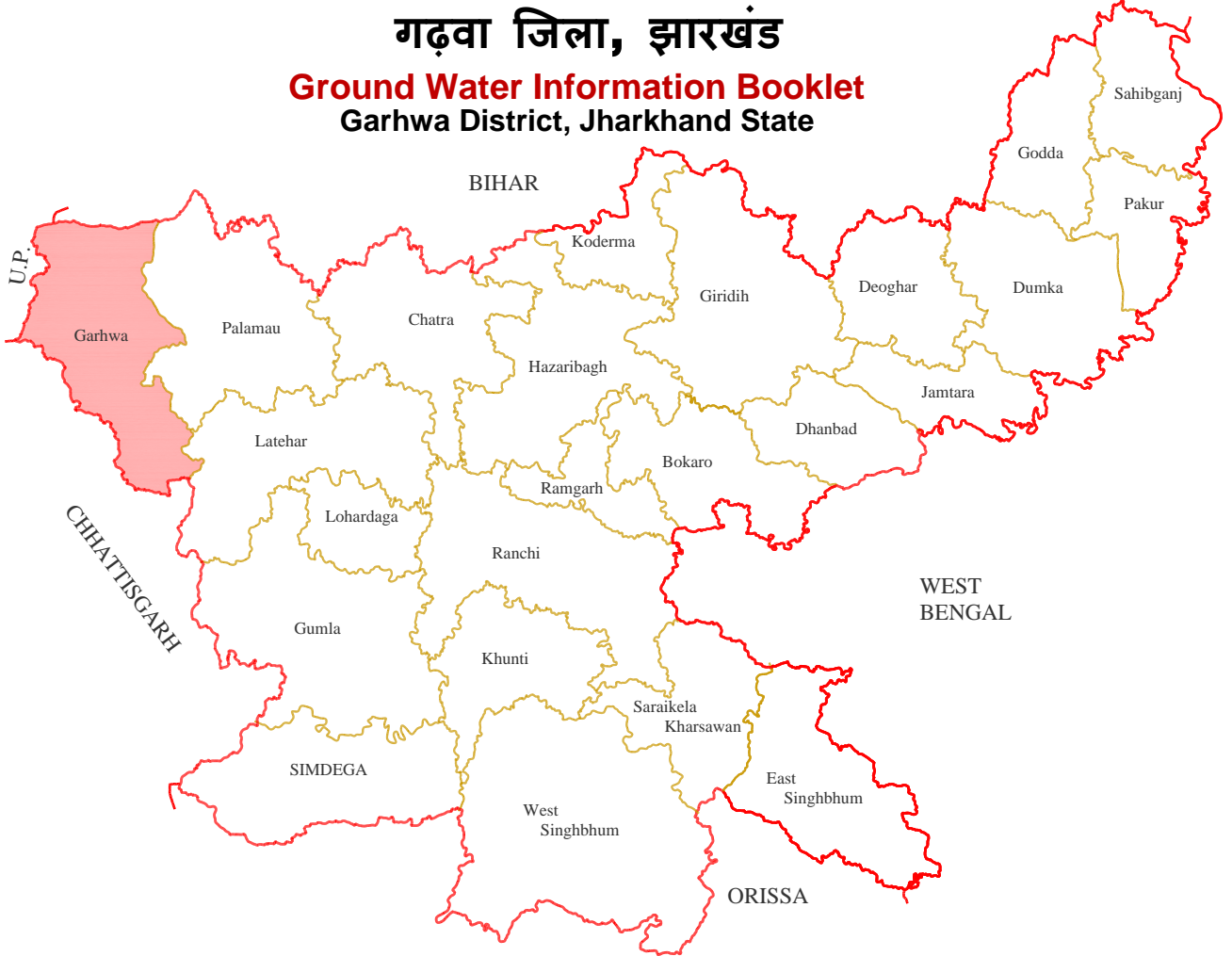




# भूजल सूचना पुस्तिका

## गढ़वा जिला, झारखंड

### Ground Water Information Booklet Garhwa District, Jharkhand State



### केन्द्रीय भूमिजल बोर्ड

जल संसाधन मंत्रालय

(भारत सरकार)

राज्य एकक कार्यालय, राँची

मध्य-पूर्वी क्षेत्र

पटना

### Central Ground water Board

Ministry of Water Resources

(Govt. of India)

State Unit Office, Ranchi

Mid-Eastern Region

Patna

सितंबर 2013

September 2013

**भूजल सूचना पुस्तिका**  
**गढ़वा जिला, झारखंड**  
**Ground Water Information Booklet**  
**Garhwa District, Jharkhand State**

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## **GROUND WATER INFORMATION BOOKLET OF GARHWA DISTRICT, JHARKHAND**

**1.0 INTRODUCTION** :- The erstwhile Garhwa Subdivision of Palamau district consisting of 8 Blocks was separated from Palamau district as an independent district “Garhwa” with effect from 1st April 1991. Garhwa district is a part of Palamau Commissionery consisting of 19 blocks and two subdivisions namely Garhwa & Nagar-Untrai. Garhwa district occupies the North – West Part of Jharkhand with a geographical area of 4273.52 Sq. Km. It is an under developed and draught prone district having diverse terrain. The district lies between 23° 60’ and 24° 39’ north latitude and 83° 22’ and 84° 00’ east longitude. It falls in the survey of India Toposheet No. 63P/07, 63P/08, 63P/11, 63P/12, 63P/15, 63P/16, 64M/09, 64M/13 and 64M/14. Garhwa district bordered by river Sone on the north, Palamau district of Jharkhand state on the east, Surguja district of Chhattisgarh state on the south, and Sonebhadra district of Uttar Pradesh on the west.

