

DISTRICT GROUND WATER INFORMATION BOOKLET



REWA DISTRICT MADHYA PRADESH



Ministry of Water Resources
Central Ground Water Board
North Central Region
Bhopal
2013

REWA DISTRICT AT A GLANCE

S.N	ITEMS	Statistics	
1	General Information		
	i) Geographical area	631360 ha	
	ii) Administrative Divisions (As on 2013) No. of Block No. of Panchayats / Villages	9 Blocks 7 Tehsils 9 Nagar Panchayats 2720 Village Panchayats	
	iii) Population (As per Census 2011)	2,363,744	
	iv) Normal annual Rainfall (mm)	1141.5 mm	
2	Geomorphology		
	i) Major Physiographic Units	4 Nos. 1) Kymore Hills 2) Vindhyan Hills 3) Rewa Plateau 4) Teondhar Plains	
	ii) Major Drainage	8 Nos. Toms, Beaher, Bichia Audda Maheera Gorma Belan Bolanala	
3	LAND USE (,000ha)		
	i) Forest Area	85.7	
	ii) Net Area Sown	352.2	
	iii) Gross cropped Area	478.4	
4	Major Soil Types	Alluvial Yellow soil	
5	Principal Crops	Paddy, Pulses, Gram, Wheat Soyabean	
6	Irrigation by Different Sources	Area ('000Ha)	No of Structure
	Dugwells	27.2	12129
	Tube Wells / Borewells	35.5	7276
	Tanks / Ponds	1.6	321
	Canals	12.4	41
	Other Sources	19.9	10
	Total Irrigated Area	96.60	
7.	Number of Ground Water Monitoring Wells of CGWB (As on 31.03.2013) No. of Dug Wells No. of Piezometers	30 Nos. 7 Nos	
8	Predominant Geological Formations		
9	Hydrology Major Water Bearing Formation Pre-monsoon depth to water level during 2012 Long Term Water level trend in 10 years (2003-2012) in m/yr	Jointed & Fractured Sand Stone Min 4.85 m Max 29.32 m Min. 1.60 m Max 17.70 m Fall 0.14 m - 0.39	
10	Ground Water Exploration by CGWB (As on 31.03.2013)	Nil	

	No. of wells drilled (EW, OW, PZ, SH Total)	EW=7, PZ=13
	Depth Range (m)	Nil
	Discharge (litres per second)	Nil
	Storativity (S)	Nil
	Transmissivity (m ² / day)	Nil
11.	Ground Water Quality	
	Presence of Chemical constituents more than permissible limit (eg EC, F, As, Fe)	EC- 307-3700, Nitrate- 3-43, Fluoride - .015-1.4 in phreatic aquifer
	Type of Water	Good
12	Net Ground Water Availability (2009) in ham	46801
	Gross Annual Ground Water Draft	24289
	Projected Demand for Domestic and Industrial Uses upto 2033	6281
	Stage of Ground Water Development	52%
13	Awareness and training activity	Nil
	Mass Awareness Programmes Organised	Nil
	Water Management Training Programmes Organised	Nil
14	Efforts of artificial Recharge & Rain Water Harvesting	Nil
	Projects completed by CGWB (No. & Amount Spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	
15	Ground Water Control and regulation	9
	Number of Blocks Safe	8
	Number of SemiCritical Blocks	1
	Number of Blocks Notified	Nil
16	Major Ground water problems and issues	Drinking Problem. Most of the Dug Wells , Tube Wells and Hand pumps dry during summer season, due to low rainfall in the area last 3 years.

1.0 INTRODUCTION

LOCATION, EXTENT AND ACCESSIBILITY

The Rewa district lies in the central part of the state of Madhya Pradesh, covering an area of 6287.45 Sq Km. - (As per Statistical Book) It lies between North latitude $24^{\circ}16'30''$ and $25^{\circ}11'15''$ and east longitude $81^{\circ}03'15''$;md $82^{\circ}18'45''$, falling in Survey of India Topo sheet No. 63 G, H, & 63 L. It is located in the northeastern corner of the State, and bounded by Satna district in the West, Sidhi district in the South & the State of Uttar Pradesh in the North & East (Fig 1). Rewa town is the district head quarter for administrative purposes. The district is sub divided into seven Tehsils and nine blocks. The salient features are given in in table no. 1.

