



भूजल सूचना पुस्तिका
रामगढ़ जिला, झारखंड
Ground Water Information Booklet
Ramgarh District, Jharkhand State



Open cast mines at Ramgarh district

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

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भूजल सूचना पुस्तिका

रामगढ़ जिला, झारखंड

Ground Water Information Booklet
Ramgarh District, Jharkhand State

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**GROUND WATER INFORMATION BOOKLET OF RAMGARH DISTRICT,
JHARKHAND STATE**

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RAMGARH DISTRICT AT A GLANCE

Sl. No.	ITEMS	Statistics				
1.	GENERAL INFORMATION					
	i)	Geographical area (SqKm)	1387			
	Administrative Division (As on 2011)					
	i)	Number of Tehsil/ Block	6			
	ii)	Number of Panchayat/Villages	143/351			
	iii)	Population (As on 2011 Census)	949443			
	iv)	Average Annual Rainfall (mm)	1251			
2.	GEOMORPHOLOGY					
	Major physiographic unit:		Hills, Plateau, valleys, ridges			
	Major Drainages:		Damodar, Naikari, Bhervi or Bhera and Bokaro river.			
3.	LAND USE (Sq. Km)_(2010-11)					
	a)	Forest area:	394			
	b)	Net area sown:	140			
	c)	Fallow Land:	245			
	d)	Area not suitable for cultivation	34			
4.	MAJOR SOIL TYPE		Red Soil and Sandy loam			
5.	AREA UNDER PRINCIPAL CROPS (2011-2012)		Crops	Area (HA)	Production (MT)	Productivity (KG/HA)
			Rice	7957	23855	2998
			Wheat	423	592	1400
			Pulses	1727	1153	3830
			Oilseeds	652	329	4325
			Maize	1497	2239	3450
6.	IRRIGATION BY DIFFERENT SOURCES (Number of Structures) 4 th MI census		Numbers		Potential utilized (Area in ha)	
	Dugwell		4290		1255	
	Tubewell / Borewell		8		2	
	Other sources		267		251	
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2012)					
	No of Dug wells		7			
	No of Piezometers		NIL			
9.	HYDROGEOLOGY					
	Major Water bearing formation		Granite Gneiss, Gondwana			
	(Pre-monsoon Depth to water level during 2012) m bgl.		2.25 – 11.19			
	(Post-monsoon Depth to water level during 2012) m bgl.		1.6 – 5.9			
	Long term water level trend in 10 yrs (2003 - 2012) in m/yr		Rise	0.02 – 0.88		
Fall			0.105 – 0.96			

10.	GROUND WATER EXPLORATION BY CGWB (As on 31-07-2007)	
	No of wells drilled (EW, OW, PZ, SH, Total)	17 (EW), 2 (OW)
	Depth range (m)	61 - 199
	Discharge (m ³ /hr)	1.5 – 32.15
	Storativity (S)	--
	Transmissivity (m ² /day)	--
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limit (e.g EC, F, As, Fe)	Fluoride
	Type of water	Potable
12.	DYNAMIC GROUND WATER RESOURCES(2009)- in ham	
	Net Ground water availability	10357.88
	Net Annual Ground Water Draft	4042.86
	Projected Demand for Domestic and industrial Uses up to next 25 years	1633.37
	Stage of Ground Water Development	39.09%
13.	AWARENESS AND TRAINING ACTIVITY	-
	Mass Awareness Programmes organized	-
	Date:	-
	Place:	-
	No of participant :	-
	Water Management Training Programmes organized	1
	Date	22-02-13 to 23.02.2013
	Place	Saunda – D, Patratu block
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	1 (Ramgarh block)
	Number of Blocks notified	Nil
18	MAJOR GROUND WATER PROBLEMS AND ISSUES	Declining trend in some areas,

GROUND WATER INFORMATION BOOKLET RAMGARH DISTRICT

1.0 INTRODUCTION

1.1 Administrative Details

Ramgarh district is carved out of erstwhile district of Hazaribagh on 12th September 2007. The Latitude and Longitude of District Headquarter is 23^o 38' and 85^o 34' respectively. Ramgarh district has one Sub-division namely Ramgarh and four Block's namely Ramgarh, Gola, Mandu and Patratu.

The present boundary of Ramgarh district is - North – Hazaribagh district, South – Ranchi district, East– Bokaro and West - Hazaribagh district. The district headquarter is at Ramgarh town. It is situated on National Highway 33, about 46 Km away from state's capital, Ranchi on Northern side and 52 Km away from Hazaribagh on southern side. The total area of Ramgarh district is 1387 Sq.Km, out of which 394 Sq.Km is forest area. At present Ramgarh district comprises of six blocks namely: Ramgarh, Patratu, Gola, Mandu, Chitarpur and Dulmi. Ramgarh district has 351 revenue village and 145 panchayat.. According to the 2011 census Ramgarh district has a population of 949,443 Persons with urban population of 418,955 persons and the rural population of 530,488 persons.(Table 1). Ramgarh Coalfield covers an area of 98 square kilometres and has total coal reserves of 1,059.20 million tonnes.