**1.1 Administration :-** At the time of creation of new district Garhwa, there were eight old blocks namely :-1. Garhwa, 2. Meral, 3. Ranka, 4. Bhandariya, 5. Majhiyaon, 6. Nagar-Untrai, 7. Bhawanathpur, and 8. Dhurki. Later on 6 new blocks were created from old blocks on administrative ground namely 1. Dandai, 2. Chiniya, 3. Kharoundhi, 4. Ramna, 5. Ramkanda and 6. Kandi. Later on 5 new blocks were created from old 14 blocks on administrative ground namely 1. Danda, 2. Ketar, 3. Bishunpura, 4. Bardiha and 5. Sagma. So presently there are 19 blocks in Garhwa district. There are 196 Gram Panchayats. 916 inhabited villages and 62 un-habited (Bechiragi) villages in this district. This district has two sub-division named Garhwa and

Nagar-Untraï. With eight police stations i.e.1. Garhwa 2. Meral 3. Ranka 4. Bhandariya 5. Majhiyaon 6. Nagar-Untraï 7. Bhawanathpur and 8. Dhurki.

According to the 2011 census Garhwa district has a population of 1,322,387, The district has a population density of 327 inhabitants per square kilometre (850 /sq mi) . Its population growth rate over the decade 2001-2011 was 27.71%.Garhwa has a sex ratio of 933 females for every 1000 males, and a literacy rate of 62.18%. The district headquarter is Garhwa. Garhwa has a sex ratio of 933 females for every 1000 males, and a literacy rate of 62.18%.Administrative divisions have been shown in Table – 1 & Figure-1.

TABLE-1: Administrative Division of Garhwa District

Description	2011	2001
No. of block/Gram Panchayat/Village	19/196/916	8/156/914
Actual Population	1,322,387	1,035,464
Male	683,984	535,332
Female	638,403	500,132
Population Growth	27.71%	29.21%
Area Sq. Km	4,273.52	4,044
Density/km <sup>2</sup>	327	256
Total rural Population	1,252,709	512444
Total urban Population	69,678	22888
Proportion to Jharkhand Population	4.01%	3.84%
Average Literacy	62.18	39.21

**1.2 Drainage :-** The general line of drainage is from south to north towards the river Koyal and Sone. Koyal forms the eastern

boundary and Sone forms northern boundary of the district(Fig-2). The main river is Koel and its tributaries. There are a lots of small streams, most of which are making mountain terrains with rock stream beds. The upper reaches of Koel river is characterized by high banks. The bed of the Koel is rocky for small length from the North of its confluence with Anurag river. After which it is sandy. The Koel flows from a total distance of about 255 Km from its source to the confluence of the Sone. It is generally dry in the summer. Other important rivers of the district are Danro, Sarsatiya, Tahale, Annaraj, Urea, Bai Banki, Bellaiti, Pando, Biraha, and Sapahi. Other notable river is Kanhar which forms south eastern boundary of the district for about 80 K.M. Due to its Geographical formation Garhwa district is rich in water resources.

**1.3 Land Use :-** There is a heterogeneity in the soils of the area. The soils of the district is light grey and fine textures in nature. The Cultivated area is about 15% of the geographical area and about 12% of the area is irrigated by different sources. The forest cover constitute over 45% of the total area. The surface water irrigation system has been developed to a very small scale and only 2325 Ha of land had been put under Canal irrigation System. Irrigation from ground Water resources is very low and about 20.68 % of the land of farmers have access to irrigation in the district. 65.56% farmers use wells, 26.67% use lift irrigation, 4.44% use ponds and 3.33% use other sources of irrigation. There are two dams namely Annaraj dam and Panghutua dam situated in Garhwa and Dhurki blocks of Garhwa district. In the district, the percentage of area under irrigation is 28.3. The cropping intensity in the district is 128%

#### **1.4 Studies / Activities carried out by Central Ground Water**

**Board :-** Central Ground Water Board has established network Hydrograph stations for monitoring of ground water level behaviour and quality of ground water of the district. The Board has also carried out earthwork drilling to identify the potential fractures in the district and also to know sub surface geology, depth and thickness of water bearing formation with their yield and to determine the different aquifer parameters. The exploratory wells have been constructed at Meral, Dhurki, Sonpurna, Garhwa, Ranka and Ramna.

### **2.0 RAINFALL AND CLIMATE**

**2.1 Climate :-** The climate of the district is humid and sub tropical. The year can be divided in to three main seasons, the winter season form November to March, the summer season is from March to May and Monsoon season from June to September; October is a transitional month between Monsoon and Winter seasons. December and January are the coolest months. In winter the temperature goes down to 3<sup>0</sup>C.By March temperature begin to rise steadily. In May and early part of June the maximum temperature can be as high as 47<sup>0</sup>C on individual days. Humidity is generally normal in this district, except in Monsoon months.

