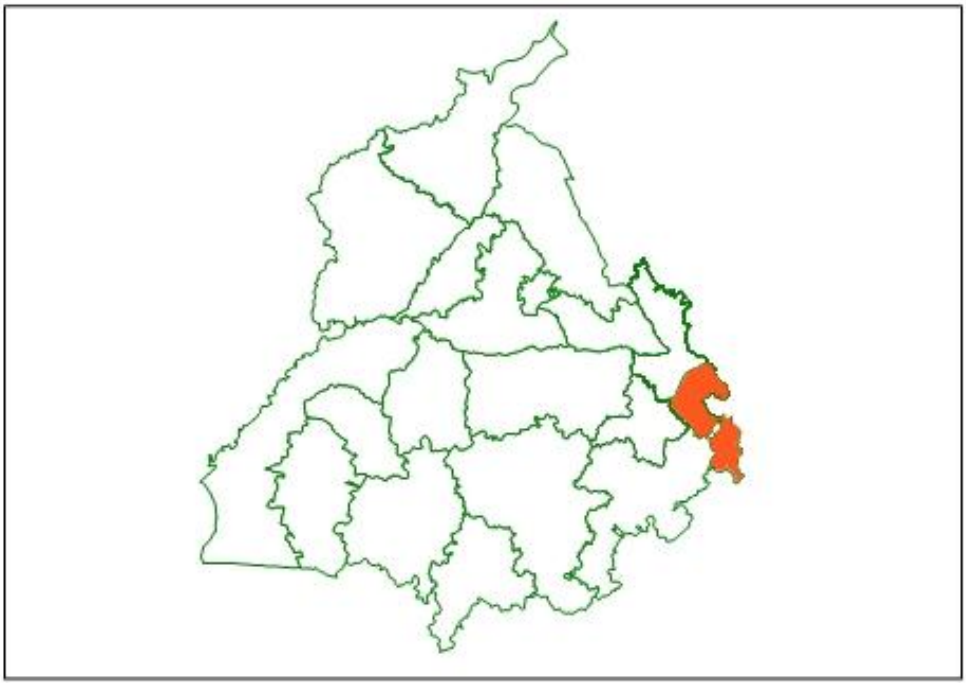
S.A.S NAGAR DISTRICT PUNJAB



CENTRAL GROUND WATER BOARD
NORTHWESTERN REGION
CHANDIGARH
2013

GROUND WATER INFORMATION BOOKLET
S.A.S NAGAR DISTRICT, PUNJAB

By

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C O N T E N T S

S.A.S NAGAR DISTRICT AT A GLANCE

Sr No	Items	Statistics
1.	GENERAL INFORMATION	
	i) Geographic Area (Sq.Km)	1189
	ii) Administrative Divisions	
	Number of Teshils	3
	Number of Blocks	3
	Number of Towns	9
	Number of Villages	384
	iii) Population (As on 2011 Census)	9,86,147
	iv) Normal Annual Rainfall (mm)	1061
2.	GEOMORPHOLOGY	
	Major Physiographic Units	Alluvial plain & alluvial fan
	Major Drainage	Ghaggar & Satluj
3.	LAND USE (Sq. Km.)	
	i) Forest Land ii) Net Area Shown iii) Gross Cropped area iv) Cropping Intensity	190 750 1180 157%
4.	MAJOR SOIL TYPES	Tropical Arid Brown (Weakly solonized)
5.	IRRIGATION BY DIFFERENT SOURCES	
	Tubewells/Borewells Shallow Tubewells Deep Tubewells	 9050 2586
	Canals	-
	Other sources	-
	Net Irrigated Area	696.88
6.	NUMBER OF GROUNDWATER MONITORING WELLS OF CGWB	
	Dugwells	10
	Piezometers	4
7.	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvium
8.	HYDROGEOLOGY	
	Major Water Bearing Formation	Alluvial Sand
	Pre Monsoon depth to water level (mbgl) Post Monsoon depth to water level(mbgl) Long term water level trend in 10 years	
9.	GROUND WATER EXPLORATION BY CGWB	
	Exploratory wells Piezometers SlimHoles Depth Range (m)	11 1 3 295-590

	Discharge (lpm)	870-2407
	Storativity (S)	$7.3*10^{-4} – 2.4*10^{-3}$
	Transmissivity (m^2/day)	55-862
10.	GROUND WATER QUALITY	
	Presence of chemical constituents more than the permissible limit	
	EC (micro mhos at 25^oC)	550-1370
	F (mg/l)	0.12-0.78
	As mg/l)	NIL
	Fe mg/l)	1.21-1.26
	Type of water	
11.	DYNAMIC GROUND WATER RESOURCES (ham) as on March 2009	
	Net annual ground water availability	27524
	Annual Ground Water Draft	28005
	Projected Demand for Domestic and Industrial use up to 2025	5455
	Stage of Ground Water Development	102%
12.	GROUND WATER CONTROL AND REGULATION	
	Number of Over Exploited Blocks	3
	Number of Critical/Semi-Critical/Safe Blocks	Nil
	Number of Blocks Notified	Nil
13.	MAJOR GROUND WATER PROBLEMS	Decline in ground water level

