भूजल सूचना पुस्तिका
खूँटी जिला, झारखंड

Ground Water Information Booklet
Khunti District, Jharkhand State

High Yielding well at Block campus, Karra, Khunti

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
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Prepared By

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State Unit Office, Ranchi
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GROUND WATER INFORMATION BOOKLET OF KHUNTI DISTRICT, JHARKHAND STATE

CONTENTS

KHUNTI DISTRICT AT A GLANCE

Sl. No.	ITEMS		Statistics			
1.	GENERAL INFORMATION					
	i)	Geographical area (SqKm)	2611			
	Administrative Division (As on 2011)					
	i)	Number of Tehsil/ Block	6			
	ii)	Number of Panchayat/Villages	86/768			
	iii)	Population (As on 2011 Census)	531885			
	iv)	Average Annual Rainfall (mm)	1111			
2.	GEOMORPHOLOGY					
	Major physiographic unit:		Hills, Plateau			
	Major Drainages:		Tajna, Banai, Chata and Karo			
3.	LAND USE (Sq. Km)					
	a)	Forest area:	1289.63			
	b)	Net area sown:	647.49			
	c)	Fallow Land:	490.26			
	d)	Area not suitable for culivation	116.85			
4.	MAJOR SOIL TYPE		Alfisols/Ultisols			
5.	AREA UNDER PRINCIPAL CROPS (2010-2011)		Crops	Area (HA)	Production (MT)	Productivity (KG/HA)
			Rice	70000	320946	4585
			Wheat	2771	5536	1998
			Pulses	14405	12556	5213
			Oilseeds	6808	3690	3711
			Maize	4302	6191	3251
6.	IRRIGATION BY DIFFERENT SOURCES (Number of Structures) 4th MI census		Numbers		Potential utilized (Area in ha)	
	Dugwell		6463		4207	
	Tubewell / Borewell		41		43	
	Other sources		762		1107	
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2012)					
	No of Dug wells		5			
	No of Piezometers		NIL			
9.	HYDROGEOLOGY					
	Major Water bearing formation		Chotanagpur Granite Gneiss, Older alluvium, Laterite			
	(Pre-monsoon Depth to water level during 2012) m bgl.		4.09 - 10.15			
	(Post-monsoon Depth to water level during 2012) m bgl.		2.73 – 6.06			
	Long term water level trend in 10 yrs (2003 - 2012) in m/yr		Rise	0.04 – 0.52		
			Fall	0.07 – 0.41		

10.	GROUND WATER EXPLORATION BY CGWB (As on 31-07-2007)	
	No of wells drilled (EW, OW, PZ, SH, Total)	10 (EW), 3(OW)
	Depth range (m)	90-200
	Discharge (m^3/hr)	5.4 - 69.84
	Storativity (S)	--
	Transmissivity (m^2/day)	--
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limit (e.g EC, F, As, Fe)	--
	Type of water	Potable
12.	DYNAMIC GROUND WATER RESOURCES(2009)- in ham	
	Net Ground water Resources	14359.58
	Net Annual Ground Water Draft	4058.84
	Projected Demand for Domestic and industrial Uses up to next 25 years	962.75
	Stage of Ground Water Development	28.26%
13.	AWARENESS AND TRAINING ACTIVITY	-
	Mass Awareness Programmes organized	01
	Date:	17.02. 2012
	Place:	S.S.+2 High School, Khunti
	No of participant :	150
	Water Management Training Programmes organized	-
	Date	-
	Place	-
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	Declining trend in some areas

GROUND WATER INFORMATION BOOKLET
KHUNTI DISTRICT

1.0 INTRODUCTION

1.1 **Administrative Details**

On September 12, 2007, it was carved out of Ranchi District as the 23rd district of Jharkhand. Earlier it was a Sub-division of Ranchi District. Khunti district spreading over an area of 2611 sq.km with it's headquarter at Khunti. The district is divided into 6 blocks namely i) Karra ii) Khunti iii) Arki iv) Torpa v) Murhu and vi) Rania.(Fig-1) The district is bounded in the north by Ranchi, in the south by West Singhbhum and Simdega districts and east by Saraikela-Kharsawan, and part of Ranchi district, in the west by part of Gumla and Simdega districts . The total population of Khunti district as per the 2011 census is 5,31,885 persons with urban population of 44,982 persons and the rural population of 4,86,903 persons.(Table 1)

Table 1: Administrative division of Khunti district*:*

Block	Panchayat	Villages			Population		
		Inhabited	uninhabited	Total	Total	Rural	Urban
Rania	7	66	1	67	39349	39349	--
Murhu	16	141	0	141	85486	85486	--
Torpa	16	95	0	95	92991	84399	8592
Karra	19	178	0	178	109082	109082	--
Khunti	12	158	1	159	124388	87998	36390
Arki	16	127	1	128	80589	80589	--
	86	**765**	**3**	**768**	531885	486903	44982

1.2 Drainage

The drainage of the district is mainly controlled by the Major rivers flowing in the district are Tajna, Banai, Chata and Karo.(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 5 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

2.1 Rainfall

The district falls under unassured rainfall zone and hence receives monsoon rainsduring June to September. The average annual rainfall of the district is 1111 mm More than 80% of the precipitation is received during the monsoon months.

