DISTRICT BROCHURE OF
GAUTAM BUDH NAGAR, U.P.

(A.A.P.: 2008-2009)

By

Dr. B.C. Joshi
Scientist 'B'

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DISTRICT AT GLANCE (GAUTAM BUDH NAGAR)

1.	**GENERAL INFORMATION**		
i.	Geographical Area (Sq. Km.)	:	1442
ii.	Administrative Divisions (as on 31.03.2005)	:	
	Number of Tehsil/Block		3/4
	Number of Panchayat/Villages		
iii.	Population (as on 2001 census)	:	11,05,292
iv.	Average Annual Rainfall (mm)	:	700.60
2.	**GEOMORPHOLOGY**		
	Major Physiographic Units	:	Ganga – Yamuna Alluvial Plain which is subdivided in flood plain, upland & land adjacent to Patawata
	Major Drainages	:	Yamuna, Hindon
3.	**LAND USE (Sq. Km.)**		
a)	Forest area	:	24.00
b)	Net area sown	:	1164.86
c)	Cultivable area	:	47.75
4.	**MAJOR SOIL TYPES**	:	Sandy loam and clay (Bhur, Matir & Dumat)
5.	**AREA UNDER PRINCIPAL CROPS (as on 2005-2006)**	:	1319.24
6.	**IRRIGATION BY DIFFERENT SOURCES** (Areas and Number of Structures) 2005-06 (ha)		
	Dugwells	:	375.37
	Tubewells/Borewells	:	19.59 / 422.88
	Tanks/ponds	:	Nil
	Canals	:	91.41 (385 Km length)
	Other Sources	:	-
	Net Irrigated Area	:	906.25
	Gross Irrigated Area	:	1330.35
7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007)**		
	No. of Dugwells	:	4
	No. of Piezometers	:	7

8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	:	Quaternary Alluvium consisting of mainly sands of various grades, silt, clay and kankar
9.	**HYDROGEOLOGY and AQUIFER GROUP**	:	Multiple aquifer groups (3) upto 350 m/depth
	Major water bearing formation	:	Gravel, Sand and silt intercalations
	(Pre-monsoon Depth to water level during May'2007)	:	3.35 to 14.40 mbgl
	(Post-monsoon Depth to water level during Nov'2007)	:	2.00 to 13.35 mbgl
	Long term water level trend in 10 years (1998-2006) in m/yr	:	Pre-monsoon : Fall (Range 0.12-0.35m) in three blocks (CGWB wells) Post-monsoon : Fall (Range 0.07-0.51m) in three blocks (CGWB wells)
10.	**GROUND WATER EXPLORATION BY CGWB (As on 31-3-2007)**		
	No of wells drilled (EW, OW, PZ, SH, Total)	:	EW-1, PZ-7, SH-3
	Depth range (m)	:	150-350
	Discharge (litres per second)	:	8-16
	Storativity (S)	:	4.84×10^{-4}
	Transmissivity (m^2/day)	:	1759 (at Tugalpur Haldona)
11.	**GROUND WATER QUALITY**		
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	:	EC (Range: 419-4900 µs/cm at 25^0C) & Fluoride 1.7 at one well only.
	Type of water	:	Good-saline
12.	**DYNAMIC GROUND WATER RESOURCES (2004)-in MCM**		
	Annual Replenishable Ground Water Resources	:	630.66
	Gross Annual Ground Water Draft	:	307.92
	Projected Demand for Domestic and Industrial Uses upto 2029	:	-
	Stage of Ground Water Development	:	District (51.40%), All four blocks are 'Safe' category

13.	**AWARENESS AND TRAINING ACTIVITY**		
	Mass Awareness Programmes organized	:	None
	Date	:	-
	Place	:	-
	No. of participants	:	-
	Water Management Training Programme organized	:	None
	Date	:	-
	Place	:	-
	No. of participants	:	-
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	:	
	Projects completed by CGWB (No & Amount spent)		None
	Projects under technical guidance of CGWB (Numbers)		None
15.	**GROUND WATER CONTROL AND REGULATION**	:	
	Number of OE Blocks	:	Nil
	No of Critical Blocks	:	Nil
	No of blocks notified	:	Nil
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	:	The ground water in deeper zones gets brackish to saline as it occur more than 1000 μs/cm at 25^0C in sector-8 and sector-9. Depletion of ground water levels locally in NOIDA and Greator NOIDA area is attributed to over exploitation of ground water. Higher Manganese concentration in NOIDA urban areas is also reported.

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1.0 INTRODUCTION

1.1 ADMINISTRATIVE DETAILS:

Gautam Budh Nagar district with geographical area of 1442 Sq. Km with headquarters at industrial city of Greater Noida has three Tehsils and four developmental blocks viz. Bisrakh, Dadri, and Dankaur & Jewar. According to 2001 census, the total population of the district was 1105292 and average population density was 766 persons per sq. km. The demographic details of the district are as follows:

Block	**Area (Sq Km.)**	**Population**				
		Male	***Female***	***Total***	***Scheduled Cast***	***Scheduled Tribe***
Bisrakh	318.25	99591	83059	182650	28623	8
Dadri	473.82	94368	81314	175682	30560	30
Dankaur	452.78	92126	78457	170583	33157	0
Jewar	428.99	71970	62131	134101	32917	241
Total Rural	1291.26	358055	304961	663016	125254	279
Total Urban	150.74	242899	199377	442276	47830	100
Total District	1442.00	600954	504338	1105292	173084	379

(Source: Statistical Diary, 2005, District Gautam Budh Nagar)

1.2 BASIN / SUB-BASIN:

The Gautam Budh Nagar district falls in Yamuna Sub-basin and forms a part of Ganga Yamuna Doab. Major part of the district is covered by Hindon river water shed.

