GROUND WATER BROCHURE OF GHAZIABAD DISTRICT, U.P.

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

By

Dr. R.C. Verma
Scientist 'B'

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ANNEXURE:

PLATES:

GHAZIABAD DISTRICT AT GLANCE

1.	**GENERAL INFORMATION**		
i.	Geographical Area (Sq. Km.)	:	1966
ii.	Administrative Divisions	:	
	Number of Tehsil/Block		Tehsil 4 / Block 8
	Number of Panchayat/Villages		Panchayat 73 / Vill. 580
iii.	Population (as on 2001 census)	:	33,14,070
iv.	Average Annual Rainfall (mm)	:	905
2.	**GEOMORPHOLOGY**		
	Major Physiographic Units	:	Ganga Khadar, Hindon Khadar and Yamuna Khadar and Upland
	Major Drainages	:	Ganga, Yamuna and these tributaries namely Kali Nadi, Chhaiya and Hindon
3.	**LAND USE (Sq. Km.)**		
a)	Forest area	:	34.40
b)	Net area sown	:	1499.03
c)	Cultivable area	:	–
4.	**MAJOR SOIL TYPES**	:	Bhur, Matiyar, Domat or Loam
5.	**AREA UNDER PRINCIPAL CROPS (as on 31.03.05) Km^2**	:	Wheat-727.5, Rice-203.3, Maize-34
6.	**IRRIGATION BY DIFFERENT SOURCES** (Areas and Number of Structures) (Km^2)		
	Dugwells	:	37.05
	Tubewells/Borewells	:	1066.36
	Pumpsets	:	30509
	Tanks/ponds	:	Nil
	Canals	:	207.71 by 596 Km
	Other Sources	:	-
	Net Irrigated Area	:	1311.12
	Gross Irrigated Area		-

7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007)**		
	No. of Dugwells	:	7
	No. of Piezometers	:	13
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	:	Alluminium
9.	**HYDROGEOLOGY**		
	Major water bearing formation	:	Sand, medium to coarse & Gravel
	(Pre-monsoon Depth to water level during 2006)	:	22.78 mbgl
	(Post-monsoon Depth to water level during 2006)	:	21.95 mbgl
	Long term water level trend in 10 years (1998-2007) in m/yr	:	Premonsoon – 0.2125
	Base on GWD data for 1998-2007		Postmonsoon – 0.3016
10.	**GROUND WATER EXPLORATION BY CGWB (As on 31-3-2007)**		
	No of wells drilled (EW, OW, PZ, SH, Total)	:	EW-12, PZ-14
	Depth range (m)	:	35 – 302
	Discharge (litres per second)	:	16.72 – 47.37
	Storativity (S)	:	1.31×10^{-5} to 5.56×10^{-4}
	Transmissivity (m^2/day)	:	282 to 3053
11.	**GROUND WATER QUALITY**		
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	:	EC more than 2250 µ/cm at 25^0C at Radha Kunj, Surya Nagar & 220 KV substation Sahibabad
	Type of water	:	Bicarbonate Type
12.	**DYNAMIC GROUND WATER RESOURCES (2004)-in MCM**		
	Annual Replenishable Ground Water Resources	:	981.63
	Net Annual Ground Water Draft	:	704.93
	Projected Demand for Domestic Industrial Uses upto 2025	:	51.29
	Stage of Ground Water Development	:	71.81%
13.	**AWARENESS AND TRAINING ACTIVITY**		
	Mass Awareness Programmes organized	:	
	Date	:	21.05.1999
	Place	:	Surya Nagar (Block Loni)
	No. of participants	:	250

	Water Management Training Programme organized	:	A Public Awareness Programme was organized on 04.03.99 at Ghaziabad
	Date	:	04.03.1999
	Place	:	Ghaziabad
	No. of participants	:	150
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING** Projects completed by CGWB (No & Amount spent)	:	Nil
	Projects under technical guidance of CGWB (Numbers)		
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**	:	Declining in ground water regime due to over exploitation and deterioration in ground water quality due to pollution / salinity in Loni block

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1.0 INTRODUCTION

District Ghaziabad is situated in the middle of Ganga-Yamuna doab and spreads over 1966 sq Km. It is bounded by longitude $77^0$12' $78^0$13' latitude $28^0$26' $28^0$54' and is underlain by Quaternary sediments. The district is administratively divided into 4 tehsil and is further divided into 8 development blocks. The total population as per 2001 census is 33,14070. The density of population is 1995 per sq km.

District at Ghaziabad is drained by river Yamuna and Ganga and their tributaries namely Hindon and Kali, Minor distributaries of Kali Nadi being Hawa drain Chhoiya Nala and Chhoiya Nadi.

The irrigation in major part of the district is by means of minor irrigation structures such as tubewells capacity wells and surface irrigation system i.e. canals. Upper Ganga canal and its tributaries irrigate western part of the district and Anup Shalon branch of upper Ganga Canal irrigate eastern part of the district. Hapur and Loni block are practically devoid or surface irrigation.

The Central Ganga Water Board has carried out 12 Nos. of exploratory drillings to decipher subsurface aquifer geometry and to determine the aquifer parameters and quality of sub surface water. CGWB has also constructed 14 Nos. of piezometers to close watch the depth to water level in data scare regions.

2.0 RAINFALL & CLIMATE

The rainfall in the area is mainly due to southwest monsoon and nearly 80 to 85% of the annual rains occurs between July and September. Remaining 15% to 20%

rain is distributed unevenly, some times rain also occurs between January and March. The normal Annual rainfall of the district has been reported to be 731 mm based on data from 1901 to 1970. There is a large variation in rainfall in space and time.

The district is endowed with typical climate with extremes in summer as in winters. The mercury shoots up to 40^0C or even more during peak summer and dips to less than 5^0C during the month of January. Winter spans from mid of November to mid of February. Summer months are April to middle of June which ends with onset of monsoon.

3.0 GEOMORPHOLOGY & SOILS TYPES

The entire district of Ghaziabad forms the part of Ganga-Yamuna doab, eastern boundary is marked by Ganga river and the river Yamuna defines the western boundaries. The area represents almost a monotonous flat plain dissected by drainage of different order. Ghaziabad town is situated almost in the old flood plain of river Hindon. Morphologically, the area can be divided into 3 morpho units viz a viz (i) older Alluvial Plain (ii) Older Flood Plain and (iii) Active Flood Plain. The banks of rivers are steep and ravinous. The older alluvium occupies the entire upland and interfluve area occurring between major drainage ways i.e. Yamuna and Hindon and Hindon and Ganga.

The development of soils in the district can be ascertained to different erosional and depositional agencies. Different morphological units have been bestowed with different types of soils. The soil range from pure sand to stiff clays, with combinations of these two extreme litho units. The pure sand is called Bhur. Clay is called Matiyar. When the sand is mixed with clay in equal proportion the soil may be termed as Dumat or loam a good agricultural soil.

