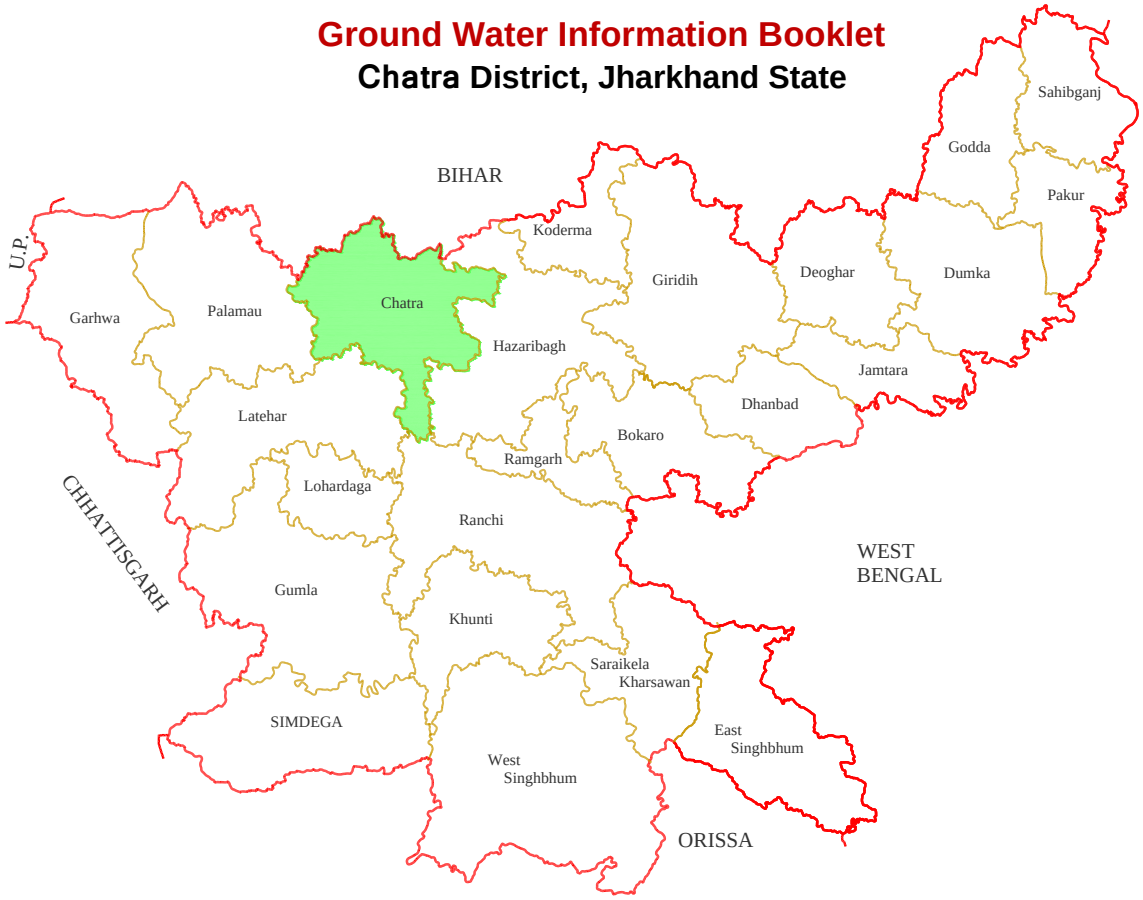
भूजल सूचना पुस्तिका

चतरा जिला, झारखंड

Ground Water Information Booklet

Chatra 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

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Updated By

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State Unit Office, Ranchi

Mid Eastern Region, Patna

GROUND WATER INFORMATION BOOKLET OF CHATRA DISTRICT, JHARKHAND STATE

CONTENTS

CHATRA DISTRICT AT A GLANCE

Sl. No.	ITEMS		Statistics	
1.	GENERAL INFORMATION			
	i)	Geographical area (SqKm)	3706	
	Administrative Division (As on 2013)			
	i)	Number of Tehsil/ Block	10	
	ii)	Number of Panchayat/Villages	172/2304	
	iii)	Population (As on 2011 Census)	13,11,382	
	iv)	Average Annual Rainfall (mm)	1250	
2.	GEOMORPHOLOGY			
	Major physiographic unit:		Rolling topography marked by isolated hills and valleys	
	Major Drainages:		Major rivers flowing in the district are Yamuna, Barki, Chako, Damodar and Garhi.	
3.	LAND USE (Sq. Km)			
	a)	Forest area:	2238.42	
	b)	Net area sown:	464.73	
	c)	Cultivable area:	464.73	
4.	MAJOR SOIL TYPE		Entisols/Inceptisols/Alfisols	
5.	AREA UNDER PRINCIPAL CROPS			
6.	IRRIGATION BY DIFFERENT SOURCES (Areas in ha and Number of Structures) (MIP Census-2000-2001)		Number of structures	Area (ha)
	Dugwell		17015	9364
	Tubewell/Borewell		184	537
	Tank/ponds		100	587
	Canals		2	2
	Other sources		69.50	Bhaurna Bandh , Triveni Weir scheme and Dania weir scheme
	Net irrigated area			
	Gross irrigated area			
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2013)		08	
	No of Dug wells		08	
	No of Piezometers		Nil	
9.	HYDROGEOLOGY			

