

# **GROUND WATER BROCHURE OF FATEHPUR DISTRICT, U.P.**

*(A.A.P.:2012-13)*

*By*

**U.B. Singh**

Asstt. Hydrogeologist

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## **DISTRICT AT GLANCE**

### **1. GENERAL INFORMATION**

- i. Geographical Area (Sq. Km.) : 4152
- ii. Administrative Divisions (as on 31.03.2012)
  - Number of Tehsil : 3
  - Number of Block : 13
  - Number of Nyaya Panchayat : 132
  - Number of Villages : 1519
- iii. Population (as on 2001 census) : 578070
- iv. Average Annual Rainfall (mm) : 938

### **2. GEOMORPHOLOGY**

- Major Physiographic Units : Two
  - i) Physiographic unit the lowland regions flood plain of Ganga and Yamuna.
  - ii) The upland region border & the flood plain older alluvium.
- Major Drainages : The Ganga and Yamuna are two major river and sub basin Kind.

### **3. LAND USE (Hectare)**

- a) Forest area : 7615
- b) Net area sown : 287425
- c) Net irrigated area : 196978

### **4. MAJOR SOIL TYPES**

- : Older alluvial soil consisting broadly of Bhur and sandy, Matiar & clay rich and Dumat or loam.

### **5. AREA UNDER PRINCIPAL CROPS (As on 2010) Ha.**

- : Rabi – 245756
- Kharif – 152143
- Zaid -7329

### **6. IRRIGATION BY DIFFERENT SOURCES**

**(Area in ha. and number of structures)**

Dug wells	:	0
Tubewells / Borewells nos. 470	:	4926, 148941
Tanks / Ponds	:	
Canals (Length = km) 1450 km.	:	42404
Other sources	:	149548
Net Irrigated Area	:	196978
Gross Irrigated Area	:	277500
<b>7. NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (2009)</b>		
No. of Dugwells	:	16
No. of Piezometers	:	Nil
<b>8. PREDOMINANT GEOLOGICAL FORMATIONS</b>		Quaternary alluvial comprises of older and newer alluvium.
<b>9. HYDROGEOLOGY AND AQUIFER GROUP</b>	:	District lies in the Doab of Ganga and Yamuna three tier of aquifer system have been found. I Tier – 00-70mbgl. II Tier- 200- 300mbgl. III Tier- 250- 350 mbgl.
Major water bearing formation	:	Quaternary sediments Deposited over concealed basement making to major fresh water aquifer group.
Pre-monsoon Depth to water level during May' 2012	:	3.57 to 26.80 mbgl.
Post-monsoon Depth to water level during Nov.' 2012	:	2.27 to 21.96 mbgl.
Long term water level trend in 10 years (2003-2012) In m/year.	:	Rise-0.0168 to 1.507 Fall-0.0339 to 0.9099
<b>10. GROUND WATER EXPLORATION BY CGWB (As on 2012)</b>		
No of wells drilled (EW, OW, PZ, SH, Total)	:	18
Discharge (litres per minute)	:	1000 to 2728 lpm.
Storativity (S)	:	$9.96 \times 10^5$
Transmissivity (m <sup>2</sup> /day)	:	1287 to 6338

<b>11.</b>	<b>GROUND WATER QUALITY</b>	
	Presence of Chemical constituents more than permissible limit (EC in microsiemens/cm)	: 2100 3100
<b>12.</b>	<b>DYNAMIC GROUND WATER RESOURCES (2009)-in HAM</b>	
	Annual Replenishable Ground Water Resources	:
	Gross Annual Ground water Draft	: 100903.63
	Projected Demand for domestic Industrial uses up to 2033	: 12061.03
	Stage of Ground water Development	: 83.89%
<b>13.</b>	<b>AWARENESS AND TRAINING ACTIVITY</b>	
	Mass Awareness Programmes organized	: Nil
	Date	:
	Place	:
	No. of participants	:
	Water Management Training Programme (Artificial Recharge) organized	: Nil
	Date	:
	Place	:
	No. of participants	:
<b>14.</b>	<b>EFFORTS OF ARTIFICIAL RECHARGE &amp; RAINWATER HARVESTING</b>	
	Projects completed by CGWB (No & Amount spent)	: Nil
	Projects under technical guidance of CGWB (Numbers)	: Nil
<b>15.</b>	<b>GROUND WATER CONTROL AND REGULATION</b>	:
	Number of OE Blocks	: 13
	No of Critical Blocks	: 4
	No of blocks notified	:
<b>16.</b>	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	: Broadly natural and Geoenvironmental problem occurs i.e. natural hazards like flood common in low lying area Yamuna & Ganga terrace alkalinity soil at few place traced.

