

DISTRICT BROCHURE OF KUSHI NAGAR DISTRICT, UTTAR PRADESH

(A.A.P.: 2012-2013)

By

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Scientist 'C'

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DISTRICT AT A GLANCE

1. GENERAL INFORMATION

i. Geographical Area (Sq. Km.)	: 2906
ii. Number of Tehsil / Block	: 4/14
iii. Number of Villages / Town	: 1640 / 7
iv. Population (as per 2011 census)	: 35,60,830
v. Population density (2011 census)	: 1225
vi. Average Annual Rainfall (mm)	: 1203

2. GEOMORPHOLOGY

Major Physiographic Units	: Flood Plain, Sand bars, Alluvial Plain
Major Drainages	: Gandak and Little Gandak

3. LAND USE (in ha) (2010-11)

a) Forest area	: 817 ha
b) Net area sown	: 225210 ha
c) Gross area sown	: 346840 ha

4. MAJOR SOIL TYPES : (i) Bhat, (ii) Bangar

5. IRRIGATION BY DIFFERENT SOURCES

(Irrigated Area and Number of Structures)

(2011-12)

Govt. Tubewell	: 2538 ha/ 147 nos
Private Tubewell	: 106058 ha/ 59978 nos.
Tanks & Ponds	: 29 ha
Canals	: 51872 ha / 1491 kms
Wells	: 16859 ha
Other Sources	: 184 ha
Net Irrigated Area (2010-11)	: 177540 ha
Gross Irrigated Area (2010-11)	: 273570 ha

6. NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007)

No. of Dugwells	: 11
No. of Piezometers	: Nil

7. PREDOMINANT GEOLOGICAL FORMATIONS : Alluvial deposit of Quaternary Age

8. HYDROGEOLOGY

- i Major water bearing formation : Alluvium, sand and silt
- ii Pre-monsoon Depth to water level during 2012 : 2.27 to 5.16 mbgl
- iii Post-monsoon Depth to water level during 2012 : 0.83 to 2.76 mbgl
- iv Long term water level trend in 10 years (2003-2012) *Ranges in m/yr*
 - Premon Rise : 0.039 to 0.169
 - Premon Fall : 0.012 to 0.126
 - Postmon Rise : 0.010 to 0.511
 - Postmon Fall : 0.002 to 0.194

9. GROUND WATER EXPLORATION BY CGWB (As on 31-3-2012)

Number of wells drilled (E.W., O.W., PZ)

Type of Structure	No. of Structure Constructed	Depth Range (mbgl)	Discharge (lpm)	Storativity (S)	Transmissivity (T) m ² T/day
Exploratory Well	2	Upto 317.50	2846-3000	-	-
Observation Well	1	182.0	-	-	-

10. GROUND WATER QUALITY

Qualitatively ground water is potable throughout the district

11. DYNAMIC GROUND WATER RESOURCES (2009)- in MCM

- Annual Replenishable Ground Water Resources : 127489.52 ham
- Net Annual Ground Water Draft : 76175.33 ham
- Projected Demand for Domestic and Industrial Uses upto : 6371.20 ham
2033
- Stage of Ground Water Development : 59.75 %

DISTRICT BROCHURE OF KUSHINAGAR DISTRICT, U.P.

(A.A.P.: 2012-2013)

By

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I INTRODUCTION

Kushinagar, district of the eastern Uttar Pradesh, is known for its cultural heritage all over the world. It is one of the four holiest places for the Buddhists. At Kushinagar, Great Lord Buddha, founder of Buddhism, delivered his last sermon. Outside India, it is an International Buddhist Pilgrimage Centre. The followers of the Buddhism, especially from Asian Countries, wish to visit this place at least once in their lifetime.

It constitutes a district of Gorakhpur division occupying the extreme north-eastern corner of Uttar Pradesh with Padrauna as its district headquarter. It is bounded by the district Maharajganj on the west as is partly the northern apex which is also flanked on the east by the Betia district of Bihar which along with Gopalganj district (Bihar) forms its eastern boundary. The dividing line is marked by the Gandak and Little Gandak rivers. In the south of this district lies Deoria District.

Kushi Nagar district was formed in the year 2006 as a result of bifurcation of Deoria district consisting of four Tehsils namely Hata, Kasia, Padrauna, and Tamkuhi along with its fourteen community Development Blocks namely Kaptanganj Ramkola, Motichak, Hata, Sukrauli Khadda, Nebuwa Naurangiya, Vishunpura, Padrauna, Kasia, Dudhai, Fazil nagar, Tamkuhi and Sevarahi.

II RAINFALL AND CLIMATE

The average annual rainfall is 1203 mm. The climate is sub-humid and is influenced to some extent by the proximity of the north and the existence of Terai swamps. About 90% of rainfall takes place from June to September. During monsoon surplus water is available for deep percolation of ground water.

