CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

GROUND WATER SCENARIO
DHOLPUR DISTRICT

WESTERN REGION

JAIPUR

MARCH, 2010

DHOLPUR DISTRICT AT A GLANCE

S. No.	Item	Information
1.	**GENERAL INFORMATION**	
i.	Geographical area (sq. km)	3033
ii.	Administrative Division	
a.	No. of tehsils / blocks	5/4
b.	No. of Panchyat / villages	1805 786 in habitated 19 unhabitated
c.	No. of towns	3
d.	No. of municipalities	3
III.	Population (as per 2001 census)	983258
IV	Average annual rainfall (mm) (1971-2006)	598.00
2.	**GEOMORPHOLOGY**	
i.	Major physiographical Units	i. Western hilly areas. ii. Central undulating plains iii. The eastern plains (east of Dholpur – Mania alignment. iv. About 3 to 10 km wide strip of plateau along the southern boundary demarcated by Chambal river. Ravines are very common and prominent physiographic features.
ii.	Major Drainage	The drainage system is well developed and represented by Chambal, Gambir and Parbati river and their tributaries Parbati river catchment forms 1950.7 sq. km area forming 64.5% of district. Gambhir

		river catchment forms 203.5 sq. km and forming 17.8% of district. Chambal river forms 869.4 sq. km of catchment forming 28.8% of district area.
3.	**LAND USE (sq. km) (2003-04)**	
i.	Forest area	270.9
ii.	Net area sown	1514.97
iii.	Cultivable area (net area Sown + Padat land)	1414.97 + 180.20 = 1695.17
4.	**MAJOR SOIL TYPES**	1. Sandy soil 2. Loamy sandy soil 3. Sandy loamy soil 4. Clayey soil 5. Sandy clayey loam soil 6. Sandy clayey soil
5	**AREA UNDER PRINCIPAL CROPS (sq. km) (2003-04)**	
i.	Food grain	Bajra : 674.57 Jawar : 2.44 Wheat : 446.04 Barley : 9.46 Rice : 7.79
ii.	Pulses	64.25
iii.	Oil seeds	755.50
iv.	Non food grains	23.62
6	**IRRIGATION BY DIFFERENT SOURCES (sq. km) (Total area / net area)**	
i.	Dug well / Tube well / Bore wells	931.61 / 910.49
ii.	Tanks / Ponds	1.78 / 1.78

iii.	Canals	91.32 / 90.91
iv.	Other sources	-
v.	Net Irrigated area	1003.18
vi.	Gross Irrigated area	1024.71
7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB**	
i.	No. of dug wells	
ii.	No. of piezometers	
8.	**PREDOMINENT GEOLOGICAL FORMATION**	Quaternary : Alluvium Formations of Vindhyan Super Group : Sandstone and shale
9.	**HYDROGEOLOGY**	The main water bearing formation is older alluvium of quaternary system and sand stone of Vindhyan Super Group. Older alluvium covering 62.50% of potential zones & rest area by sandstone potential zone. The total potential area of the district is 2049.9 km^2. The potential zone of command area is around 81.11 km^2 covering 36.44 km^2 area under dams and bunds. The area under command is well connected by about 95.99 km length of main and about 67.48 km length of main canal. Rest falls under non command area.
ii.	Pre-monsoon depth to water level during 2006 (mbgl)	5.70 to 42.47 mbgl in general 10 to 20 mbgl.

iii.	Post monsoon depth to water level during 2006 (mbgl)	6.74 to 32.42 mbgl. 7 to 15 mbgl.
iv.	Long term water level in last 10 years (1997-2006) m/year	Rise in two hydrograph station 0.11 to 1.104 m/year, fall in rest of hydrograph station in general 30 to 50 cm/year.
10	**GROUND WATER EXPLORATION BY CGWB (as on 31.03.2007)**	

No. of wells drilled	Type of wells	Formation		
		Alluvium	Hard rock	Total
	EW	4	1	5
	OW	5	-	5
	SH	4	-	4
	PZ	11	-	11

ii.	Depth Range (m)	Uncon.	Con.
		19.78 to 126.70 mbgl	159.55 mbgl
iii.	Discharge (lpm)	100 to 700 lpm	
iv.	Transmissivity (m^2/day)	11.9 to 277	
v.	Storativity	1.8×10^{-1} to 3.8×10^{-2}	
11.	**GROUND WATER QUALITY**		
i.	Presence of chemical constituent more than permissible limit	EC – 390 to 7440 micro mhos/cm at 25° in general within 2000 micro mhos/cm at 25°C. F – 0.3 – 3.7 mg/liter in general within permissible limit except Farakhpur, Pura Ka Sad, Sepau, Sikroda.	