GROUND WATER INFORMATION BOOKLET
S.A.S NAGAR DISTRICT, PUNJAB

1.0 INTRODUCTION

S.A.S Nagar district is located in the eastern part of the Punjab state and lies between North latitudes of 30°21'00" and 30°56'00" and East longitudes of 76°30'00" and 76°55'00" covering a geographic ambience of 1189 sq.km. The district is bounded by Patiala and Fatehgrah Sahib district in the south-west, Ropar district in the northwest, Chandigarh and Panchkula in the east and Ambala district of Haryana state in the south.

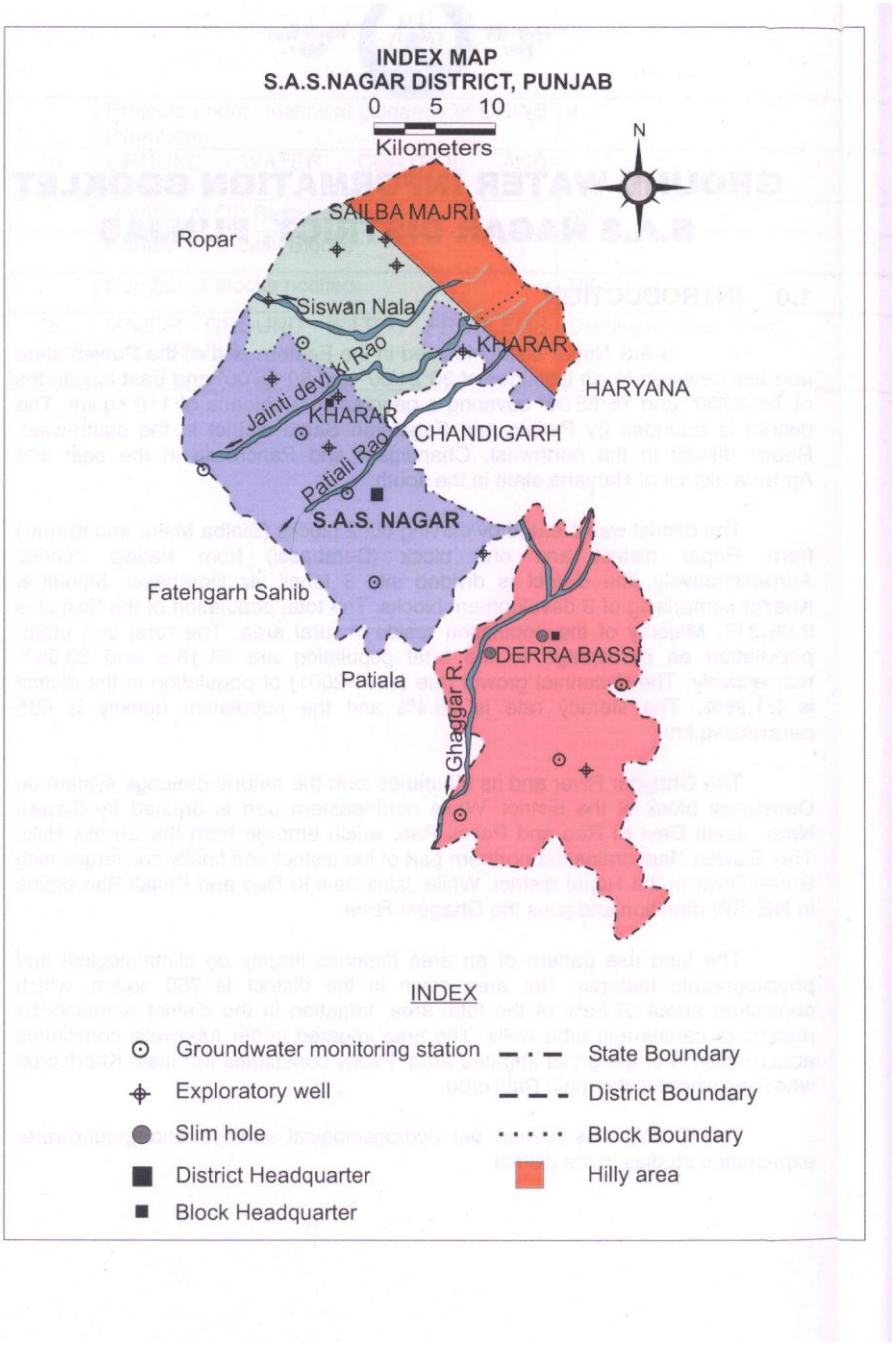
The district was created by carving out 2 blocks (Sialba Majra and Kharar) from Ropar district and one block (Derabassi) from Patiala district. Administratively, the district is divided into 3 tehsil viz.,Derabassi, Mohali & Kharar comprising of 3 development blocks. The total population of the district is 9,86,147. The decennial growth rate (2001-2011) of population in the district is 30.02%. The literacy rate is 84.9 % and the population density is 830 persons/sq.km.