There is a meteorological observatory at Gorakhpur, The records of which may be taken as representative meteorological conditions. January is the coldest month with mean daily maximum temperature at 23⁰C and mean daily minimum temperature at 9.9⁰C may is the hottest month with daily maximum temperature at 39⁰C and mean daily minimum temperature at 25.9⁰C. With the onset of monsoon day

temperature drop appreciably but night continue to be warm. The mean monthly maximum temperature is 19.8⁰C.

During the monsoon and post monsoon seasons the relative humidity is high and decreases in winter months. The mean monthly maximum relative humidity is 69% and mean monthly evening relative humidity is 53%.

Winds are generally light with slight increase in force in the late summer and southwest monsoon months .The mean wind velocity is 4.1 km/hr. The potential evapotranspiration is 1422.7 mm.

III. GEOMORPHOLOGY & SOIL TYPES

Kushi Nagar district is a part of central Ganga plain and is almost a flat country with gentle slope from north–west to south-east. Main rivers of the district are Gandak and little Gandak along with their tributaries apart form several lakes and ponds. Gandak flows in north-east part of the district and every year threatens the district with floods. Little Gandak flows from north to south in the western part of district with its tributaries viz. Khanua, Mawan and Dhurachi. Other tributaries of the river are Karma, Nakta Maghin, Undri, Koiler, Sonda, Jharhi and Bansi. The Important lakes existing in the district are Rampur Tal located south of Kasia, Kuser Tal near Dhara in Hata and Khaklumi Tal lying south east of Tamkuhi.

A major part of the soil is Bhat and consists of aluminum brought down by Gandak from Maharajganj district. Ridges run in winding course though the southern part of tehsil Hata making long abandoned channel of depression as lakes. Pebbles and boulders are also encountered while sinking wells at several places. Bangar tract comprises the western part of Hata Tehsil and is very fertile level plain.

IV. GROUND WATER SCENARIO

HYDROGEOLOGY:

General Geology:

The district of Kushi Nagar forms part of the central Ganga plain and is underlain entirely by deposits of quaternary alluvium. Alluvium consists of clay kankar and sand of different grades. Sand mixed with gravel and kankar forms the principal aquifers.

Sub-Surface-Geological Configuration:

The study of the sub-surface lithological log correlation reveals that there is a persistent clay bed occurring depth varying between 55 and 110 meters below ground level. The alluvial material above the clay bed comprises sand of varying grain sizes with occasional gravel and kankar. Clay occurs in the form of irregular levee which reduce the effective thickness of the granular zone. A moderately thick granular zone occurs below the clay bed which appears to merge with the upper sand bed in the eastern part of the district. Borehole drilled through the granular zone reveals that it contains fine to medium grain sand with occasional gravel. The cumulative effective thickness of granular zone tapped in Kushi nagar district varies from 60 to 80 meters.

Mode of Occurrence of Ground Water:

Precipitation is the principal source of replenishment of ground water. Ground water in Kushi nagar district occurs in the unconsolidated alluvial sediments under unconfined condition. The shallow aquifers, under water table conditions, are being tapped by open wells and hand pumps. Water in deeper aquifer occurs under confined to semi confined conditions.

DEPTH TO WATER LEVEL:

Based on premonsoon water level date of May 2012 of Ground Water Monitoring stations of CGWB a depth to water level map of premonsoon period May, 2012 has been prepared. The depth of water level in the district varies from 2.27 to 5.16 mbgl. The deepest water level is observed in Fazil nagar followed by Padrauna. Areas along Gandak river show shallow water levels of less than 3.00 mbgl. The water levels in the western parts of the district also fall under this range of water level.

During the post monsoon period of 2012 the depth to water level varies from 0.83 to 2.76 mbgl. Belwa shows the deepest water levels whereas Khadda, located in the northern part of the district shows shallowest water levels. Thus entire district falls under water logging condition, the reason being an intricate network of canals of Gandak Command, measuring about 1490 kms in length. Total command area is 51872 ha leading to excessive usage of canal water which in turn results in water logging conditions.

During monsoon season the natural ground water recharge take place by percolation of rainfall. To study the distribution of depth to water level during post monsoon period, depth to water level map of Nov 2012 has been prepared.

