DISTRICT GROUND WATER INFORMATION BOOKLET

UMARIYA DISTRICT DISTRICT

MADHYA PRADESH

Ministry of Water Resources

Central Ground Water Board

North Central Region

Government of India

BHOPAL

2013

UMARIYA DISTRICT AT A GLANCE

S.No	ITEMS	STATISTICS
1	General Information	
	i) Geographical Area (Sq.Km)	4503
	ii) Administrative Divisions Number of Tehsil / Block Number of Villages	 2/3 660
	iii) Population	643579
	iv) Normal Rainfall (mm)	1242.8
2	**GEOMORPHOLOGY**	
	Major Physiographic Units	1Nortern Valley area 2Central-Plateau area 3 SouthernHilly area
	Major Drainage	1 Son River 2 Johila River 3 Chhoti-Mahanadi River
3	**Land Use (Sq. Km.)** i) Forest area : ii) Net sown area : iii) Gross cropped area :	 765 1604 1941
4	**Major Soil Types**	1 Lateritic Soils 2 Clayey Soils 3 Loamy Soils
5	**Principle crops (2013)**	Paddy,Maize,Wheat, Mustured, Gram and Arhar
6	**IRRIGATION BY DIFFERENT SOURCES**	
	Structures	**No Area (Sq. Km.)**
	Dug wells Tube wells/ Bore wells Tanks/ ponds Canals Other Sources Net Irrigated Area. Gross Irrigated Area	3062 39.41 1002 35.49 205 08.11 027 29.31 3670 82.27 ---- 195.09 ---- 195.49
7	**Number of Ground Water Monitoring Wells of CGWB (As on 31-03-2013)**	
	No. of Dug Wells No. of piezometers	13 02
8	**PREDOMINANT GEOLOGICAL FORMATIONS**	Lower Vindhyan, Archaeans,Gondwana formations, Deccan Traps & Alluvium.
9	**HYDROGEOLOGY**	

	Major water bearing formation (Pre-monsoon DWL during 2012) (post-monsoon DWL during 2012) Long term water level trend in10 yrs (2003-2013) in m/year	Granites, Sand -Stones, Shales, Basalts & Alluvium 3.36-16.77m, bgl 0.37-10.20m, bgl +0.07m/yr (Pre Monsoon) –0.04-.05 m/ yr (Pre Monsoon)
10	**GROUND WATER EXPLORATION BY CGWB (as on 31.03.2013)**	
	No of wells drilled (EW, OW, PZ, SH, Total)	09 EW+ OW nil + 2 PZ= 09
11	**GROUND WATER QUALITY**	
	EC,NO3,F	Ec-35-1140,NO3-0.3-70,F-0.01-0.79
12	**DYNAMIC GROUND WATER RESOURCES (2009) in MCM**	
	Net Ground Water Availability	426.72 MCM
	Annual Ground Water Draft	36.56 MCM
	Projected demand for Domestic and Industrial Uses up to next 25 Years	17.43 MCM
	Stage of Ground Water Development	11 %
!3	**EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING**	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Nil
14	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Notified Blocks	Nil
15	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Depletion of water levels may occur near Coal mines .

1.0 INTRODUCTION

Umaria district is one of the newly formed district of Vindhyan region. Presently district headquarters Umaria was also formerly district head quarters of South - Rewa district of Rewa State till year 1948. The Umaria district is famous for Bandhogarh fort, which was formerly capital of Magha Kingdom, and is place of importance of Archaeological and historical considerations. Bandhogarh is also famous for its National Park having highest density of tigers in reserve forest of Tala. Umaria is a tribual district, where tribal population is 46% of the total population. Umaria district is also full of natural resources. About 53% of the area is covered with forest and it is abundance in mineral resources including coal and clay minerals. Coal based power plant is also located at Pali-Birsinghpur in the district having 840 Mega Watt Power Generation capacity.

Umaria district lies in eastern part of Madhya Pradesh. It is bounded by Satna district in North, Dindori district in South, Shahdol district in ceast and Katni district in West. The district lies between north latitudes 23° 05' and 24° 20' and east longitudes 80° 40' and 81° 17'. Umaria district is falling under Survey of India Toposheets No. 63D/16, 63H/4, 64A 10,11,13,14,15, 15,16 64E 1,2,3,4,6,7 and 8.

It extends for about 100 Kms from North to South and 66 Kms. From East of West. The area of district is 4503 Sq.kms. There are total 591 villages in the district.

District Head Quarters is located at Umaria town, which is also Tehsil Head Quarters Katni - Amarkantak State Highway is passing through the district. Broad-guage Railway line connection Katni - Bilaspur section is running parallel to State Highway. Important town and villages of Umaria district are connected by Pitch roads.

Administrative Divisions

Umaria district has been divided into two Tehsils namely Bandhogarh and Pali and three blocks namely Manpur, Karkeli and Pali for convenience of administrations. The salient features of tehsils/blocks are given in table and administrative map is given in Fig-I

Table: 1 Administrative Divisions, Umaria district (M.P.)

S. No.	Name of Tehsil	Name of Block	Geographical Area (in Sq.kms)
1	Bandhogarh	a) Manpur b) Karkeli	1952 1678
2.	Pali	a) Pali	0873
		Total	4503

