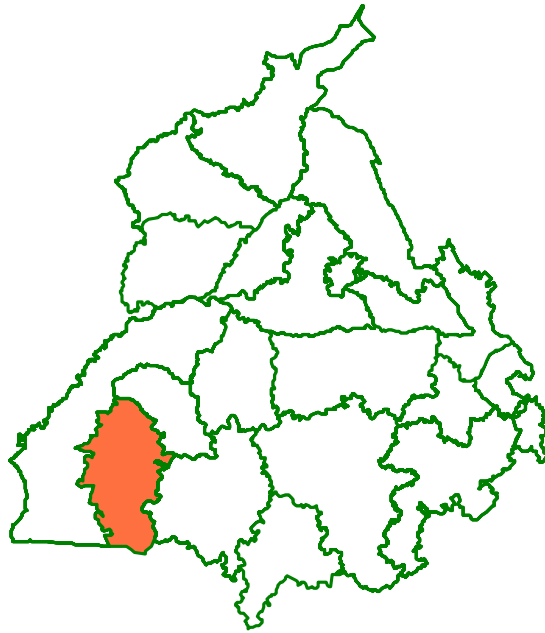




MUKTSAR DISTRICT PUNJAB



CENTRAL GROUND WATER BOARD
Ministry of Water Resources
Government of India
North Western Region
CHANDIGARH
2007



GROUND WATER INFORMATION BOOKLET MUKTSAR DISTRICT, PUNJAB

CONTENTS

MUKTSAR DISTRICT AT A GLANCE

- 1.0 INTRODUCTION**
- 2.0 RAINFALL AND CLIMATE**
- 3.0 GEOMORPHOLOGY AND SOILS**
- 4.0 GROUND WATER SCENARIO**
 - 4.1 HYDROGEOLOGY**
 - 4.2 GROUND WATER RESOURCES**
 - 4.3 GROUND WATER QUALITY**
 - 4.4 STATUS OF GROUND WATER DEVELOPMENT**
- 5.0 GROUND WATER MANAGEMENT STRATEGY**
 - 5.1 GROUND WATER DEVELOPMENT**
- 6.0 GROUND WATER RELATED ISSUES & PROBLEMS**
- 7.0 RECOMMENDATIONS**

MUKTSAR DISTRICT AT A GLANCE

S. No	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical area (sq.km)	2630Sq.Km
	ii) Administrative Divisions (as on 31.03.05)	
	Number of Tehsil	3
	Number of Block	4
	Number of Panchayat/Villages	235
	iii) Population (as on 2001 Census)	7,77,493
	iv) Normal Annual Rainfall (mm)	430.7mm
2.	GEOMORPHOLOGY	
	Major Physiographic units	Fat occasionally
	Major Drainage	South, south western direction
3.	LANDUSE (Sq.Km)	
	a) Forest area	20
	b) Net area shown	2260
	c) cultivable area	2210
4.	MAJOR SOIL TYPES	Two sierozem soil desert soil
5.	AREA UNDER PRINCIPAL CROPS (Sq.Km)	Cotton-1170, Rice-770, Wheat-2000
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Numbers of Structures)	
	Tube Wells	160
	Canals	2080
	Other Sources	-
	Net Irrigated area	2240
	Gross irrigated area	4416
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB	
	No. of Dug Wells	10

	No. of Piezometers	nil
8	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvium
9	HYDROGEOLOGY	
	Major Water bearing formations	Sand
	Pre-monsoon depth to Water Level	1.65-6.43m bgl
	Post-monsoon depth to water level	1.49-6.63 m bgl
	Long term water level trend in 10 yrs	-1.16-3.87 m bgl
10	GROUND WATER EXPLORATION BY CGWB	
	No of wells drilled (EW,OW,PZ,SH,Total)	2
	Depth Range (m)	332-422m
	Discharge (liters per min.)	3.5lps
	Storativity (S)	34-78
	Transmissivity (m ² /day)	3.13x10 ⁻²
.11	GROUND WATER QUALITY	
	Presence of chemical constituents more than permissible limit (e.g.EC ,F,As ,Fe)	Lambi (3510us/cm Giddarbaha (3149 us/cm) Kabarwala (5.36)
	Type of Water	Ca-Mg-HCO ₃ & Na mixed anions
12	DYNAMIC GROUND WATER RESOURCES (2004) in MCM	
	Annual Replenishable Ground Water Resources	843.28
	Net Annual Ground water Draft	521.50
	Projected Allocation for Domestic and Industrial Uses upto 2025	1.60
	Stage of ground Water Development	62%
13	AWARENESS AND TRAINING ACTIVITY	nil
14	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	-
	Projects completed by CGWB (No. & Amount spent)	-