1.3 DRAINAGE:

District of Gautam Budh Nagar is drained by river Yamuna and its tributaries namely- Hindon River and Bhuriya nadi. All these drainage ways flow in a southerly or southeasterly course. These streams generally follow a meandering course through a narrow flood plains.

1.4 LAND USE:

District statistical data (2005) reveal that most of the land is put into active cultivation i.e. 67.93% leaving 1.4% under forest and negligible 0.3% for pasture and 0.23% for orchids & bushes which is much below the state average and environmental standard. The area under forest cover falls in all the four blocks maximum being in Bisrakh block which basically protected under urban planning. About 2.78% land of the district can be further developed for agricultural practices.

1.5 IRRIGATION:

The irrigation in the district is basically met by means of minor irrigation structures such as tube wells, cavity tube wells and occasionally dug wells. The surface water irrigation system i.e., canals is also being used substantially. As per the district statistical records, 9141 hectare of area constituting 10.1% of the total irrigated area is irrigated by canals whereas a total of 81484.0 hectares of area constituting 89.9% is irrigated by Minor irrigation structures.

A large part of the district area falls in Upper Ganga Canal Command. The eastern parts of the district have good network of canals. The main canals are the Mat Branch and Jewar Distributary. The total length of canal network in the district is 385kms.

1.6 STUDIES / ACTIVITIES OF C.G.W.B.:

The district being a part of Ghaziabad and Bulandsahar districts has been covered under systematic surveys earlier by Central Ground Water Board. Lately on carving a new district by taking two blocks each from above two districts, the reappraisal hydro geological surveys have been taken up in 2000-01& 2006-07. The focus of the study has been mainly on hydrogeological condition of the area including water bearing formation, aquifer geometry, hydrological properties of the aquifer

material, resource estimation and quality assessment of ground water. A comprehensive district report was also prepared by CGWB. In addition some special studies have also been taken in Noida area during 1993-94.

2.0 RAINFALL & CLIMATE

2.1 RAINFALL:

The annual normal rainfall (1901-1970) of the district comes to 700.6 mm as observed in the nearest rain gauge station at Sikandrabad. The maximum rainfall occurs during the monsoon period i.e., June to September having the normal value of 600 mm which is 85.7% of annual rainfall. August is the wettest month having the normal rainfall of 205.8 mm followed by July when normal rainfall received about 194.4 mm.

2.2 CLIMATE:

The climate of the district is sub-humid and characterized by hot summer and bracing cold season. After February there is continuous increase in temperature till May which is generally the hottest month. The district experiences the hottest weather in the month of June with average mean temperature of 32.85°C followed by May with 31.9°C. The coldest month is January with average mean temperature of 14.2°C followed by December with 15.4°C.

During the southwest monsoon season the relative humidity is high and after the withdrawal of the monsoon humidity decreases. The mean monthly maximum relative humidity in the morning of August month is 84% and mean monthly minimum relative humidity measured in the morning of May is 41 %.

The normal annual mean wind speed in the district is 6.7 kmph the highest normal wind speed is 9.2 kmph in the month of June followed by 8.3 kmph in May.
The annual normal potential evapo-transiration of the district is 1545.3 mm. The maximum PET occurs in the month of June followed by May with 225.3 mm and 222.2 mm respectively.

3.0 GEOMORPHOLOGY & SOIL TYPES

3.1 GEOMORPHOLOGY:

Gautam Budh Nagar district, a part of Ganga-Yamuna Doab in the vicinity of River Yamuna, forms almost a monotonous plain with occurrence of sand dunes, sandy ridges, ravenous tracts and depressions close to the river system of Yamuna. At places, close to river ravines are developed in the form of narrow gullies on land surface due to excessive erosion by surface runoff. Ravines form a bad land topography along Hindon and Bhuriya Nadi between Bisrakh and Dankaur areas and also in Jhajhar area. Lenses and beds of Kankar are seen exposed and forms mounds or pinnacles. Flood plain of river Yamuna with remnants of old meander scars, oxbow lakes and relict drainages is developed along the river in western part of the district. The terrain has gentle slope from northwest to south-east with a gradient of 0.2 m/km.

3.2 SOIL TYPES:

The soil ranges from pure sand to stiff clays and including all combination of the two extreme litho units. The pure sand is called Bhur and clay is called Matiar. The mixture of sand and clay in equal proportion forms Dumat or loam, a good agriculture soil. Several subcategories of Dumat are possible depending upon the contents of clay and sand. The bad land patches (Kallor) which are ingested with Reh at places do not support any vegetation growth. Alluvial soils occurring in flood plain of rivers is called Kemp which yield good crops. Kankars invariably associated with clay and at times retards ground water movement.

4.0 GROUND WATER SCENARIO

4.1 HYDROGEOLOGY:

Water Bearing Formation:

The thick unconsolidated sediments occur up to the explored depth of 352.0m in the area. The underlying basement comprising Delhi Quartzite has been reported to

be encountered at 116.4m depth at Brijbihar Exploratory borehole, 330.0 m at Tila moth and 325.0 m depth at Rajendra Nagar boreholes in Ghaziabad district (Singh & Srivastava, 1995). The alluvial deposits occur in Ganga - Yamuna Doab area comprises an aquifer system form good repository of ground water that occur in granular zones constituted of fine to coarse sand and occasional gravel. Thick clay beds inter lying with sand act as confining layers and separate the aquifers. The thickness of the unconsolidated sediments progressively increases towards east.