WATER LEVEL FLUCTUATION:

The pre and post monsoon water level and fluctuation in shallow aquifer is based on the data of National Hydrograph Stations are as below:

Table-1

PRE-POST MONSOON WATER LEVELS & FLUCTUATION DATA OF KUSHI NAGAR DISTRICT, U.P. (2012)

Sl No.	Location	Water Level (mbgl)		Fluctuation in m
		2012/May	2012/Nov	
1	Belwa	5.79	2.76	3.03
2	Bisunpura	2.77	2.29	0.48
3	Captanganj1	4.27	1.87	2.40
4	Chittauni	2.27	2.52	-0.25
5	Fazil nagar	5.16	2.17	2.99
6	Kasia1	4.04	1.22	2.82
7	Khadda	3.51	0.83	2.68
8	Mansurganj	2.53	2.57	-0.04
9	Mathauli	3.73	1.36	2.37
10	Naurangia	4.93	1.93	3.00
11	Rambar	3.67	1.72	1.95

The magnitude of fluctuation depends upon the quantities of water being recharged & discharged. The water level fluctuation during pre–post monsoon period ranges from 0.48 m in Mansurganj area to 3.03 m. Mostly, the fluctuation varies from 2 to 3 m in the district.

LONG TERM WATER LEVEL TREND:

Based on water level data of 10 years a long term water land trend for pre and post monsoon period has been worked out as summarized below in table 2.

On persusal of table-2 indicates that falling trend is observed at 6 out of 11 analysed stations. The falling trend ranges from 0.0123 m/year (at Captanganj1) to 0.126 m/year (observed at Belwa in Padrauna block). At the remaining 5 stations a rise in water levels is observed during premonsoon period ranging from 0.039 to 0.159 m/year. Declining trend of more than 0.10 m/year is observed at two stations viz. Belwa and Fazilnagar.

Table-2

**WATER LEVEL TRENDS OF GROUND WATER MONITORING
STATIONS, KUSHI NAGAR DISTRICT, U.P.**

Sl. No.	Location	Pre Monsoon			Post Monsoon		
		<i>Data Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Data (Points)</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>
1	Belwa	10		0.1262	9		0.0488
2	Bisunpura	10	0.1592		9		0.0286
3	Captanganj1	9		0.0123	9		0.0338
4	Chittauni	10		0.0697	9		0.0782
5	Fazil nagar	9		0.1025	9		0.1935
6	Kasial	8		0.0768	9	0.5105	
7	Khadda	9	0.0775		9	0.0315	
8	Mansurganj	10	0.0390		9		0.0020
9	Mathauli	9		0.0249	8		0.0922
10	Naurangia	9	0.0693		9	0.0103	
11	Rambar	10	0.1692		9	0.2482	

Similarly during post monsoon period falling water levels are observed during premonsoon period at 7 monitoring stations. The declining trend ranges from 0.002 to 0.194 m/year. Maximum decline is observed at Fazil nagar. During post monsoon period the rising trend ranges between 0.010 and 0.511 m/year. Five stations show a rising trend.

GROUND WATER MOVEMENT:

Water table contour map prepared in ground water management survey reveal that ground water movement direction is from Northwest to southeast and the hydraulic gradient of water table is around 0.3 m/km.

GROUND WATER EXPLORATION:

Two exploratory wells have been drilled in past by Central Ground Water Board. The depth drilled of these wells varies from 301.75 m to 317.5 mbgl. The storativity is 1.38×10^{-4} and Transmissivity ranges from 2650 m²/day to 3918 m²/day. Details of Exploratory Wells drilled by CGWB are given in table-3

In addition to these wells numbers of tubewell have been drilled by State Irrigation Department and U.P. Jal Nigam. The depth of these tubewells varies from 70.0 mbgl to 120.0 mbgl. These wells were constructed to meet the irrigation and drinking water requirement.

Table-3

**DETAILS OF EXPLORATORY TUBEWELLS,
DISTRICT KUSHINAGAR, U.P.**

Sl. No.	Location/ Latitude/ Longitude/ Toposheet	Type of well	Year of Const.	Drilled Depth/ Bedrock (mbgl)	Zones Tapped (mbgl)	Water Level (mbgl)	Yield (lpm)	Draw Down (m)	Transmissivity T (m ² /day)	Storativity S	Geology
1.	Udit Nagar Degree College	EW	2003-04	317.5	57-69 119-131 155-161 185-197	4.54	2846	7.44			Alluvium
2.	Shairi Durga Mandir	EW	2003-04	301.75	59.00 65.00 74.00 80.00 11500 121.00 127.00 133.00 164.00 18200	1.54	3000	4.8			Alluvium

V. GROUND WATER RESOURCE AND ESTIMATION

The estimation of ground water resources is a basic pre requisite for sustainable development with out causing adverse effect on the ground water requirement. The ground water resources of Kushinagar district is given in table-4.

The estimation of ground water resource potential of Kushinagar district has been worked out on the norms suggested by Ground Water Estimate Committee.

Table-4 showing Dynamic Ground Water Resources reveals that net annual availability of ground water in the district is 127489.52 ham. Various factors which are involved in ground water recharge such as rainfall, seepage from canal, seepage from applied irrigation, recharge from surface bodies like ponds, lakes and flood plain have been taken into account. The highest ground water recharge has been estimated in Nebuwa Naurangia block, which is 12519.27 ham, whereas lowest recharge is 6422.46 ham in Fazil Nagar block.

