

जल वर्ष
2007



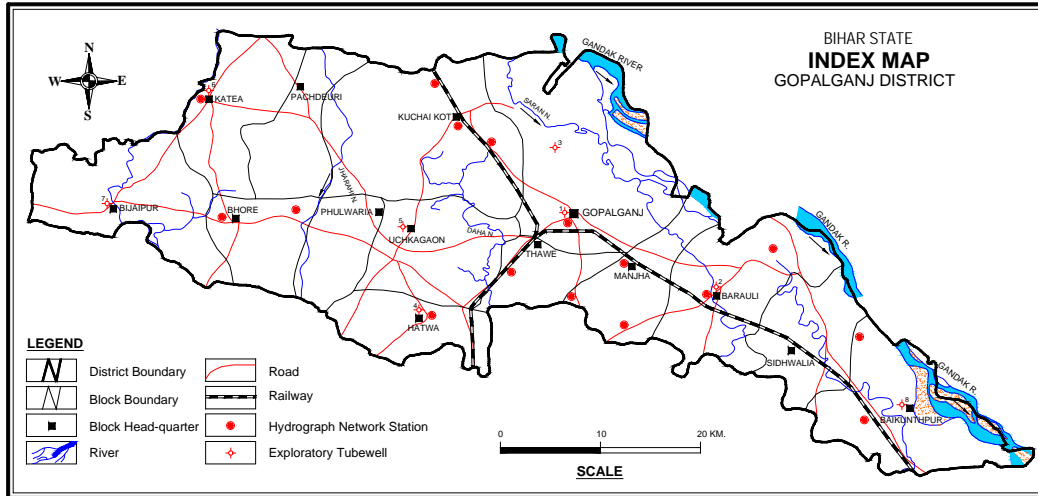
Water Year
2007

स्वच्छ सुरक्षित जल - सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE



Ground Water Information
Gopalganj District, Bihar State



Central Ground Water Board

Ministry of Water Resources

(Govt. of India)

Mid-Eastern Region

PATNA

August, 2008

PREPARED BY	-	Mr. S. Upadhayay, AHG
CARTOGRAPHY BY	-	Mr. J.K. Tandon, Draughts man (Gr.- II)

GOPALGANJ DISTRICT AT A GLANCE

Sl. No.	ITEMS	Statistics	
1.	GENERAL INFORMATION		
	i) Geographical area (SqKm) Administrative Division (As on 2001)		2033
	i) Number of Tehsil/ Block		14
	ii) Number of Panchyat/Villages		1564
	iii) Population (As on 2001 Census)		2149343
	iv) Average Annual Rainfall (mm)		1170
2.	GEOMORPHOLOGY		
	Major physiographic unit :		
	Major Drainages:	Gandak	
3.	LAND USE (Sq.Km)		
	a) Forest area:		Nil
	b) Net area sown:		1545.5
	c) Cultivable area:		
4.	MAJOR SOIL TYPE		
5.	AREA UNDER PRINCIPAL CROPS		
6.	IRRIGATION BY DIFFERENT SOURCES	Area	No.
	(Areas Sq.km and Number of Structures)		
	Dugwell	-	4580
	Tubewell/Borewell	644.10	21299
	Tank/ponds	Nil	-
	Canals	319.72	-
	Other sources	1.89	72
	Net irrigated area	970.71	
	Gross irrigated area	1094.35	
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31- 3-2007)		
	No of Dug wells	16	
	No of Piezometers	Nil	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Quaternary Alluvium	
9.	HYDROGEOLOGY		
	Major Water bearing formation		
	(Pre-monsoon Depth to water level during 2006) m bgl.	1.66 to 4.67	
	(Post-monsoon Depth to water level during 2006) m bgl.	1.24 to 3.35	
	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)	8 + 10
	Depth range (m)	200 to 205
	Discharge (litres per second)	20 to 50
	Storativity (S)	2.3 X 10⁻³ to 4.3 X 10⁻⁴
	Transmissivity (m²/day)	1284 to 2392
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 (2004)- in mcm	
	Annual Replenishable Ground water Resources	633.61
	Net Annual Ground Water Draft	316.73
	Projected Demand for Domestic and industrial Uses up to 2025	
	Stage of Ground Water Development	49.99
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)	Nil
	Project under technical guidance of CGWB (Numbers)	Nil
15.	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Blocks notified	Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	

