

**DISTRICT BROCHURE OF
NORTH EAST DISTRICT, NCT DELHI**

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DISTRICT AT A GLANCE

S.No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION	
	i. Geographical Area (Sq. Km.)	60
	ii. Administrative Divisions (as on 31.03.2011)	
	a) Number of Tehsils	3
	b) Number of Villages	24
	c) Number of Towns	3
	iii. Population (as on 2011 Census)	
	a) Total Population	22,40,749
	b) Population Density (persons/sq. km)	37,346
	c) No. of Households	3,95,060
	iv. Average Annual Rainfall (mm)	886 (Chandrawal)
2.	GEOMORPHOLOGY	
	Major Physiographic Units	Yamuna Alluvial Plain, which is sub-divided into Active Flood Plain and Older Flood Plain
	Major Drainage	Yamuna River
3.	LAND USE (Sq. Km.)	
	a) Forest area	4.10
	b) Water bodies	0.13
4.	MAJOR SOIL TYPES	Silty-clay to clayey silt along with sandy loam
5.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2013)	
	a) Number of Dugwells	1
	b) Number of Piezometers	4

6.	NUMBER OF GROUND WATER EXTRACTION STRUCTURES a) Dugwells b) Handpumps c) Tubewells/borewells	217 45707 22360
7.	PREDOMINANT GEOLOGICAL FORMATIONS	Quaternary Alluvium consisting mainly of sand of various grades, silt, clay and kankar
8.	HYDROGEOLOGY & AQUIFER GROUP Major water bearing formation Pre-monsoon Depth to water level during May'2012 Post-monsoon Depth to water level during Nov'2012 Long term water level trend in 10 years (2003-2012) in m/yr	Alluvium Sand, silt, gravel/kankar 2.76 to 6.83 mbgl 3.80 to 7.19 mbgl Pre monsoon : Fall (Range 0.51 – 1.68) Post monsoon : Fall (Range 0.96 – 2.34)
9.	GROUND WATER QUALITY Presence of Chemical constituents more than permissible limit (e.g. EC, F, Fe) Type of water Fresh/Saline Interface	EC(380-1720 μ S/cm at 25°C) Iron :1.13 mg/l Mixed type 25-50 m
10.	DYNAMIC GROUND WATER RESOURCES (2011)- in MCM Annual Replenishable Ground Water Resources Gross Annual Ground Water Draft Stage of Ground Water Development Number of OE Tehsils Number of Semi Critical Tehsil	12.55 12.99 114.36% 2 1

11.	GROUND WATER CONTROL AND REGULATION	The entire district has been notified by the Government of Delhi
12.	GROUND WATER EXPLORATION BY CGWB (AS ON 31.3.2011) No. of wells drilled (EW, OW, PZ, SH, Total) Depth range (m) drilled/constructed Depth of Bedrock (m) Discharge (liters per minute) Transmissivity (m ² /day)	EW-6, PZ-8 30 - 242/ 24 – 66 50 to 232.4 210-2339 47-2758
13.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Ground water in deeper zones is saline. Depletion of ground water levels is attributed to over exploitation of ground water. Higher Iron content at Usmanpur.

DISTRICT BROCHURE OF NORTH EAST DISTRICT, NCT DELHI

1.0 INTRODUCTION

1.1 ADMINISTRATIVE DETAILS

North-East district is located east of Yamuna River and bordering to Gaziabad district & Meerut District of Uttar Pradesh on the east and north respectively. North East district is covering a geographical area of 60 sq. km. This district lying in between two rivers i.e. Yamuna in the west and Hindon in the east (6 Km eastward from the Delhi border). For administrative convenience, the district is divided into three tehsils namely Seelam Pur, Seema Puri and Shahdara.

The total population of the district is 22,40,749 as per the census, 2011 and average population density is 37,346 persons per Sq. Km, which is the highest population density in Delhi.

1.2 BASIN/SUB-BASIN:

The district falls in Yamuna sub-basin and forms part of the Ganga basin. The entire district is covered by Yamuna River water shed.

1.3 DRAINAGE:

The river Yamuna flowing North-South direction bordering western part of the district, controls the entire drainage system. The river has meandering courses with an abandoned channels in the form of stagnant water bodies along the course.

1.4 LAND USE:

North-East District has mixed land use with many using their residences for other purposes as well. The district has small forest area of 4.10 sq km.

