DISTRICT GROUND WATER INFORMATION BOOKLET

TIKAMGARH DISTRICT
MADHYA PRADESH

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

2013

TIKAMGARH DISTRICT AT A GLANCE

S. N.	ITEMS	STATISTICS	
1	**General Information**		
	1) Geographical area	5,04800 hactare	
	2) Administrative Divisions (As on 2012)		
	Number of Thesil/Blocks	6/6	
	Number of Panchayats/Villages	459/976	
	3) Population (Census 2011)	1,444,920	
	4) Normal Annual Rainfall (mm)	1064.1 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 ('000Ha)**		
	1) Forest area	68.6	
	2) Net area sown	208.8	
	3)Gross Cropped area	301.0	
4	**Major Soil Types**		
		Black Humus Granitic & yellowish grey colour with Kankar soils.	
5	**Principal Crops**		
	a) Soyabean b) Gram c) Rice d)Wheat e) Jawar f) Urad **Total**		
6	**Irrigation by Different Sources**		
		No.	**Area('000ha)**
	Dug wells	**76296**	**114.4**
	Tube wells/ Bore wells	**2129**	**9.6**
	Tank/Ponds	**1148**	**6.2**
	Canals	**175**	**6.7**
	Other sources	**8**	**8.3**
	Net Irrigated area	**---**	**110.3**
	Gross Irrigated area	**---**	**145.2**
7	**Number Of Ground Water Monitoring Wells of CGWB (As on 31.03.2013)**		
		No of Dug Wells **: 14** No of Piezometers **: 07**	

8	**Predominant Geological Formations**	
		Bundelkhand Granite and Gneisses.
9	**Hydrogeology**	
	Major Water bearing Formation	Granite and Gneisses Alluvium
	Pre-Monsoon depth to water level during 2012	3.34 mbgl-14.52 mbgl
	Post-Monsoon depth to water level during 2012	2.01 mbgl-11.31 mbgl
	Long-term water level trend in 10 years (2003-2012).	0.2 to 0.97 M/Year Fall
10	**Ground Water Exploration by CGWB (As on 31.03.2013)**	
	No of wells drilled (EW,OW, Pz, Total)	EW-59 OW-01 PZ-7 Total -67
	Depth Range	60.97 m -200 mbgl
	Discharge	<1 lps – 6.25(lps)
	Storamity	----
	Transmissivity	----
11	**Ground Water Quality**	
	Presence of Chemical constituents more than permissible limits (e.g. Nitrate, EC, F, AS, Fe)	EC- 713-2040, Nitrate- 0.75-212, Fluoride -.0.26-0.82 in phreatic aquifer
12	**Dynamic Ground Water Resources (2009) In MCM**	
	Net Annual Ground Water Availability	529.51 MCM
	Existing Gross Ground Water Draft	378.01MCM
	Projected Demand for Domestic and Industrial Uses upto next 25 years	36.52 MCM
	Stage of ground Water Development	71%
13	**Awareness & Training Activity**	
	Mass Awareness Programme Organised Number of participant	NIL
	Water Management Training Programme Number of Participant	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.