		Fe – 0.03 – 8.27
ii.	Type of water	Alkaline in nature in general.
12.	**DYNAMIC GROUND WATER RESOURCES (as on 31.03.2004)**	
		(Figure in MCM)
i.	Annual replenishable ground water resources	225.2432
ii.	Net annual ground water draft	240.0209
iii.	Projected demand for domestic and industrial uses upto 2025	35.7771
iv.	Stage of ground water development (%)	106.56
13	**AWARENESS AND TRAINING ACTIVITIES**	
i.	Mass awareness programmes organized	Nil
ii.	Water management training programmes organized	Nil
14.	**EFFORTS OF ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING**	
i.	Projects completed by CGWB (number and amount spent)	Nil
ii.	Projects under technical guidance of CGWB (numbers)	Nil
15.	**GROUND WATER CONTROL AND REGULATIONS**	
i.	Number of OE blocks	2
ii.	Number of critical blocks	1
iii.	Number of block notified	Nil

16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**
i.	Declining water levels and increasing drafts due to increasing irrigation draft of domestic draft as well.
ii.	Surface water irrigation projects should be sanctioned and executed immediately to decrease the pressure on ground water exploration so that ground water draft can be optimized.

DISTRICT GROUND WATER BROCHURE

DHOLPUR DISTRICT

I. INTRODUCTION

Dholpur district with an area of 3033 sq. km is located in easternmost extremity of the state of Rajasthan and is situated with in latitude 26°21'19" and 26°57'33" North and longitude 77°13'06" and 78°16'45" East. It is bounded by Bharatpur district in North West of Swaimadhopur and Karauli district in south west and rest of the boundaries are bordered by Agra district of Uttar Pradesh and Bhind – Morena district of Madhya Pradesh.

The administrative set up of the district is give below

Sr. No.	Name of block	Geographical area in sq. km 1991/2001	Name of Tehsil & it covers	Name of tehsil
1	Baseri	999.46 / 1001.42	Complete tehsil of Baseri	Baseri / 998.04
2	Rajakhera	568.89 / 580	Complete tehsil of Rajakhera and parts of Dholpur tehsil now Sapau tehsil	Raja Khera 387.02 Sapau / 304.06
3	Dholpur	610.12 / 609.32	Parts of Dholpur tehsil	Dholpur / 509.71
4	Bari	899.98 / 816.24	Complete tehsil	Bari / 810.61

The population of the district as per 2001 census is 983258 persons including 538103 males and 445155 females. The rural and urban population is 806640 and 176618 respectively.

The district comprises of plains of alluvium and ravines in eastern part and small flat topped hills in the western part. These hills spread over in 378.33 km^2 area attaining altimetric variation of about 174 m from the plains and is also known for the ravines covering about 272 km^2 area developed mainly on the banks of Chambal river.

Dholpur district covers in part by three river basins namely Parbati, Chambal and Gambhiri. The river Parbati flows from west to east and is located in the central part of the district where as River Chambal and River Gambhir flowing in the southern and northern extremity of the district respectively. All these rivers flow from Southwest to north east direction.

Geomorphologically the district can be divided into following four main morphological units:

i. Western hilly areas.

ii. Central undulating plains.

iii. The eastern plain (east of Dholpur - Maina) alignment.

iv. About 3 to 10 km wide strip of plateau about the southern boundary demarcated by Chambal river. Ravines are very common and prominent physiographic features in the district.

The land use statistics of the district is furnished below:

S. No.	Particulars	Figure in sq. km
1	Area not suitable for cultivation	746.51
2	Hills and hilly forest	270.59
3	Pasture land	178.77
4	Barren land	113.38
5	Other	4.63

6	Area suitable for cultivation but not cultivated	180.20
7	Area under cultivation	1514.97
i.	Area irrigated by wells	910.49
ii.	Area irrigated by canals	90.91
iii.	Area irrigated by tanks / ponds	1.78
iv.	Area irrigation by other sources	Nil
	Total Irrigated	1003.18
8	Un-irrigated area	510.79

Agriculture activity is spread over both Kharif and Rabi cultivation. Kharif cultivation is rain fed and Rabi cultivation is mostly based on ground water. During the Kharif cultivation only 10.10 sq.km area is under irrigation, whereas during Rabi cultivation 1012.41 sq.km area is under cultivation (including area under double crops). The main Kharif crops grown in the area are Bajra, Guar, Moong and Moth etc., whereas principal Rabi crops are wheat, gram and mustard. The total sown area is 2045.13 sq. km (including area twice sown) and net sown area is 1514 .97 sq. km out of which net irrigated area is 1003.18 sq. km forming nearly two third of the net area sown.

The ground water investigation was carried out by GSI in 1969-70 and systematic hydrogeological Survey has been carried out by CGWB, WR, Jaipur in 1980-81. Ground water exploration has also been undertaken in the year 1983-85, later other hydrogeological activities has been undertaken by CGWB, WR, Jaipur for ground water evaluation and resources estimation in association with ground water department of Rajasthan State. Monitoring of National hydrograph stations four times in a year is done by Central Ground Water Board, Western Region, Jaipur.

2. RAINFALL AND CLIMATE

Climate of the district can be classified as semi arid type. The summers are very hot and dry and the winters are very cold. The summer season prevails from March to mid June after which the rainy season starts with the on set of monsoon rains lasting till the end of September. During the May / June month the mean daily temperature is about 40°C. The potential evapotranspiration is 1780.0 mm annually.