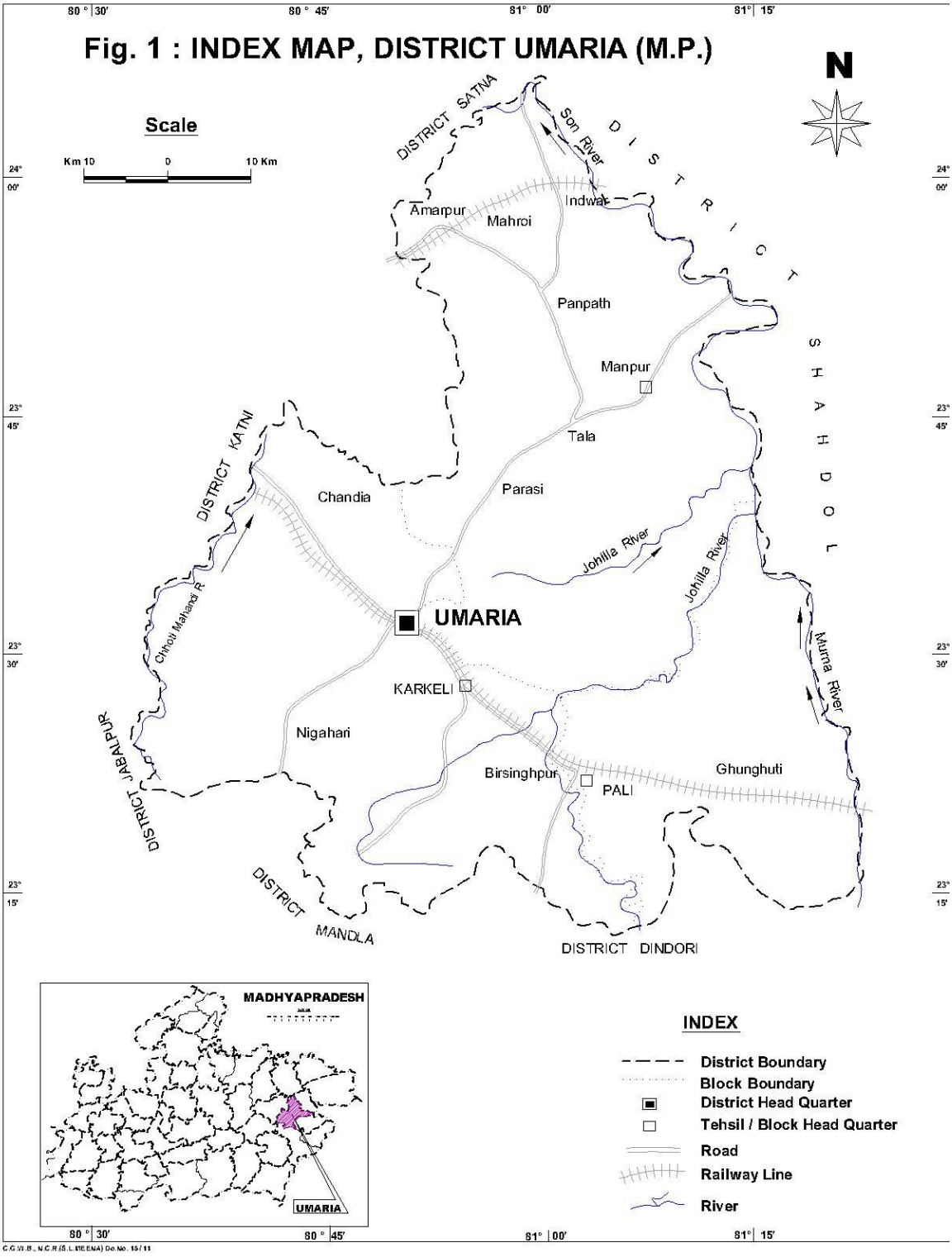


Fig. 1 : INDEX MAP, DISTRICT UMARIA (M.P.)
N
Scale
Km 10 0 10 Km
80 ° 30'
80 ° 45'
81° 00'
81° 15'
24° 00'
23° 45'
23° 30'
23° 15'
DISTRICT SATNA
Son River
D I S T R I C T
Amarpur
Mahroi
Indwar
Panpath
Manpur
S H A H D O L
Tala
DISTRICT KATNI
Chandia
Parasi
Johilla River
Johilla River
Chhoti Mahanadi R.
UMARIA
Murma River
KARKELI
Nigahari
DISTRICT JABALPUR
Birsinghpur
PALI
Ghunghuti
DISTRICT MANDLA
DISTRICT DINDORI
MADHYAPRADESH
UMARIA
INDEX
District Boundary
Block Boundary
District Head Quarter
Tehsil / Block Head Quarter
Road
Railway Line
River

Drainage

The entire Umariya distnct is falling under Son sub basin area of the Ganga basin the main river of the district is the son which flows from south -west to north- east direction and forming district boundary between Shahdol and Umariya district. The Son or Survarna means the gold is one of the biggest tributary of the rivers Ganga, and it is considered as sacred river. The river Son originates from Son kund (22°42°32" : 2°01°10") from Amarkantak plateau, located in Anuppur district of Madhya Pradesh. Rivers Johila and Chhoti Mahanadi are main tributaries of Son river in Umariya district.

The Johila is the most important tributary of the Son in the Umariya district. The Johila also originals from Amarkantak plateau (Maikhal rang) in Anuppur district and flows to north East direction upto Pali and turns to the north until it meets the Son from Pali to confluence point with son river, further in north-east direction covering about 40 kms distance.

The Chhoti Mahanadi is also important tributary of the river Son and it is forming western boundary between Umariya and Katni districts and it merges with son on northern part of the district. Chhoti Mahanadi originates from Tordara (761 m above mean sea level) from Satpura hills of Dindori district. Important tributary of Chhoti-Mahanadi river in Umariya district is Umrar river which drain north central part of the area, and flows in north west direction and joins Chhoti Mahanadi river near village Pipariya-kalan in Katni district.

Irrigation

Analysis of the irrigation details of the district reveals that irrigation facilities in the district are minimum. Only about 4% of the total is area of the district is coming under irrigation facility and rest of the area is un-irrigated. Ground water is next main source of irrigation in Umaria district, after Irrigation from other sources (Lift Irrigation and Irrigation from Ponds/ Tanks etc). Dugwells are the main ground water structures used for irrigation purpose.. There were 3062 open wells for irrigation in the district and density of wells was 0.7 wells per sq.kms area. Other structure for irrigation from ground water reservoir are tubewells. Total 1002 tube were recorded in the district during year 2006 and density of tubewells is 0.22 tubewell per sq.km area.Canal irrigation in the district is minimum and reported area from canal irrigation was 2931 hectares which is about 15 % of total irrigation of the districts. Total 205 ponds were also in use for irrigation in the district and area irrigated from them is reported 811 hecates, which is about 4 % of the irrigation of the district. Irrigation from other sources, which includes lift irrigation was 8225 hectares which accounts for 42 % of the total irrigation in the district.

CGWB Activities:

Systematic Hydrogeological Surveys of the area was carried out by Shri M.V. Gopal and Shri I. Javed Ali, Asstt. Hydrogelogists during year 1987-1988.CGWB had taken up exploratory drilling programme in the district during year 1993-1997 and wells were constructed using Rotary Rigs. CGWB had also drilled 3 piezometers in the district during year 1998.

2.00 CLIMATE AND RAINFALL

Climate

The Climate of this district is characterized by a hot summer and general dryness, except during southwest monsoon season. The year may be 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 June to September is the southwest monsoon season. October and November from the post monsoon or transition period. There is only one IMD meteorological observatory located at district headquarters Umaria. Meteorological data of this observatory has been used for analysis.

Rainfall

The average annual rainfall of Umaria district is about 1248.8 mm. The maximum rainfall takes place during the south-west monsoon period i.e. from June to September. The August month is the wettest month of the year and about 30% of the annual rainfall takes place only during this month. During winter & summer season about 10% & 3% of respectively rainfall takes place. From October to May, only 13% of the annual rainfall takes place..

3.0 GEOMORPHOLOGY AND SOIL TYPES

Geomorphology:

Physiographically, structural land forms represented by plateau, hills and valleys have developed in central, southern and north eastern part of the district.