Table 1: Administrative division of Ramgarh district:

Name of Block	Male	Female	TotalPopulation	SC		Total SCPopulation	ST		Total STPopulation
				Male	Female		Male	Female	
Ramgarh	85780	76041	161821	9314	8819	18133	12029	11807	23836
Gola	76765	73045	149810	6239	5873	12112	22013	21504	43517
Mandu	131486	121546	253032	18055	16960	35015	25970	25523	51493
Patratu	129469	118372	247841	16705	15286	31991	32921	31722	64643
Chitrapur	36737	33964	70701	1975	1819	3794	3634	3516	7150
Dulmi	33993	32245	66238	2698	2613	5311	5334	5193	10527
Total	494230	455213	949443	54986	51370	106356	101901	99265	201166

Source: Census India 2011

FIG-1 ADMINISTRATIVE MAP OF RAMGARH DISTRICT

85° 15'

85° 30'

85° 45'

23° 45'

23° 45'

23° 30'

23° 30'

85° 15'

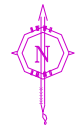
85° 30'

85° 45'


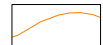
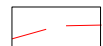


K.M. 5 0 5 10 K.M.



SCALE



LEGEND

-  State Boundary
-  Block Boundary
-  District Boundary
-  Block H.Q.
-  District H.Q.

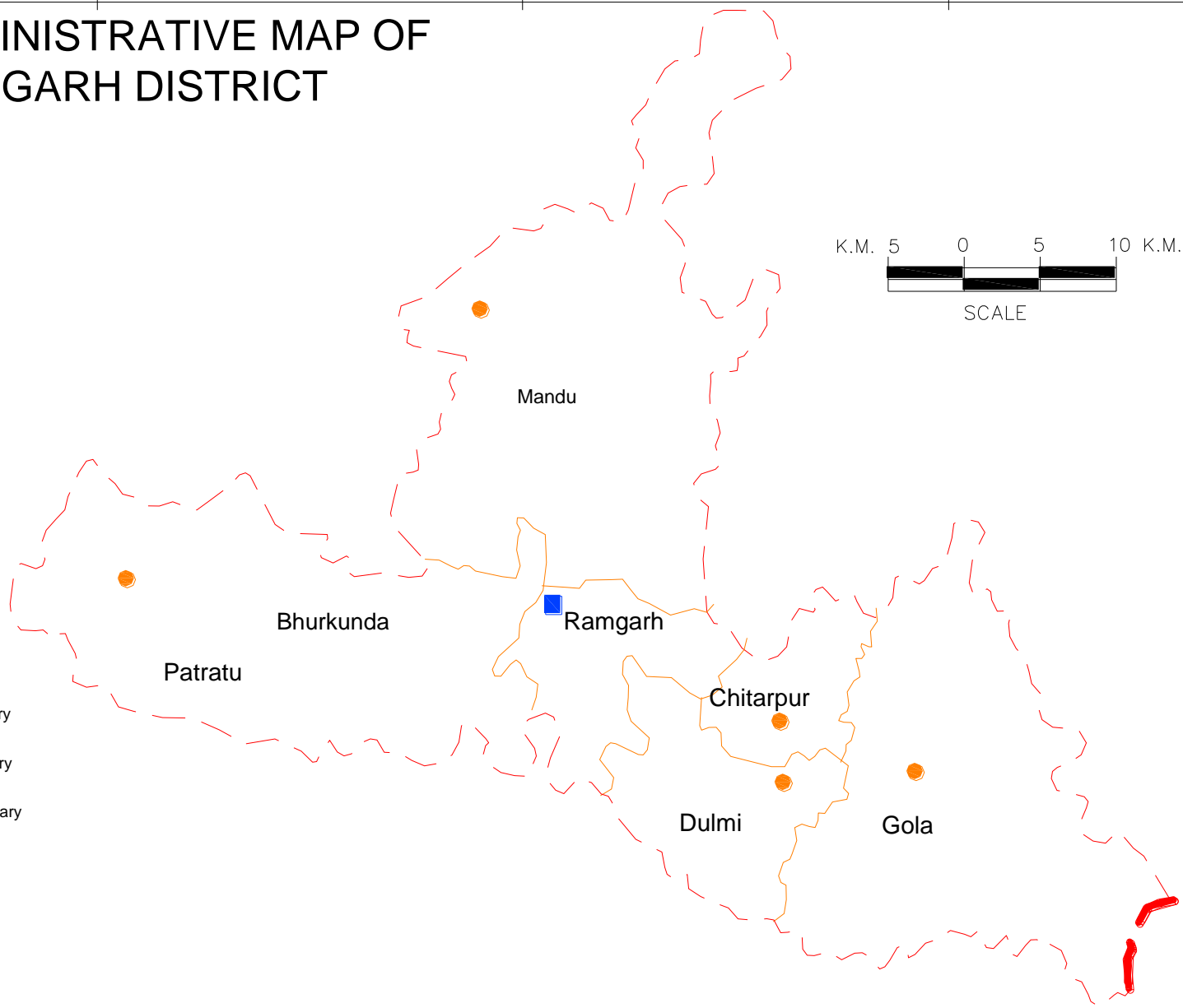
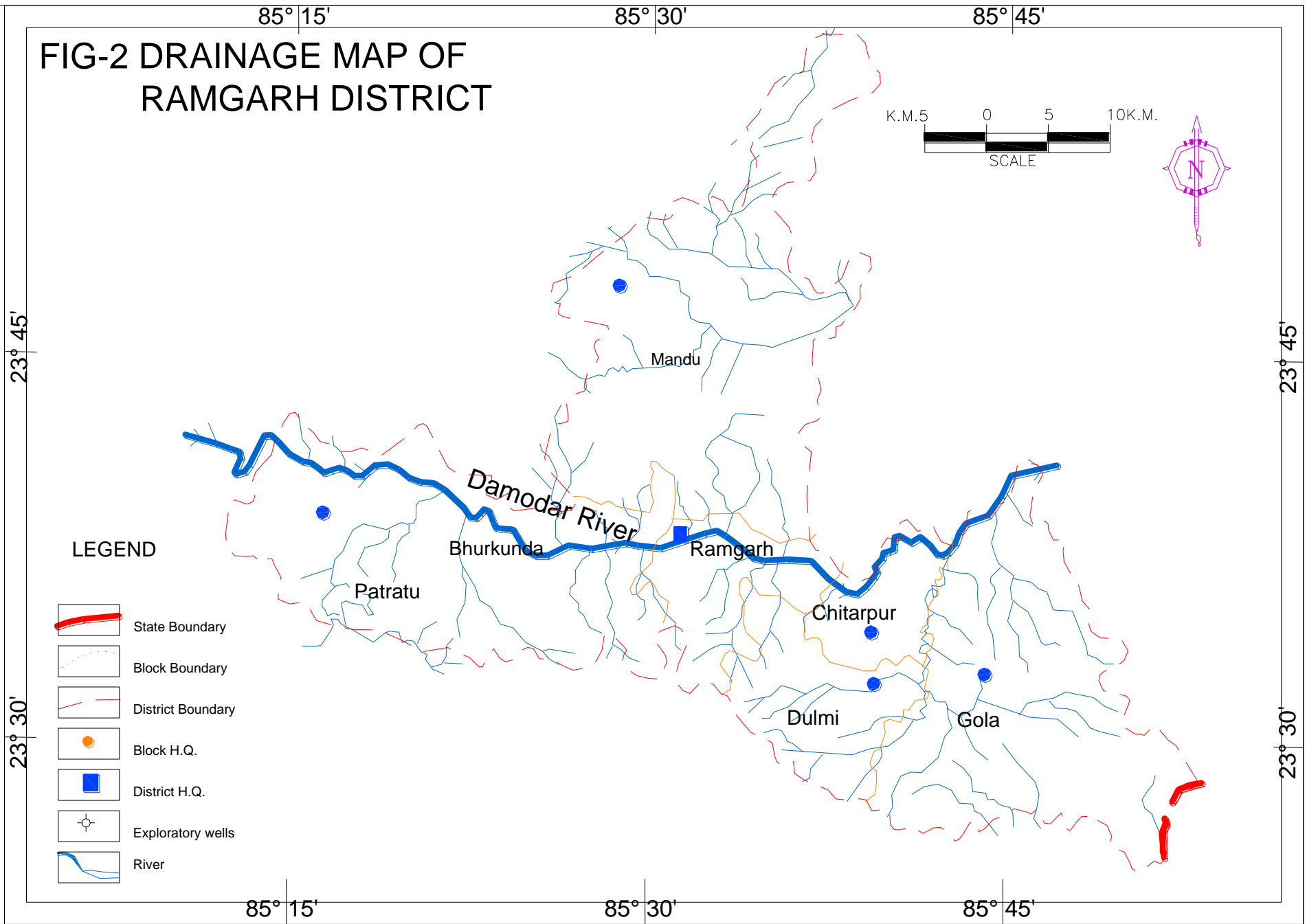


