PALWAL DISTRICT HARYANA

CENTRAL GROUND WATER BOARD
Ministry of Water Resources
Government of India
North Western Region
CHANDIGARH
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Contributors

Sanjay Pandey
Asstt.Hydrogeologist

Prepared under supervision of

A. K. Bhatia

Regional Director

Our Vision

"Water Security through Ground water Management"

GROUND WATER INFORMATION BOOKLET
DISTRICT PALWAL, HARYANA.

By
Sanjay Pandey
Asstt. Hydrogeologist

C O N T E N T S

PALWAL AT A GLANCE

S.NO.	ITEMS	STATISTICS
1	**GENERAL INFORMATION**	
	I Geographical Area (Sq Km)	1368
	Ii Administrative Divisions	
	Number of Tehsils	3 (Palwal, Hodal and Hathin)
	Number of Blocks	5 (Palwal, Hodal and Hathin, Hassanpur, Prithla)
	Number of Villages	280
	Iii Population (as per 2011 census)	10,40,493
	Iv Average Annual Rainfall (mm)	542
2	**GEOMORPHOLOGY**	
	Major Physiographic Units	Plain
	Major River/ Canal	Yamuna/ Gurgaon canal
3	**LAND USE (sq km)**	
	a Forest area	-
	b Net Sown area	1070
	c Cultivable area	1160
4	**MAJOR SOIL TYPES**	Arid Brown (Solonised) and Sierozem
5	**IRRIGATION BY DIFFERENT SOURCES** (areas sq. km.)	
	Dugwells	-
	Tubewell / borewell	770
	Tanks / Ponds	-
	Canals	270
	Other sources	-
	Net Irrigated Area	1050
6	**NUMBER OF GROUNDWATER MONITORING WELLS OF CGWB**	
	DUGWELLS	12
	PIEZOMETERS	5
7	**PREDOMINANT GEOLOGICAL FORMATIONS**	ALLUVIUM
8	**HYDROGEOLOGY**	
	Major waterbearing formations	Sand and Gravel
	Pre-monsoon depth to water level	1.72 – 10.75
	Post-monsoon depth to water level	1.46 – 9.07
	Long term waterlevel trend in 10 years in m /yr	0.06m-0.60m
9	**GROUNDWATER EXPLORATION BY CGWB (as on 31.3.2012)**	
	Number of wells drilled EW OW PZ	 21 - 5
	Depth range (m)	350

	Discharge (liters per minute)	750 lpm to 900 lpm
	Storativity	0.00457
	Transmissivity (m^2/day)	55 to 200 m^2 /day
	Type of Water	Alkaline
11	**DYNAMIC GROUND WATER RESOURCES (2009) IN Ham**	
	Annual Replenishable Groundwater Resources	44769
	Net Ground water Draft	46891
	Projected Demand for domestic and industrial uses upto 2025	953
	Stage of Groundwater Development	102%
12	**AWARENESS AND TRAINING ACTIVITY**	
13	**EFFORTS OF ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING**	nil
14	**GROUNDWATER REGULATION**	
	NUMBER OF OE BLOCKS	nil
	NUMBER OF CRITICAL BLOCKS	nil
	NUMBER OF NOTIFIED BLOCKS	nil
15	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Groundwater Salinity Watetrlogging High Fluoride

GROUND WATER INFORMATION BOOKLET

DISTRICT PALWAL, HARYANA

1.0 INTRODUCTION

Palwal district of Haryana lies between 27^{o} 50' : 28^{o} 15'40" north latitudes and 77^{o} 05' : 77^{o}33' east longitudes. Total geographical area of the district is 1364.55 sq.km. Administratively, Palwal is the district Headquarter of the district. It is divided into 4 development blocks namely Palwal, Hathin, Hodal and Hassanpur . The district area is bounded on western side Mewet district, Eastern side by U.P. state and northern side by Faridabad district and falls in survey of India toposheets no. 53H/3, H/4, H/7, H/8, H/9, H/12, and 54E/5 and E/9.There vare two main canals Agra canal and Gurgaon canal which passes through western and central part of the district respectively from north to south.In the northeren part of the district Budia nala is flowing from east to west and discharges its rainy water in river Yamuna. The Gaunchi main drain passes through north south direction of the district running in between Agra canal and Gurgaon canal. CGWB has carried out ground water exploration besides other hydro geological and geophysical studies in the district.

2.0 RAINFALL AND CLIMATE:

The climate of Palwal district can be classified as tropical steppe, semiarid and hot which is mainly characterized by the extreme dryness of the Air except during monsoon months. During three months of south west monsoon from last week of June to September, the moist air of oceanic penetrate into the district and causes high humidity, cloudiness and monsoon rainfall. The period from October to December constitutes post monsoon season. The cold weather season prevails from January to the beginning of March and followed by the hot weather or summer season which prevails up to the last week of June.