The southern part of this district is represented by hilly terrain, which is northern part of Amarkantak hills extending in East-west direction. The highest elevation of the district is located on southern boundary of the district near village Singhpur having an elevation of 980 m above mean sea level, comprising of basaltic rocks. Other prominent hills are also located on southern and south western part near villages Mangthar, Manri and Surajpura having elevation 856 m, 678 m and 760 above mean sea level respectively. The elevation of the district 355 m above mean see level is located near village Darbai (10°59'-24^{0}04') near the junction of river son and with Chhoti Mahanadi.

The northern part of the district in Manpur block area there is prominent valley which, almost originates from the Achaean hills and extends north wards.

The physiographic features developed in the area bounded between Johilla river in the east and Chhoti Mahanadi in the west are hilly and undulating plains which attains the maximum elevation of 842 m (approximately) above mean level (Donadi hill) near village Aganhuri (23°28°15' : 80°50'30", 46/A15) and minimum elevation of above 362 m above mean sea level neer Jogia (23°42'50: 80°41'45,64A/15).

In central part of the district prominent hill range is Bondhogarh - Shahagur range which extends North-East from western boundary of Bandhogarh tehsil, marks the old historical fort extends across the son at Kursaria and towers the conference of the Son River with Sandin nala. This hill range is consisting of Gondwana Sedimentary formations and it riser to 779 m above mean sea level.

Slopes of southern hill range is between 1:50 to 1:100, while it is 1:100 to 1:200 for Bandhogarh hill range.

Soils :

The Umaria district is covered by various rock types viz Basaltic, Sedimentary and Grainitic terrains. Soil is also depending upon lithology of the area.

As per classification of National Bureau of soil survey and land use planning, Nagpur, soils of the area have been described in following groups, while same are given in table –3 and Soil map of the district is presented in Plate No – II

Table: 3 Description of soils of Umaria district (M.P.)

Soil Type	Description	Soil Taxonomy
(A) Soils of Late rite Terrain	1) Soils of Undulating Land	Slightly deep-to-deep, well-drained loamy skeleton to loamy soils with moderate erosion.
(B) Soils of Basaltic Rocks	1) Soils of Hills and Hill Ranges:	Very thin Stony with severe erosion
	2) Soils of undulating Plateau:	Deep, moderately well drained clayey soils on gently slopping plateau with moderate erosion.
(C) Soils of Sedimentary Rocks (Gondwanas)	1) Soils of Hills and Ridges:	Very Shallow, excessively drained, loamy skeleton soils on moderately to steep sloping hills with severe erosion.
	2) Soils of Dissected Plateau:	Deep well drained loamy soils with moderate erosion.
	3)Soils of undulating plateau and plains:	Deep, moderately well drained clayey to loamy soils on gently slopping plateau with moderate erosion.
	4) Soils of undulating plateau:	Deep, moderately well drained clayey soils on foothills slopes with moderate erosion.

4.0 GROUND WATER SCENARIO

Hydrogeology:

The main source of ground water recharge in Umariya district is rainfall. The major part of the district is underlain by Gondwana sedimentary formations, which are potential aquifers in the area. the other geological formation occurring in the districts are Archaeans lower vindhyans. Granular zones govern occurrence and movement of ground water in semi consolidated Gondwana formations. Within these formations and impervious horizons like coal seams trapped in between this rock occurrence and movement of ground water in Hard rocks is essentially by development and nature of secondary joints and fractures while priming vesicular in basalt also plays on important role. Ground water in general in hard rocks areas occurs under unconfined to semi confined conditions while in Gondwana rocks it is also found under confined conditions.

The occurrence and movement of ground water in different lithological units is briefly described in the following paragraphs.

Granitic gneiss (Archaeans)

These are unclassified crystalline hard rocks of Archaeans group which form the basement rock in the district. They yield water through fractures, joints and secondary porosity developed in the weathered thickness of the weathered overlying the massive rock. The open well that exist in these formations range depth from 8 to 12 m bgl generally the column of water available during pre monsoon period varies between 2m to 4m.

Bijawar Series

This consists of Phytllite, quartzite, dolomite, limestone etc representing meta sediments and these are moderately weathered and jointed. Weathering in quartzites is reported as high as 10m in Bamhangaon. That village in Manpur block ground water occurs in secondary fracture portion of these rocks. Yield of dug wells is reported between 400 to 40000 liter per day. The wells during summer i.e in pre monsoon water level in wells is as deep as 12m.

Lower Vindhyans

Semri series of rocks represent lower vindhyan. They also support development of ground water through open wells. Porcellanite shales one quite disintegrated (about 15 m thick). Due to disintegrated shale layer and its stratification, some percentage of precipitation is allowed to percolate downward and move along bedding planes and water gets pooled up in weathered /disintegrated crushed zones, along the contact planes. In Manpur blocks, where semri series of rocks (Porcellanite & shales) are exposed in northern part, semi weathered yellowish shale forms poor to moderate yielding aquifers, in the area. the dug wells in vindhyan aquifers range in depth range from 16.00-20 mbgl. The depth to water level in the wells during pre monsoon ranges between 4.80 to 15.00 mbgl.

Gondwanas

The Gondwana group of rocks, that less coal deposit, is a potential aquifers in the district. The fieldspathic medium to coarse grained sandstone, bears ground water in the inter connected primary pores in the formation as well as the contact planes between shales and

sandstone, coal seams in Barakar sandstone act as confining layers and at places they give rise over flowing conditions while negotiating under laying aquifers below coal seams. Ground water is also met along with the coal in almost all coal fields in the district. Ground water occurs in both unconfined and confined conditions in the Gondwana formation of the district. Due to excessive pumpage of ground water from under coal mines, lowering of water levels in the phreatic ground water regime overlying the coal field layers is reported. Gondawan formation particularly the upper part of Baracker sandstone supports development of phreatic aquifers, which extends from few meter below ground level to 25 m below land surface Gondwana formation is providing sufficient moisture content to vegetation resulting in thick presets in the area, specially observed in Bandogarh area. the fluctuation in ground water level is between 3-5 m. The ground water mover over a gradient of 1 in 220 laterally then moves down wards from phreatic aquifers. Into the deeper section upto the coal seams.

Lametas :

These are sedimentary deposits resting over Gondwana formations generally these are compact and impervious rocks (siliceous limestone). However at places the nodular limestone and poorly consolidated sandstone have allowed the development of ground water in confined and confined conditions.

The Karkali blocks area lametas are occupying hilly and thickly forested areas and in these area density of population and habitants is quite low. However there are quite a few number of dug wells that are used for drinking purposes by tribal populations. It is noticed that about 80% of dug wells one within the depth range of 8 m to 16 m bgl having diameter from 3 m to 4 m. The pre monsoon depth to water level goes as deep as 17 m to 20 m (Tendua 23^0 43' : 80^0 45' and Pondi 23^0 18' : 80^0 17' villages in Karkali blocks). The yield of the well is between 50000 liters per day (Pinoura 23^0 21' 00" : 80^0 56' 30") to 75000 liter per day (Jarha 23^0 24' 00" : 80^0 49' 15").