Fig 1

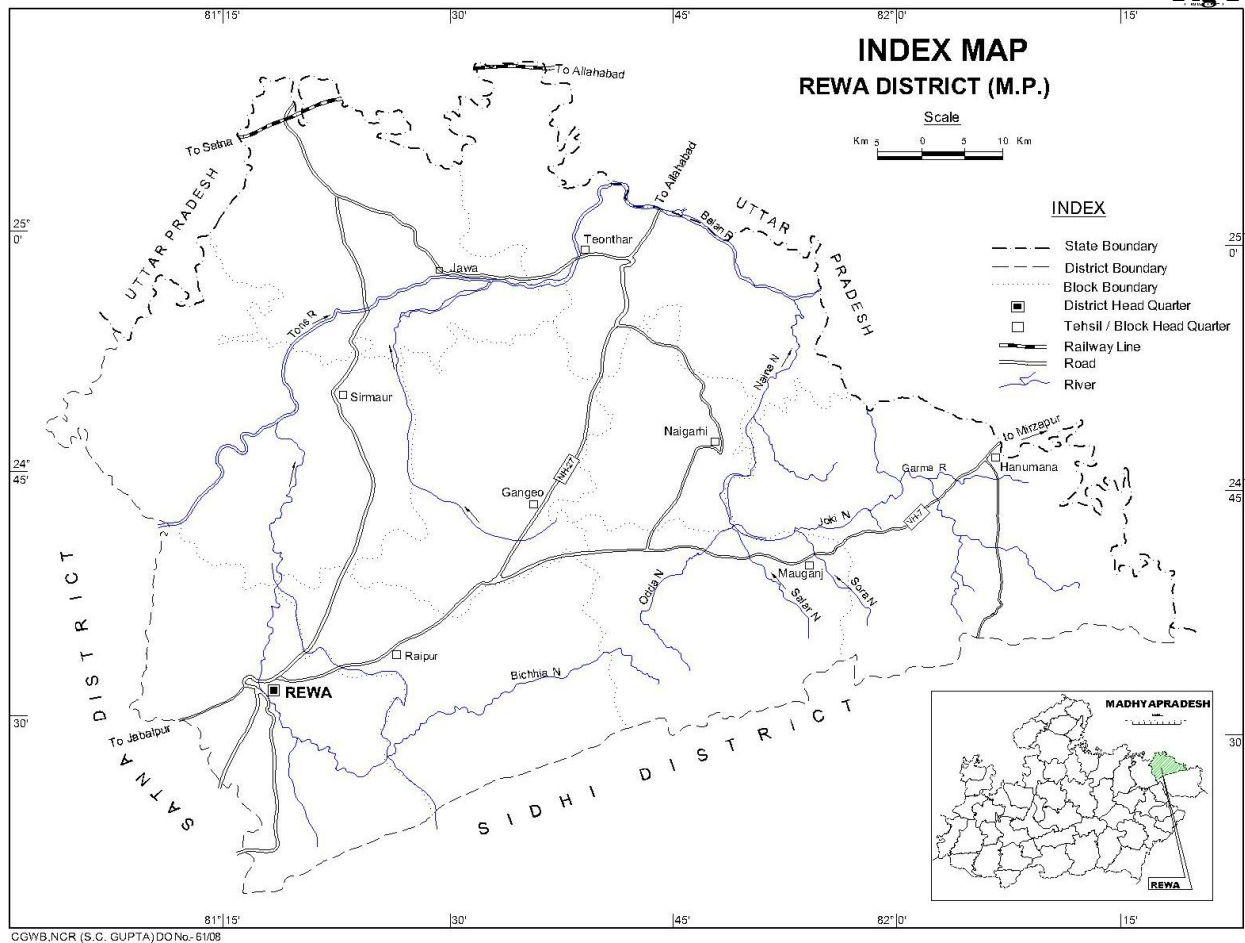


Table 1: Administrative Divisions, Rewa District , M.P.

Tehsil	Block	Area (sq. kms.)
1. Huzzur	1. Rewa	593.49
	2. Raipur	66.12
TEHSIL TOTAL AREA		659.61
2. Gurh	1. Rewa	99.26
	2. Raipur	262.29
TEHSIL TOTAL AREA		361.55
3. Raipur	1. Rewa	11.42
	2. Raipur	299.75
TEHSIL TOTAL AREA		311.17
4. Mauganj	3. Mauganj	527.26
	4. Naigarhi	377.87
TEHSIL TOTAL AREA		905.13
5. Sirmaur	5. Sirmaur	913.16
	6. Gangav	591.32
TEHSIL TOTAL AREA		1504.48
6. Teondhar	7. Teodhar	797.74
	8. Jawa	787.02
TEHSIL TOTAL AREA		1584.76
7. Hanumana	9. Hanumana	960.75
TEHSIL TOTAL AREA		960.75

COMMUNICATION

The district and block head quarters are connected by a network of metallic roads apart from the state highways, The National Highway Nos 7 (Varanasi Kanyakumari) & NH 75 (Gwalior - Ranchi joins to NH 33) passes