2.2 Climate

The district is characterized by warm climate in March to June and later on there is a gradual decline in temperature from October onwards to December. January is the coolest month of the year. March, April and May are the hot and dry months of the district. The district witnesses dust storms between March and June associated with low humidity, high temperature and fast blowing wind. During winter season the district records temperature between 7 to 21 degrees centigrade.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

The northernmost and southernmost parts of the district are covered with hillocks and forests. Altitude of the area varies from 500m to 700m above mean sea level in general. There are many hillocks through the district having altitude 700m above mean sea level. The District is the part of Chotanagpur plateau.

3.2 Soil

The soils of the district are mostly of the residual type. High temperature and high rainfall have led to the formation of lateritic type of soils from rocks of Archean metamorphic complex exposed in the greater part of the district. Texturally the soils of the district have been classified into four classes-

1. Stony and gravelly soils--- These are low grade soils having a large admixture of cobbles, pebbles and gravels generally found at the base of the hills.

2. Red and yellow soils: - This soil is formed by the decomposition of crystalline metamorphic rocks like granite- gneiss etc. These rocks contain mineral particles

like biotite, hornblende and iron. Higher areas have soils with light red color but the lower areas have relatively dark color. It lacks nitrogen, Phosphorus acid and humus. Potash and lime are sufficiently found.

3. Lateritic soils: - The soil has dark red or brown colour, It has high iron content and has been formed by the process of lateritisation of the weathered material in the favourable climate and topography.

4. Alluvial soils: - River channels in the district are covered with alluvial soils consisting mainly of coarse sand and gravel mixed with silt and clay. Soil thickness depends upon the topographical control.

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 10-25 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)

Aquifer geometry---- The aquifer geometry for shallow and deeper aquifer has been established through hydro geological studies, exploration and the surface and sub-surface geophysical studies in the district.