	spent)	
	Projects under technical guidance of CGWB (Numbers)	-
15	GROUND WATER CONTROL AND REGULATION	
	Number of OE Blocks	NA
	Number of Critical Blocks	Nil
	No. of Blocks notified	Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES.	Salinity and water logging.



GROUND WATER INFORMATION BOOKLET MUKTSAR DISTRICT, PUNJAB

1.0 INTRODUCTION

Muksar district lies in the south western part of the state and lies between North Latitude $29^{\circ} 54' 20''$ & $30^{\circ} 40' 20''$ and East Longitude $74^{\circ} 15' 74''$ and falls in Survey of India Toposheet No.44J & 44K and covers an area of 2630km². The district has a population of 777493 as per 2001 census with the population density of 295 person per sq.km. The district falls in the Ferozpur division and is divided into three tehsil subdivision two sub tehsils and four development blocks namely Kotbhai, Lambi, Malout and Muktsar for the purpose of administrative control. The district shares its boundary with Faridkot district in north and north east, in north west and eastern side with Ferozpur district. On the east it is bonded by Bathinda district of Punjab. On the south by Hanumangarh district of Rajasthan and Sirsa district of Haryana state.

Physiographically the area has no river and is covered extensively by the canal net work of Sirhind feeder canal to meet the irrigation and drinking water needs of the people. The area is flat and plain and slopes from NE to SW. The climate of the district is dry sub humid with grass land type of vegetation. The district receive an annual rainfall of 380mm in 22 rainy days. 79% of the annual rainfall occurs during monsoon period and 21% occurs during non monsoon period. The district form part of Satlej sub basin and main Indus basin. The district has mostly sierozem type of soil and partly desert soil in the south western part

2.0 RAINFALL AND CLIMATE

The normal annual rainfall of the area is 380mm in 22 days which is unevenly distributed over the district. The south western monsoon sets in the last week of June and withdrawn towards the end of September and contributes about 79% of the rainfall. July and August are the rainiest month, rest 21% occur during the non monsoon period in the form of thunder storm and western disturbances..