4.0 GROUND WATER SCENARIO

4.1 HYDROGEOLOGY:

Regionally the eastern half of the district forms part of Ganga alluvial plain where as its western part in close proximity of Hindon and Yamuna rivers represents

marginal alluvial plain Tectonically the alluvial plain of Ganga basin represents a structural trough (Fore deep) or down wrap of earth crust. The Original of which is correlated to plate tectonic and Himalayan uplift. The area is underlain by quaternary sediments, there thickness increase from west to east and also towards north east. As per available subsurface alluvium in the district varies from 115 m to 450 m. In Hindon Yamuna doab, the thickness of quaternary sediments including alluvial deposit varies from 300 m the north to 115 m in the central part of the Western side of Hindon river.

On the basis of exploratory drilling carried out in the area Annexure-I three tier aquifer system has been identified down to a depth of 450 mbgl. The first aquifer system extends down to a depth of 125 mbgl and extends down to 200 mbgl in north part of the district. Thickness of aquifer decreases in the western part of the district and depth of bedrock is shallow. The aquifer material is medium to coarse grained sand exception being Trans Hindon area. The yield varies between 1000 and 2500 lpm. Transmissivity ranges from 300-2000 m^2/day. The quality of formation water is good in the eastern part of the district and deteriorates in the western part of the district in trans Hindon area. Second aquifer system exists in the depth ranges of 170-350 mbgl. The aquifer medium is medicine to fine grained sand with occasional coarse grained sand. The quality of formation water is good. The tubewells are yielding 1000-2000 lpm at a considerably high drawdown. The third aquifer system occurs below 350m and continues down to depth explored of 450 m. Since no tubewell has been constructed in this aquifer group, therefore aquifer parameters are not known. As per electrical log the quality of formation water seems to be good. Details of exploratory tubewell constructed by CGWB is appended in Table-1 and location of exploratory wells in Plate-I.

Ground water occurs in the pore spaces of this unconsolidated sediments in this zone of saturation. The ground water generally occurs under unconfined conditions and depth to water level ranges between 1.70 to 24.60 mbgl during premonsoon period (May 2005) Plate-II and during post monsoon period (Nov. 2005) if varies between 2.20 to 23.37 mbgl (Plate-III) where as piezometric head of deeper aquifers rests between 3.04 to 16.37 mbgl. The general slope of water table is from north to south (Plate-V) and broadly follows the direction of surface slope. The hydraulic gradient varying from 0.4 to 4.8 m/Km. The maximum water level fluctuation (4.83) was observed in Rajapur (Pz) of Rajapur block. The water level

elevation varies from 192 mamsl to 214 mamsl (Plate-V). The long-term water level trend in 10 years (1998 to 2007) is observed 0.2125 m/year during monsoon and 0.3016 m/year during post monsoon period.

4.2 GROUND WATER RESOURCES:

To facilitate the ground water development judiciously, the ground water resources have been worked out. The blockwise resources are as follows:

Table-1

BLOCKWISE GROUND WATER RESOURCE AS ON 31.3.2004

Sl. No.	Blocks	Annual Ground Water Recharge (in ham)	Net 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	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1.	Bhajpur	11964.53	11336.30	8453.72	2759.71	74.38	safe
2.	Dhaulano	13165.85	12507.55	7578.50	4774.86	60.59	safe
3.	Garhmukteshwar	18285.54	16456.99	10168.18	6165.98	61.79	safe
4.	Hapur	17739.93	15965.94	14003.64	1879.13	87.71	Semi critical
5.	Loni	8185.45	7366.90	5548.47	1425.95	75.32	Semi critical
6.	Murad Nagar	12510.86	11259.77	7355.34	3747.72	65.32	Safe
7.	Rajapur	11146.68	10032.02	5935.95	3925.35	59.17	safe
8.	Simbhaoli	14675.62	13208.06	11449.75	1670.88	86.69	Safe
	Total	**107674.46**	**98163.53**	**70493.55**	**26349.50**	**71.81**	

The annual utilisable ground water resource in the district for year 2003-04 have been marked as 98,163.53 ham of which 70493.55 ham is utilized during same year thus leaving balance of 26349.50 ham for future development which may create an additional irrigation potential in about 31051 ham if 85% of total balance is fully utilized. With respect to stage of ground water development blocks Hapur and Loni come under 'Semi Critical' Category while remaining 6 blocks are under safe category. The average stage of ground water development in the district is 71.81%.

Table-2

BLOCKWISE PROPOSAL OF GROUND WATER DEVELOPMENT FOR IRRIGATION PURPOSE

Sl. No.	Blocks	Net Annual Ground Water availability for future irrigation development (in ham)	Ground water allocated for domestic / industrial uses 15% of col. 2 (ham)	Ground water available for irrigation (85% of Col 2) (ham)	Ground water proposed to be utilized for supply of future irrigation and development (70% of Col.4)	Proposed structures as per available potential		Feasibility for deep tubewells drilling depth 350 mbgl	Additional irrigation potential may be created through newly prepared T/w unit (Hact)
						Private T/w borings with pumping sets taking 50% of Col.5) unit draft 1.8 ham	*State T/w taking 50% of Col.5 unit draft 12.8 ham*		
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1.	Bhajpur	2759.71	413.95	2345.75	1641.15	456	64	Feasible	3384
2.	Dhaulana	4774.86	716.23	4058.63	2841.04	789	110	Feasible	5682
3.	Garhmukteshwar	6165.98	924.90	5241.08	3668.76	1019	143	Feasible	6936
4.	Hapur	1879.13	281.87	1597.26	1118.08	310	43	Feasible	2236
5.	Loni	1425.95	213.89	1212.06	848.44	235	33	Not Feasible	1696
6.	Murad Nagar	3747.72	562.16	3185.56	2229.89	619	87	Feasible	4459
7.	Rajapur	3925.35	588.80	3336.55	2335.58	648	90	Feasible	4670
8.	Simbhaoli	1670.88	250.63	1420.25	994.17	276	39	Feasible	1988
	Total	**26349.58**	**3952.43**	**22397.14**	**15671.11**	**4355**	**612**	**Feasible**	**31051**

4.3 GROUND WATER QUALITY:

Ground water in phreatic aquifers, in general, is colourless, odourless and slightly alkaline in nature. The specific electrical conductance of ground water in phreatic zone ranges from 527 to 3318 μs/cm at 25^0C. Conductance below 750 μs/cm at 25^0C has been observed in a 44% of the analysed samples, whereas, above 2250 μs/cm at 25^0C in 11% of the samples. It is observed that the ground water is suitable for drinking and domestic uses in respect to all constituents except for total Hardness & Nitrate. High concentration (>600 mg/l), total hardness in found in 11% of the samples with a maximum value of 990 mg/l from Bhojpura. Nitrate is found in excess of permissible limit (>45 mg/l) in 22% of the samples analysed with a maximum of 168 mg/l from Bhojpura. High nitrate values may be due to return irrigation flow from agricultural fields where indiscriminate use of fertilizer is being done.

The Arsenic content has not been detected in the ground water of the district.