FIG: 1 ADMINISTRATIVE MAP KHUNTI DISTRICT, JHARKHAND

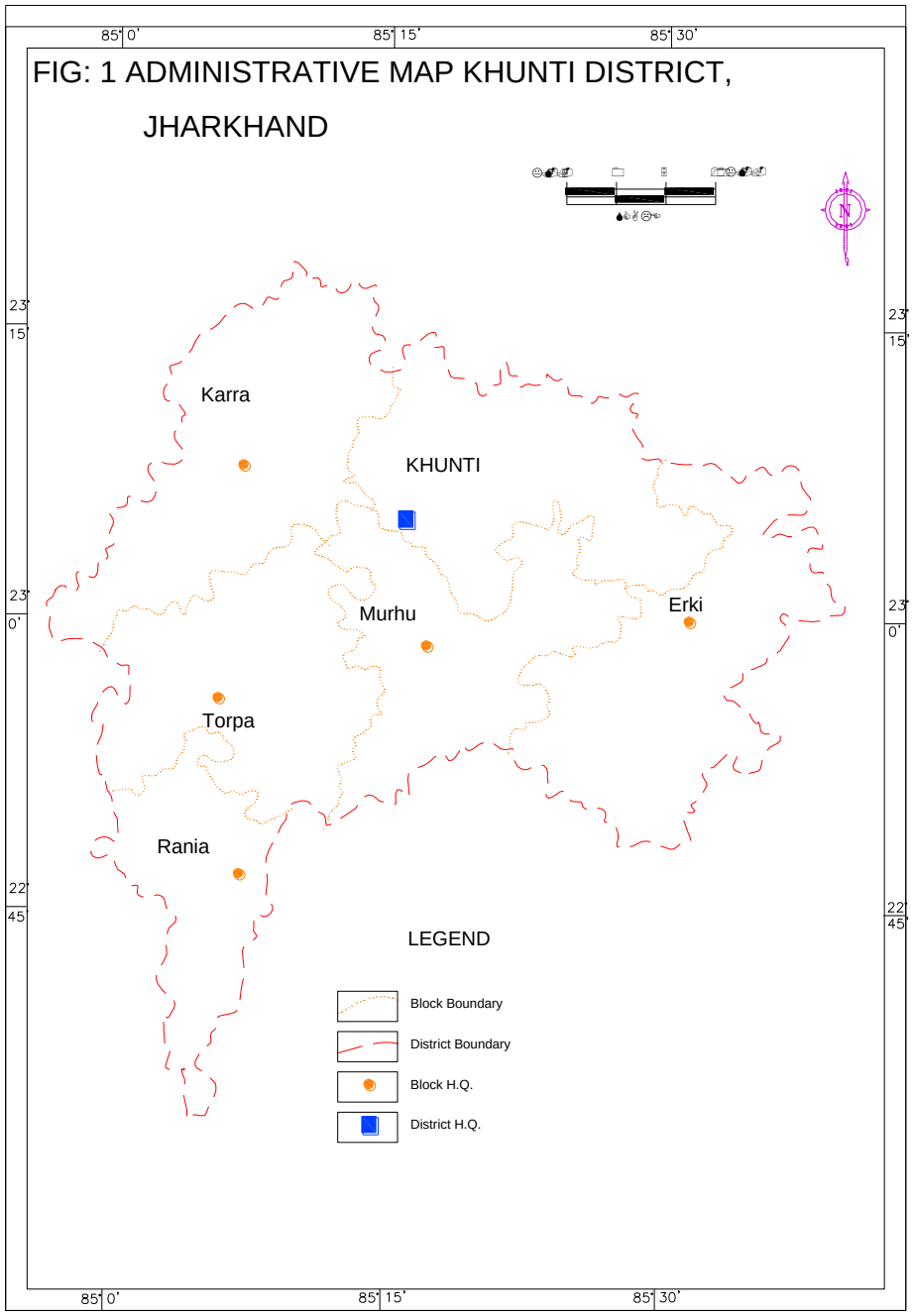
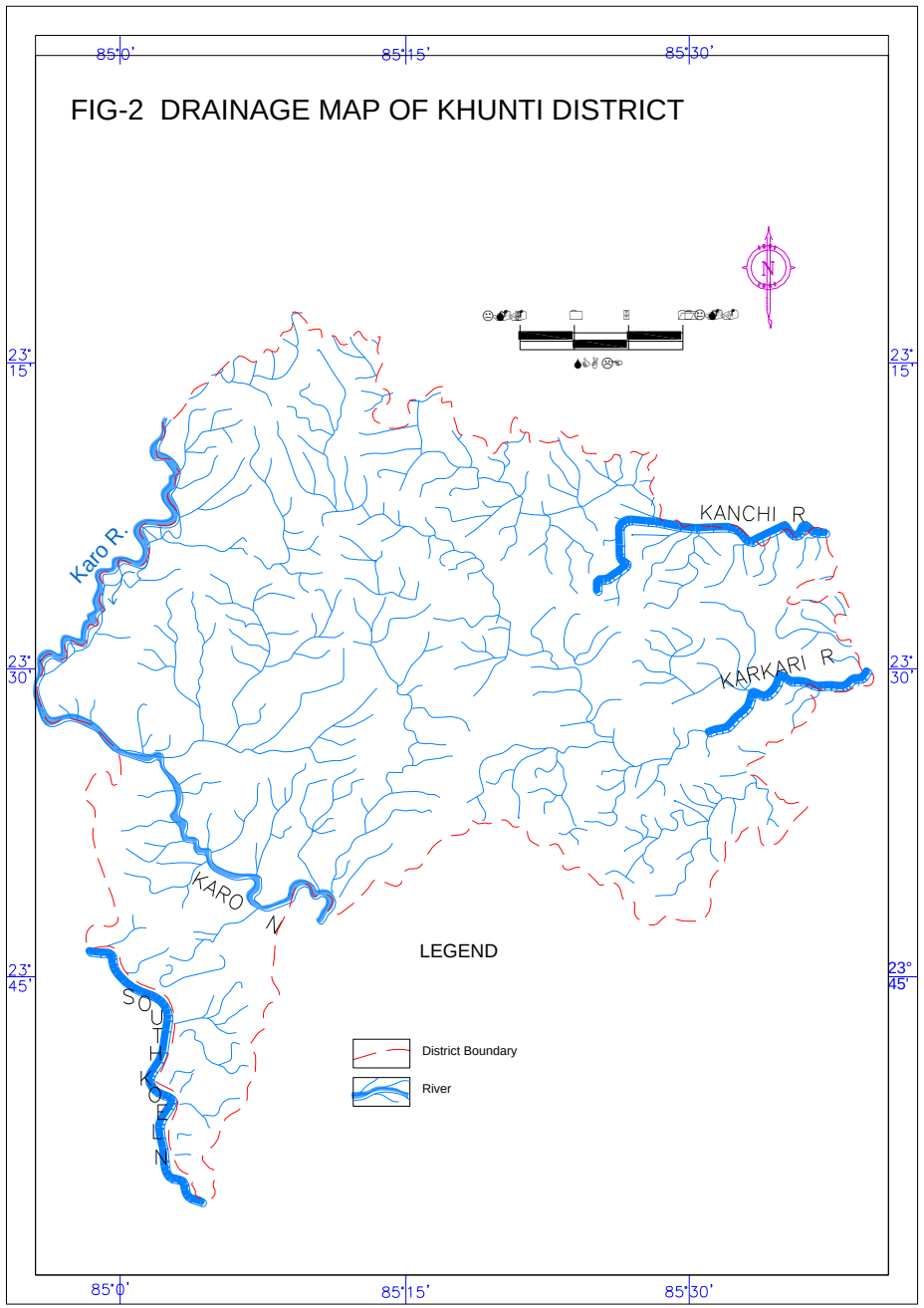


FIG-2 DRAINAGE MAP OF KHUNTI DISTRICT



Shallow aquifer—The shallow aquifers are being tapped through dug wells, dug -cum borewells and hand pumps. The thickness of weathered mantle varies from 5 to 20 m.bgl. In lateritic terrain many dug wells dry up during summer months. Hand pumps generally tap first fracture zones and its depth is 30-40 m.bgl.

