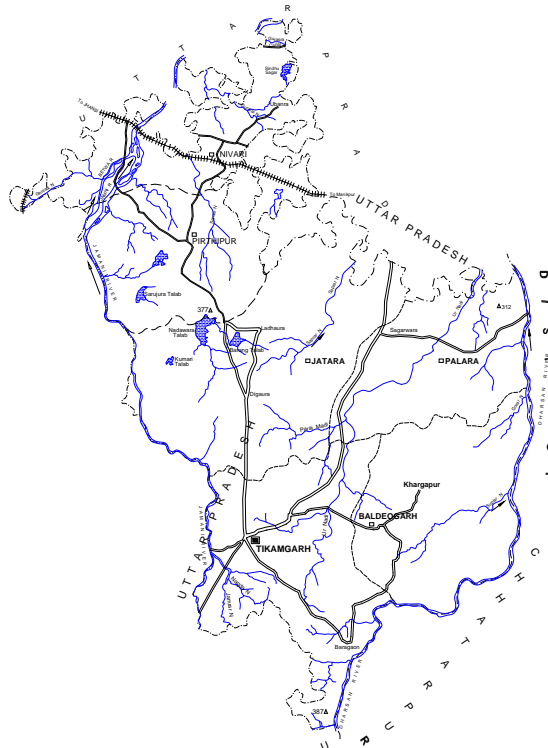


DISTRICT GROUND WATER INFORMATION BOOKLET



TIKAMGARH DISTRICT MADHYA PRADESH



**Ministry of Water Resources
Central Ground Water Board
North Central Region
Government of India**

September, 2009

TIKAMGARH DISTRICT AT A GLANCE

S. N.	ITEMS	STATISTICS	
1	General Information		
	1) Geographical area	5,048 Km ²	
	2) Administrative Divisions (As on 2006)		
	Number of Thesil/Blocks	6/6	
	Number of Panchayats/Villages	459/865	
3) Population (Census 2001)	12,02,998		
4) Average Annual Rainfall (mm)	1057.1 mm		
2	Geomorphology		
	Major Physiographic Units	1. The hill ranges. 2. The intermountain fertile valleys.	
	Major Drainage	1. Betwa River. 2. Dhasan River.	
3	Land Use (Km²)		
	1) Forest area	294.38	
	2) Net area sown	2619.20	
	3) Cultivable area	2409.51	
4	Major Soil Types		
		Black Humus Granitic & yellowish grey colour with Kankar soils.	
5	Area Under Principal Crops (In Km²)		
	a) Soyabean	283.52	
	b) Gram	296.87	
	c) Rice	183.73	
	d)Wheat	944.44	
	e) Jawar	62.26	
	f) Urad	643.59	
	Total	2414.41	
6	Irrigation by Different Sources		
		<u>No.</u>	<u>Area(Km²)</u>
	Dug wells	76215	1235.74
	Tube wells/ Bore wells	1955	88.73
	Tank/Ponds	276	105.13
	Canals	175	134.80
	Other sources	---	65.86
	Net Irrigated area	---	1629.76
	Gross Irrigated area	---	2067.78
7	Number Of Ground Water Monitoring Wells of CGWB (As on 31.03.2007)		
		No of Dug Wells : 15 No of Piezometers : 07	

8	Predominant Geological Formations	
		Bundelkhand Granite and Gneisses.
9	Hydrogeology	
	Major Water bearing Formation Pre-Monsoon depth to water level during 2007 Post-Monsoon depth to water level during 2007 Long-term water level trend in 10 years (1998-2007).	Granite and Gneisses Alluvium 6.44 mbgl-16.58 mbgl 3.80 mbgl-13.30 mbgl -0.08 to 0.64 M/Year (Pre) -0.16 to 0.86 M/Year (Post)
10	Ground Water Exploration by CGWB (As on 31.03.2007)	
	No of wells drilled (EW,OW, Pz, Total) Depth Range Discharge Storability Transmissivity	53 Nos 60.97 m -200 mbgl <1 lps – 6.25(lps) ---- ----
11	Ground Water Quality	
	Presence of Chemical constituents more than permissible limits (e.g. Nitrate, EC, F, AS, Fe)	NIL
12	Dynamic Ground Water Resources (2004) In MCM	
	Annual Replenish able Ground Water Resources Net Annual Ground Water Draft Projected Demand for Domestic and Industrial Uses upto 2025 Stage of ground Water Development	766.14 MCM 393.73 MCM 37.66 MCM 51%
13	Awareness & Training Activity	
	Mass Awareness Programme Organised Number of participant Water Management Training Programme Number of Participant	NIL NIL