The normal annual rainfall in Palwal district is about 542 mm spread over 27 days. The south west monsoon sets in the last week of June and withdraws towards the end of Septembe and contributes about 85% of the annual rainfall. July and August are the wettest months 15% of the annual rainfall occurs during the nonmonsoon months in the wake of thunder storms and western disturbances.

Normal Annual Rainfall 542 mm

Normal Monsoon Rainfall : 460 mm

Temperature 41^{0} C (May & June)

m

3.0 GEOMORPHOLOGY AND SOILS:

Soils of Palwal district are classified as tropical and brown soils, existing in major parts of the district. In Hathin block the organic content of soils ranging from 0.41 to 0.75 percent which is of medium category. In rest of the area organic contents is 0.2 to 0.4 percent and falls in Low category.

The average conductivity of the soil is not more than 0.80 µmhos /cm and the average pH of the soil is between 6.5 and 8.7. The area comprises almost flat plains traversed by one ridge running N-S to NNE-SSW direction, divides the alluvium into two parts. The major river is Yamuna which is a perennial river.

4.0 GROUNDWATER SCENARIO

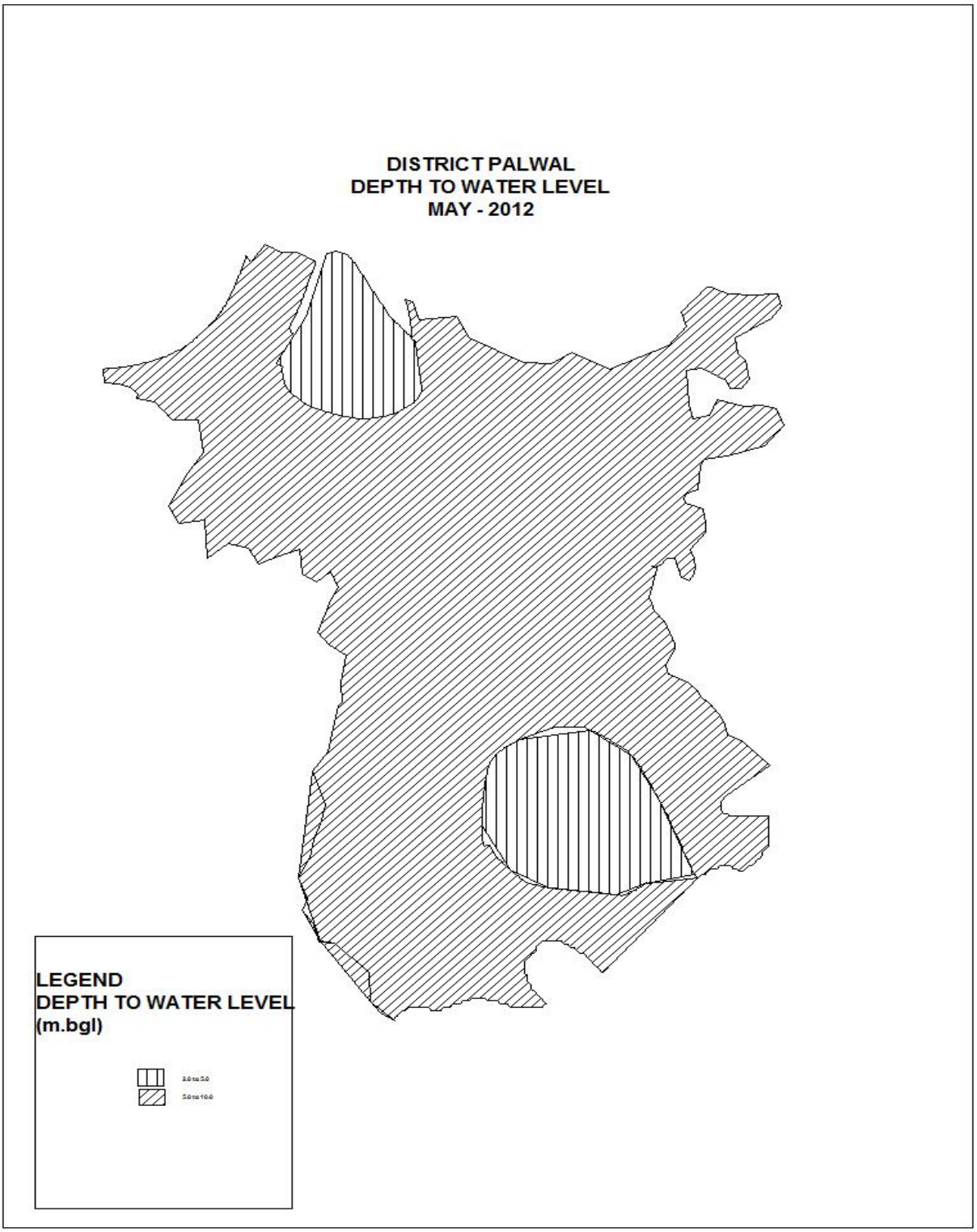
4.1 HYDROGEOLOGY

The district is occupied by Indo-Gangetic alluvial plain of Quaternary age, and falls in Yamuna sub -basin of Ganga basin. The Central Ground Water Board has drilled 21 exploratory boreholes to delineate and determine potential aquifer zones, evaluation of aquifer characteristics.Out of 21 exploratory boreholes 13 boreholes were abandoned due to poor quality of ground water. The permeable granular zones comprising fine to medium grained sand and occasionally coarse sand and gravel. Their lateral and as well as vertical extent is limited. The borehole data reveals that clay group of formations dominate over the sand group in the district area. Ground water occurs in alluvium and the underlying weathered/fractured quartzites. Alluvium comprises sands silt, Kankar and gravel. Which form the principal ground water bearing horizon. In Quartzite formation, occupying