Deeper aquifer—In granite gneiss terrain area first fracture occurs between 50-70 m and second fracture is found between 100-120 m depth. Discharge of borewells varies between 10 to 30 m3/hr in these areas. Drawdown varies between 13 to 20 m. Discharge may vary between 15 to 25 m^3/hr. Drawdown may vary between 20-25 m.

4.2 DEPTH TO WATER LEVEL

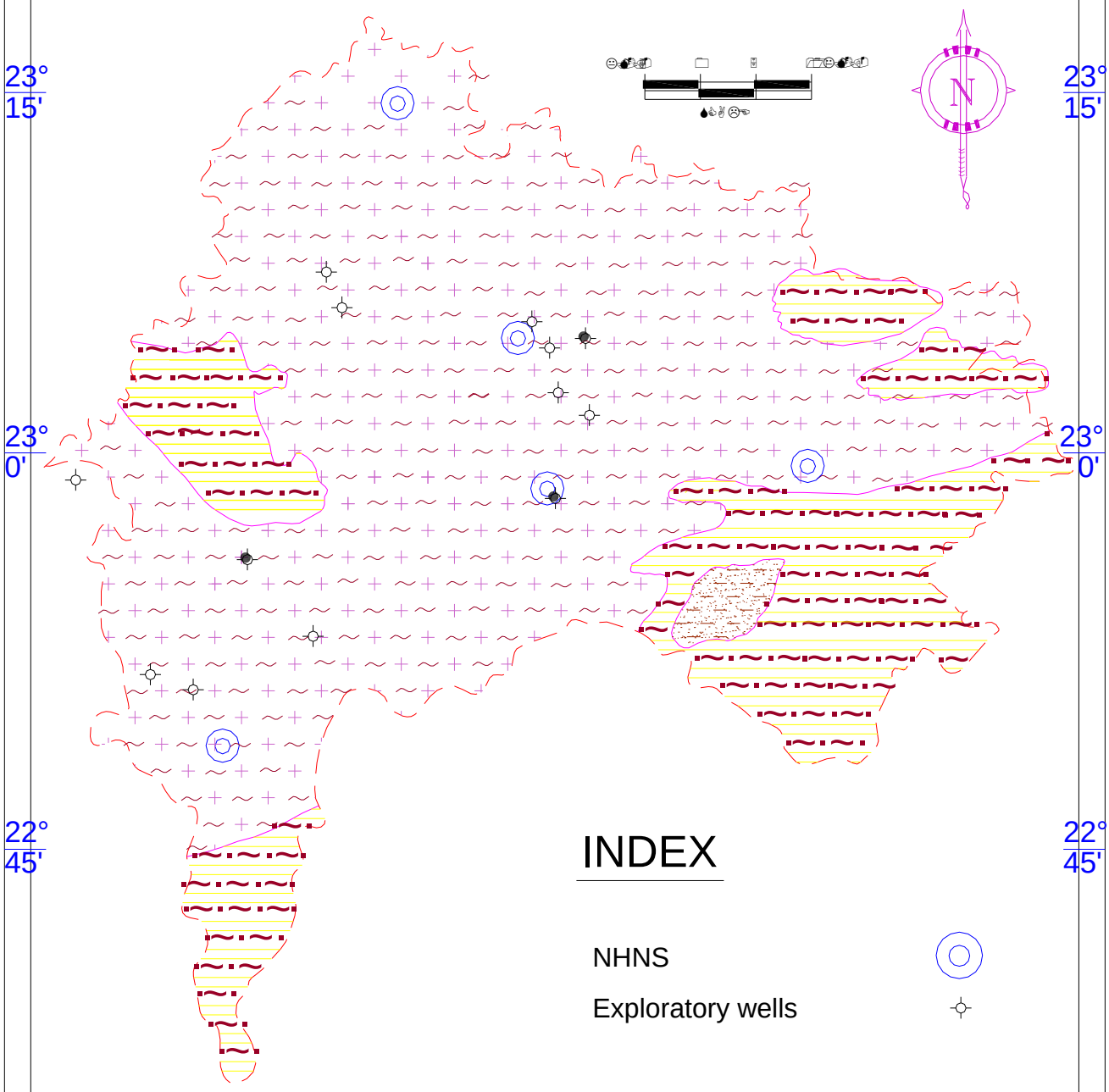
Central Ground Water Board has established network of observation wells for monitoring of groundwater level to know the behavior of ground water regime in the district. There are five monitoring stations which are monitored every year in January, May, August & November.

