DISTRICT GROUND WATER INFORMATION BOOKLET

RAJGARH DISTRICT

MADHYA PRADESH

Ministry of Water Resources

Central Ground Water Board

North Central Region

BHOPAL

2013

RAJGARH DISTRICT AT A GLANCE

S.No.	Items	Statistics	
1.	**General Information**		
	i) Geographical area	615498 Ha	
	ii) Administrative Divisions (As on 2006) Number of Tahsil/Blocks Number of Panchayats Number of Villages	 7/6 627 1744	
	iii) Population (Census 2011)	12,54,085 1,546,541	
	iv) Normal Rainfall	985.8mm	
2.	**Geomorphology**		
	1. Major Physiographic Units:	Gently undulating, pediplain, uplands and residuals hills	
	2. Major Drainage:	i. Parwati River & its tributaries ii. Kali Sindh River & its tributaries	
3.	**Land Use**	('000Ha)	
	a) Forest area b) Cultivable area c) Net area sown d) Gross cropped area	17.63 423.05 423.05 607.71	
4.	**Major Soil Types**	Alluvium, Black cotton soil and Sandy soil	
5.	**Principal Crops**	Soyabean, Gram, Maize, Wheat, Jowar	
6.	**Irrigation By Different Sources**	**No.**	**Area ('000ha)**
	Dug wells Tube wells/Bore wells Tanks/Ponds Canals Other Sources Total Irrigated Area Gross Irrigated Area	86281 11002 59 36 - - -	129.50 36.236 3.986 5.775 104.36 178.80 178.80
7.	**Number 0f Ground Water Monitoring Wells of CGWB (As on 31.3.2013)**		
	Number of Dug Wells Number of Piezometers	18 14 (7 Deep + 7 Shallow)	
8	**Predominant Geological Formations**	Alluvium, Deccan Trap basalts, Vindhyan shales and sandstone	
9	**Hydrogeology**		
	Major Water Bearing Formation Pre-monsoon depth to water level during 2012 Post-monsoon depth to water level during 2006 Long-term water level trend in 10 years (2003-2012) cm/yr	Sandy alluvium, Weathered/vesicular basalt, flow contacts and fractured sandstone. 4.75- 22.32 m bgl 0.47 – 17.83 m bgl 2.08 to 10.06 (fall)	

10.	**Ground Water Exploration By CGWB (As on 31.3.2013)**	
	No of wells drilled (EW, OW, PZ, Total)	83 (EW-30, OW-38, PZ-15)
	Depth Range	48.80 – 210.30 m. bgl
	Discharge	Meager – 13.25 lps
	Specific Capacity	-
	Transmissivity	0 – 132.48 m^2 /day
11.	**Ground Water Quality**	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC Range (435-2120 µs/cm at 25^0C) Nitrate-12-276 Flouride-0.02-5.59.
12	**Dynamic Ground Water Resources (2009)**	(ham)
	Net Annual Ground Water availability	84736
	Existing Gross Ground Water Draft	69067
	Projected Demand for Domestic and Industrial uses up to 25 years	4079
	Stage of Ground Water Development	82 %
13	**Awareness and Training Activity**	
	Mass Awareness Programme Organised	Nil
	Water Management Training Programme	Nil
14	**Efforts of Artificial Recharge & Rainwater Harvesting**	
	Projects completed by CGWB	Ajnar Sub-Surface Dyke
	Projects under technical guidance of CGWB	Technology Mission on drinking water
15	**Ground Water Control and Regulation**	
	Number of OE Blocks	Nil
	Number of Semi Critical Blocks	4, Biora, Khilchipur, Narsinghgarh, Sarangpur
	Number of Safe Blocks	2, Rajgarh, Zeerapur
16	**Major Groundwater Problems and Issues**	Depletion in groundwater level and deterioration of groundwater quality

1.0 INTRODUCTION

Rajgarh district was constituted after the formation of Madhya Bharat in May 1948. The district is located at western part of Madhya Pradesh and is bounded by Shajapur district in the south as well as west. The district of Sehore, Bhopal, Guna and Jhalawar (Rajasthan) enclose it from the southeast, east, northeast, and north directions respectively. Rajgarh district extends between the parallels of North latitudes 23^0 27' 12" and 24^0 17' 20" and between the meridians of east longitudes 76^0 11' 15" and 77^0 14'. It has a quadrangular shape with the northern and western sides longer than the southern and eastern sides, respectively. The district is well connected by road NH-3, NH-7 and railway network.