Table-4

**DYNAMIC GROUND WATER RESOURCES OF KUSHINAGAR DISTRICT,
UTTAR PRADESH (AS ON 31.03.2009)**

(in ham)

Sl. No.	Assessment Units - Blocks/ District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for All Uses	Net Ground Water Availability for future Irrigation Development	Stage of Ground Water Development (4/3)*100 (%)	Category of block
1	2	3	4	5	6	7
1-	Dudhai	8560.98	3414.08	5056.18	39.88	SAFE
2-	Fazil Nagar	6422.46	4701.74	1659.04	73.21	SAFE
3-	Hata	8418.64	4845.06	3513.72	57.55	SAFE
4-	Kaptan Ganj	9367.14	7632.04	1680.38	81.48	SAFE
5-	Kasiya	7119.05	4255.48	2818.09	59.78	SAFE
6-	Khadda	12241.59	6738.47	5456.17	55.05	SAFE
7-	Motichak	7541.15	5072.56	2418.62	67.27	SAFE
8-	Nebuwa Naurangia	12519.27	8187.50	4268.59	65.40	SAFE
9-	Padrauna	11144.37	6197.95	4832.03	55.62	SAFE
10-	Ram Kola	8472.13	3565.91	4835.65	42.09	SAFE
11-	Sewarhi	8201.40	4932.58	3186.16	60.14	SAFE
12-	Sukrauli	6841.40	4307.48	2509.99	62.96	SAFE
13-	Tamkuhi	9310.37	6088.45	3143.47	65.39	SAFE
14-	Vishunpurwa	11329.58	5300.95	5936.11	46.79	SAFE
	TOTAL	127489.52	75240.25	51314.19	59.02	

Similarly the ground water draft from different ground water structures such as dugwell, shallow and deep tubewell of entire district is 75240.25 ham. Maximum ground water draft has been calculated for Nebuwa Naurangia block, which is 8187.50 ham. Where as minimum ground water draft has been worked out for Dudhai block, which is 3414.08 ham. The annually available ground water balance for future development in the district is 51314.19 ham. The maximum ground water balance is noticed in Vishunpurwa block which is 5936.11 ham, whereas Fazil Nagar block has the lowest balance of 1659.04 ham for future development.

All the blocks of Kushinagar district are under Safe category with the stage of development ranging from 39.88 % in Dudhai to 81.48% in Kaptanganj. The

availability of ground water resource potential for irrigation for entire district is 51314.19 ham for further ground water development.

VI. GROUND WATER QUALITY

In general the quality of ground water is suitable for drinking and irrigation purpose. The quality of ground water is described as follows:

GROUND WATER SUITABILITY FOR DRINKING PURPOSES:

Ground water samples were collected during National Hydrograph Stations monitoring. These sample were analysed in the chemical laboratory of CGWB, Northern region.

The summarized results falling in permissible limit and undesirable effect and undesirable effect out side permissible limit are shown in Annexure-I and the analytical results are shown in Table-5.

To evaluate the drinking water quality of ground water 14 water samples were collected from different locations in each of the 14 blocks during the A.A.P. 2011-12. The study shows that ground water in general is suitable for domestic as well as irrigational purposes. The pH value of ground water in the district varies from 7.98 to 8.10. Which is well within the permissible limit.

The Electrical Conductivity is a reflection of the concentration of various chemical constituents in ground water and reflects the overall quality of drinking, irrigation and other purposes. The study reveals that EC ranges from 420 to 1350 micro Siemens/cm at 25⁰C.

The concentration of chloride, Nitrate, Fluoride, TH and calcium etc. are within permissible/ desirable limits.

Table-5

CHEMICAL ANALYSES OF GROUND WATER SAMPLES COLLECTS FROM KUSHINAGAR DISTRICT (U.P)
SAMPLES COLLECTED DURING 2011 (MAY)

