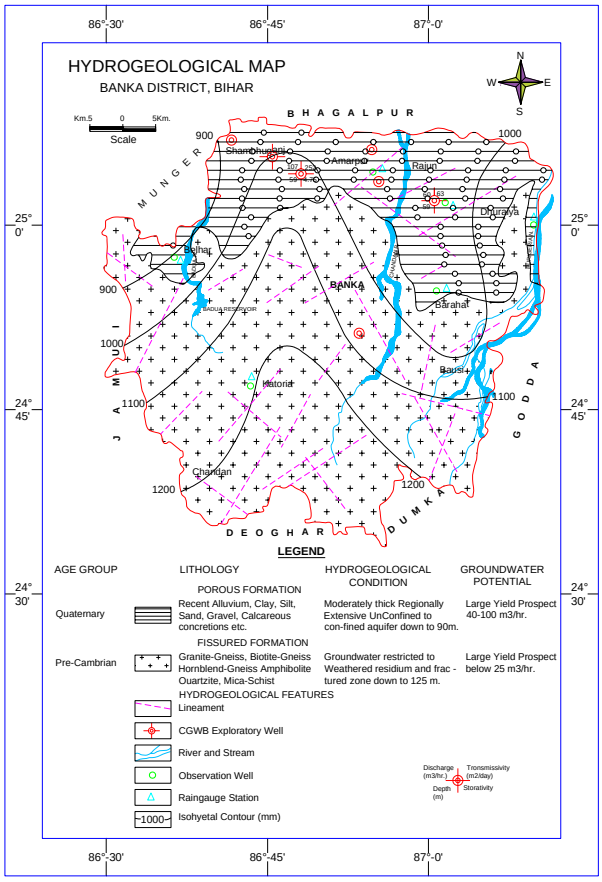
जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

"Ground Water Information Booklet"

Banka District, Bihar State



Central Ground Water Board

Ministry of Water Resources

(Govt. of India)

Mid-Eastern Region

PATNA

July, 2007

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Ground Water Information Booklet
Banka District, Bihar

CONTENTS

FIGURES

TABLES

BANKA DISTRICT AT A GLANCE

Sl. No.	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (SqKm)	3019
	Administrative Division (As on 2001)	
	i) Number of Tehsil/ Block	11
	ii) Number of Punchyat/Villages	199/2131
	iii) Population (As on 2001 Census)	1292504
	iv) Average Annual Rainfall (mm)	1168
2.	GEOMORPHOLOGY	
	Major physiographic unit :	Alluvial Plain,Hills & Pediments
	Major Drainages:	Chandan,Badua & Burigeria rivers
3.	LAND USE (SqKm)	
	a) Forest area:	460
	b) Net area sown:	1460
	c) Cultivable area:	1730
4.	MAJOR SOIL TYPE	
5.	AREA UNDER PRINCIPAL CROPS	
6.	IRRIGATION BY DIFFERENT SOURCES (Areas in Hectare and Number of Structures)	Area(SqKm)
	Dugwell	20
	Tubewell/Borewell	270
	Tank/ponds	190
	Canals	330
	Other sources	340
	Net irrigated area	
	Gross irrigated area	1150
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007)	
	No of Dug wells	9
	No of Piezometers	
9.	HYDROGEOLOGY	
	Major Water bearing formation	Quaternary Alluvium, Granite Gneiss
	(Pre-monsoon Depth to water level during 2006) m bgl.	3.2
	(Post-monsoon Depth to water level during 2006) m bgl.	5.1
	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)	20,3, ,4
	Depth range (m)	54 to 202 m
	Discharge(m3/hr)	60 to107m^3/hr
	Storativity (S)	2.75 x10^{-3} to 4.75x10^{-3}
	Transmissivity (m^2/day)	63 to 1265
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	41453
	Net Annual Ground Water Draft	13558
	Projected Demand for Domestic and industrial Uses up to 2025	3849
	Stage of Ground Water Development(%)	32.71
13.	AWARENESS AND TRAINING ACTIVITY	NIL
	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	Nil
	Number of Critical Blocks	Nil
	Number of Blocks notified	Nil
18	MAJOR GROUND WATER PROBLEMS AND ISSUES	

1.0 Introduction

1.1 Administration

Banka district was a sub-division of erstwhile Bhagalpur district and was upgraded into a full fledged district on 21st Feburary,1991. The district lies between north latitude 24°30'0'' to 25° 07'0'' and east longitude 86°30'00''to 87°12'00''. It covers a parts the degree sheet number 72K, 72O, 72L and 72P of Survey of India. The geographical area of the district is 3019.5 km^2. It's district Headquarter is in Banka town. The district is bounded in the north by Bhagalpur, in the south by Deoghar, in the east by Godda, in the west by Jamui, in the NW by Munger and in the southeast by Dumka districts. There are 11 development blocks in the district. It's population is 1608773 (2001 census). The sex ratio is 908 females per 1000 males. The district is having population density 533 person/km^2 and the decadal growth rate of the last decade (1991-2001) is 24.47%. The population of schedule tribes and schedule caste are 4.7%and 12.43%of the total population respectively. There are two statutory towns namely Banka and Amarpur. The most populous block is Dhuraiya and the least populous is Phulidumar. The administrative map of the district is given in Figure 1.