	Major Water bearing formation	Chotanagpur Granite Gneiss, Gondwanas, Alluvium.
	(Pre-monsoon Depth to water level during 2012) m bgl.	7.30-11.05
	(Post-monsoon Depth to water level during 2012) m bgl.	4.92-9.67
	Long term water level trend in 10 yrs (1997-2006) in m/yr	---
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-07-2007)	
	No of wells drilled (EW, OW, PZ, SH, Total)	Nil
	Depth range (m)	-
	Storativity (S)	-
	Transmissivity (m^2/day)	-
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limit (e.g EC, F, As, Fe)	F and NO_3
	Type of water	
12.	DYNAMIC GROUND WATER RESOURCES(2009)- in mcm	
	Annual Replenishable Ground water Resources	247.63 mcm
	Net Annual Ground Water Draft	86.62mcm
	Projected Demand for Domestic and industrial Uses up to 2025	21.97 mcm
	Stage of Ground Water Development	34.98 %
13.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes organized	Nil
	Date:	
	Place:	
	No of participant :	
	Water Management Training Programmes organized	Nil
	Date	
	Place	
	No of participant	
14.	EFFORT OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING	
	Project completed by CGWB(No & Amount spent)	

	Project under technical guidance of CGWB (Numbers)	
15.	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Blocks notified	Nil
18	MAJOR GROUND WATER PROBLEMS AND ISSUES	Fluoride and Nitrate above permissible limit in patches

CHATRA DISTRICT INFORMATION BOOKLET

1.0 INTRODUCTION

1.1 **Administrative Details**

Chatra district spreading over an area of 3706 sq.km lies between North latitudes 23°38´34´´:24°27´48´´ and East longitudes 84°26´50´´:85°23´41´´ with it's district headquarter at Chatra. The district is divided into 12 blocks namely i) Hunterganj ii) Pratappur iii) Kunda iv) Lawalaung v) Chatra vi) Itkhori vii) Gidhaur viii) Pathalgora, ix) Simarla, x) Tandwa xi) Kanha Chatti and xii) Mayur Hand. The district comprises of 154 numbers of panchayats and 1474 no. of villages. The total population of Chatra district as per the 2011 census is 10,42,886 persons with urban population of 62,954 and the rural population of 9,79,932 persons.(Table 1) Chatra district is located on the Hazaribagh plateau. The district is bounded in the north by Gaya district of Bihar State, in the west by Palamu district, in the south by Latehar, Ranchi and Hazaribagh districts, , in the east by Koderma and Hazaribagh districts. Fig 1

TABLE 1: POPULATION OF CHATRA DISTRICT (2011)

Sr. No.	Block	Total	Rural population	Urban population	Male	Female
1	Chatra	150999	101014	49985	78513	72486
2	Gidhaur	40919	40919	0	20910	20009
3	Hunterganj	187590	187590	0	96328	91262
4	Itkhori	74929	74929	0	37869	37060
5	Kanha Chatti	63012	63012	0	32112	30900
6	Kunda	30018	30018	0	15427	14591
7	Lawalaung	50553	50553	0	25651	24902
8	Mayur Hand	58925	58925	0	29482	29443
9	Pathalgora	31530	31530	0	15867	15663
10	Pratappur	120221	120221	0	61780	58441
11	Simaria	107871	107871	0	54855	53016
12	Tandwa	126319	113350	12969	65141	61178
	Total	1042886	979932	62954	533935	508951