**2.2 Rainfall :-** From the onset of the Monsoon by the middle of June, rainfall rapidly increases reaching the peak level in August and continued to till the September.. The annual variation of rainfall is not much. The maximum precipitation occurs during July month. The average normal rainfall of the district as a whole is 1193 mm. During winter season it hardly records 10 cm rainfall but most of the rain occur during rainy season.

### **3.0 GEOMORPHOLOGY AND SOIL TYPES :-**

**3.1. Geomorphology :-** Garhwa district is highly rugged topography with thick green forest all over the area. The hills are widely scattered and rise up to 1164 m above MSL in the Southern of the district. Average height of the hills varies from 700 – 900mts. The hill which is called Gulgulpath -3819 ft. is said to be second highest peak in Jharkhand situated in Bhandriya Block of the district. There are also low land in Northern and Western part of the district which is suitable for agricultural purposes. The elevation of plain varies from 250 – 500 mtr. The slope of the district is towards north.

**3.2 Soil Types :-** There is a soil variation in the district. The soils of the district can broadly be grouped into three classes :-

- a) Heavy Clays :** This soil is locally known as Kewal Soil. This soil becomes hard when dry and sticky when wet. This soil can hold moisture for a longer period and as a result considered to be favourable for Rabi crops.
- b) Sandy Soil :** This soil is locally known as Balsundar and consists of coarse sand to a large extent and facilitates production of Paddy, Fruits and vegetables.
- c) Loamy Soil :** This soil is locally name as Dorasa and consists of sand and clay. This soil is suitable for growing sugarcane.

### **4.0 Ground Water Scenario:**

**4.1 Hydrogeology :-** The district is underlain by hard rock foundations if belonging to the precambrian period and recent alluvium along river banks. The geology and structure of underlying basement controls the occurrence and movement of

ground water. The ground water occurs in secondary porosity like joints, fractures and the extent of inter connection with them.

Ground water occurs in the district within weathered mantle. Limited volume in alluvial deposits occurring along the Sone and North Koel rivers. The thickness of weathered mantle varies from 5 to 16 mbgl in general. The source of Ground Water recharge is entirely by rainfall. The rivers of the district are effluent which do not contain appreciable amount of water during lean period to recharge Ground water at lower reaches. Major part of the rain water goes as run off. The Hydrogeology of the district is shown in Fig – 3.

**4.2 Depth of Water Level:-** Central Ground Water Board has established network of observation wells for monitoring of ground water level to know the behaviour of ground water regime in the district. There are six nos. of NHNS monitoring wells which are monitored every year in January, May, August and November.

During Premonsoon season in general the water level varies between 5 and 10 mbgl through out the district. Higher water level >10 mbgl are recorded in northern and southern part of the state. (Fig - 4 ). The water level in general the water level varies between 2 and 5 mbgl as through out the district. Higher water level > 5.00 mbgl are recorded in northern and southern part of the state. (Fig - 5 ).

**4.3 Water Level Trend :-** There are six nos. of ground water monitoring wells in the district. The water level of the maximum wells show the falling trend in the district which are localized patches of the area. The observation well in Majhiaon and Ranka are showing rising trend. The maximum and minimum



fall of water level trend of the observation wells are 0.205 M/Yr. (Garhwa) and 0.125 M/Yr. (Nagaruntari) respectively. The rising and falling trend of water level has been tabulated in the Table -3. The hydrographs with pre and post monsoon trend is presented in Figure-6.

**4.4 Ground Water Resources :-** Ground Water Resources assessment has been carried out based on the recommendations of Central Water Estimation Committee Report 1997 (GEF, 1997). Block wise ground water resource growth and stage of ground water development have been worked out for the year 2009 and presented in Table-5. The net ground water availability has been assessed to be 31073.03 ham. The existing ground water draft for all uses has been assessed as 109586 ham. The net ground water availability for future irrigation has been assessed as 19305.88 ham. The stage of ground water development in Garhwa district is 35.29.

**4.5. Ground Water Quality :-** Chemical Quality of water is very important from the agriculture and public health point of view. The chemical constituents of water should be within the prescribed limits to avoid any harmful effect of crops and general health of local population.

The available chemical analysed data reveals that ground water of the district is mainly alkaline in character (PH – 8.3). The chemical constituents are within the tolerance limit as per the drinking water norms.

**4.6 Status of Ground Water Development :-** There is sufficient scope for shallow as well as deep borewells. State Government agency has been drilled a no. of borewells to minimize the drinking water problems in the district. Central Ground water

Board has also drilled 7 no. of borewells in the district. The depth of borewell ranges between 114.07 to 206 mbgl. The discharge of borewells ranges from 1.4 m<sup>3</sup>/hr. to 20.4m<sup>3</sup>/hr. The maximum draw down of the borewell is 30m below ground level. The transmissivity and storativity of the borewell at Meral is 16m<sup>2</sup>/day and 1.7 x 10<sup>-4</sup> respectively.

## **5.0 Ground Water Management Study:**

**5.1 Ground Water Development :-** There is sufficient scope of ground water for drinking and irrigation purpose in the district. The shallow and medium dugwells are suitable for extraction structures in the area to meet the increasing demand of domestic water supply and ground water irrigation. The over all stage of ground water development(as per March'2011) in the district is 36.15%.