1.0 INTRODUCTION

The Tikamgarh District encompassing an area of 5048 Km Co-ordinates of 24°26' ; 25°40' North Latitudes and 78°26' to 79°26'; East longitudes falling in toposheets No. 54 K, 54 P, 54 O and 54 L. Tikamgarh district is situated in the northern part of Madhya Pradesh. It is bounded in the north and west by the Jhansi and Lalitpur of Uttar Pradesh, in east by the Chhatarpur district and separated by River Dhasan.

The District has been divided into six Thesils and Blocks (Fig-1). There are 865 Villages and 13 Towns in the District. Details of administrative divisions of the district are given in Table-1.

Table – 1: Administrative Divisions, District TIKAMGARH, (M.P).

S.No	Block	Area Sq.Km	No. of Villages	No. of Towns
1.	TIKAMGARH	867.00	155	3
2.	BALDEVGARH	858.96	151	2
3.	JATARA	1008.60	171	2
4.	PALERA	748.22	135	1
5.	NIWARI	606.00	123	2
6.	PRITHIPUR	958.62	130	3
TOTAL		5048	865	13

Drainage

The entire district comes under Betwa sub-basin of Ganga basin. Dadhni, Janmi, bargi, Ur and Dhasan are the major rivers draining in the district area and ultimately join in the north with Betwa river. Dhasan, Jamni and Sadhni are Perrenial Rivers whereas Ur, Bargi, Gorar and Supihar are ephemeral rivers. The overall drainage pattern in the district is dendritic.

Irrigation

Irrigation facilities in Tikamgarh are under developing stage. 67.63% of net sown area is irrigated and rest of the area is rain-fed. Surface water irrigation in the district is constituted to 14.73%. Ground water is main source of irrigation and constitutes to 81.27% of the total Agricultural land in the district. Total area irrigated by surface water and Ground water is 240.11 Sq.km & 1324.47 Sq.km respectively. There are 1925 tube wells and 76215 dug wells in the district for Irrigation.

CGWB Activities

- 1) Systematic Hydrogeological Survey in Tikamgarh district was carried out by Sh. P.N. Singh and Sh. V.S. Verma during 1990-91
- 2) Report on “Groundwater resources and development potential of Tikamgarh district” was prepared by Sh. R.N. Sharma in 1994.
- 3) Exploratory Drilling by Contractual drilling under accelerated exploratory drilling in the years 201-02 and 2003-04.
- 4) District Ground water management and development studies in Niwari, Tatava and Prithipur block of Tikamgarh district by Sh. D.K. Rai, Sc ‘B’ in the Year 2005-06.
- 5) District Ground Water Management and Development studies in Tikamgarh, Palara and Baldeogarh block of Tikamgarh district by Sh. A.K. Jain, Sc ‘B’ in the year 2005-2006.

2.0 CLIMATE AND RAINFALL

The Climate of Tikamgarh district, M.P. characterized by a hot summer and general dryness except during the southwest monsoon season. The year may divided into four seasons. The cold season, December to February is followed by the hot season from March to about the middle of June. The period from the middle of June to September is the southwest monsoon. October and November form the post monsoon or transition period.

The normal annual rainfall of Tikamgarh district is 1057.1 mm. Tikamgarh District received maximum rainfall received during southwest monsoon period i.e. June to September. About 90.3% of the annual rainfall received during monsoon season. Only 9.7% of the annual rainfall takes place between October to May period. Thus, surplus water for ground water recharge is available only during the southwest monsoon period.

The normal maximum temperature received during the month of May is 41.8° C and minimum during the month of January is 7.0°C. The normal annual means maximum and minimum temperatures of Tikamgarh district are 32.4°C & 17.5°C respectively.

During the southwest monsoon season the relative humidity generally exceeds 87% (August month). In the rest of the year it is drier. The driest part of the year is the summer season, when relative humidity is less 35%. May is the driest month of the year.

The wind velocity is higher during the pre monsoon period as compared to post monsoon period. The maximum wind velocity 9.3 km/hr observed during the month of June and minimum 3.0 km/hr during the month of December. The average normal annual wind velocity of Tikamgarh district is 5.6 km/hr. Normal climatologically parameter of Tikamgarh district is given in Table - 2.