Occurrence of Ground Water:

Ground water occur under Phreatic conditions in shallow aquifers down to the depth of 100 mbgl, in intermediate and deeper aquifers it occurs under confined to semi-confined conditions.

Depth to water level:

To monitor the nature of water level and its behavior, ground water monitoring well established in the district are being monitored four times in a year. Pre-monsoon and post-monsoon water level data are collected during May and November months respectively. Depth to water level maps for pre-monsoon and post monsoon periods (Plate-4 & 6) have revealed that the entire area can be divided into different zones on the basis of depth to water ranges. Fairly a large area has shallow to moderate depth to water conditions. Water level in phreatic aquifer ranges from 3.35 to 14.40 m bgl during pre-monsoon period whereas it ranges from 2.00m to 13.95 mbgl during post monsoon period (Annexure- V). Water levels greater than 9m bgl occur in most of the non-command areas of the district. Some isolated patches deeper water levels occur in east of Jhajhar (Dankaur Block) and Dadri area. Deeper water levels (> 9 mbgl) also occur along Yamuna river which perhaps indicate that the water levels are deepening toward river thus forming the river effluent in nature.

Seasonal Water level fluctuation:

The seasonal water level fluctuation has been computed from the water level data obtained from the GWM wells monitored in the area during pre-monsoon & post-monsoon period. Fluctuation in water level is outcome of mainly the amount of rainfall received by the area & ground water draft taken from the ground water reservoir. Besides many other factors viz. base flow of rivers, evaporation losses,

seepage from canal etc. also control the inflow and outflow of ground water. Majority of wells show water levels elevated during post monsoon period, the rise in water levels range between 0.12 to 3.69m. In some wells however, further decline in water levels have been reported during post monsoon period in the range of 2.76 to .09m. It transpires that such areas have moderate to low recharge over the ground water draft during the period.

Long Term Water Level Trend:

Long term Water level trend analysis of pre-monsoon and post monsoon data of seven (7) CGWB, NHS (Period from 1977 to 2006) reveal that out of seven wells considered, three wells situated in Jewar, Dankaur and Dadri locality show declining trends during pre to post monsoon period which attributed to the fact that most of these area are semi-urban centers which are heavily depend on ground water for catering domestic as well as irrigation needs.

Hydrogeological Characteristics of Aquifer:

The ground water structures constructed in the top shallow aquifer are minor irrigation structures like dug well, dug cum bore wells and shallow tubewells.

The State Government has constructed various tube wells down to a depth of 80m to as much as 350 mbgl. The aquifer parameters have been determined at various places. The discharge of these structures generally ranges between 8 to 16 lps with moderate drawdown of 3 to 6m, however, a few wells have yielded exceptionally as high as 500 lps. The coefficient of transmissivity has been determined at Tugalpur Haldona is 1759 m^2 /day and storage coefficient of 4.84×10^{-4}

A total seven piezometer, down to 50m depth and one exploratory well at Allabas have been constructed by CGWB so far in the district. The shallow (50m deep) piezometers constructed show 82 to 100 lpm discharge.

4.2 GROUND WATER RESOURCES:

Blockwise ground water resources as estimated using GEC, 1997 methodology jointly by CGWB and State Ground Water Department on 31.03.04 are tabulated as follows:

Sl. No.	Blocks	Annual ground water recharge (in ham)	Net Annual ground water availability (in ham)	Existing gross ground water draft for all uses (in ham)	Net ground water availability for future irrigation development (in ham)	Stage of ground water development (in %)	Category of block
1.	Bisrakh	9528.38	9051.96	6756.76	2079.39	74.64	Safe
2.	Dadri	20355.50	19337.73	5024.83	14155.37	25.98	Safe
3.	Dankaur	17673.36	16789.69	9762.34	6933.23	58.14	Safe
4.	Jewar	15509.17	14733.71	9248.54	5424.44	62.77	Safe
	Total	**63066.42**	**59913.10**	**30792.48**	**28592.44**	**51.40**	

4.3 GROUND WATER QUALITY:

In general ground water quality in the district is good and all the constituents are well with in the permissible limits as prescribed by ICMR (1975). The general range of various important chemical constituents in the ground water samples are as follows:

Chemical Constituents	Range
pH	7.95 - 8.15
Specific Conductance (EC) (µs/cm at 25°C)	419 - 2270
Bicarbonate (mg/l)	152 - 750
Chloride (mg/l)	14 - 347
Nitrate (mg/l)	3.3 – 141
Sulphate (mg/l)	9.6 – 125
Fluoride {mg/l)	0.27 - 1.7
Calcium (mg/l)	8 - 136
Magnesium (mg/l)	4.8 - 50
Total Hardness as $CaCO_3$ (mg/l)	150 - 450
Sodium (mg/l)	35 - 506
Potassium (mg/l)	4.8 - 18
Arsenic (mg/l)	0.0007 – 0.001

Quality of Shallow Ground Water:

Ground water in shallow aquifers in general is good and safe for drinking and irrigation purposes. The ground water is generally alkaline type (pH 7.95 - 8.15) and salinity limits with in the permissible limits except in few samples collected from Jahangirpur, Luharli, Bilaspur, Dadri, Dankaur and Jewar where it is more then 1000μs/cm at 25°C.

Quality of Deeper Ground Water:

The ground water which is generally good in major parts of the district in shallow aquifers tend to deteriorate in deeper zones where it gets brackish to saline as it occur more than 1000 μs/cm at 25°C in tube well samples of Chlera, Sector-8 and sector-9. Salinity in deeper zones also opined to be attributed due tectonic activity as it is predominant only west of Hindon river while east Hindon it is generally potable (Mehrotra, 1999)

The analytical results of major chemical constituents does not indicate any major ground water problem in rural areas. Fluoride is slightly higher than permissible limit (1.5 mg/l) in Luharli village only which may be geo-genic in origin. An isolated sample from Dankaur town however, shows that Chloride, Nitrate and Sodium contents are quite high which may probably be the result of leaching from domestic waste disposals.