the north- western part of the district, ground water occurs in weathered and jointed fractured horizons. Weathering and fracturing has resulted in formation of semi-consolidated sand bads (BADARPUR SANDS) which form potential aquifer zones. This quartzite formation has not been explored for ground water occurrence. In alluvium, granular zones are evenly distributed in entire thickness which is negligible near the quartzite outcrops to over 350 m in the eastern parts near Yamuna River. The discharge of the wells ranges from 750 lpm to 900 lpm at a drawdown of5.5 to 7.00m. The transmissivity 'T' value ranges between 55 to 200 m^2 /day was determined. Shallow tube wells for irrigation use are generally constructed upto a depth of 40 m. The discharge of these shallow tubewells range 360 -600 litres per minutes.

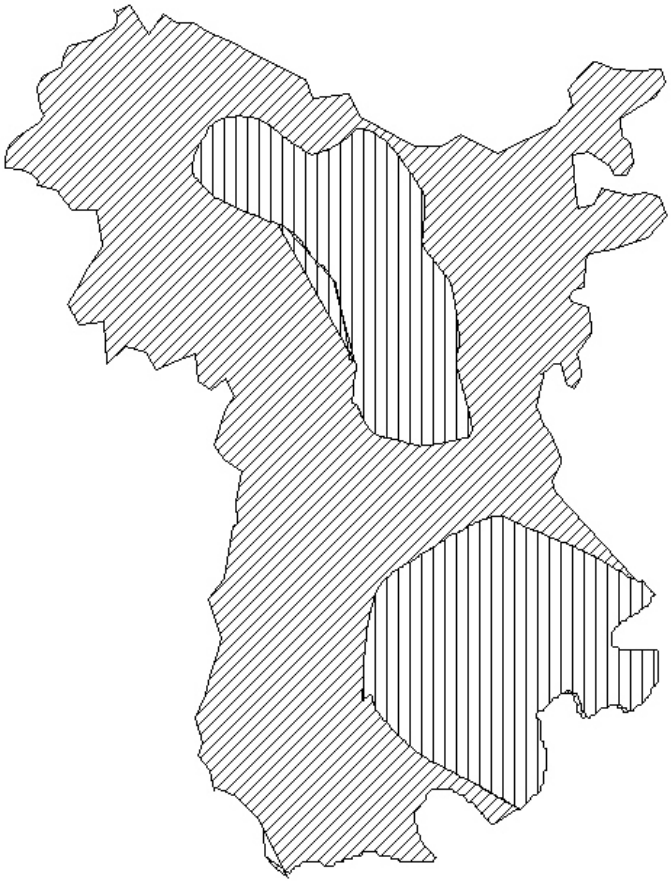
Water level behaviour :

The depth to water level ranges from 2.00 m bgl to 10.75 m bgl during pre monsoon period (Plate1), and m. bgl village. 2 to 9.40 m. bgl. during post monsoon period (Plate 2). The water level trend during pre monsoon period indicates average fall of 0.20m/year. The long term water level trend is show small decline and other places rise in district.

Plate 1



DISTRICT PALWAL
DEPTH TO WATER
NOV.-2012



LEGEND
DEPTH TO WATER LEVEL
(m.bgl)

2.0000..5.0000

5.0000..10.0000

Ground water flow :

The elevation of the water table in the district varies from 213 m to 219 m above mean sea level. The average gradient of the water table is of the order of 1 m/km. The overall flow of ground water is from north to south direction.

4.2 GROUND WATER RESOURCES

The block wise ground water resource potential in the district has been assessed as per GEC-97 as on March 2009. The stage of ground water development ranges between 89% (Hathin) to 113% (Palwal). The total replenish able ground water resource in the district is 44769 Ham of which the total existing ground water draft by all means is 46891 Ham. The net utilizable ground water resources for future irrigation development are -2074 Ham.