1.5 STUDIES /ACTIVITES OF CGWB:

Central Ground Water Board had covered the entire district under Systematic Hydrogeological Surveys. Based on the Re-appraisal Hydrogeological survey carried out in 1983-84, CGWB, NWR brought out consolidated report on Hydrogeological conditions and Ground Water Development Potential of Union Territory of Delhi in 1989. In 1996 and 2009, reports highlighting development and augmentation of Ground Water Resources of the State were published by CGWB. The Dynamic Ground Resources of the district have been estimated in 2011 for understanding of ground water scenario. CGWB, SUO Delhi is also monitoring water level and quality assessment regularly from the existing National Hydrograph Network Stations. The district was covered under Ground Water Exploration by Central Ground Water Board (CGWB) in 1973. A total of 6 exploratory wells and 8 piezometers/ observation wells have been drilled in the district. Salient features of ground water exploration in the district are furnished in Table 1.

Table 1: Salient features of ground water exploration

Type of well	No.	Depth drilled (m)	Depth constructed (m)	SWL (m)	Discharge (lpm)	Drawdown (m)	Sp. Capacity (lpm/m)	T (m ² /day)	S	EC (μS/cm at 25°C)
EW	6	30 – 242	26 – 66	1.54 – 4.5	210 – 2339	2.28-14.2	14-431	47 – 2758	2.14*10 ⁻⁴	777 – 11700
PZ/OW	8	57-129.35	24-66	2.97 – 5.87	160-197	1.82	-	-		690

2.0 RAINFALL & CLIMATE

2.1 RAINFALL:

The average annual normal rainfall of the district is 886 mm (Chandrawal). About 81% of the annual rainfall is received during the monsoon months July, August and September. The rest of the annual rainfall is received as winter rain and as thunderstorm rain in the pre and post monsoon months. The variation of rainfall from year to year is large. On an average rain of 2.5 mm or more falls on 27 days in a year, of which, 19 days are during the monsoon months. Two to three days in June are rainy. In other months, except in November and in first part of December when it is practically rainless, rain falls on a day or two only in each month.

2.2 CLIMATE:

The climate of district is mainly influenced by its inland position and prevalence of air of the continental type during major part of the year. Extreme dryness with intensely hot summer and cold winter are characteristics of the climate. The cold season starts towards the latter half of November when both day and night temperatures drop rapidly with the advance of the season. January is the coldest month with the mean daily maximum temperature at 21.3°C and the mean daily minimum temperature at 7.3°C. May and June are the hottest months. In May and June maximum temperature may sometimes reach 46 or 47°C.

3.0 GEOMORPHOLOGY & SOIL TYPES

3.1 GEOMORPHOLOGY:

North East district is under Yamuna Alluvial Plain, which is sub divided into Active Flood Plain and Older Flood Plain. The district is prone to the floods during the monsoon season.

The wider Older Yamuna flood plain indicates lateral migration of river Yamuna over large areas. This belt has good potential for ground water development. The Yamuna Active Flood Plain represents the wide belt bounded on both the sides by Eastern and Western Bunds and is naturally prone to annual/periodic floods being in the flood way and flood fringe zone of river Yamuna. The river Yamuna is the only perennial river flowing in southerly direction. Either side of the river Yamuna is marked by the extensive alluvial flood plain.

3.2 SOIL TYPES:

The district has silty-clay to clayey silt alongwith sandy loam type of soil. The soils are calcareous in nature.

4.0 GROUND WATER SCENARIO

4.1 GEOLOGY:

The geological formations underlying the district belong to Quaternary Age. Quaternary sediments are divided into Older Alluvium and Newer Alluvium. The older Alluvium is of Middle to Late Pleistocene Age and Newer Alluvium is of Recent Age. The older alluvium comprises silt, clay mixed with kankar in varying proportions. The Newer Alluvium mainly consist of un-oxidised sands, silt and clay occurring on the Yamuna Flood Plain.