Construction of dug cum borewell structure is also suitable for enhance the yield of dug wells. The ground water resources of the district can be developed as substantial ground water resources which are available. Maintenance of Dug cum borewell and shallow tubewells will be done by local bodies with the help of mechanics and electricians in each block. The potential available for the ground water development considering the ground water draft has been worked out as per norms of Ground Water Estimation Committee 1997. The details of ground water recharge net annual draft, net ground water balance and stage of ground water development has been evaluated.

**5.2 Water Conservation and Artificial Recharge :-** Water conservation is the activity of collection of rain water for augmenting the ground. Thus the rain water can be stored and recharged into ground. The conservation of rain water aims at

optimum utilization of the natural resources. In hydrogeological point of view, rain water conservation is needed to arrest decline in ground water level and to improve ground water quality by dilution. Very high percentage of surface run off goes to river. There should be proper planning to arrest the decline of ground water and ensure sustainable and economic utilization of ground water resources in the district. There is an undulating topographic features, so rain water harvesting structure like check dam, gully plug structure, percolation tank, contour bund and trenching may be constructed.

## **6.0 Ground Water Related Issues And Problems :**

During Summer season the dug well dried up. The ground water level has been observed in Garhwa district (Jharkhand).

## **7.0 Awareness and Training activity :**

**7.1** Central Ground Water Board has organized one mass awareness program in Town hall, Garhwa on 29.01.2004. The topic of mass awareness was “Rain Water Harvesting & Artificial Recharge”. About 150 people from different organizations participated in the programme including representatives of NGO’s. In addition to technical lectures, a interaction and discussion session was also included with participants in the programme.

**7.2 Participation in exhibition, fair : NIL**

**7.3 Presentation & Lectures delivered in Public Forum / Audio / T.V. / Institution of Repute / Grassroots Associations / NGO / Academic Institutions etc. : NIL**

**8.0 Areas Modified by Central Ground Water Board / Central Ground Water Association :-** As per the ground water resource assessment evaluated all blocks of the district falling

under the safe category. Thus, the authority has not been notified any blocks.

## **9.0 Recommendation :-**

1. The exploration data is indicating the poor percentage of successful borewells in the district. So, geophysical survey is needed for selection of suitable sites for Ground Water exploration.
2. In order to conserve runoff water during monsoon, it is suggested to construct the Water conservation structures at suitable places in the district.
3. In certain places, the dug wells go dry during the summer. In such places the wells should be deeper so that it can tap the entire saturated thickness of weathered residuum.
4. Rain water harvesting and artificial recharge to Ground Water schemes may be adopted in all block head quarters in the district. The artificial recharge structure like percolation tank, gully plugging, sub surface dykes can be constructed to maintain the ground water sustainability.
5. In hilly area, contour bund can be constructed to avoid run off of the surface water in the district.
6. The river water can be lifted for irrigation as well as drinking purposes.

**TABLE-1: Administrative Division of Garhwa District**

Block	Area (as per 2011 census)	Rural Population	Urban Population	Total Population
Bhandaria	661.19	65906		65906
Bhawnathpur	440.93	80005		80005
Chinia	285.83	38762		38762
Dandai	138.33	63702		63702
Dhurki	311.29	55444		55444
Garhwa	305.39	155338	45992	201330
Kandi	176.98	81539		81539
Kharaundhi	141.08	51373		51373
Manjhiaon	239.17	52591	18348	70939
Meral	263.87	130397		130397
NagarUntari	197.96	102827		102827
Ramkanda	221.25	44340		44340
Ramna	233.44	70575		70575
Ranka	427.43	90554		90554
Bardiha	NA	37913		37913
Bisunpra	NA	32270		32270
Danda	NA	17838		17838
Ketar	NA	50223		50223
Sagma	NA	30439		30439
Sinduria (CT)	NA		5206	5206

TABLE-2: **Exploratory Wells of Garhwa district**

Location	Depth	SWL	Fracture	Discharge	Drawdown
Meral	180m	-	-	15.6 m <sup>3</sup> /hr	30 m.
Dhurki	206m	4.15	154.00 – 155.00	2.7 m <sup>3</sup> /hr	
Sonpurwa	198m	3.75	87.60 – 88.60	1.8 m <sup>3</sup> /hr	
Garhwa	151.76m	10.60	93 – 94 106 – 107.90 114 – 115 133 – 134 137 – 138	8.3 m <sup>3</sup> /hr	30 m.
Ranka P.S.	197.96m	-	-	1.44 m <sup>3</sup> /hr	
Ranka Block	198.48m	-	20 – 21 44.50 – 45 76.60 – 77.60 96.80 – 98.40 102 – 103	1.5 m <sup>3</sup> /hr	
Ramna, Ranka	114.07m	5.04	9.00 – 15.90 21.99 – 23.61 38.85 – 46.40 54.09 – 60.00 64.50 – 82.50 110.70 – 114.50	20.4 m <sup>3</sup> /hr	

**TABLE-3: Trend of Ground Water Level in Garhwa District**

**Period 01 – Jan. 2002 to 31 – Dec. 2012**

Location	No. of Data	Rise (Meter / Yr.)	Fall (Meter/Yr.)
Garhwa	22	-	0.205
Nagaruntari	27	-	0.125
Ranka	5	0.241	-
Bhawanathpur	19	-	0.160
Manjhian	5	0.208	-