1.2 Basin/sub-basin, Drainage

The Banka district lies in south of the river Ganga and constitutes a part of the Ganga River Basin. It falls under Badua –Chandan sub-basin. It has three watershed,namely Badua Nala ,Chandan river watershed and the left bank watershed of Burigeria Nala. The major part of the district falls under Chandan river watershed.

Three major rivers/nalas, namely Badua N.(forming the north western boundary),Chandan R. which flows through the central part of the district and the Burigeria N.(forming the eastern boundary of the district) drains the area. All the three rivers/nalas originate from the hilly tracks present in the south of the district and flows from south to north direction. The streams namely Kudar, Orni, Panchkatia are the main tributaries of

Chandan,while Lohargara,Karunior,Belharna are the main tributaries of Badua. All the rivers are ephemeral in nature.

1.3 Irrigation Practices

The various major surface water irrigation schemes present in the district are as follows:

1. Chandan Reservoir Irrigation Scheme
2. Kajia Danr Irrigation Scheme
3. Badua Reservoir Project-shambhuganj and Belhar blocks
4. Chandan,Bilasi Irrigation Scheme - Banka
5. Orhni Reservoir Irrigation Project – Banka ,Pullidumer
6. Laxmipur Reservoir Irrigation Project-Bounsi Block

The Chandan reservoir is major irrigation project in the Banka district.Its command area falls in the Banka,Barahat,Rajaun and Dhuraiya block of Banka district. The gross command area is 1.40 m ha. and the surface water irrigation facility is available only to 0.64 m ha in kharif and 7690 ha during rabi (this is inclusive of water directed from small structures like ahar etc.

As per the available statistics of 1994-1995, area irrigated by different sources e.g canals,tubewells,dugwells,other sources etc. constitute 66% of the total cultivated area in the district.canal is the most important source of irrigation in the district. The area irrigated by ground water constitutes 9.44 %(private shallow tubewells 7.9%, other wells 1.5%) of the gross irrigated.

The major landuse categories of the district are given in tabular form(Table.1)

Landuse	Area(in hectare)
Forest	46000
barren and uncultivable land	43000
Land under non-agricultural uses	42000
Permanent pasture and grazing land	2000
cultivable waste other than fallow	8000

source : 1999 directorate of statistics and evaluation,Bihar,Patna)

1.3 Studies/ activities carried out by CGWB

Central Ground Water Board issued a report unpublished report on Hydrogeological condition, Ground Water Resources and development potential

of Bhagalpur district in the year 1985 (unpublished report C.G.W.B) . Quaternary geology and geomorphology mapping of parts of Chandan-Badua sub-basin in undivided Bhagalpur district was carried out by Geological Survey of India in the year 1990.

The district was covered under reappraisal survey during 1995. Under Ground Water Exploration 20 EW and 2 OW were constructed through departmental Rigs (Table-1) by CGWB. One of the EW at Jagatpur, Banka block, had been abandoned. Nine Hydrograph Network Stations (HNS) are being monitored four times in a year as per the ground water regime-monitoring plan of Central Ground Water Board.

2.0 Rainfall and Climate

The climate of the district is characterized by hot summer and a pleasant winter. April to June comprises summer month while November to March makes cold season. The southwest monsoon breaks in the month of June and continues upto the end of September. The average annual rainfall in the district is 1168 mm. The district receives major amount (86%) of precipitation during the monsoon period.

3.0 Geomorphology and Soil

3.1 Geomorphology

The district can be broadly divided into two broad physiographic division viz. alluvial plain in the north and the hilly track in the south. The regional slope from south to north is prominent. The west of the alluvial plain of the river Ganga is bordered by the Munger-Kharagpur hills. The hills of the district are generally moderate in height, denuded and irregularly scattered.Geomorphologically the area is being divided into five distinct units.These units given below are in chronological order from youngest to oldest.

1) Diara Surface: It is the youngest morpho-unit of the area comprising of yellow-brown to brownish-grey compact clay. It is the recent flood plain of the major rivers passing through the district.
2) Belhar Surface: It is a flat alluvial low land usually free from regular annual flooding, but is prone to water logging in the patches. The surface overlies the recent flood plain surface .The soil is buff to brown colour and rich in silt, sand or silty clay.

3) Sautadih Surface: The surface belongs to the older alluvial upland bordering the pediplains and the hilly area. The soil profile is well developed and characterised by deeply oxidesed yellow to brownish red clay with ferruginous concretions.

4) Pediplain Surface: The surface borders the northen margin of the distrct. These rocky units are essentially produced by the erosional process. The surface has developed primarily on the granite gneisses and is characterized by lack of good soil profile and colluvial deposits of weathered material.

5) Hilly /Rocky upland: This includes the hilly area of the Chotanagpur plateau, consisting of granite gneiss, quartzites, phyllites and mica schist.