4.4 STATUS OF GROUND WATER DEVELOPMENT (BLOCKWISE):

In Ghaziabad district, the salient features of ground water structures are as below:

Table-3

SALIENT FEATURES OF GROUND WATER STRUCTURE IN GHAZIABAD DISTRICT AS ON 31.03.05

Sl. No.	Name of Ground water structure	Depth range mbgl	Diameter m	Discharge range	Types of Pump & water lifting device	Use
1.	Dug Wells	4-20	1.00-2.00	-	Rope & bucket	Domestic but now not in use
2.	Private Tubewells/Borings	30-50	0.10-0.2	500-600	Electric/ diesel operated	Water supply for domestic irrigation
3.	Public (State Tubewells)	75-110	0.30-0.35	1000-4200	Electric Operated	-Do-

The blockwise sources of irrigation and irrigated area by different sources are given in Table-4.

Table-4

BLOCKWISE SOURCE OF IRRIGATION AND IRRIGATED AREA BY DIFFERENT SOURCES AS ON 31.03.2007

Sl. No.	Name of Block	Irrigated Area by Canals (Surface Irrigation) (ham)	Canal Length (Km)	Irrigated Area by Public T/W (ham)	No. of Public T/W (State)	Irrigated Area by Private T/W /Boring (ham)	No. of Pvt. T/W & Borings
1.	Bhojpur	3382	111	265	20	11294	
2.	Murad Nagar	4121	156	703	23	10,361	
3.	Rajapur	1525	56	241	19	9464	
4.	Loni	334	53	330	12	8382	
5.	Dhaulana	4707	24	169	25	11144	
6.	Hapur	343	12	497	43	21719	
7.	Simbhaoli	2215	12	93	19	13242	
8.	Garh Mukteshwar	4144	72	565	37	17326	
	Total Rural	**20771**	**496**	**2854**	**198**	**102932**	
	Total Urban	**0**	**100**	**0**	**0**	**850**	
	Total District	**2077**	**596**	**2854**	**198**	**103782**	

The long term data of National hydrograph stations of CGWB shows that except at few places, the entire district exhibit a declining trend of water level resulting in drying out the number of dug wells and also shallow ground water structures particularly in Non Canal Command areas. Based on the data recorded in the piezometers of GWD, the Declining trend of water level is 25.7 cm/year (1998-2007).

5.0 GROUND WATER MANAGEMENT

5.1 GROUND WATER DEVELOPMENT:

Keeping in view the availability of ground water resources and prevailing hydrogeological scenario, a blockwise future development plan for augmenting the irrigation water supply have been worked out (Table-2) utilizing 70% (15678.00) ham of ground water balance allocated for irrigation. It has been further proposed to

exploit the 50% of this balance (i.e. 7839 ham) through private tubewells /borings of maximum 100 m depth and remaining through moderately deep tubewells of 150-200 m depth. Thus by this way about 4352 private tubewells/borings and about 609 state tubewells may be constructed which will create additional irrigation potential for 31356 hact. in the district.

5.2 WATER CONSERVATION & ARTIFICIAL RECHARGE:

Effective and efficient water management options needs to incorporate both structural & Non Structural measures including water conservation, augmentation of this natural resource (especially ground water assets by artificial recharge techniques).

Depth to water levels are deep in Loni, Hapur and Garhmukteshwar blocks and show declining trend in ground water due to overexploitation. The surplus ground water especially during monsoon can be then utlised for recharge to ground water in deeper and depleting water level areas.

The areas west of Hindon river represent complex nature of ground water where in pockets, the quality of ground water is bad having high salinity and less medium alkalinity. The quality of ground water in Sahibabad area of Loni block at deeper reaches near 220 KV substation is brackish to saline. Formulation and implementation of large-scale artificial recharge to ground water is a key solution to the problem. To arrest the further decline of water level and improving the ground water level and improving the ground water quality, Roof top rain water harvesting and appropriate practice of artificial recharge should be adopted particularly in urban areas. In rural areas, desilting of old tanks and improvement of drainage system, direct and indirect methods for artificial recharge i.e. water spreading through lateral ditch and furrow pattern in Younger flood plain should be adopted.

Besides, the feasibility of suitable structures for artificial recharge may also be explored in other blocks where level or ground water is beyond 8.00 m below ground level. The artificial recharge schemes through roof top rainwater harvesting may be taken up at the towns /villages of Rajapur, Hapur and Garhmukteshwar blocks.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

The major ground water related issue and problems is of deep ground water levels, declining water levels in major parts of the district and in some parts of Loni block ground water deterioration/salinity problem is reported. There is no any water logged, draught affected or water scarcity area reported from the district. No drilling problems or risk to natural disaster etc. are faced in any part of the district.

7.0 AWARENESS & TRAINING ACTIVITY

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

A mass awareness programme (MAP) was organised by Central Ground Water Board in the park of Surya Nagar block, Loni on 21.05.1999. Shri Som Pal Shastri, Minister of Water Resources, Govt. of India was Chief Guest, Senior Officers of CGWB, MLA's, Gram Pradhan, Sabhasad, Officers/Officials, of Sate Govt. teachers of Schools and residents of the Surya Nagar colony participated in the programme. More than 300 people took put in the programme. Shri Som Pal Shastri, Ex Minister of Water Resources also inaugurated an exploratory tubewell at the same site. No management Training Programme yet has been organised by the CGWB in the district. However a public awareness programme was organised on 04.03.99 at Ghaziabad and about 150 people took part in the programme.

7.2 PARTICIPATION IN EXHIBITION, MELA, FAIR ETC.:

No exhibition, Mela, Fair etc. were organised in the district so far. However a demonstration of Rig Machine in the Park of Surya Nagar was held along with mass awareness/programme organised by CGWB on 30.05.99.

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

No presentation of lecture delivered in public forum by CGWB in the district. However a national publicity for mass awareness programme on consumption water,

artificial recharge practices to adopt in the area for augmenting water resources etc. are being carried out by the Ministry of water resources, Govt. of India.

8.0 AREA NOTIFIED BY CGWA/SGWA

The area of Ghaziabad, block, Loni has been notified by Central Ground Water Authority.

9.0 RECOMMENDATIONS

Based upon the studies carried out in the district it is observed that water level is declining very fast and strongly recommended that exploitation of ground water through tubewells in first aquifer group particularly in Loni and Hapur blocks (Semi-critical) be stopped. Artificial recharge practice to shallow aquifers by various methods should be adopted to raise the water level.

Since about 90% ground water requirements are being catered by aquifer group-I and partly by group-II, declining trend in ground water levels has regionally been observed. To check this trend and minimise the stress on shallow aquifers, withdrawal of ground water through shallow tubewells, tapping aquifer group-I should be restricted and efforts should be made as far as possible to exploit the ground water in future from aquifer group-II & III through heavy duty tubewells. Scientific approach should be made while executing the future ground water development plan and water management practices should be utilized and public be made aware about the decline of water level and to improve the ground water quality by adopting artificial recharge practice in quality problematic areas of Loni Block.