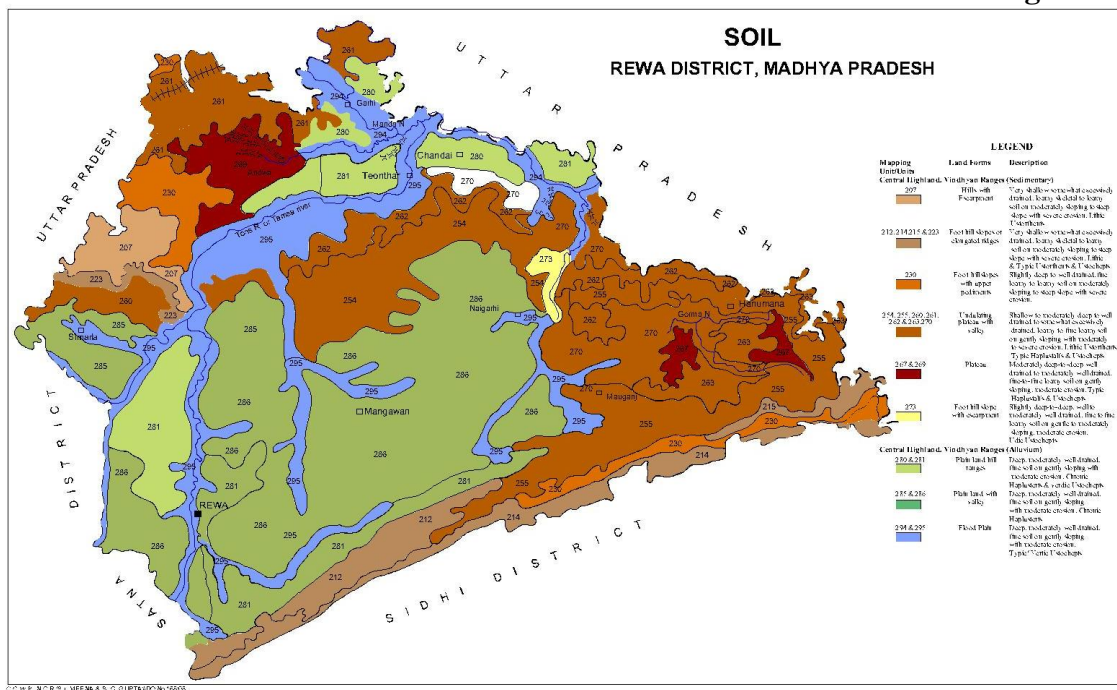
through the Rewa and NH -27 (Mangawan - Allahabad) also passes through the district. Rail line pass through the district.

The Rewa district has a total population of 2363744 in 2011.

PEDOLOGY

The district is generally covered with red & yellow mixed soils. The soil has developed mainly from the weathering of shales & sandstones. Generally soil is argillaceous mixed with lime kanker. In Teondhar tehsil alluvial soils are found in the vicinity of the Tons River and its tributaries (fig 2). These soils vary in color from ash to light brown and mostly sandy loam & clay loams

Fig 2



LAND USE

The land use in the district, as per district statistical handbook 2006-07, A very large part of the district (13.60%) is covered with forests. Only 59% area of the district is sown. The maximum sown area i.e. 78% is in Naigarhi block and the minimum in i.e. 44% is in Jawa block. About 70% area in the district is double cropped. The double-cropped area is the same as in the year 2004-05 i.e. 4422.96 Sq. Kms.

A large part of the district is covered with forests (13.60%). Out of the total district area of 6287.45 sq. kms the forest area is 852.89 sq kms.

PREVIOUS WORK

During the year 1981 - 82 Shri C.H.R.K. Reddy, Junior Hydrogeologist, carried out systematic Hydrogeological surveys in parts of the district in Raipur & Rewa blocks

Shri A.R. Bhaisare, Regional Director & Shri Saleem Romani, Channan (Retd) has compiled data and written Ground water Resources and Development Potential of Rewa district with special reference to the Auto flowing wells in the Year 19M 84- 85.

Shri S.S.P. Mishra, Sc 'B' carried out Systematic Hydrogeological Studies under the' AAP 1985-86.

Under the World Bank assisted Hydrology Project, 13 shallow and deep piezometers hm'e been drilled by the Central Ground Water Board for water level and quality monitoring.

Ground water User Map of the district was prepared in the during the AAP 2004-05.

2.0 CLIMATE AND RAINFALL

The climate of Rewa District, M.P, characterized by a hot summer and general dryness except during the south west monsoon season. The year may divide into four seasons. The cold season, December to February is followed by the hot season from March to about the middle or June. The period from [he middle of June to September is the south west monsoon season. October and November form the post monsoon or transition period.