The Ghaggar River and its tributaries form the natural drainage system on Derabassi block of the district. While north-eastern part is drained by Siswan Nadi, Jainti Devi Ki Rao and Patiali Rao, which emerge from the Siwalik Hills. The Siswan Nadi drains the northern part of the district and finally converges with Sutlej River in the Ropar district. While Jainti Devi Ki Rao and Patiali Rao drains in NE-SW direction and joins the Ghaggar River.

The landuse pattern of an area depends largely on climatological and physiographic features. Net area sown in the district is 750 sq.km, which constitute about 73% of the total area. Irrigation in the district is mainly by means of tube wells. The area irrigated under tubewells constitutes about 67% of the gross irrigated area. Paddy constitutes the main Kharif crop whereas wheat is the main Rabi crop.

The CGWB has carried out hydrogeological surveys and groundwater exploration studies in the district. Index Map of S.A.S District is given in Plate-I

Plate-I



2.0 CLIMATE & RAINFALL

The climate of S.A.S district can be classified as subtropical monsoon. The normal annual rainfall of the district is 1061 mm which is unevenly distributed over the area in 49 days. The south west monsoon contributes about 80% of annual rainfall.

3.0 GEOMORPHOLOGY AND SOIL TYPES

The area can be broadly grouped into two depending upon its geomorphic features as alluvial fan and alluvial plains. Alluvial fans are deposited by hill torrents with a wavy plain rather than a steep slope. Adjacent to the alluvial fan are the alluvial plains which forms a part of large Indo- Gangetic Quaternary basin comprises of thick sand and silty sand layers interbedded with silt and clay beds. The alluvial plains are of vital economic value as it supports the dense population of the district. The soils are mainly developed on alluvium under the dominant influence of climate followed by topography and time. The major soil type of the district is weakly solonized tropical arid brown soils.

4.0 GROUND WATER EXPLORATION

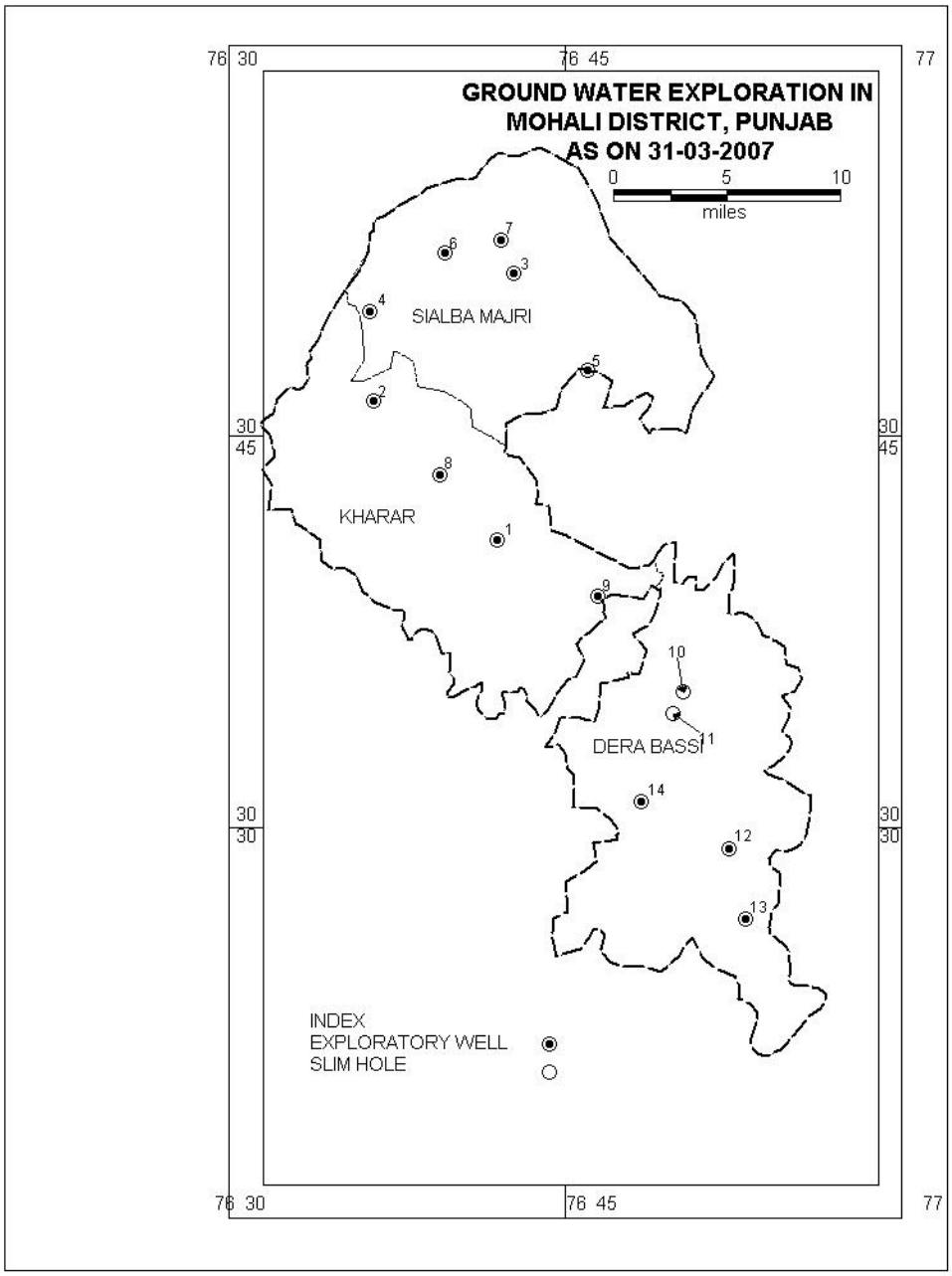
The CGWB has drilled 11 exploratory wells, 2 slim holes and 1 piezometer in the district in the depth range of 295-590 m bgl to determine the various aquifer systems and its extent. All the exploratory wells drilled in the Derabassi block were abandoned due to insufficient thickness of aquifer zones and low yield. Exploratory drilling has revealed 4-13 saturated granular zones comprising of fine to coarse sand, silt and kankar up to the total drilled depth of 460 m in Kharra and Sialba Majra blocks. The discharge ranges from 870-2407 lpm for 21.65 and 11.36 m drawdown respectively. The transmissivity and hydraulic conductivity varies between 55 to 862 m2/day and 7.4 -48m/day respectively. The storativity value ranges between 7.3*10-4- 2.4*10-3, which clearly indicates a leaky confined condition. Status of ground water exploration in S.A.S. District (Mohali) is given below & Plate-II.