Table-2 Normal Climatological Parameters For Tikamgarh District

S.No.	Parameter	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1	Maximum Temp (°C)	24.3	26.8	33.2	39.1	41.8	38.9	32.5	30.9	32.3	33.2	29.8	25.5	32.4
2	Minimum Temp (°C)	7.0	9.1	13.8	20.0	25.1	26.9	24.5	23.8	22.7	22.7	11.7	7.4	17.5
3	Relative Humidity (%)	74	69	55	36	35	58	83	87	82	82	64	4	65
4	Wind Velocity (Km/hr)	3.3	3.9	4.7	5.4	6.8	9.3	8.9	7.2	5.5	5.5	3.0	5.3	5.6
5	Rainfall (m.m.)	21.5	20.8	6.6	3.0	4.8	115.4	321.0	387.3	131.4	131.4	22.0	6.6	1057.1

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

Geomorphological features are directly controlled by the geological formations and their structures. They can be classified into two broad regions.

1. The hill ranges.
2. The intermountain fertile valleys.

The hill ranges are made up of hard compact and resistant granite masses intruded by quartz reef. The heights of hills range from 200 m to 400 m amsl.

The intermountain valley is fertile and covered by colluvial and detrital of parent rock along with organic material. The thickness of alluvial fill varies from 10-16 meters. Thus, the important valleys in the district are;

1. Jooramora – Madia valley sloping N-W
2. Majrakachhar to Dighuar Khurd village sloping north –west.
3. Mudeni to Dhoura valley trending northwards.
4. Bachchoda to Khistone valley trending northwards.

3.2 Soils

Soils derived from parent rocks are of three types i.e. black humus granitic and yellowish grey colour with kankar soils are derived due to disintegration and decomposition of parent rocks.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

Entire district of Tikamgarh falls in Bundelkhand granite and gneisses, which are profusely intruded by quartz reefs and pegmatite's. Granite is generally flesh-red colour and coarse grained showing porphyritic texture. However, grey-coloured granite which appears to be metamorphosed into gneissic variety are also discernible in some blocks like Jatara, Baldeogarh, Palera etc. Both the pink and grey Coloured granite have undergone intensive weathering. The long narrow ridges formed by quartz-reef are intrusive into the granite. The joints and fractures developed in the host granitic body are due to such intrusions. These quartz reefs act as water divides as well as cut off walls across the ground water flows.

Thus the main factors which define the groundwater environs are: -

1. The nature and structure of granitic rock.
2. Depth and nature of weathered mantle (overburden) overlying hard compact basement.
3. Size intensity and inter connections of joints and fractures developed in the granitic country rock.
4. Arial extent and configuration of valleys between the quartz reefs.
5. Water holding and yielding capacity of the aquifers developed both in the overburden and fractured granite. Thus, thicker the overburden and intense is the weathering along with closer joint planes in granitic terrain. The more will be the ground water storage and yield.

From the Hydrogeological studies two distinct groundwater environs are found to exist in this district.

- a). Upland and Hilly tract of granite. This tract is formed by highly weathered product of granite amendable for faster percolation of rainwater and favours groundwater occurrences within 5 to 8 m bgl. The average yield of groundwater structured ranges from 0.16 m^3 to $0.1 \text{ m}^3/\text{day}$. The annual fluctuation of water table ranges from 2 m to 2.5 m.
- b). Granitic tract between too intrusive bodies: This tract is influenced by the occurrence of quartz reefs. The granites have developed fractured and joints, which favours and act as good conduct for groundwater circulation and occurrence within the boundaries defined by quartz reef.

Depth To Water Level

Central Ground Water Board has been carrying out water level monitoring of Ground Water monitoring wells (GW MW), since more than last two decades. Water levels of these monitoring wells are being monitored four times in a year during the months of January, May, August and November. A hydrogeological map (fig-2) of Tikamgarh district has been prepared

on the basis of available data. To study ground water regime of the area, pre-monsoon and post-monsoon depth to water level maps of the district has been prepared.