4.2 HYDROGEOLOGY:

Water Bearing Formation:

Hydrogeological map of North East district is presented in Plate 1. Subsurface geological sections along Usmanpur – Jyoti Nagar and Usmanpur – RAF Wazairabad are shown in Plate 2. The sub-surface material along Yamuna flood plain and along eastern border (proximity of Hindon river) shows a thick fine sand and sandy silt strata at shallower depth i.e. up to 60 m bgl. The finer sediments like clayey –silt, silty-clay and buff coloured clay along with Kankars also exist, as parting between granular zone. The deeper zones beyond 60 m depth are characterized by fine material and lacking in granular zone. Basement rock condition along the Yamuna Flood Plain in this district is shallower because Delhi central ridge which is running NNE to SSW diminishes at Wazirabad Barrage and protrudes further in the same direction resulting to shallower depth of basement condition in sub-surface –horizon. In this district the depth is ranging from 54 mbgl (Mandoli) to 67 m bgl (Usmanpur). Further east the depth of basement rock increases.

Depth to water level:

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. The pre monsoon water level in the district varies from 2.76 to 6.83 mgl and post monsoon water level water level varies from 3.80 to 7.19 mbgl (Plates 3 and 4).

Seasonal Water level fluctuation:

The seasonal water level fluctuation has been computed from the water level data obtained from the ground water monitoring wells monitored in the area during pre-monsoon and post-monsoon period. Fluctuation in water level is outcome of mainly the amount of rainfall received by the area and ground water draft taken from the ground water reservoir. The seasonal fluctuation in water level between pre and post monsoon periods shows fall in water level from 0.20 to 1.04 m.

Long Term Water level trend:

The long-term trend in depth to water level in the district over the last 10 years period shows

i) a fall of 0.51 to 1.68 m during the pre-monsoon period and

ii) a fall of 0.96 to 2.34 m in during the post-monsoon period.

4.2 GROUND WATER RESOURCES:

Tehsil wise ground water resources as estimated using GEC, 1997 methodology by CGWB as on 31.03.2011 are given in Table 2. Total annually replenishable ground water resources of the district have been assessed as 1254.91 ham, out of which net annual ground water availability has been assessed as 1135.749 ham. Total annual ground water draft for all uses has been estimated to be 1298.81 ham with overall stage of ground water development at 114.36%. Out of 3 tehsils, 1 tehsil is falling under semi critical category whereas 2 fall under over exploited category.

Table 2: Tehsil wise ground water resources of North East district (As on 2011)

S.No.	Tehsil	Annual ground water recharge (ham)	Net annual ground water availability (ham)	Existing annual gross ground water draft for irrigation (ham)	Existing annual gross ground water draft for domestic and industrial uses (ham)	Existing annual gross ground water draft for all uses (ham)	Stage of ground water development (%)	Category
1.	Seelam Pur	969.91	872.919	328.90	414.56	743.46	85.17	Semi-critical
2.	Seema Puri	126.59	120.2605	0	268.60	268.60	223.35	Over-exploited
3.	Shahdra	158.41	142.569	0	286.75	286.75	201.13	Over-exploited
	Total	1254.91	1135.749	328.90	969.91	1298.81	114.36	Over-exploited

4.3 GROUND WATER QUALITY:

Ground water is saline below 25 m depth. Iron is reported 1.13 mg/l at Ushmanpur. The general ranges of various important chemical constituents in ground water samples collected from the district are given in Table 3.

Table 3: General ranges of various chemical constituents in ground water

Chemical Constituents	Range
pH	8.54-9.09
EC (μ S/cm at 25°C)	380-1720
Bicarbonate (mg/l)	92.6-112.24
Chloride (mg/l)	13.66-251.98

Nitrate (mg/l)	7.6-115
Sulphate (mg/l)	27.1-247.5
Fluoride (mg/l)	0.22-0.32
Calcium (mg/l)	44.28-118
Magnesium (mg/l)	14.35-82.78
Total Hardness as CaCO ₃ (mg/l)	170.54-601.74
Sodium (mg/l)	4.14-234.4
Potassium (mg/l)	4.75-129.95
Iron (mg/l)	1.13

Electrical Conductivity in the district has been found to vary from 690 to 11700 $\mu\text{S}/\text{cm}$ at 25°C. Fluoride values are found to be within permissible limit of drinking water standards. High Nitrate has been reported from some parts of the district.

4.4 STATUS OF GROUND WATER DEVELOPMENT (TEHSILWISE)

The present level of ground water development is maximum (223.35%) in Seema Puri whereas minimum (85.17%) development in Seelam Pur has been recorded. The district as a whole is categorized as over exploited with ground water development at 114.36%.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 GROUND WATER DEVELOPMENT:

As stated above that the district as a whole is categorized as over exploited with stage of ground water development at 114.36%. This indicates the reality that the ground water resources of the district are stressed. In view of the increasing extraction of ground water and consequent adverse environmental impacts, sustainable development of this precious natural resource is extremely important.