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## **1.0 INTRODUCTION**

The Fatehpur district is a part of central Ganga plain and it lies between north latitude, 25°80'00" and 26°15'00" and east longitude 80°14'00" and 81°20'00" covering an area of 4152 sq.km. and administratively it is divided in to 3 Tehsil and 13 block. As per the 2011 census the district has population 2308384 of which 1219602 males and 1088782 females. Scheduled caste population 578070 and scheduled tribe population 467. Geographically the area comprise quaternary alluvium sediment Heterogeneous in nature are deposited over the concealed basement of Vindhyan sand stone and shale of varying thickness. The main and major drainage of the district belong to Ganga river system of which river Yamuna and Rind are tributaries, Physiographically the area can be divide in to two unit.

- (i) The low land region trans Ganga lies to south of Ganga river.
- (ii) Doab Yamuna which lies between south of Ganga and Yamuna on north.

Agriculture is the main source of economy of district. Both surface and ground water are used for irrigation. The net irrigated area 196978 Ha and the net are shown 287425 Ha. Which show that 65.53% area is irrigated and the rest area depend on rainfall. Length of canal is 1450 km and the number of government tubewell 470.

Fatehpur District is drained by Ganga River system of which Yamuna and Rind are tributaries. The Ganga enters the district through Khajuha Block where as Yamuna first touches the district Amauli block and flow over the length 85Km in the district Fatehpur.

The district was covered under hydrogeology and water potential study by Srivastava A.K. 1994 Dr. D.S. Pandey 2000-2001, reappraisal survey was carried out by Dr. D.S. Pandey 2000-2001.

## **2.0 RAINFALL & CLIMATE**

The average annual rainfall is 932 m.m. The climate is typical sub humid punctuated by long and intense summer and mild winter. About 90% of annual rain fall is received from south west monsoon. May is the hottest month with temperature shooting up to 46.5<sup>0</sup>C. January is generally the eldest month and temperature drops generally 8<sup>0</sup>C but occasionally even up to 4<sup>0</sup>C. The highest relative humidity in the morning during the month of August is 86% and the lowest is 25% during the month of May.

## **3.0 GEOMORPHOLOGY & SOIL**

### **3.1 GEOMORPHOLOGY:**

Geomorphologically the district form a part of central Ganga plain and exhibits fluvial feature typical of the flood plain Fatehpur district can be categorized as the composite flood plain and the meander flood plain. The meander flood plain occurs in northern part of district along river Ganga covering in the northern part of Malwar, Teliyam, Bhitura, hathgon and Airwan blocks and southern part of district along river Yamuna covering of south part of Amamli, Khayua, Asother, Bijaipur and Dhata block. These plains are low lying, the river meander are found within the area and form Ox-bow Lake due to abandoning channel. The composite flood plain occupy, entire central part of district extending from NE to SW. these flood plain bear feature of more than one phase of flood plain formation.

### **3.2 SOIL:**

The Soil found in the district exhibit a great variety of composition and appearance. The soil types are sandy loamy and sandy soil, loam clayey, fine texture soil. The diversity of soil is mainly due to the influence of the various river and partly due to presence of peculiar soil Bundelkhand along the course of the Yamuna river. The major part of district consist of the ordinary soil locally known as Bhur or sand which is found on the ridge, Matiar or clay in the depression and Dumat or loan in the plains, Reh prevails in the clay dominant area. Prominent patches have been observed in part of eastern part of Teleyami block, Bhitaura,

Hathgaon, and northern part of Haswa Khayua blocks. Purely alluvial soil of the river valley are present notably in the Kachhar of the Ganga and Yamuna rivers formed by repeated deposit of silt, brought down by river during floods.

### 3.3 GEOLOGICAL SETUP:

The area is underlain by the unconsolidated sediments of Quaternary to recent period which comprises of silt, clay, sand of various grades or gravel and Kankar in varying proportions. The unconsolidated sediment deposited over the undulating surface of the basement granite Vindhyan sand stone rocks. It exhibits the existence of thick succession of granular and clastic formations. The depth of basement varies between 100 to 200 mbgl along southern boundary of district along river Yamuna 200 to 350 mbgl in the central part of district and 300 to 450 mbgl along Ganga river boarding the northern part of district. The geological succession is as follow:

<b>Age</b>	<b>Formation</b>	<b>Lithology</b>
Recent	Newer Alluvium	River alluvium and residual soil.
	Older Alluvium	Alluvium consist to sand clay, pebble, kankar, gravel
-----Unconformity-----		
Precambrian to Lower Cambrian	Vindhyan	Limestone Dolomite shale sand & Quartzite

#### 4.0 GROUND WATER SCENARIO

##### HYDROGEOLOGY:

Table-1

**WATER LEVEL FLUCTUATION (PRE & POST - MONSOON)  
FOR THE YEAR 2012**

District	Fatehpur			
Sl. No.	Well Name	Pre-Monsoon (mbgl)	Post- Monsoon (mbgl)	Fluctuation (m)
1.	Asother	3.57	2.30	1.27
2.	Bahua	11.67	9.02	2.65
3.	Barwa	26.80	7.52	19.28
4.	Bela	4.10	2.95	1.15
5.	Bindki 1	9.90	6.55	3.35
6.	Deori (Choti)	23.67	21.96	1.71
7.	Fatehpur	11.00	8.22	2.78
8.	GAzipur	-	10.00	-
9.	Jahanabad	20.75	17.22	3.53
10.	Lalauli	13.42	12.77	0.65
11.	Musfha	6.79	4.72	2.07
12.	Naubaste	12.19	11.34	0.85
13.	Rampur	14.50	-	-
14.	Sarain Bakewar	3.45	2.27	1.18
15.	Thariyayan 1	14.89	13.80	1.09
16.	Umrادipur	7.32	5.07	2.25