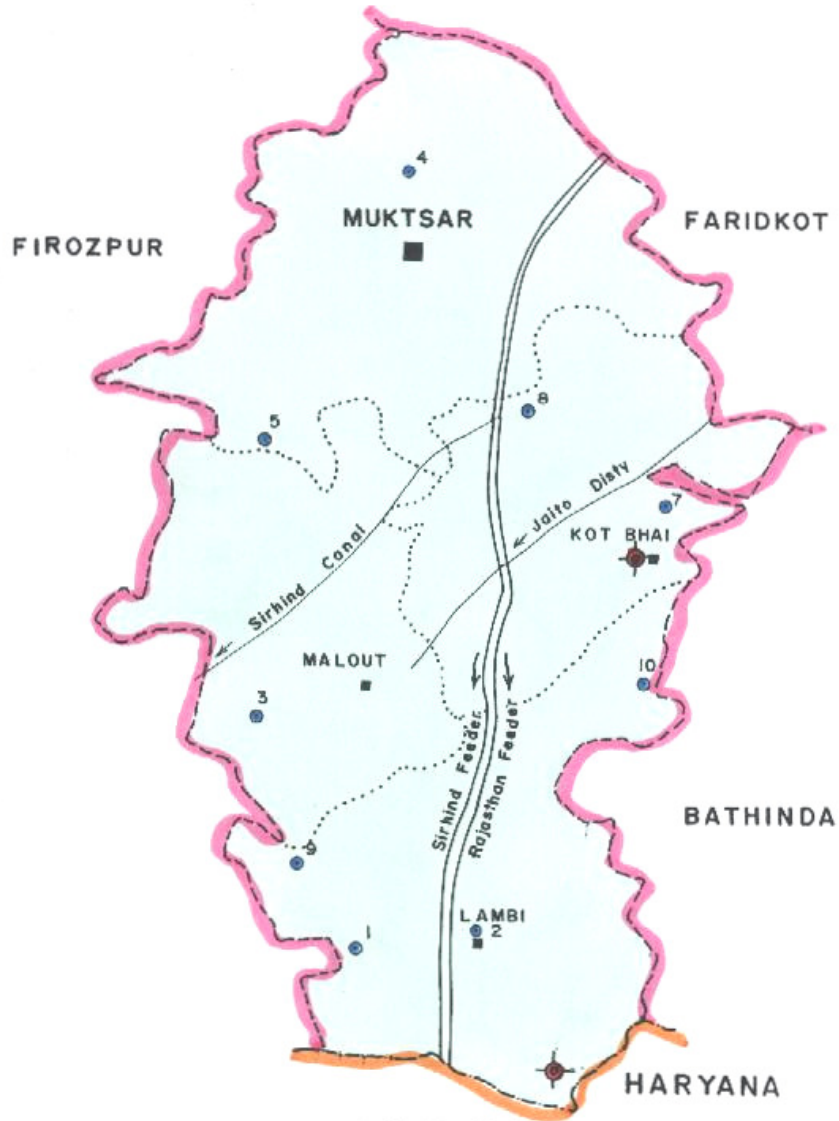
The climate of the district is sub- tropical steppe, semi arid and hot which is mainly dry except in rainy months and characterized by intensely hot summer and cold winter.

3.0 GEOMORPHOLOGY AND SOILS

The area forms a part of Satlej sub basin and main Indus basin alluvial plains. The topography of the district is almost flat. It has an average elevation of 200m amsl. and slopes gently towards south and south west. The district is dotted with a number of isolated sand dunes of varying dimensions. The sand

INDEX MAP MUKTSAR DISTRICT, PUNJAB

Km. 5 0 5 15 Km.

I N D E X

- | | |
|------------------------------------|-------------------------|
| ■ DISTRICT HEAD QUARTER | --- STATE BOUNDARY |
| ■ BLOCK HEAD QUARTER | - - - DISTRICT BOUNDARY |
| ⊕ EXPLORATORY WELL | BLOCK BOUNDARY |
| ● GROUND WATER MONITORING STATIONS | |



dunes are of longitudinal type and do not show any preferred alignment. There is no river flowing through the district. A number of artificial drains cross the district which carry the excess run off during rains.

The soils in the district have largely developed on alluvium the material laid by rivers under the dominant influence of climate followed by topography and time. It has two types of soil viz the sierozem soils and desert soil.

Sierozem soils : The soils are light yellowish brown to pale brown in colour. Soils are calcareous and usually have kankars at a depth of 0.75m to 1.25m . There are deficient in nitrogen phosphorous and potash. Salinity and alkalinity are the serious problems particularly in the irrigated area. Wind erosion is also the common feature in the tract. These soils are found in whole of Muktsar blocks , Kotbhai block, in northern and eastern part of Malout blocks and eastern central southern part of Lambi block.

Desert soil : These soils are light brown to yellowish brown and are deficient in nitrogen phosphorous and potash wind erosion is a serious problem here. These soils are found in southern and western part of Melout and Lambi blocks of the district gram wheat barley bajra , jawar , cotton rope and mustard are the principle crops of whole of the area

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

On the basis of two exploratory borehole drilled by CGWB (1) Kumharwala , Lambi Block) during 1974-78) and Kotbhai Block HQ during 1999, the aquifer system belongs to huge aquifer system of Indus plains. It cannot primarily of quaternary alluvial sediments . The area has both unconfined and confined aquifer. In general unconfined condition exist only upto 30m depth . The confined aquifer is band at top by confining bed . The proportion of permeable beds at deeper depth is generally low. At Kumharwala drilling down to the depth of 422m was done. At the depth of 416m Nagaur clay stone has been encountered indicating that the alluvium thickness is 416m and beyond this depth Nagaur clay stone occurs. Transmissivity 3.13×10^{-2} and hydraulic conductivity was computed 34.78m/day. At Kotbhai drilling was done upto 331m . At both the places well was constructed down to the depth of 54.0 and 53.0 m respectively because of poor quality beyond this depth. At Kumharwala even the EC of constructed well is 4557 which is also not fit for drinking purposes.