5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE:

As the district receives 886 mm of annual rainfall there is ample scope of rain water harvesting. However, water level is shallow, rain water can be conserved through construction of storage tanks. Also, suitable structures are shaft/trench with recharge well and recharge pit with/without bore in the district.

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 3 m bgl during pre and post monsoon periods. Such areas generally fall in the vicinity of river Yamuna, indicating excessive seepage from the river.

6.2 DEPLETING GROUND WATER LEVEL & QUALITY:

The wells located in this district show decline trends during pre and post monsoon period which is attributed to over exploitation of ground water. Seasonal and long term water level records indicate a very gradual declining of water levels.

The depth of Fresh –Saline water interface in the district is ranging from 25 to 50 m.

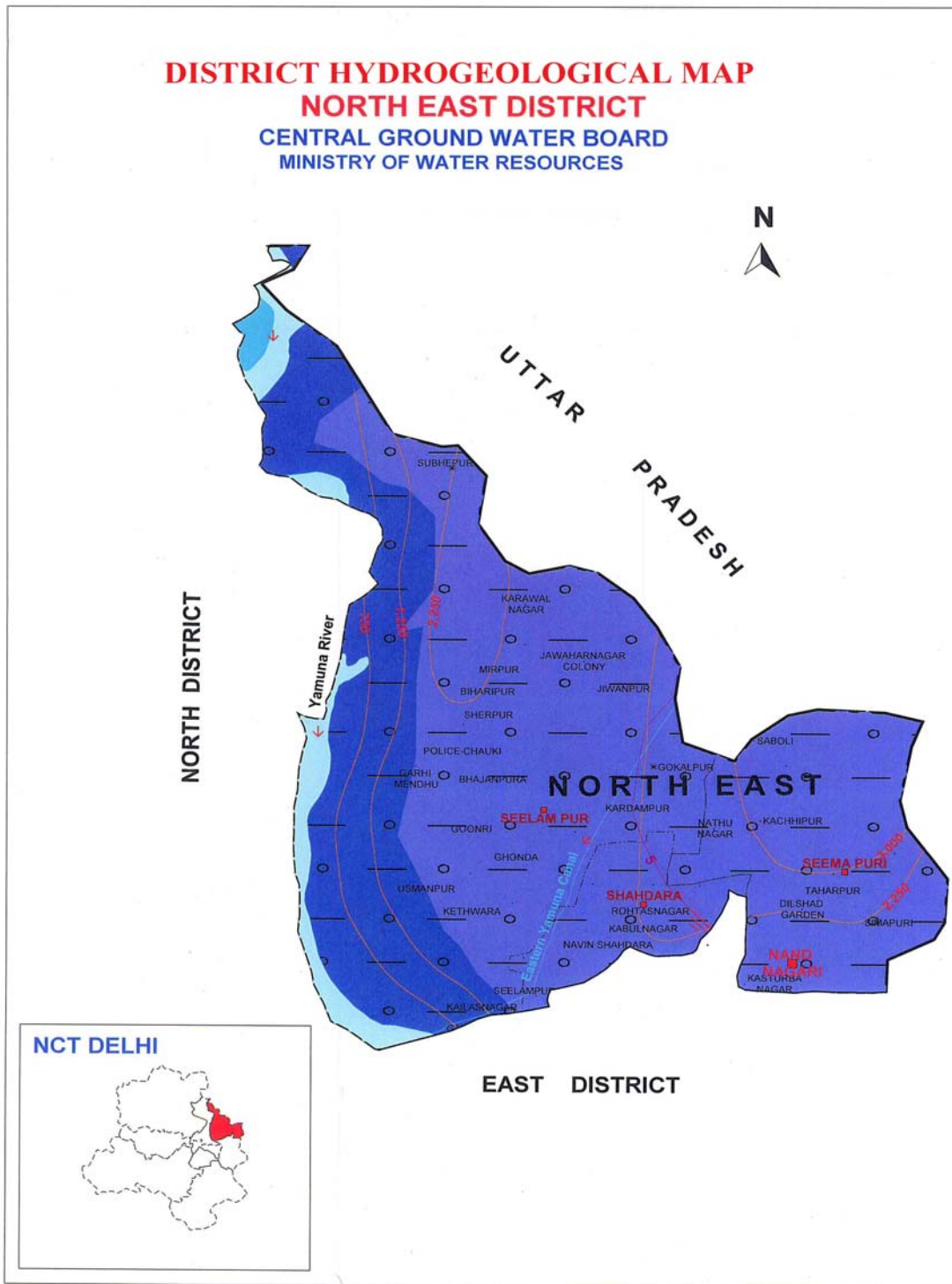
7.0 AREA NOTIFIED

The entire district is notified by Hon'ble Lt. Governor of Delhi for regulation of ground water development.

8.0 RECOMMENDATIONS

















1. The assessment of ground water in the district indicates that future development of ground water should be regulated.
2. An attempt should be made to arrest the declining ground water levels by preventing indiscriminant withdrawal of ground water and adopting roof top rain water harvesting and artificial recharge.
3. Monitoring of water levels and chemical quality is required.
4. The areas receiving drinking water supply from ground water sources should be monitored rigorously for quality consideration. The contaminants if in the manageable range should be removed by various techniques.