BLOCKWISE STATUS OF GROUND WATER EXPLORATION
DISTRICT MOHALI (PUNJAB)

(AS ON31-03-2011)

District	Block	Location	Ref No. on map	Type of well
Mohali	KHARAR	Sohana	1	EW
		Rukhi pakhta	2	EW
		Satmazra	8	EW
		Bhabat(Daulat Singh wala)	9	EW
	SIALBA MAJRI	Sultanpur	3	EW
		Jhingra kalan	4	EW
		Sangriwala	5	EW
		Khizrawad	6	EW
		Dulwan Khadri	7	EW
	DERA BASSI	Dera Bassi	10	SH
		Bakarpur SH	11	SH
		Jauli Kalan	12	EW
		Bhagla	13	EW
		Dhappar	14	EW

Plate-II


GROUND WATER EXPLORATION IN
MOHALI DISTRICT, PUNJAB
AS ON 31-03-2007
0 5 10
miles
76 30
76 45
77
30 45
30 30
SIALBA MAJRI
KHARAR
DERA BASSI
1
2
3
4
5
6
7
8
9
10
11
12
13
14
INDEX
EXPLORATORY WELL
SLIM HOLE

5. HYDROGEOLOGY

The S.A.S Nagar district is occupied by Quaternary Alluvial deposits belonging to the vast Indo-Gangetic alluvial plains, which forms the main aquifer system. Groundwater occurs under phreatic conditions in the shallow aquifers while leaky confined to confine conditions occur along the deeper aquifers of Quaternary alluvial deposits.

The principal aquifer system of the district is Alluvium and major aquifer system is Depth to water level maps of pre monsoon (May 2011), post monsoon (Nov. 2011) and seasonal fluctuation (May 2011 to Nov. 2011) are given in plate III,IV & V respectively. In major part of the district, the water level ranges between 5 and 10 m while the water level in the north western and eastern part is between 10 to 20 meters, in the extreme western part of the district water levels are around 30 meters. In the southern part of the district water level ranges from 2 to 5 meters. Seasonal fluctuation shows that, in general, there is an overall decline in the water level except few isolated patches.