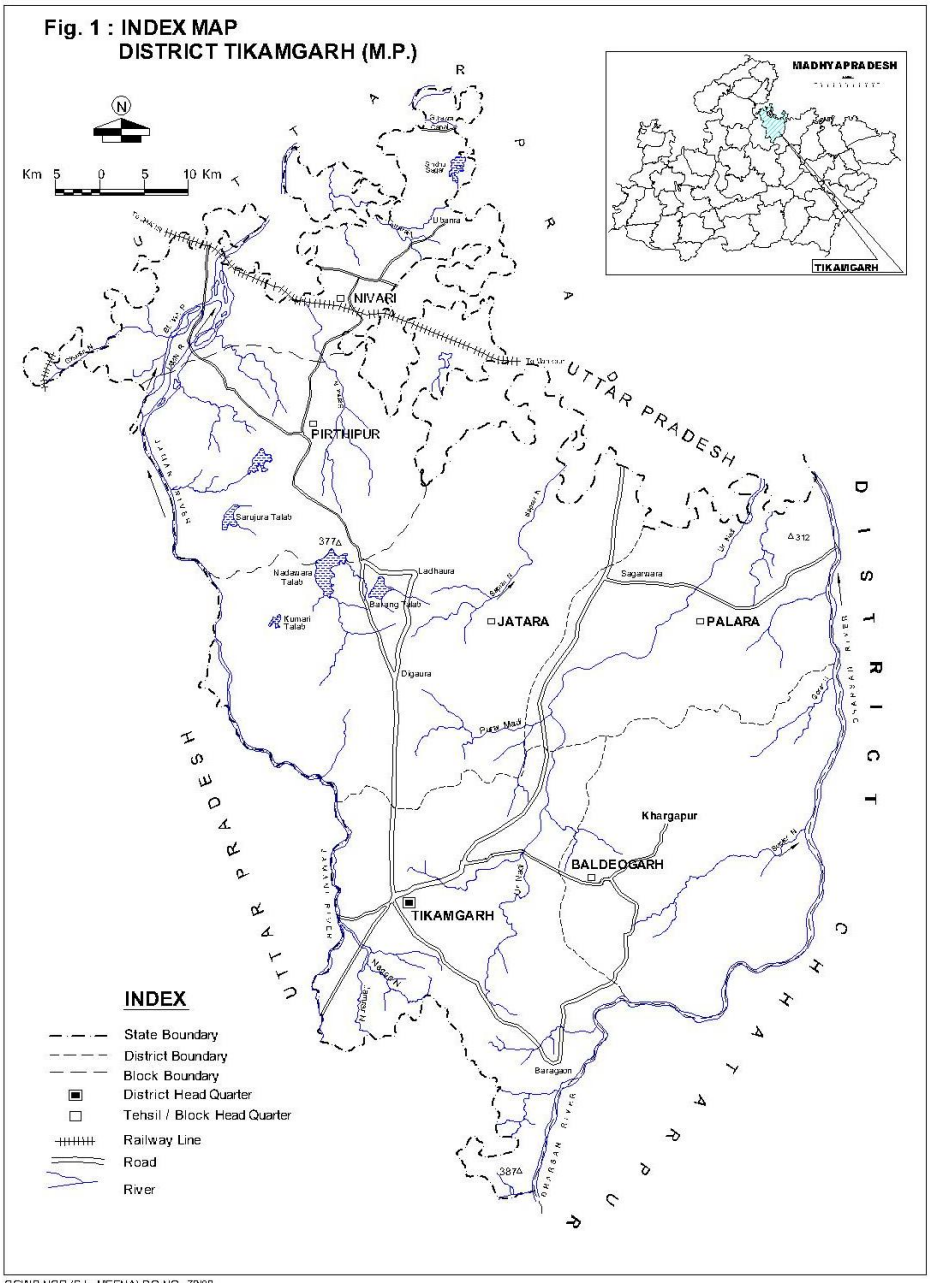


Table – 1: Administrative Divisions, District TIKAMGARH, (M.P).

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	54	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 are 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.