3.2 Soils

Banka district is characterized by a wide variety of soils, which can be broadly grouped into two categories, the alluvial soil and hilly soil. The alluvial soil derived partly from the older alluvium deposit and partly form the newer flood plain deposit is characterized by light grey to dark grey colour and fine texture. The hilly soil derived from the weathered product of rocks is coarse grained, ferruginous, low in nitrogen ,medium to high potash and acidic in nature.

4.0 Hydrogeology

The Banka district can be sub-divided broadly into two hydrogeological units.(figure-2)

1) Alluvial Formation: It occupies the northern part of the district.The Quaternary alluvial deposits consisting of sand ,silt and clay forms a good repository of the ground water.The ground water occurs in the porous material under both unconfined and semi-confined to confined conditions depending on the disposition of aquifers.

2) Fissured Formation: The fissured formation constitutes the Chotanagpur Granite Gneissic Complex and meta sedimentaries. Ground water occurs in these rocks under confined to semi-confined conditions. The secondary porosity e.g. fractures,joints and fault

planes acts as aquifer and controls the storage and movement of ground water.

Ground water in the alluvial track of the district

The thickness of Quaternary Alluvial deposit generally ranges from 15m to 100m in the northern part of the district. The maximum depth to bedrock is at Raipura which is 99m.The sandy layers in the alluvial terrain form the main repository of ground water in the northern part of the district. The thickness of alluvial deposit increases from south to north. Ground water usually occurs under both unconfined conditions in aquifer disposed at shallower depth and under semi-confined to confined condition at deeper depths. The thickness of granular zone ranges between 18-25 m at a depth ranging between 50 and 99 m below ground level. The yield ranges between 60m^3/hr to 124 m^3/hr for a drawdown of 21 m and 8.00 m respectively. The available data indicate that in Shambhuganj block there exist a number of granular zones in shallow and deeper levels. In this block there is a wide scope of ground water development through shallow tubewells upto 50m depth. The deep tube wells up to 100m depth may give a discharge of 75-100 m^3/hr. The exploratory data indicate that there is a wide variation of the transmissivity value which varies from 63.7 m^2/day at Khirri to 1265 m^2/day at Rudpai.The transmissivity is found to be increasing towards northwestern part of the district, where the thickness of the aquifer is also more. The storage co-efficient value as estimated has been 2.75 x 10^{-3} at Warshabad, which shows that aquifer are under semi-confined condition.

Ground water in the hard rock formation

As the southern part of the district is underlain by Precambrian formations, the movement, occurrence and distribution of the ground water is primarily controlled by nature and distribution of joints, fissures and other structural zones of weakness. At places the granites and meta-sedimataries are weathered and extensively jointed. Ground water occurs in this weathered formation in unconfined condition, Whereas the deeper fracture within the hard rocks also form a very good repository of ground water.

Depth to Ground Water level

Depth to ground water level maps for pre-monsoon (Figure-3) and post-monsoons (Figure-4) 2006 have been prepared. A perusal of the depth to water level map of pre-monsoon period indicates that water level is shallowest (0-4m

bgl) in the northwestern part of the district covering Shambhuganj, western parts of Amarpur and northern part of Belhar blocks,

The depth to water level in the range of 4-5 m covers the rest of Amarpur block, southern part of the Belhar and Shambhuganj and northern part of Pullidumar blocks and the subsequent range of 5-7 m water level occupies the major part of the distrct covering Belhar, north Chandan, north Katoria almost entirely Banka, Rajaun ,Dhuraiya and northern part of Bausi blocks. The deepest water level range of 7-9m occupies the southern hard rock area of the district,covering rest of Chandan,Katoria and Bausi blocks.

During the post-monsoon period the depth to ground water level in the north western and north eastern parts of the district rests in the range of 0-3m bgl, followed by 3-5m range of water level covering the central part of the district. The southern part of Chandan and western part of the Katoria blocks show the deepest water level of 5-7m.

4.1 Ground Water Resources:

Annually replenishable dynamic ground water resource of the unconfined aquifer has been estimated as on 31st march 2004 for all the blocks following GEC-1997 methodology. The net annual replenishable ground water resource of the district is 41453 ham. The gross draft for all uses (irrigation, domestic and industrial water supply) as on 31st March 2004 worked out to be 13558 ham,and the existing gross ground water draft for irrigation works out to be 10957 ham. The allocation for domestic and industrial requirement up to next 2025 years works out to be 6873 ham and for irrigation 26646.0 ham. The stage of ground water development of the district is 32.7% which indicate that though all the blocks of the district falls under safe category and are under developed in terms of utilisation of ground water resources. This gives ample scope for development of ground water for irrigation and other uses. Maximum ground water development is in Barahat block (46.0%), where as the minimum in Katoria block (21.1%). Details of ground water resources of all blocks are presented in Table 2.

