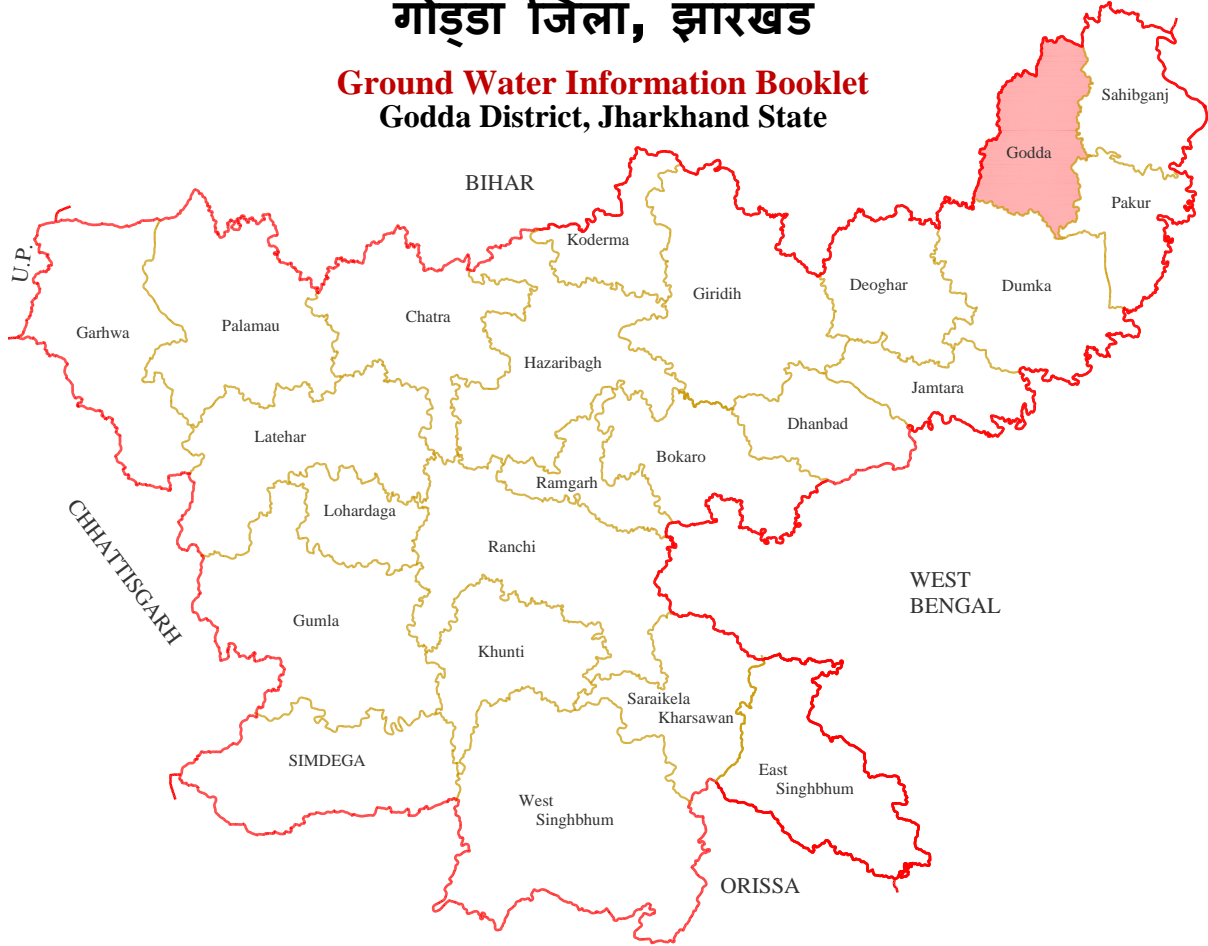




भूजल सूचना पुस्तिका

गोड्डा जिला, झारखंड

Ground Water Information Booklet Godda 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

गोड्डा जिला, झारखंड

Ground Water Information Booklet
Godda District, Jharkhand State

Updated By

के रमेश रेड्डी

(वैज्ञानिक ख)