Plate-III

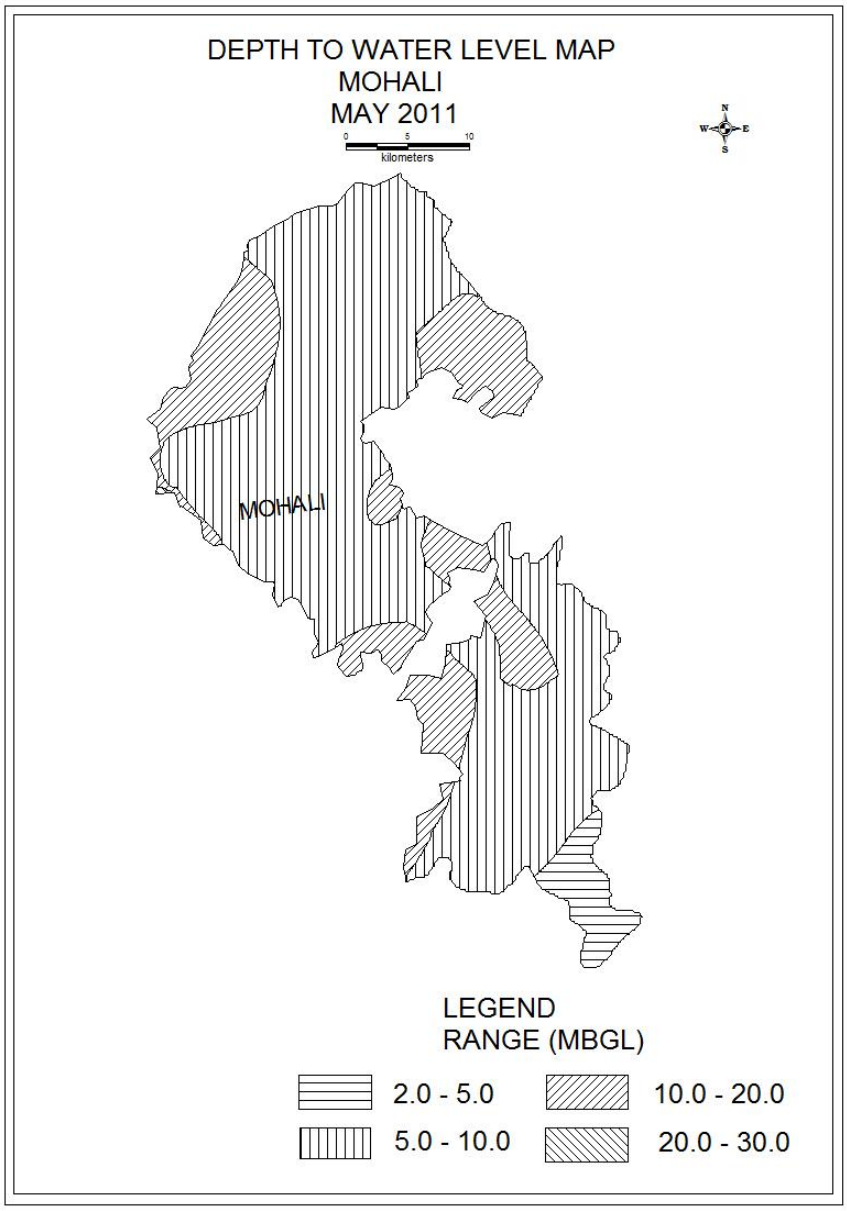

DEPTH TO WATER LEVEL MAP
MOHALI
MAY 2011
0 5 10
kilometers
N
W E
S
MOHALI
LEGEND
RANGE (MBGL)
2.0 - 5.0
5.0 - 10.0
10.0 - 20.0
20.0 - 30.0