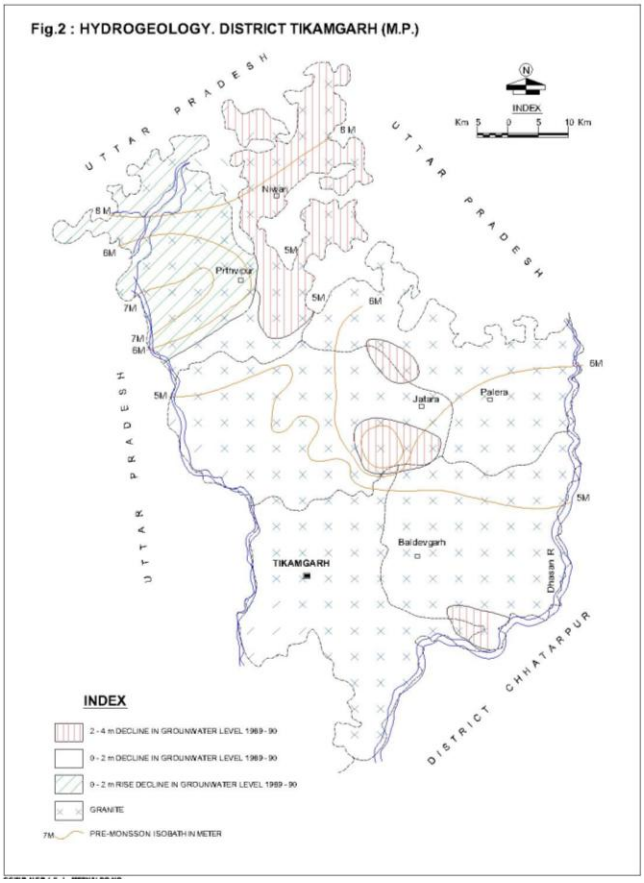
4.0 GROUND WATER SCENARIO

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 m^3/day. The annual fluctuation of water table ranges from 2 m to 2.5 m.

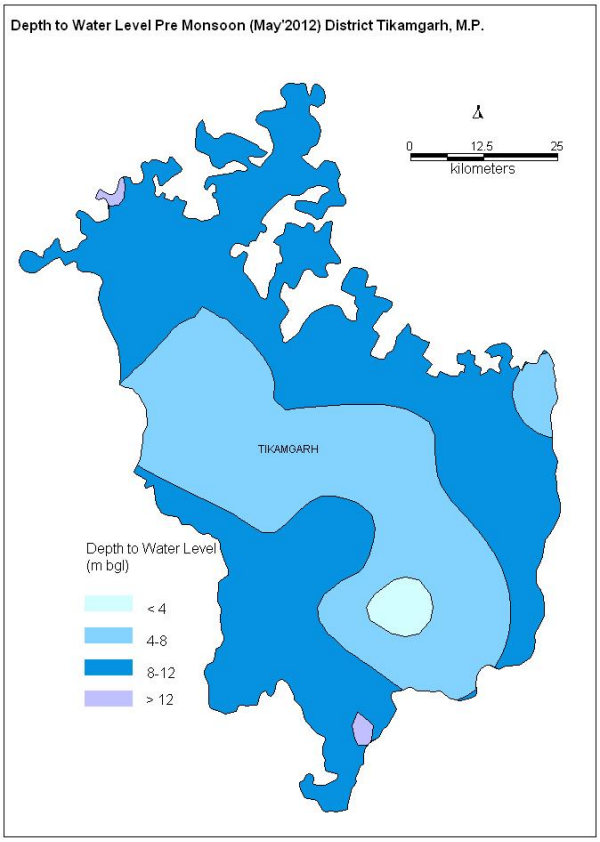
b). Granitic tract between too intrusive bodies: This tract is influenced by the occurrence of quartz reefs. The granites have developed fractured and joints, which favours and act as good conduct for groundwater circulation and occurrence within the boundaries defined by quartz reef.

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.

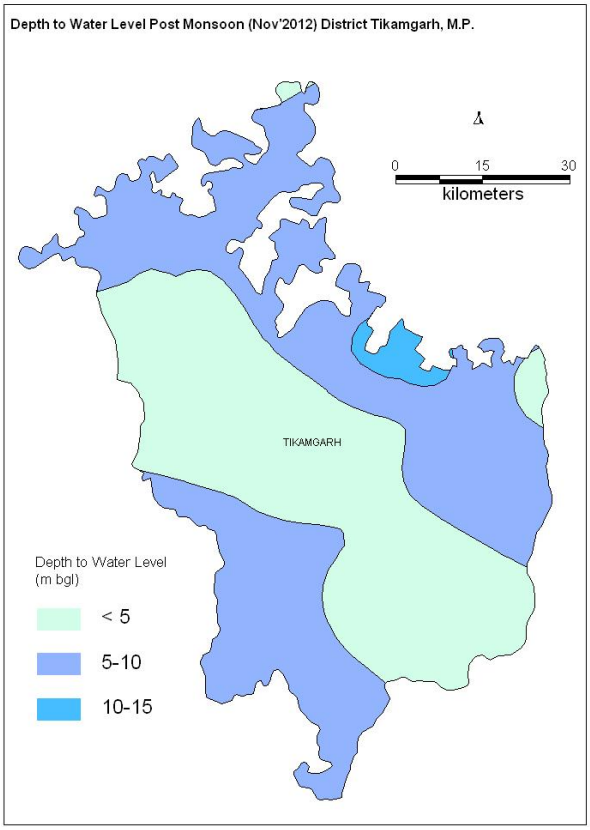
Pre-monsoon (May2012)

The pre-monsoon depth to water level in the district ranges between 4.13 m bgl and 18.50m bgl. Major part of the district have water level in the range of 4-12m bgl during the pre monsoon.