K. RAMESH REDDY

(Scientist B)

राज्य एकक कार्यालय, राँची
मध्य-पूर्वी क्षेत्र, पटना

State Unit Office, Ranchi
Mid Eastern Region, Patna

GODDA DISTRICT AT A GLANCE

Sl. No.	ITEMS	Statistics		
1.	GENERAL INFORMATION			
	i)	Geographical area (SqKm)	2110	
	Administrative Division (As on 2001)			
	i)	Number of Tehsil/ Block	8	
	ii)	Number of Panchayat/Villages	172/2304	
	iii)	Population (As on 2011 Census)	13,13,551	
	iv)	Average Annual Rainfall (mm)	1063.1	
2.	GEOMORPHOLOGY			
	Major physiographic unit:		Rolling topography marked by isolated hills and valleys	
	Major Drainages:		Ganga, Kajhia, Harna, Sunder Sapin, Kao, Cheer and Geura Rivers	
3.	LAND USE (Sq. Km)			
	a)	Forest area:	313.7	
	b)	Net area sown:	782.1	
	c)	Cultivable area:	782.1	
4.	MAJOR SOIL TYPE		Alfisols / Ultisols	
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	Bhurna 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)		10	
	No of Dug wells		10	
	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.	4.2-9.9		
	(Post-monsoon Depth to water level during 2012) m bgl.	2.25-8.34		
	Long term water level trend in 10 yrs (2003-2012) in m/yr		Rise	Fall
		Pre Mon-	0.001-0.150	0.03-0.3
		Post Mon	-	0.03-0.53
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-12-2012)			
	No of wells drilled (EW, OW, PZ, SH, Total)	13 (EW) 12 (OW)		
	Depth range (m)	Upto 191m		
	Storativity (S)	4.3×10^{-3} to 1.01×10^{-5}		
	Transmissivity (m^2/day)	8-177		
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 ham			
	Annual Replenishable Ground water Resources	15971.03		
	Net Annual Ground Water Draft	5560.78		
	Projected Demand for Domestic and industrial Uses up to 2025	2127.85		
	Stage of Ground Water Development	38.68 %		
13.	AWARENESS AND TRAINING ACTIVITY			
	Mass Awareness Programmes organized			
	Date:			
	Place:			
	No of participant :			
	Water Management Training Programmes organized			
	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	1
	Number of Critical Blocks	Nil
	Number of Blocks notified	Nil
18	MAJOR GROUND WATER PROBLEMS AND ISSUES	Declining trend of ground water level.

GODDA DISTRICT INFORMATION BOOKLET

1.0 INTRODUCTION

1.1 Administrative Details

Godda district spreading over an area of 2110 sq.km lies between North latitudes 24°30'08'' :25°13'42'' and East longitudes 87°02'44'' :87°31'39'' with it's district headquarter at Godda. The district is divided into 8 blocks namely i) Nehema ii) Thakurgati iii) Borijor iv) Mahagama v) Pathargama vi) Godda vii) Porayahat viii) Sundarpahari. The district comprises of 172 numbers of panchayats and 2304 no. of villages. The total population of Godda district as per the 2011 census is 13,13,551 persons with urban population of 64419 and the rural population of 1249132 persons. The district is bounded in the northwest by Bhagalpur district of Bihar , in the south by Dumka, in the west by Banka district of Bihar, in the east by Sahebganj and Pakur districts.

TABLE 1: POPULATION OF GODDA DISTRICT (2011)

Sr. No.	Block	Total	Rural population	Urban population	Male	Female
1	Boarijor	138330	138330	0	70106	68224
2	Godda	270255	216805	53450	140618	129637
3	Mahagama	196976	186007	10969	101987	94989
4	Meharma	146325	146325	0	76588	69737
5	Pathargama	115662	115662	0	59780	55882
6	Porayahat	187489	187489	0	95814	91675
7	Sundar Pahari	65463	65463	0	32895	32568
8	Thakur Gangti	99603	99603	0	51822	47781
	Total	1313551	1249132	64419	677927	635624