Pre-Monsoon (May 2007)

In general depth to water level in the district ranges between 6.44 mbgl in Beta and 16.58 mbgl in Orcha of Hiwari block. In major part of the district, depth to water level is ranging between 9 to 12 mbgl in the block area of Tikamgarh, Baldeogarh and Palera blocks (Fig-3). Depth to water levels ranges between 12 to 15 mbgl has observed in northern part and in pockets of southern and central parts. Depth to water level more than 15 mbgl is observed in northern most part of the district.

Post-Monsoon (November 2007)

During post-monsoon period of year November 2007, depth to water level varied from 3.80 mbgl at Beta to 13.30 mbgl at Maina village. Water level less than 6 mbgl is observed in Eastern most and Central part of the district while water level more than 12 mbgl is observed in Central and Southern part of the district (Fig.4). In general the major part of the district depth range of water level ranges between 6m to 12 mbgl.

Water Level Fluctuation between Pre and Post Monsoon season (Year 2007)

In Tikamgarh district rise and fall in water levels between pre and post monsoon seasons have been recorder. Water level rise/fall is ranging from 6.61m at Palera village to -1.3 m at Jatara in the district. Fall in water level of less than Zero is observed in central part in Jatara and Prithivipur blocks. Rise of water level of more than 4 m in Palera block in Eastern part and Northwest part of the district. Water level between 2.4 and 0.2 m is observed in Northwest to South East part of the Tikamgarh district.

Aquifer Parameters

Central Ground Water Board has drilled 53 exploratory wells in the district. Hydrogeological data of exploratory wells in the district is given in Table-4.

Perusal of Table-4 reveals that, the depth of these bore wells varies from 60.97 mbgl to 200 mbgl and Discharge of the bore well varies from less than 1 lps to 6.25 lps. Aquifer in these bore wells is generally jointed, fractured and weathered Granite.

DETAILS OF EXPLORATORY WELLS CONSTRUCTED BY CONTRACTUAL DRILLING UNDER DROUGHT ASSISTANCE IN TIKAMGARH DISTRICT (2001-2002).

S No.	Location	Month of Construction	Depth Drilled (m)	Zones Tapped	Geology	Static Water Level (mbgl)	Tested Discharge (lps)	Draw Down (m)
1	Orchha		200	16.59-32.59, 117.13-126.77	Granite	7.95	1.0	33.0
2	Tarichar Kalan	January, 2002	200		Granite	-	Dry	-
3	Murara	January, 2002	182.92	16.59-21.16, 66.86-71.43	Granite	6.63	1.0	1.17
4	Pohakhas	January, 2002	60.97	9.74-14.31, 28.02-32.59	Granite	-	2.0	-
5	Prithvipur	January, 2002	152.43	30.30-34.87, 73.72-78.29	Granite	0.85	1.0	33.0
6	Nivari	January, 2002	83.84	28.00-32.59, 66.86-83.84	Granite	7.14	1.0	2.22
7	Achhrumata	January, 2002	200	14.31-16.59, 155.98-165.12	Granite	4.91	1.0	19.73
8	Mudrani	January, 2002	110.71	7.5-11.5(0.8) 16.21 (1.5) 34.0-38.0 (3.2)	Granite	7.41	1.0	0.47
9	Birora Khet	January, 2002	200	5.0-7.50(0.5), 12-14 (2.0)	Granite	4.17	1.0	0.6
10	Churara	January, 2002	187.97		Granite	-	Dry	-
11	Joramora	January, 2002	187.97	9.50-16.00 (2.0) 21-25.50 (0.5)	Granite	7.68	1.0	9.97
12	Manakpura	January, 2002	200		Granite	-	Dry	-
13	Nandanwara	January, 2002	200	28.00-32.00, 73.00-82.00	Granite	3.04	1.0	17.0
14	Bamori	January, 2002	200	21.00-28.00, 41.00-50.00	Granite	8.55	1.6	0.55
15	Samara	January, 2002	200	9.00-16.00, 28.00-34.00 80.00-92.00	Granite	7.51	1.0	8.86
16	Mogna	January, 2002	187.97		Granite	-	Meager	-
17	Digora	January, 2002	187.97		Granite	-	Dry	-
18	Lar	January, 2002	200		Granite	-	Dry	-
19	Birou	January, 2002	200	3.5-5.0, 16.00-21.00	Granite	8.33	1.0	23.0
20	Buhdhera	January, 2002	162.12	12.00-16.00(1.2lps)	Granite	11.0	1.0	6.0
21	Malgawan	January, 2002	151.41		Granite	>60	1.0	-
22	Hatta	January, 2002	200	41.00-53.00, 76.00-82.00	Granite	13.49	1.0	32.0
23	Radhepur	January, 2002	114.85		Granite	-	Dry	-

Table-4: Well wise Details of Exploratory By Contractual drilling of CGWB in Tikamgarh District (M.P).