Manganese concentration in NOIDA urban areas is however, presumed to be attributed from out side sources as the river water also show a bit higher value of manganese. The manganese is considered to be the least toxic of heavy metals.

4.4 STATUS OF GROUND WATER DEVELOPMENT (BLOCKWISE):

The blockwise determination of the present level of ground water development has been assessed on the basis of the percentage ratio between the net annual availability of ground water and the present gross annual ground water draft for all uses. The present level of ground water development is maximum (74.64%) in Bisrakh block which happened to house the NOIDA & major parts of Greater Noida urban areas whereas minimum (25.98%) development has been recorded in Dadri block as indicated in table above.

All the blocks and district as a whole is categorized as safe category with only 51.40% ground water development. However the case may not be same for densely populated and industrial hubs in NOIDA and Greater NOIDA area where ground water regime locally effected due to over exploitation of ground water.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 GROUND WATER DEVELOPMENT:

As stated above that all the blocks and district as a whole is categorized as safe category with only 51.40% ground water development which leaves ample scope for future ground water development. The net annual ground water availability in the district is 599.13 MCM and the gross ground water draft for all uses in the district is of the order of 307.92 MCM, leaving 285.92 MCM of ground water available for future developments. Block wise net ground water availability for irrigation has been assessed. Dadri block has maximum (141.55 MCM) water availability for irrigation. Like wise other blocks have also sufficient water balance for future development.

The ground water development in the district is basically done through Tube wells (shallow & deep) and hand pumps. Dug wells are also in use occasionally for drinking water purposes in rural areas. The area is considered economically backward, and its major population was engaged primarily in agricultural activity with little land holdings and negligible forest cover. Almost 67.93% of the land is put into active cultivation leaving 1.4% under forest and negligible 0.3% for pasture and 0.23% for orchids. Two principal harvest of the district are Rabi & Kharif. Irrigation depends upon surface as well as on ground water resources, Out of the total irrigated land (906.25 Sq.km) about 89.9% is covered by ground water irrigation.

Major area of the district has already been acquired by NOIDA and Greater NOIDA Development Authorities and Private Builders and Industries, there is quite scope of utilizing the share of ground water availability kept for irrigation with the change of land use.

5.2 WATER CONSERVATION & ARTIFICIAL RECHARGE:

As the district receives 700.6 mm of annual rainfall there is ample scope of rainwater harvesting in existing ponds by rejuvenating these and even constructing new pond in the low lying areas with enough catchment's. Construction of Percolation tanks and recharge shafts may be an economical option in areas with deeper water levels on community basis. Though there is a large area forms Yamuna flood plain major parts of which, is isolated from active flood plain by constructing river embankments along the river. The land use of these plains has been modified. The ground water in these flood plains can be recharged by constructing gully and furrow structures. There is a considerable scope of roof top rainwater harvesting for ground water recharge in urban areas.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

6.1 WATER LOGGING:

A considerable part of the district fall under water logging and prone to water logging conditions as depth to water level rest within 4 mbgl during pre and post monsoon period. Such areas generally fall in the vicinity of major canals and distributaries, indicating excessive seepage from these canals.

6.2 DEPLETING GROUND WATER LEVEL:

Out of seven wells considered three wells situated in Jewar, Dankaur and Dadri show declining trends during pre & post monsoon period which attributed to over exploitation of ground water for catering domestic as well as irrigation needs.

Seasonal and long term water level records indicate a very moderate and gradual declining of water levels.

6.3 USAR LAND:

The occurrence of thick clay and kankar bed at shallow depth level develop `Reh' in fairly large area making the land non-agriculturable due to salt encrustations.

6.3.1 Ground Water Quality:

As such the ground water in shallow zones is of good quality except at places where it is deteriorated (EC more then 1000 micro siemens/cm at 25°C) with depth. Salinity has been found as high as more than 4000 micro siemens/cm at 25°C at few isolated pockets in Sorkha and Harola villages. Fluoride content is also found slightly more than permissible limit in a sample from Luharli village.

7.0 AWARENESS & TRAINING ACTIVITY

7.1 MASS AWARENESS PROGRAMME (MAP) & WATER MANAGEMENT TRAINING PROGRAMME (WMTP) BY CGWB:

Mass Awareness Programme and Water Management Training Programme has not been conducted yet in the district.

7.2 PARTICIPATION IN EXHIBITION, MELA, FAIR ETC.:

No participation by CGWB in any of the Exhibition, Mela, Fair etc.

7.3 PRESENTATION & LECTURES DELIVERED IN PUBLIC FORUM / RADIO / TV / INSTITUTION OF REPUTE / GROSS ROOTS ASSOCIATION / NGO / ACADEMIC INSTITUTION ETC.:

Not any presentation & lectures delivered in public forum / radio / T.V. / institution of repute / grass root associations / NGO / academic institutions etc.

8.0 AREA NOTIFIED BY CGWA/SGWA

None of the areas has been notified in the district by either of the organisations.

9.0 RECOMMENDATIONS

Rain water harvesting and augmentation of ground water by artificial recharge should be encouraged in areas where ground water levels have gone down. Direct recharge techniques may be applied in such areas where shallow aquifers are capped by thick clays. There is a considerable scope of roof top rainwater harvesting for ground water recharge in urban areas.