FIG-2 DRAINAGE MAP OF RAMGARH DISTRICT



1.2 Drainage

Damodar is the Main River of the district and it also forms a major river basin, comprising a number of tributaries. Important amongst them are: Naikari, Bhervi or Bhera and Bokaro river. Small Rivers are Hurhuri, Gomti, Barki, Kurum, Kochi, Sherbhuki, Dhobdhab etc. Subarnarekha River flows south eastern part of district. Tributaries of Subarnarekha are Kadamgara, Khatgara etc. (Fig-2)

1.3 Studies/Activities carried out by CGWB

Central Ground Water Board has carried out hydrogeological surveys and ground water exploration in the district. Ground water regime monitoring is carried out 4 times annually from 7 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 HYDROMETEOROLOGY

Three broad seasons in the district are:

1. The winter season, November to February.
2. The hot season, March to May.
3. The rainy season, June to October.

2.1 Rainfall

The average annual rainfall of the district is 1251.2 mm. More than 80% of the precipitation is received during the monsoon months.

2.2 Climate

The area lies in the sub-humid region of Chotanagpur Plateau and enjoys semi-extreme type of climate. The day temperature rises around 40°C during the summers and drops down to around 10°C during the winter.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

The district is a part of Chotanagpur plateau. Important physiographic regions of the district is Damodar Valley. Major area of the district comes under Damodar

Valley. Damodar Valley is bounded by Hazaribag Plateau in north and Ranchi Plateau in south. Ranchi and Hazaribag plateau is separated by East-West running Damodar valley. Barka Pahar (Marang Buru)^[20] 1049 meters high above sea level located along the Ramgarh-Ranchi border is probably the highest Peak and it also separate both district.

3.2 Soil

Mainly two type of soil found -Red Soil and Sandy loam. Three soil orders namely Entisols, Inceptisols and Alfisols were observed in the district

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The district is having varied hydrogeological characteristics due to which ground water potential differs from one region to another. It is underlain by Chotanagpur granite gneiss of pre-Cambrian age in three-fourth of the district.