Sr No	Location	Depth Drilled (mbgl)	Zones tapped (mbgl)	Static water level (mbgl)	Discharge (m³/hr)	Draw down (m)/ Discharge (Lpm)	Aquifer material
1	Tikamgarh Town	178.73	9.5-16.0, 98-105	5.5	7.2	2.4/68	Weathered & Fractured Granite
2	Dunga	125.59	9.5-14, 100-105	4.70	37.8	0.5/375	Sand Boulder Cobble & Fractured Granite
3	Khargapur	174.16	24-32	6.80	5.4	-	Fractured Granite
4	Dhonga	183.030	6-7.5, 18-30, 64-74	5.58	7.2	2.50/42	Weathered & Fractured Granite
5	Manikpura	200	170-184	132.0	4.32	-	Fractured Granite
6	Larkhas	200	9.5-12.0	116.0	2.16	-	Fractured Granite
7	Amarpur	151.31	24-32, 51-60	9.12	19.44	5.5/250	Negligible
8	Badagaon	178.73	5-10, 24-28	5.60	9.36	-	Weathered & Fractured Granite
9	Doda	114.75	24-30	7.5	32.4	0.5/250	Weathered & Fractured Granite
10	Hyderpur	192.00	23-28	15.00	1.44	-	Weathered & Fractured Granite
11	Ganeshpura	192.44	17-28	5.70	7.92	-	Weathered & Fractured Granite
12	Baldeogarh	32.49	17-30	4.73	64.8	2.28/240	Sand Boulder Cobble & Fractured Granite
13	Palera	183.30	16-25	3.04	17.28	4.30/214	Weathered & Fractured Granite
14	Jatara	200	10-12	5.93	5.4	-	Fractured Granite
15	Chandora	200	11.50-18.0	8.5	12.6	-	Weathered & Fractured Granite
16	Bherua Tal	137.60	9.5-18.50	4.03	21.6	3.0/350	Sand
17	Kari	200	9-15	8.5	7.2	-	Weathered & Fractured Granite
18	Mohangarh	200	18-23, 75-80	2.05	17.28	3.00/288	Weathered & Fractured Granite
19	Hateri	200	7.5-8.5	9.00	4.32	-	Fractured Granite
20	Bandha	200	19-22	8.50	3.6	-	Fractured Granite
21	Kargawan	192.44	14-19, 53-62	5.08	12.6	1.5/88	Weathered & Fractured Granite
22	Bhopalpura	200	Dry	-	-	-	-
23	Ziron	200	8.5-15.0	3.5	12.6	3.5/250	Weathered & Fractured Granite

24	Sakera Bhadram	200	15-18	14.60	5.4	-	Weathered & Fractured Granite
25	Garar	200	16-18	5.06	5.4	-	Weathered & Fractured Granite
26	Harshmau	200	18-25	8.50	4.68	-	Weathered & Fractured Granite
27	Mohanpura	200	Dry	-	-	-	Weathered & Fractured Granite
28	Panhari	200	10-12	20.0	0.72	-	Weathered & Fractured Granite
29	Parkheda	200	16-18,23-28,173-178	3.85	21.6	8.5/214	Weathered & Fractured Granite
30	Asati	200	20-26	12.60	5.4	-	Weathered & Fractured Granite

Table-6: Ground Water Quality of Tikamgarh District (M.P).