The normal annual rainfall of Rewa District is 1141.5 mm Rewa District received maximum rainfall during south west monsoon period i.e. June to September. About 89.2% annual rainfall received during monsoon season. Only 10.8% of the annual rainfall takes place between October to May period. Thus surplus water for ground water recharge is available only during the south west monsoon period.

The normal maximum temperature received during the month of May is 41.3°C and minimum during the month of January 7.9°C. The normal annual means maximum and minimum temperature of Rewa District is 31.8°C & 18.4°C respectively,

During the south west monsoon season the relative humidity generally exceeds 83% (August month). In the rest of the year is drier. The driest part of the year is the summer season. when relative humidity generally exceeds 8.3% (August month). In the rest of the year is drier. The driest part of the year is the summer season, when relative humidity's are less 37%. Normal Climatological parameter for Rewa District

S. No.		Jan.	Far.	Mar.	April	may	Jun.	July	Aag.	Sept.	Oce	Nov.	Des.	Annul
1.	Maximum Temp.	24.4	26.6	32.3	38.3	41.3	38.6	32.5	31.2	31.8	32.4	28.6	24.2	31.8
2.	Maximum Temp	7.9	10.7	15.5	21.4	25.8	26.8	24.5	23.9	23.4	19.6	13.3	8.4	18.4
3.	Relative Humidity (%)	71	62	45	37	38	57	80	83	77	64	61	70	62
4.	Wind Velocity (km / l)	2.0	2.6	3.2	3.9	5.0	6.4	5.3	4.6	3.8	2.5	1.8	1.6	3.6
5.	Rainfall (m.m)	22.4	19.2	14.9	6.3	10.1	156.1	316.1	350.4	193.9	24.1	17.3	8.3	1139.

3.0 GEOMORPHOLOGY

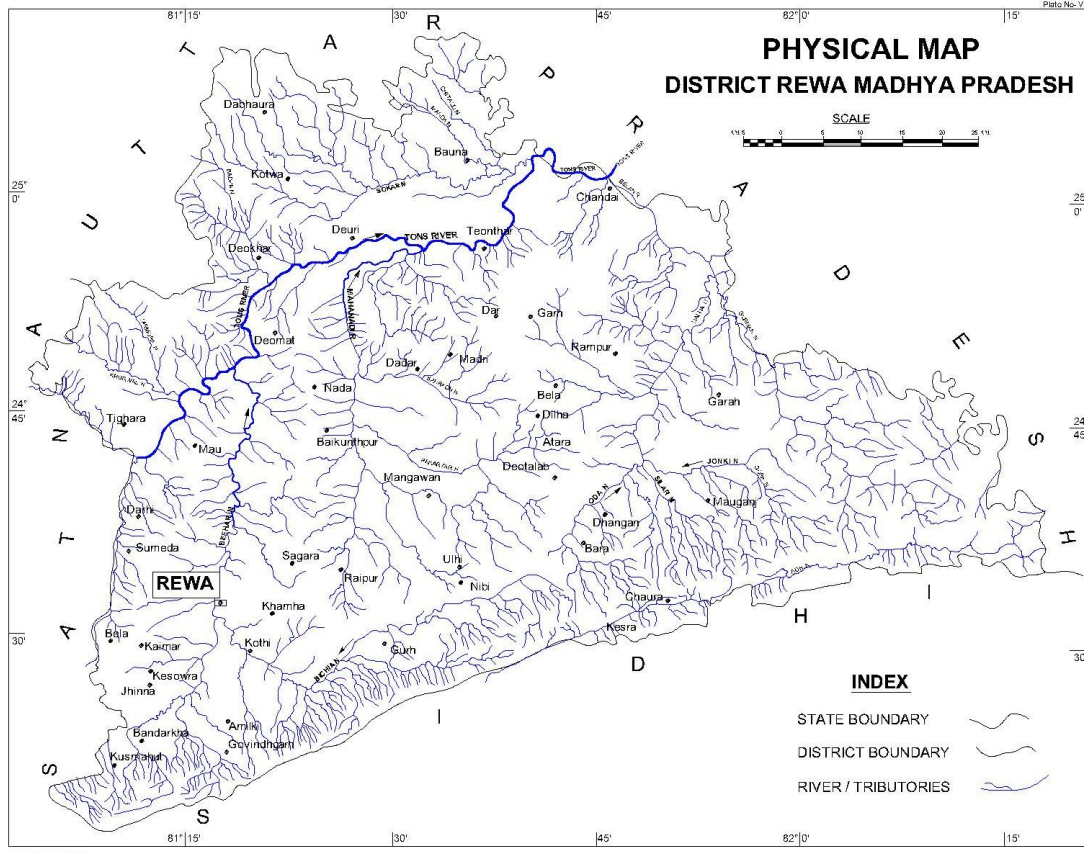
3.1 PHYSIOGRAPHY

Physiographically, Rewa district can be divided into four units i.e. Vindhyan Hills, Rewa Plateau, Keimur Hills & Northern Low Lying Ground.