A perusal of the table and depth to water level contour map for the period May'2012, reveal that the water level varies from 3.45 mbgl Bakewar block Deomai 26.80 mbgl at Barwa in block Khajuna. Almost all the blocks, covering approximately 75% area of the district, I part of Umardipur Murga. Asother, Bindaki 25% of area show DWL between 5 to 10 mbgl.

A perusal table and depth of water level contour map of the period Nov.'2012 reveals water level has becomes shallower and varies from 2.27mbgl block Deomai 21.96 mbgl at Deori.



#### **4.1 SEASONAL FLUCTUATION:**

Water level/table fluctuates in response to recharge the aquifer and withdrawal from the aquifer. The quantum of fluctuation is a direct function of the above. Recharge takes place mainly during rainy season. The minimum depth to water level in an area is expected sometime at the close of monsoon or in the middle of monsoon period depending upon the intensity and duration of rainfall as well as soil characteristics and maximum depth to water level is expected to be just before the rainfall. The part of the rainfall in the initial period goes towards meeting the soil moisture as well as to saturate the Evapotranspiration losses.

#### **ANNUAL SEASONAL FLUCTUATION OF WATER LEVEL:**

Annual seasonal fluctuations of water level has been determined from the pre monsoon (may 2012) and post monsoon (Nov. 2012) water level data of ground water monitoring wells. The fluctuation varies from min. 0.65 mbgl to max 19.25 mbgl at Naubasta and Barwa places.

#### **LONGTERM TREND OF WATER LEVEL: Table-2**

Show the long term trend of water level ground water monitoring wells for the ten year period 2003 to 2012.

#### **LONG TERM WATER LEVEL TREND**

##### **Pre monsoon trend of water level:**

A perusal of the table show that there is falling trend in all the wells except three No of wells in pre monsoon period. The range of decline is 0.0339 cm/year at Umardipur in block Malwan and 1.53 mts at Kishanour in Vijapur block. Almost 32% of wells are showing decline in range of >50 cm/year of 91% of well showing the increasing trend of water level.

##### **POST MONSOONAL TREND OF WATER LEVEL:**

A perusal of the table show that there is falling trend during post monsoon period in all the wells. The range of decline 0.0124 mts/year is minimum at Ashothar block. As other and maximum 1.0131 ms/year at Jahanabad in the block Deomai. 91% of wells show the decline trend.

Table-2

**TREND OF WATER LEVEL - ALL**  
**From Year 2003 to Year 2012**

Sl. No.	Location	Pre Monsoon			Post Monsoon			Annual		
		<i>Date Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Date Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Date Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>
1	Bindki 1	10		0.7009	9		0.6539	39		0.6231
2	Fatehpur	10		0.7035	9		0.5820	39		0.5415
3	Hathgaon	2			2			8		
4	Hussaiganj	0			0			0		
5	Umradipur	10		0.0339	9		0.0166	39	0.0208	
6	Aung 2	3			2			12		
7	Bela	9		0.0599	9		0.0247	37		0.0388
8	Sanvra	6		0.7643	4			22		
9	Sarain Bakewar	10	0.0168		10		0.0259	60	0.0429	
10	Joniha	3			1			8		
11	Ramapur	10		0.6391	6		0.3166	33		0.3811
12	Saha	7		0.9099	4			24		0.7119
13	Musfha	7	1.5077		7	0.1520		29	0.4260	
14	Jamrwan	7		0.7344	4			24		0.1554
15	Saunt harjan co	5			3			16		
16	Naubasta	10		0.0799	8	0.0096		38		0.0129
17	Khaga 3	0			0			1		

Sl. No.	Location	Pre Monsoon			Post Monsoon			Annual		
		Date Points	Rise (m/year)	Fall (m/year)	Date Points	Rise (m/year)	Fall (m/year)	Date Points	Rise (m/year)	Fall (m/year)
18	Thariyayan 1	2			3			12		
19	Jahanabad	4			9		1.0131	29		0.6471
20	Amoli	7		0.5773	5			24		0.8781
21	Deori (choti)	8		0.8599	7		0.8829	33		0.7464
22	Barwa	7		0.5837	8		0.1297	32		
23	Khaga 2	2			2			8		
24	Thariyayan	6		0.4168	4			20		
25	Bahua	9		0.2780	8		0.3503	36		0.2178
26	Amni	7		0.2762	4			23		
27	Gazipur	2			3			12		
28	Datauli	0			2			5		
29	Katoghan	2			2			8		
30	Dhata	1			0			1		
31	Bijapur	3			2			10		
32	Lalauli	10		0.2765	9		0.3126	39		0.1817
33	Bilanda	6		0.5346	3			22		
34	Kishanpur	7		1.5341	3			22		
35	Asother	10	0.1155		9	0.0124		39		0.1442

## 4.2 GROUND WATER RESOURCES:

Ground water resources of the district as on 31.3.2009 are given in following Table-3.