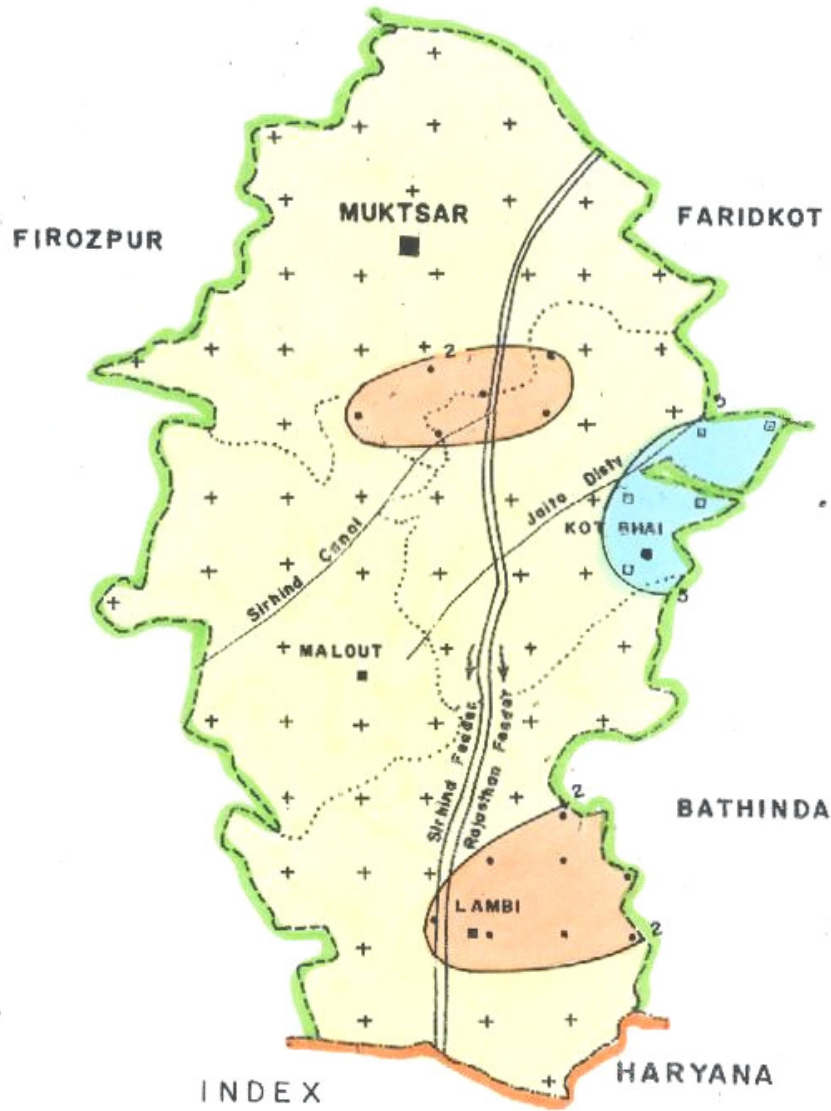
The area is underlain by unconsolidated formation comprising sand silt clays etc. Extensive moderately thick unconfined to confined aquifer exists down to the drilled depth of about 30m bgl . In the district the ground water is generally saline at all levels except at local patches. There is wide lateral variation in the chemical quality depending upon the proximity of the area to the surface irrigation channels.

4.2 Ground Water Resources

Ground water resources estimation of the district was done in 2004 for each individual block. Perusal of the estimates reveals that overall stage of

DEPTH TO WATER LEVEL
(PRE MONSOON)
MUKTSAR DISTRICT, PUNJAB

Km. 5 0 5 15 Km.