Post-monsoon (November 2012)

During post-monsoon period, water level varies from 2.94m bgl to 15.17m bgl. In major part of the district, water level is less than 10 m bgl.



Groundwater level trend (May 2003 to May 2012)

Analyses of Groundwater level data of pre-monsoon period indicate that there is declining trend in the range of 0.0018 - 0.27 m/yr.

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 (m^3/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

4.2 Ground Water Resource

Tikamgarh district is occupied by Bundelkhand granite with a thin soil cover. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. Out of 5,04,800 ha of geographical area, 4,88,100 ha (97%) is ground water recharge worthy area and 16,700 ha (3%) is hilly area. There are six number of assessment units (block) in the district which fall under non -command (88%) and command (12 %) sub units. All blocks of the district in command area are categorized as safe. Non command area of Baldeogarh, Jatarah, Niwari, Palera and Tikamgarh are caategrised as semi critical (safe in 2003/04).Highest stage of ground water development is computed as 82 % for Baldeogarh Block. The net ground water availability in the district 52,951ham and ground water draft for all uses is 37,801 ham, making stage of ground water water development 71 % (51 % in 2003/04) 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 13,742 ham.

Table-5: GROUND WATER RESOURCES AND STAGE OF DEVELOPMENT, (2009)

S. No	Assessment Unit	Sub-unit Command/ Non-Command/	Net Annual Ground water Availability (ham)	Existing Gross Ground water Draft for Irrigation (ham)	Existing Gross Ground water Draft for Domestic & Industrial water Supply (ham)	Existing Gross Ground water Draft for All uses (ham)	Provision for domestic, and industrial requirement supply to next 25 year (2033) (ham)	Net Ground water Availability for future irrigation d development (ham)	Stage of Ground water Development (%)	Category
	Baldeogarh	Command	1111	338	40	379	74	699	34	Safe
		Non-Command	7489	6233	395	6628	609	647	89	Semi Critical
		Block Total	**8600**	**6571**	**435**	**7006**	**683**	**1346**	**81**	
	Jatara	Command	3483	932	50	982	93	2458	28	Safe
		Non-Command	8451	6205	480	6686	761	1485	79	Semi Critical
		Block Total	**11934**	**7137**	**530**	**7668**	**854**	**3943**	**64**	
	Niwari	Command	1430	594	56	651	85	751	45	Safe
		Non-Command	5095	4029	281	4310	379	687	85	Semi Critical
		Block Total	**6525**	**4623**	**337**	**4960**	**464**	**1438**	**76**	
	Palera	Command								
		Non-Command	6973	5227	395	5622	624	1121	81	Semi Critical
		Block Total	**6973**	**5227**	**395**	**5622**	**624**	**1121**	**81**	Semi Critical
	Prathivipur	Command	1191	473	38	510	65	653	43	Safe
		Non-Command	7949	4625	271	4896	407	2917	62	Safe
		Block Total	**9140**	**5098**	**309**	**5406**	**473**	**3569**	**59**	
	Tikamgarh	Command	2249	867	29	896	61	**1321**	40	Safe
		Non-Command	7529	6033	209	6242	493	**1003**	83	Semi Critical
		Block Total	**9779**	**6900**	**238**	**7138**	**555**	**2324**	**73**	
		District Total	**52951**	**35557**	**2244**	**37801**	**3652**	**13742**	**71**	

4.3 Ground Water Quality

Groundwater quality in Tikamgarh district is accessed annually by CGWB on the basis of samples collected from 14 numbers of hydrograph stations in the district. On the basis of examination of data for the year 2011, the water quality is described as follows. The Electrical Conductivity ranges from 713 to 2040 micromhos per cm at 25°C. The fluoride ranges from 0.26 mg/l to 0.82 mg/l. The nitrate ranges from 0.75 mg/l to 212 mg/l.