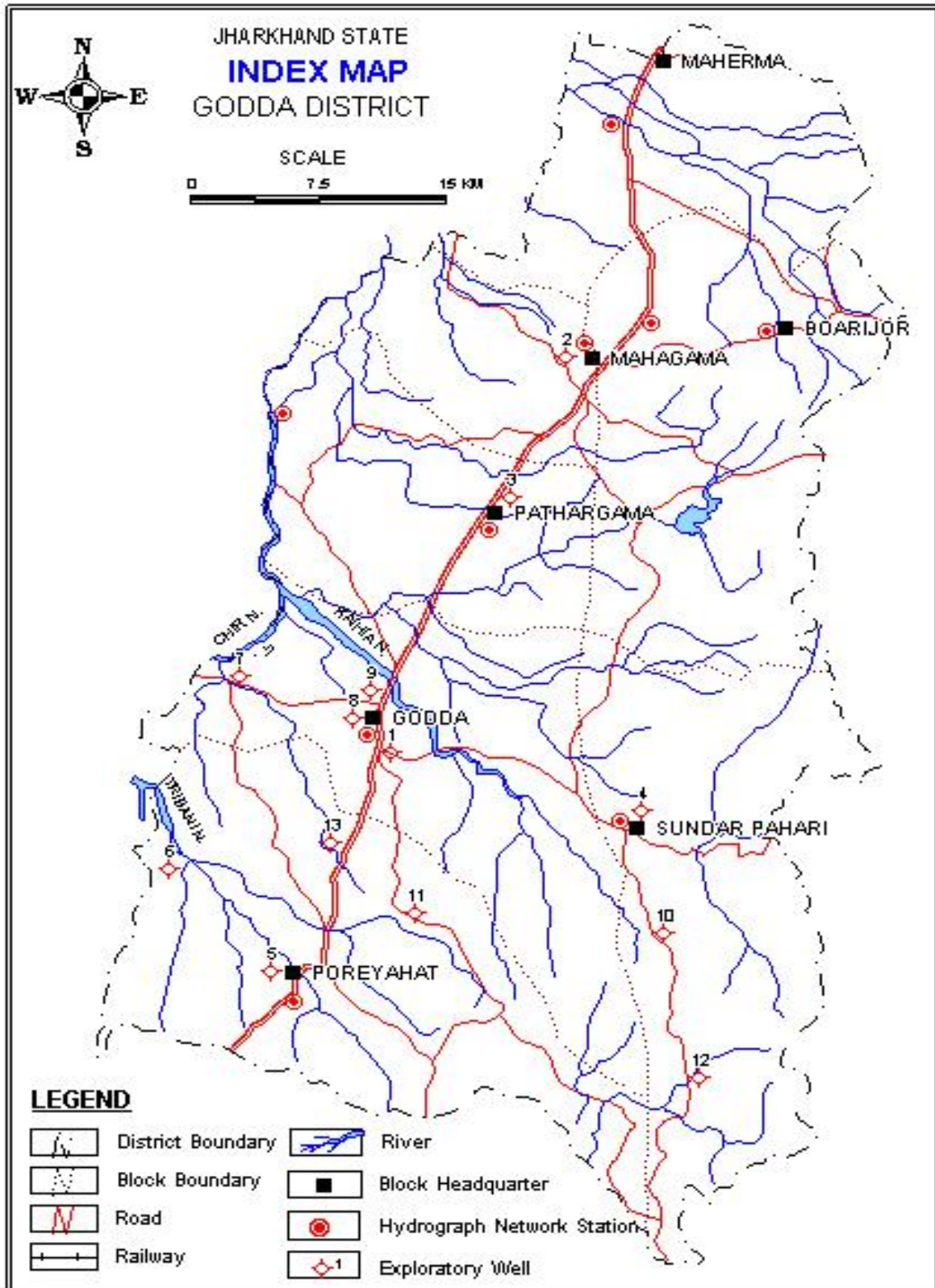


Fig-1 Index Map of Godda district

1.2 Drainage

The principal rivers of the district are Kajhia, Harna, Sunder, Sapin, Kao, Cheer and Geura. The general trend of the drainage is from SE-NW.(Fig-1) The structural features particularly the foliation and joints exert profound impact upon the drainage and control the drainage pattern of the district.