The total geographical area of the district is 6,155 sq km with a population of 15,46,541 according to census 2011. The details of administrative units are given in Table.

FIGURE - 1 : INDEX MAP

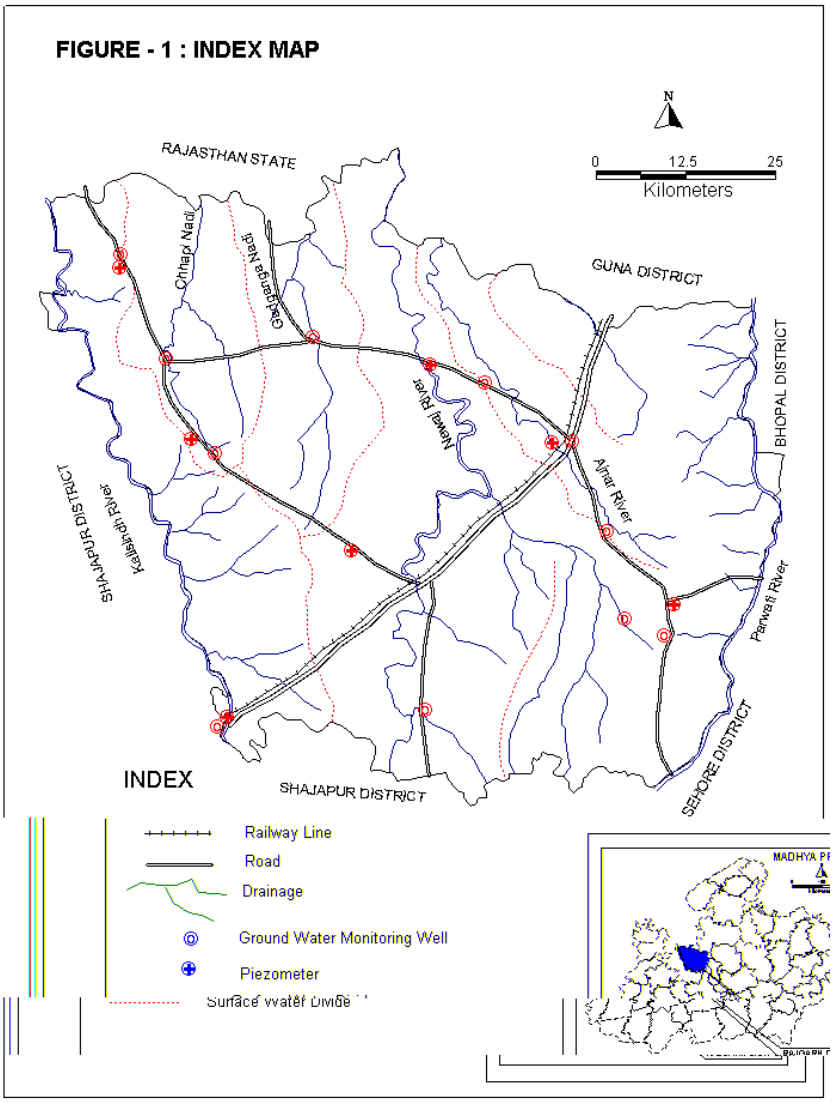


Table: Administrative units of Rajgarh district, Madhya Pradesh.

S.No	Tahsil	Sub-Division	Area in Sq Km	No. of Villages
1	Rajgarh	Rajgarh	1105	387
2	Khilchipur	Khilchipur	0792	335
3	Zirapur	Zirapur	0845	220
4	Biora	Biora	1148	287
5	Narsinghgarh	Narsinghgarh	1368	306
6	Sarangpur	Sarangpur	0905	192
			6,155	**1,744**

Central Ground Water Board (CGWB) Activities:

- Shri G. P. Dalal Sr. Hydrogeologist, Shri P. K. Sahajpal, Jr. Hydrogeologist and Shri S. Mehrotra Asstt. Hydrogeologist conducted Systematic hydrogeological surveys in the district during 1987-88.
- Under "Technology Mission on drinking water" CGWB has provided technical guidance to the State Government for locating suitable drilling sites during 1987- 90.
- Shri. M. L. Parmar, Assistant Hydrogeologist and Shri. S. N. Bangar Assistant Hydrogeologist conducted Reappraisal hydrogeological surveys in the district area during 1994-95.
- Under Central Sector Scheme, CGWB has provided financial and technical support to State PHED to construct a Sub-Surface dyke at Barwakalan village on Ajnar Nadi in Rajgarh district during 1987-90.