**TABLE-4: Block wise Ground Water Resources of Garhwa District as on 31<sup>st</sup> March 2009(Ha-m)**

S.N.	Assessment Unit	Command/Non-Command area Total	Total Ground Water Recharge	Natural Discharge during Non Monsoon Season	Net Ground Water Availability	Existing Gross Ground Water Draft For all Uses	Stage of Ground Water Development
1	2	3	4	5	6	7	10
1	Bhandaria	6633.42	737.296	86.81	824.10	127.58	5768.55
2	Bhawnathpur+Kandi	5882.81	1301.70	285.81	1587.51	419.50	4161.60
3	Chinia	1308.98	309.95	51.91	361.86	76.29	922.73
4	Dandai	982.32	382.80	83.97	466.77	123.41	476.11
5	Dhurki	1996.89	957.70	111.79	1069.49	164.30	874.89
6	Garhwa	3863.38	1431.62	253.25	1684.88	368.80	2062.96
7	Kharaundi	919.59	277.94	68.84	346.78	101.18	540.47
8	Majhiaon	1468.15	593.46	143.94	737.40	211.56	663.13
9	Meral	1821.11	656.56	169.09	825.65	248.51	916.03
10	Nagaruntari	1288.74	570.72	136.22	706.94	200.21	517.81
11	Ramkanda	1286.09	197.66	57.01	254.68	83.80	1004.63
12	Ramna	1482.63	1071.48	138.94	1210.42	204.20	206.94
13	Ranka	2138.91	768.6	122.68	891.28	180.30	1190.01
	<b>Total</b>	<b>31073.03</b>	<b>9257.492</b>	<b>1710.26</b>	<b>10968</b>	<b>2509.65</b>	<b>19305.88</b>