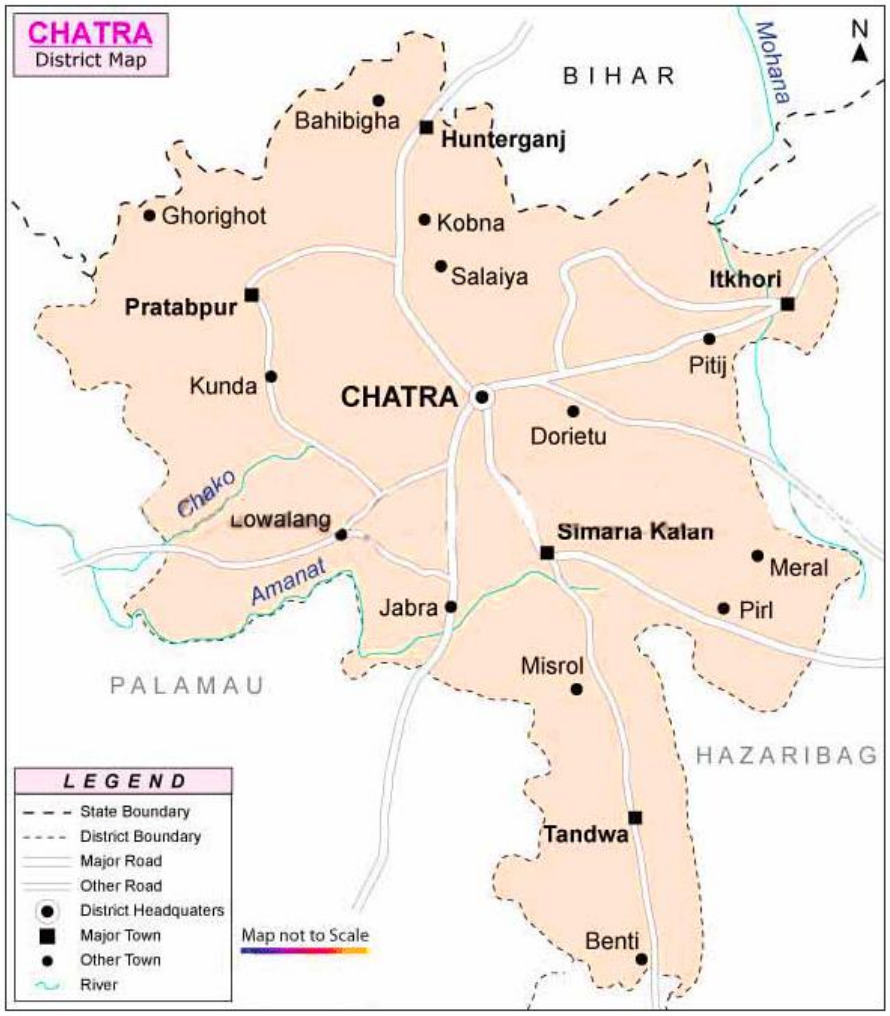


Fig: 1 Administrative Map

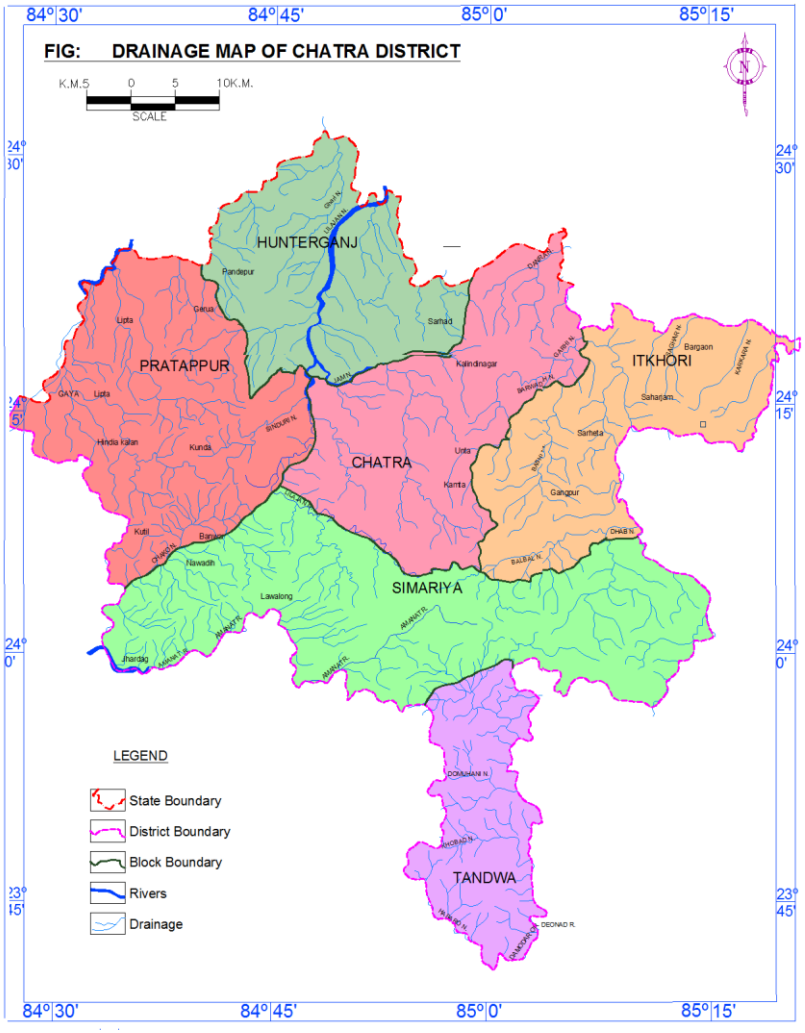


Fig: 2 Drainage Map

1.2 Drainage

The principal rivers of the district are Yamuna, Barki, Chako, Damodar and Garhi.The general slope of the district is North to South. The general trend of the drainage is from SE-NW. The structural features particularly the foliation and joints exert profound impact upon the drainage and control the drainage pattern of the district. Fig 2

1.3 Studies/Activities carried out by CGWB

Central Ground Water Board has carried out hydrogeological surveys in the district. Ground water regime monitoring is carried out 4 times annually from 8 HNS wells in the district. Water samples are collected during the month of May to study the changes in water quality along with monitoring of pre-monsoon water level.