3.2 Drainage

Entire district falls in The Ganga basin. There are two tributaries of Ganga river namely Tons & Son. Kymore Hill range form the water divide between these two rivers. Most of the rivers & nals of the district are seasonal & forms dendritic pattern.

Fig 3



4.0 GEOLOGY

The geological formation in the district is mainly Vindhyan Formation. The area forms a part of the northern marginal belt of the peninsular bordering the Indo - Gangetic plains. The quartzites, sandstones, shales shales and limestone, belonging to upper Vindhyans formation, generally underlie district. The recent sediments form thin alluvium covers ranging in thickness from 15 to 45 m, in the valley of the major rivers and along their, tributaries overlying the Vindhyan basement. The geological succession in the district is as follows and geological map shown in Plate.

Table: Geology, Rewa District

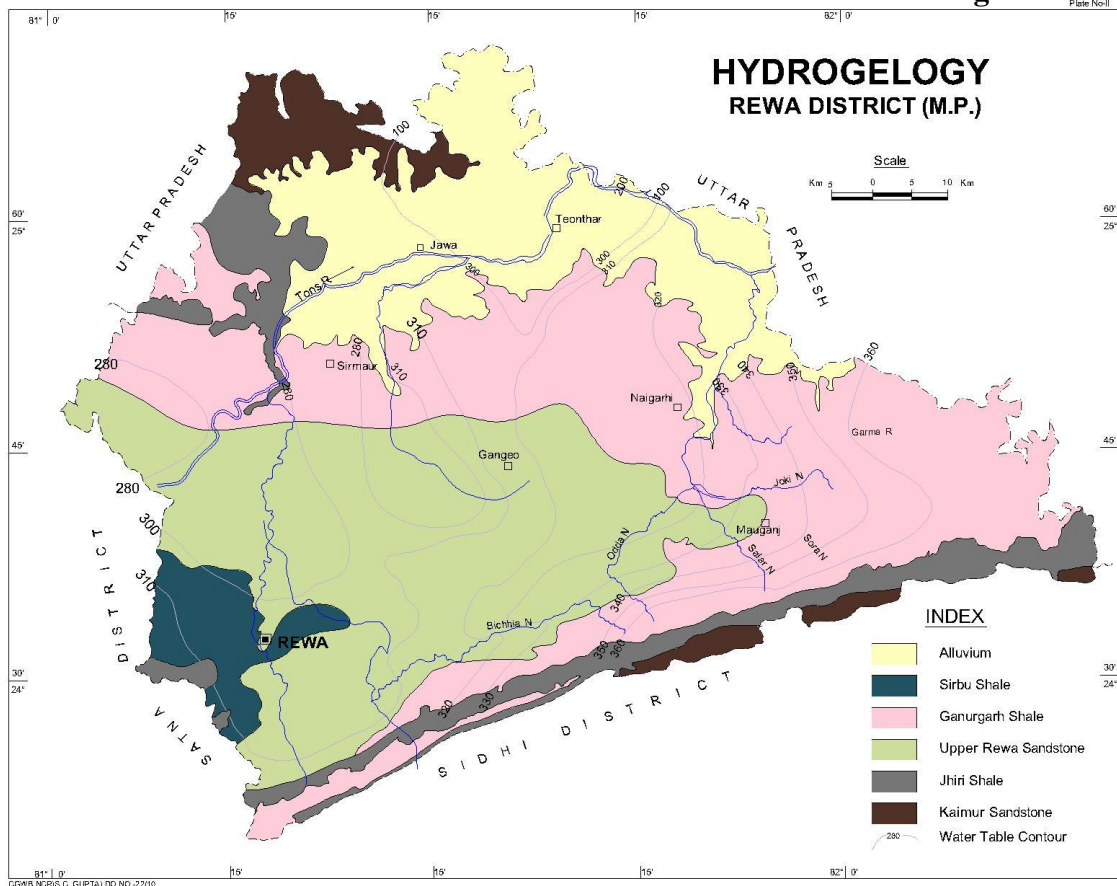
Age	Group	Series	Lithology	Nature & Characteristic
Quaternary	Allivium			Unconsolidated Sand. Gravel & Clay
Neo – Proteozoic (late)		Bhander	Sirbu Shale	Purple & Olive Green in Colour Thinly laminated Silty Shale to Missive With few Stro
			Nagod limestone	Fine grained hard 7 Compact thinly bedded to Missive With few Stro
			Gunurgarh or simrawal Shale	Soft purple and reddish brown thinly bedded to flaggy, calcareous with thin bands of Calcite and sypsum.
Neo – proteozoic (early)		Rewa	Uppar Rewa Sandstone	Reddish brown hard and missing coarse grained thinly bedded
			Jhiri or Kokah Shale	Soft reddish Splintery with
Meso – Proteozoic (late)		Kaimur	a) Dandr aul quartzite b) Bijing arh Shale	Fine Grained, hard Massi and thickly bedded.