INDEX

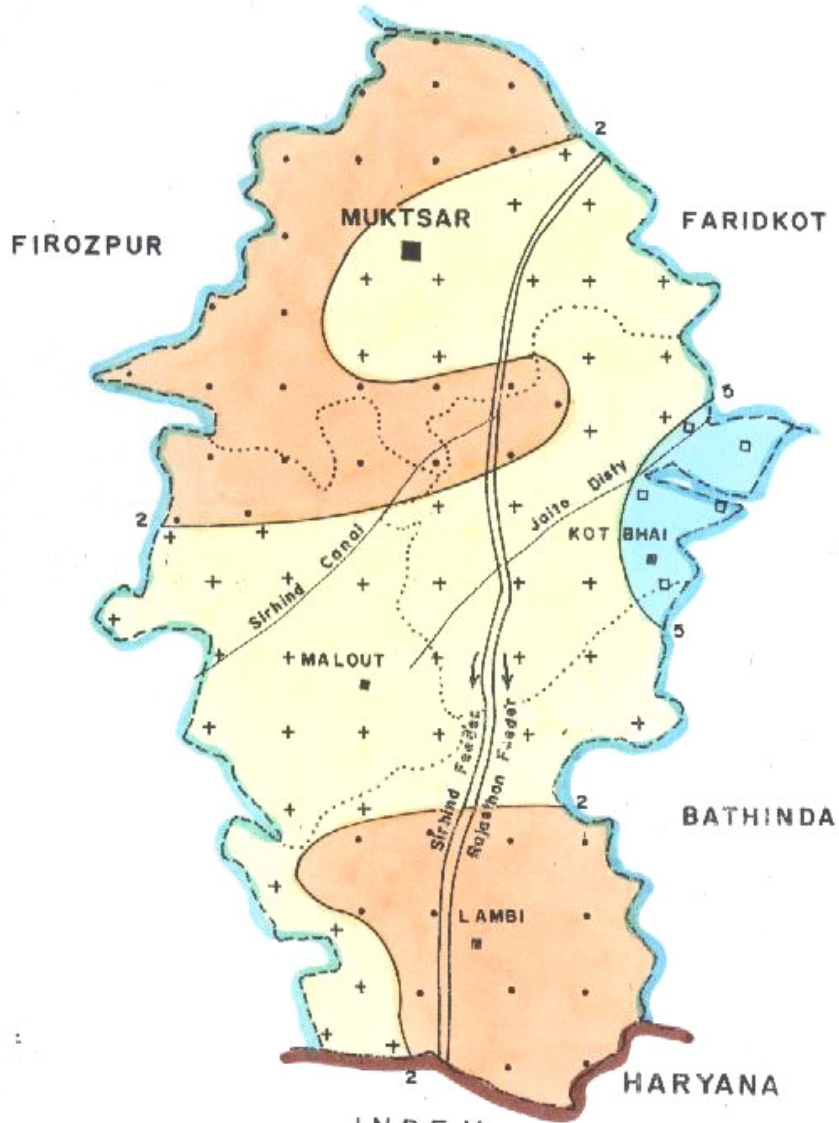
DEPTH TO WATER LEVEL IN m. b.g.l.

	<	—	2
	2	—	5
	ABOVE		5



DEPTH TO WATER LEVEL
(POST MONSOON)
MUKTSAR DISTRICT, PUNJAB

Km. 5 0 5 15 Km.



INDEX

DEPTH TO WATER LEVEL IN m.b.g.l.	Symbol	Value
< 2	Orange box with dots	2
2 - 5	Yellow box with plus signs	5
ABOVE 5	Light blue box with squares	5

development in the district is of 62% The ground water development of all the blocks is below 100% and have been categorized as safe for ground water development. The ground water development of each block is as follows Kotbhai- 53%, Lambi-62%, Melout-57%, Muktsar-74%. The blockwise ground water resources potential in the district has been assessed as per GEC 97 and are as on 31.3.2004 as follows:-