During pre-monsoon season the minimum and maximum water level were observed as 4.09 mbgl at Murhu and 10.15 mbgl at Kalimati respectively. The water level during the post-monsoon season of the district ranges from 2.73 to 6.06 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 KHUNTI DISTRICT DURING THE YEAR OF 2012 – 2013

Sl No.	Location	May '2012 (mbgl)	August '2012 (mbgl)	November '2012 (mbgl)	January '2013 (mbgl)
1	Dorma	6.3	2.20	3.35	4.25
2	Kalimati	10.15	1.30	4.48	5.24
3	Karra	10.2	4.08	6.06	7.02
4	Khunti	10.15	3.52	3.76	5.34
5	Lodma	4.89	1.01	2.73	3.53
6	Murhu	4.09	4.93	5.05	4.32
7	Torpa	9	5.68	5.37	6.38

FIG-3 HYDROGEOLOGY MAP OF KHUNTI DISTRICT



Formation	Age	Lithology	Symbol	Hydrogeological condition	Ground water prospects
Unconsolidated formation	Quaternary	Older alluvium (Sand,Silt,clay and gravel)		Discontinuous along river courses (unconfined)	Moderate yield prospects upto 10 m^3/hr.
Consolidated formation	Pre-cambrian	Quartzite, Shale and schist		Ground water restricted to weathered residuum & secondary porosity	Limited yield prospects (1-10 m^3/hr.)
Consolidated formation	Archean	Gneissic complex		Ground water restricted to weathered residuum & secondary porosity	Moderate yield prospects upto 25m^3/hr.

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 0.013 – 0.319, 0.192 – 0.196 and 0.103– 0.187 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 KHUNTI DISTRICT (2003 – 2012)

Sl No.	Location	Pre monsoon trend (m/year)		Post monsoon trend (m/year)		All period (m/year)	
		Rise	Fall	Rise	Fall	Rise	Fall
1	Karra	-	0.09097	0.140806	-	0.166749	-
2	Kalimati	-	0.31913	-	0.192167	-	0.18714
3	Khunti	0.527432	-	0.045714	-	0.412883	-
4	Lodma	0.046417	-	0.095069	-	0.071974	-
5	Murhu	-	0.012667	-	0.196167	-	0.103917

4.4 Aquifer Parameters

Central Ground water Board has altogether drilled 10 no. of exploratory wells and 3 no. of observation wells in the district. Depth of drilling vary between 83-200mbgl.Thickness of weathered formation vary between 4-21m Highest weathered thickness was observed in Khunti block. Discharge of wells vary between 5-69.4 m^3/hr Highest discharge observed at Kunjla exploratory well was 69.4 m^3/hr Block campus Torpa has discharge of 28.8 m^3/hr and Block campus Kerra has discharge of 37.8 m^3/hr Water level varies between 3.79 m-10.82 m Fractures were encountered between 20-25m,50-51m,60-62m,100-101m,109-110m,114-116m and 122-123m Transimmitivity value of Kunjla site is 35m2/day while Storativity value is 4.9*10-4.It shows that aquifer is confined in nature.The summarised hydrogeological data of exploratory drilling in the district has been given in table-4.

FIG-4 PRE MONSOON DEPTH TO WATER LEVEL (2012)