2.0 RAINFALL AND CLIMATE

The normal annual rainfall of Rajgarh district is 985.8 mm. The district receives maximum rainfall during southwest monsoon period i.e. June to November. About 92% of annual rainfall is received during monsoon season.

3.0 GEOMORPHOLOGY & SOIL TYPES

Rajgarh district forms the part of Malwa plateau, generally, an undulating topography. The Vindhyan hill range occupies the southeastern part of the district. The basaltic rocks of Malwa plateau occupy almost entire district except southeastern part. Recent alluvium deposits are found along the river course. The highest elevation of 576.08 m amsl in the district is recorded near Narsinghgarh, a hillock of Vindhyan ranges.

Rivers of Chambal Sub-basin drain the entire Rajgarh district. All the rivers are almost northerly flowing. Kalisindh and Parwati rivers at western and eastern side bound the district respectively. The Newaj River flows through the middle portion of the district.

Almost three-fourths area of the district is covered with black cotton soils forms by the weathering of basaltic rocks. The rest part of the district area is covered with yellowish-red, mixed soils derived from sandstone and shale. The

alluvial soils are found along the river courses. The higher elevations i.e. the hilly regions have a cover of murum, which is made up of small rounded pieces of weathered basalts. The Vindhyans have a thin cover of sandy loams. The alluvium is derived from hill slopes by numerous streams and watercourses.

4.0 GROUNDWATER SCENARIO

4.1 Geology

The general geological successions in the district are given in table.

Table: General geological successions of Rajgarh district.

Age	Stratigraphic Unit	Lithology
Quaternary to Recent		Alluvium and Laterite
---------- Unconformity ----------		
Upper Cretaceous to Lower Eocene	Deccan Trap	Basalt
Upper Proterozoic	Vindhyan Super Group (Bhander Group)	Sandstone and shale

4.2 Hydrogeology

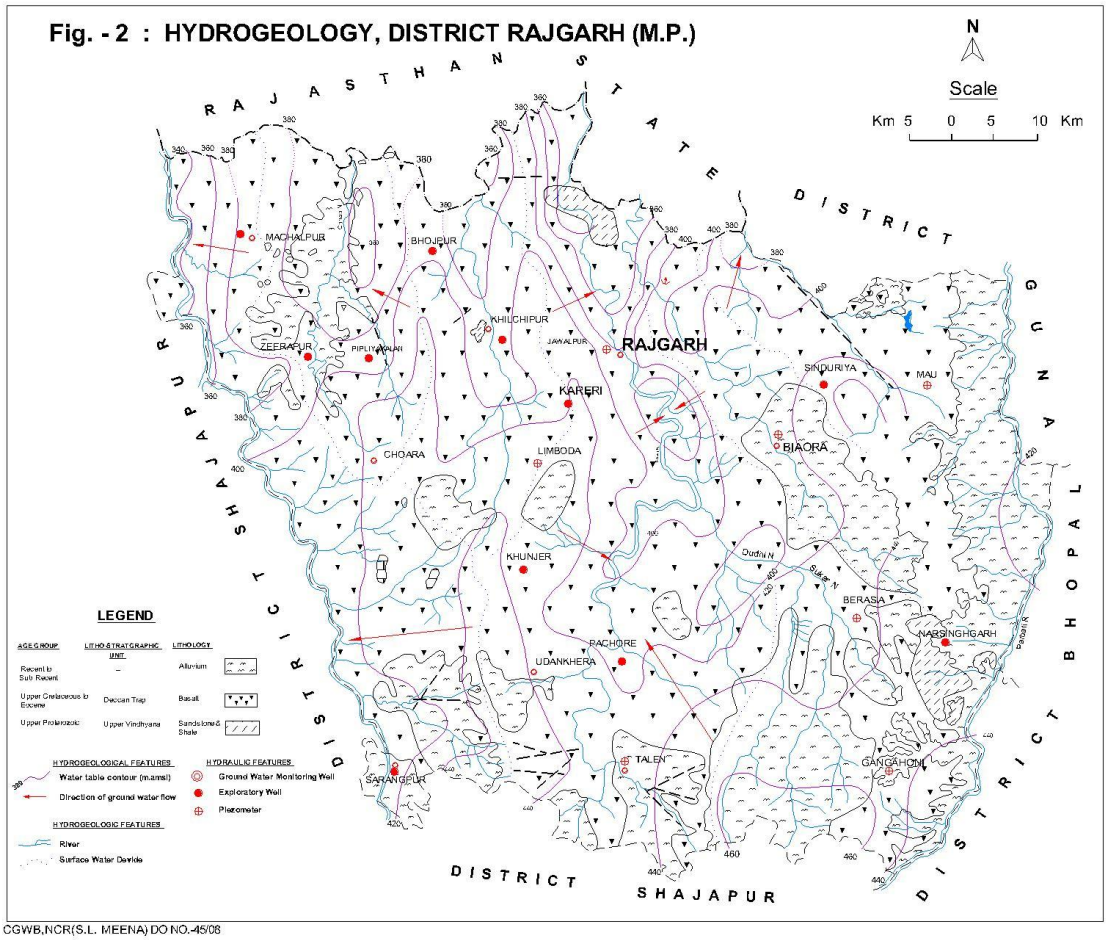
The general hydrogeological conditions of the district are depicted in figure-2 and formation wise settings are discussed below.