FIGURE - 1: Administrative Map of Garhwa

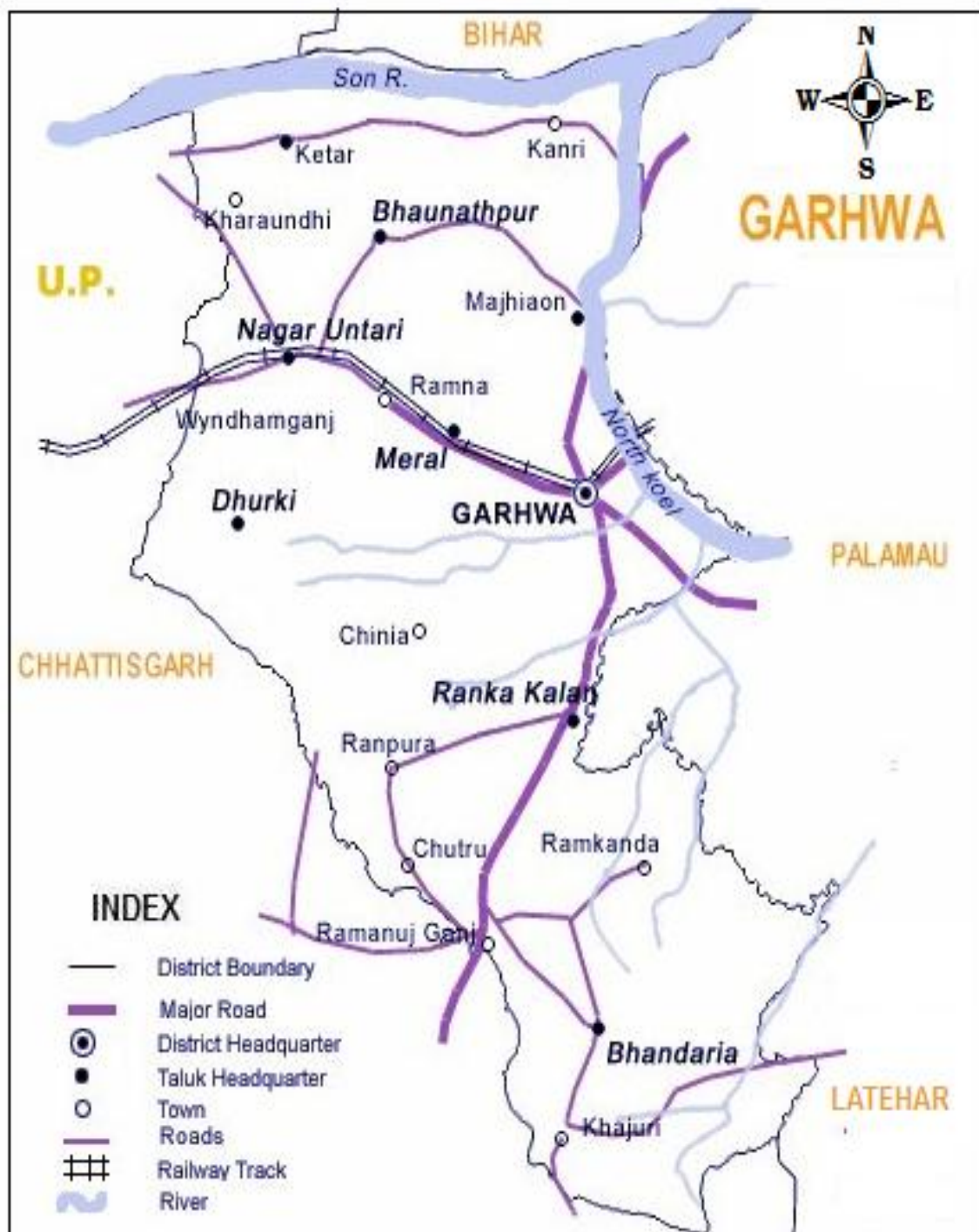
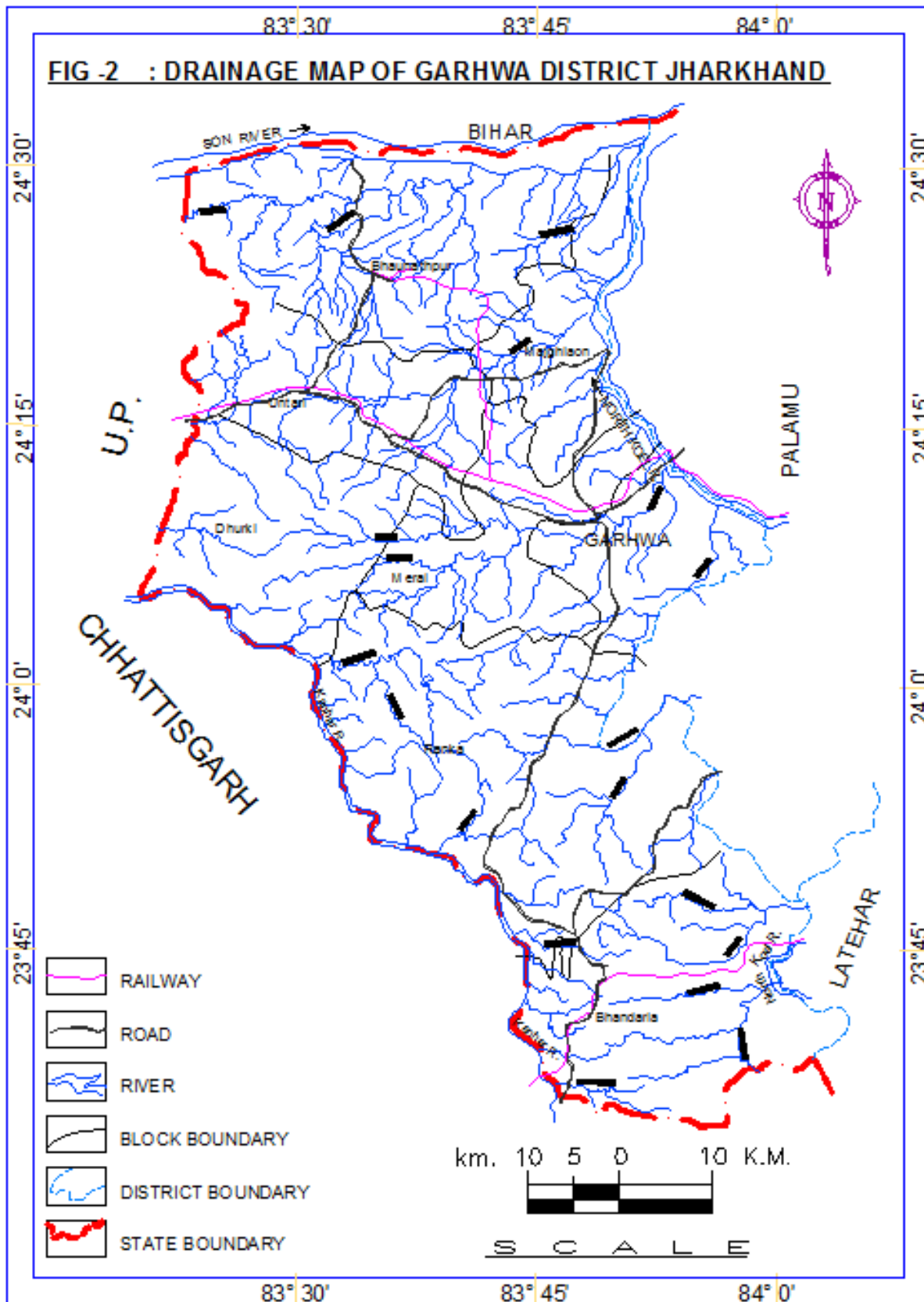