Plate 1: District Hydrogeological Map



NORTH EAST DISTRICT

LEGEND

	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures **
 Soft Rock Aquifer	Tube Wells	Reverse / Direct Rotary	25-60 *	600-1200	Not Feasible
 Soft Rock Aquifer	Tube Wells	Reverse / Direct Rotary	25-45*	300-600	Shaft/Trench with recharge well, Recharge Pit with/without bore
Depth to Water level in m (Pre-monsoon decadal mean, 2003-2012) 		Electrical Conductivity (Micro mhos/cm at 25° C) 		Major river / Drain 	Faults/Lineaments 
Fluoride > Permissible limit (1.5 ppm)  State boundary  Tehsil head quarter  District Head quarter 	Nitrate > Permissible limit (100 ppm)  District boundary  Over exploited block 	Iron > Permissible limit (1.0 ppm) / * Fe  Tehsil boundary  Area feasible for Artificial recharge structures 			

Average depth to water level in the major part of the district is about 5 meters below ground level.
* Depth of the well is restricted to the availability of fresh water. ** Feasible in areas where depth to water level is more than 8 m below ground level.

OTHER INFORMATION

Name of State	Delhi
Name of District	North East
Geographical Area	60 S q .Km.
Major Geological Formation	Soft Rock Younger and Older Alluvium
Major Drainage System	Yamuna
Population (as on 2011)	22.41 lakhs
No of Tehsils	3 , Seelampur, Shahdara and Seemapuri
Replenishable Ground Water Resources (MCM)/ Draft (MCM)/ Stage of Ground Water Development (%)	Seelampur-9.70/7.41/85
	Seemapuri-1.27/2.67/222
	Shahdara-1.58/2.85/200
Average Annual Rainfall	Chandrawal - 886 mm
Range of Mean Daily Temperature	18-31°C
Tehsil Showing Intensive Ground Water Development	Seemapuri and Shahdara

Plate 2: Sub-surface geological cross section along Usmanpur- Jyoti Nagar and Usmanpur-RAF, Wazirabad