4.1 HYDROGEOLOGY

The occurrence, movement & recharge of ground water is governed by water bearing properties of the different litho units occurring in the area. Hydrogeological map of the district is given as figure 4. The water bearing properties of different hydrogeological units in the district are described as under:

Kaimur: - The Kaimur rocks forming the hilly tracts of the district comprise consolidated quartzites, sandstones & shales. These rocks possess meager porosity and permeability. Joints, fissures & fractures developed in these rocks provide secondary porosity. The yield of the rocks of the Kaimur series is poor

Fig 4



Rewa Series: - The Rewa sandstones are hard & compact with little primary porosity. The weathered & fractured sandstones control occurrence & movement of ground water on a limited scale. In the topographic low areas weathered residuum attains a maximum thickness of 5 m. The yield of sandstones & shales ranges from 1 to 3 and <1 to 1.5 lps respectively.

Bhandar Series: - The Gunurgarh & Sirbu shales are poorly permeable due to their susceptibility to weathering. A weathered mantle of 5 to 10 meters has been developed in the area. The dug wells tapping this weathered horizon yields limited quantity of water. At deeper depths, due to seepage of ground water through joints and fractures solution cavities developed along bands of gypsum and limestones. The ground water occurring in artesian condition with high piezometric heads are occurring in these solution cavities and they are tapped by some dug cum bore wells & bore wells.

Limestones are hard, compact but jointed & fractured.. The weathered zone in this extends down to a maximum depth of 5 m in topographic low areas.

Along the joints & planes of stratification "Grikes" & solution cavities are developed. These cavernous limestones hold good amount of ground water. The drilling carried out by Madhya Pradesh Public Health Engineering Department in the western part of the Rewa town reveals cavernous water bearing zones below zones below 24 m at village Madhavpur and below 39 m at village Dholgarh and Nowbastha. The yields is upto 450 m³ /day per well have been reported.

Alluvium: - The alluvium in the area is mainly composed of silt, fine to medium grained sands with admixtures of clay and little amount of Kankars. The sandy horizons are encountered at depth of 25 to 35 m below ground level in Jawa block, 30 to 35 m bgl. in Teondhar block. Thickness of alluvium in Jawa & Teondhar blocks varies from 20 to 45 m and in Mauganj & Rewa & Raipur blocks varies from 4 to 7 m. The tube wells tapping this horizon sustain yield of the order of 450 to 673 m³/day with the draw down of 3 to 10 m recorded after 24 hours of pump mg.

4.2 Occurrence of Ground Water

Ground water in Rewa district occurs under phreatic and semi confined & confined conditions. The salient features of the data collected during the reconnaissance hydrogeological survey in the year 1992 are given below in the order of their relative importance from ground water development aspect.

4.2.1 Alluvium:- In the alluvium area, mainly extending in Teondhar & Jawa blocks of Rewa district, ground water occurs both under phreatic and semi confined to confined conditions.

4.2.2 Limestone:-The Rewa block is mainly covered with the Bhandar Limestone. Ground Water occurs under both water table & semi confined to confined conditions. The limestone below phreatic aquifer zones are cavernous and yield good amount of water from solution channels and cavities encountered in bore wells and dug cum bore wells. Cavernous horizons have been reported at depth of 24 m.bgl at Medhepur (24°32'30": 81°10'00" 63H/2) and at 39 m bgl at Dholagarh (24° 3' 50": 81°12'45"

63H/2). The some of the bore wells drilled in the are recorded artesian condition and a few are free flowing with a free flow of about 100 liters/minutes and show free flow condition only for a short period after monsoon. A spring is also occurring in limestone exposed in a nala bed near bus stand of Rewa town. The bore wells sustain pumping for 24 hrs with discharge of about 450 cubic. meters per day. The limestone area has not been fully explored fully and holds promise for future exploitation.

4.2.3 Gunurgarh Shales:- Gunurgarh shales cover most ,of the areas in Raipur, Sirmour & Gangao blocks. Ground Water 'occurs both under water table and semi confined to confined conditions. The phreatic aquifer comprising mainly weathered shales with joints etc. is characterized by poor yields of ground water and is mainly tapped by dug wells for domestic uses. The bore wells drilled in Gunurgarh shales down to the depth of 60m b.g.l. encountered cavernous horizons, which contain ground water under artesian condition. The solution cavities formed in this formation are along the bands of gypsum and limestones occurring at the depth. Solution cavities have been reported at depth of 39 m b.g.l. in village Delhi (24°43'40": 81°2(00" 63H/6) and at a depth of 25 m b.g.l. in village Kanuaja (24 23 00 : 81 2345 63H/7). Auto flowing wells are also occurring in this formation in some bore wells with a discharge ranging from 5 to 500 liters per minutes. The discharges of the auto flowing wells decreases after monsoon period and after 2 to 3 months it ceases. Due to the gypsiferous horizon these bore wells are having high suphate in ground water.