Ground Water Information Booklet
Gopalganj District, Bihar State

1.0 INTRODUCTION

1.1 Administration

Gopalganj district is situated in the northwest part of the state. It lies between N-latitude 26012' & 26039' and E longitude between 83054' & 84055'. It covers parts of Survey of India toposheet Nos. 72 A/2, B/3, O/6, B/7, B/10, B/11 & B/25. This district comes under Indo-Gangetic plain covering plain and Gandak-Ghaghra sub-basin. There are 14 development blocks with two sub-basins. It is bounded by Uttar Pradesh on the north and west whereas by Gandak river in the east and by Siwan district on south.

The district Gopalganj is having an area of 2033 sq.km with 14 blocks and 1564 villages. As per 2001 census the total population in the district is 21.49 Lakhs with decimal growth of 24.9%. The density of population is 1057 Person/Sq.km as per 2001 census.

1.2 Basin/Sub-basin, Drainage

The district is mainly drained by Gandak river that has taken the present course ,which forms the eastern and north eastern boundary of the district. The Gandak river flows in a south easterly direction with an average gradient of 0.28 m/km. The river brings a lot of silt, which is deposited in the river bed resulting in oscillation of course.

Apart from this main rivers there are numerous ephemeral streams flowing in the district namely Jharbi, Dahe, Khanua, Ghoghli, Kedanjot, Sona etc. They all emerge near Gandak embankment which are locally known as Chauras and Tal. In course of time these beds get silted and their course start shifting. During the process of shifting of course there streams leave behind abandoned channels and a number of marques locally known as Chaus. These Chaus are also responsible for water logging in the area by spreading their span with the onset of monsoon and become localize during summer. Most of the ephemeral streams have their flow direction in north south.

1.3 Irrigation Practices

The rapid growth of population demands for greater production in bringing more and more land under cultivation. The socio-cultural and economic political factors play

significant role over land use in soft rural and urban area in the district. The blockwise details of land utilization reveals that 74% of the total area is net shown.

1.4 Studies/ Activities carried out by CGWB

The Central Ground Water Board has carried out hydrogeological surveys followed by ground water exploration in alluvial of the district. A report entitled “Hydrogeology and Ground Water Resource Development Plan of Gopalganj district, Bihar” was issued in the year 1992. A total of 8 exploratory wells has been drilled in the district. Water levels of 16 hydrograph stations representing phreatic aquifer are being monitored four times a year since 1975. Chemical quality of ground water of phreatic aquifer is monitored for premonsoon period. Ground water resource has been estimated for the district (GEC-1997, norm) as on 31st March 2004.

2.0 RAINFALLS AND CLIMATE

In the area monsoon sets in somewhere in June and lasts upto September. The average annual rainfall in Gopalganj district is about 1218 mm. Most of the rainfall receives from South West monsoon. Data reveals that there is a large variation in the rainfall over year to year. The behaviour of isohyte is given in Plate.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

Flat alluvial formations of considerable thickness is very common in the entire district. The entire flat terrain has been divided into two main categories.

a) Alluvial Low Tracts: - They are most commonly found in the immediate vicinity of river Gandak which is subjected to periodical submergence by flood water.

Diara Land: - They are nothing but heap and sands, brought by rivers during flood and usually found in the bed of the river Gandak. There is a gradual slope from the north western to south eastern direction. The general slope varies between 70.69 mt MSL to 57.09 mabMSL. In general the surface gradient is about 0-11 m/km in the area.

3.2 Soil Characteristics

As per the U.S. Survey Staff (1975) the soil of the area is broadly divided into three groups based upon the diffluent conditions of pedogeny, climate and texture.

a) Entisols – These are younger alluvial soil, fringes near the bank of Gandak and the eastern bank of Ghaghra in the western part of the district. The entisols are generally a light, friable, loam with higher proportion of sand and silt. The maximum percent of clay is found to be upto 35%. They are often associated with calcareous nodules. The higher content of sand keeps the soil, except in the river bed, fairly drained and makes it suitable for autumn and rabi crops which do not need much water. These soils are most suitable for cultivation of high yielding crops like sugar cane and wheat.

b) Inceptisols - There are locally known as Bangar and there calcareous alluvial soils occur mostly in the central part of the district. This forms the typical paddy land of Bihar. The clay and silt % ranges between 30-45%.