Aquifer systems---Two types of aquifers are found. Weathered aquifer and fractured aquifers. Thickness of weathered aquifers varies from 10-20 m in granite terrain and 30-60m in lateritic terrain. In weathered aquifer ground water occurs in unconfined condition while in fractured aquifer ground water occurs in semi confined to confined condition.(Fig-3)

4.2 DEPTH TO WATER LEVEL

Central Ground Water Board has established network of observation wells for monitoring of groundwater level to know the behavior of ground water regime in the district. There are seven monitoring stations which are monitored every year in January, May, August & November.

During pre-monsoon season the minimum and maximum water level were observed as 2.25 mbgl at Barwatola and 11.19 mbgl at Bhurkunda respectively. The water level during the post-monsoon season of the district ranges from 1.6 to 5.9 mbgl. The pre-monsoon and post-monsoon depth to water level has been presented in figure-4 & 5, Table 2.

TABLE: 2 DEPTH TO WATER LEVEL OF NHS OF RAMGARH DISTRICT DURING THE YEAR OF 2012 – 2013

SI No.	Location	May '2012 (mbgl)	August '2012 (mbgl)	November '2012 (mbgl)	January '2013 (mbgl)
1	Barkakhana	4.34	1.60	2.50	3
2	Barwatola	2.25	1.00	1.60	1.8
3	Chitarpur	---	1.1	2.60	3.1
4	Gola	9.58	3.90	5.90	7.2
5	Bhukunda	11.19	--	--	--
6	Mandu	7.07	3.10	4.00	4.8
7	Ramgarh1	6.62	5.10	4.50	5.3

4.3 Water Level Trend

Water level depends upon the storage of ground water development and variation in rainfall over a long period. The water level data of each station has been analysed. The pre monsoon and post monsoon long term water level trend has been calculated for the period of 2003 – 2012 (Table 4). The long term water level trend is showing declining trend between 0.120 – 0.361, 0.017 – 0.966 and 0.105– 0.236 m/ year for pre monsoon, post monsoon and all period respectively. The data is presented in table-3.

TABLE 3: LONG TERM WATER LEVEL TREND FOR EXISTING HYDROGRAPH NETWORK STATIONS IN RAMGARH DISTRICT (2003 – 2012)

SI No.	Location	Pre monsoon trend (m/year)		Post monsoon trend (m/year)		All period (m/year)	
		Rise	Fall	Rise	Fall	Rise	Fall
1	Barkakhana	0.130902	-	-	0.017044	0.023708	-
2	Barwatola					0.887323	-
3	Chitarpur					0.247302	-
4	Gola	-	0.265455	-	0.366167	-	0.174324
5	Mandu	0.216907	-	-	0.071833	0.014737	-
6	Rajrappa	-	0.361325	-	0.432828	-	0.105296
7	Ramgarh	-	0.120714	-	0.966781	-	0.236389