Annexure-I

STATUS OF GROUND WATER EXPLORATION CARRIED OUT BY C.G.W.B. N.R. LUCKNOW IN GHAZIABAD DISTRICT AS ON 31.03.2006

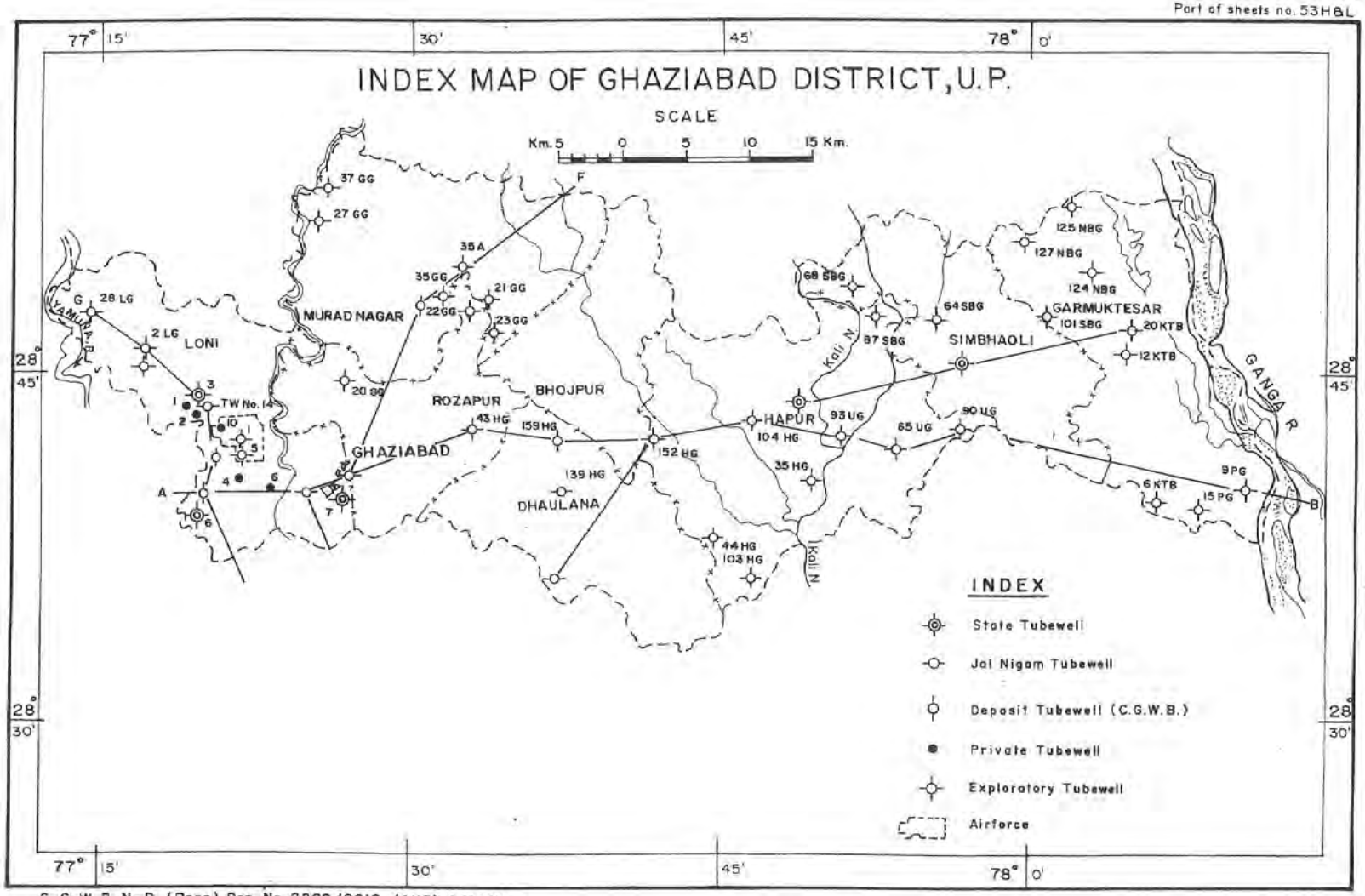
Sl. No.	Location	Type of well	Depth Drilled (mbgl)	Depth of Well (mbgl)	Zones tapped / Fracture (mbgl)	Static Water level (mbgl)	Discharge (lpm)	Draw Down (m)	Transmiss-ivity	Storativity	Aquifer	Remarks
1.	Babugarh	EW	453.00	145.00	71-83 101-119 133-139	13.18	2842	3.37	3053	5.29×10^{-4}	Alluvium	
2.	Loni	EW	118.00	67.00	36-42 47-62	3.84	1025	4.47	1435	1.31×10^{-5}	do	Basement encountered at depth of 117.9 (Delhi Quartzite)
3.	Radha Kunj	EW	202.2	35.00	21-30	9.37	1018	-	1435	1.31×10^{-5}	do	Basement encountered at depth of 202.2 (Delhi Quartzite)
4	Ramprashth	EW	106.53	35.00	20.5-32.5	6.18	1003	4.13	282	-	do	Basement encountered at depth of 103.53 (Delhi Quartzite)
5.	Sanjay Nagar	EW	449.6	215.00	100-103 106-112 134-137 148-154 200-212	16.37	11307.64	-	-	-	do	
6	Surya Nagar	EW	85.99	38.00	22-26 30-35	4.95	1014	3.38	291	5.56×10^{-4}		

Sl. No.	Location	Type of well	Depth Drilled (mbgl)	Depth of Well (mbgl)	Zones tapped / Fracture (mbgl)	Static Water level (mbgl)	Discharge (lpm)	Draw Down (m)	Transmiss-ivity	Storativity	Aquifer	Remarks
7	Modi Nagar	EW	369.20	302.00	110-116 149-152 209-221 257-272 281-296.00	6.30	-	-	-			
8.	Umesh Park, Modi Nagar	E.W.	375.00	155.00	68-74 86-92 112-121 141-150	6.13	2438	4.25			do	
9.	Pilkhua	EW	554.00	255.00	150-165 177-192 207-225 232-249	8.55	2074	4.74				
10.	Garhmukteshwar	E.W.	360.25	282.00	75-81 105-108 129-141 180-183 224-227 273-279	5.60	2300	4.47	2652.8	2.68×10^{-4}	do	
11	Simbhaoli	E.W.	366.65	171.50	72-78 82-88 94-100 112-124 136-148 160-166							

Sl. No.	Location	Type of well	Depth Drilled (mbgl)	Depth of Well (mbgl)	Zones tapped / Fracture (mbgl)	Static Water level (mbgl)	Discharge (lpm)	Draw Down (m)	Transmiss -ivity	Storativity	Aquifer	Remarks
12	Kanvi	E.W.	360.00	204.00	95-101 104-110 119-134 149-151 163-169 181-187 193-199	-	-	-	-	-	-	-