GROUND WATERRESOURCE AND DEVELOPMENT POTENTIAL OF PALWAL DISTRICT, HARYANAAS ON 31ST MARCH, 2011 in ha m

Block	Net annual ground water availability (ham)	Existing gross ground water draft for irrigation (ham)	Existing gross ground water draft for all uses (ham)	Provision for domestic & industrial requirement supply to 2025 (ham)	Net annual ground water availability for future irrigation development (ham)	Stage of ground water development (%)	catagory
Palwal	19552	21702	22048	346	-2496	113	Over Exploitad
Hathin	8364	7263	7457	329	772	89	Safe
Hodal	**9569**	**9610**	**9888**	**278**	**-318**	**103**	Safe
Hassanpur	**7284**	**7317**	**7498**	**0**	**-32**	**103**	Safe
Total	**44769**	**45894**	**46891**	**953**	**-2074**	**102**	

4.3 GROUND WATER QUALITY

The shallow ground water of the district is alkaline in nature (pH 7.75 to 8.62) and is moderately to highly saline (EC 693 to 3600 mS/cm). Among anions, bicarbonate predominates at some places, whereas at other places either none of the anion dominates or chloride is dominant. Among cat ions, by and large, sodium is the dominant cat ion. At some places mixed cationic character has been observed. Comparing the concentration values of major ions with the recommended desirable and permissible concentration limits for drinking waters (Bureau of Indian Standards) It is found that more than half (75%) of the ground waters are not suitable for drinking purposes mainly due to fluoride content that exceeds the maximum permissible limit of 1.5mg/1.

Salinity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the parameters for ascertaining the suitability of ground water for irrigational uses. These parameters range from 693 to 3590 micromhos/cm at 25^0 C, 2.19 to 15.79 and -14.52 to 13.97 milli equivalents respectively. Plot of USSL diagram used for the classification of irrigation waters indicated that ground water samples fall under class C2S1, C3S1, C3C2, C4S2, C4S2, C4S3 and C4S4. These waters are not suitable for customary irrigation as they may cause salinity and sodium hazards. It would be better if such waters are used for semi-salt tolerant to salt tolerant to salt tolerant

crops along with appropriate amount of gypsum on well drained soils.

5.0 STATUS OF GROUND WATER DEVELOPMENT

The hydrogeological data generated through exploratory drilling has proved a vital information regarding identification of aquifer system, demarcation of their vertical and lateral extent, and delineation of potential aquifer characteristics. These studies also provide information on well design and drilling techniques. A well assembly of 203 mm dia, using about 20 m to 30 m long housing pipe and MS slot pipe with slots of 1.19 mm to 1.59 mm size would be ideal in the district area. “V” wires galvanized Screen having 0.50-1.5 mm slot can also be used as it can provide more open area conventional slotted pipes. Entrance velocity of water in the well has to be kept in mind while designing the well assembly.

Reverse /Direct circulation rig is suitable for carrying out the drilling in alluvial parts of district whereas percussion or Down the Hole Hammer (DTH) technique with Odex attachement are suitable for drilling in bouldery formation.

6.0. GROUND WATER RELATED ISSUES & PROBLEMS

There are certain areas in the district, which have recorded water level decline in recent past. Since ground water is the only source of irrigation in major part of the district, ground water aquifers are under great stress due to increased demand in irrigation and industrial sector.

Necessary remedial measures need to be taken up to arrest further declining of water levels in the areas and suitable methodology to be adopted to recharge the aquifers.

There are frequent cases of well failure of tube well reported from all over the district. The tube wells render max 4-5 years of service and become defunct. Their discharge either has decreased or reported to have become silty. The shortening of life of the tube well is due to chemical action known as incrustation. Water tends to deposit mineral on the screen surface and in the pores of the formation, thus plugging the screen opening and the pores of the formation just out side the screen thereby decreasing discharge of the tube well. The pH of water in the area is more than 7.5 and is the reason of frequent failure of tube wells.

7.0 RECOMMENDATIONS

- In order to arrest the declining trends of water levels in the block, the rooftop rainwater harvesting technology should be adopted and recharge structures may also be constructed in depression areas where water gets accumulated during rainy season. This will help in enhancing the recharge to ground water reservoir.

- The crops consuming less quantity of water may be grown in place of crops requiring more water in the over-exploited block.

- The construction of roof top rainwater harvesting structures should be made mandatory in building byelaws, which will help in checking the falling water level trend in the Palwal town.

- The abandoned dug wells may be cleaned and should be used for recharging the ground water by utilizing the surface monsoon runoff.

- The conjunctive use of poor quality groundwater and canal water by mixing in different ratio.

- Cyclic use of canal water and poor quality groundwater.

- The water level monitoring network needs to be increased in the block.

- Local populace to be educated regarding consequences of mining of ground water and need for effective and economic use.