2.0 HYDROMETEROLOGY

The district falls in the rain shadow of the Santhal Pargana plateau. The average annual precipitation is 1250 mm and the average number of rainy days is 59. Even this meager precipitation is erratic which coupled with long interspell forces the district to suffer from drought.

3.0 GEOMORPHOLOGY AND SOIL TYPES

The predominant physical feature over major part of the district is the rolling topography dotted with isolated inselbergs except in the Borijore and Sundarpahari blocks. A substantial part of Borijore and Sundarpahari block is under forest cover. The altitude of the land surface increases from west to the east. The major hills are confined to the eastern part of the district comprising the Gandeshwari Pahar (238.41m) and Kesgari Pahar (268.29m) while in the western part of the district isolated hills are in the form of the inselbergs and other small hillocks.

The soil is mostly acidic, reddish yellow, light textured and highly permeable with poor water holding capacity.

4.0 GROUND WATER SCENARIO

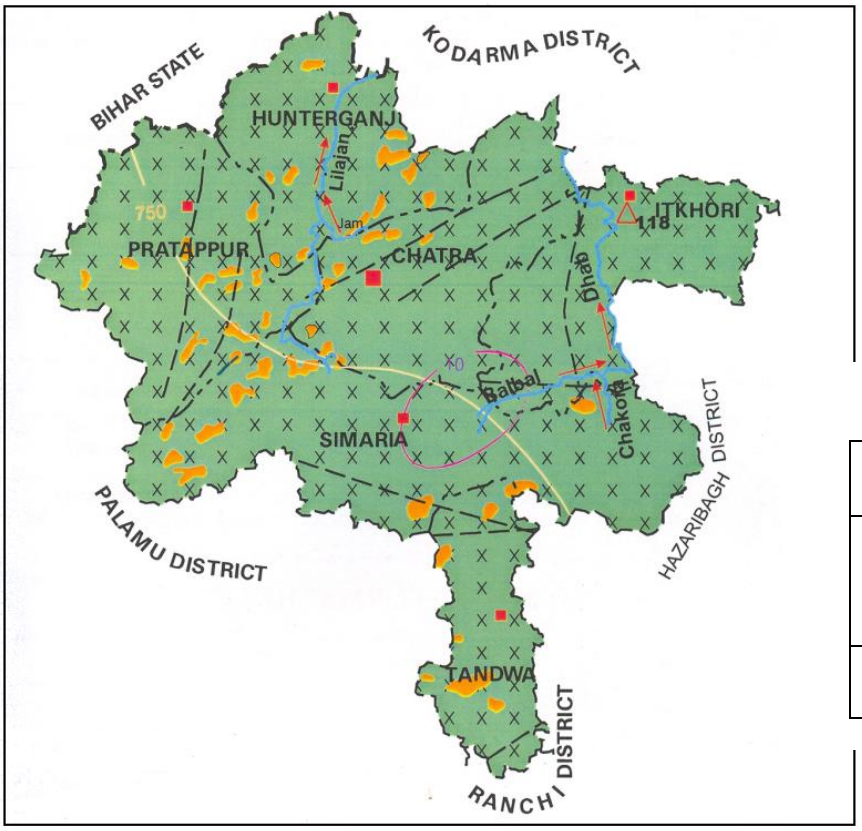
4.1 Hydrogeology

The southern part of the district is underlain by Granite-gneiss of Achaean age forming the basement. These occur as large batholiths and are intruded by basic rocks. In the central and northern part of the district the rocks of Barakar formation consisting of feldspathic sandstones, shales and coal seams overlying the metamorphics are exposed. In the western and northern part of the district alluvial cover of moderate thickness, caps the Archaean crystallines and the Gondwana sedimentaries.

The district is underlain by diverse geological formations with complex tectonic framework. The geological formations have been grouped under three main categories

a) The gneissic complex in the southern and the central part
b) The Rajmahal traps in the eastern and southeastern part
c) Gondwanas overlain by thin mantle of alluvial cover in the northern and central part.

Ground water occurs mostly under phreatic condition in all the lithological units within the shallow aquifers and locally under semiconfined and confined condition in deeper aquifers. Hydrogeolocical map is shown in Fig 3.