FIGURE - 2: Drainage Map of Garhwa



**FIGURE- 3: Hydrogeological Map of Garhwa**

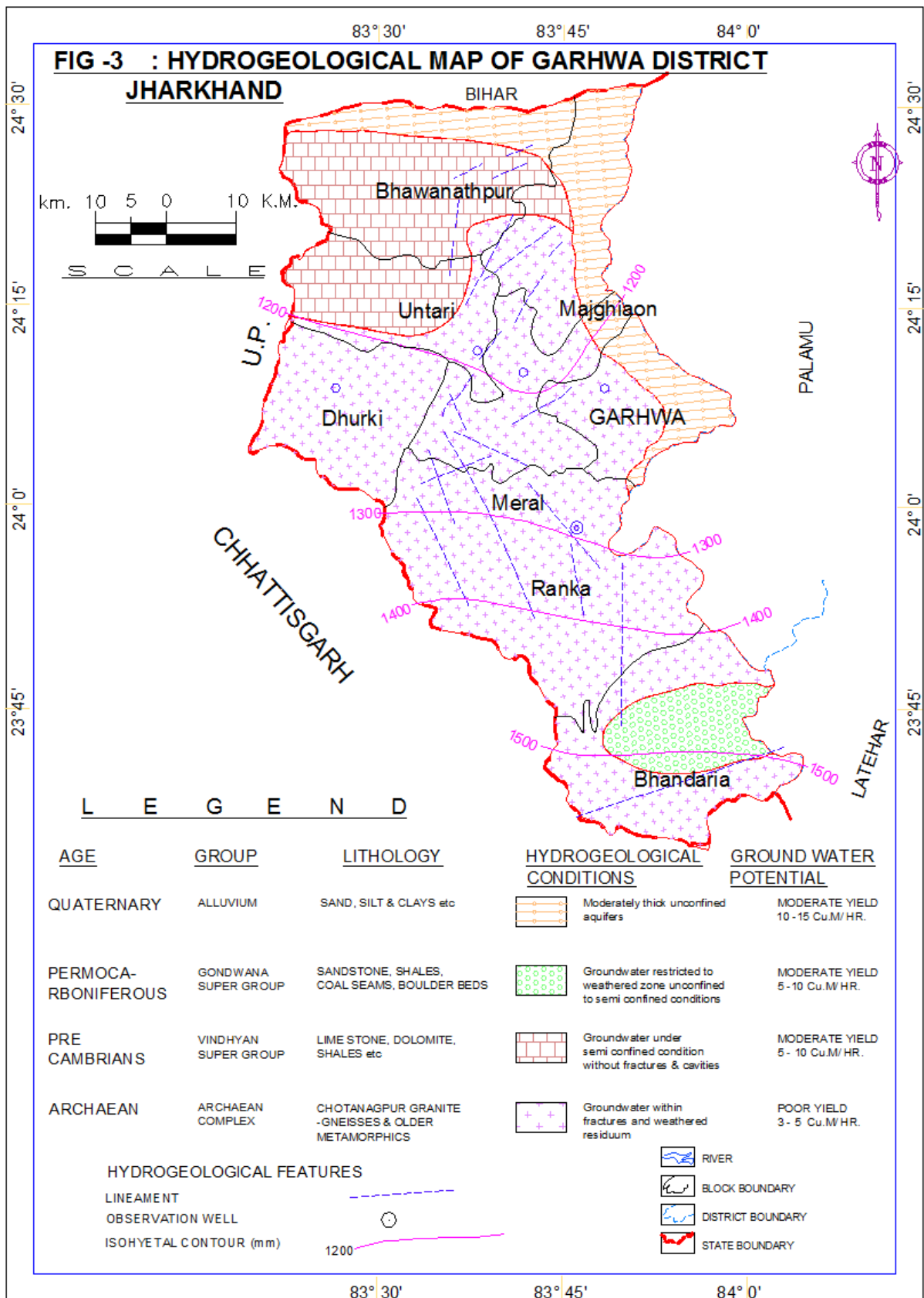


FIGURE – 4: Pre monsoon depth to water level