Ground Water Resources if Muktsar district, Punjab as on 31.3.2004

S.No	Block	Total Replenish able Ground Water resource (ham)	Utilizable ground water Resources for irrigation (ham)	Existing ground water draft For Domestic, industrial and other uses (ham)	Gross draft (ham) as on 31.3.04	Allocation for future up to next 25 years for domestic and industrial uses	Net ground water availability for future irrigation develop-ment	Stage of ground water develop-ment %	C A T E G O R Y
1	Kotbhai	23618	12560	32	12592	32	11026	53	Safe
2	Lambi	19452	11974	32	12006	32	7446	62	Safe
3	Malout	17786	10040	56	10096	56	7691	57	Safe
4	Muktsar	23471	17416	40	17456	40	6016	74	Safe
5	Total	84328	51990	160	52150	160	32178	62	Safe

4.3 Ground Water Quality

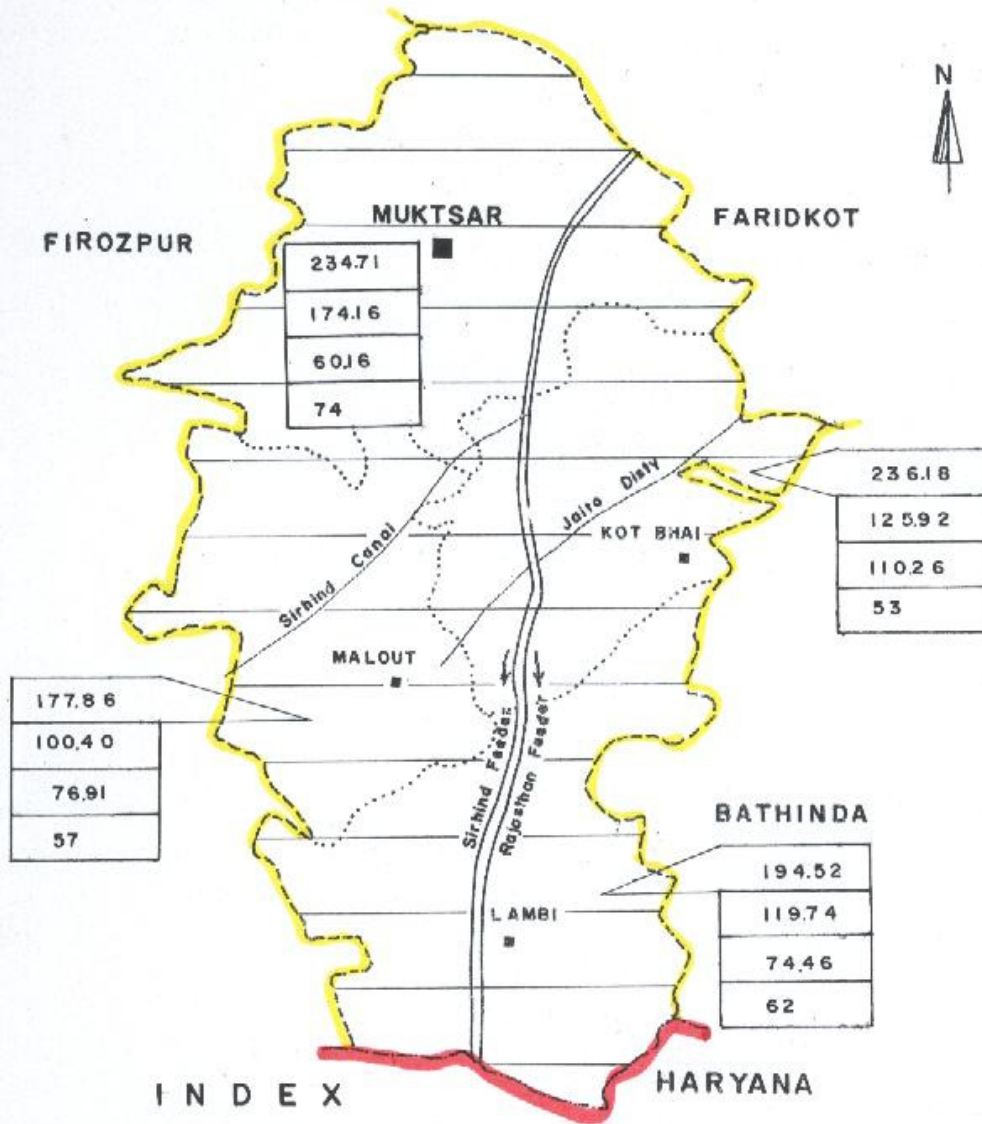
The shallow ground water of the district is alkaline in nature(pH 7.23 to 8.66) and is moderate to highly saline(EC 436 to 3510 us/cm) Among anions , by and large , none of the anions dominates , whereas among cations , sodium + potassium predominates in 50% of the samples and in the remaining none of the cation is dominant .