LEGEND

	Wells feasible	Depth of well (m)	Discharge
Hard Rock Aquif	Dug well Bore well	8 – 16 62 - 160	20-50 100-500
	Hilly Area (> 20 % Slope)		

4.1.1 Depth to Water level

During May 2012, the depth to water levels in HNS wells tapping shallow aquifer ranged from 7.30 to 11.05 m bgl. Fig: 4

Categorization of depth to water level of pre-monsoon period (May 2012) for HNS in Chatra district is presented below in table-2

Table-2 Categorization of depth to water level of pre-monsoon period (May 2012)

No. of wells measured	**Depth to water level (m bgl)**		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	**Max**	No.	%	No.	%	No.	%	No.	%
3	7.30	11.05	0	0	0	0	2	66.7	1	33.3

Depth to ground water levels during the post monsoon period (November 2012) varied between 4.92 and 9.67 m bgl. Fig: 5

Categorization of depth to water level of post-monsoon period (November 2012) for HNS in Chatra district is presented below in table-3

Table-3 Categorization of depth to water level of post-monsoon period (Nov-2012)

No. of wells measured	**Depth to water level (m bgl)**		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	**Max**	No.	%	No.	%	No.	%	No.	%
6	4.92	9.67	0	0	1	16.7	5	83.3	0	0