FIG-3 HYDROGEOLOGY MAP OF RAMGARH DISTRICT

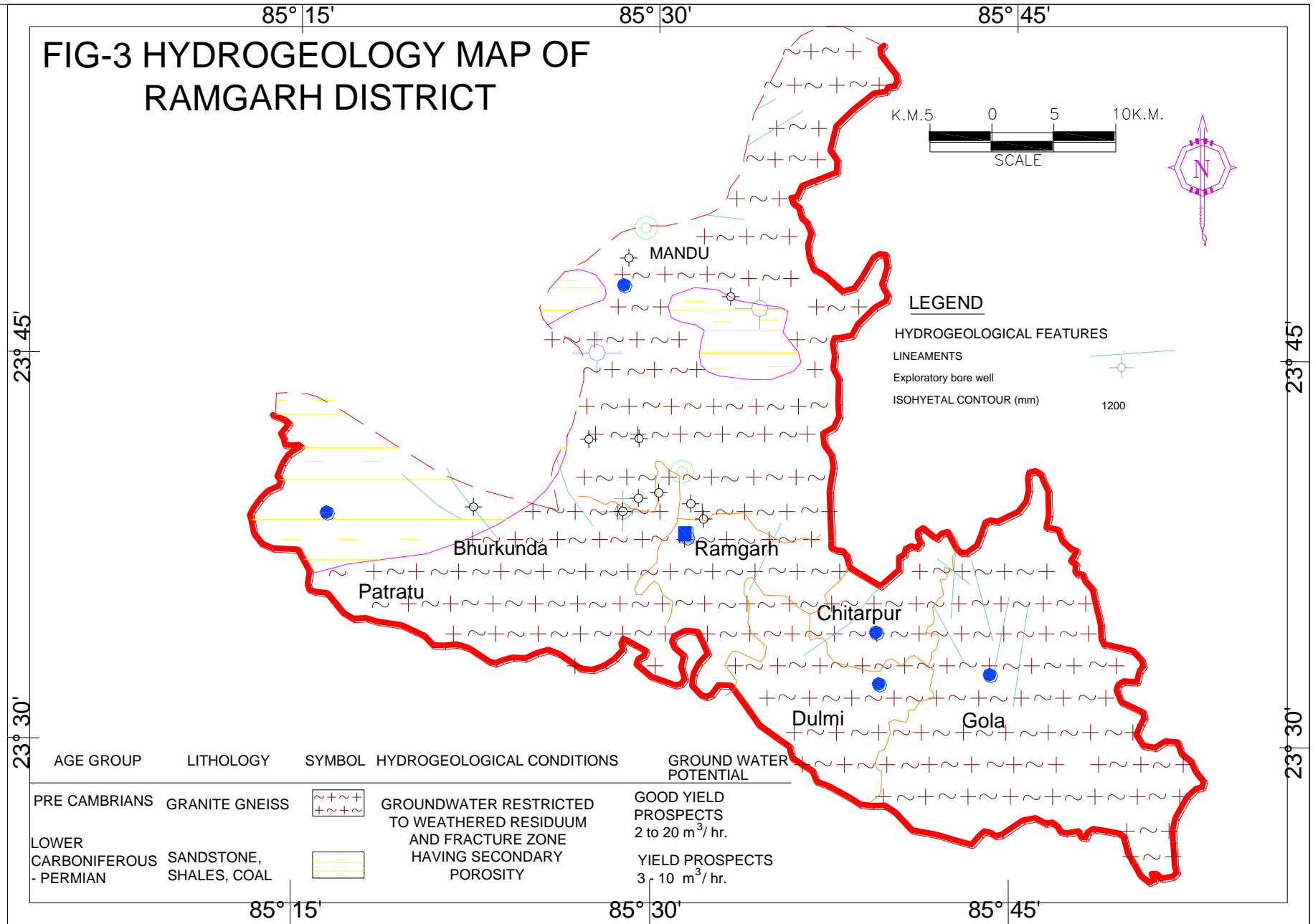


FIG-4 PRE MONSOON DEPTH TO WATER LEVEL (2012) MAP OF RAMGARH DISTRICT

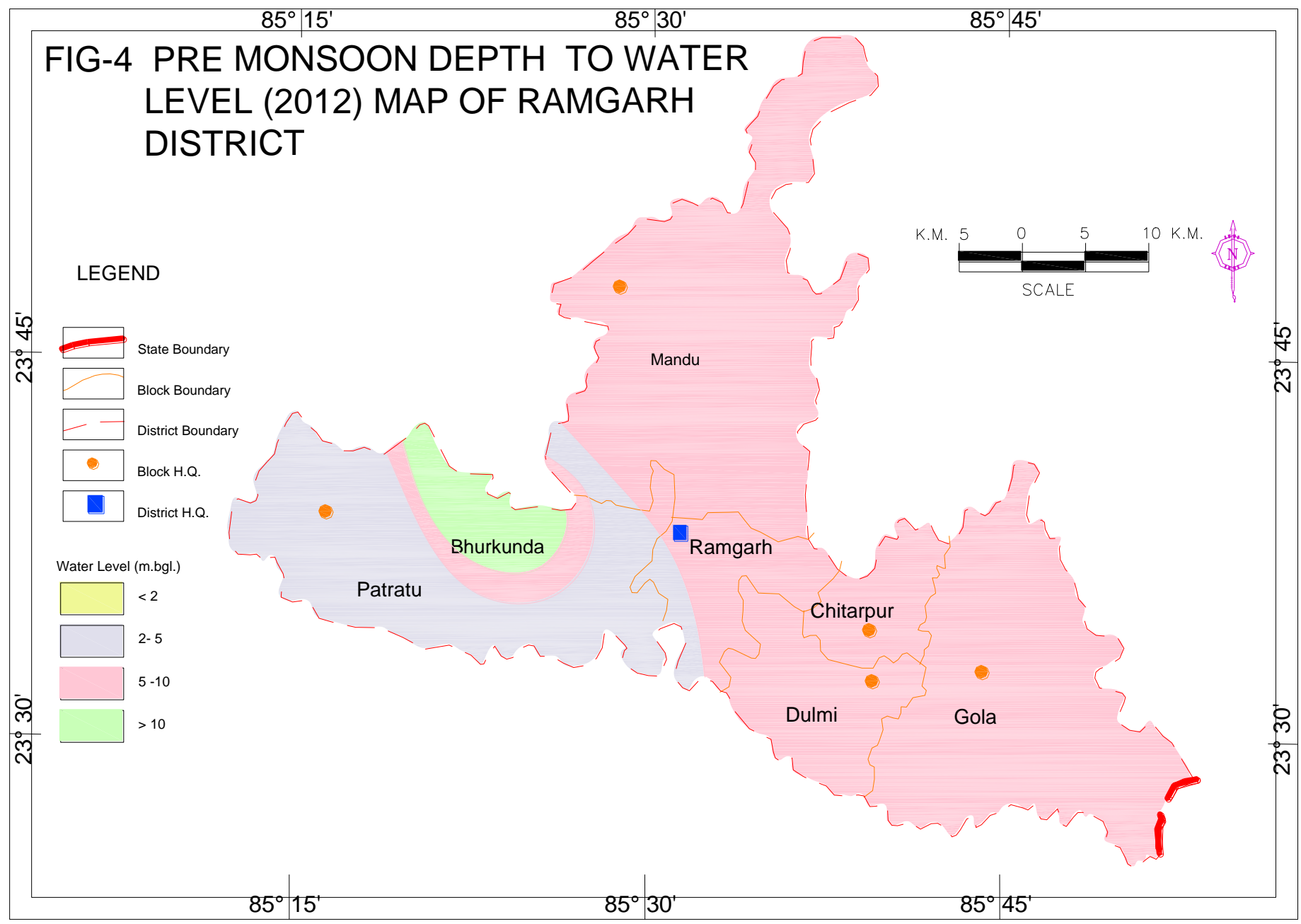
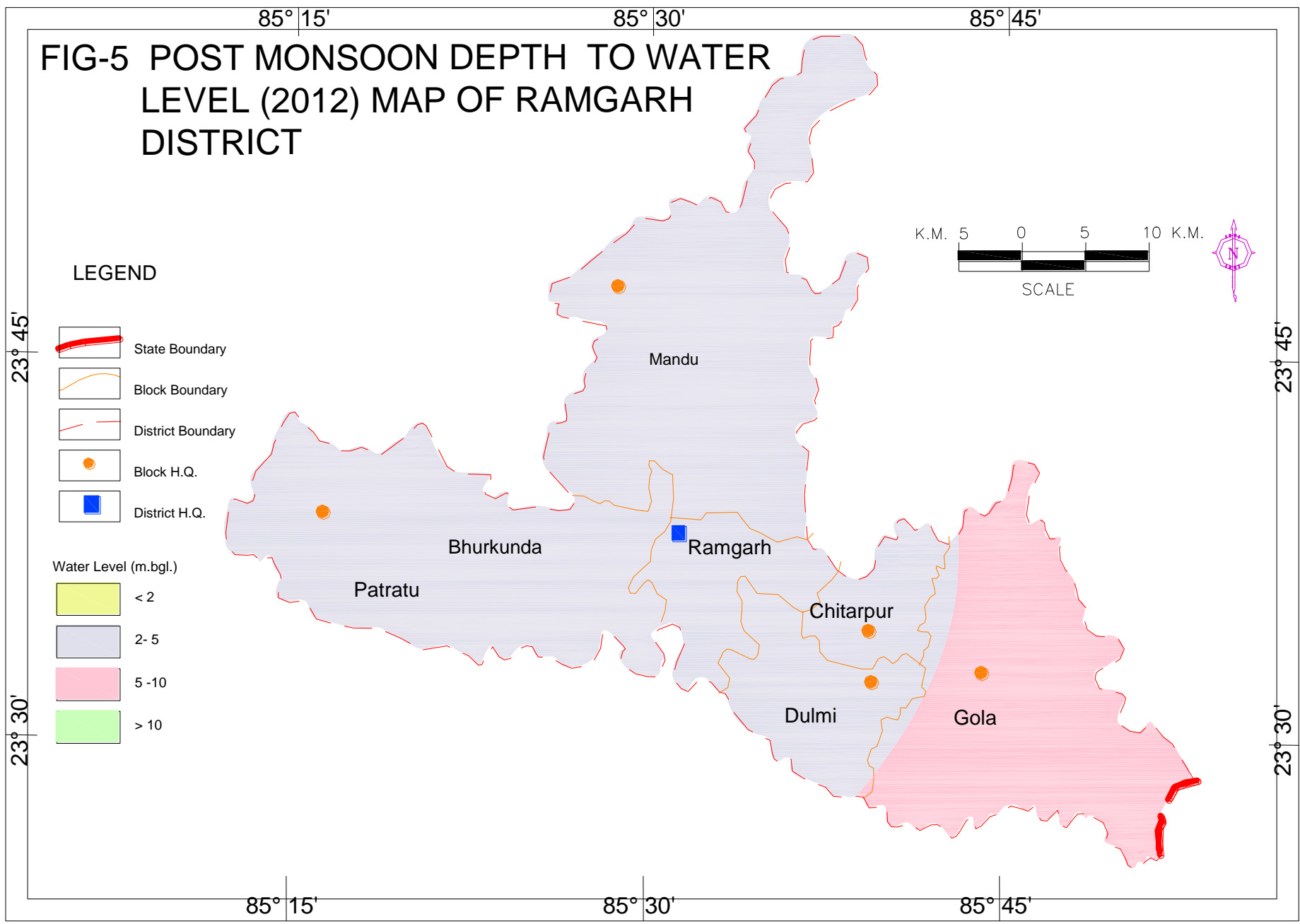


FIG-5 POST MONSOON DEPTH TO WATER LEVEL (2012) MAP OF RAMGARH DISTRICT



4.4 Aquifer Parameters

Central Ground water Board has altogether drilled 17 no. of exploratory wells and 2 no. of observation wells in the district. Depth of drilling vary between 61-199 mbgl. Ten wells were drilled in Chotanagpur granite gneiss and seven wells were drilled in Gondwana formation. Thickness of weathered formation vary between 4 – 18 m. Highest weathered thickness was observed in Bhurkunda, Patratu block. Discharge of wells vary between 1.5 – 32.15 m³/hr. Highest discharge observed at Ramgarh exploratory well was 32.5 m³/hr. Static water level varies between 3.00 m -17.9 m 1 – 4 sets of fractures were encountered between 22 and 176 m The summarised hydrogeological data of exploratory drilling in the district has been given in table-4.