4.2.1 Vindhyan Super Group

The rocks of the Vindhyan Super Group are exposed in the southern and southeastern part of district. These rocks form NW-SE trending ridges and small isolated hillocks (inliers). The Upper Bhander sandstone is reddish brown to purple in colour, massive, medium to coarse grained, exhibiting well-defined bedding with plenty of current bedding and occasional ripple marks. The sandstone is highly jointed with four sets of prominent vertical joints. Because of its compact nature the Bhander sandstone is poor repository of groundwater. In sandstone, the joints and fractures control the occurrence of groundwater in areas located in topographical depression and adjacent to surface water bodies. The soil and weathered profile developed on the Vindhyan is generally thin and as a result groundwater occurs at shallow depth under unconfined conditions in the areas where the rock is jointed, fractured and weathered. The Vindhyan rocks underlying the weathered basalts in topographical depressions are often found to form moderate aquifers. The surface water runoff along the slopes of hillocks formed by Vindhyan inliers is recharged to the deeper jointed and fractured sandstone through overlying cover of weathered basalt.

4.2.2 Deccan Trap

The Deccan Trap basalts occur in the district as lava flow infillings in the valleys of pre-existing Vindhyan topography. The Vindhyan sandstone show `baking effect' due to the hot lava coming in contact with sandstones, the lava flows are mostly `$P_{ahoehoe}$' character and less of `A_a' character. The individual lava flow range from 10 to 30 m in thickness and consist generally of two units i.e. the upper most vesicular/amygdaloidal basalts with their weathering top portion often overlain by grey or red clay and the massive thin amygdular layer (with pipe amygdulars) towards the bottom.



CGWB,NCR(S.L. MEENA) DO NO.-45/08

Shallow groundwater occurs in the weathered, vesicular, jointed and fractured basalt under unconfined conditions. In areas where the weathered basalt layer is extensive a continuous phreatic aquifer can be traced to some distance. However, due to low permeability of weathered basalts the aquifer sustains limited groundwater withdrawal, mainly through open wells. On higher ground the weathered basalts may be thin or even absent. In such condition groundwater occurrence is restricted to the joints and fractures. The groundwater in Deccan Traps at deeper levels occurs under semi-confined to confine conditions, at the different lava flow contacts, at Deccan trap and underlying Vindhyan contact or in the deeper jointed/fractured and vesicular amygdular basaltic horizons.

The thickness of the individual aquifers varies from a few centimetres to a few meters and is generally restricted in their regional extent. The recharge to the deep aquifers takes place from the phreatic aquifers through deep joints, faults and contact zones. The red bole horizons (clay) generally act as semi confining or confining layers for the deeper aquifers.