### DYNAMIC GW RESOURCES OF FATEHPUR DISTRICT (as on 31.3.2009)

Block (Assessment Unit)	Net Annual GW Availability (ham)	Existing Gross GW Draft for Irrigation (ham)	Existing Gross GW Draft for Domestic & Industrial Supply (ham)	Existing Gross GW Draft for All Uses (ham)	Provision for Domestic & Industrial Requirement for 2025 (ham)	Net GW Availability for Future Irrigation Development (ham)	Stage of GW Development (%)	Category of Block
AIRYAN	6899.28	4562.4	462.5	5024.9	1241.65	1095.23	72.83	Semi Critical
ANAUKI	5073.48	4522.69	357.55	4880.24	550.79	0.00	96.19	Critical
ASOTHER	7267.86	3305.4	413.08	3718.48	1035.63	2926.83	51.16	Safe
BAHUA	7164.31	5695.6	372.75	6068.35	916.61	552.10	84.70	Semi Critical
BHITaura	11041.76	9305.6	448.59	9754.19	1085.48	650.68	88.34	Safe
DEOMAI	6636.77	5395.6	296.3	5691.9	688.16	553.01	85.76	Semi Critical
DHATA	8714.77	6640.8	405.18	7045.98	1025.25	1048.72	80.85	Safe
HASWA	8589.66	7803.8	444.56	8248.36	785.86	0.00	96.03	Critical
HATHGAON	7600.60	6726.4	451.23	7177.63	874.2	0.00	94.44	Critical
KHAJUHA	7823.86	5557.8	413.36	5971.16	971.26	1294.80	76.32	Semi Critical
MALWAN	9195.30	8106.2	478.77	8584.97	1089.1	0.00	93.36	Critical
TELIYANI	7869.96	6782.2	315.59	7043.79	760.95	380.81	89.50	Semi Critical
VIJAYEEPUR	7026.15	5027.2	414.35	5441.55	1036.09	962.86	77.45	Semi Critical
<b>TOTAL</b>	<b>100903.76</b>	<b>79377.69</b>	<b>5273.81</b>	<b>84651.5</b>	<b>12061.03</b>	<b>9465.04</b>	<b>83.89</b>	

The net annual ground water availability in the district ranges from 5073.48 Ham minimum in Amauli block and maximum at 11041.76 Ham. at Bhitaura block. Gross ground water draft ranges from 5024.0 ham to 9754.19 ham minimum in Airayan block and maximum in Bhitaura block. Net ground water availability for future irrigation development is minimum in 0.00 at Malwan, Harwa, Hathgawan and Amauli maximum in 2926.83 Ham Asother block. Stage of Ground water

development in the district is minimum (51.16%) in Ashother block and maximum in (94.44%) Hathgaon block. Stage of ground water development in the district is 83.89%.

All the blocks in the district only two are safe (Asother & Bhitaura) Airayan, Bahua, Deomai, Khajuha, Teliyalni, Vijaipur falls in the Semi critical category. However Amauli Haswa, Hathgaon and Malan falls in the critical category. Stage of ground water developments high is significant decline in ground water of Post-monsoon water level 1.15mts./year during 2003 to 2012.

#### **4.3 GROUND WATER QUALITY:**

Ground water in shallow aquifer, in general is colorless, odorless and slightly Alkaline in nature. The specific conductance ranges from 500 to 3100 cm at 25<sup>0</sup>C.

It is observed that ground water is suitable for drinking and domestic in respect of all parameter.

#### **4.4 STATUS OF GROUND WATER DEVELOPMENT:**

Development of ground water in the district in mainly through dug wells, hand pumps India Mark II and tubewells. The gross ground water draft for irrigation in the district is 79377 ham. Whereas the ground water draft for domestic and industrial purposes is 527381 ham. Hence existing gross ground water draft for all uses in district is 84651.50 ham. Net ground water availability for future irrigation and development in the district is 9465.04 ham. A quantum of 12061.03 ham. has been allocated for domestic and industrial requirement for next 25 years (2033). Net available ground water availability in the district is 100903.76 ham. The stages of ground water development for the district 83.89% of all the blocks in the district three are safe.

#### **Water Supply Based on Ground Water Sources:**

U.P. Jal Nigam is the government agency responsible for providing drinking water supplies to the urban and rural population in the district. The water requirements of the habitants are met with through surface water sources or through various mini water supply schemes or integrated water supply schemes utilizing the available ground water resources.