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 10 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 1063.1 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.

4.1.1 Depth to Water level

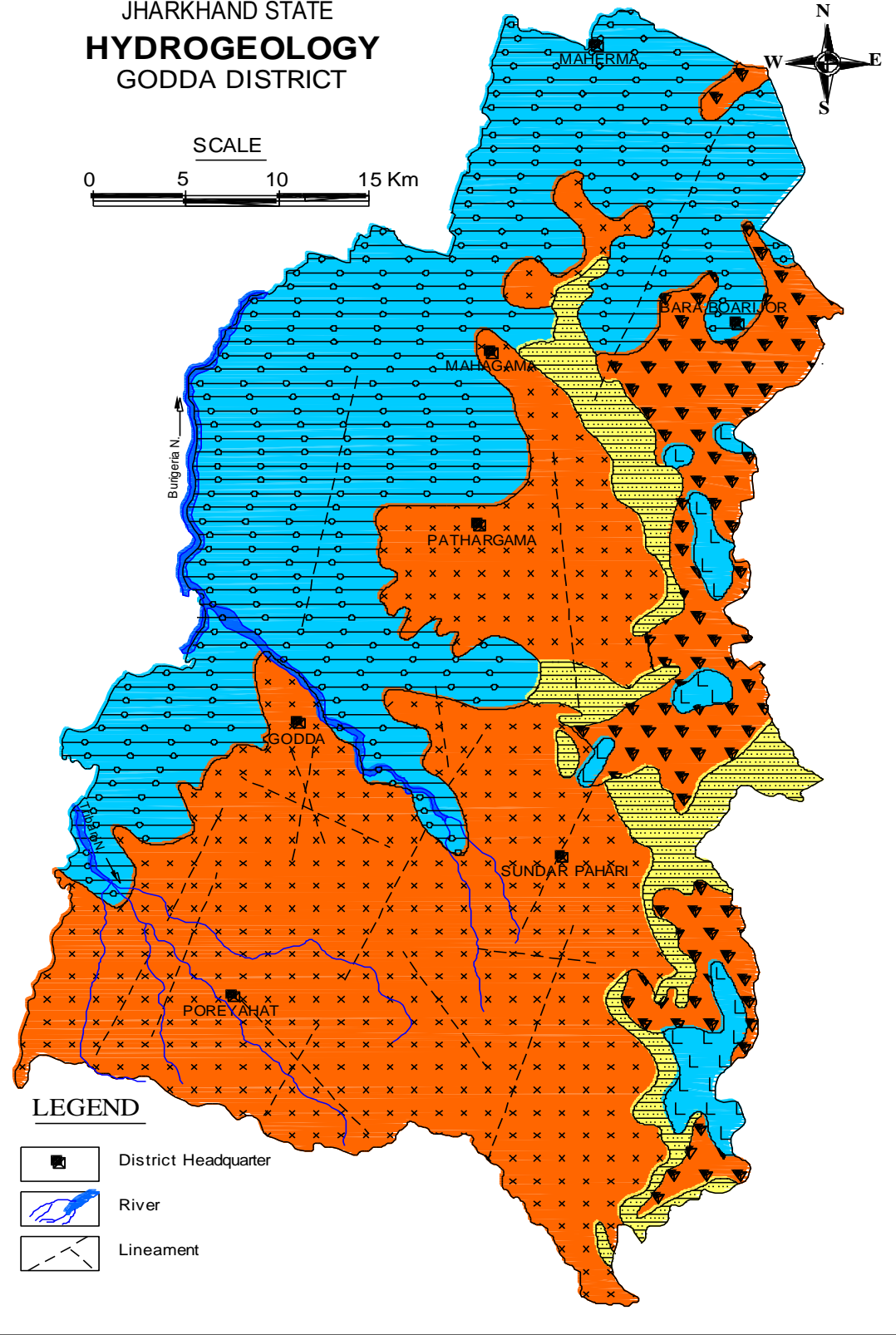
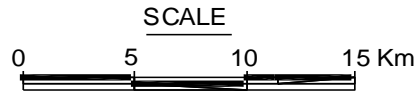
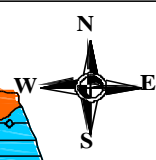
During May 2012, the depth to water levels in HNS (Fig-3) wells tapping shallow aquifer ranged from 4.55 to 9.90 m bgl. Depth to ground water levels during the post monsoon period (November 2012) varied between 2.25 and 8.34 m bgl.