Conjunctive use of ground water and surface water resources may be viable option in south-eastern parts of Jewar and Dankaur blocks of the district as fairly a large area comes under water logged condition during post monsoon period and deep ground water level zones occur along the river Yamuna in western parts of these blocks. .

Non-agricultural areas where land is affected by `Reh' development due to salt encrustation can be developed by applying Zypsum treatment to the surface soil and by increasing the use of ground water so as to down the ground water levels from phreatic aquifers.

The development of ground water is being widely done in urban and rural areas for irrigation and domestic purposes, which may be continued with caution for salinity hazards.

Plate-1

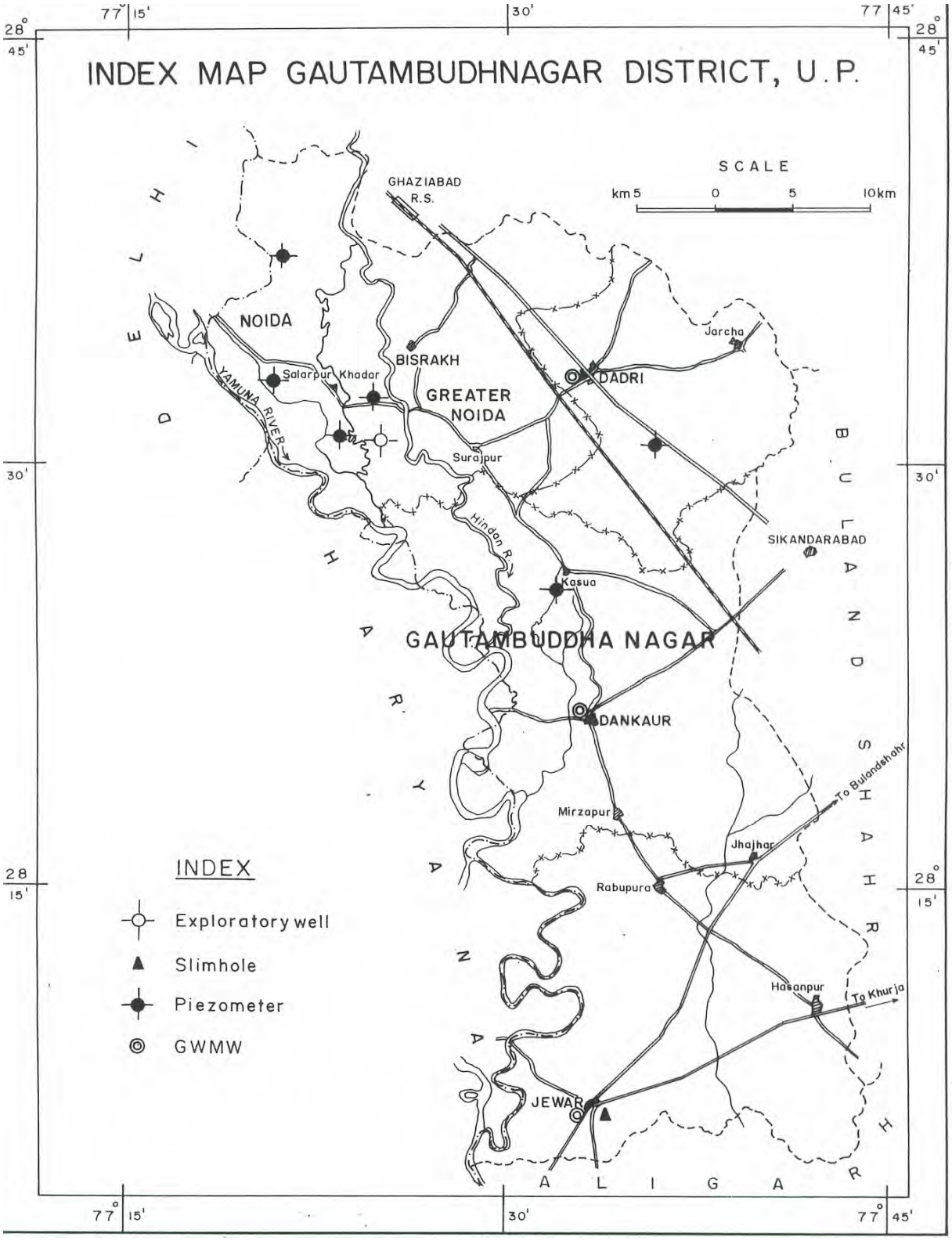
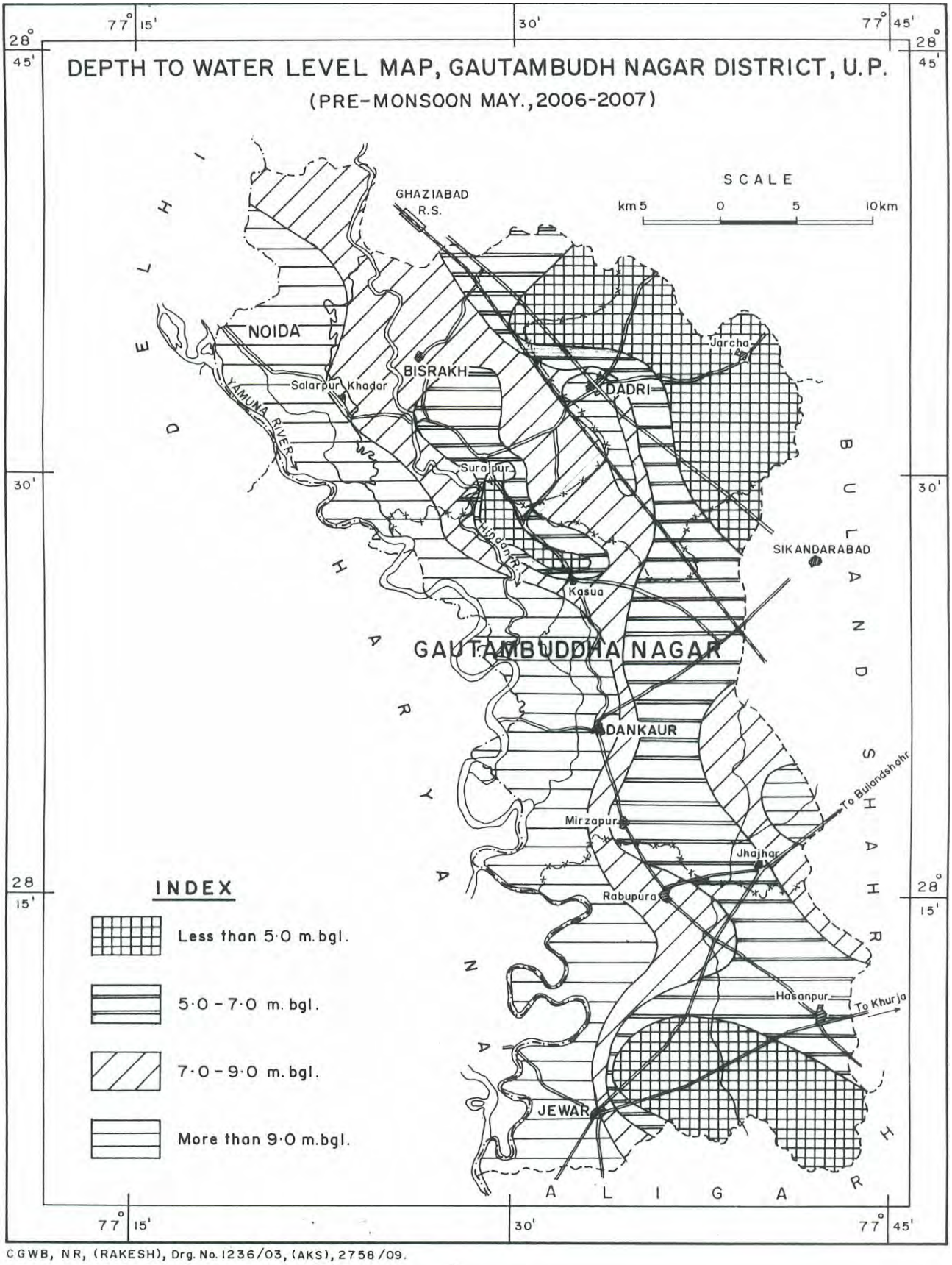
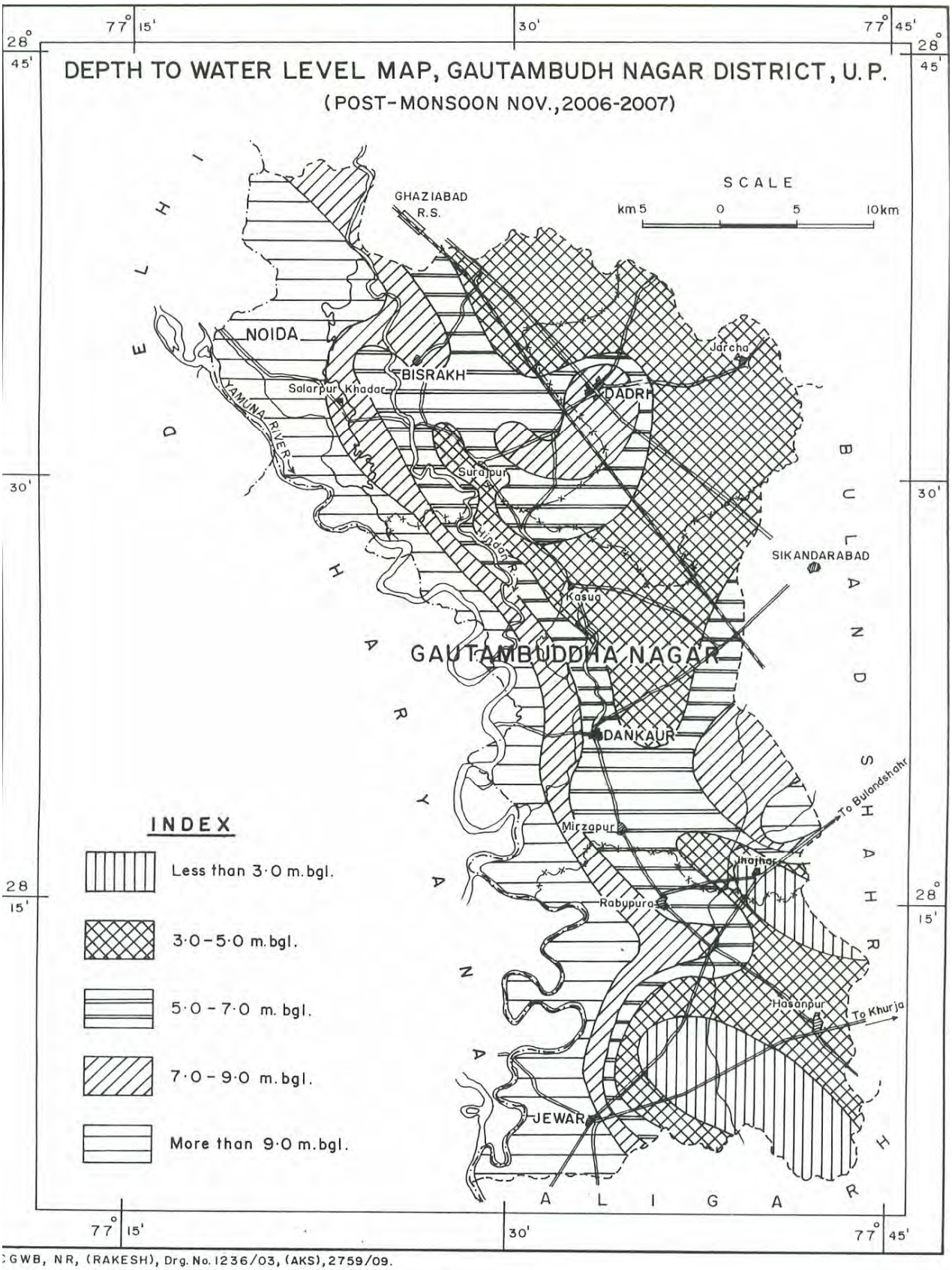