4.2.3 *Alluvium and Laterite*

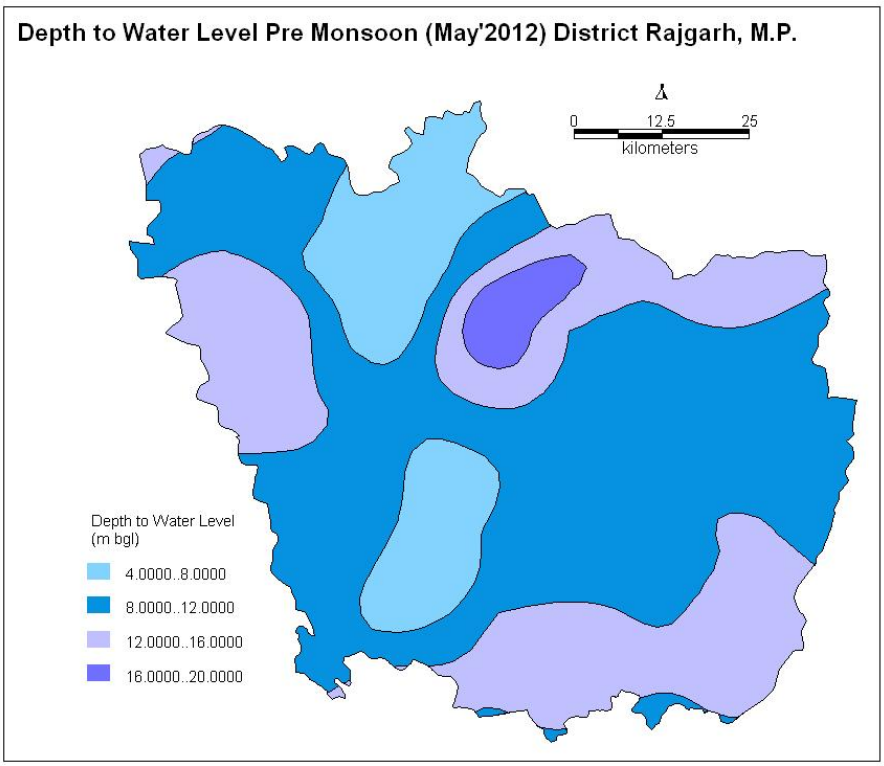
Localized patches of alluvium cover occur along the banks of major and minor rivers and streams in the district. In general it is difficult to differentiate between alluvium and product of black cotton soil underlain by yellow clay with kankar. The thickness of alluvium varies from few metres to 30 m. Laterite capping on top of Deccan Trap basalt are seen in localized patches. The rocks are generally bouldery in nature, highly ferruginous and weathered to yellowish red soil.

4.3 Ground Water Levels

To monitor the seasonal and annual change in quantity and quality of groundwater, CGWB has established 18 Ground Water Monitoring Wells and 14 piezometers in the district.

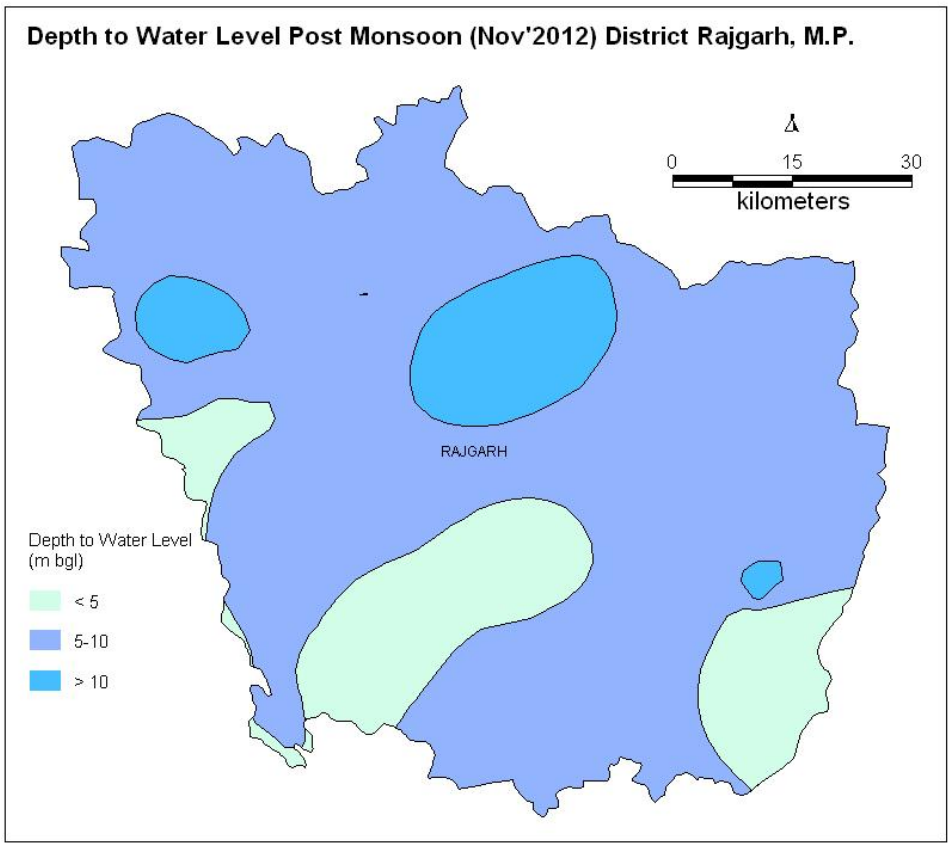
4.3.1 Pre-monsoon (May 2012)