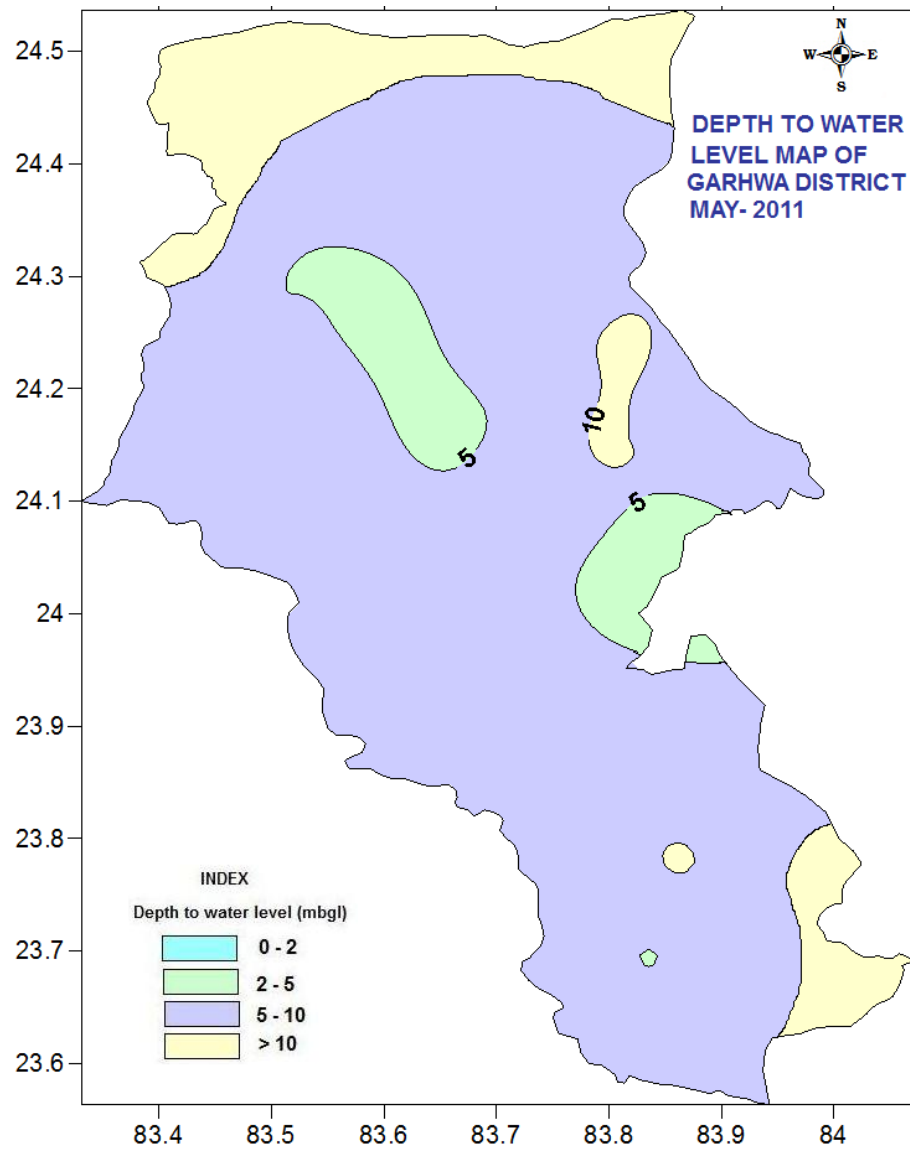


FIGURE - 5: Post monsoon depth to water level

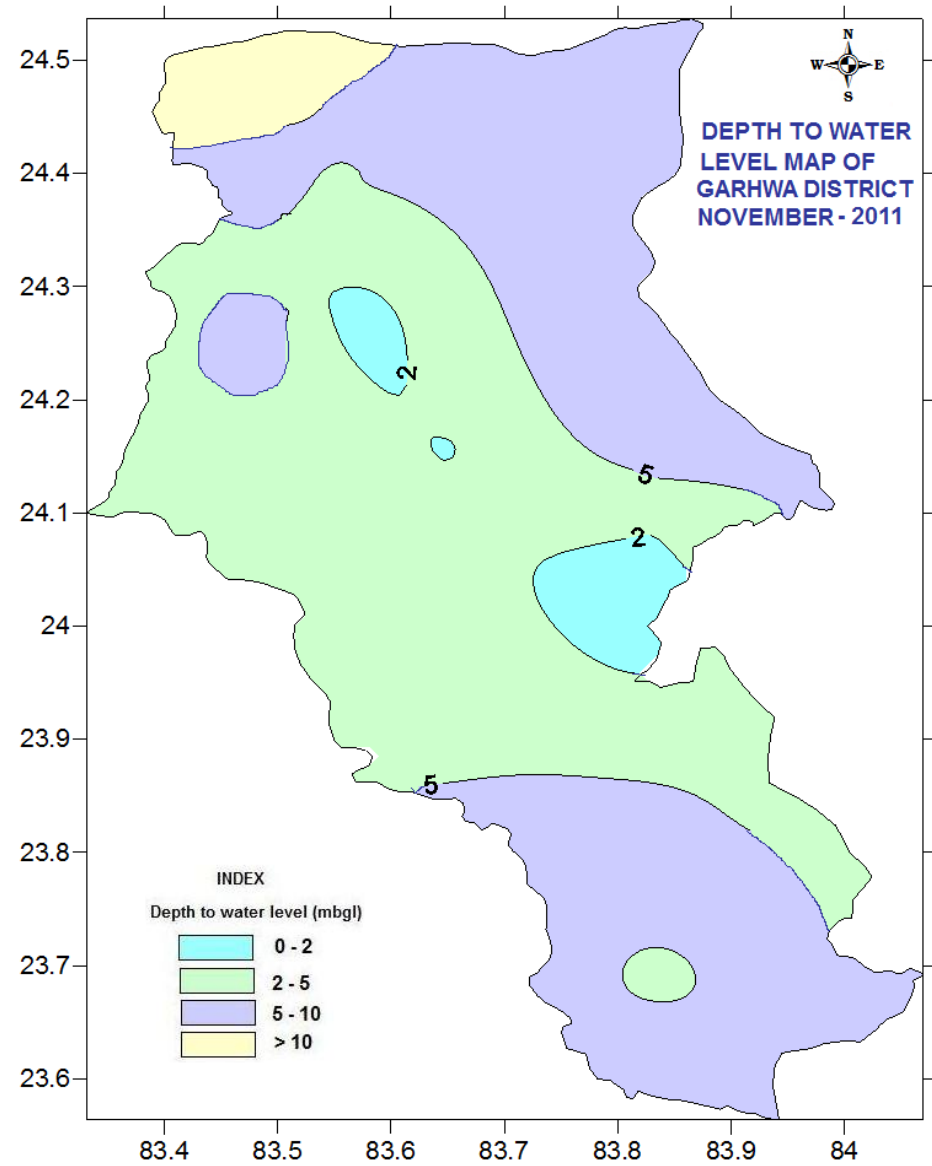


FIGURE - 6: Hydrographs with Water level trend