Location (Blocks)	pH	EC in $\mu\text{s/cm}$	CO ₃	CO ₃	Cl	F	NO ₃	SO ₄	TH	Ca	Mg	Na	K	TDS
	values in mg/L													
Kaptan ganj	8.06	1000	0	512	42	0.32	15	34	395	40	71	63	3.9	600
Kasia	8.02	466	0	268	14	0.18	0	0	200	28	31	18	3.2	280
Ram Kola	8.00	464	0	293	14	0.21	0	0	230	12	48	11	4.1	278
Nebuwa Naurangia	7.99	992	0	439	85	0.15	0	29	320	20	65	71	31.0	595
Khadda	8.01	1350	0	518	149	0.3	0	43	465	8	107	97	5.6	810
Vishnoopur	8.10	781	0	464	35	0.52	0	14	400	8	91	19	1.4	469
Fazilnagar	8.10	602	0	390	7	0.16	0	0	300	12	65	9	4.8	361
Padrauna	8.00	420	0	250	14	0.13	0	0	200	12	41	9	4.6	252
Mathauli	7.98	1240	0	488	128	0.8	0	29	410	8	94	105	0.9	744
Se warahi	8.04	610	0	396	14	0.15	0	0	320	16	67	4.1	9.7	366
Hata	8.02	523	0	24	42	0.34	0	0	240	24	43	8.2	3.7	314
Sukrauli	8.00	660	0	451	7	0.23	0	0	360	12	79	4.2	12.0	396
Dudahi	8.00	641	0	256	42	0.29	0	0	225	24	40	21	2.2	385
Tamkuhi	8.02	796	0	476	42	0.56	0	0	370	20	77	30	11.0	478

SUITABILITY OF GROUND WATER FOR IRRIGATION USE:

As per Wilcox classification based on EC of ground water, the water can be grouped into five categories as detailed below: As per the EC values water falls under Good to Permissible class for irrigation use.

Sl. No.	Water Class	Ec. in micro mhos/cm at 25⁰C	No. of Samples
1.	Excellent	<250	-
2.	Good	250-750	8
3.	Permissible	750-2000	6
4.	Doubtful	2000-3000	-
5.	Undesirable	>3000	-

The ground water of the district is of good quality from irrigation point of view.

VII. GROUND WATER MANAGEMENT STRATEGY

Kushinagar district comprises alluvial areas. The ground water scenario is excellent for future withdrawal of ground water for domestic as well as irrigation purposes. Having a future development potential of 51314.19 ham and level of ground water development well within safe limits, there is an ample scope of constructing ground water abstraction structures such as shallow tubewells, hand pumps, dugwells etc.

However, the cultivators of the area are having small land holding & are poor. The fragmented nature of land holding is creating an hardship to an individual farmers to develop the ground water resource economically suitable strategy should be taken up by the state government to enhance the irrigation by ground water sources for future development.

Kushinagar district falls under the Gandak canal command area and hence is facing acute water logging and related problems at several places. Lack of awareness amongst farmers and their apathy towards water management and conservation measures is one of the reasons. Uncontrollable withdrawal of water from canals for irrigation has led to underutilization of ground water resources which has resulted in

rise in water levels to 2 to 3 mbgl. Shallow water levels also cause salinization of the soil rendering it infertile.

Thus awareness about conjunctive use of surface and ground water should be inculcated amongst farmers and their active participation in managing ground as well as surface water must be ensured. Since return seepage from surface water irrigation contributes to rising water levels in ground water this should be controlled through rostering of canals, cultivating crops that require less water.

The surface drainage needs to be improved and culverts need to be constructed or repaired on the roads that obstruct the natural surface or ground water flow. Existing channels need to be deepened for enhancing the carrying capacity.

VIII. AWARENESS & TRAINING ACTIVITY

Mass awareness programme and water management training programme by CGWB has not taken place in the district so far.

AREAS NOTIFIED BY CGWA/SGWA:

Kushinagar district has not been notified as yet.

IX. RECOMMENDATIONS

Kushinagar district has 51314.19 ham of ground water availability for future irrigation. To increase the agricultural productivity the main requirement is that the ground water should be developed in a planned and scientific manner. The recommendations are as follows:

- a. Due to presence of canal network the actual utilization of ground water available for irrigation is much less than the potential available and all the blocks fall under Safe category. Multiple cropping pattern needs to be adopted to utilise the potential available.
- b. The concept of conjunctive use of surface water and ground water in canal command area must be adopted. Conjunctive use of ground water can be planned as detailed below.
 - Ground water can be used in the Kharif season to supplement irrigation requirement to the necessary extent.
 - It can be used during Rabi season when rainfall contribution is much less compared to the irrigation requirement

- Ground water can also be used for meeting its requirement of summer crops.
- c. Marginal and poor farmers should be given financial help for constructing ground water abstraction structure with a view to draw water for irrigation.
- d. The district is backward industrially. The water-based industry may be promoted for utilizing the resources in a planned manner.
- e. High yielding varieties and use of improved technology be adopted to get maximum production per unit of water.
- f. Awareness programmes should be taken up to educate the user regarding rising trend of water level and use of ground water in conjunction with surface water to save land from becoming water logged in future.
- g. The potential of certain forest species to draw more water than the agriculture crops because of their deeper root system, higher transpiration rates through out the year and ability to minimise rains, provides a technique for keeping water table under control and increase forest produce and needs to be adopted in the areas having both shallow water levels and rising trends.
- h. The canals main branch / distribution and minors should be lined to minimise the seepage in canal command areas, thus making availability of more water at the tail end of canals.
- i. The surface drainage needs to be improved and existing channels needs to be deepened for enhancing the carrying capacity.