The mean annual rainfall of the district is 598.00 mm (1977-1906). The long term normal annual rainfall (1901-1970) is 717.5. This indicates that annual rainfall of the district has decreased. The co-efficient of variation varies from 28.2% at Bari to 41.6% at Rajakhera indicating that rain fall is slightly unreliable. The occurrences of mild droughts are highest in the district. Normal drought occurs sometimes where as severe type of drought occurs rarely.

3. PHYSIOGRAPHY, GEOMORPHOLOGY AND SOIL TYPES

The Dholpur district can be divided into four main morphological divisions as follows:

i. Western hilly areas

ii. Central undulating plains

iii. The eastern plains (east of Dholpur- Maiwa alignment)

iv. About 3 to 10 km wide strip of plateau along the southern boundary demarcated by Chambal river.

Ravines are very common and prominent physiographic feature in the district.

The highest peak (the Gurjar Pahar) in the district is the highest peak about 357 m amsl and is located in the south west of the district. The eastern

plain lies at altitude between 163 and 171 mamsl. The central part of the district lies between the altitude of 232 and 177 mamsl.

The drainage system of the district is quite well developed and is represented by Chambal, Gambhir and Parbati rivers and their various tributaries. The entire district falls under the Yamuna basin as both Chambal and Gambhir rivers are tributary of Yamuna river. Major part of the district comes under the Gambhir and Parbati sub basins and a narrow strip of the Soupur part of the district running NE-SW direction falls under Chambal sub basin. The details are given below:

Basin	Area sq. km	% of district	% of Basin
Parbati	1950.70	64.50	81.70
Gambhir	203.50	17.80	4.90
Chambal	869.40	28.80	2.80

The distribution of soil types has been studied, during the course of systematic hydrogeological surveys. Based on these studies soils of the district has been classified in to six categories, where areal distribution has been shown in Fig.

i. Sandy soil: It is restricted with in a small NE-SW trending lanticular patch in the west of Dholpur district.

ii. Loamy sandy soil: this type of soil in formed in a very small patch of the area in the western vicinity of Bari town.

iii. Sandy loamy soil: It is found in two small patches one is located to the west of Dholpur adjoining a sandy soil patch and the other patch is located around Turripura village situated in the western part of the district.

iv. Clayey soil : This variety of soil is formed in two isolated patches, one patch is formed in the eastern part of the district about 5 km SW of Rajakhera and other patch of found 5 km north of Turripura village in the north western part of the district.

v. Sandy clayey loam soil: This type of soil is formed in four isolated patches, two in north western part and two in the central part of the district.

vi. Sandy clayey soil: This type of soil is most prevalent in Dholpur district.

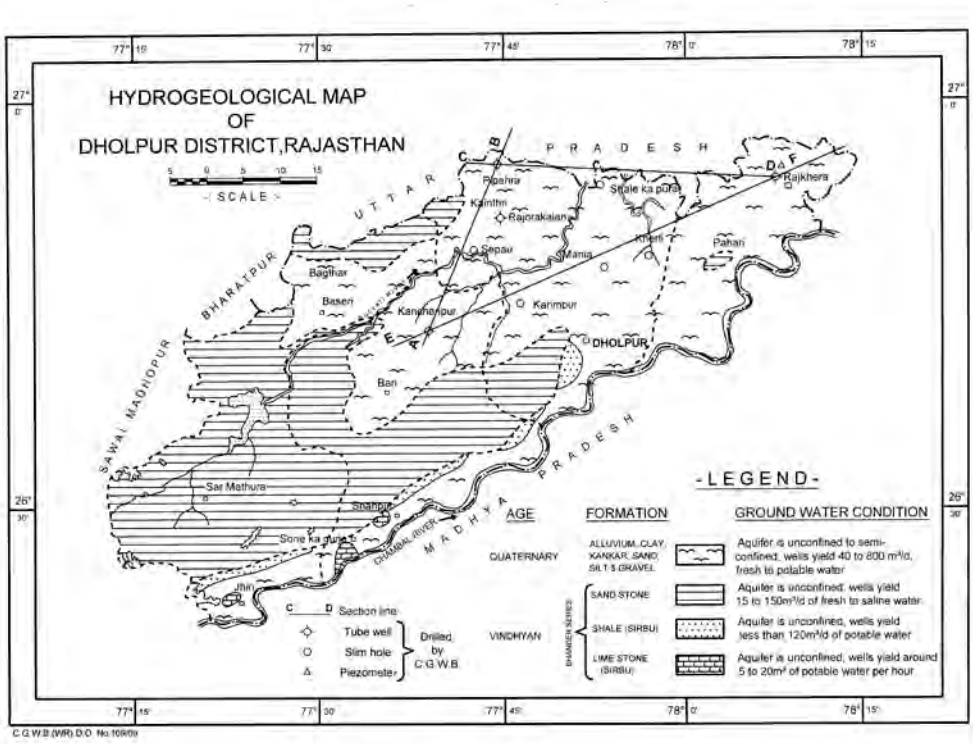
4. GEOLOGY

The rock formations exposed in Dholpur district are sedimentary in nature and belonging to Vindhyan Super Group and overlain is most part of the district by the Quaternary alluvium. The stratigraphic succession of different types of formations in the district is as follows:

Quaternary	Recent to sub recent	Alluvium	Clay, silt, sand, kankar, gravel and rock fragments
Upper Proterozoic	Vindhyan Super Group	Bhander Group	Upper Bhander sandstone. Sirbhu shale with bands of siltstone and lime stone

5. GROUND WATER SCENARIO

In Dholpur district, ground water occurs in mainly four hydrogeological formations. These hydrogeological formations are alluvium, sandstone, shale and limestone and among these formations alluvium is the most important formation as it covers the maximum area and also it is the most potential among different hydrogeological formations.