Deccan Traps :

These are basaltic lava flows forming hill ranges in the district. Basaltic rocks occurring in valley section and pediplains are weathered. Because of jointing and fracturing in basalts, development of secondary porosity in such area. however yield is limited in this rock unit and vary from place to place depending on thickness of weathered mantle, and degree of jointing and fracturing.

The wells in the basaltic flows of deccan traps vary in depth between the range of 6-9 mbgl with a diameter of 2 m to 3 m most of wells go dry during summer. The yield varies between pre monsoon and post monsoon from 70000 liters per day to 13,00,00 liters per day.

Alluvium :

There are two kinds of alluvium in the district, the younger alluvium and river banks Machhrar, Jahila, joner, umrar, chkoti Mahanadi and son rivers. This younger alluvium consist of silt clays associated with pebbles and gravels.

The older alluvium generally occupies the faulted through. In Karkeli blocks there is a vast alluvial plain between Pararia nala and Ghor, Chhatra river with a thickness of about 30m. this alluvial fill is in the faulted through created between Gondwanas and Lametas.

The alder alluvium yield moderately good quantity of water from dug wells (900 kilo litre per day) and these wells are also used for irrigation purposes in the area.

Well Design

Central Ground Water Board, had drilled 7 exploratory wells in the district at Panapatha, Manpur, Kaudiya, Salaiya, Karkali, Pali , Ghunghatti and Majhgawan. Semi consolidated Gondwana formations were negotiated using Rotary Rigs for proper design of wells and to achieve full life well assembly of varying length from 119 m to 245 m was lowered in the exploratory wells drilled in the area. Diameter of well assembly lowered in these well vary from 4" (at Panpatha) to 8" (at Ghughtti) slot size recommended in well assembly were between 1/8" to 1/16" gravel size recommended for these wells here 3/8", 3/16", 5/16" depending on hydrogeological situations encountered in well sites. Cement sealing was also down between depth 55 m to 49 m at Panpatha between 42 m to 34 m at Majhgawan and between 150 m to 140m at Ghunghutti.

Aquifers Parameters

Aquifers parameters of different exploratory wells were obtained by conducting long duration pumping tests and analysis of its data yield of exploratory wells varies from 80 liter per minute at Kandiya, Salaiya SWL of exploratory wells ranges. From 0.50 agl (over flowing) at Majhagawan to 24.59 mbgl at Pali Draw down recorded during pumping test was between 11.24 at Manpur to 52-25 m at Panpatha. Transmissivity of Ghunghutti well was calculated as 16.95 m^3/day and coefficient of storage was $1.42x10^{-4}$. hydrogeological details of exploratory wells drilled in Umariya district is given below in table : 4