Plate-IV

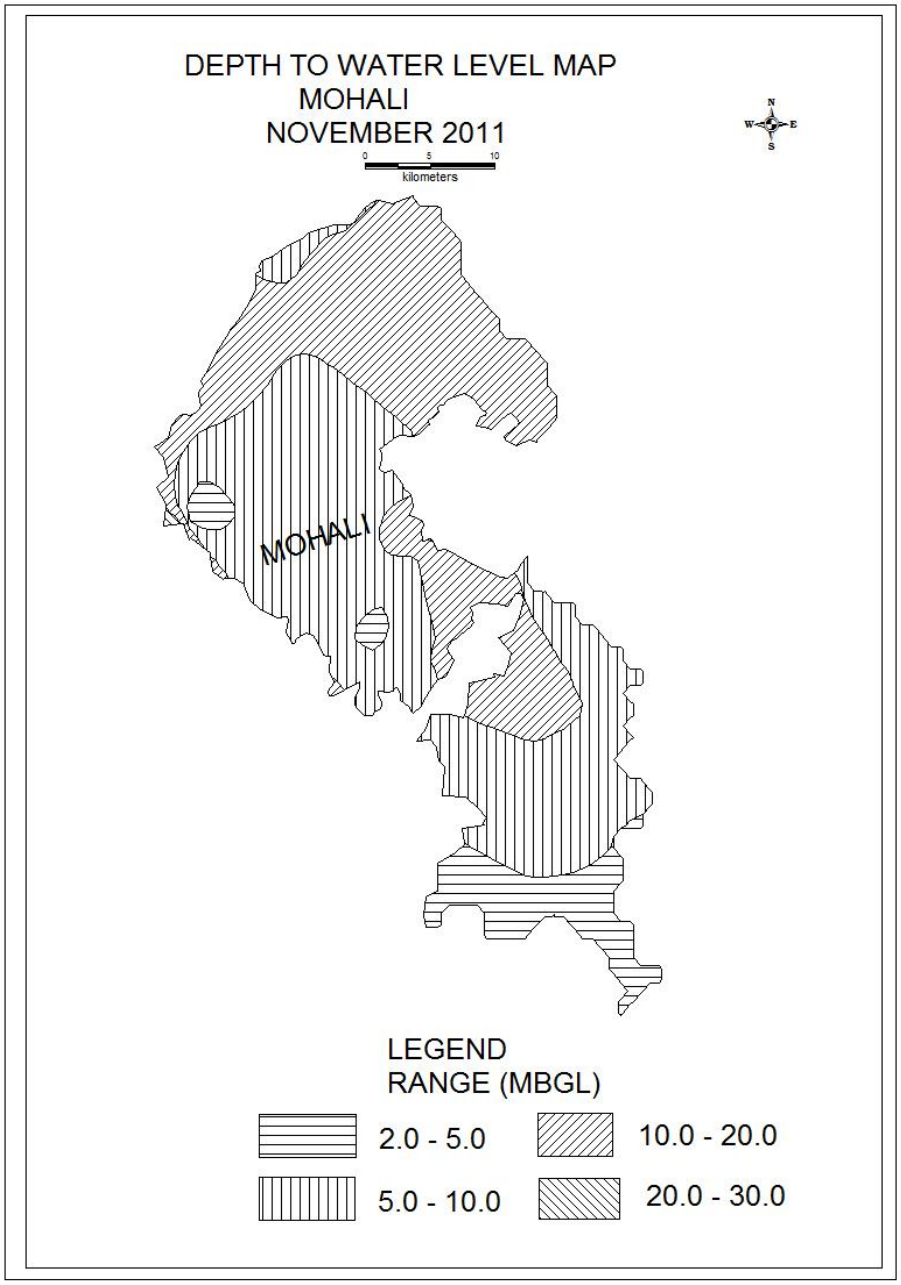
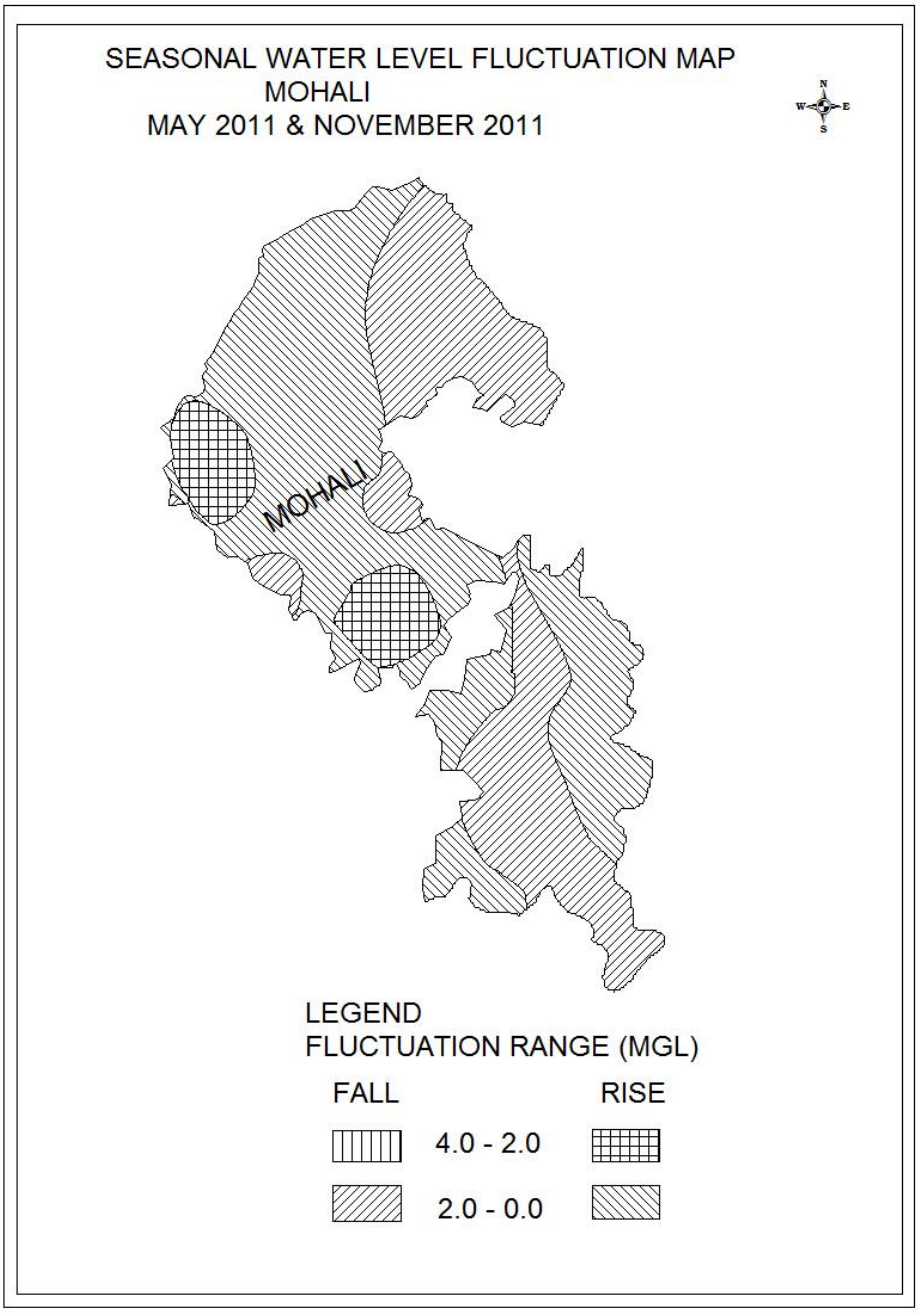