Comparing the concentration values of major ions with the recommended desirable and permissible concentration limits for drinking water (Bureau of Indian Standards) it is found that 60% ground water is not suitable for drinking purposes mainly due to nitrate that exceeds the recommended limit of 45mg/l.

Plot of USSL diagram used for the classification of irrigation waters indicated that ground waters fall under classes C₂S₁ C₃S₁ C₃S₂ C₂S₁ C₃S₃ C₂S₁ and C₄S₁.These waters are suitable for customary irrigation for semi salt tolerant crops like wheat , rice , maize , gram etc without any fear of salinity hazards to crops. However waters falling under class C₃S₃ are likely to cause both sodium and salinity hazards and those falling under class C₂S₁ and C₄S₁ may cause salinity hazards . It would be better if such waters are used for irrigating salt tolerant crops along with appropriate amount of gypsum on well drained soils.



GROUND WATER DEVELOPMENT POTENTIAL AND CATEGORISATION OF BLOCKS MUKTSAR DISTRICT, PUNJAB



INDEX

234.71	GROUND WATER RESOURCES (MCM)
174.16	GROSS GROUND WATER DRAFT (MCM)
60.16	FUTURE GROUND WATER AVAILABILITY (MCM)
74	STAGE OF GROUND WATER DEVELOPMENT %
	SAFE BLOCK



4.4 Status Of Ground Water Development

In whole of the district water for irrigation is based on both canal and tubewell supplies. The main stress is on canal water because the whole of the district has an intense net work of canal system. The two major canal Sirhind feeder and Sirhind canal is the main source of water supply which is further divided into various distributaries and minors. From the data available of Agriculture Deptt. , Punjab about 96% of the district is being irrigated by canal irrigation and only 4% of the area is irrigated by tubewells . Tubewells are of shallow depth ranging from 25-55 m bgl . There are 10086 electric operated tubewells and 16518 are diesel operated tubewell in the district . From the water level monitoring data available in CGWB . Only two wells are showing decline i.e. Muktsar and Bhamial . The decline at Muktsar (May 97 to May 2006) is 1.57 m and from Nov 97 to Nov 2006 is 2.14m whereas at Bhamia, decline is 1.09 m (May 97 to May 2006) and 1.16m (Nov.97 to Nov 2006) which is a nominal decline in 10 years whereas all the other wells are showing rise in water levels ranging from 0.32 to 4.39m in May 2006 and 1.94m to 3.87m in Nov,2006.

The water levels of district ranges between 2-5 m whereas only a small portion i.e. east of Kotbahai is more than 5m . Northern and western part of Muktsar block and southern and central part of Lambi block fall in less than 2m category whereas rest of district falls in 2-5m category in NOV.2006. Whereas in May 2006 whole of the district comes under 2-5m category except two patches near Lambi and NW of Kotbahai . All the blocks fall in the safe category ranging from 53 to 74% of development.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