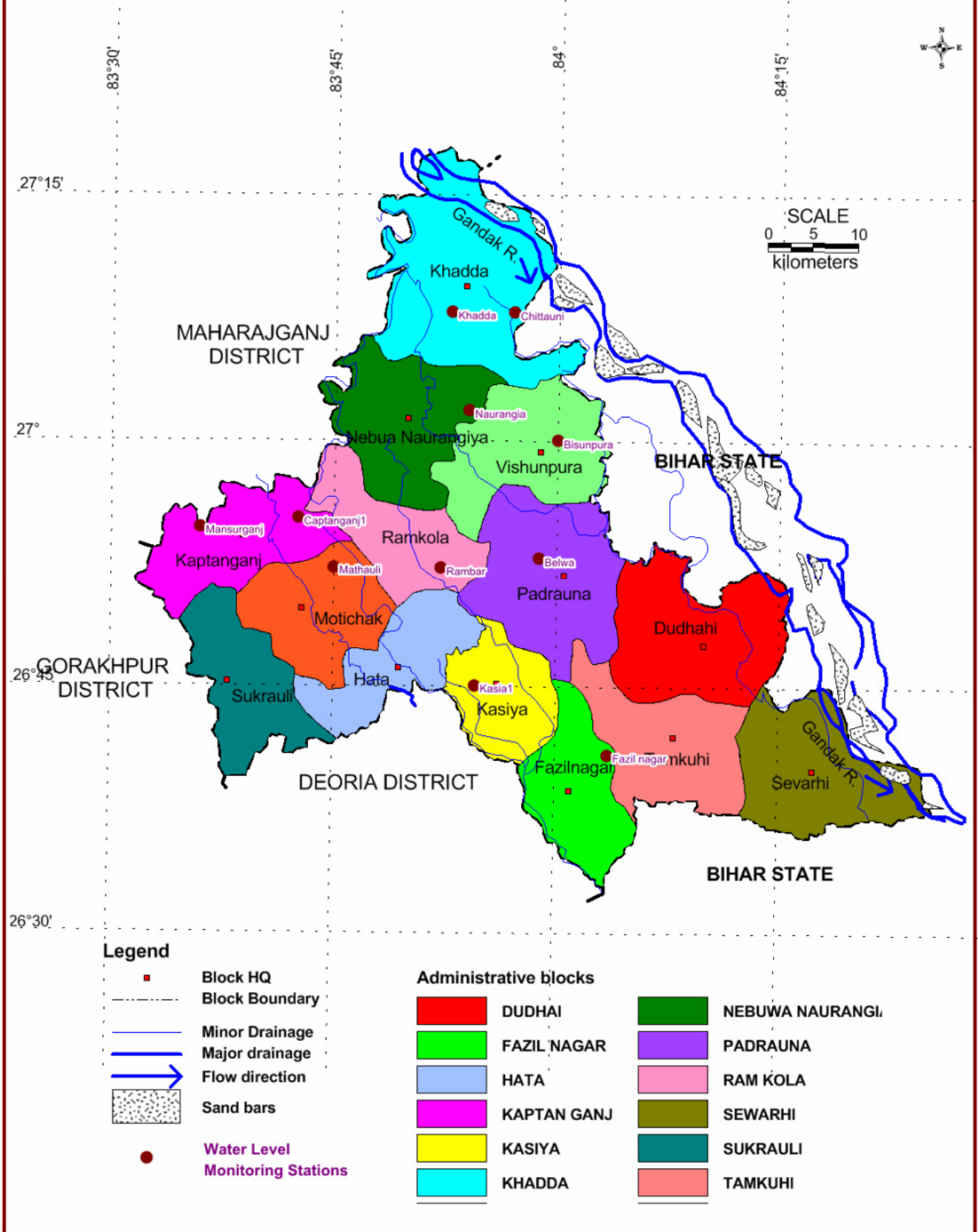
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Annexure-I

**Constituents, Desirable Limit, Permissible limit, No. of Samples beyond
Permissible limit and Undesirable effect beyond permissible limit**