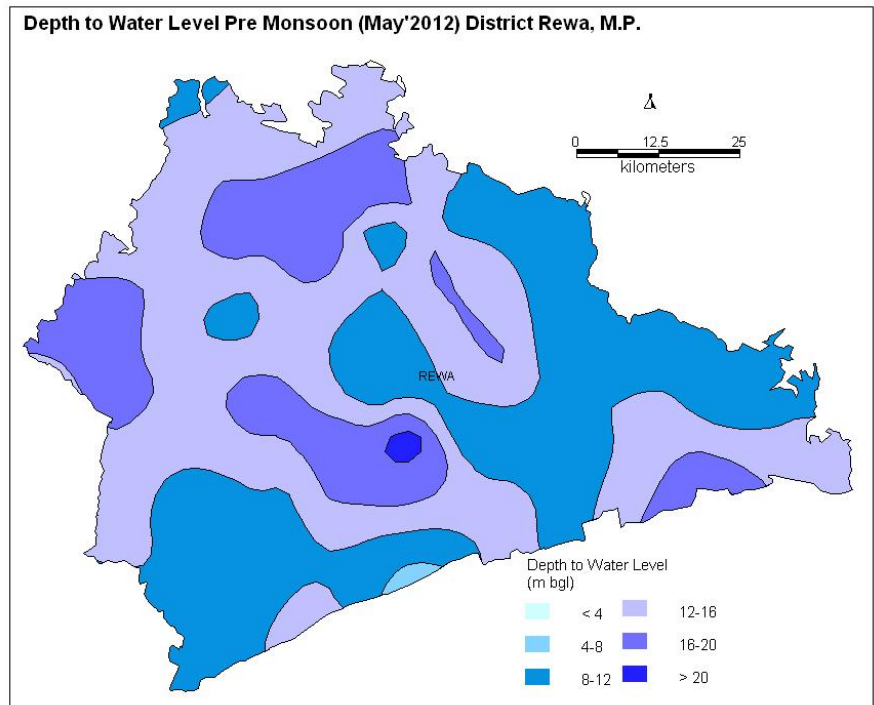
4.2.4 Rewa sandstones & shales:- Ground water generally occurring under phreatic conditions in wreathed and jointed horizons of sandstones and shales of Rewa series. In the valley at the base of Kaimur ranges near village Gadhwa (24 3100 : 81 4500 63H/14) and Gaduawan (24°3(50": 81°48'00" 63H/14) the bore wells drilled down to the depth of about 40 m encountered confined condition and auto flowing condition is observed in these wells. A bore well near Naigarhi (24°47"00": 81°36'00" 63H/13)

4.3 Ground Water Scenario

Depth to water level

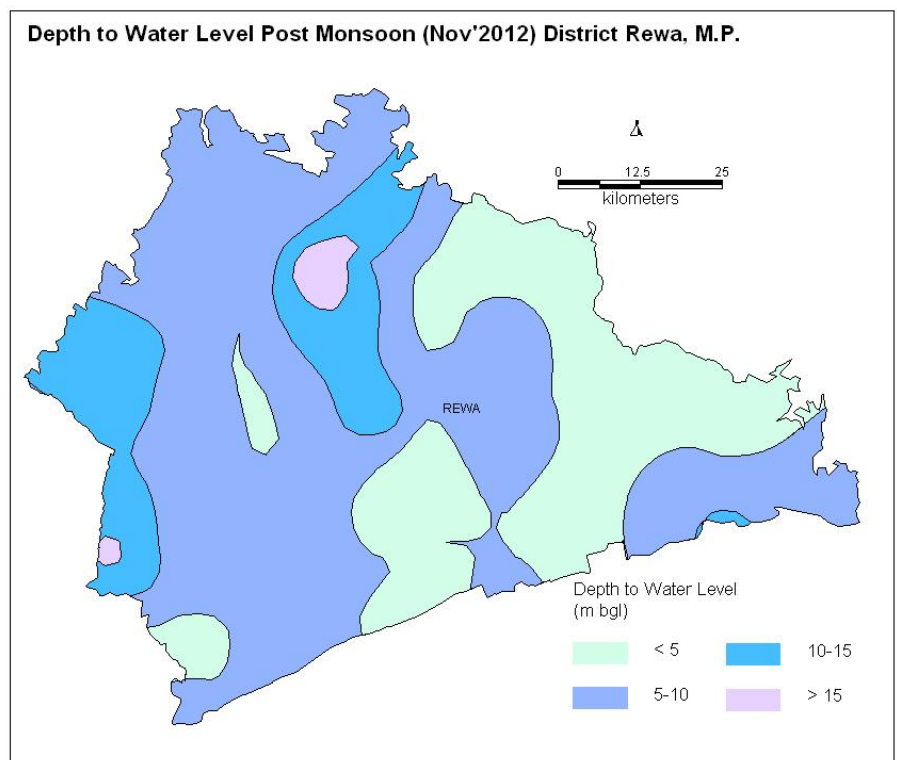
Pre-monsoon (May 2012)