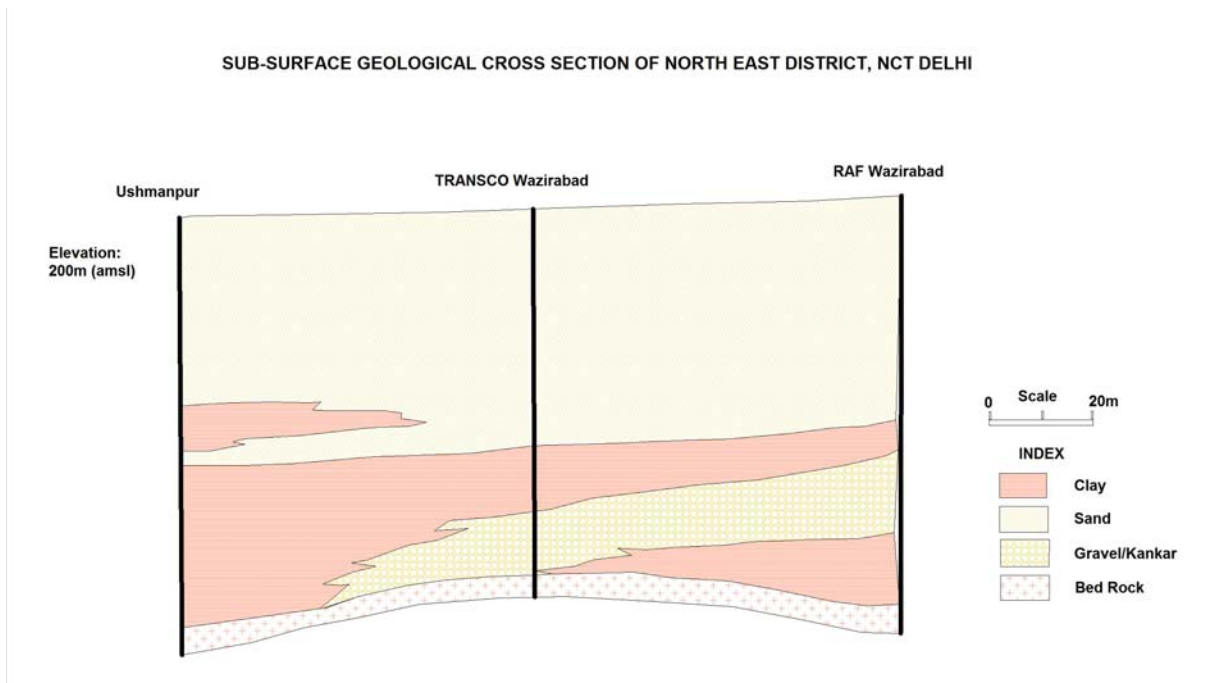
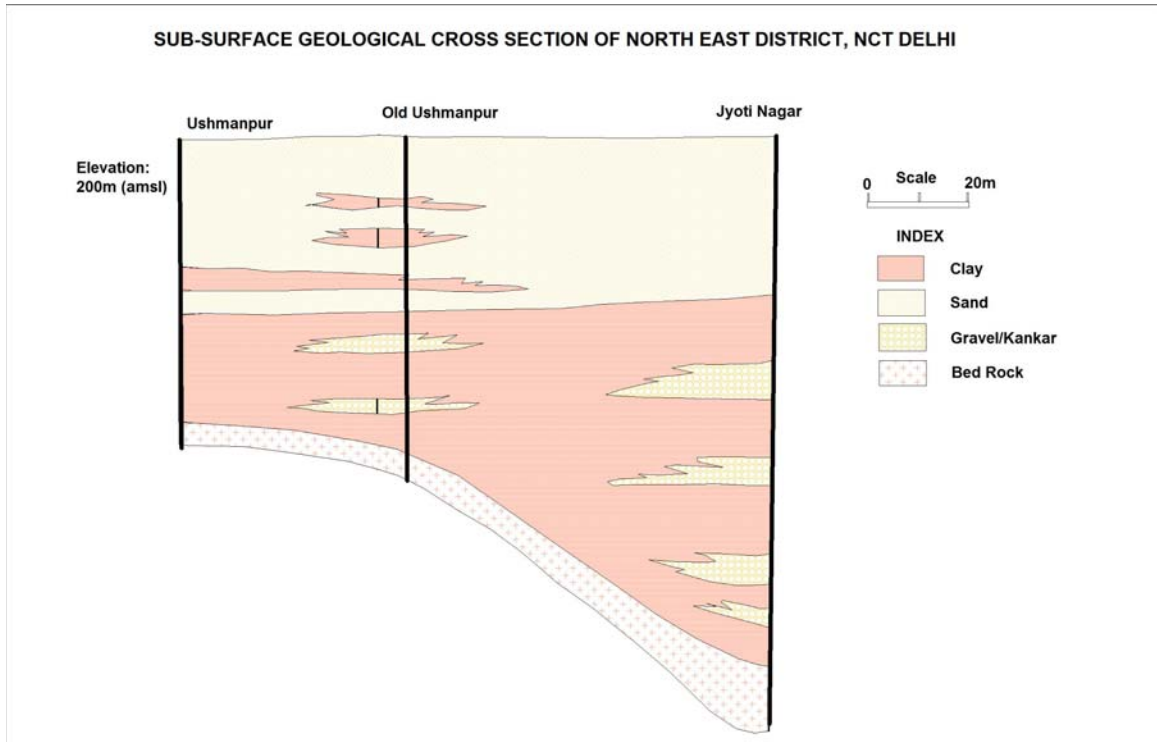