Depth to water level, during pre-monsoon, ranges between 4.75 m bg l to 22.32m bgl. In the most part of the district, water level ranges between 9 and 12 m bgl during the pre-monsoon.



4.3.2 Post-monsoon (November 2012)

During post-monsoon period, water level ranges from 0.47 m bgl to 17.83m bgl. In major part of the district, water level lies between 3 to 6 m bgl.



4.3.3 Ground Water level trend (May2003 to May 2012)

Analyses of ground water level data of pre-monsoon period indicate that there is declining trend in water level in entire district. In general, decline in the range of 2.08 to 10.06 cm/year in water level has been observed in the district.

4.4 Aquifer Parameters

The exploratory drilling has been carried out in Deccan Trap basalt underlain by Vindhyan shale and sandstone. In Deccan Traps, the vesicular, weathered and fractured basalt form the aquifers while in Vindhyans, fractured sandstones and shales forms aquifer. These exploratory wells have been drilled down to the maximum depth of 210.30 m bgl and their yields have been recorded maximum up to 13.25 lps. The piezometers were restricted to the depth range of 30 m, 60 m, 90 m and 120 m bgl only. The Transmissivity value has been calculated as 4.0 X 10^{-4} at Mundla exploratory well site.

4.5 Ground Water Resources (2009):

Rajgarh district is underlain by mainly Basaltic lava flows of Deccan trap. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis (Table). There are six assessment units (block) in the district which fall under non-command . Biora, Khilchipur, Narsinghgarh and Sarangpur blocks of the district are categorized as semi critical. Rajgarh and Zeerapur as safe. The highest stage of ground water development is computed as 98 % in Narsinghgarh block. The net ground

water availability in the district is 84,736 ham and ground water draft for all uses is 69,067 ham, making stage of ground water development 82 % 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 14,887 ham.

Table: Ground water availability and stage of development

DYNAMIC GROUND WATER RESOURCES (As on March, 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**
		Command								
1	Biora	Non-Command	15248	11163	594	11757	730	3355	77	Semi Critical
		Block Total	**15248**	**11163**	**594**	**11757**	**730**	**3355**	**77**	Semi Critical
		Command								
2	Khilchipur	Non-Command	11389	9777	378	10155	489	1124	89	Semi Critical
		Block Total	**11389**	**9777**	**378**	**10155**	**489**	**1124**	**89**	Semi Critical
		Command								
3	Narsingh garh	Non-Command	19476	18209	797	19006	797	470	98	Semi Critical
		Block Total	**19476**	**18209**	**797**	**19006**	**797**	**470**	**98**	Semi Critical
		Command								
4	Rajgarh	Non-Command	14385	9369	496	9864	710	4306	69	Safe
		Block Total	**14385**	**9369**	**496**	**9864**	**710**	**4306**	**69**	Safe
		Command								
5	Sarangpur	Non-Command	12355	10173	611	10784	611	1571	87	Semi Critical
		Block Total	**12355**	**10173**	**611**	**10784**	**611**	**1571**	**87**	Semi Critical
		Command								
6	Zeerapur	Non-Command	11883	7081	420	7501	742	4061	63	Safe
		Block Total	**11883**	**7081**	**420**	**7501**	**742**	**4061**	**63**	Safe
		District Total	**84736**	**65771**	**3296**	**69067**	**4079**	**14887**	**82**	

4.6 Ground Water Quality

Groundwater quality in the district is fresh to saline with EC value ranges from 435 to 2120 µs/cm at 25^0C. Nitrate was observed in the range of 12 to 276 mg/l whereas fluoride ranges from 0.02 to 5.59 mg/l.