4.5 Ground Water Quality

Ground water in the phreatic aquifers in Ramgarh district is alkaline in nature as pH ranges between 7.11 – 7.97 in five samples out of six samples. The specific electrical conductance of ground water in phreatic zone during May 2011 was in the range of 604 - 1238 μ S/cm at 25°C. The chemical concentration of these constituents, are presented in Table-5

4.6 Ground Water Resource

As per the latest resource estimation carried out following GEC 97 methodology, the overall stage of ground water development in Ramgarh district is 39.03% indicating sufficient scope of development. Net ground water availability is 10357.88 ham whereas total draft 4042.86 ham. All blocks are under safe category except Ramgarh block which categorized as critical block with 94.29% stage of development . (Fig-6)).The ground water resource of Ramgarh district is shown in the table-6.

Table-4 Summarised hydrogeological data of exploratory drilling of Ramgarh district

Sl.No.	Location/	Block	Depth Drilled	Length of Casing pipe/Depth const.	Granular/Zone/ fracture Tapped	Static Water level	Discharge	Drawdown	Specific Capacity	Transmissivity	Formation	Year
			mbgl.	m.	m.	m. bgl.	m ³ /hr.	m.	m ³ /hr./m.	m ² /day		
1	PRC, Ramgarh EW	Ramgarh	124.24	6.6	-		Low discharge	-	-	-	CGG*	Jun-98
2	RAMGARH SRC-I	Ramgarh	61.86	5.15	044.00-046.00	5.1	32.15	-	134.54	-	CGG	Jun-98
	EW1				049.00-051.00							
					056.00-058.00							
3	RAMGARH SRC-II	Ramgarh	82.18	7.6	020.00-025.00	5.26	31.03	-	115.57	-	CGG	Jul-98
	EW2				035.00-037.00							
					069.00-071.00							
4	HANUMAN TEMPLE SRC,EW	Ramgarh	120.3	10	022.00-024.00	5.12	9	-	25.51	-	CGG	Jun-98
					044.00-046.00							
					080.00-082.00							
					106.00-107.00							
5	IB, RAMGARH CANT	Ramgarh	120.3	5	037.00-038.00	3	Low discharge	-	-	-	CGG	Sep-98
	EW				052.00-053.00							
6	MANDU, PWD I.B. EW	Mandu	199.92	4.65			Low discharge				Gondwana	May-98
7	Mandu,bajar hat	Mandu										Mar-98
8	Ghato Banji EW	Mandu	201	17			6.4	5			Gondwana	Sep-02
9	HANSALONGA EW-1	Mandu	201				Abodoned				CGG	Oct-02
10	HANSALONGA EW-II	Mandu	174.45				Abodoned				CGG	Nov-02
11	PATEL NAGAR	Patratu	201	18	91-92,175-176	17.9	4.5	16.5	0.27	3	Gondwana	Sep-02
	BHURKUNDA, EW											
12	Tilaiya	Mandu	150.24	12			1.5				CGG	May-12
13	Orla(Topa),EW	Mandu	133.12	12			30.96				Gondwana	Jun-12
	Orla(Topa),OW		150.48	12			2.88				Gondwana	Jul-12
14	Lapanga	Patratu	150.48	9.5			2.88				Gondwana	Aug-12
15	Patel nagar,bhurkunda	Patratu	150.48	16.5			1.62				Gondwana	Sep-12
16	Siyal,CCL colony,EW1	Patratu	150.48	6.5			2.88				Gondwana	Sep-12
17	Siyal,CCL colony,EW2	Patratu	153.8	12			25.56				Gondwana	Nov-12
	Siyal,CCL colony,OW		153.89	12			25.56				Gondwana	Dec-12

*CGG - Chotanagpur Granite Gneiss

Table-5 Major chemical parameters of ground water samples of GWMS collected during May 2011

Sl.No.	Block	Location	E.C. micro	pH	CO ₃	HCO ₃	Cl	Ca	Mg	TH as	Na	K
			Siemens/cm							CaCO ₃		
			at 25o C		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	RAMGARH	Ramgarh	1238	7.53	0	400	198	64	43.74	340	124	1.6
2	PATRATU	Patratu	765	7.40	0	196	68	26	31.59	195	65	20
3	GOLA	Gola	604	7.91	0	105	60	40	17	170	25	0.5
4	RAMGARH	Barkakana	1102	7.65	0	197	106	46	54	295	102	0.5
5	GOLA	Rajrappa	710	6.57	0	105	121	44	19.44	190	61	12.71
6	PATRATU	Bhurkunda	800	7.11	0	209	63.81	26	51.03	275	42.26	20.15

FIG-6: STAGE OF GROUND WATER DEVELOPMENT IN RAMGARH DISTRICT, JHARKHAND (2009)