Plate 3: Depth to Water Level Map during Pre-monsoon (May, 2012)

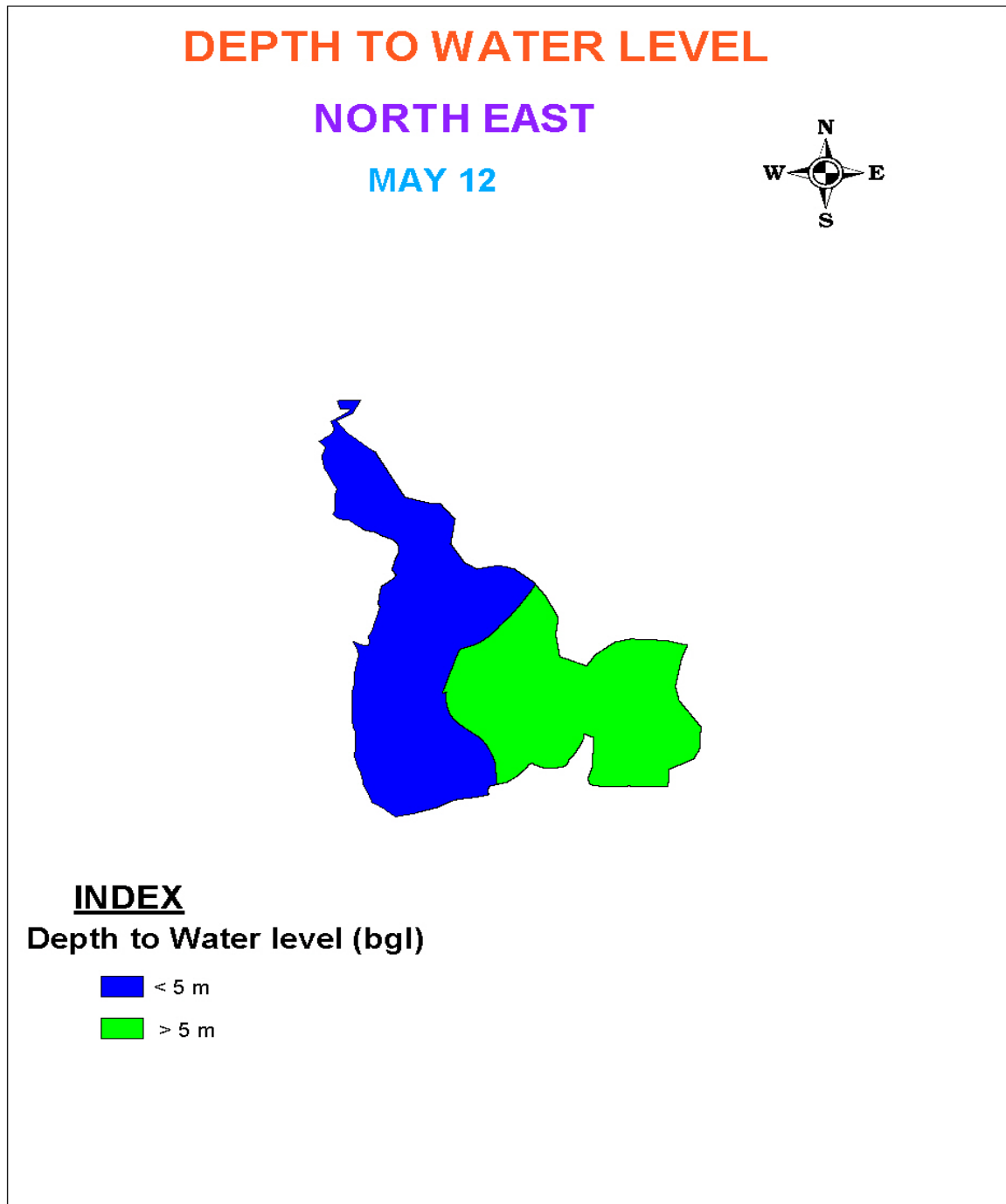


Plate 4: Depth to Water Level Map during Post-monsoon (Nov, 2012)