The ground water bearing character of the various formations are described below:

i. Sirbhu shale

Sirbhu shales occur as water bearing formation in isolated patches and these are located along the southern contact of upper Bhander sandstone with alluvium. The shale is easily weatherable in to clayey products and therefore the water storing capacity of shale is very poor. With in shale generally ground water moves through joints and fractures, which do not persist much downward or laterally and further the joints are filled with secondary materials making the shale a poor aquifer.

ii. Sirbhu limestone

Sirbhu limestone as a hydrogeological formation occurs in the extreme corner of the district near Chambal river. The investigation indicates that the cavernous nature of limestone is not properly developed and aerial distribution of this formation is very limited. The ground water occurs under

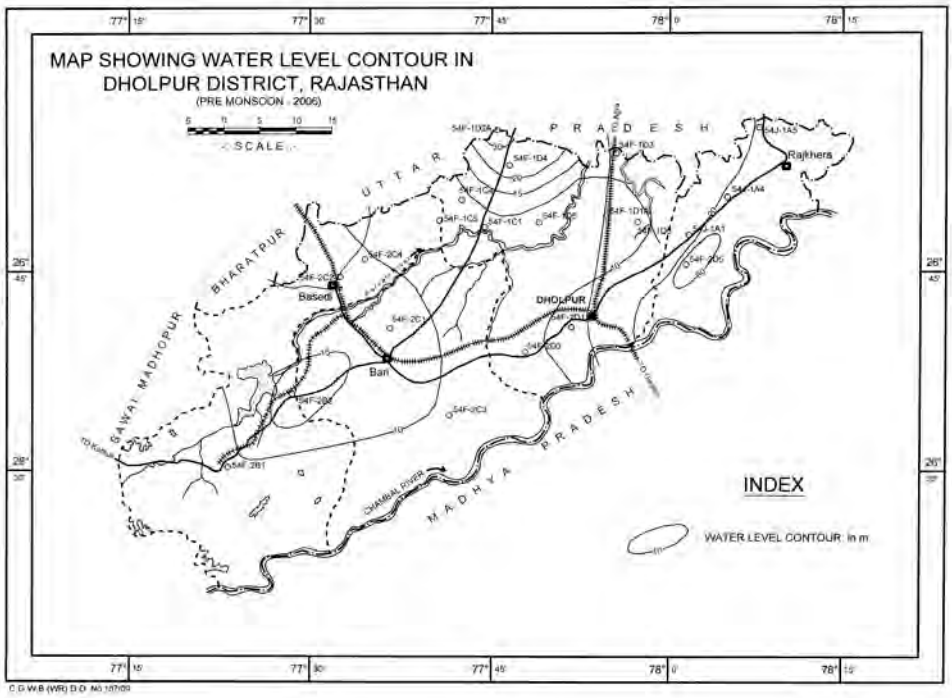
water table condition and yield from the open wells ranges from 5 to 20 m^3/hr individually.