MAP OF KHUNTI DISTRICT, JHARKHAND

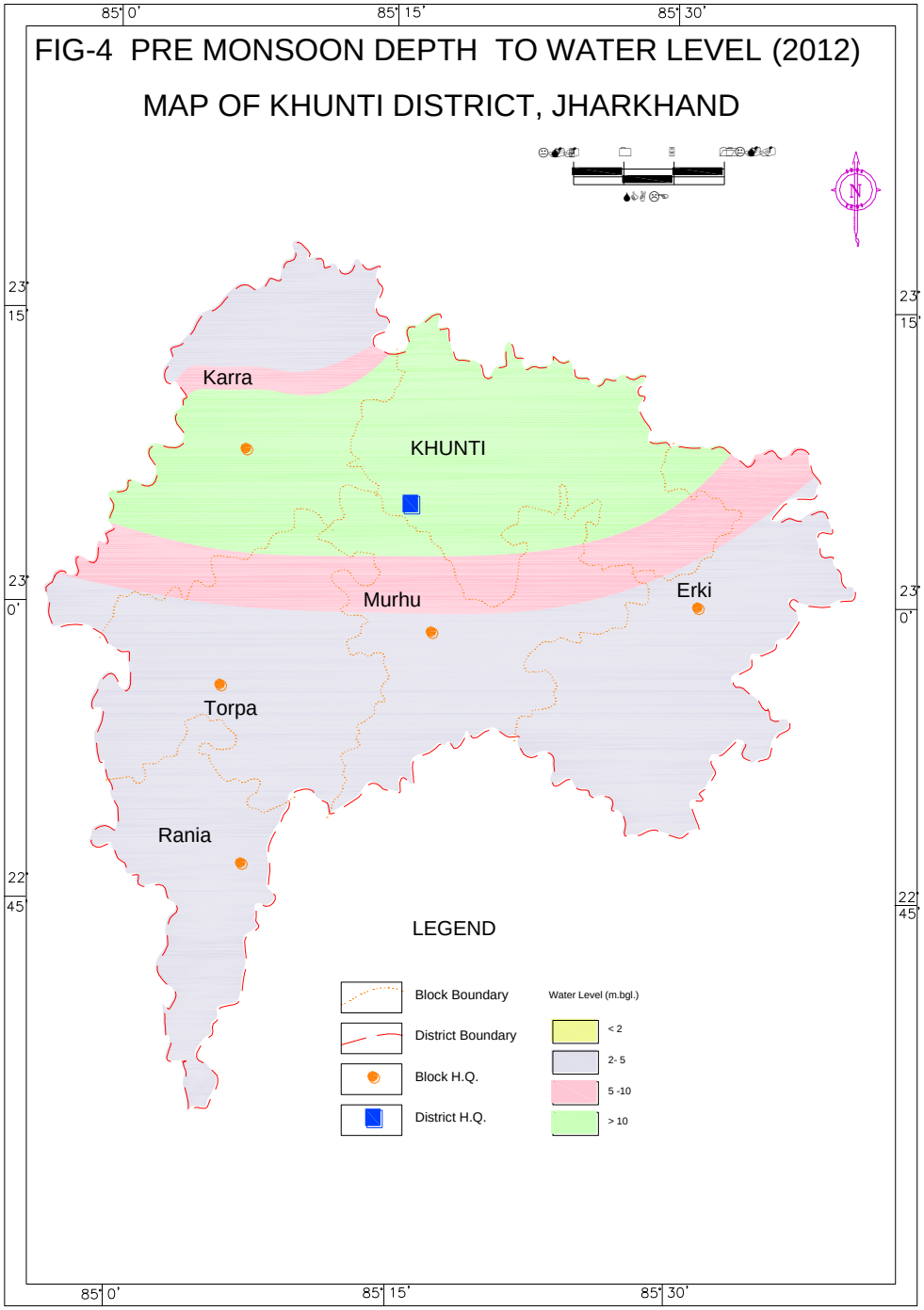


FIG-5 POST MONSOON DEPTH TO WATER LEVEL (2012)