Alfisols – These soils occur in patches around eastern part of the district. These are fairly matured soils subject to continuous leaching operation, leading to formation of calcareous nodules and ferruginous clay pans. Texturally there are well-drained reddish yellow silty sandy and clayey loams.

4.0 Ground Water

4.1 Hydrogeology

The district forms a part of the vast alluvial terrain of Gandak and Ghaghra sub-basins forming a part of Indo-Gangetic alluvium consisting of a thick pile of unconsolidated quaternary sediments. They are recent to sub-recent deposits underlain by erosional basement of Vindhyan formation of pre-cambrian age. The thickness of alluvium is still not yet confirmed through boreholes. These quaternary sediments consist of sequences of finer clastics like clay and silts with various grades of sand and gravel associated with Kankar. The lithological characteristics are mainly governed by the depositional environments namely distance from the provenance, agencies of deposition and the medium of transport. Marked lateral and vertical variations in texture and composition of sediments support these propositions.

The Gangetic alluvial deposits can be sub-divided into two types viz. newer alluvium and older alluvium. The older alluvium of Pleistocene age in the area is rather dark in colour, occupies the higher ground and generally rich in kankar which are concretion of nodules of impure calcium carbonate ranging in size from small grains to

loose lumps whereas the newer alluvium of recent age occupying the lower grounds constitute a thick sequence of clay, silt and sand with occasional kankar.

4.2 Ground water Resources

The main source of the ground water recharge in the district is rainfall. Apart from this, the return flow from ground water irrigation, seepage from canal, ponds, tanks and direct infiltration from river beds are the other secondary sources of recharge. The annual recharge of ground water bodies constitute the replenishable or dynamic resource.

The blockwise ground water resource of Gopalganj district has been calculated upto 31.03.2004 as per the norms laid down by the Ground Water Estimation Committee, Ministry of Water Resources, Govt. of India, 1997. The detail is being given in annexure. Recharge has been calculated by water level fluctuation method. The specific yield of the alluvium in the district has been assumed between 12 to 18%.

A 20% gross annual draft is presumed to be recharging the ground water bodies. A review of the annexure reveals that Kuchaikot block is having the highest ground water potential whereas Thawe has the lowest.

	In MCM
Total Ground Water Resource	633.61
Total ground Water Resource for irrigation	279.96
Gross annual Ground water Draft	380.97
Ground water Balance	297.71
Level of ground water development	50%
Stage of development of after 10 Years	70%

As per estimation of blockwise draft data the level of development is maximum in Thawe block whereas in the block of Panchdevvari the development is the minimum.

4.3 Chemical Quality of Ground Water

The quality of groundwater has gained importance with increasing population and industrialization. These factors spoil the environment of which groundwater is an important part.

Ground water is uncontaminated water not containing suspended particles or bacteria as it occurs below the ground and is in accessible in a sense. It is generally clear and odourless. But ground water usually contains dissolved mineral ions. The type and concentration of ions present determines the usefulness of ground water for various purposes. Hence, hydrochemistry is an important aspect and the chemical constituents need to be assessed for various uses.

Ground water samples from HNS were taken into consideration. These wells are located in Gopalganj district and represent the same hydrogeological and aquifer system (in this case phreatic). The analytical results are given in Table...

Table: Range of Chemical Constituents, Gopalganj district

Constituent	Range (in mg/l)	Drinking Water Standards (BIS : 10500 : 1990)
		Desirable limit/ permissible limit (in mg/litre)
EC	370-1270	500/2000 TDS
PH	7-7.5	6.5-8.5 / 6.5-8.5
HCO ₃	122-415	
Cl	18-270	250/1000
Ca	12-66	75/200
Mg	19-90	30/100
Na	25-138	-
TH	120-535	300/600
K	3-16	-
As		.05 mg/l (Karanth)

4.4 Status of Ground Water Development-Block wise

The occurrence and movement of ground water is governed by geology and geomorphology. An attempt has been made to summarize block wise information on suitable well type, depths, discharge and suitable drilling method.

5. Ground Water Management Strategy

5.1 Ground Water Development

The development of ground water resource of Gopalganj district shows that at present the stage of development is about 50 %. At present all the blocks come under safe category.

The district is an agricultural district. So, in areas where ground water development is high, such development can be done phase wise with a cautions and judicious outlook.