4.2 Chemical quality of ground water:

The chemical analysis of ground water samples of the HNS location in the district for May 2006 indicates that the water is potable and can be used for industrial and irrigation purposes. The ground water of the district is basic in

nature. On the basis of chemical analysis data the major cation and anion in the district are Ca and (HCo_3) respectively. The range of concentration of major constituents in ground water is given below (Table-2):

Chemical Parameters	Range
1. pH	7.05 – 8.44
2.Specific conductance	390 – 1030 micromhos/cm at 25oC
3.Calcium	16 – 100 milligram/litre
4.Magnesium	4.9 - 24 milligram/litre
5.Bicarbonate	128 -226 milligram/litre
6.Chloride	28 - 163 milligram/litre
7.Total hardness as CaCo3	70 -350 milligram/litre
8. Na	18 - 115 milligram/litre
9. K	0.4 – 43 milligram/litre

4.3 Status of Ground Water Development- Block wise

In Banka district the stage of ground water development is 32.70%(Figure-5). The low utilization of ground water for irrigation in the district can be visualized from the fact that only 9.44% of the total irrigation comes from ground water. The structures like dug well, private shallow tube well, deep tube well are the main source of ground water abstraction structures.Till the year 1995 state tubewell existed in the district. However,eight exploratory wells constructed in the alluvial tracks of the district by CGWB ,opened new avenue for ground water utilization. Surface water irrigation plays important role in providing assured irrigation in the district.

Only the towns have drinking water supply. The rural area depends on dug well,private shallow tubewells,river hand pumps and ponds for drinking water purposes.

5.0 Ground Water Management Strategy

5.1 Ground Water Development

A perusal of Table 2 indicates that most of the blocks have low ground water development except Barahat and Phulidumar blocks which have the stage of ground water more than 40%. As per the available record the present utilization of ground water for irrigation is low as compared to the surface water. Surface water canal is the most important source of irrigation. In the pediplain the large diameter dug wells should be preferred to tubewell. The tube well site

should be scientifically located after hydrogeological and geophysical studies. A shallow tube well can yield upto 25m^3/hr discharge.

In the alluvial tracks shallow tubewell upto a depth of 50m may yield 50 m^3/hr by tapping the granular zones thickness. A deep tube well of 100m depth may yield upto 75-100 m3/hr.

Feasibility of Ground Water Structures in Banka district.(Table 3)

Type of Structure	Diameter(m)	Depth range(m)	Expected thickness of aquifer /fracture	Expected yield range(m3/hr)	Command area(Ha)	Hydrogeological setting
Dug well	3	10-15	2-3	5	0.5	Alluvial plain/Granite gneiss
Shallow Tube well	100	40-50	10-15	40-50	5	Alluvial Plain/ Granite gneiss
Deep tube well	150	75-100	15-25	75-100	10-12	Alluvial Plain
Shallow bore well	125	40-50	5-10	15	15	Pediplain/Granite gneiss
Deep bore well	150	100-125	10-20	25-30	5	Granite gneiss

5.2 Water Conservation and Artificial Recharge

As the southern portion of the district is dominantly hilly and is surrounded by gently sloping pediment surfaces, there is ample scope to conserve water by water conservation structures like contour bunds, tanks and ponds. Construction of any water conservation structure should be done after taking into consideration the local topography, slope, depth to ground water level and public participation. By these conservation structure will help recharge ground water.

6. 0 Ground water related issue and problems:

Water-Logging and Flooding: The alluvial plain of the district is by and large free from any major flood or water logging problems. But due to excessive load of sediments in the streams during the peak monsoon, flash flood occurs in the district. Most affected blocks are Banka, Rajaun and Amarpur.

Low ground water development: The overall stage of ground water development in the district 32.7% which is very low and the contribution of ground water towards irrigation is minimal.

7. 0 Mass Awareness and Training Activity:

7.1 Mass Awareness Programme:

No mass awareness and training activitie have been carried out in this district.

8.0 Area notified by CGWA/SGWA

All blocks of Banka district are under safe category for ground water development point of view. So far no block has been notified by either Central Ground Water Board or by State Ground Water Authorities.

9.0 Recommendation

(1) Keeping in view the fact that huge volumes of ground water exist, a ground water development plan may be taken up. In the hard rock gneissic terrain large diameter dug wells are preferred to borewell. However, with proper scientific approach shallow borewell of 40-50 m depth and deep bore well of 100-125 m depth are feasible in gneissic rocks. In alluvial area shallow tubewell upto 50m depth is preferred as compared to dugwell. The shallow tubewell can yield 50m^3/hr, while deep deep tubewell upto a depth of 100 m (specially in Shambhuganj block) can yield upto 100 m^3/hr.

(2) In Chandan Badua command area conjunctive use of surface and ground water may be practiced.In Shambhuganj block the augmentation of canals by ground water resource can be done and a portion of surface water can be diverted to adjacent areas where ground is scarce.

(3) Artificial recharge in the hilly and pedimental landscape area should be taken up by consideration the post monsson ground water level. As it can be observed from the post monsoon water table map ,the southern area of blocks Chandan and Katoria blocks are suitable for articial recharge.

4) Flooding in the district can be minimized by constructing a series of check dams and gully head plugs.