INDEX MAP GAUTAMBUDHNAGAR DISTRICT, U.P.
SCALE
km 5 0 5 10km
GHAZIABAD R.S.
NOIDA
BISRAKH
Salarpur Khadar
YAMUNA RIVER
GREATER NOIDA
DADRI
Jarcha
Surajpur
Hindan R.
Kasua
SIKANDARABAD
GAUTAMBUDDHA NAGAR
DANKAUR
To Bulandshahr
Mirzapur
Jhajhar
Rabupura
Hasanpur
To Khurja
JEWAR
DELHI
HARYANA
BULANDSHAHR
ALIGARH
INDEX
Exploratory well
Slimhole
Piezometer
GWMW
28° 45'
77° 15'
30'
77° 45'
28° 15'
77° 15'
30'
77° 45'

Plate-2

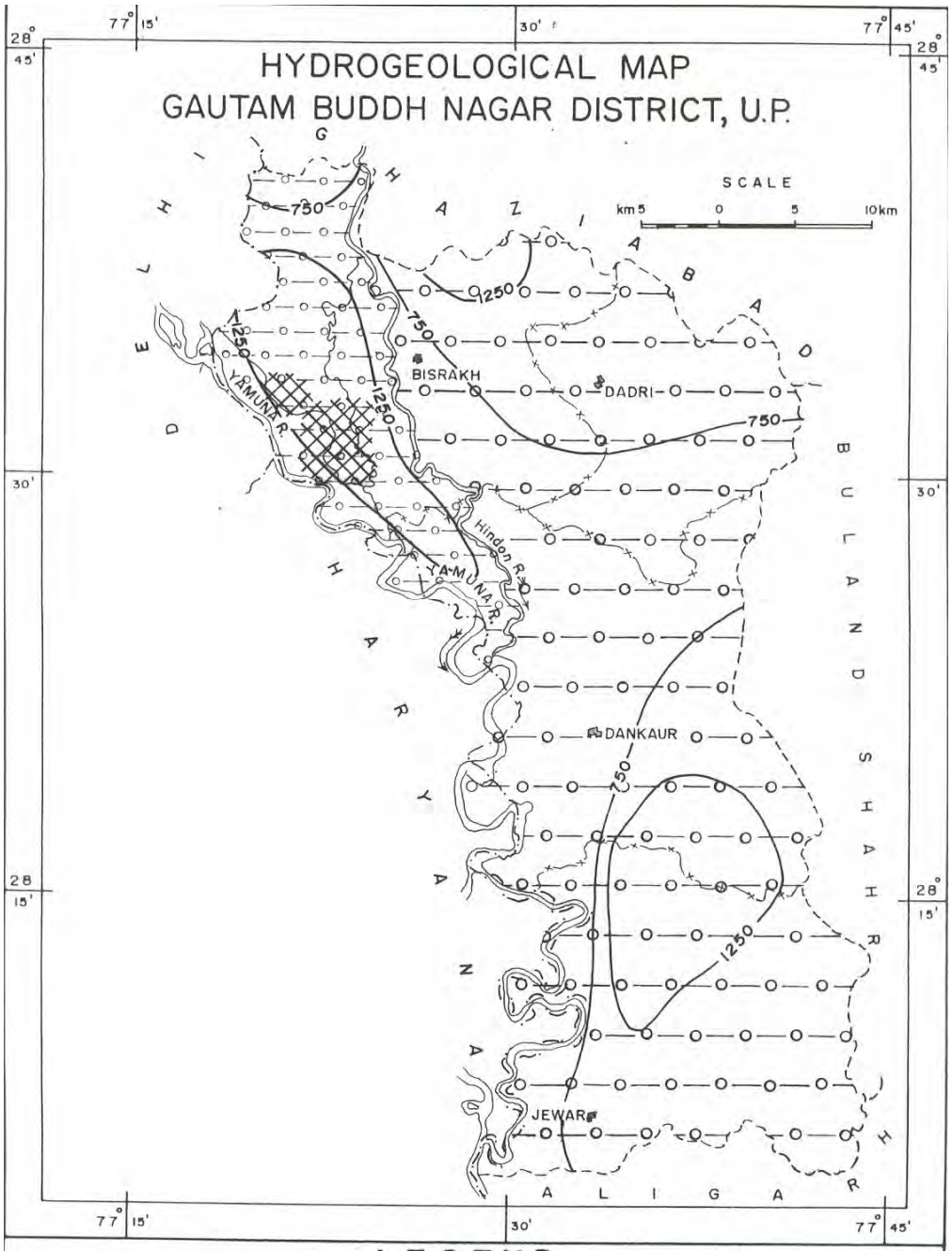


CGWB, NR, (RAKESH), Drg. No. 1236/03, (AKS), 2758/09.