Present Ground Water Development

It has been observed that nearly 60% of the net irrigated area of the district is served by ground water structures based upon minor irrigation system. The canal irrigation is still far away from satisfaction and nearly 15% of the area is irrigated by canal. The draw back with canal irrigation system is that the canal water is still unavailable at tail end area and in upper reaches it is not relieved in time. The maintenance of the canal system is also not satisfactory.

In the entire district, still most of the villages depend upon wells, tanks, ponds, hand pumps/tubewells, rivers and other sources for drinking water supply still only a limited towns / villages are promoted by water supply.

To meet the requirement of ground water in Gopalganj district, many tubewells were completed by E.T.O. and State Govt. agencies. Later on by CGWB; at eight sites exploratory tube wells were constructed. The heavy-duty tube wells were constructed by tapping the granular zones of 90 m to 100 m

with a thickness of about 20m to 50 m. whereas in the state shallow tubewells granular zones between 50 to 90 m has been tapped. The discharge of heavy-duty tubewell ranges between 134 to 250 m³/hr whereas for shallow tubewell it varies between 20 to 50 m³/hr. In this regard a number of dug wells were also constructed with a diameter between 1.10 to 2.40 m and the discharge of well depends generally on the thickness and nature of aquifer tapped up to 14.00 m.

Future Ground Water Development Possibility

As per available present ground water utilisation it is observed that there is still a good chance to enhance the ground water development. So, by using different types of structures; based upon high yielding and low yielding discharge tubewells the demand of drinking and irrigation requirement can be met as per the demand of user agencies.

5.2 Water Conservation and Artificial Recharge

All the blocks of the district fall under safe category. Artificial recharge and Rainwater harvesting technique may be adopted in the Thawe and Vijayee pur blocks where stage of ground water development is high. As entire district is covered by the alluvial formation contour bunding and recharge ponds are most suitable structure in the rural areas of the blocks.

6.0 Ground Water Related Issue and Problems

There are no ground water related issues and problems in the district.

7.0 Mass Awareness and Training Activity

7.1 Mass Awareness Programme

Till date no any mass awareness/training programme has been organised in the district

8.0 Area Notified by Central Ground Water Authority (CGWA) / State Ground Water Authority (SGWA)

All blocks of Gopalganj district are under safe category for ground water development point of view. No blocks has been notified by CGWA/SGWA.

9.0 RECOMMENDATIONS

1. As the district is an agricultural based district and its all socio-economic fabric is directly related with agriculture, so the main emphasis is to be given for development of ground water especially in the care of irrigation.
2. In view of inadequate surface water irrigation the gap between the demand and supply can be filled by integrated use of surface water resource available in the district.
3. The special attention should be given towards the structures already created but which have become defunct. These structures unit be rehabilitated so that it creates a confidence among the beneficiaries and it can help to boost the overall productivity through multiple cropping pattern.

4. The behaviour of water table should be watched constantly. In this context, the rise and fall in water level should be studied and monitored so that the additional irrigation structures can be planned accordingly.
5. To mitigate the water logging problem in the district the conjunctive use of surface water and ground water should be taken up in phase manner. The lining of the canals is strongly recommended.
6. To keep in view the efficiency and proper discharge, minimum standard for well spacing should be maintained. For this a minimum distance for shallow wells should be kept 150 mt whereas for deep tubewells it should be 600 mt. Selection of pumping system should be such that they can yield in the optimum efficiency.
7. To minimise the cost the brass stainer should be replaced by low cost materials. In the district there are 2 to 3 types of aquifers, so just to give benefit the small and marginal farmers it is always suggested that the shallower aquifers should be left for them.
8. To increase the agricultural productivity, scope of environmental hazards like flooding etc can be reduced.