PLATE-I

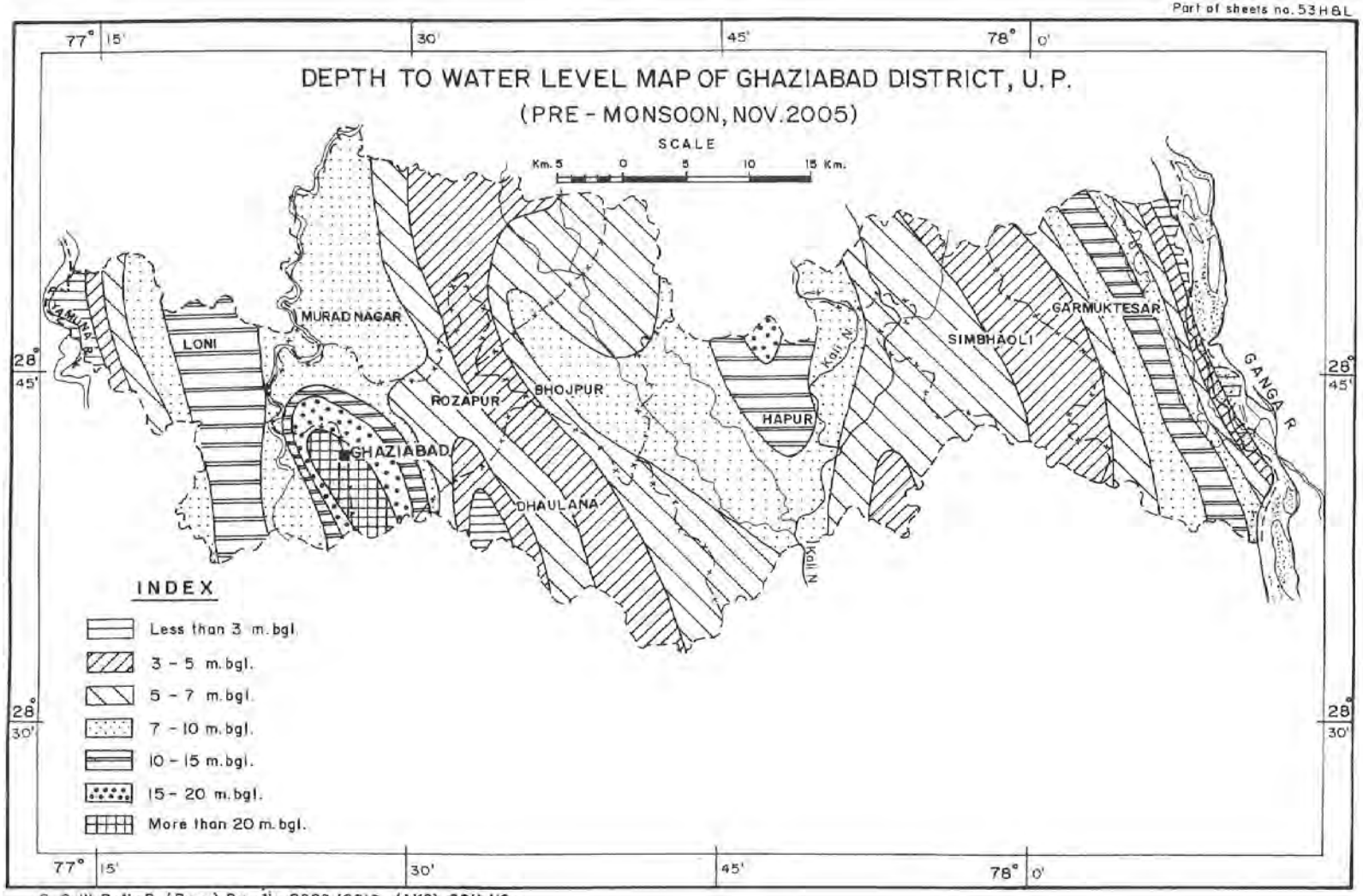
Part of sheets no. 53H&L



C. G. W. B, N-R. (Roza) Drg. No. 2809/2010., (AKS), 2810/10.

PLATE-II

Part of sheets no. 53 H&L



C. G. W. B, N-R. (Raza) Drg. No. 2809/2010., (AKS), 2811/10.

PLATE-III