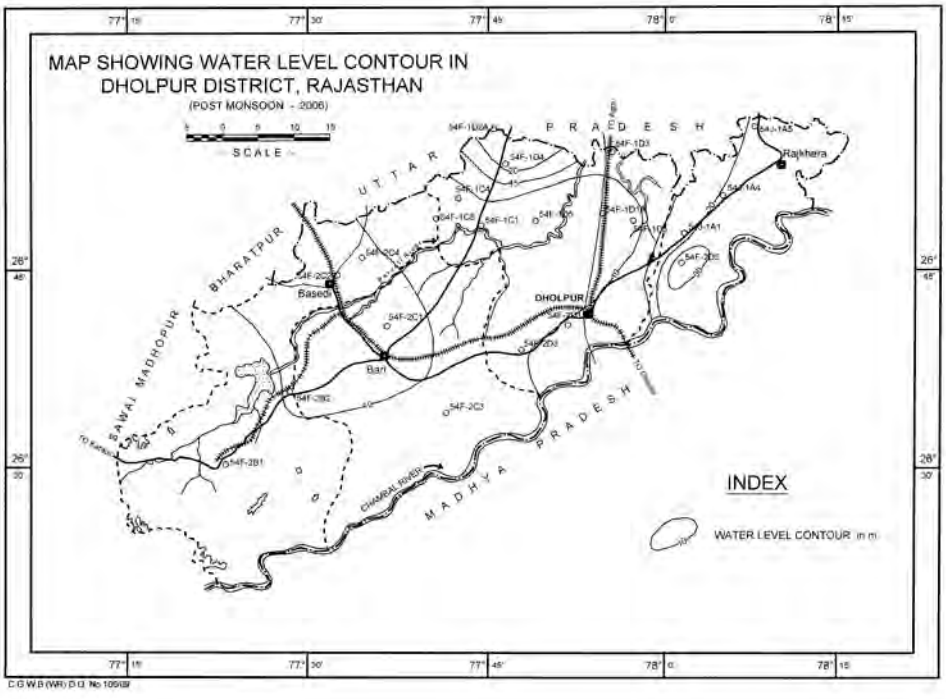
iii. Upper Bhander sandstone

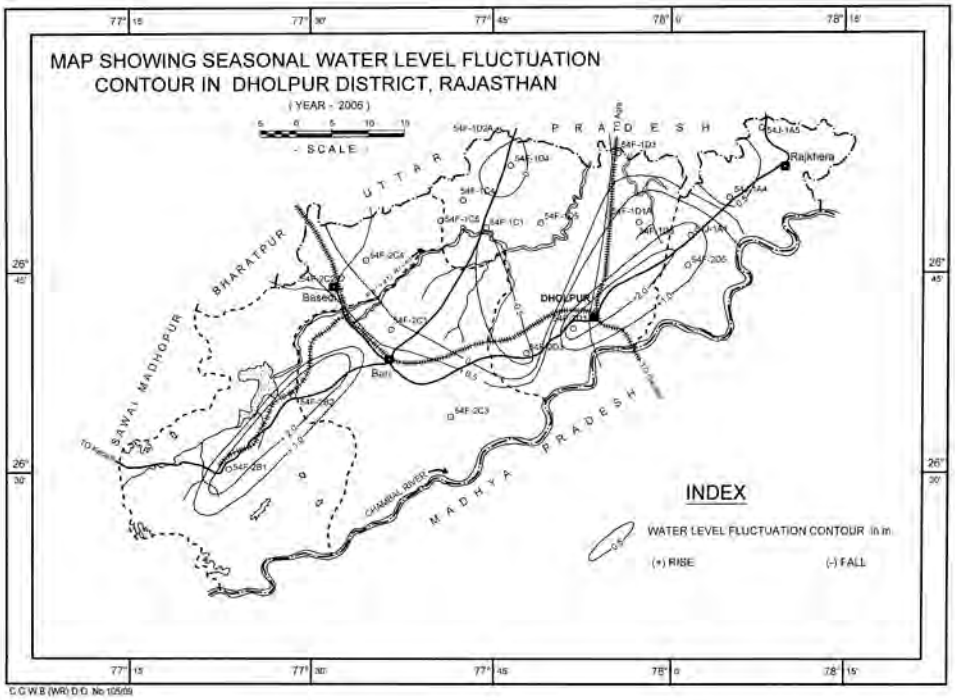
Upper Bhander sandstone occurring in the central, southern and western part of the district is the second important hydrogeological formation in the district and in the areal coverage it is next to alluvium. Ground water occurs under water table condition. Sandstone is very hard compact, fine grained, devoid of secondary porosity and very much resistant to weathering and as such water holding capacity of sandstone is very poor. In general, the yield of wells tapping this aquifer is very poor, however, good yielding wells has been observed, where extent and spacing of joints and fractures are more. The yield of wells tapping sandstone ranges from 15 to 150 m^3/day and recuperation is markedly slow.