DISTRICT : GOPALGANJ

Sl.No.	Location/ Block	Depth Drilled mbgl.	Length of Casing pipe/ Depth const. m.	Granular/ Zone/ fracture Tapped m.	Static Water level m. bgl.	Discharge m ³ /hr.	Drawdown m.	Specific Capacity m ³ /hr./m.	Trans- missivity m ² /day	Storativity 	Diameter of assembly mm.	Formation	Qual of Water
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	GOPAL- GANJ/ Gopalganj sadar 26 ⁰ 28'50" 84 ⁰ 26'45"	201	150	040.00-049.00 065.00-083.00 097.00-104.00 108.00-114.00 114.50-147.50	3.87	194.64	9.68	20.1	1127	4.80X10 ⁻⁴	2"/6"	ALLUVIUM POT	
	OW	152.7											
2	BARAULI/ BARAULI/ 26 ⁰ 25'00" 84 ⁰ 37'40"	200	150	052.00-064.00 085.00-097.00 099.00-105.00 111.00-117.00 123.00-135.00 141.00-147.00	3.05	200.3	5.61	35.7	2392	2.40X10 ⁻³	12"/6"	-do-	
	OW	156.1											
3	YADAVPUR Gopalganj Sadar 26 ⁰ 33'65" 84 ⁰ 31'50"	200	110	031.00-043.00 046.00-058.00 104.00-107.00	4.17	211.44	5.77	36.64	1836	4.30X10 ⁻⁴	12"/6"	-do-	

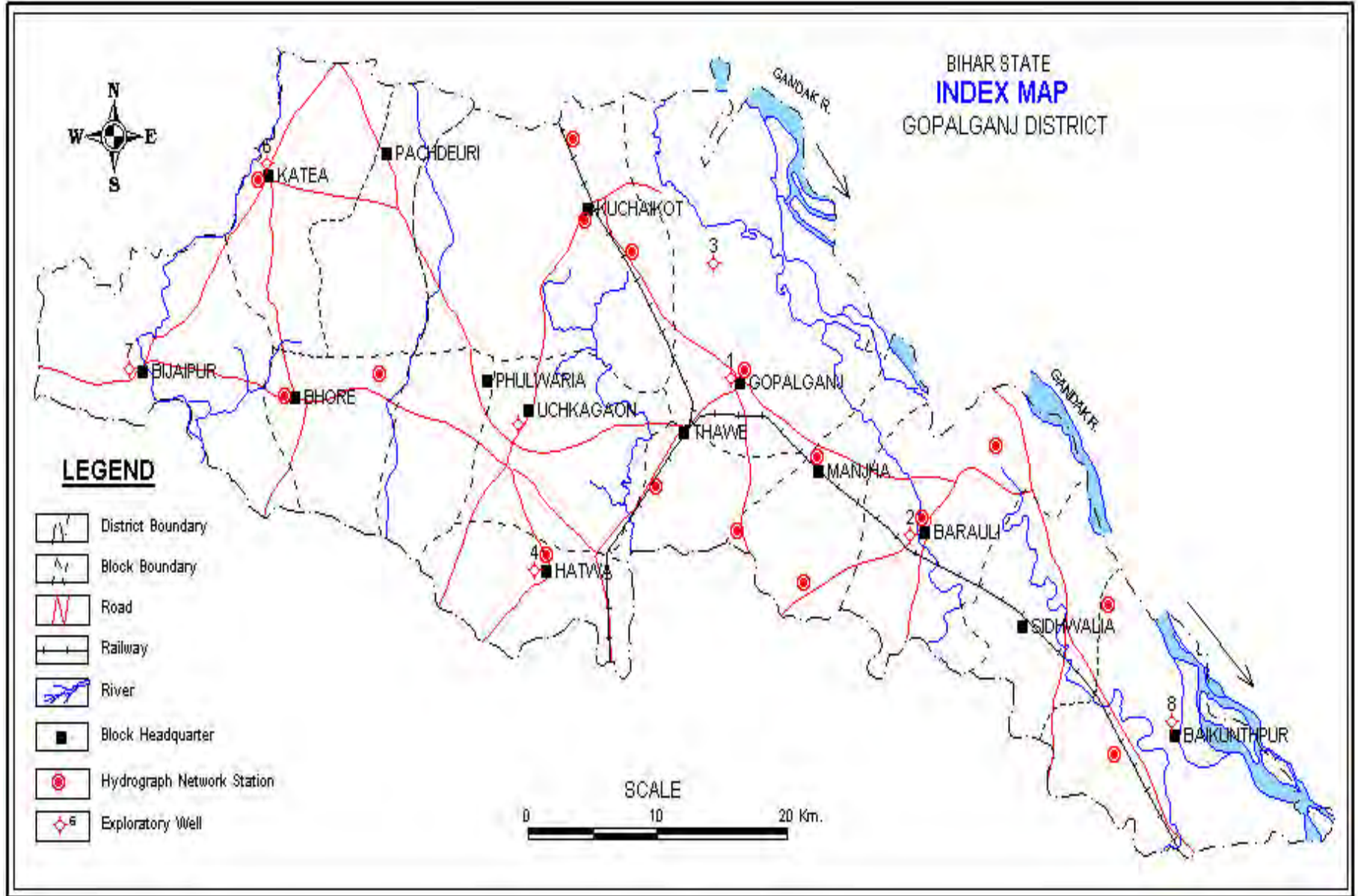
	OW	113.65											
4	HATHUA/ Hathua 26 ⁰ 22'20" 84 ⁰ 19'10"	201	122	086.00-098.00 107.00-119.00	4.79	208.2	11.21	18.57	1284.52	1.25X10 ⁻⁴	12"/6"	-do-	
	OW	125.63											
5	UCHKA- GAON/ Uchkagaon 26 ⁰ 27'15" 84 ⁰ 17'25"	200	150	041.00-047.00 061.00-067.00 098.00-104.00 110.00-122.00 145.00-148.00	1.08	208.7	9.7	21.68	1899	4.3X10 ⁻⁴	12"/6"	-do-	
	OW	153											
1	2	3	4	5	6	7	8	9	10	11	12	13	14
6	KATEA/ Katea 26 ⁰ 36'00" 84 ⁰ 07'40"	202	135	056.00-062.00 072.00-078.00 084.00-090.00 102.00-108.00 120.00-132.00	2.36	215	9.91	21.69	2210	3.01X10 ⁻⁴	12"/6"	-do-	