Part of sheets no. 53 H&L

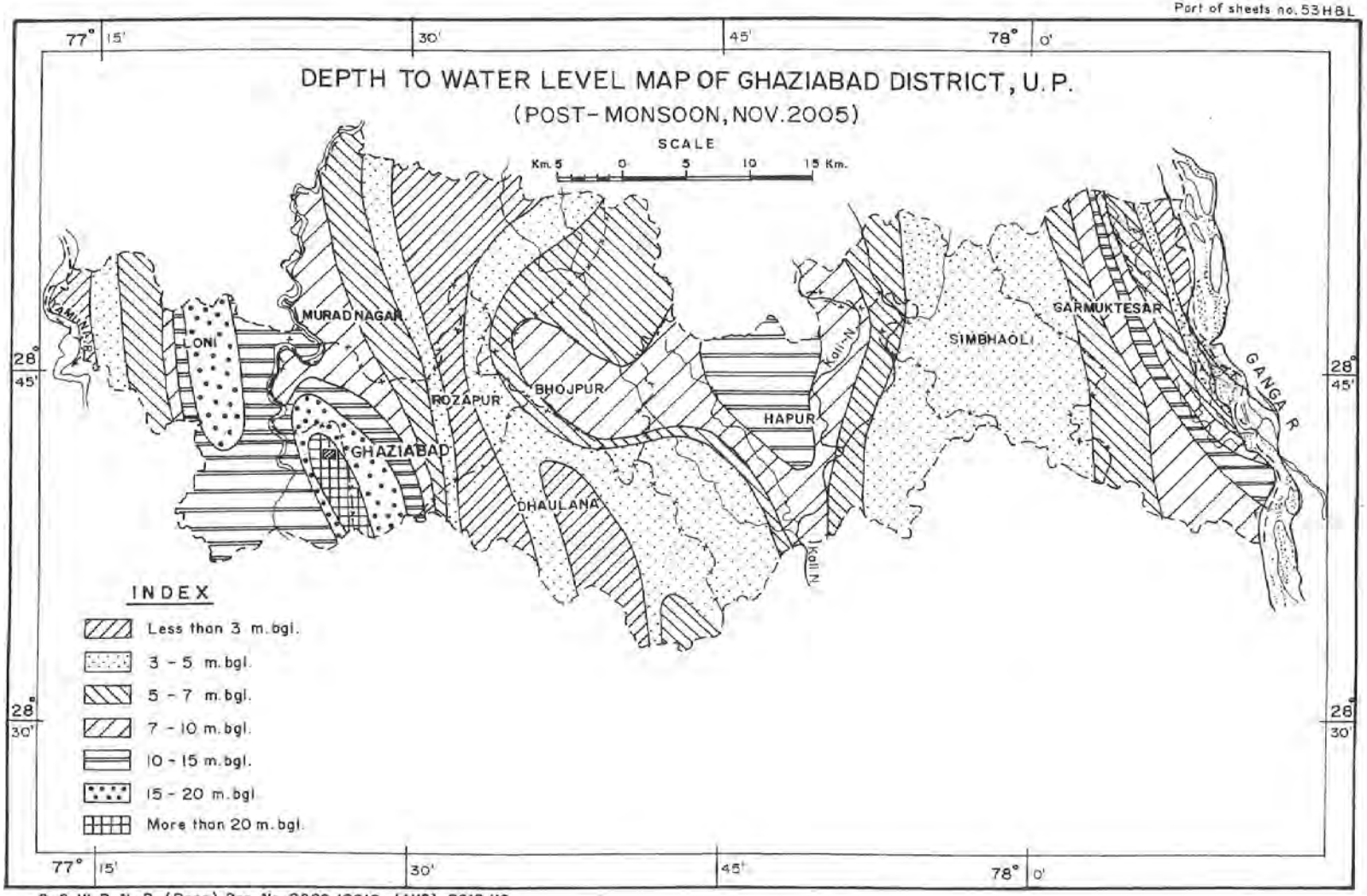


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PLATE - IV

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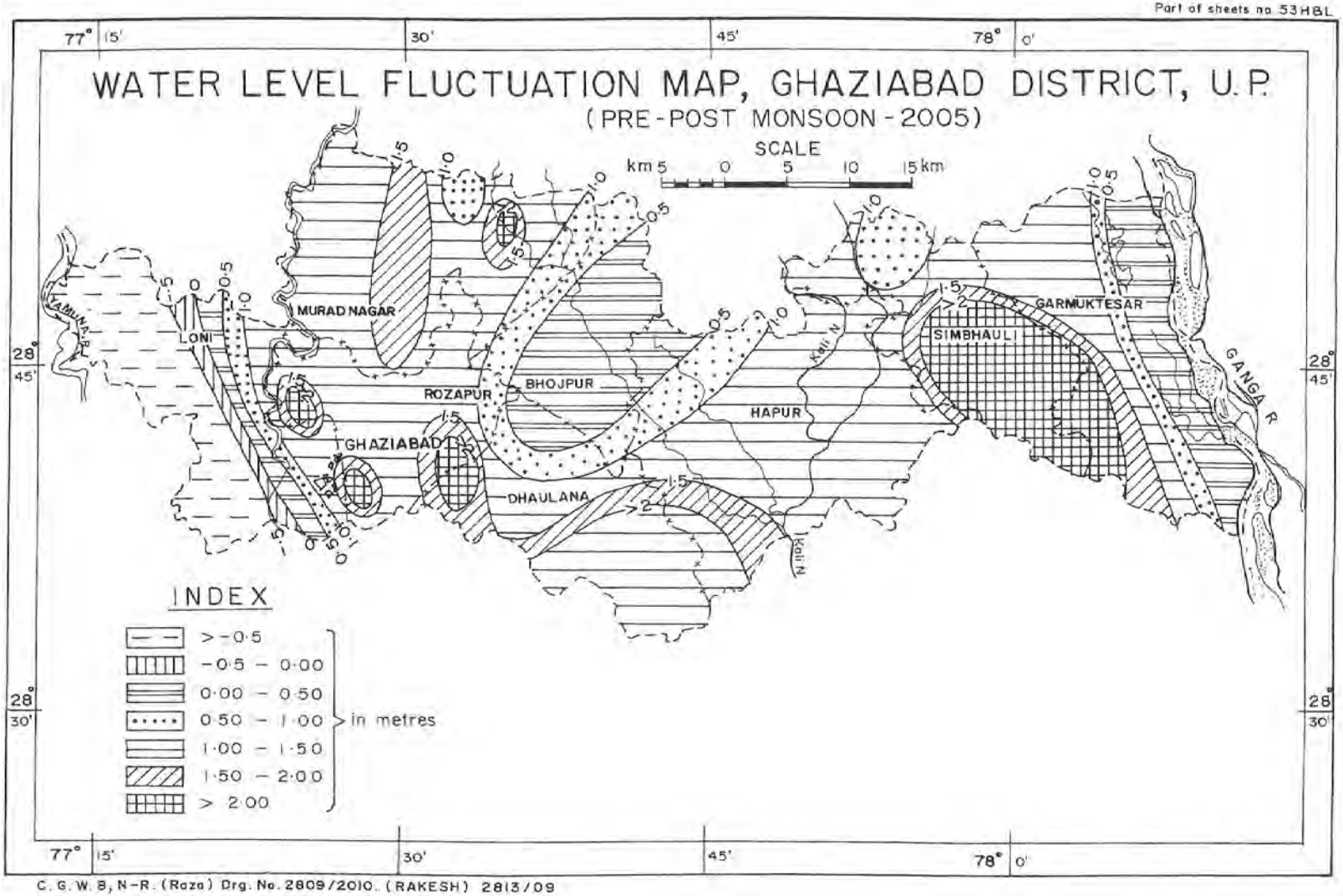
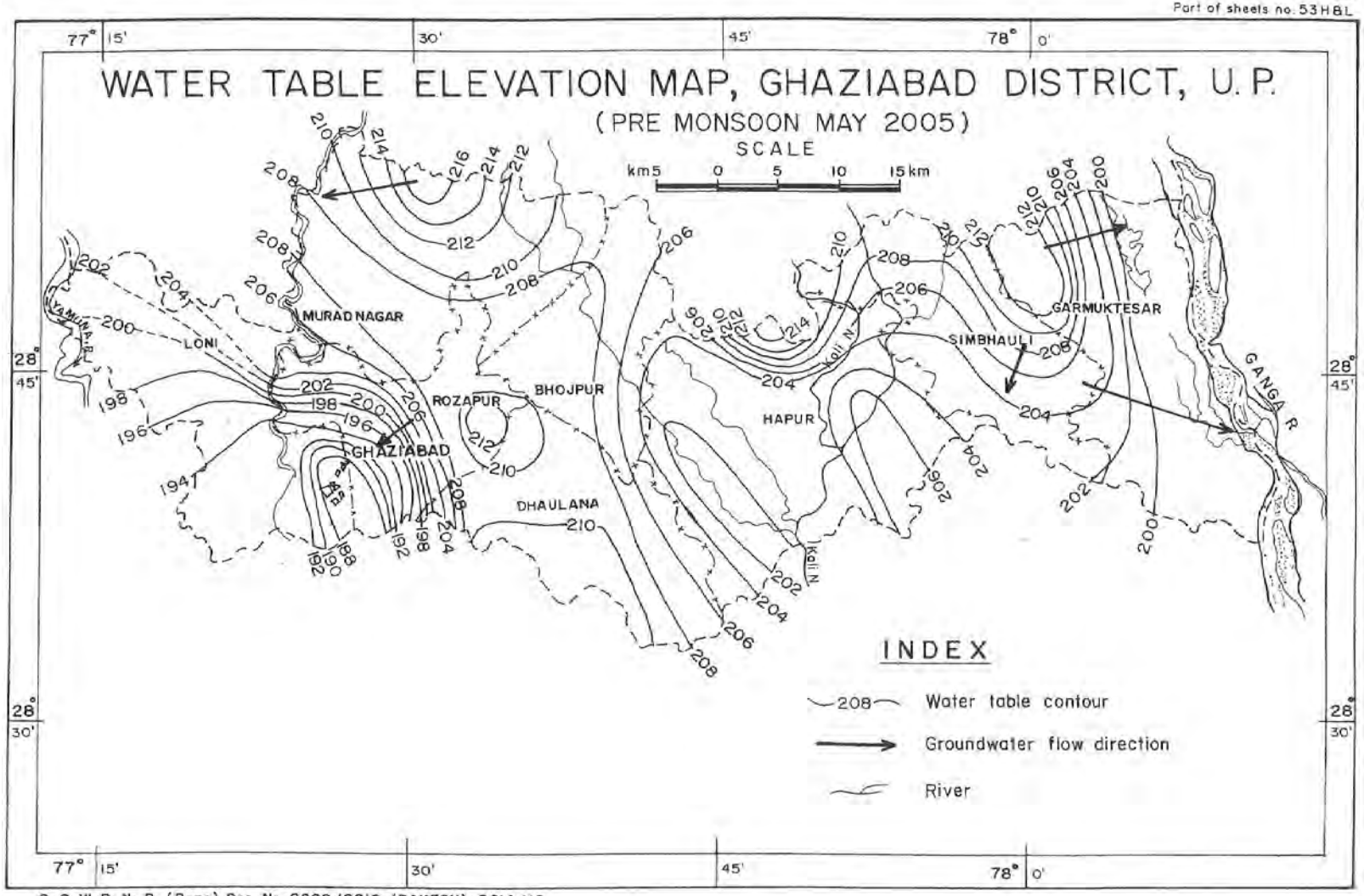