MAP OF KHUNTI DISTRICT, JHARKHAND

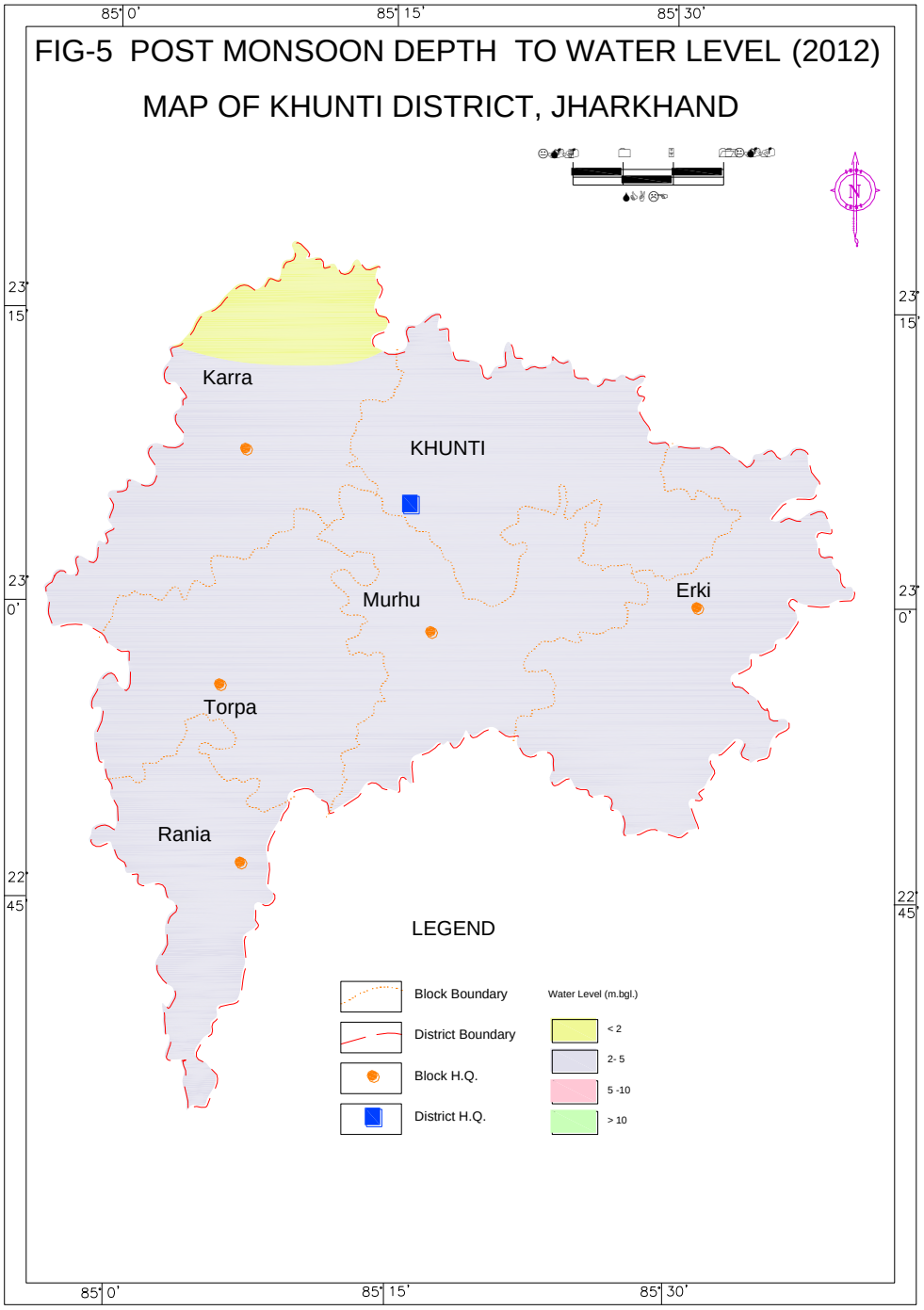


Table-4 Summarised hydrogeological data of exploratory drilling of Khunti district

Sl No	Location	Block	Co-ordinate	Depth Drilled	Length of Casing pipe	Granular Zone / fracture Tapped	Static Water level	Discharge	Drawdown	Specific Capacity	Transmissivity	Storativity	Dia. of assembly	Formation	Year
				mbgl.	m	m	m bgl	m^3/hr	m	$m^3/hr/m$	m^2/day		mm		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
EXPLORATORY WELLS DRILLED BY DEPARTMENTAL RIGS															
1	Khunti Judges Colony, E.W.	Khunti	23°05'30" 85°16'25"											Chhotanagpur Granite Gneiss	2010-11
2	Karra Block Campus, E.W	Karra	23°07'40" 85°07'25"	123.60	9.88	100-101, 114-116	10.82	37.8					175	Chhotanagpur Granite Gneiss	2011-12
	Karra Block Campus, O.W	Karra	23°07'40" 85°07'27"	117.50	11.02	24-25, 109-110,	10.82	37.8					175	Chhotanagpur Granite Gneiss	2011-12
3	Kumhari EW	Karra	22°57'00" 84°49'00"	90.46			5.44	21.39					203	Chhotanagpur Granite Gneiss	1977
4	Konbir EW	Rania	22°51'00" 84°49'20"	83.19			4.73	9					203	Chhotanagpur Granite Gneiss	1977
	OW	Rania	22°51'00" 84°49'25"	90.00									203	Chhotanagpur Granite Gneiss	1977
5	Tapkara E.W.	Torpa	22°52'45" 85°07'55"	200.00	4			Dry					203	Chhotanagpur Granite Gneiss	2010-11
6	Kunjla E.W.	Khunti	23°03'10" 85°16'55"	99.10	17.78	22-26, 60-61	3.79	69.84					175	Chhotanagpur Granite Gneiss	2010-11
	Kunjla O.W.	Khunti	23°03'11" 85°16'55"	105.20	18.78	22-26, 60-62	3.79	69.84					175	Chhotanagpur Granite Gneiss	2010-11
7	Khunti Forest Nursery Campus, E.W.	Khunti	23°04'30" 85°17'20"	166.20				Dry					175	Chhotanagpur Granite Gneiss	2010-11
EXPLORATORY WELLS DRILLED BY OUTSOURCED RIGS															
8	SS High School, Khunti EW		23°04'30" 84°16'25"	71.16	20.8	50-51, 70-71	5.25	28.8					203	Chhotanagpur Granite Gneiss	31/01/2005
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
9	Block Campus Murhu EW		22°58'20" 85°17'25"	150.00	18.5		6.1	5.4					203	Chhotanagpur Granite Gneiss	02/02/2005
10	Block Campus, Torpa EW		22°56'30" 85°03'25"	123.65	6.14	122-123	4.98	28.8					203	Chhotanagpur Granite Gneiss	02/02/2005

4.5 Ground Water Quality

Ground water in the phreatic aquifers in Khunti district is alkaline in nature. The specific electrical conductance of ground water in phreatic zone during May 2011 was in the range of 193 - 1081 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, when compared with the drinking water specification recommended by IS:10500,1991 as presented in table-4 below, indicates that in two samples pH exceeded the permissible limit of 8.5 .(Table-5)