	OW	140.77											
7	BIJAIPUR 26 ⁰ 30'30" 84 ⁰ 00'45"	200	140	048.00-060.00 072.00-084.00 090.00-096.00 132.00-138.00	3.84	200.3	8.62	23.2	1472	3.3X10 ⁻³	12"/6"	-do-	-
	OW1	144.2											
	OW2	31.4											
8	BAIKUNTH- PUR/ Baikunthpur 26 ⁰ 00'26' 84 ⁰ 44'54"	205	141	065.00-074.00 086.00-092.00 099.00-105.00 117.00-123.00 126.00-138.00	3.02	84.2	18.9	4.45	1788	2.30x10 ⁻³	12"/6"	-do-	-
	OW1	144.3											
	OW2	16.2											

Gopalganj district

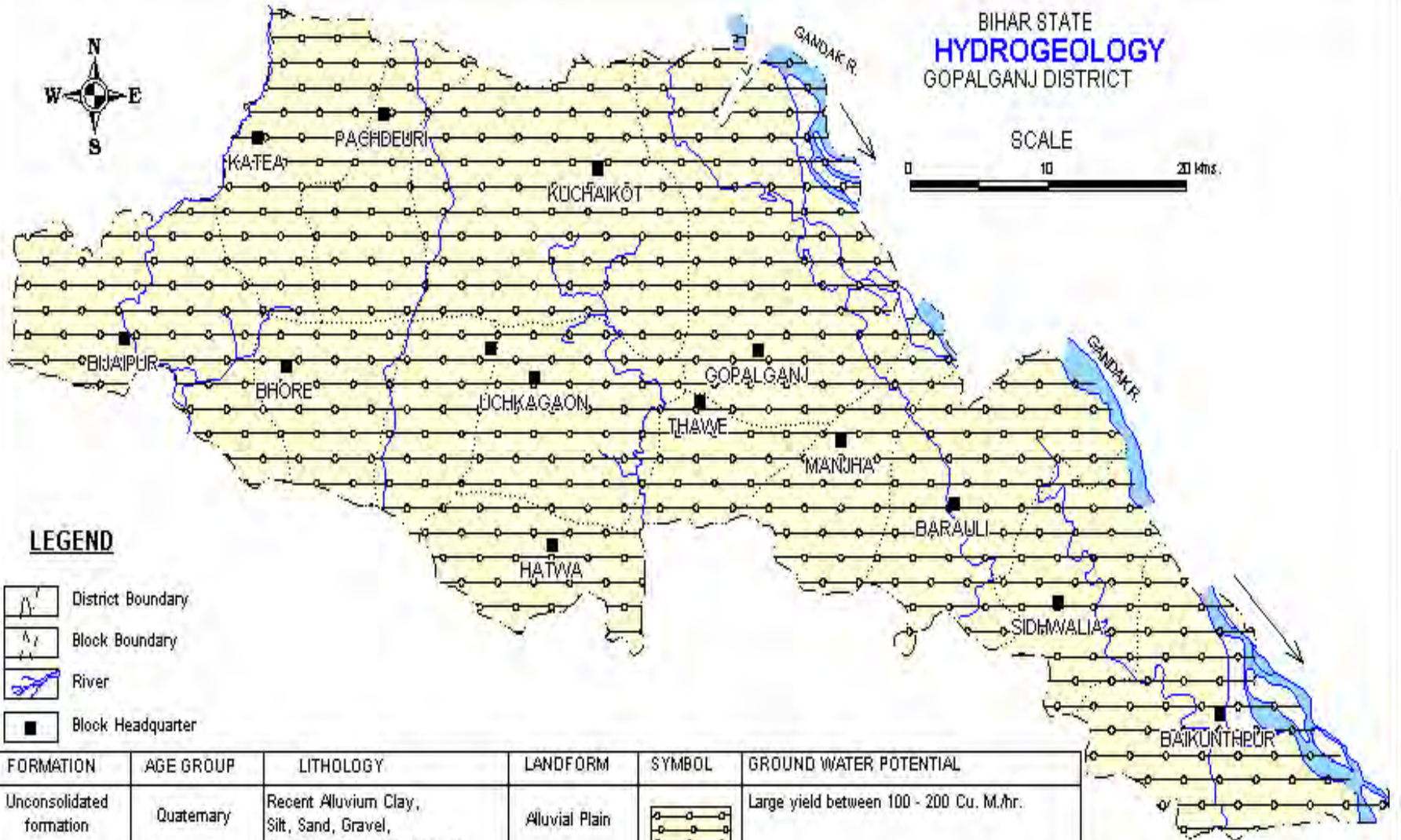
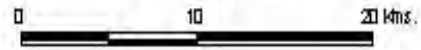
Sl.No	AssessmentUnit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Suply	Existing Gross Ground Water Draft For all Uses (10+11)	Allocation for Domesticand Industrial Requirement suply upto next 25 years	Net Ground Water Availability for future irrigation development (9-10-13)	Stage of Ground Water Development (12/9)*100 (%)
1	2	9	10	11	12	13	14	15
1	Baikunthpur	5670.3	2835.3	278.3	3113.6	417.2	2417.8	54.9
2	Barauli	4909.4	2349.9	472.8	2822.7	739.4	1820.2	57.5
3	Vijayeeपुर	4162.6	2500.5	181.7	2682.2	272.4	1389.7	64.4