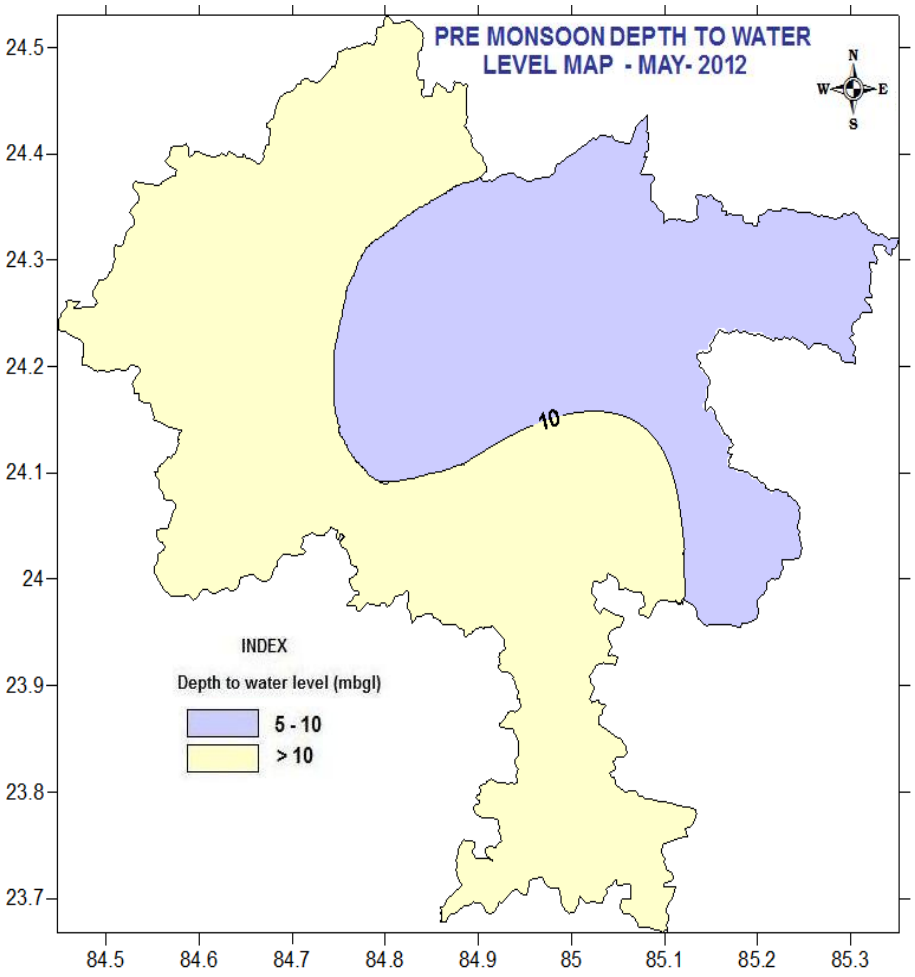


Fig: 4 Pre monsoon water level

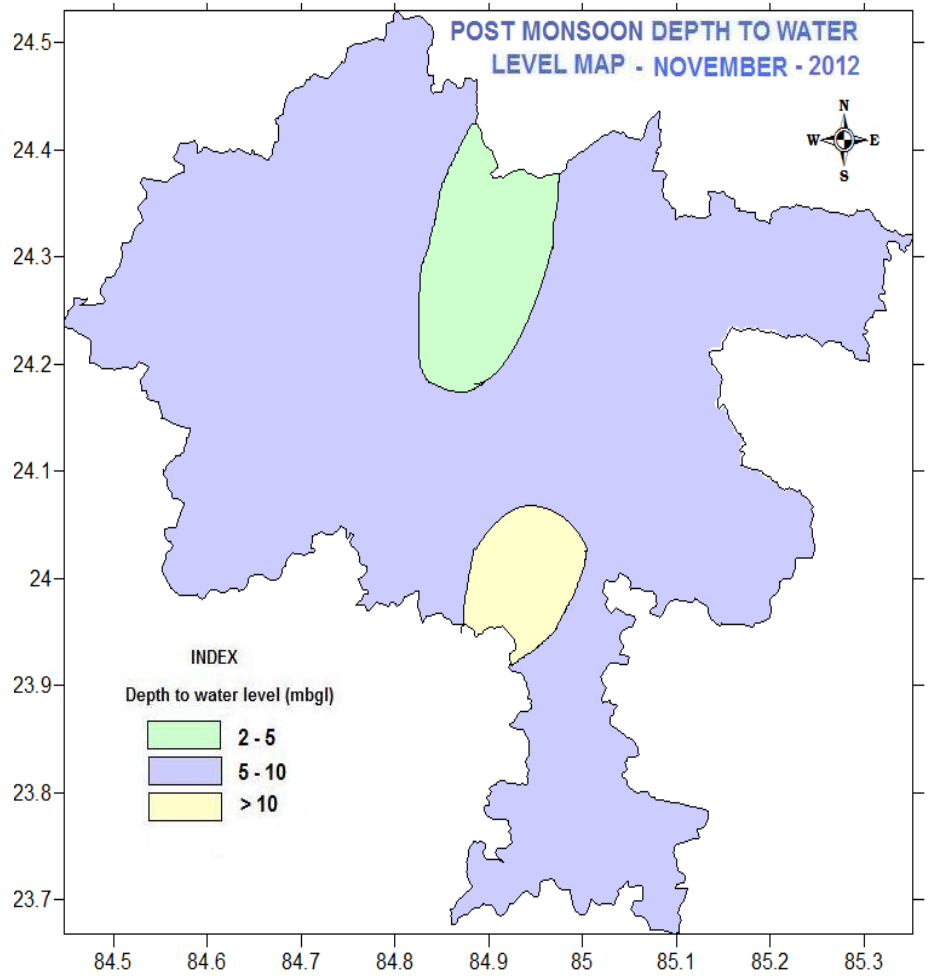


Fig: 5 Post monsoon water level

4.2 Ground Water Quality

Ground water in the phreatic aquifers in Chatra district slightly alkaline in nature, which is also colourless, odourless . The specific electrical conductance of ground water in phreatic zone during May 2011 was in the range of 655 -2408 µS/cm at 25ºC. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO_3. The chemical concentration of these constituents is presented below in table-4. Isoconductance Map is produces in figure -6

Table-4 The chemical concentration of samples (May 2011) of Chatra district.

Block	Location	E.C. micro	pH	CO_3	HCO_3	Cl	Ca	Mg	TH as	Na	K
		Siemens/cm							$CaCO_3$		
		at 25° C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SIMARIA	Tutilawa	690	7.57	ND	110.7	70.9	48	30.37	245	32.48	4.88
CHATRA	Chatra	1440	7.41	ND	446	147	62	49	355	127	30
ITKHORI	Itkhori	657	7.56	ND	344.4	17.72	38	27.94	210	38.9	5.07
SIMARIA	Simaria	249	7.4	ND	110.7	17.72	26	7.29	95	14.59	1.86
SIMARIA	Bagra	1399	7.41	ND	110.7	215.52	76	57.1	425	81.94	17.02