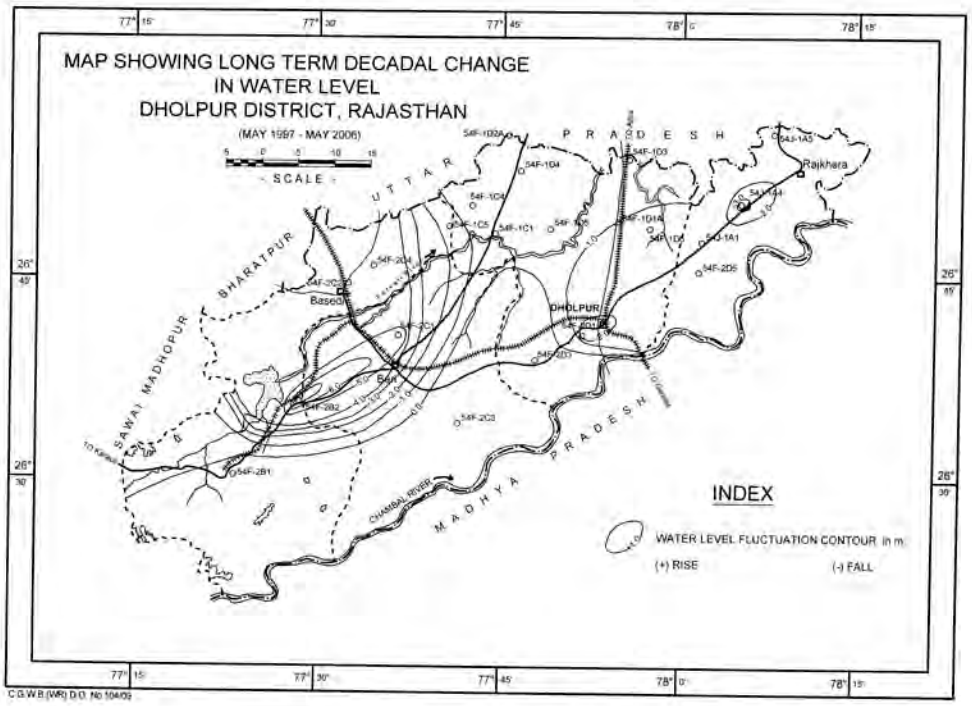
iv. Alluvium

Alluvium is the most important hydrogeological formation in the district and it covers maximum area. The ground water occurs under unconfined condition. In the district mainly sandy clay, silty clay, sand and gravel type of aquifers has been observed. In some of the area clay with kankar also forms aquifers, which are generally very poor aquifers. Whenever, the aquifers contains mainly sand / sand and gravel, it become the potential aquifer and yield from open wells ranges from 200 to 800 m^3/day and discharge from tube wells as high as 726 lpm (Piphera) and 632 lpm (Rajakhera). The open wells tapping clay and kankar as aquifer have poorest yield, the recuperation is also slow in these wells. The intermediate yields are obtained from the aquifer comprised of silty clay and sandy clay.


MAP SHOWING WATER LEVEL CONTOUR IN
DHOLPUR DISTRICT, RAJASTHAN
(PRE MONSOON - 2006)
SCALE
U T T A R
P R A D E S H
BHARATPUR
SAWAI MADHOPUR
M A D H Y A
P R A D E S H
Rajkhera
Baseri
DHOLPUR
Bari
CHAMBAL RIVER
INDEX
WATER LEVEL CONTOUR in m


MAP SHOWING WATER LEVEL CONTOUR IN
DHOLPUR DISTRICT, RAJASTHAN
(POST MONSOON - 2006)
SCALE
U T T A R
P R A D E S H
BHARATPUR
SAWAI MADHOPUR
M A D H Y A
P R A D E S H
Rajkhera
Baseri
DHOLPUR
Bari
CHAMBAL RIVER
INDEX
WATER LEVEL CONTOUR in m


MAP SHOWING SEASONAL WATER LEVEL FLUCTUATION
CONTOUR IN DHOLPUR DISTRICT, RAJASTHAN
(YEAR - 2006)
- SCALE -
U T T A R P R A D E S H
BHARATPUR
SAWAI MADHOPUR
M A D H Y A P R A D E S H
CHAMBAL RIVER
Rajkhera
Baseri
Bari
DHOLPUR
INDEX
WATER LEVEL FLUCTUATION CONTOUR in m
(+) RISE
(-) FALL
C.G.W.B (WR) D.O. No 105/09


MAP SHOWING LONG TERM DECADAL CHANGE
IN WATER LEVEL
DHOLPUR DISTRICT, RAJASTHAN
(MAY 1997 - MAY 2006)
- SCALE -
U T T A R P R A D E S H
BHARATPUR
SAWAI MADHOPUR
M A D H Y A P R A D E S H
CHAMBAL RIVER
Rajkhera
Baseri
Bari
DHOLPUR
INDEX
WATER LEVEL FLUCTUATION CONTOUR in m
(+) RISE
(-) FALL
C.G.W.B (WR) D.O. No 104/09

The status of ground water exploration as on 31.03.2007 is given below:

Type of borehole	Formation		
	Alluvium	Hard rock	Total
EW	4	1	5
OW	5	-	5
SH	4	-	4
PZ	11	-	11

All the bore holes have been drilled in alluvium formation except one drilled in hard rock. The data of the bore holes indicate that depth of the wells is the alluvium generally ranges from 22 m (Dholpur piezometers) to 122 m (Farakpur piezometer). Discharge of wells generally ranges from less than 100 lpm to 700 lpm with a draw down range of 0.37 to 11.41 m. the transmissivity of aquifer ranges from 11.9 m^2/day to 277 m2/day and storativity ranges from 1.8 x 10-1 to 3.8 x 10-2. The ground water exploration in hard rock area of Vindhyan sandstone and shale has been taken in year 2004-05 with contractual rig. Only one well drilled at Pichgaon with 159 m depth and found to be unproductive.