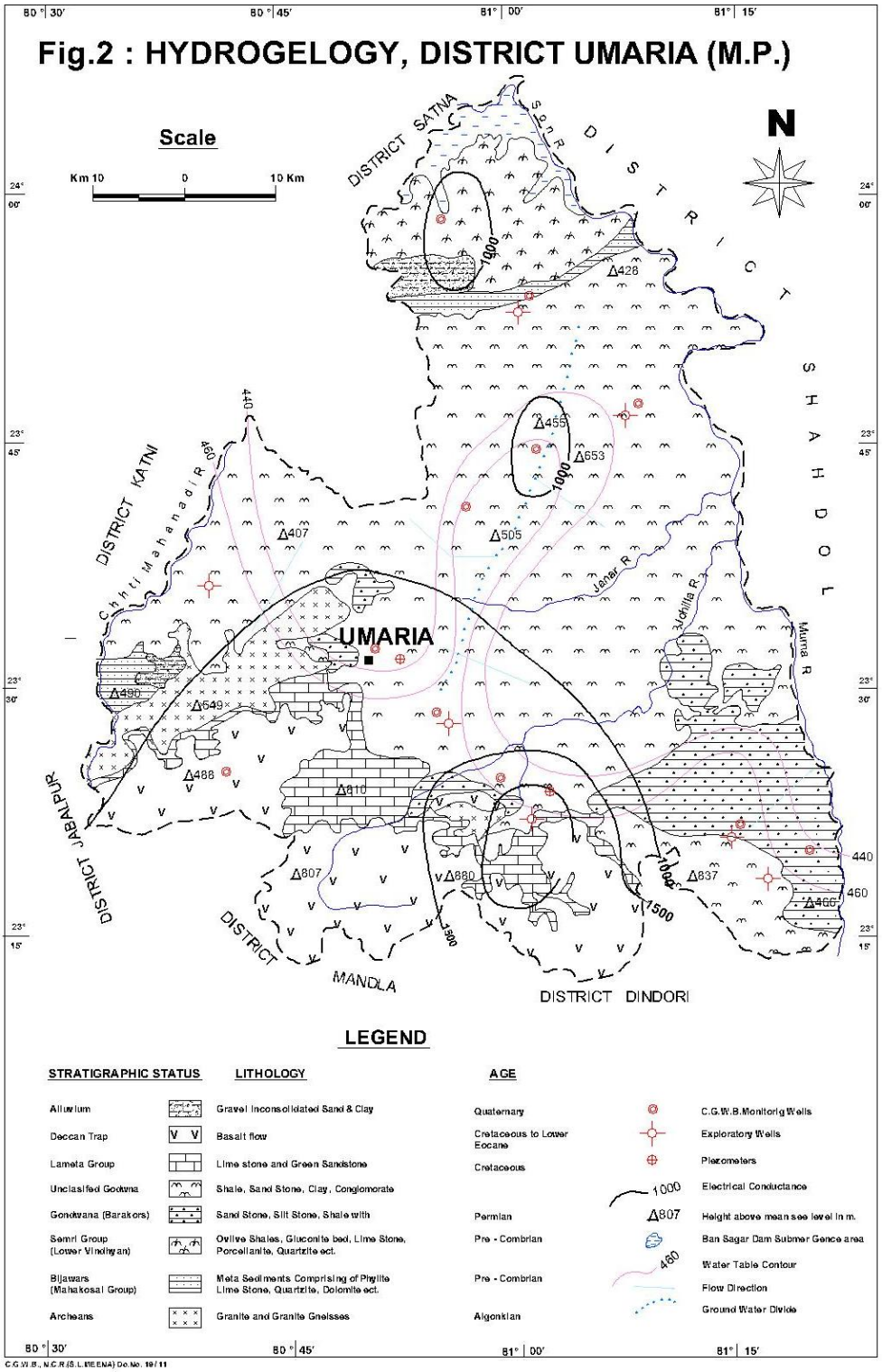


Fig.2 : HYDROGEOLOGY, DISTRICT UMARIA (M.P.)
Scale
Km 10 0 10 Km
N
80° 30'
80° 45'
81° 00'
81° 15'
24° 00'
23° 45'
23° 30'
23° 15'
DISTRICT SATNA
Sone R
DISTRICT SHAHDOL
DISTRICT KATNI
Chhoti Mahanadi R
Jonar R
Johilla R
Muma R
UMARIA
DISTRICT JABALPUR
DISTRICT MANDLA
DISTRICT DINDORI
Δ428
Δ455
Δ653
Δ407
Δ505
Δ490
Δ649
Δ488
Δ810
Δ807
Δ880
Δ837
Δ466
1000
1500
440
460
480
LEGEND
STRATIGRAPHIC STATUS
LITHOLOGY
AGE
Alluvium
Gravel Inconsolidated Sand & Clay
Quaternary
Deccan Trap
Basalt flow
Cretaceous to Lower Eocene
Lameta Group
Lime stone and Green Sandstone
Cretaceous
Unclasified Gondwna
Shale, Sand Stone, Clay, Conglomerate
Gondwana (Barakors)
Sand Stone, Silt Stone, Shale with
Permian
Semri Group (Lower Vindhyan)
Ovlive Shales, Gluconite bed, Lime Stone, Porcellanite, Quartzite ect.
Pre - Combrian
Bijawars (Mahakosal Group)
Meta Sediments Comprising of Phyllite Lime Stone, Quartzite, Dolomite ect.
Pre - Combrian
Archeans
Granite and Granite Gneisses
Algonkian
C.G.W.B.Monitorig Wells
Exploratory Wells
Piezometers
1000 Electrical Conductance
Δ807 Height above mean see level in m.
Ban Sagar Dam Submer Gence area
480 Water Table Contour
Flow Direction
Ground Water Divide
C.G.W.B., N.C.R.(S.L.MEENA) Dc.No. 19/11

Table: 4 HYDROGEOLOGICAL DATA OF EXPLORATORY WELLS

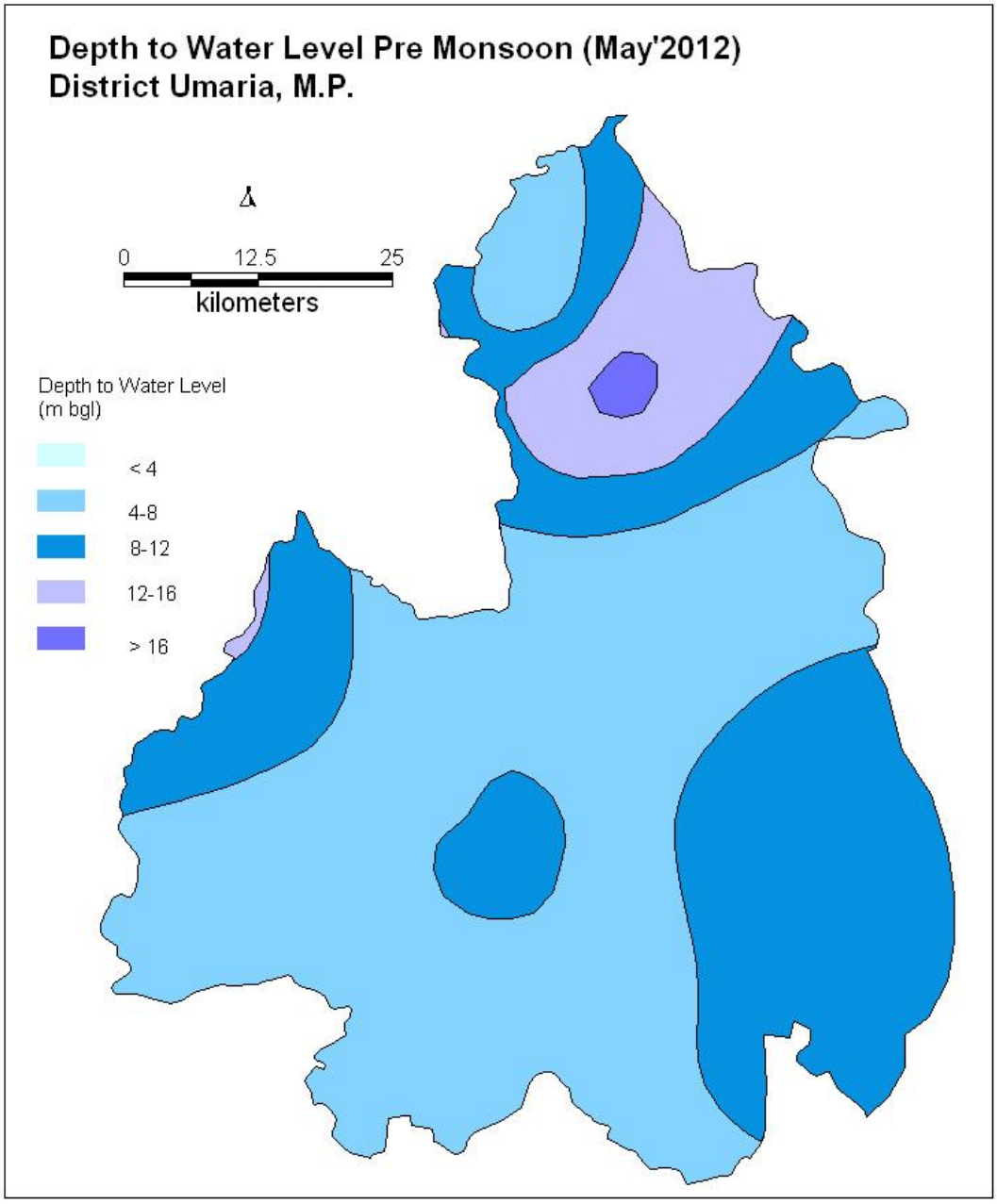
S. No.	Location	Year of Exploratory	Well Completion depth (m)	Aquifer zones (m)		SWL (m) bgl	Yield (L.P.M.)	Draw down (m)	Transmissivity (m^2/day)	Storage coefficient (s)	EC in micro mhos/cm at 25^0 C.
1.	Panpatha	1996-97	155.00	90.00	100.00	0.43	128	52.25	-	-	493
				104.00	107.00						
				112.00	117.00						
				121.00	127.00						
				135.00	155.00						
	Manpur	1994-95	171.00	60.00	69.00	4.43	114	11.24	-	-	327
				73.00	79.00						
				76.00	102.00						
				114.00	126.00						
3.	Kaudiya-Salaiya	1995-96	105.00	140.00	152.00	3.70	2340	14.00	-	-	520
				40.00	49.00						
				52.00	58.00						
				88.00	91.00						
				97.00	103.00						
4.	Karkehi	1994-95	200.00	45.00	55.00	7.99	224	19.86	-	-	703
				81.00	97.00						
				114.00	120.00						
				137.00	148.00						
				163.00	200.00						
5.	Pali	1994-95	119.00	56.00	62.00	24.59	306	33.94	-	-	813
				70.00	76.00						
				87.00	93.00						
				105.00	117.00						
6.	Ghunghutti	1994-95	236.00	80.00	102.00	0.48	180	28.67	16.95	$1.42x10^{-4}$	104
				120.00	128.00						
				171.00	187.00						
				195.00	213.00						
				218.00	234.00						
7.	Majhagawan	1995	245.00	113.00	119.00	0.50	80	35.00	-	-	808
				131.00	143.00						
				156.00	162.00						
				197.00	179.00						
				229.00	242.00						