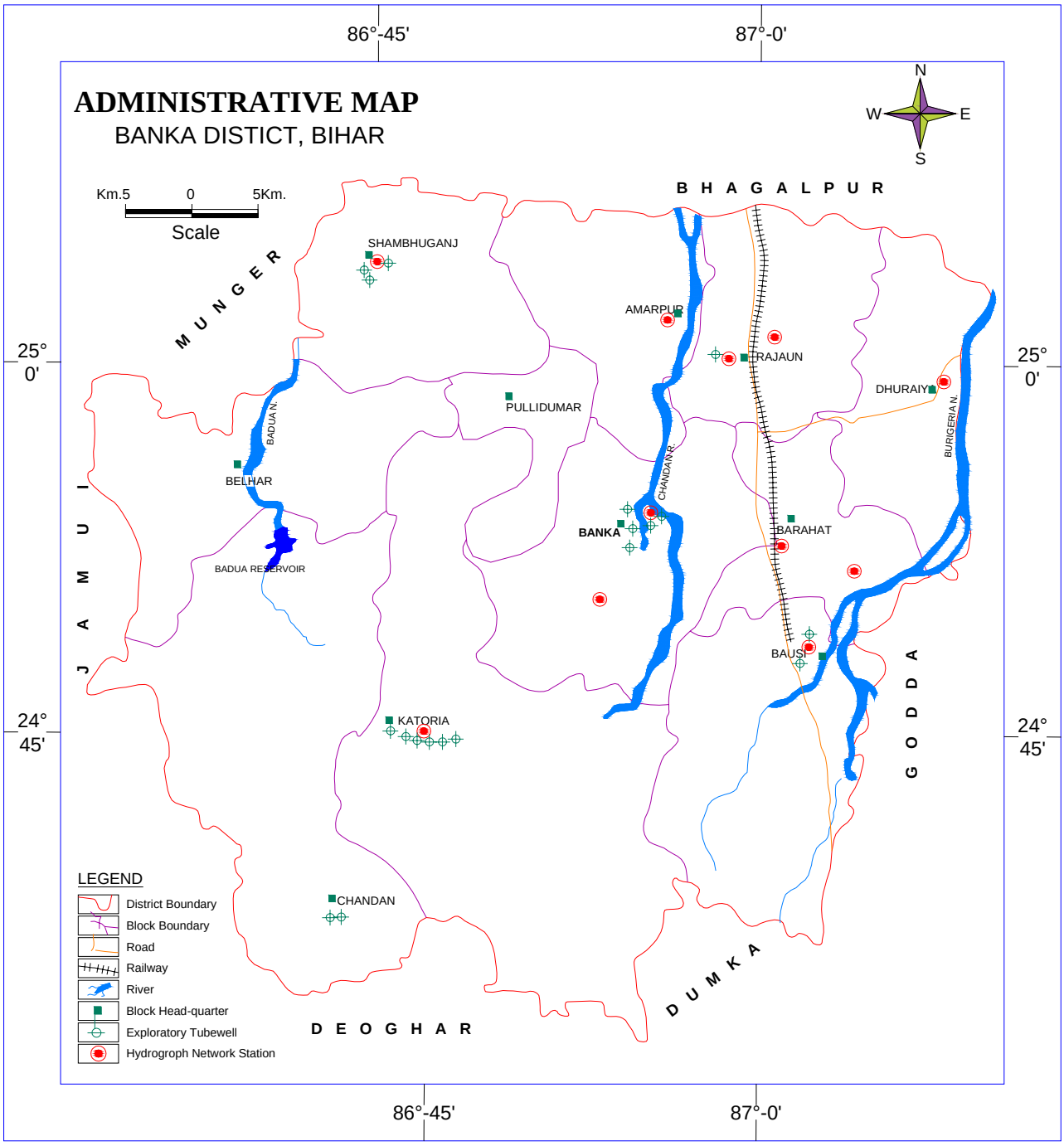

FIGURE 1.ADMINISTRATIVE MAP OF BANKA DISTRICT,BIHAR

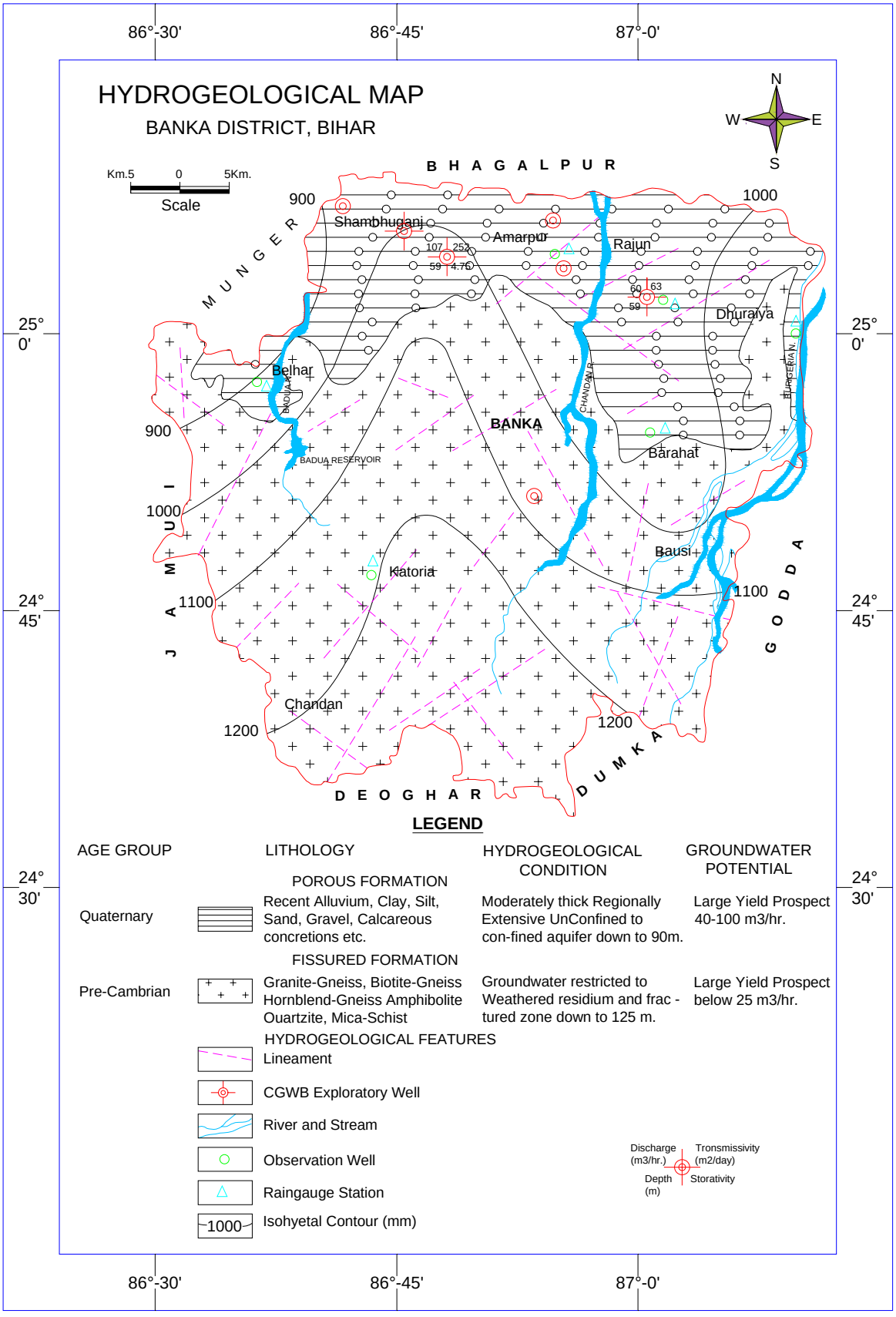