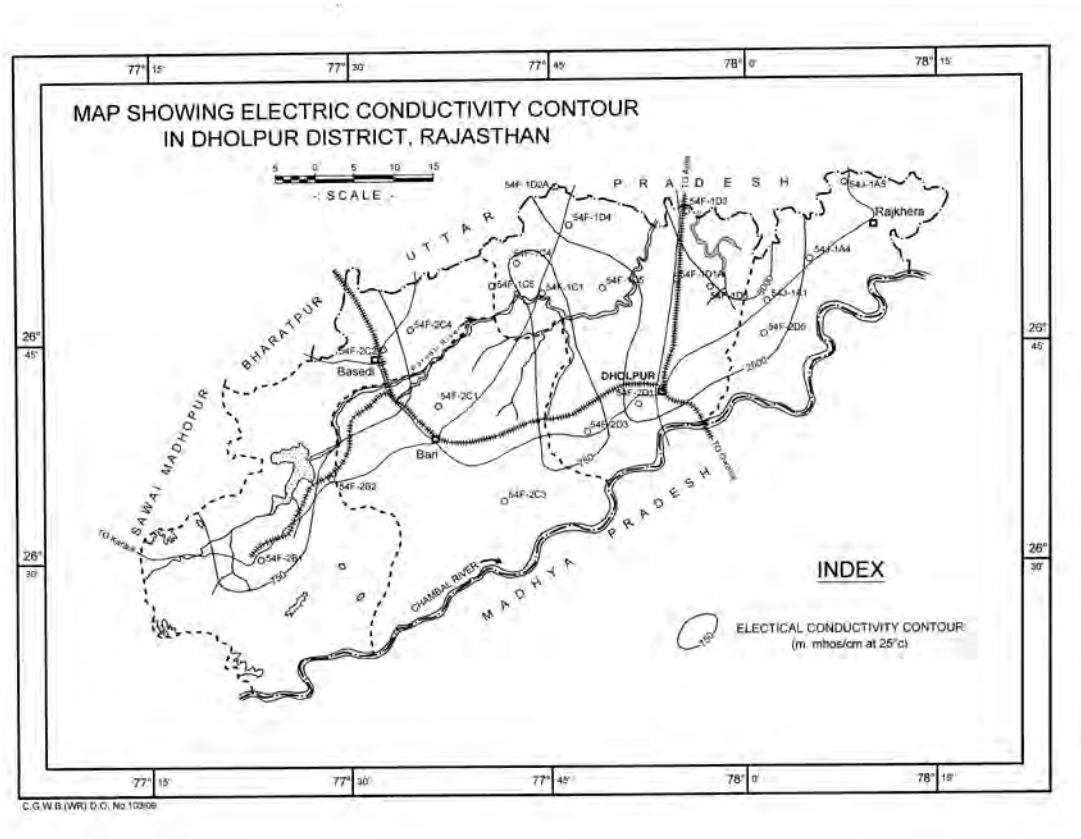
6. CHEMICAL QUALITY

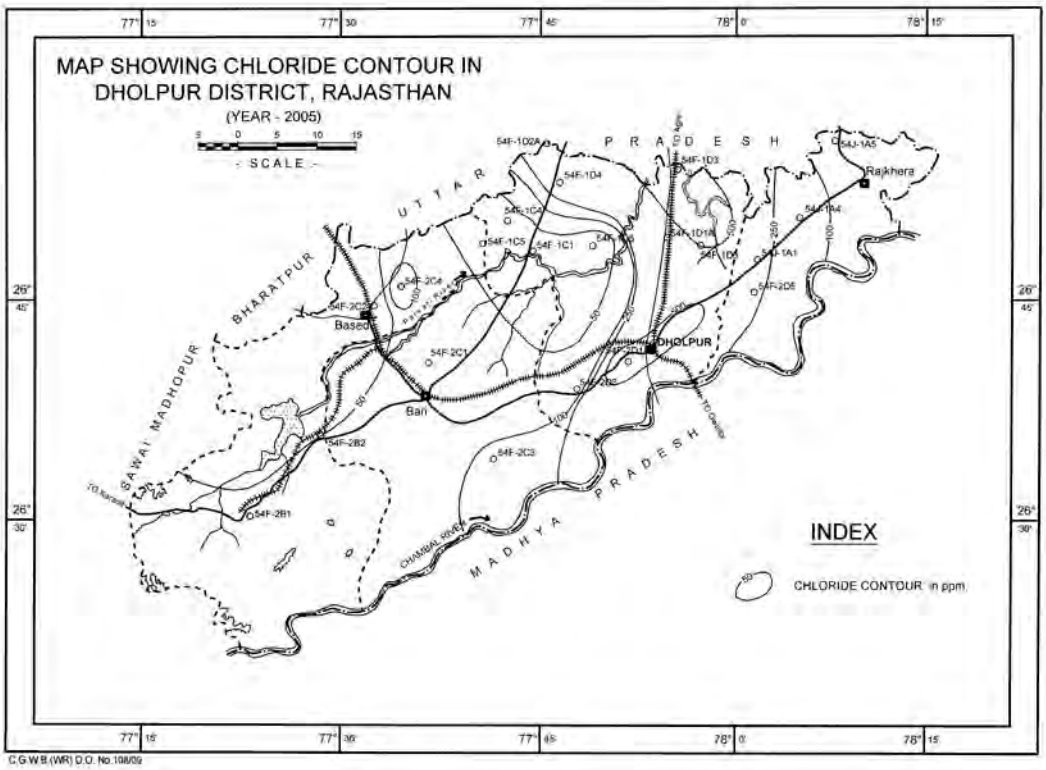
Shallow aquifer ground water quality has been studied on the basis of National hydrograph station water samples chemical analysis. The range of chemical constituent is given below:

Chemical constituent	Range
pH	7.96 – 9.18
EC in micro mhos / Cm at 25°C	390 – 7440 in general below 2000 micro mhos / Cm at 25° except few patches where it rises more than 3000 micro mhos / Cm at 25°
Carbonate CO_3 in ppm	0 – 96

Bicarbonate HCO_3 in ppm	171 – 1086
Chloride Cl in ppm	14 – 1953
Sulphate SO_4 in ppm	4 – 1017
Nitrate NO_3 in ppm	3.5 – 242
Phosphate PO_4 in ppm	0.05 – 1.21
TH as $CaCO_3$ in ppm	130 – 1520
Fluoride in mg / lit.	0.3 – 3.7 in general below 1.5 mg/lit permissible limit for drinking water
Iron in mg/lit.	0.03 – 8.27

In general quality is good for drinking, irrigation and industrial use in the shallow water. In general the deeper aquifer also shows that quality is good except at localized places and there is little change in the quality of ground water with depth.