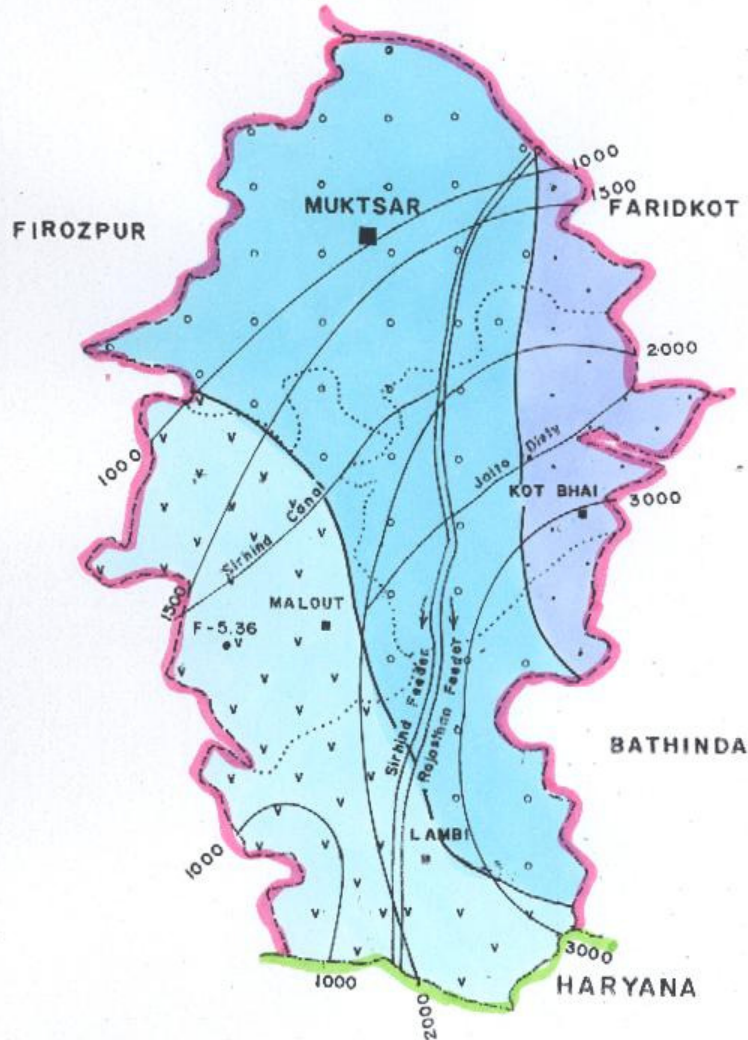
All the blocks fall in safe category and EC ranges 3150-3500 $\mu\text{S/cm}$, the ground water can be utilized for blending with the canal water. More and more shallow tubewells be constructed .The electrical connection for shallow tubewells may be liberalized so that the water from the phreatic aquifer may be withdrawn. The tubewells upto 30m depth may be constructed with the slot opening of 1.0mm and 10-15m slot may be used. These tubewells give an discharge of about 1000 lpm . The ground water is to be used after blending with the canal water so that the withdrawal from the ground water may increase.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

Almost whole of the district is facing the problem of water logging southern and north western part is severely effected with the water logging problem. Out of 2630km² area of the district 2240km² is fed by the canals and there being the quality problem the ground water exploration is low. As a result all the four blocks of the district are safe. The water logging problems is least severe in the pre monsoon period and more severe in the post



HYDROGEOLOGY MUKTSAR DISTRICT, PUNJAB



INDEX

	WELLS FEASIBLE	RIGS SUITABLE	DEPTH OF WELL (m)	DISCHARGE (lpm)	REMARKS
	TUBE WELLS	REVERSE / DIRECT ROTARY	25 - 55	1000 - 2000	DEEPER ZONES ARE SALINE
	TUBE WELLS	REVERSE / DIRECT ROTARY	20 - 50	250 - 1000	
	TUBE WELLS	REVERSE / DIRECT ROTARY	15 - 45	100 - 250	
ELECTRICAL CONDUCTIVITY (MICROMHOS/CM AT 25°C)		5.36 ● FLUORIDE > PERMISSIBLE LIMIT (1.5 ppm)			
1000					



monsoon period. Pre monsoon decline in ten years is shown at only two places whereas all the other eight places (NH Stations) have shown rise in water level which has caused water logging. The breach in the canal system give rise to recharge of the phereatic aquifer system. The chemical quality the water is marginal to saline can be used with blending with the canal water.

7.0 RECOMMENDATIONS

1. Since the area is water logged and showing rise in the water levels to range of 32cm to 4.39m in May 2006 and 1.94 to 3.87m in post monsoon period in Nov.2006 . The phearatic aquifer system is to be exploited and used the water in conjunctive use for irrigation purpose.
2. The electrical connection may be liberalized so that the phreatic system may be exploited.
3. Cropping pattern may be changed.
4. Drip irrigation system may be embodied which will reduces the recharge (reverse seepage) to ground water.
5. The canal system may be monitored and breaching of canal may be repaired to decrease the ground water recharge from the canal.