DEPTH TO WATER LEVEL MAP
MOHALI
NOVEMBER 2011
0 5 10
kilometers
N
W
E
S
MOHALI
LEGEND
RANGE (MBGL)
2.0 - 5.0
5.0 - 10.0
10.0 - 20.0
20.0 - 30.0

Plate-V



Depth to water level ranges from 2.14 to 32.24 m bgl during pre-monsoon and 2.61 to 33.37 m bgl during post monsoon period. Seasonal fluctuations (pre & post 2011) in the district ranges from -1.03 to 3.67 meters. The long-term trend of water level (2002 to 2011) also shows that there is decline in water level on major part of the area ranging from 0.16 to 0.35 m/yr except a few isolated patches where there is rise at the rate 0.02 to 0.06 m/yr which is insignificant.

6.0 GROUND WATER RESOURCES

Groundwater resource potential of the district has been assessed as per Groundwater Resource Estimation Methodology (GEC-97) as on 31.03.09 by considering administrative block as the assessment unit. The Net Annual Ground Water Availability of the district is 27,514 ham, existing ground water draft for all uses is 28,005 ham. Provision for domestic and industrial requirement supply to 2025 years is 5455 ham. Net ground water availability for future irrigation development is -1379 ham. The stage of groundwater development for the district is 102%.

The stage of groundwater development in Dera Bassi ,& Kharar blocks is 133 % & 100% respectively and falls under Over Exploited category, whereas stage of ground water development of Sialba Majri Block is 46 % and falls in safe category. In Kharar block Agriculture draft decreased but Industrial & Domestic drafts increased tremendously.

Block-wise Groundwater Resource of S.A.S Nagar district as on 31.03.2009

Block Name	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 upto year 2015 (ham)	Net Ground Water Availability for future irrigation development (ham)	Stage Ground Water Development (%)	Category
DERA BASSI	11907	13867	15612	2225	-4185	133	Over-Exploited
KHARAR	9346	6901	9256	2821	-476	100	Over-Exploited
SIALBA MAJRI	6361	2670	2936	409	3282	46	Safe
TOTAL	27514	23438	28005	5455	-1379	102	

Net ground water development of the district is 27514 ham and exiting ground water draft for all users is 28005 ham. Net ground water availability for future irrigation development is -1379 ham. The stage of groundwater development in the district as a whole is 102%. It falls under Over Exploited category.

7.0 HYDROCHEMISTRY

The development of high productive agricultural practices, industries and changing life style of people have taken place which has affected the quality of surface and ground water and which has become more prone to deterioration. Range of various constituents in ground water is given below:

Constituent	Range	
Ec (micro mohs at 25^0 C	550	1370
pH	7.37	8.08
F (mg/l)	0.12	0.78
Fe (mg/l)	1.21	1.26
Cl (mg/l)	21	118

Suitability of ground water for drinking purposes

The ground water in the district is slightly alkaline in nature with medium to high salinity. The pH values ranges from 7.38 to 8.08. Chloride, nitrate & fluoride are the important parameters that are normally considered for evaluating the suitability of ground water for drinking uses and it is found that the ground water in the district is suitable for domestic use as all cations and anions are within the permissible limits as per BIS 10,500-1991 standard. Iron which is an essential plant and animal nutrient is found to be within permissible limit except in some parts of the district. Arsenic is below permissible limits in whole of the district.