There are many shallow and deep tube wells through which water is supplied through pipe lines/taps in the urban areas of the district.

In the rural areas of the district there are 1519 no. of village in which water is supplied by Tap/hand pump India mark II, benefiting 2070363 population as per data 2010-11.

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

### **5.1 Ground Water Development:**

In fill the block of Fatehpur district blocks, the level of development is <50% in these blocks. There is scope of ground water development with proper management and control.

In the blocks of high level of ground water development 77% covering major parts of the district it is necessary to exercise caution while planning further development of available ground water resources in the district.

In the areas of low ground water development the wells suitable for extraction of ground water, suitability of rigs, depth range and discharge in the district can be summarized as follows:

<b>Sl. No.</b>	<b>Well Feasible</b>	<b>Rig Suitable</b>	<b>Depth of Wells</b>	<b>Discharge (lpm)</b>
1	Dug well/ Hand Pump	Manual/ Hand Boring set	20-40	50-100
2.	Shallow Tube well	Rotary Rigs (Direct/ Rotary Reverse)	50-120	1500-2000
3.	Deep Tube Well	Rotary Rig	150-280	2000-4000

### **5.2 Water Conservation Artificial Recharge:**

In the area where the post monsoon depth to water level is more than 8 mbgl and rate of decline during post monsoon 72cm/year there is immediate need to adopt techniques of water conservation and Artificial Recharge.

In such urban area roof top rain water harvesting should be made mandatory for government building, schools etc. Recharge Pit/Shafts/Trenches of suitable design are

ideal scheme for rain water harvesting in such area. Central Ground Water Board provides free technical guidance for implementation of roof top rain water harvesting schemes. In rural area check dams, gully plug should be constructed as per local hydrogeological condition to recharge the area. Revival, Renovation and Restoration of ponds should be encouraged to arrest the decline of water level.

## **6.0 GROUND WATER RELATED ISSUES AND PROBLEMS**

The trend analysis of ground water level data indicate fall both in pre and postmonsoon period in the major part of district. This will impact in.

1. Further decline of ground water level.
2. Drying up of dug wells/ shallow wells.
3. Decrease in yield of Tube wells, and
4. Increased expenditure and power consumption for withdrawing water from progressively deeper depth.

### **SOIL ALKALINITY/SODACITY:**

Alkaline effervescences is wide spread in the north western and southeastern parts of Yamuna district, mostly in the area lying Between Ganga River and Yamuna River.

## **7.0 AWARENESS & TRAINING ACTIVITY**

Central Ground Water Board has not conducted any mass awareness Programme and water management training programme in the district.

## **8.0 AREAS NOTIFIED BY CENTRAL GROUND WATER AUTHORITY**

Central Ground water Authority has not notified any/block in the district.