FIGURE 2. HYDROGEOLOGICAL MAP OF BANKA DISTRICT,BIHAR

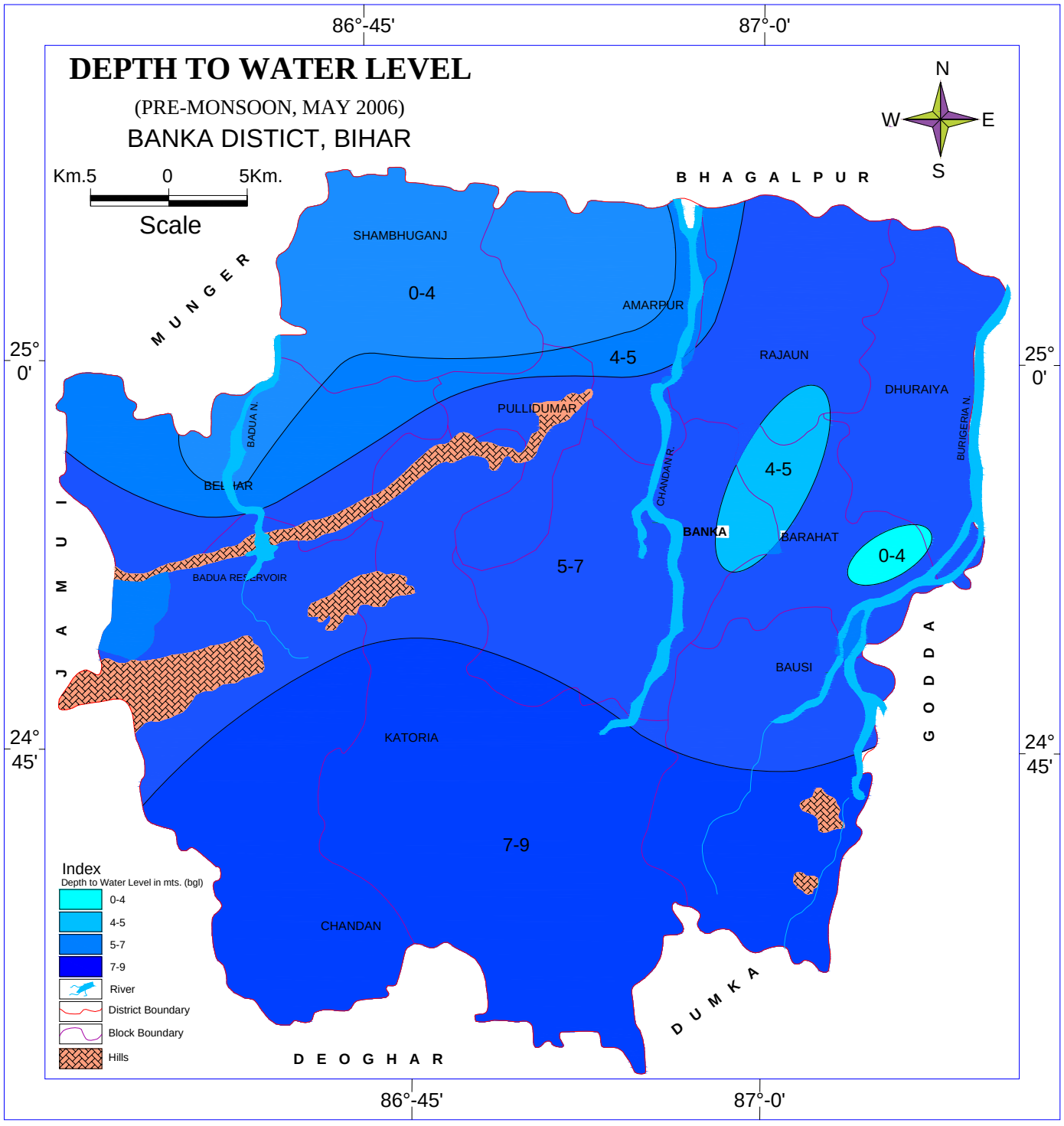

FIGURE 3. DEPTH TO WATER LEVEL