Plate-3



CGWB, NR, (RAKESH), Drg. No. 1236/03, (AKS), 2759/09.



LEGEND

	WELLS FEASIBLE	RIGS SUITABLE	DEPTH OF WELL (M)	DISCHARGE (LPM)	SUITABLE ARTIFICIAL RECHARGE STRUCTURES*
Soft Rock Aquifer	Dug Wells / Hand Pump	Manual / Hand boring set	20 – 50	50 - 100	Recharge Shaft, Recharge Pit, Abandoned Hand-pumps / Tubewells, Roof Top Rain Water Harvesting Structures in urban areas.
	Shallow Tube Well	Rotary Rigs (Direct / Reverse)	50 - 100	1000 - 1500	
	Deep Tube Well	Rotary (Direct)	100 – 300**	2000 - 3000	
Soft Rock Aquifer	Dug Wells / Hand Pump	Manual / Hand boring set	20 – 50	50 – 100	
	Shallow Tube Well	Rotary Rigs (Direct / Reverse)	50 - 100	500 – 1000	
	Deep Tube Well	Rotary (Direct)	100 – 300**	1000 – 2000	

Major river

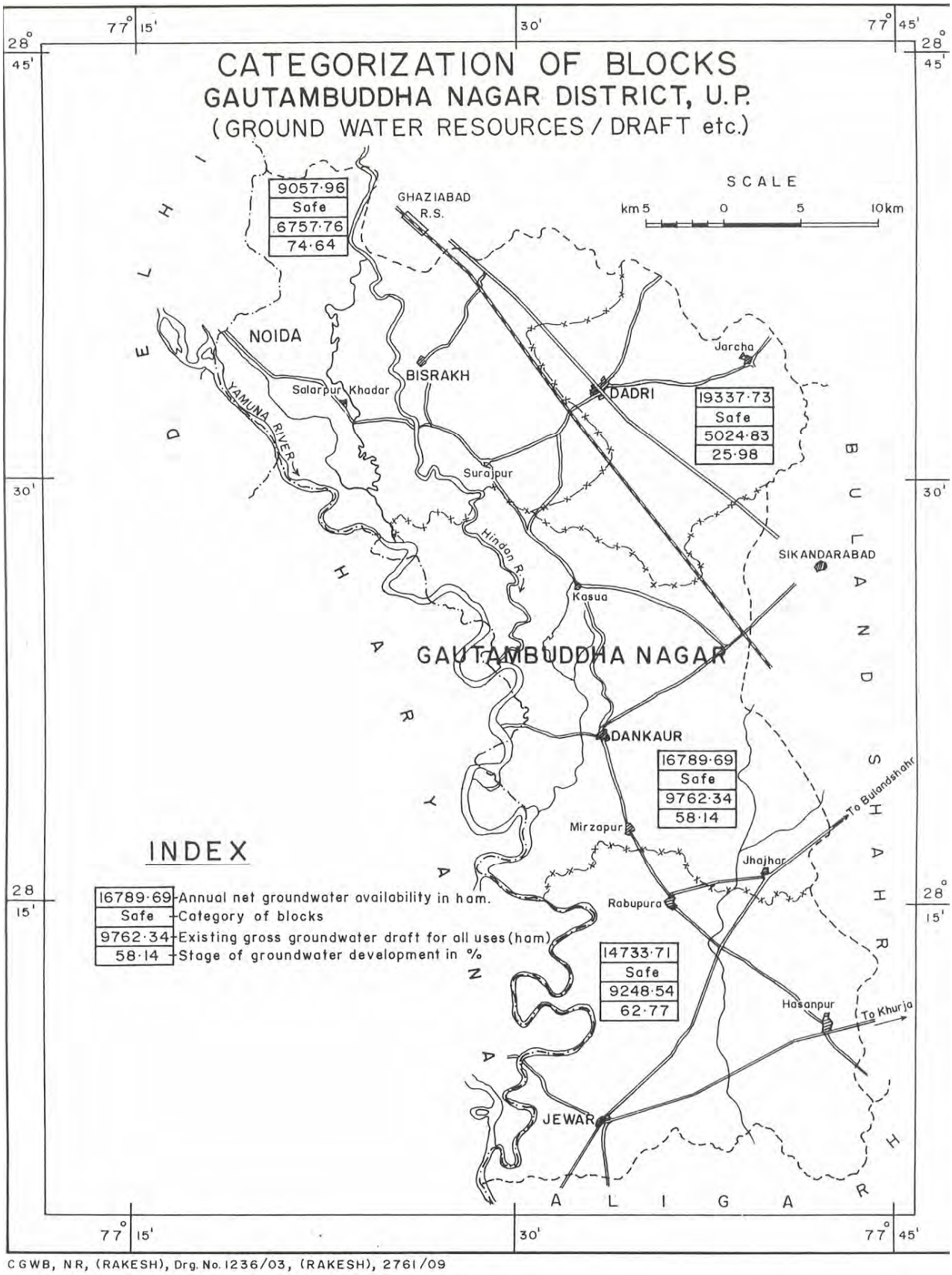
Electrical Conductivity (Micromhos/cm at 25o C) — 750

Manganese > Permissible limit (0.3 ppm)

C.G.W.B., NR, (N.C. Pandey) Drg. No. 2760/09

* Applicable in alluvial area where depth to water level is > 8 m.
** Limited upto depth explored i.e. deeper prospects yet to be found.

Plate-5



CGWB, NR, (RAKESH), Drg. No. 1236/03, (RAKESH), 2761/09