The pre-monsoon depth to water level in the district ranges between 4.85 m bgl and 29.32m bgl. Major part of the district have water level in the range of 8-20 m bgl during the pre monsoon.



Post-monsoon (November 2012)

During post-monsoon period, water level varies from 1.60m bgl to 17.70m bgl. In major part of the district, water level lies between 5 & 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 0.14 - 0.39 m/yr.

4.4 Ground Water Exploration

The exploratory drilling has been carried out in the district and drilled 7 exploratory wells & 13 piezometers.

4.5 Ground Water Resources

Rewa district is underlain by Vindhyan Shale, Limestone and Sandstone and Alluvium. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. There are nine assessment units (block) in the district which fall under non-command. All blocks, of the district are categorized as safe excepts Gangeo block as semi critical. The highest stage of ground water development is computed as 82 % in Gangeo block. The net ground water availability in the district is 46,801 ham and ground water draft for all uses is 24,289 ham, making stage of ground water development 52 % 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 21079 ham.

Stage of Ground Water Development as on 31st March 2009

Assessment unit	Command / non-command/Total	Net annual Gross Groundwater Availability	Existing Gross Groundwater Draft for irrigation	Existing Gross Groundwater Draft for Domestic & industrial Water Supply	Existing Gross Groundwater Draft for All uses	Allocation for domestic & requirement supply upto next 25 years	Net groundwater availability for future irrigation development	Stage of Ground water Development (%)	Category
Gangao	Command								
	Non-Command	4875	3526	476	4002	565	784	82	Semi Critical
	Block Total	4875	3526	476	4002	565	784	82	Semi Critica
Hanumanna	Command								
	Non-Command	6953	287	500	786	783	5883	11	Safe
	Block Total	6953	287	500	786	783	5883	11	Safe
Jawa	Command								
	Non-Command	6089	1876	472	2348	548	3665	39	Safe
	Block Total	6089	1876	472	2348	548	3665	39	Safe
Mauganj	Command								
	Non-Command	3317	1107	353	1460	519	1691	44	Safe
	Block Total	3317	1107	353	1460	519	1691	44	Safe
Naigarhi	Command								
	Non-Command	2590	1264	335	1599	426	900	62	Safe
	Block Total	2590	1264	335	1599	426	900	62	Safe
Raipur	Command								
	Non-Command	4517	2423	537	2960	707	1387	66	Safe
	Block Total	4517	2423	537	2960	707	1387	66	Safe
Rewa	Command								
	Non-Command	5225	2353	1115	3468	1323	1549	66	Safe
	Block Total	5225	2353	1115	3468	1323	1549	66	Safe
Sirmour	Command								
	Non-Command	5985	3584	566	4151	722	1679	69	Safe
	Block Total	5985	3584	566	4151	722	1679	69	Safe
Teonthar	Command								
	Non-Command	7249	3021	493	3515	688	3540	48	Safe
	Block Total	7249	3021	493	3515	688	3540	48	Safe
District Total		46801	19441	4847	24289	6281	21079	52	

5.0 Ground Water Quality of Rewa District

The EC values were found to be in the range of 307 and 3700 $\mu\text{S}/\text{cm}$ at 25° C. The Nitrate concentration was also reported less than of 45 mg/l of BIS (1990) limit. None well of the district was reported having fluoride greater than 1.5 ppm of BIS (1990) limit and further no arsenic content as detected in the ground water of district.

Rewa district is underlain by Vindhyan Shale, Limestone and Sandstone and Alluvium. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. Out of 6,31,360 ha of geographical area, 5,9,3760 ha (93 %) is ground water recharge worthy area and 37600 ha (7%) hilly area. There are nine number of assessment units (block) in the district which fall under non-command. All blocks, of the district are categorized as safe excepts Gangeo block as semi critical (safe in 2003/04). The highest stage of ground water development is computed as 82 % in Gangeo block. The net ground water availability in the district is 46,801ham and ground water draft for all uses is 24,289 ham, making stage of ground water development 52 % (42 % 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 21079 ham.