MAP(PREMONSOON) OF BANKA DISTRICT,BIHAR

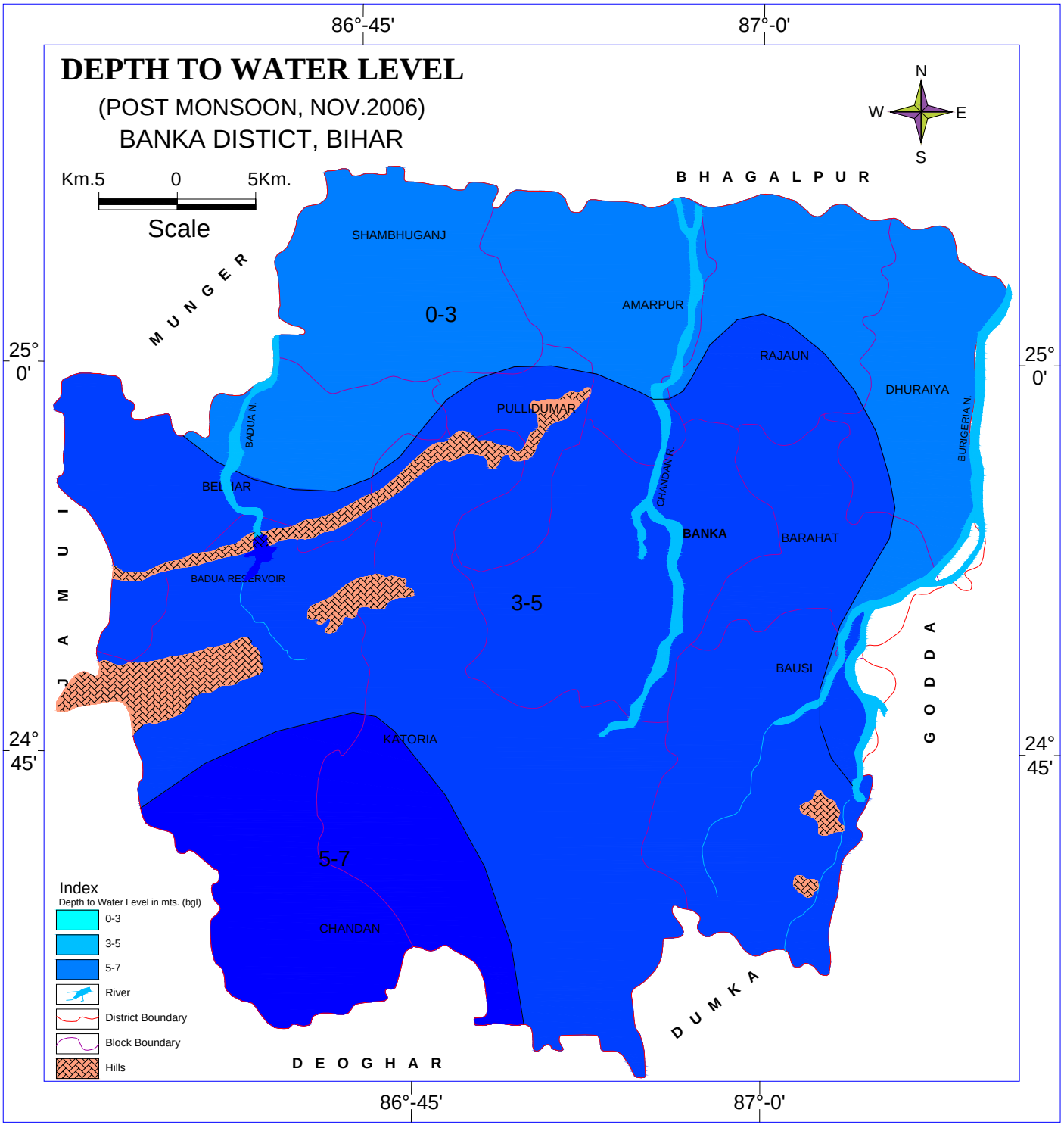

FIGURE 4. DEPTH TO WATER LEVEL MAP(POSTMONSOON) OF