S No.	District	Village	pH	EC	CO ₃	HCO ₃	Cl	SO ₄	NO ₃	F	PO ₃	TH	Ca	Mg	Na	K	SAR
1	TIKAMGARH	Badeogarh	7.4	845	0	299	82	25	40	0.5	0.51	295	96	13.49	63	0.6	1.6
2	TIKAMGARH	Bela	7.64	770	0	336	39	27	38	0.86	0.53	250	86	8.61	70	0.9	1.93
3	TIKAMGARH	Jatara	7.56	1218	0	427	71	60	111	0.16	0.9	220	50	23.16	186	5.1	5.45
4	TIKAMGARH	Palera	7.33	995	0	403	64	30	44	0.59	0.47	335	118	10	83	0.6	1.97
5	TIKAMGARH	Niwari	7.16	1149	0	433	78	52	86	0.24	0.4	420	152	9.91	84	0.1	1.78
6	TIKAMGARH	Orchha	7.34	1323	0	421	110	62	102	0.45	0.69	485	130	39.06	90	1.9	1.78
7	TIKAMGARH	Bamori	7.46	885	0	464	18	10	22	1.33	0.53	270	88	12.26	88	0.7	2.33
8	TIKAMGARH	Digaura	7.15	1535	0	500	149	69	120	0.48	0.73	480	154	23.28	142	6.8	2.82
9	TIKAMGARH	Ladhaura	7.44	1042	0	390	57	62	83	0.71	0.59	360	112	19.59	85	1.2	1.95
10	TIKAMGARH	Birorakhet	7.12	1690	0	268	177	140	291	0.59	1.19	425	148	13.55	210	1.8	4.43
11	TIKAMGARH	Nengawan	7.49	950	0	384	67	25	39	0.85	0.59	340	94	25.64	74	0	1.75
12	TIKAMGARH	Prithipur	7.68	984	0	323	64	70	58	0.41	0.38	200	50	18.3	145	1.6	4.46
13	TIKAMGARH	Baragaon	7.29	1159	0	238	110	55	84	0.54	0.69	305	116	3.79	138	0.6	3.44
14	TIKAMGARH	Majna	7.11	1547	0	311	199	80	195	0.25	0.64	590	224	7.57	92	1.3	1.65
15	TIKAMGARH	Tikamgarh	7.2	1983	0	342	287	260	30	0.62	0.41	605	162	48.82	193	0.8	3.41

4.2 Ground Water Resource

Ground Water resources estimation of Tikamgarh district has been completed for base year 2004, on the block wise basis. Entire blocks except Patera block of Tikamgarh district are falling under command and non-command category there are no major irrigation projects in the district. All blocks of Tikamgarh district are categorised as “Safe” blocks and highest stage of ground water development is completed as 59% for Palera block.

As per ground water resource estimation figures, Net ground water Availability in Tikamgarh district is 766.14 MCM, making stage of ground water development 51% as a whole for district. After making allocation for future domestic and industrial supply for next 25 years, balance available ground water for future irrigation would be 354.97 MCM, at 50% stage of ground water development's safe limits in Tikamgarh district.

Block wise ground water resource estimation data of Tikamgarh district is given in Table-5 and data is also presented in Fig-5.

4.3 Ground Water Quality of Tikamgarh District

Groundwater quality in Tikamgarh district is accessed annually by CGWB on the basis of samples collected from 15 numbers of hydrograph stations in the district. On the basis of examination of data for the year 2006, the water quality is described as follows.

Quality of ground water for drinking

The pH value of water samples of all the stations (ranging in between 7.11 to 7.68) did not show significant variations since all the values were of alkaline in nature and within permissible limit (6.5 to 8.5) as set by BIS (1991).

The EC values were found to be in the range of 770 and 1983 $\mu\text{S}/\text{cm}$. The EC values exceeding BIS limit (1000 $\mu\text{S}/\text{cm}$) were noticed at eight villages named Ladhura (1042 $\mu\text{S}/\text{cm}$), Niwari (1149 $\mu\text{S}/\text{cm}$), Baragoan (1159 $\mu\text{S}/\text{cm}$), Jartara (1218 $\mu\text{S}/\text{cm}$), Orcha (1323 $\mu\text{S}/\text{cm}$), Digaura (1535 $\mu\text{S}/\text{cm}$), Majna (1547 $\mu\text{S}/\text{cm}$) and Tikamgarh (1983 $\mu\text{S}/\text{cm}$, highest) itself. The anion chemistry shows that the well of Tikamgarh district itself had highest and abnormal concentration of chloride as 287 mb/l against the safe limit of 250 mg/l fixed by BIS (1990).

The concentration of NO_3 can be expected from the other sources and is an indicative of man made pollution. A scrutiny of data shows that non-village had fluoride greater than 1.5 ppm of BIS (1990) limit. No arsenic content was detected in the ground water of the district as per the analysis carried out in 2003.

Quality of ground water for Irrigation

In classification of water for irrigation purpose, it is assumed that the water will be used under average conditions with respect to soil texture, infiltration rate, drainage and climate.