7. GROUND WATER RESOURCES

In accordance to GEC, 97 ground water resources assessed as on 2004. The assessment table showing the general details of ground water resources of the Dhlopur district is given as table.

The view of this table shows that the Bari Block having sandstone and alluvium as aquifer units covering an area of about 816.2 km^2 out of which 513.42 km^2 is considered as potential area zone.

Net annual ground water availability: 48.6377 MCM and net annual ground water draft is 35.7255 MCM. The stage of ground water development is 73.45% and block is categorized safe.

The Baseri block having alluvium and sandstone as aquifer unit covering an area of 1001.42 sq. km out of which 558.91 km^2 is considered as potential area zone. The net annual ground water availability is 59.0479 MCM and net annual ground water draft is 54.8953 MCM and stage of ground water development is 92.97%. The block has been categorized as critical.

The Dholpur block having alluvium and sandstone as aquifer unit covering an area of 609.32 km^2, out of which 488.85 km2 considered potential area zone. Th net annual ground water availability is 59.9034 MCM and net annual ground water draft is 80.6098 MCM. The stage of ground water development is 134.57%. The block has been categorized over exploited.

The Rajakhera block, the hydrogeological formation in older alluvium comprising clay, ‘kankar’ and sand, covers an area of 582.07 sq.km out of which 488.72 sq.km in considered potential zone. The net annual ground water availability is 57.65 MCM and net annual ground water draft is 68.7903. The stage of ground water development is 119.32%. The block is categorized over exploited.

8. GROUND WATER DEVELOPMENT AND STRATEGY

The over all stage of ground water development in the district is 106.56% (over exploited) with two blocks viz., Dholpur and Rajakhera being over exploited with stage of ground water development 134.57% and 119.32% respectively and Baseri block being critical (92.97% ground water development) and only block Bari (73.75% ground water development is safe).

As it is clear that alluvial aquifer is the main aquifer in the Dholpur district and ground water extraction is also maximum from this aquifer by dug wells, dug cum bore wells and tube wells. The study the water level data and hydrographs of the National Hydrograph Stations monitored by CGWB

indicate a declining trend and ground water resources assessment also shows that this area is over exploited.

It is recommended that increasing number of ground water structures should not be encouraged and artificial ground water recharge schemes like check dams, bunds, annecuts etc., should be constructed at appropriate hydrogeological location. Surface water reservoir should be constructed like ponds, talaos etc., which serve dual purpose of supply of water during lean period and recharge to the ground water body. Also water shed development projects and soil conservation project should be encouraged.

Sandstone is the next important aquifer in the Dholpur district. The extraction of ground water in this aquifer is by large dia dug wells and dug cum bore wells and tube wells. The draft is mainly for agriculture, which is more than 80% of the total draft in most of the area. The stage of ground water development in this aquifer varies from 57.71 to 120.94%. As this aquifer is hard rock aquifer the ground water storage capacity is very less hence during summer season, dug wells either goes dry or yield very poor. Hence, it is recommended that deepening of the dug wells, enough to have good storage during pumping and don't go dry during lean period can be safe guarded. Also the number of ground water structure in Bari block may be increased.

9. RECOMMENDATIONS

1. Ground water exploration has been carried out only in alluvium aquifer areas except one bore hole in hard rock area; hence, ground water exploration should be given priority in hard rock area.

2. Large diameter (5-8 m) dug wells should be constructed in hard rock area with sufficient depth 30-40 m bgl as to have good storage during pumping and also during the lean period. Horizontal bring can be done

in sandstone is large dia dug wells in the deciphered fracture direction to increase the yield of the wells.

3. Although among the four blocks, two blocks Dholpur and Rajakhera are over exploited and third Baseri is critical and only block Barti is safe. These conditions restrict the future ground water development in the Dholpur block. However, areas showing potential aquifer should be developed with care full monitoring of water level by increasing the monitoring stations.

Also it is recommended that artificial ground water recharge schemes like check dams, bunds, annicuts etc. should be constructed at proper hydrogeological locations so that these structures serve the dual purpose of storage of surface water and supply of water during lean period and recharge the ground water body. Also ground water structure number may be increased in Bari block.

Lift irrigation projects and on going construction of dams, annicut should be speeded up particularly Chambal / Dholpur lift irrigation scheme and surface water reservoir project, which will irrigate the large area reducing the ground water draft and increasing the ground water recharge.

4. Irrigation draft in the Dholpur district should be reduced by the use of Sprinkler system / drip irrigation system and use of low water consuming crops.

5. The Quality, of ground water in most part of the district is good for irrigation and domestic / drinking purpose except at few places where fluoride problems needs to looked by either supply from different source in the nearby areas or it not possible the defluoridisation plant should be established.