Water levels

The Central Ground Water Board has been carrying out water level monitoring of National Hydrograph Stations (NHS) since year 1979 in the district. Water levels of these hydrograph stations are being monitored four times in a year viz. during the month of January, May, August and November presently there are 15 Hydrograph Stations in the district. A Hydrogeological map (Fig.-2) of Umariya has been prepared on the basis of data available with Central Ground Water Board, to study ground water regime of the area. Water level data of national hydrograph stations have been used and Per-Monsoon & Post-Monsoon water Level Maps have been Compiled. The behavior of water level is as follows.

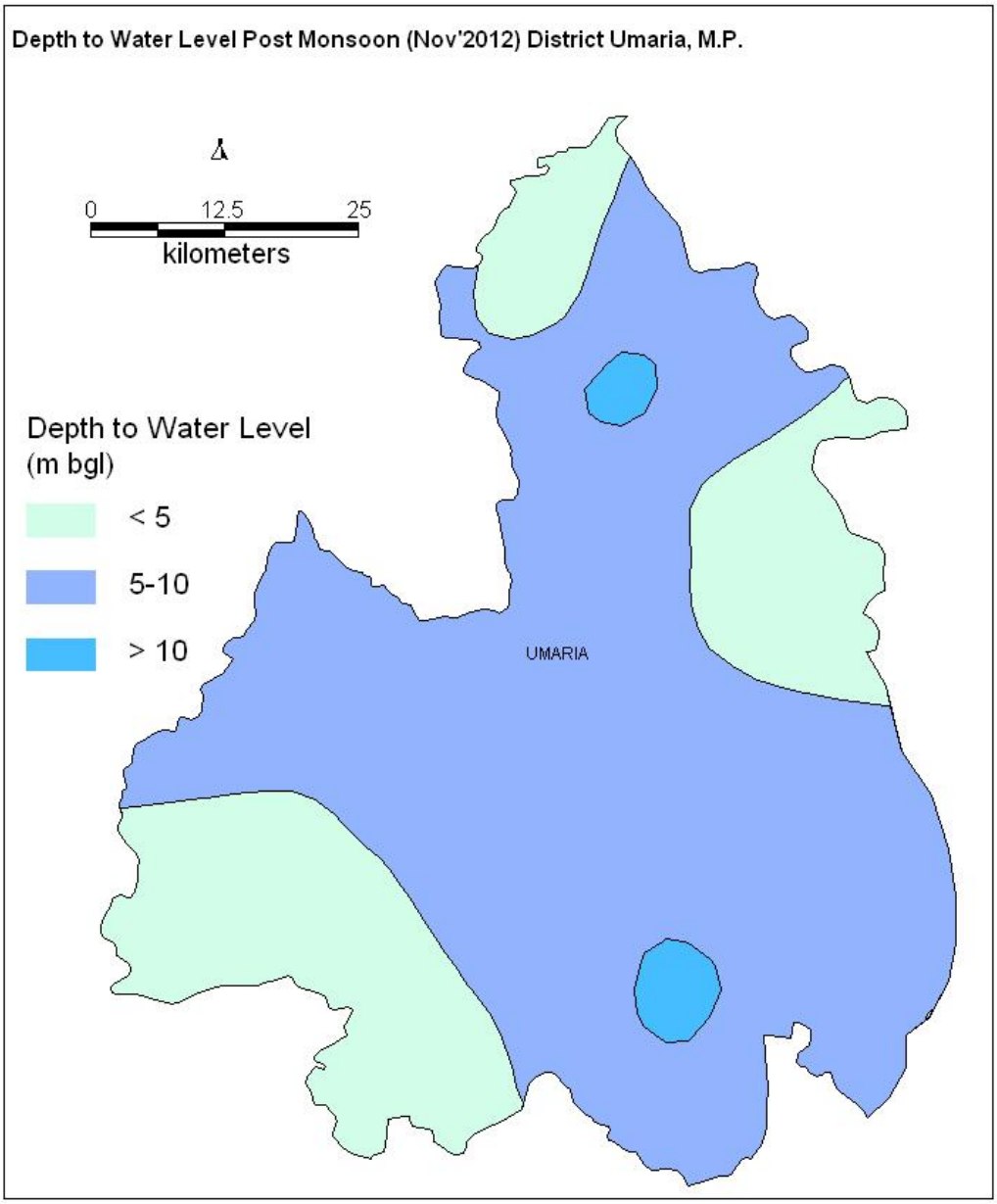
(A) Pre-Monsoon depth to water level (May 2012,)

In general depth of water level in the area ranges from 3.36-16.77 mbgl


Depth to Water Level Pre Monsoon (May'2012)
District Umaria, M.P.
0
12.5
25
kilometers
Depth to Water Level
(m bgl)
< 4
4-8
8-12
12-16
> 16

(B) Post-Monsoon depth to water level ,November 2012,)

In general post monsoon depth to water level in the district ranges between0.37-10.20mbgl.



Ground Water Resources :

Umaria district is underlain by Gondwanas sandstone, Archaeans granite-gneisses, -clays, Lametas and Deccan trap basalts. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. Out of 4,53,900 ha of geographical area, 4,21,900 ha (93 %) is ground water recharge worthy area and 32,000 ha (7 %) is hilly area. There are three number of assessment units (block) in the district which fall under non-command category. All blocks of the district are categorized as safe blocks, and highest stage of ground water development is computed as 14 % for Karkeli Block. The net ground water availability in the district is 42,672 ham and ground water draft for all uses is 4,871 ham, making stage of ground water development 11 % (9 % 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 37,273 ham at 50 % stage of ground water development's safe limits in the district.