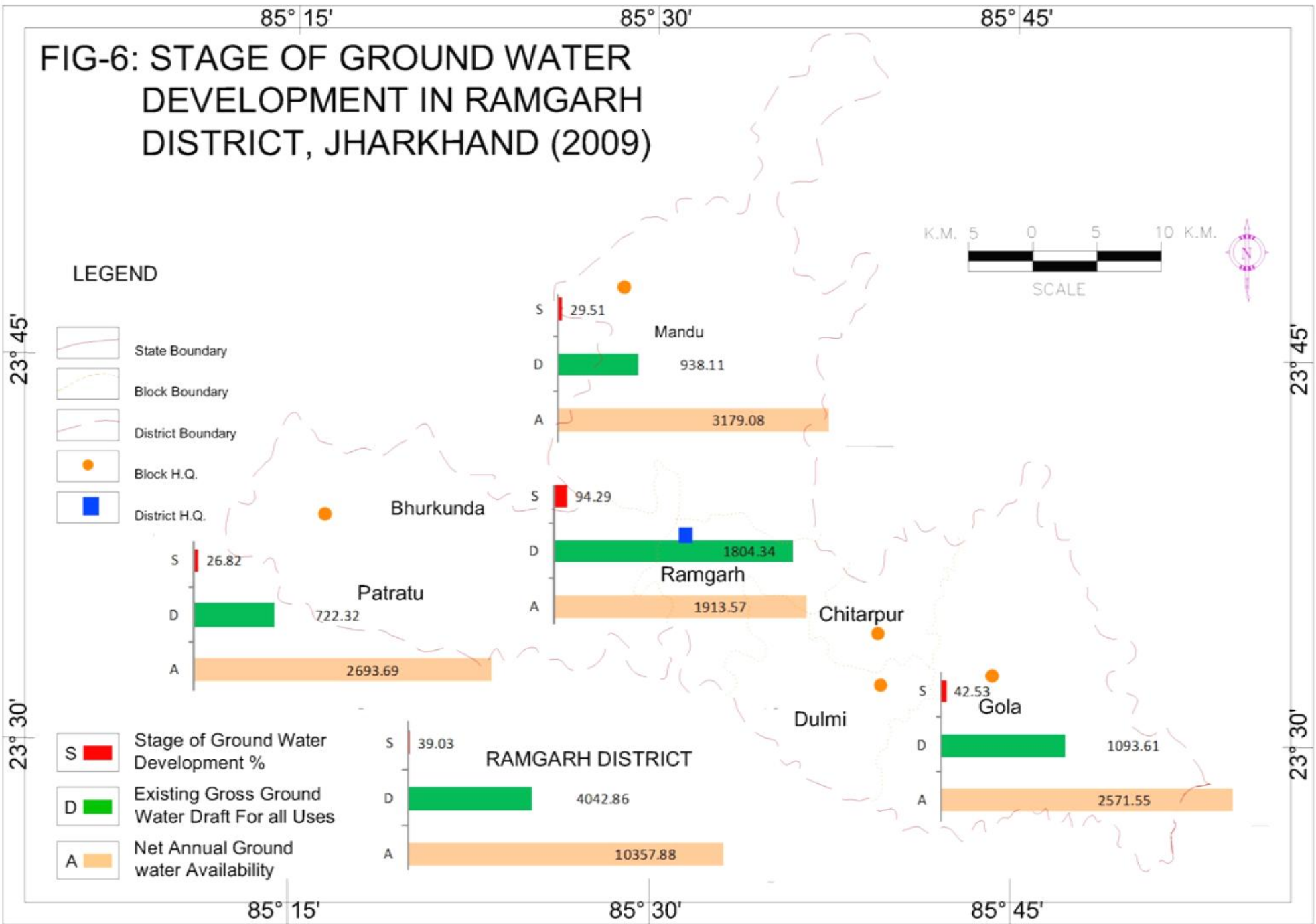


Table-6 : Dynamic Ground Water Resource of Ramgarh district as on 31st March 2009 as per GEC 97 (ham)

Assessment Unit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Suply	Existing Gross Ground Water Draft For all Uses	Allocation for Domestic and Industrial Requirement suply upto next 25 years	Net Ground Water Availability for future irrigation development	Stage of Ground Water Development (%)
Gola	2571.55	882.06	211.55	1093.61	316.86	1372.62	42.53
Mandu	3179.08	627.10	311.01	938.11	433.85	2118.13	29.51
Patratu	2693.69	453.56	268.76	722.32	402.56	1837.57	26.82
Ramgarh	1913.57	945.63	343.18	1804.34	480.10	487.83	94.29
TOTAL	10357.88	2908.35	1134.51	4042.86	1633.37	5816.16	39.03

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 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. Dug wells are in general of 2 m diameter and between 8 to 15 m depth, depending on the thickness of the weathered zone, tapping the shallowground water 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) are less susceptible to contamination from surface sources and ii) they 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 Ramgarh district the number of hand pumps drilled by PHED is 8743 of which 7310 are under working condition as on April 2012. There are 4290 dug wells, 8 shallow tube wells as per minor irrigation census 2006-07. 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.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Some of key ground water related issues are

- 1) Long term water level decline has been observed to the tune of 0.96m/year at Ramgarh block during post monsoon.
- 2) Locating suitable sites for bore wells
- 3) Suitable design of dug wells and hand pumps
- 4) Taking up artificial recharge projects to augment the resource availability in Ramgarh district
- 5) Optimal development of irrigation intensity by developing ground water available for future uses:
- 6) Creating public awareness for conserving ground water through awareness camps, NGO's and mass media

7.0 AWARENESS & TRAINING ACTIVITY

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

One two days three tier training programme was organized at Saunda – D, Patratu block, Ramgarh on 22.02. 2013 to 23.02.2013 in which over 115 persons participated.

8.0 AREA NOTIFIED BY CGWB/SGWA

None

9.0 RECOMMENDATIONS

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, proper selection of sites can be arrived at making use of 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 so designed that it penetrates the weathered zone as well as top part (1-2 m) of the underlying bed rock so as to derive the benefit 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 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 hydro-geophysical surveys. Sites for artificial recharge should be taken up if fractures are available and the depth of the recharge well should be governed by the depth of occurrence of fractures. De-saturated or partially de-saturated fractures / aquifers should be properly demarcated.