The chemical data of all the water samples pertaining to Tikamgarh district was plotted on U.S. Salinity Laboratory diagram. It is clear that 100% wells of study area namely 1. Baldeogarh, 2. Bela, 3. Jatara, 4. Palera, 5. Niwari, 6. Orcha, 7. Bamori, 8. Digura, 9. Ladhura, 10. Birorakhet, 11. Nengawan, 12. Prithivipur, 13. Baragoan, 14. Majna, & 15. Tikamgarh were observed under C₃-S₁ High Salinity & Low Sodium) class. This water can be used on soils with restricted drainage.

Special management practices are required for salinity control. Salt tolerance crops maybe grown.

Geogenic Problems

Geogenic problems are not reported in the district. Fluoride in ground water is recorded within safe limits of 1.5 mg/l. Fluoride more than 1.5 mg/l in water is causing 'Fluorosis disease' including bone deformities.

Table-5: GROUND WATER RESOURCES AND STAGE OF DEVELOPMENT, TIKAMGARH DISTRICT (in MCM).

Assessment Unit/District	Command/Non-Command	Net Annual Ground Water Availability	Existing Gross groundwater draft for Irrigation	Existing Gross groundwater draft for Domestic & Industrial water supply	Existing Gross groundwater draft for all uses (4+5)	Allocation for domestic and industrial requirement supply upto next 25 years	Net ground water availability for future irrigation development	Stage of ground water development $\{(6/3)*100\}\%$
1	2	3	4	5	6	7	8	9
Tikamgarh	Command	29.73	3.78	.39	4.17	.72	25.23	14
	Non-Command	109.43	62.94	2.75	65.69	5.51	40.99	60
	B.Total	139.16	66.72	3.14	69.86	6.23	66.22	50
Palera	Command							
	Non-Command	104.86	58.85	3.30	62.14	6.10	39.91	59
	B.Total	104.86	58.85	3.30	62.14	6.10	39.91	59
Niwari	Command	22.68	4.48	.65	5.13	1.22	16.98	23
	Non-Command	67.23	43.77	2.63	46.40	4.92	18.54	69
	B.Total	89.90	48.25	3.28	51.53	6.14	35.51	57
Jatara	Command	43.20	5.53	.68	6.22	1.28	36.39	14
	Non-Command	115.91	69.66	3.63	73.29	6.78	39.48	63
	B.Total	159.11	75.19	4.32	79.51	8.06	75.87	50
Prithivipur	Command	21.78	2.92	.33	3.25	.60	18.27	15
	Non-Command	111.96	48.67	2.32	50.99	4.21	59.07	46
	B.Total	133.74	51.59	2.65	54.23	4.81	77.34	41
Baldeogarh	Command	18.91	2.77	.30	3.08	.54	15.60	16
	Non-Command	120.45	70.15	3.23	73.38	5.78	44.52	61
	B.Total	139.37	72.92	3.54	76.46	6.32	60.12	55
	District Total	766.14	373.51	20.22	393.73	37.66	354.97	51

4.4 Status of Ground Water Development

Ground water is the main source for drinking and irrigation in Tikamgarh district. About 81% of irrigation in the district is from ground water sources and level of irrigation in the district is 68%. There are 1955 tube wells and 76,215 dug wells for irrigation in the district.

In Tikamgarh district there are 52,383 electric connections for agriculture purposes. Depth of dug wells in the district ranges from 5 to 15 m. Yield of bore wells/tube wells varies from less than 1 lps to 6.25 lps, depending on hydro-geological situation in the area. High yielding bore wells have been found at Dunga, Amarpur, Doda, Baldeogarh, Bherua Tal, Mahangarh and Ziran villages of Tikamgarh district. Apart from private sources, hand pumps and dug wells are main sources of rural water supply in the district. As far as urban water supply is concerned in 13 towns of the district are based partly on ground water (through bore wells) and partly through surface water.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

As per ground water resource estimation of Tikamgarh district for the year 2004, the available ground water resources and gross annual ground water drafts are 766.14 MCM and 393.73 MCM respectively, making stage of ground water development 51% as a whole for the district. Thus, there is enough scope for future development of ground water resources in the district.