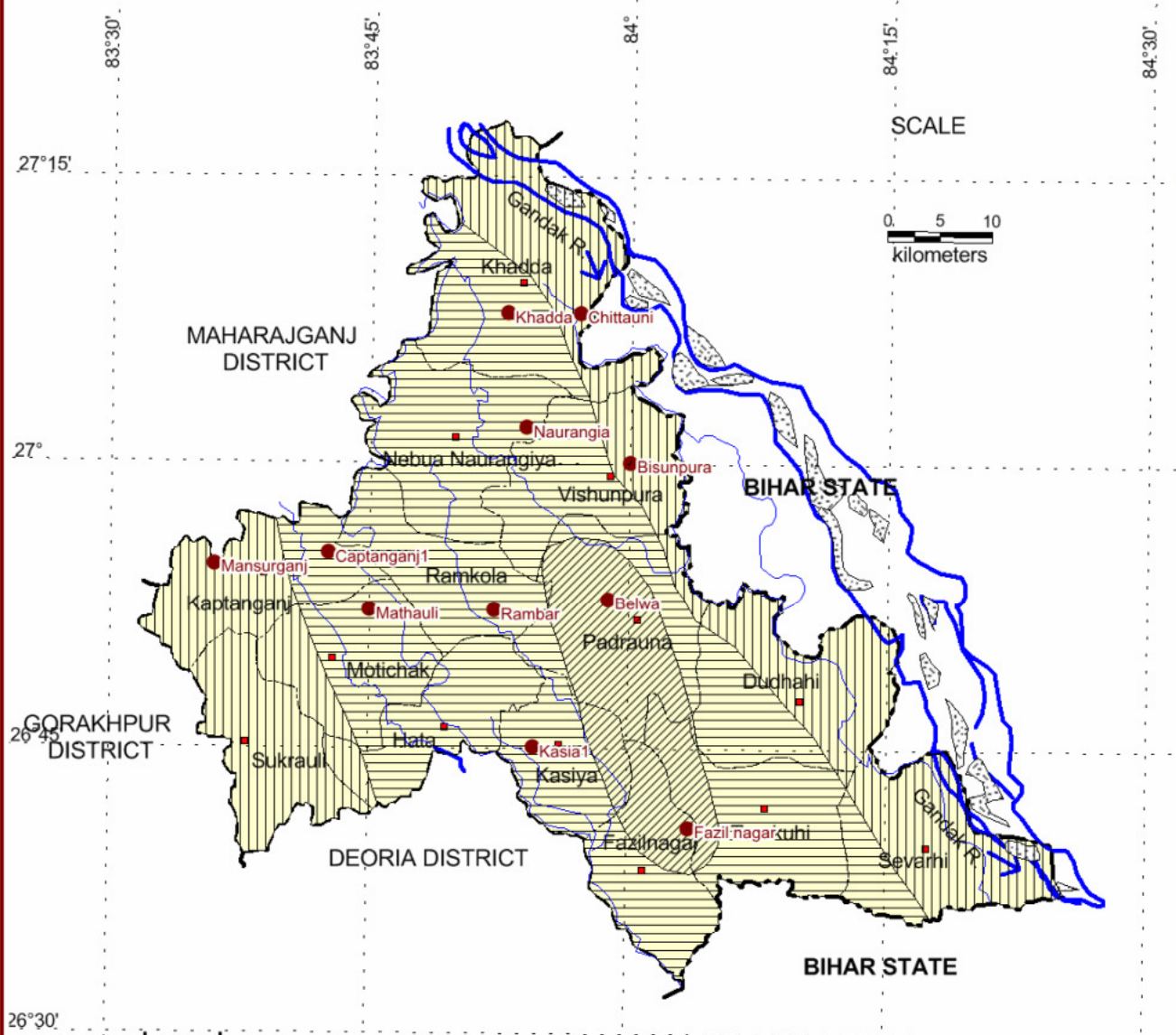
Sl. No.	Constituent	Desirable Limit (ppm)	Permissible Limit (ppm)	No. of samples Beyond permissible Limit	Undesirable effect beyond Permissible Limit
Essential Characteristic					
1.	pH	6.5-8.5	No. relaxation	Nil	Beyond this range water will effect mucus membrane and water supply system
2.	Total Hardness as CaCO ₃	300	600	Nil	Encrustation in water supply structure and adverse effect on domestic use
3.	Iron	0.3	1.00	Nil	Precipitate after exposure in air, causes turbidity stains plumbing fixture laundry and cooking utensil.
4.	Chloride	250	1000	Nil	May cause physiological damage.
5.	Fluoride	1.00	1.5	Nil	High fluoride leads to fluorosis, pronounced mottling and disfiguration of teeth
Desirable Characteristic					
6.	Total Dissolved solid	500	2000	Nil	May cause Gastro-intestinal irritation
7.	Calcium	75	200	Nil	Encrustation in water supply structure and adverse effect on domestic use.
8.	Magnesium	30	100	Nil	-----Do-----
9.	Sulphate	200	400	Nil	Causes Gastro-intestinal irritation when Mg & Na are present.
10.	Nitrate	45	No Relaxation	Nil	May cause methamoglobinemia