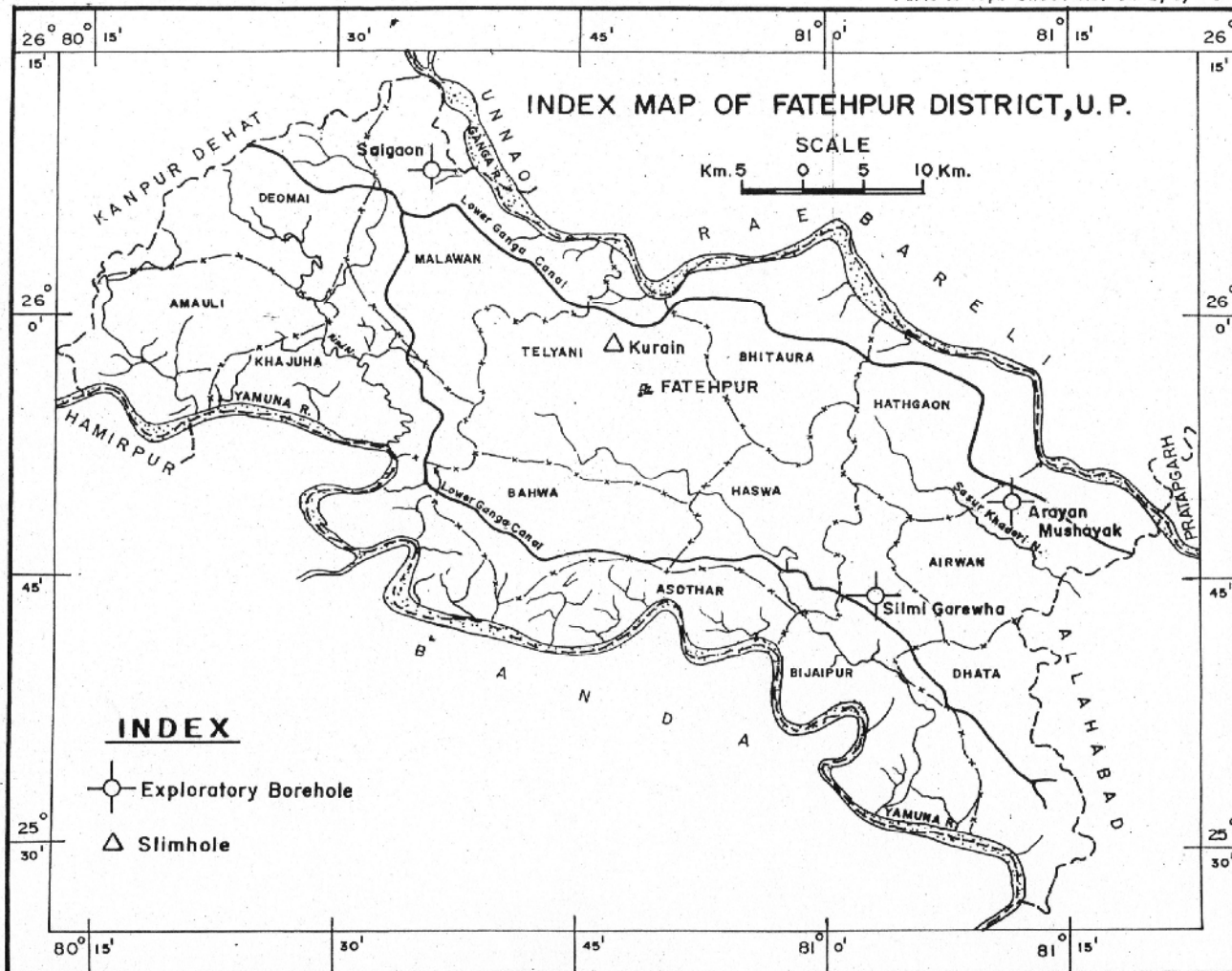
## **9.0 RECOMMENDATIONS**

1. The level of development in many blocks of the district is high, further development of ground water should be restricted in these areas, especially in Hathgaon, Haswa & Malwon, block which falls in critical category.
2. Artificial recharge technique should be adopted in the district due to occurrence of deep water condition to restrict / minimize the decline of water level, in urban areas, roof top rain water harvesting, with structures such as recharges pits/shafts/trenches of suitable design, should be made mandatory for all government buildings, schools etc. having large roof top area.
3. All the blocks are exhibiting declining trends in their ground water level hence proper vigilance and regular monitoring of water levels at close intervals through suitably located structure is essential.
4. To minimize the over stress on Aquifer Group – I, it is advisable to plan heavy duty water supply tubewell for future all uses by exploiting the Ground water from the deeper aquifer.
5. Efforts should be made reclaim the barren land resulted due to saline efflorescence for agriculture purpose. The area of shallow ravines is reclaimable for cropping.
6. Excessive use of fertilizers by the farmers should be discouraged particularly in blocks showing high nitrate concentration.