C. G. W. B, N-R. (Roza) Drg. No. 2809/2010. (RAKESH) 2813/09

PLATE - V

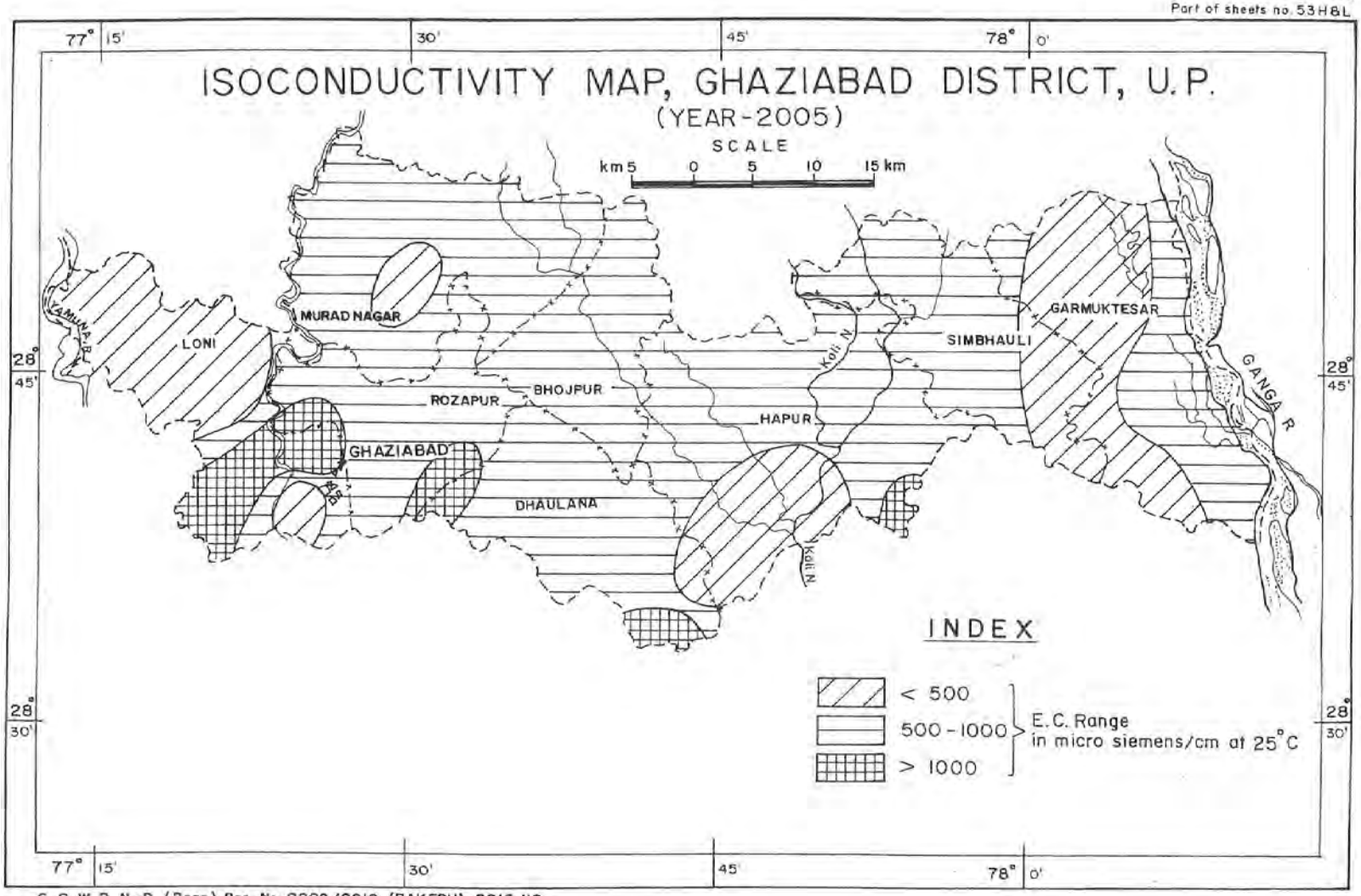
Part of sheets no. 53 H&L



C. G. W. B, N-R. (Raza) Drg. No. 2809/2010. (RAKESH), 2814/10

PLATE - VI

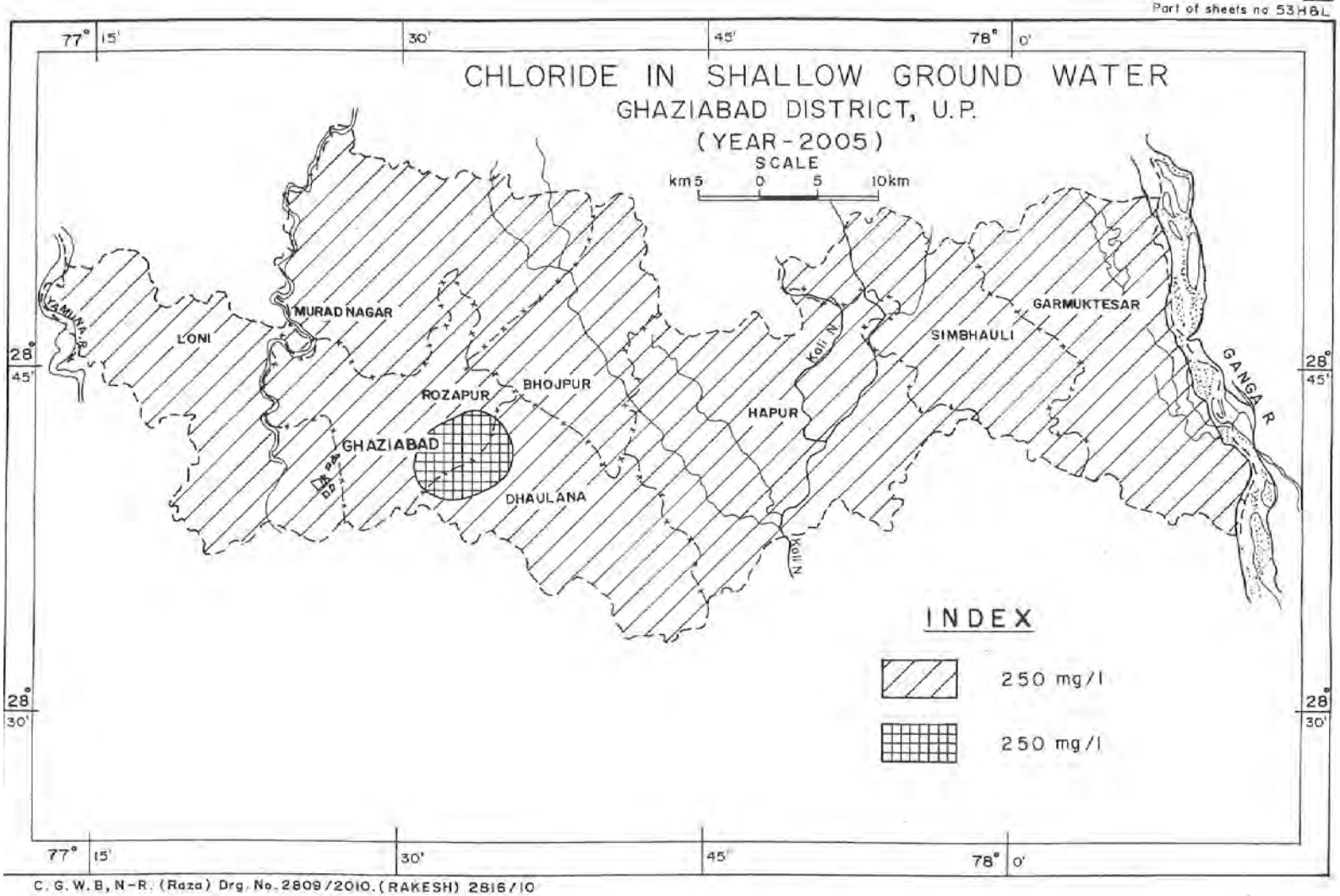
Part of sheets no. 53 H&L