INDEX MAP, DISTRICT KUSHINAGAR, UTTAR PRADESH



DEPTH TO WATER LEVEL - MAY-2012 DISTRICT KUSHINAGAR

PLATE - II



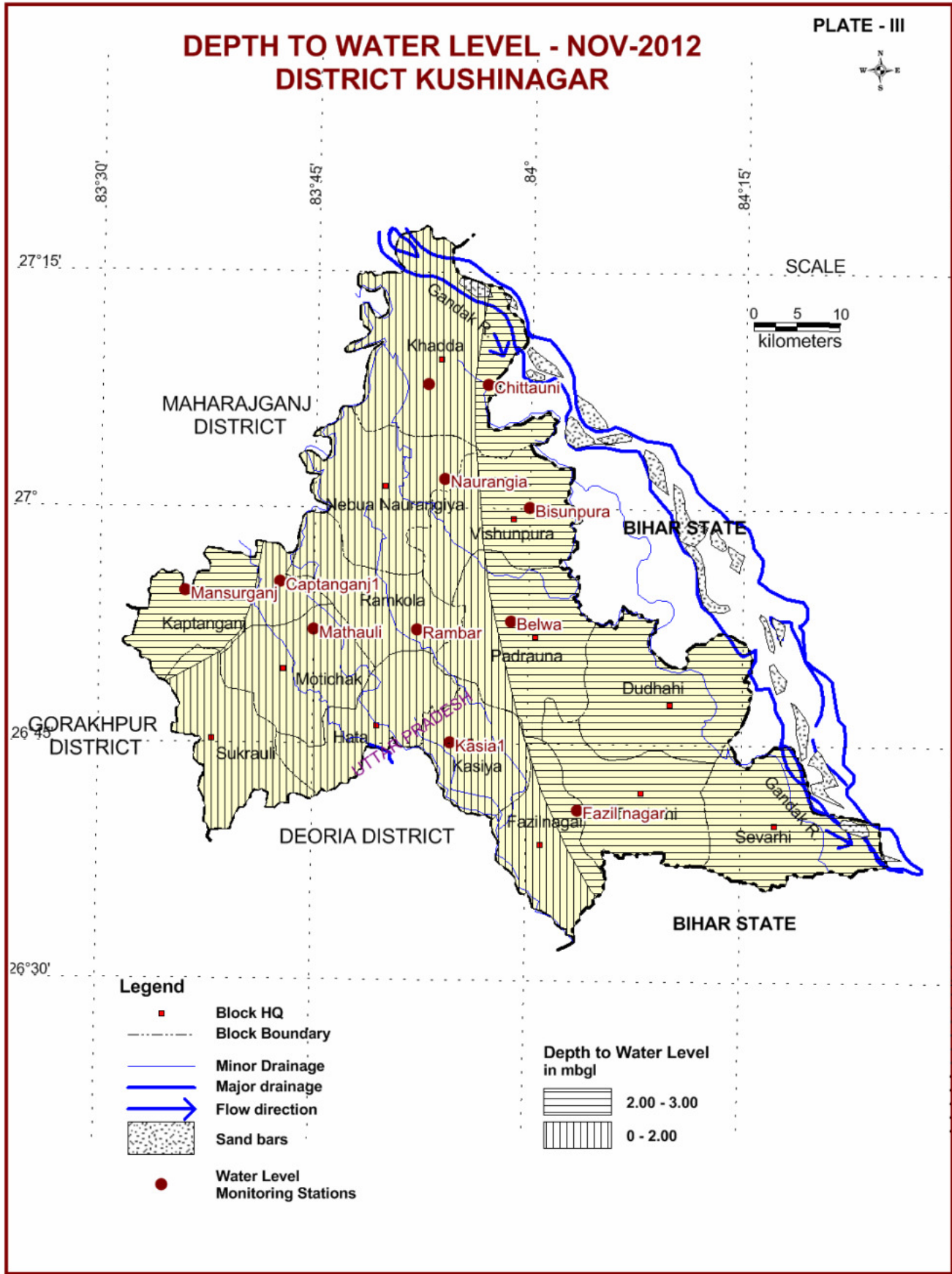
- Legend**
- Block HQ
 - - - Block Boundary
 - Minor Drainage
 - Major drainage
 - ➔ Flow direction
 - ▨ Sand bars
 - Water Level Monitoring Stations

Depth to Water Level in mbgl

	5.00 - 6.00
	3.00 - 5.00
	< 3.00

DEPTH TO WATER LEVEL - NOV-2012 DISTRICT KUSHINAGAR

PLATE - III



Legend

- Block HQ
- - - Block Boundary
- Minor Drainage
- Major drainage
- ➔ Flow direction
- ▨ Sand bars
- Water Level Monitoring Stations

Depth to Water Level in mbgl

- ▨ 2.00 - 3.00
- ▨ 0 - 2.00

WATER TABLE ELEVATION DISTRICT KUSHINAGAR

PLATE - IV