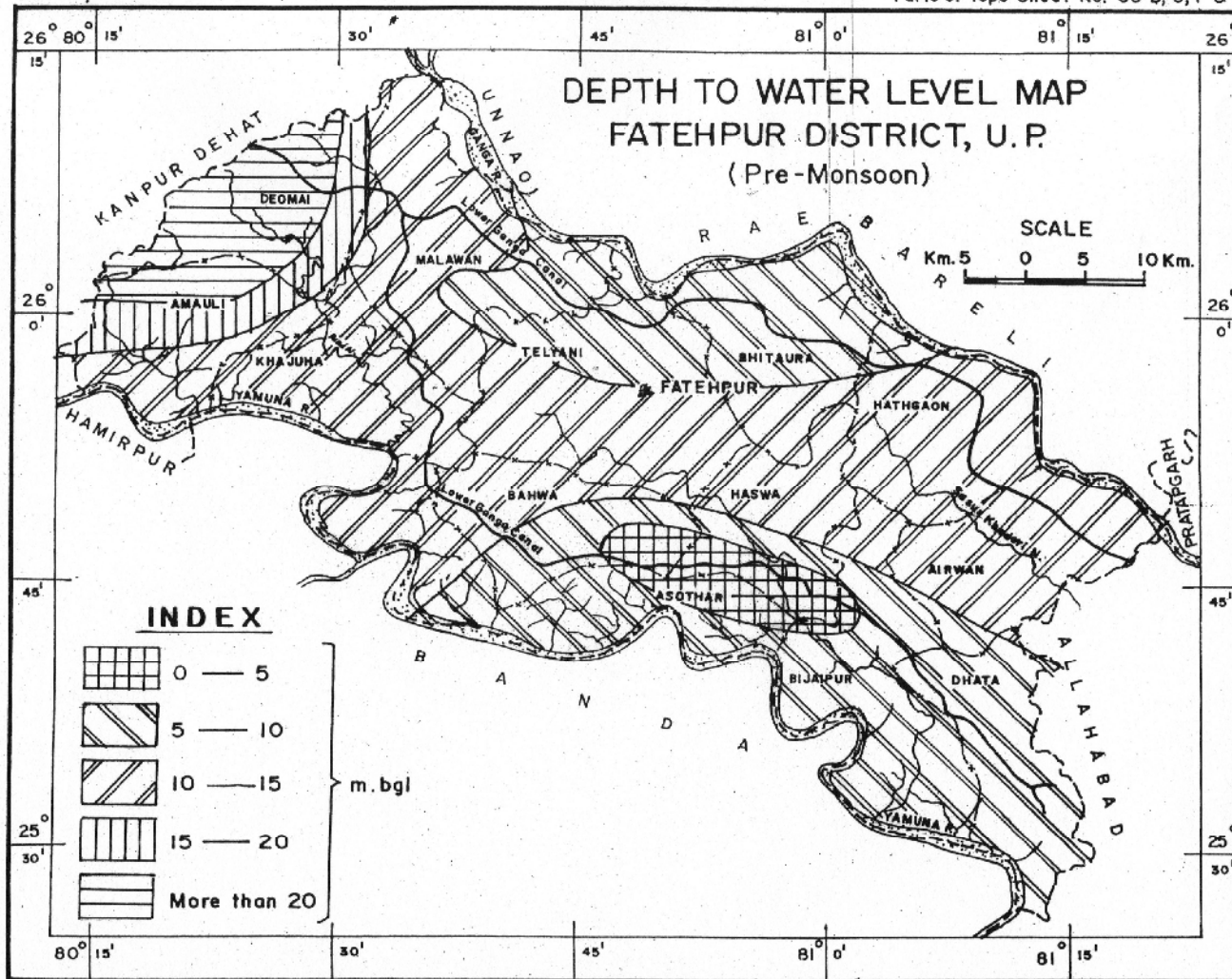
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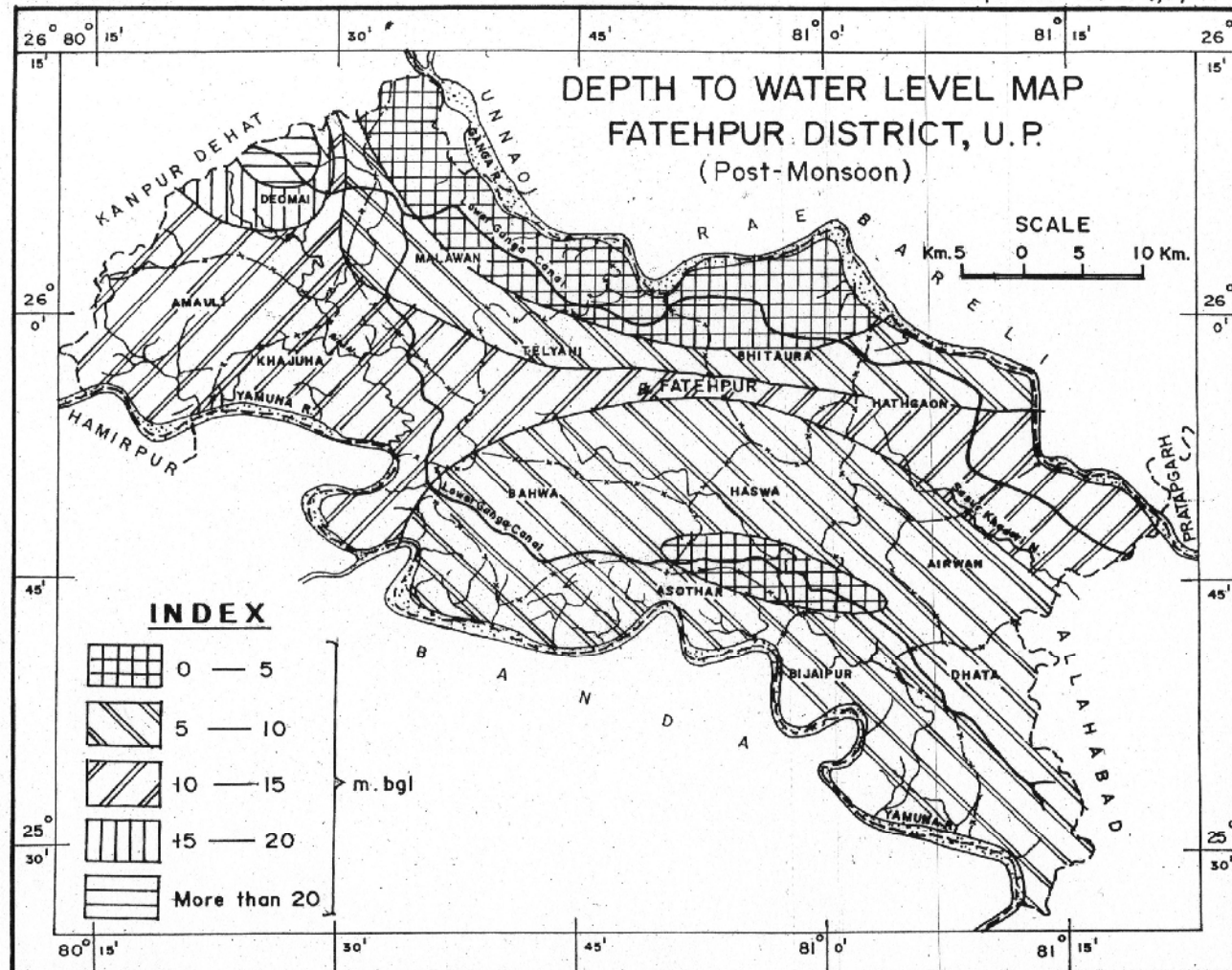