Categorization of depth to water level of pre-monsoon period (May 2012) for HNS in Godda district is presented below in table-1




Table-1 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.	%
8	4.55	9.90	0	0	2	20	8	80	0	0






JHARKHAND STATE
HYDROGEOLOGY
GODDA DISTRICT



LEGEND

-  District Headquarter
-  River
-  Lineament

LEGEND

AGE GROUP	LITHOLOGY	SYMBOL	HYDROGEOLOGICAL CONDITION	GROUND WATER POTENTIAL
UNCONSOLIDATED / POROUS FORMATION				
Quaternary	Recent & older alluvium clay, sand, gravel, calcareous & ferruginous concretion		Moderately thick, regionally extensive unconfined / semi confined aquifer down to 100m.	Good yield prospect 25 - 75 m ³ / hr.
Tertiary	Laterite		Thin veneer in patches under unconfined aquifer down to 10 - 15 m.	Limited yield prospect 5 m ³ / hr.
SEMICONSOLIDATED FORMATION				
Gondwana super group	Sandstone, shale, siltstone, with coal seams.		Moderately thick, regionally extensive confined qquifer / free flowing condition down to 200m.	Very good yield prospect 50 - 100 m ³ / hr.
CONSOLIDATED FORMATION / FISSURED FORMATION				
Rajmahal Trap	Basalt with intertrappean sandstones & shales		Groundwater restricted to weathered zone, fractured zone. Contact of two flows & intertrappeans down to 100m.	Limited yield prospect blow 25 m ³ / hr at selective places.
Precambrian	Granite - gneiss, mica schist amphibolotes etc.		Groundwater restricted to weathered zone, fractured zone. down to 150m.	Moderately good yield prospect 10 - 40 m ³ / hr at selective places.

Categorization of depth to water level of post-monsoon period (November 2012) for HNS in Godda district is presented below in table-2(Fig-4)

Table-2 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.	%
9	2.25	8.34	0	0	4	40	6	60	0	0