S. No.	District/ 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 (11+12) (ham)	Provision for domestic, and industrial requirement supply to next 25 year (2033) (ham)	Net Ground water Availability for future irrigation development (ham)	Stage of Ground water Development {(13/10)*100} (%)
	Umaria								
	Karkeli	Command							
		Non-Command	13622	1335	590	1925	761	11527	14
		Block Total	**13622**	**1335**	**590**	**1925**	**761**	**11527**	**14**
	Manpur	Command							
		Non-Command	18965	2038	409	2447	493	16434	13
		Block Total	**18965**	**2038**	410	**2448**	**493**	**16434**	**13**
	Pali	Command							
		Non-Command	10085	283	214	497	490	9312	5
		Block Total	**10085**	**283**	**214**	**497**	**490**	9312	5
		District Total	**42672**	**3656**	**1215**	**4871**	**1743**	**37273**	**11**

Ground water Quality of Umariya District :

EC value ranges from 35-1140,NO3 value ranges from 0.30-70,F- value ranges from 0.01-0.79

Quality of Ground Water for Irrigation :

High SAR is not good for irrigation, as it leads to sodium hazards. Water samples in the district generally fall in **C1S1 & C2S2 classes** of US Salinity diagram. Ground water in general is safe for irrigation.

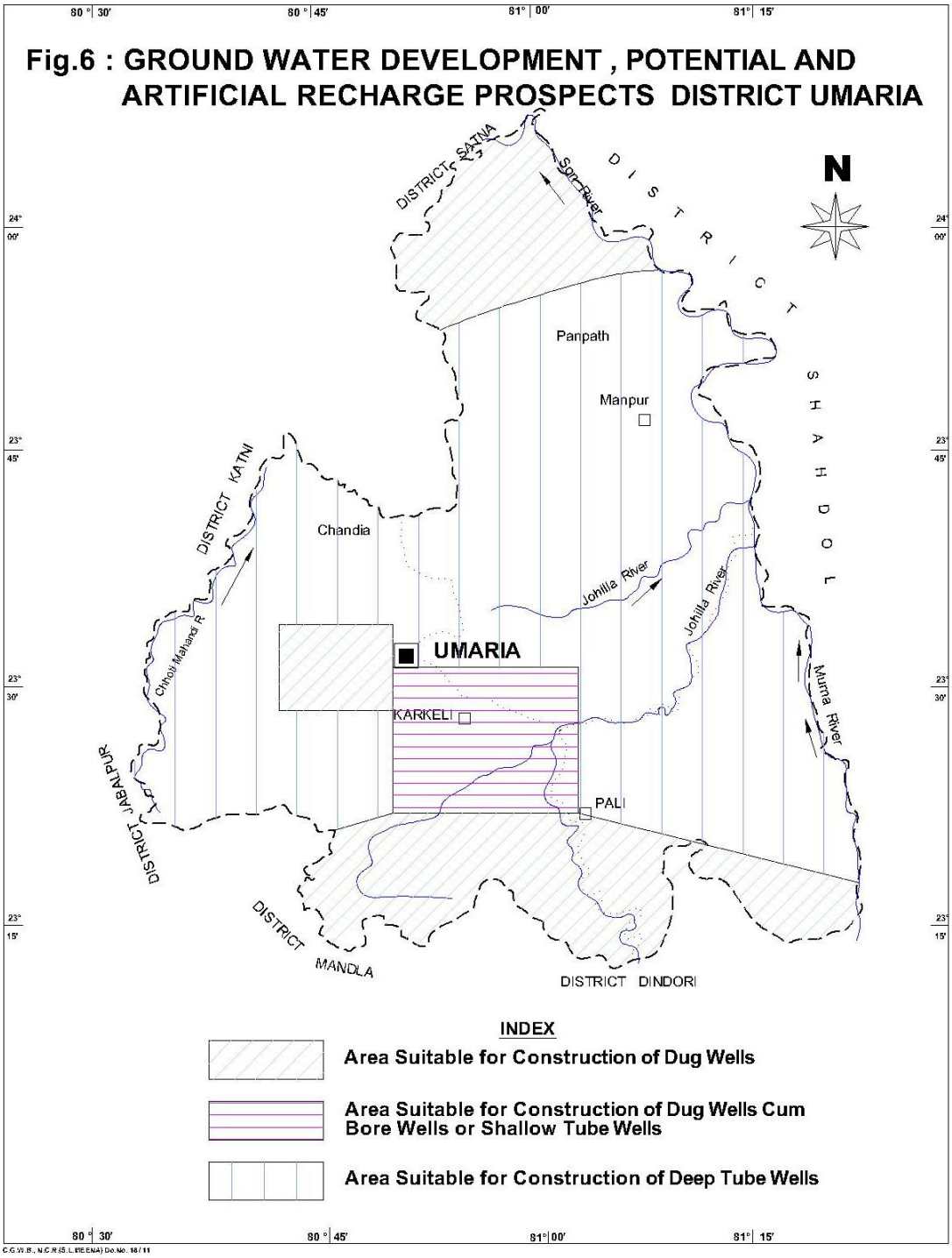
Status of Ground Water Development:

CGWB exploratory well drilling results reveals, good scope for ground water development in the district, specially area occupied by semi-consolidated Gondwana formations. Completed depth of exploratory wells vary between 105 and 236m b.g.l. and yield of wells ranging from 114 LPM at Panpatha to 2340 LPM at Kaudiya-Salaiya.Depth of assembly lowered in exploratory wells vary from 119 m to 245 m, b.g.l. Rural water supply is based on ground water system through private dug wells and PHED hand pumps. Town water supply of Chandiya and Pali (Block Head quarters) is also based on ground water. Reported population of these towns are 22,401 and 20,868 respectively and per day water supply was 29800 liters and 84,000 liters respectively.
re in water may cause fluorosis disease

5.0 GROUND WATER MANAGEMENT STRATEGY

Ground Water Development :

As described earlier in Non command and command both areas of Umariya district stage of ground water development is not more than 11 % and all blocks are categorized as “Safe” from ground water resources availability point of view. There is ample scope for ground water development in the area. New feasible ground water abstraction structures can be constructed at suitable hydrogeological situations. Area purpose for future development is indicated in recommendation chapter. Government. of M.P. may take up construction of community irrigation wells (Deep tube wells) for enhancing irrigation potential and agriculture growth of the area. Gondwana formations are potential aquifers which can be developed for future ground water uses. In Gondwana formations deep tube wells can be constructed deployment of Rotary Rigs. Wells with full assembly of appropriate slot size can give very good yield along with enhanced life of wells. Conjunctive use of surface water and ground water is also recommended so that both type of resources are used in definite proportion, otherwise various type of problem like water logging in command areas and over exploitation of ground water resources in non-command areas may arise.