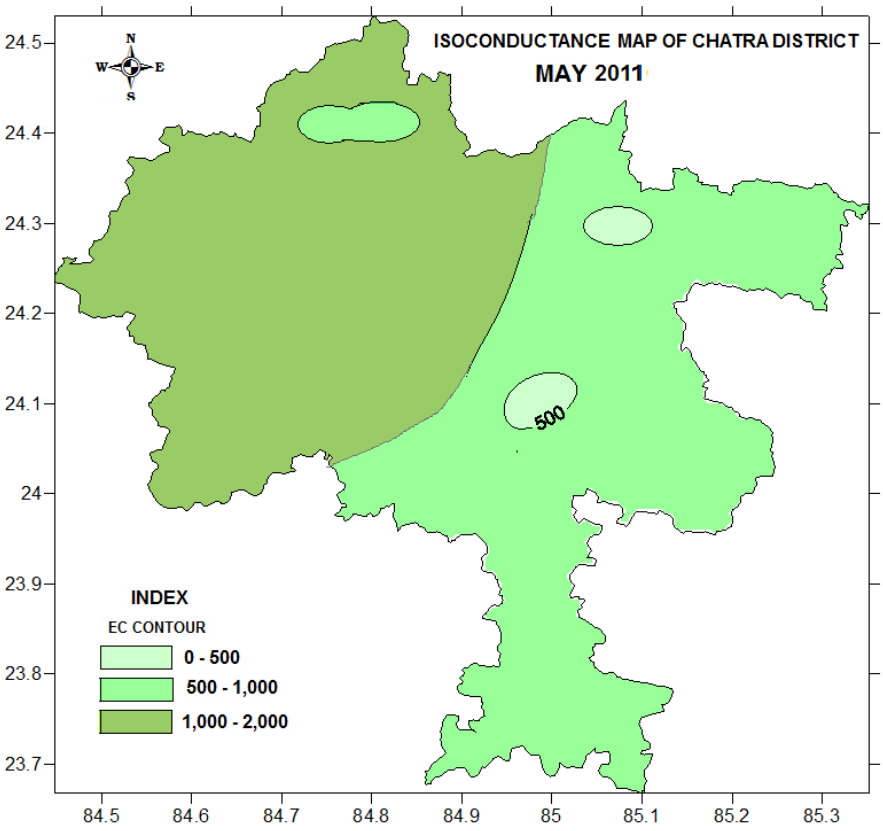


Figure 6: Isoconductance Map of Chatra district

4.2.1 Status of Ground Water Development

In the rural areas the entire water supply is dependent on ground water. Ground water development is mainly carried out in the district through dug wells and Hand pumps. In general dug wells are of 2 m diameter and the depth ranges between 8 to 15 m depending on the thickness of the weathered zone, tapping the shallow aquifer in the weathered zone and uppermost slice of the basement. Large number of dug wells used for drinking water is under private ownership for which there is no reliable data. Over the years Mark II/ Mark III hand pumps are being drilled in large numbers for ground water development. These hand pumps have the following two major advantages i) less susceptible to contamination from surface sources and ii) tap fractures between 20-60m depth which have been found to be less affected by seasonal water level fluctuation and thus have lesser chances of failure even during extreme summer. In rural areas of Chatra district the number of hand pumps drilled by PHED is 12311 of which 9342 are under working condition. There are 574 dug wells constructed by government departments that are under regular use.

In the urban areas ground water plays a supplementary role in water supply, the major supply being made through dams, reservoirs or weirs across rivers or streams. No authentic data is available on the number of ground water structures catering the urban water supply.

As per the latest ground water resource estimation carried out adopting GEC 97 methodology, the overall stage of ground water development in Chatra district has been found to be 41 % indicating enough scope for future development. (Fig.7& 8). The ground water resources of Chatra district is given in the table-5.

5.0 GROUND WATER RELATED ISSUES & PROBLEMS

Some of key ground water related issues are

a) Locating suitable sites for bore wells

b) Suitable design of dug wells and hand pumps

c) Taking up artificial recharge projects to augment the resource availability in Chatra district

d) Optimal development of irrigation potential by developing ground water available for future uses:

e) Creating public awareness for conserving ground water through awareness camps, NGO’s and mass media.