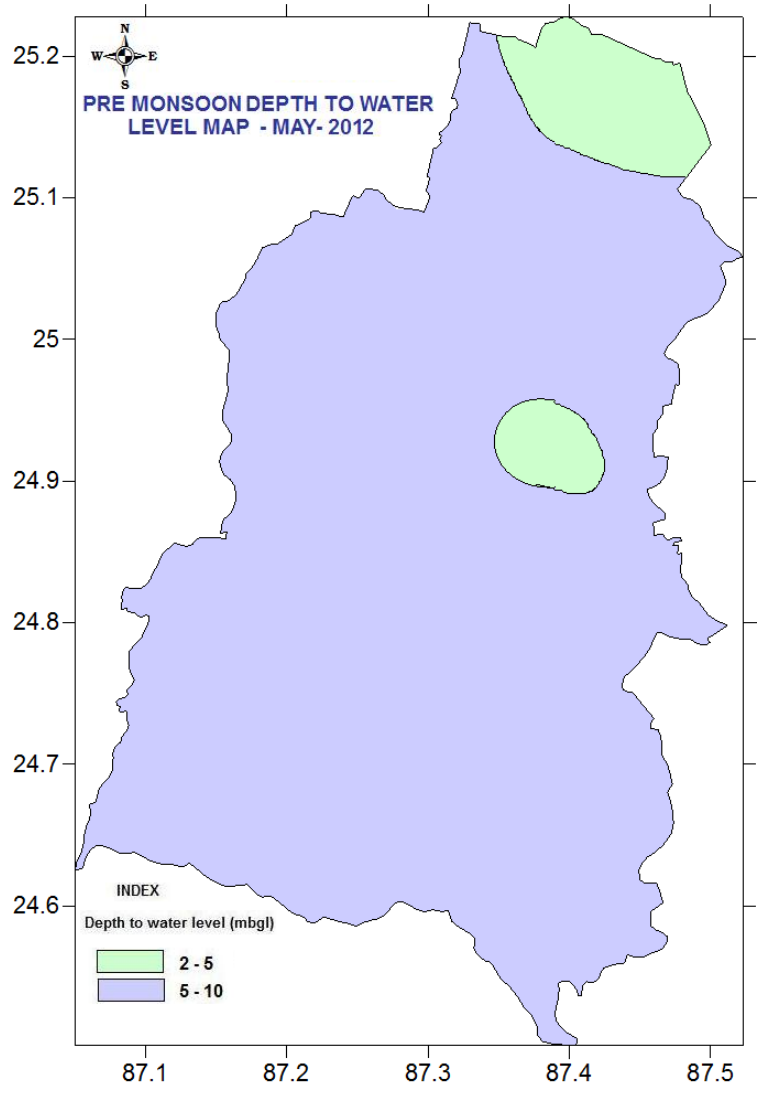


Fig-3 Pre monsoon map of Godda District

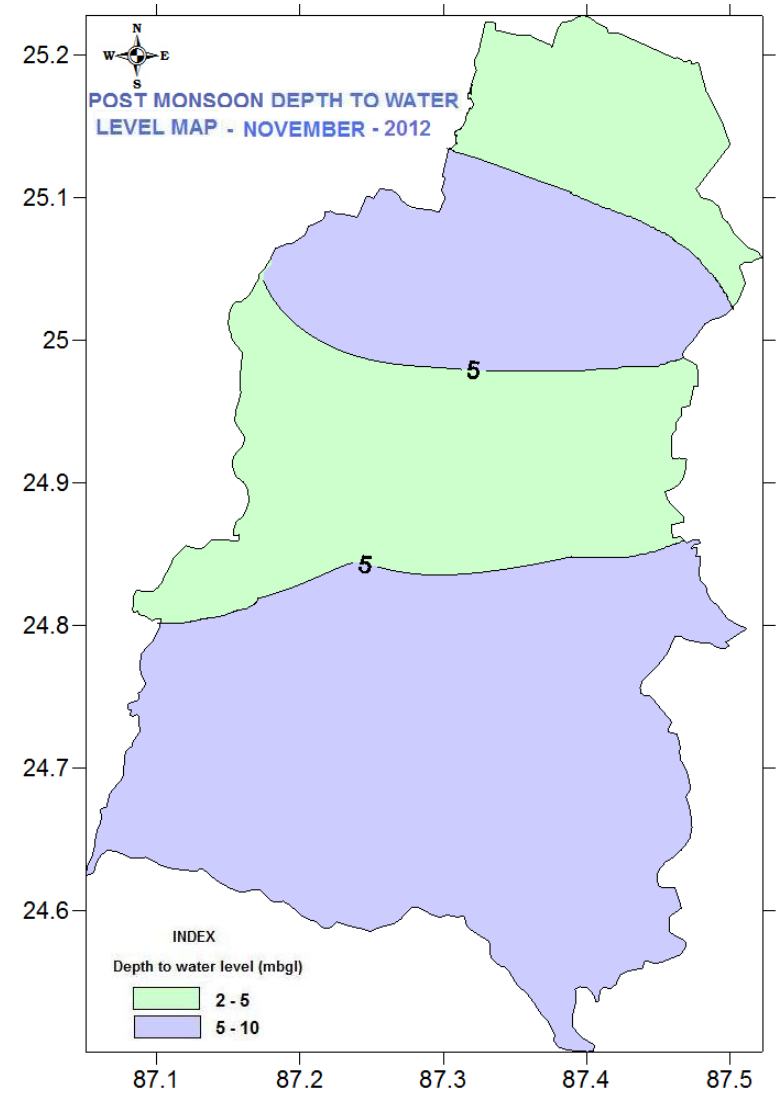


Fig-4 Post monsoon map of Godda District

4.1.2 Aquifer Parameters

A total of 13 exploratory wells (Fig-1) and 12 observation wells have been drilled down to depth of 191 m in hard rock formation to decipher the potential fracture zones. The morphotectonic analysis of crystalline formation has revealed that rocks have been subjected to several stages of deformation leading to development of deep seated tensile and shear fracture. The most potential fracture zones trend along NNE-SSW, WNW-SSE and NW-SE direction. The exploratory data reveals presence of potential fractures between 17-163 mbgl. The deeper fractures are also found in few cases upto 140 mbgl. The depth of fracture at which maximum yield was obtained in bore well ranges from 75-135 mbgl. The thickness of the weathered zone varies from 9 to 26.5m. The yield of the well is in the range of 0.25-49.2m³/hr

Summarised hydrogeological data of exploratory drilling in the district is given in table-3 below.

Table-3 Summarised hydrogeological data of exploratory drilling

Rock Type	Depth range (m bgl)	No. of fractures tapped	Depth Range of fracture Zone	Water level (m bgl)	Yield (m ³ /hr)	Drawdown (m)	T (m ² /day)	S
Granite gneiss	81-191	1-5	17-163	2-8.63	0.25-49.2	7.04-22.11	17.95-177	4.3* 10 ⁻³ - 1.01* 10 ⁻⁵

4.2 Ground Water Quality

Ground water in the phreatic aquifers in Godda 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 25°C. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO₃. The chemical concentration of these constituents, when compared with the drinking water specification recommended by IS:10500,1991 as presented below in table-4.

Table-4 Number of samples exceeding permissible limit in the district.

Quality	IS:10500, 1991	No. of samples in
---------	----------------	-------------------

	Desirable limit	Permissible limit	the district exceeding permissible limit
pH	6.5-8.5	No relaxation	0
T.H	300	600	0
Ca	75	200	0
Cl	250	1000	0
F	1.0	1.5	0
NO ₃	45	100	0

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 Godda 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 Godda district has been found to be 38.68 %

indicating enough scope for future development. (Fig-5). The ground water resources of Godda district is given in the table-5.