Water Conservation & Artificial Recharge :

So far no water conservation and artificial recharge work has been carried by CGWB in Umariya district. But rock formations of the district are having good potential, specially Gondwana formations for recharge. Water conservation and artificial recharge will further enhance availability of ground water for agriculture and forest growth. In forest area various water conservation structures like Gully Plugs, Contour Trenches, Gabbion

Structures and Small Nala-Bunds can be constructed. In other part of area Artificial Recharge structures like Percolation Tanks, Check Dams, Recharge Shafts and Stop Dams can be constructed at suitable hydro-geological locations. It reported that important water resource of the area is being pumped out from various Coal Mines of the area. It will be proper to again use dewatered water of coal mines after necessary filteration for recharge by applying feasible artificial recharge techniques, otherwise important natural resource will lost, which can create adverse environmental conditions in the area.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

In Umariya district soil is fertile and is suitable for Kharif and Rabi crops. Paddy is Sown in Kharif season in major part of district. The tendency for sustainable development is affected by limited irrigation facilities in the area. Surface water availability is in adequate to meet total water requirement for irritation. But availability of ground water resources is there in ample quantity therefore there is no ground water problem in the area for future irrigation development through ground water. However conjunctive use of surface water and ground water is needed to balance and protect both types of natural resources for long term planning.

Main ground water problem of the area is related with the dewatering of phreatic aquifer dewatering from Open- cast and Underground mining of the area. Continiued pumping from various Coal mines may cause depletion of regional water levels. Detailed studies in Colaboration with M/S Coal India Ltd. is required to assess impact of Coal mining in ground water regime of the area.

Another problem is anticipated with improper disposal of **Ash dust** produced by Sanjay Gandhi Thermal Power Station located in village Mangthar in Pali block area. It is apprehended that improper disposal of Ash dust produced by thermal power station as a waste material is causing ground water pollution after rains. Various constituents associated with Ash dust gets dissolved and leached in ground water system.

One more problem is related with deforestation and soil erosion. Due to improper and unscientific management, as well as rapid exploitation of forest to yield high revenue has been causing a regular degradation in forest quality and coverage during pre independence period. Deforestation has been also caused by large scale mining of coal, at various places and rehabilitation and construction of residential colonies surrounding mining area in Umariya district. There has been depletion of forest cover in recent past due to heavy biotic interference which has also caused threat to wild life of reserve forest. Regression in the ecology and degradation in vegetation cover has done a great damage of soil and moisture conservation in the district.

7.0 AWARENESS AND TRAINING ACTIVITY

1 Mass Awareness Programme (MAP) & Water Management Training Programme (WMTP) by CGWB :

CGWB has not carried out Mass Awareness Programme and Water Management Training Programme in Umariya district.

.2 Participation in Exhibition, Mela, Fair etc :

In Umariya district, participation in exhibition, mela and fair etc.by CGWB was not done.

3 Presentation & lectures delivered in public forum / Radio / T.V. etc. :

CGWB has not done any activity in the district, under items mentioned above.

8.0 AREAS NOTIFIED BY CGWA / SGWA

In Umariya district , no area is notified by CGWB / SGWA

9.0 RECOMMENDATIONS

For growth of agriculture, water is primary need to support growing agriculture wealth. Compilation and analysis of data reveals that there is ample scope for ground water development, which may be used for agriculture growth in the area. Ground water estimation done for phreatic aquifer systems indicates that stage of ground water development is only 11 %.

Ground water exploration down by central ground water board also support ample availability of ground water resources at deeper levels, specially in semi consolidated Gowndwana formation. Following recommendations are made:

1). Considering availability of ground water resources in availability of ground water resources in plenty and its meager use in the district it is recommended that ground water resources of the area can be further developed and used by constructing more number of ground water abstraction structures (dug wells/ tube wells). Area recommended for ground water development is mentioned in plate.

2). Pumping of ground water from different coal mines is reported for making workable the mines. It is to be clarified that continuous pumping from ground water resources and putting it to into local drainage is not environmentally friendly action, as important natural resources is lost for ever. Impact of pumping is reported as depletion of water levels in surrounding areas. It is recommended that detailed hydrogelogical surveys may be taken up around coal mines areas to study the impact of pumping in ground water regime of the area. Project may be coleborated with Coal India Ltd. and suitable techniques of artificial recharge of the pumped water has to be adopted so that adverse environmental impact is not occured in the area. Pumped water should be used for industrial/domestic water requirement of Coal India establishment and rest to should be again sent in ground water system through artificial recharge techniques after necessary filtration /purification if required. Permission for clearance for new Coal mines

should be given by Central Ground Water Authority after considering this aspect of re-cycling of water.

3). Sanjay Gandhi Thermal Power Station is located in Pali, Birsingpur (village Mangthar) and there is plan for extension of this project. Ash-dust is a by product generated after consumption of coal in thermal power plants. Proper disposal of "Ashdust" is required other wise it leaches in ground water system circulated through rainwater recharge and probably various pollution elements are reaching in ground water resources. A study of industrial pollution around Thermal Power Station is suggested to find out pollution in ground water if any, created by this industry.

4). Conjunctive use of Surface water and Ground water is suggested in command areas of irrigation projects, specially irrigation projects, specially in medium irrigation projects of Umrar and Mahroi. Uses of ground water is also to be promoted in command area, to minimize dependency on surface water and protect the area from water logging, if any taking place in the area. Better irrigation water uses and management provides more benefits from available water supplies. To derive these benefits it is essential to understand the physical water resources system and its constraints including the economical and social environment it is meant to serve. Conjunctive use management is actually management of multiple water resources in a coordinated operation to the end that total yield of such a system over a period of year exceeds the sum of yields of the separate components of the system resulting from un coordinated operation. The objective of conjunctive use in this district is to increase the yield and general efficiency of water system by diverting water from streams or surface reservoirs for conveyance to and storage in ground water basins for later use when surface water is not available. Thus is all more necessary for restoring industrial water supplies.

5). Long term strategies to is recommended for management of water resources of the area. This includes development of reliable and adequate data base system for planning and development of water resources, Assessment and management and Sustainable supply through conjunctive use of surface and ground water resources and augmentation of water resources.Net work of observation wells for water level monitoring is to be enhanced specially in command areas, command area of Umariya district to study behavior of water levels and to compute ground water resources.

6). Soil and water conservation measures are to be adopted for protecting forest cover and biotic life of the area. various structures like gully plugs, contour bunds Gabbion structures, Nala bunding etc are recommended in forest area at large scale.

7). Rock formations of Umariya district are quite favourable for artificial recharge structures, specially in semi consolidated Gondwana formation surface runoff is also available in ample quantities which can be harnessed and stored in ground water system,ultimately which will augment ground water availability in the area. Artificial recharge projects can be taken up in scientific manners on "water shed management basis" various artificial recharge structures like percolation tanks

check dams, Cement plugs, nala bunds and sub surface dykes can be constructed at suitable hydrogeolgical situation in each watershed to conserve/protect and enhance ground water resources of the area for future use.