Suitability of ground water for irrigation

Salinity (Ec), sodium absorption ration (SAR) and Residual Sodium Carbonate (RSC) are the basic parameters considered for ascertaining the suitability of ground water. The chemical data indicates that most of water fall in C_2S_1 category in USSL plot and is suitable for irrigation purposes.

8.0 STATUS OF GROUND WATER DEVELOPMENT

Tubewells are the most important groundwater development structures in the district. The granular zones are composed of sandy clay, sand and kankar. The discharge of tubewells ranges from 153 to 1784 lpm with moderate drawdown.

Drinking water supply in rural and urban areas is mainly based on groundwater. Punjab Water Resources Management & Development Corporation Ltd. and Public Health Department has drilled boreholes in the district to cater to the domestic and irrigation needs of the district. The discharge of these wells ranges from 206 to 2873 lpm. Major part of the district is irrigated by shallow and deep tube wells. Total number of tubewells in the district are 11636.

9.0 GROUND WATER MANAGEMENT STRATEGY

9.1 Ground Water Development

Dera Bassi and Kharar blocks of the district are over exploited, whereas Sialba Majri block is safe. In Kharar block agriculture draft decreased but industrial and domestic draft increased. Whereas in Sialba Majri block there is decrease in area under tubewells. Further groundwater development can be done in district with due caution.

Direct as wells as reverse rotary would be suitable for drilling in the alluvial areas of the district. Good well designs can sustain the aquifers in an efficient manner in the low operation and maintenance cost. The shallow tube wells up to 90 m can be constructed with a single straight assembly of 102 mm diameter with 15-30 m slotted pipes having 1.6 mm slot size. The annular space should be shrouded with gravel of 1.5-4.7 mm. Deep tube wells of high to moderate yield are feasible down to 350 m depth. A well design of 305/203 mm diameter with housing 35-70 m depending upon the water levels and expected drawdown is suitable. About 20-30 m saturated granular zones can be tapped using 1.2-3.8 mm slot sizeand annular space to be shrouded with 1.5-9.54 mm size gravels.

9.2 Water Conservation and Artificial Recharge

Four water conservation and artificial recharge schemes have been taken up by CGWB in Sailba Majri block, S.A.S Nagar district. The artificial structures proposed in these sites include lateral shaft and injection wells of 75 m deep. Rooftop Rainwater harvesting and artificial recharge schemes can be taken up in all the blocks of the district.

10.0 GROUNDWATER RELATED PROBLEMS

The major problem in respect to groundwater development in the district is the overall decline in the water level. It is apprehended that the declining groundwater trend will further aggravate with installation of more tube wells.

11.0 RECOMMENDATIONS

1. Groundwater resource Potential shows that Dera Bassi and Kharar blocks falls under over- Exploited category and there is no further scope of groundwater development. In Sialba Majri block the stage of ground water development is 46% and is recommended for further development.
2. It is necessary to regulate the construction of all groundwater abstraction structures in Over Exploited Blocks.
3. In order to avert the declining trend of water levels in Over Exploited blocks of the district, groundwater management structures such as roof top rainwater harvesting system and recharge structures should be constructed which in turn augment the groundwater reservoir.
3. Wherever feasible, pipe conveyance system fitted with modern pressurized irrigation practices such as Sprinkler and Drip Irrigation should be introduced to conserve water and increase the yield of crops. It has been observed that by using drip irrigation system in sandy areas, about 60% water can be saved. Use of sprinkler irrigation results in water saving to the extent of 20%. 'More crop per drop' concept should be popularized.
4. The irrigation policy is required to be modified as per the prevailing ground water conditions. The canal water allowances can be increased to save ground water. Thus, rationalization of the irrigation policy will help in controlling ground water depletion in the over-exploited.
5. It has been estimated that paddy which is sown in the month of May requires 77 cms of evapotranspiration (E.T.) whereas paddy which is sown on or after 16th June requires only 62 cms of E.T. Thus, substantial water can be saved by postponing paddy cultivation from early May to late June. State Govt. has made an Act titled “The Punjab Preservation of Sub Soil Water Act, 2009” in year 2009 to preserve the sub soil water. It provides for the prohibition of sowing nursery of paddy before 10th

May and transplanting paddy as notified by the state Government i.e before 10th of June.

6. Local Populace to be educated regarding consequences of mining of ground water and need for its economic use.

7. Management of ground water resources cannot be successful without public participation. Therefore, public awareness is of prime necessity. To make the public aware, it is necessary to organize mass awareness program at grass root level and impart training on rainwater harvesting techniques for ground water recharge to various State government agencies at regular intervals so that water policies made by government can be effectively implemented.