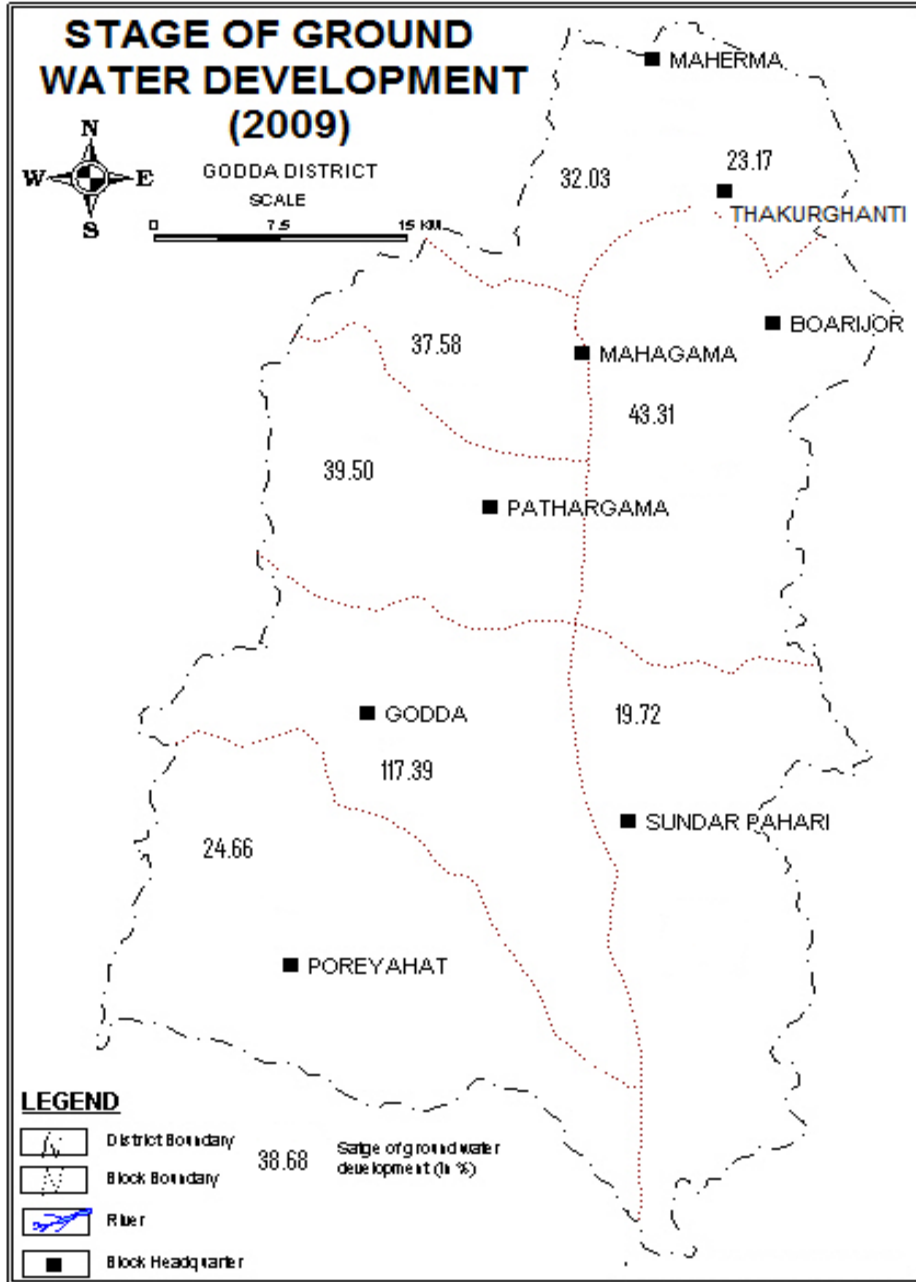


Table: 5 Dynamic Ground Water Resource of Godda district as on 31st March 2009 as per GEC 97 (ham)

Block	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
	Recharge from rainfall	Recharge from other sources	Recharge from rainfall	Recharge from other sources									
Boarijor	563.07	2450.03	528.55	101.69	1438.34	143.83	1294.51	369.82	190.89	560.71	233.98	690.71	43.31
Godda	370.05	4.79	776.51	320.59	1471.94	147.19	1324.75	1244.21	310.85	1555.06	408.26	-327.72	117.39
Mahagama	1502.71	242.54	372.21	130.86	2248.32	224.83	2023.49	506.30	254.08	760.38	311.43	1205.76	37.58
Meharma	847.35	242.14	211.91	52.20	1353.60	135.36	1218.24	194.88	195.33	390.21	239.42	783.94	32.03
Pathargama	1512.10	243.64	587.27	158.37	2501.38	250.14	2251.24	607.62	281.68	889.30	345.27	1298.36	39.50
Porayahat	1816.00	6.34	654.66	89.97	2566.97	256.70	2310.27	309.40	260.35	569.74	319.12	1681.76	24.66
Sundar Pahari	1990.86	4.41	488.63	101.00	2584.89	258.49	2326.40	368.89	89.91	458.80	110.20	1847.30	19.72
Thakur Gangti	1390.31	162.02	189.52	63.75	1805.59	180.56	1625.03	245.92	130.67	376.59	160.17	1218.95	23.17
Total	9992.45	1150.91	3809.25	1018.42	15971.03	1597.10	14373.93	3847.03	1713.75	5560.78	2127.85	8399.05	38.68

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 Godda 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.

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 8 m bgl indicating availability of sufficient space in the unsaturated zone to retain additional water and availability of surplus surface runoff, 313 Sq kms area in Godda district has been demarcated as suitable for artificial recharge. Through this 22.54 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 hydrogeological 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.