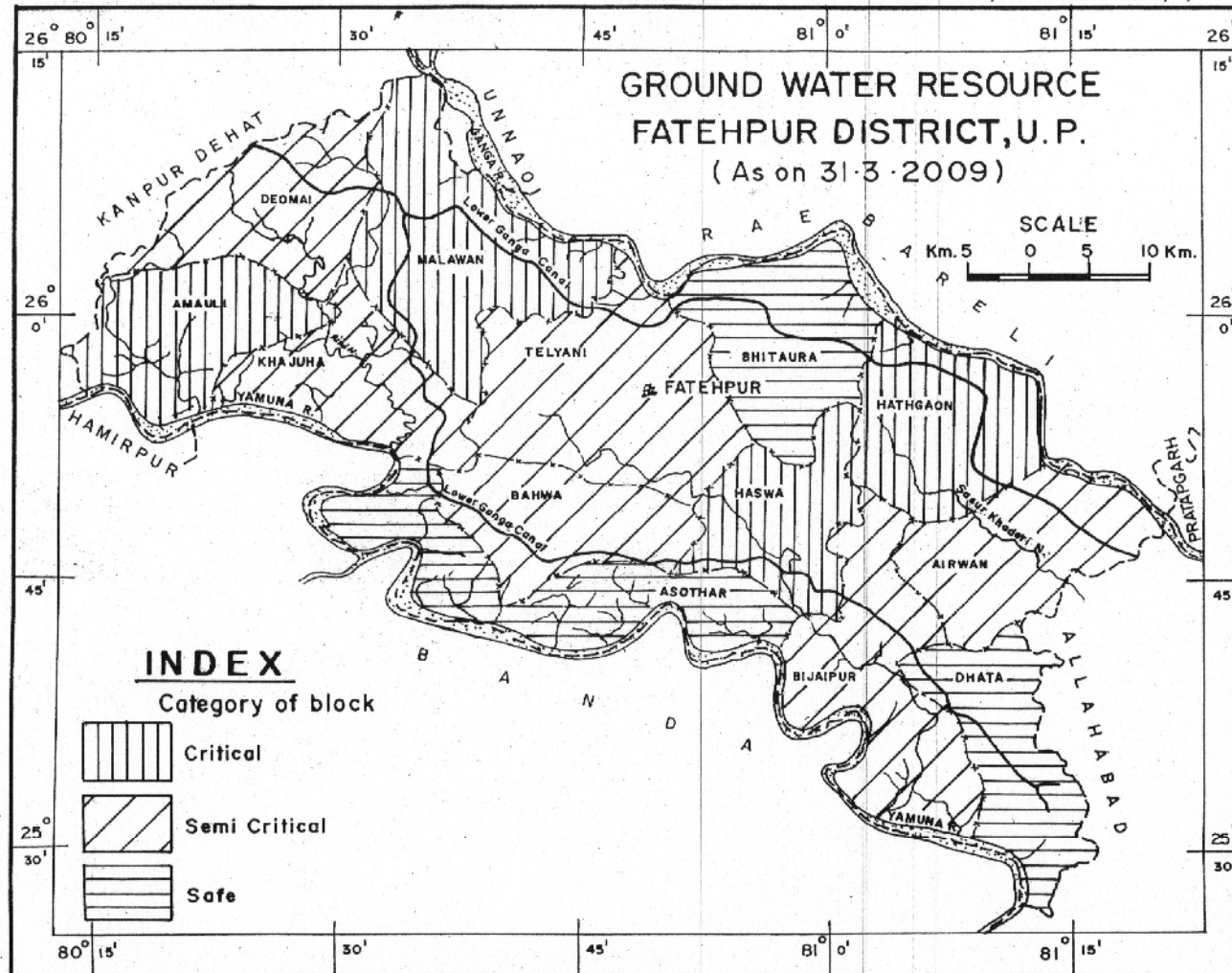
C. G. W. B., N. R. (N. Chandra) Drg. No. 6801/94, (N. C. Pandey) Drg. No. 5026/14



C. G. W. B., N.R. (N. Chandra) Drg. No. 6801/94, (N.C. Pandey) Drg. No. 5027/14



C. G. W. B., N. R. (N. Chandra) Drg. No. 6801/94, (N. C. Pandey) Drg. No. 5028/14



C. G. W. B., N. R. (N. Chandra) Drg. No. 6801/94 (N. C. Pandey) Drg. No. 5021/14