All 6 blocks namely Tikamgarh, Palera, Niwari, Jatara, Prithivipur and Baldeogarh are falling under safe categories. Decadal water trend analysis reveals falling trend of water level during pre and post monsoon seasons. After making allocation for future domestic and industrial water supply upto next 25 years balance available ground water at 50% stage of ground water development safe limit in Tikamgarh district would be 354.97 MCM. If 70% of balance available ground water resources is to be developed through dug wells and 30% through tube wells, than at suitable hydrogeological location tentatively 24800 new dug wells and 2775 new tube wells for irrigation can be constructed in the district, considering unit draft of dug wells and tube wells 0.01 and 0.04 MCM respectively.

Area recommended for future development is given in Fig. 6. Dug well are feasible structures for Granitic area, where as shallow tube well are recommended weathered/jointed granites and in alluvial areas of the district. In granites drilling may be taken up with DTH rig.

5.2 Water Conservation And Artificial Recharge

Considering the hydrogeological condition and complex hydrogeology of granitic hard rock terrain, irregular well field spacing and variable well field pump age in the district as a whole there is greater need now than ever before for irrigation. Watershed planning vis-à-vis artificial recharge to groundwater water shed management should aim at utilizing the land and water resources in the various zones of the watershed.

The activities like soil water conservation, surface water storage, groundwater recharge have to be planned in the upper reaches of the watershed in order that availability of sufficient groundwater is ensured for the developmental activities in the lower areas and valleys. There is considerable scope for artificial recharge to groundwater body in the district. Plan may be adopted using hill to valley approach in a watershed. At origin of the streams structures like gully-plug and contour trenching may be constructed to arrest surface runoff and some water may be useful for soil moisture retention and development of vegetation cover in the area.

Gabion structures may be constructed at down streams of these structures across the stream using local boulders and wire mesh to check the velocity of flowing water and to store water in up stream direction of these structures. Percolation tanks are most important structures from ground water recharge point of view. Percolation tanks are recommended in second and third order streams on porous and permeable formations.

Foundation of these structures should not rest on hard and compact or on impermeable formations and water should be allowed seep below stream bed to recharge ground water body at sub-surface. Percolation tanks in due course of time may get silted and infiltration of water may be reduced.

To overcome this problem, recharge shafts inside of percolation tank may be constructed. The advantage of recharge shaft is that, water may be allowed to hold in tank upto required level for local use.

Properly designed tube wells also act as recharge shafts. Sub surface dykes can be constructed at suitable hydrogeological location across the riverbed at the end of watershed to check subsurface flow of water along streambeds. Dug wells recharge is also applicable in rural areas. The Roof Top Rain water harvesting techniques should be implemented in urban areas.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

Long term water level trend shows depletion in ground water levels during both pre and post monsoon seasons in ground water monitoring wells. This is perhaps due to heavy load on ground water resources for irrigation and domestic purpose.

7.0 AWARENESS AND TRAINING ACTIVITY

- 7.10 Central Ground Water Board has not carried out any Mass Awareness Programme (MAP) and Water Management Training Programme (WMTP) in the Tikamgarh district.
- 7.20 Central Ground Water Board has not taken up any participation in exhibition, Mela and fair etc in Tikamgarh district.
- 7.30 Central Ground Water Board has not done any activity in presentation and lectures delivered in Public/Radio/T.V. etc. in the Tikamgarh district.

8.0 AREAS NOTIFIED BY CGWA/SGWA

In Tikamgarh district no area is notified by CGWA/SGWA.

9.0 **RECOMMENDATIONS**

- ✦ The stage of Ground Water development is 51%, which reveals adequate scope for future development of ground water for irrigation. After making allocation for future domestic and industrial water supply upto next 25 years in the district, balance available ground water at 50% stage of ground water developments safe limits would be 354.97 MCM. If 70% of balance available ground water is to be developed through dug wells and 30% through tube wells/ bore wells, then tentatively 24,800 new dug wells and 2775 tube wells can be constructed for irrigation.

 - ✦ Depletion of ground water level is recorded in all the ground water monitoring stations due to heavy use of ground water (81%) for irrigation purpose in the district. A master plan for artificial recharge should be made, so that important natural resource is again put into ground water system feasible techniques.

 - ✦ Conjunctive use of surface and ground water is recommended in the area.

 - ✦ Dug well recharge in rural areas and Roof top rainwater harvesting project should be implemented in urban areas of Tikamgarh district.

 - ✦ Deepening and desilting of existing old tanks and ponds is recommended in the Tikamgarh district on large scale.
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