4	Bhoro	4913.8	1952.7	234.5	2187.3	351.6	2609.5	44.5
5	Gopalganj	5343.1	2557.2	292.1	2849.2	452.2	2333.7	53.3
6	Hathua	3968.4	1478.0	295.5	1773.5	443.0	2047.4	44.7
7	Kateya	5397.9	1863.8	249.4	2113.2	389.6	3144.4	39.1
8	Kuchaikot	8179.6	2794.0	436.8	3230.8	654.8	4730.8	39.5
9	Manjha	3768.3	2053.8	271.3	2325.1	406.6	1307.8	61.7
10	Phulwaria	4293.0	1533.9	171.3	1705.2	256.8	2502.3	39.7
11	Panchdevari	2967.3	976.5	131.7	1108.2	197.4	1793.4	37.3

12	Sindhwalia	3289.9	1723.1	178.6	1901.7	267.8	1299.0	57.8
13	Thawe	1870.3	1128.5	152.1	1280.6	228.0	513.9	68.5
14	Uchakagaon	4627.1	2249.0	330.6	2579.7	516.4	1861.7	55.8
	Total	63361.1	27996.3	3676.8	31673.1	5593.2	29771.6	50.0



BIHAR STATE
HYDROGEOLOGY
 GOPALGANJ DISTRICT

SCALE



LEGEND

- District Boundary
- Block Boundary
- River
- Block Headquarter

FORMATION	AGE GROUP	LITHOLOGY	LANDFORM	SYMBOL	GROUND WATER POTENTIAL
Unconsolidated formation	Quaternary	Recent Alluvium Clay, Silt, Sand, Gravel, Calcareous concentration etc.	Alluvial Plain		Large yield between 100 - 200 Cu. M./hr.