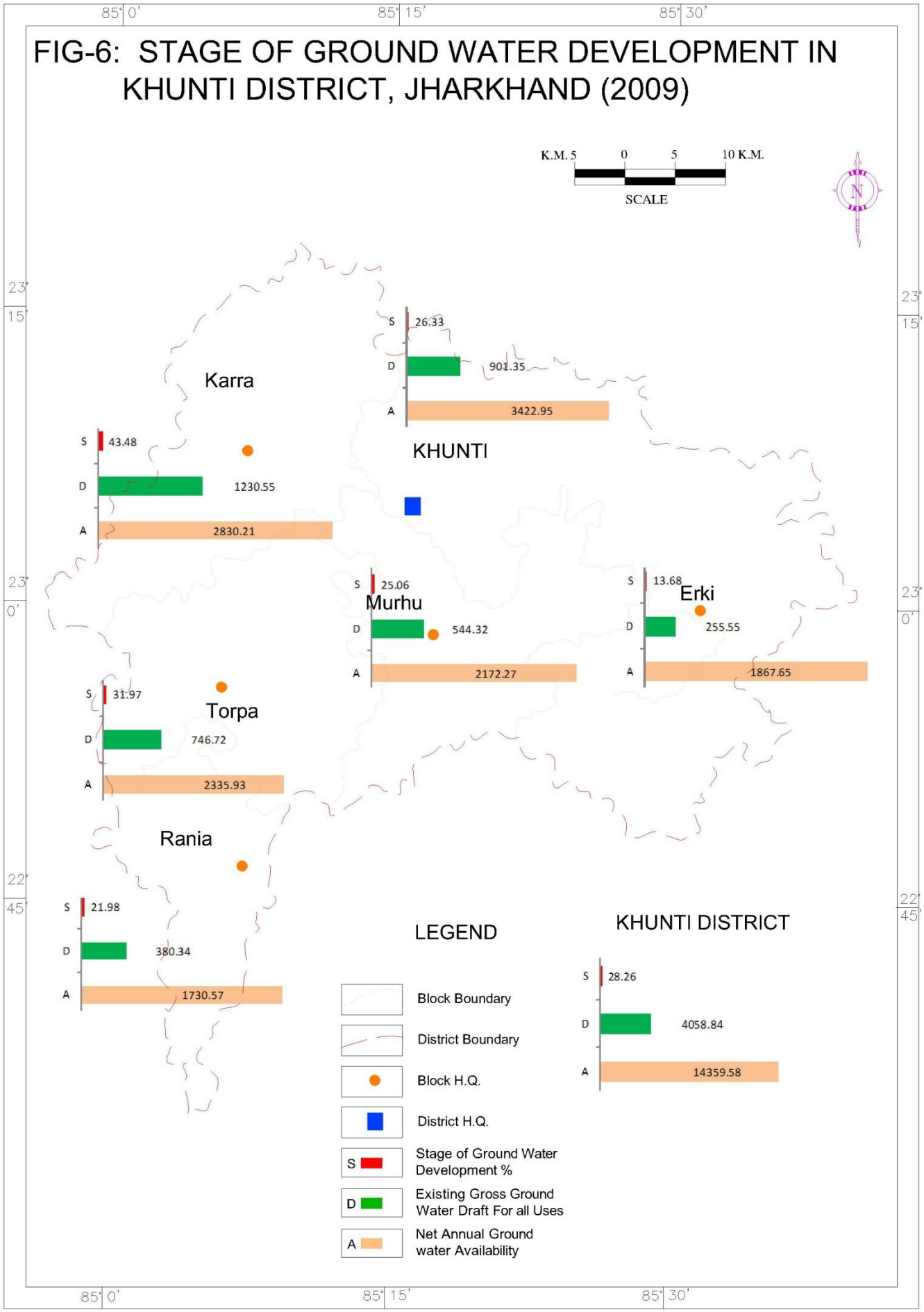
Table-5 Major chemical parameters of ground water samples of GWMS collected during May 2011

Block	Location	E.C. micro	pH	CO3	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
KHUNTI	Khunti	1081	8.5	9	276.75	170.16	24	72.9	360	72	5.8
KARRA	Karra	411	7.88	0	55.36	63.81	42	9.7	95	16	9.3
KHUNTI	Kalimati	652	8.51	9	196.8	95.71	62	18.22	230	38	2.7
MURHU	Murhu	193	7.67	0	92.25	7.09	20	6.1	75	7.5	4.3
LODHMA	Lodhma	435	8.43	3	110.7	53.17	30	13.36	130	33	2.8

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 Khunti district is 28.26% indicating sufficient scope of development. Net ground water availability is 14359.58 ham whereas total draft 4058.84 ham. All blocks are under safe category. (Fig-6)).The ground water resource of Khunti district is shown in the table-6.

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



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 Khunti district the number of hand pumps drilled by PHED is 9207 of which 8007 are under working condition as on April 2012. There are 6463 dug wells, 40 shallow tube wells and 1 tubewells 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 0.41 m/year at Khunti Block.

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 Khunti 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

Table-6 : Dynamic Ground Water Resource of Khunti 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 (%)
Arki	1867.65	141.98	113.56	255.55	139.20	1586.47	13.68
Karra	2830.21	1077.41	153.15	1230.55	214.48	1538.31	43.48
Khunti	3422.95	769.08	132.27	901.35	185.25	2468.62	26.33
Murhu	2172.27	421.78	122.55	544.32	171.63	1578.86	25.06
Rania	1730.57	323.29	57.04	380.34	69.92	1337.36	21.98
Torpa	2335.93	616.58	130.14	746.72	182.26	1537.08	31.97
TOTAL	**14359.58**	**3350.12**	**708.71**	**4058.84**	**962.75**	**10046.70**	**28.26**

7.0 AWARENESS & TRAINING ACTIVITY

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

One Mass awareness was organized at S.S. High School, Khunti on 17.02. 2012 in which over 50 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.