Fig 7: Categorisation of blocks of Chatra district

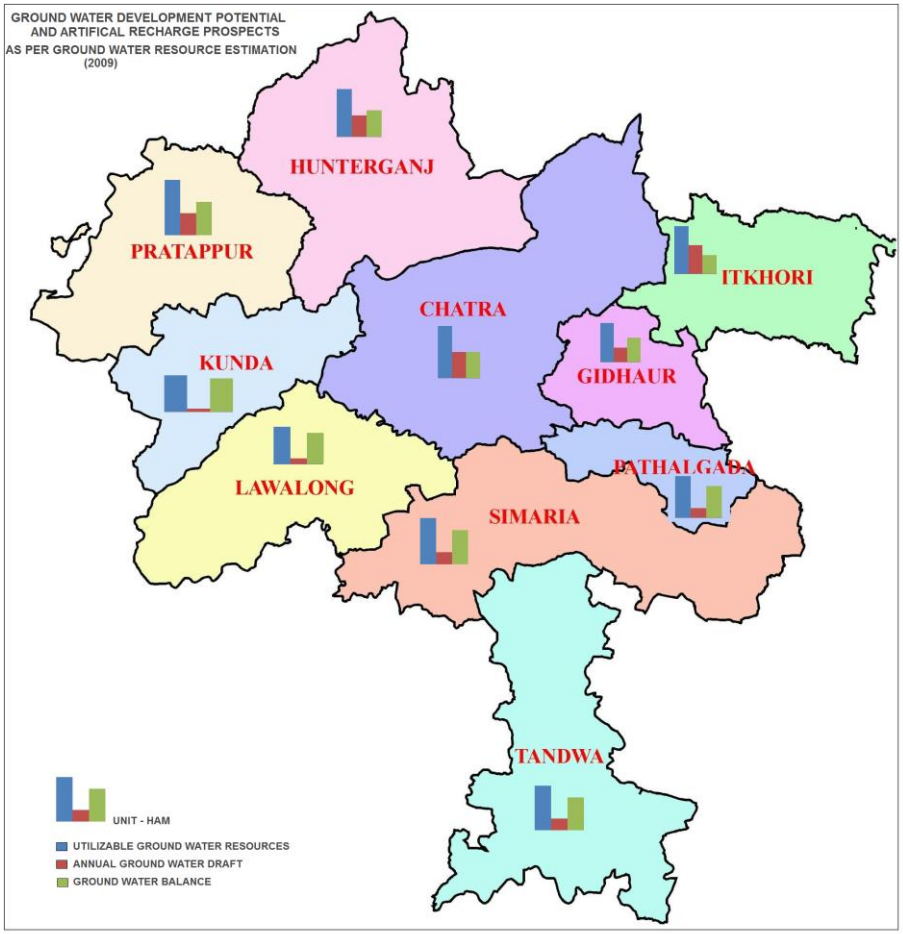


Fig 8: Ground water development potential of Chatra district

Table-5 Dynamic Ground Water Resource of Chatra district as on 31st March 2009 as per GEC 97 (ham)

	Annual Replenishable Ground Water Resource					Natural Discharge during non-monsoon season	Net Annual Ground Water Availability	Annual Ground Water Draft			Projected Demand for Domestic and Industrial uses up to 2025	Ground Water Availability for future irrigation	Stage of Ground Water Development (%)
	Monsoon Season		Non-monsoon		Total			Irrigation	Domestic and Industrial uses	Total			
Block	Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge from other sources									
Chatra	3122.90	50.15	533.33	416.97	4123.36	412.34	3711.03	1611.936	251.20	1863.13	419.68	1679.41	50.21
Gidhaur	965.53	1.91	164.89	92.90	1225.24	122.52	1102.71	356.35	52.04	408.39	88.27	658.09	37.04
Huntergan j	2929.53	71.47	500.31	336.25	3837.56	383.76	3453.80	1300.02	241.79	1541.81	410.11	1743.67	44.64
Itkhori	1741.89	69.97	297.48	287.97	2397.31	239.73	2157.58	1126.13	177.82	1303.95	301.61	729.85	60.44
Kunda	1481.27	3.13	252.97	32.34	1769.72	176.97	1592.75	104.40	38.05	142.45	64.54	1423.81	8.94
Lawalaung	2253.28	4.33	384.82	94.58	2737.01	273.70	2463.31	343.82	65.44	409.26	110.99	2008.50	16.61
Pathalgora	826.63	1.46	141.17	45.37	1014.63	101.46	913.17	169.82	43.31	213.13	73.45	669.89	23.34
Pratappur	2070.57	4.24	353.61	208.18	2636.61	263.66	2372.95	798.94	149.66	948.60	253.85	1320.16	39.98
Simaira	3274.53	5.63	535.29	226.36	4041.82	202.09	3839.73	860.56	143.13	1003.69	242.77	2736.41	26.14
Tandwa	2997.56	4.13	323.62	180.95	3506.26	350.63	3155.63	690.90	136.92	827.81	232.23	2232.50	26.23
Total	21663.69	216.44	3487.51	1921.88	27289.52	2526.86	24762.66	7362.88	1299.35	8662.23	2197.49	15202.29	34.98

6.0 Awareness & Training activity

6.1 Mass Awareness Campaign (MAP) & Water Management Training Programme (WMTP) by CGWB

NIL

7.0 AREA NOTIFIED BY CGWB/SGWA

None

8.0 RECOMMENDATIONS

As the district suffers from water scarcity, it is recommended to take artificial recharge at suitable locales. On the basis of the hydrogeological criteria such as post monsoon water level below 7 m bgl indicating availability of sufficient space in the unsaturated zone to retain additional water and availability of surplus surface runoff, 250 Sq kms area in Chatra district has been demarcated as suitable for artificial recharge. Through this 41.25 mcm water can be recharged.

In the hard rock areas, pin pointing suitable sites for bore wells is always a challenge. Considering the anisotropy in distribution of fractures at deeper level, suitable sites may be selected using remote sensing techniques in association with geophysical and hydro-geological investigations.

For deriving optimal benefit from aquifers in areas under fissured formation, the dug wells should be designed to penetrate the weathered zone as well as top part (1-2 m) of the underlying bed rock, so as to get the full benefit, from the total thickness of the shallow aquifer. For hand pumps and shallow tube wells the casing provided against the weathered zone should be slotted at the bottom so that the well can extract shallow ground water also. In urban areas use of shallow aquifers should be encouraged.

The surface run off in urban areas and its peripheral parts should be harnessed to augment the ground water resource through appropriate recharge techniques. For urban areas roof top rain water harvesting and artificial recharge is most suitable. Location and design of the structures should be guided by findings from hydrogeological and geophysical surveys. Sites for artificial recharge should be taken up at places where sufficient thickness of weathered zone as well as fracture/fracture zones are available. The depth of the recharge well should be governed by the depth of occurrence of the fractures.