C. G. W. B, N-R. (Raza) Drg. No. 2809/2010. (RAKESH), 2815/10

PLATE - VII

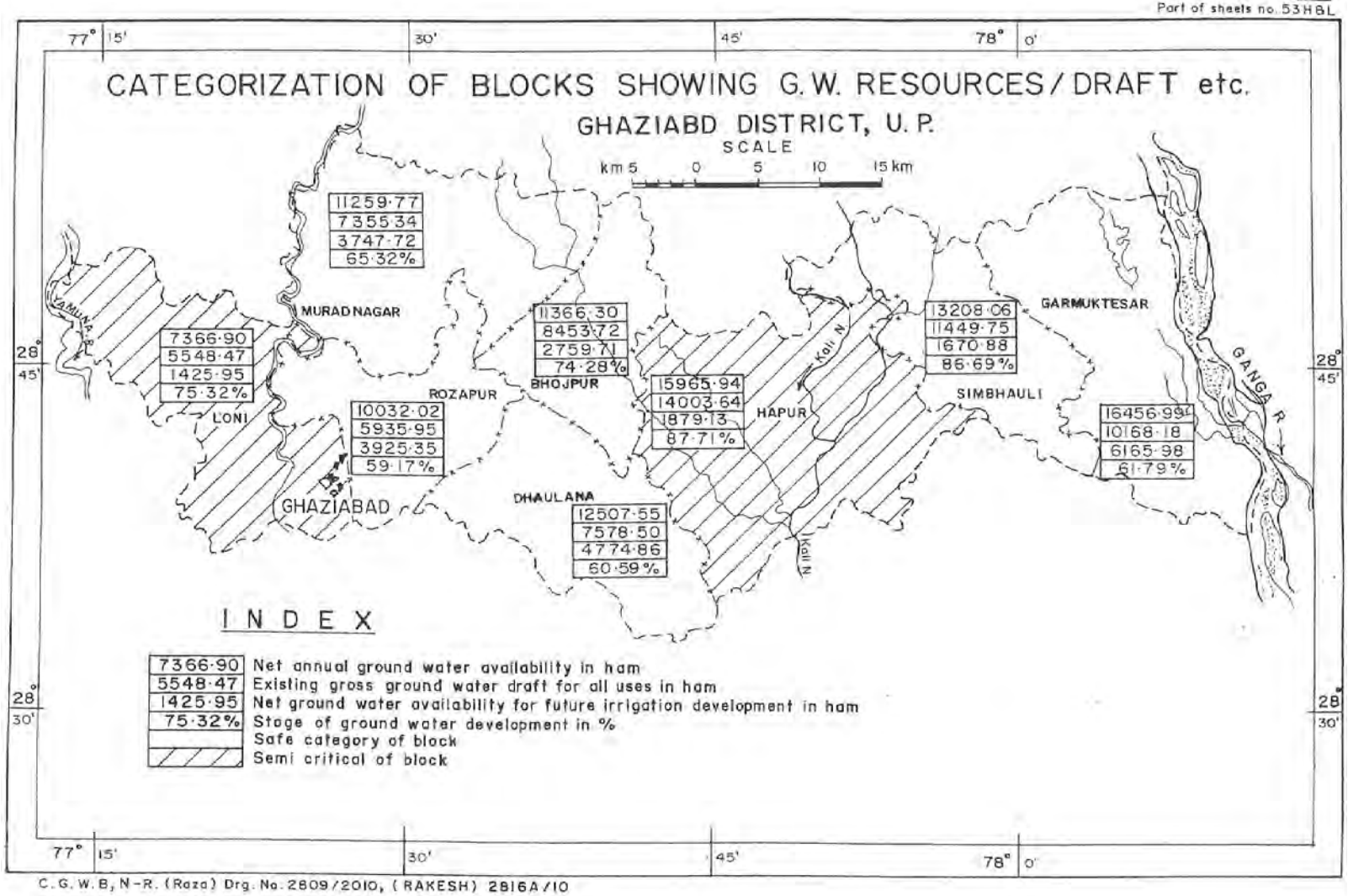
Part of sheets no 53H&L



C. G. W. B, N-R. (Raza) Drg. No. 2809/2010. (RAKESH) 2816/10

PLATE - VIII

Part of sheets no. 53H8L



C.G.W.B, N-R. (Raza) Drg. No. 2809/2010, (RAKESH) 2816A/10