BANKA DISTRICT,BIHAR

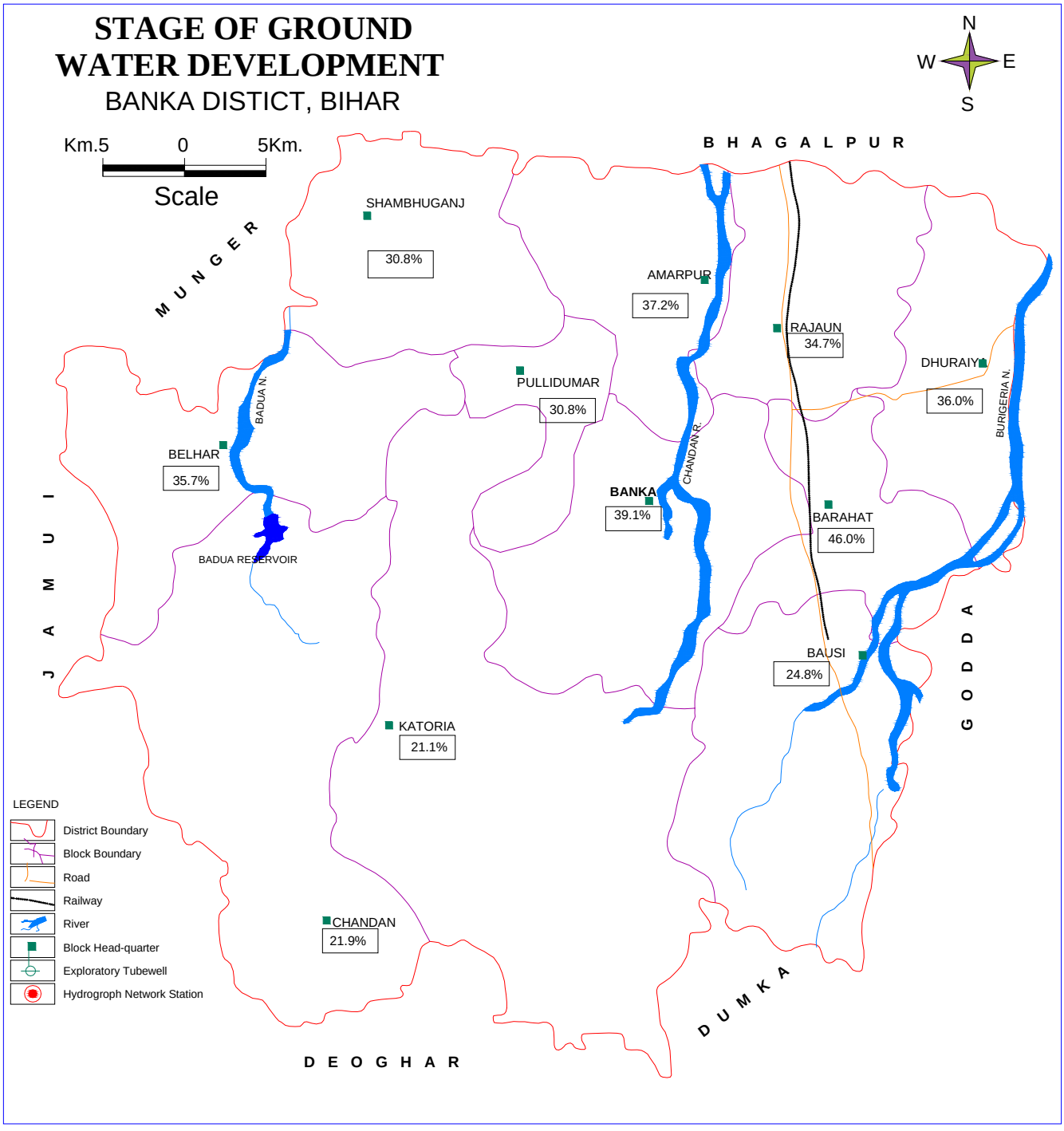

FIGURE 5. STAGE OF GROUND WATER DEVELOPMENT OF BANKA DISTRICT,BIHAR