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**Government of India  
Ministry of Water Resources,  
River Development & Ganga Rejuvenation  
Central Ground Water Board**

**PLAN ON**

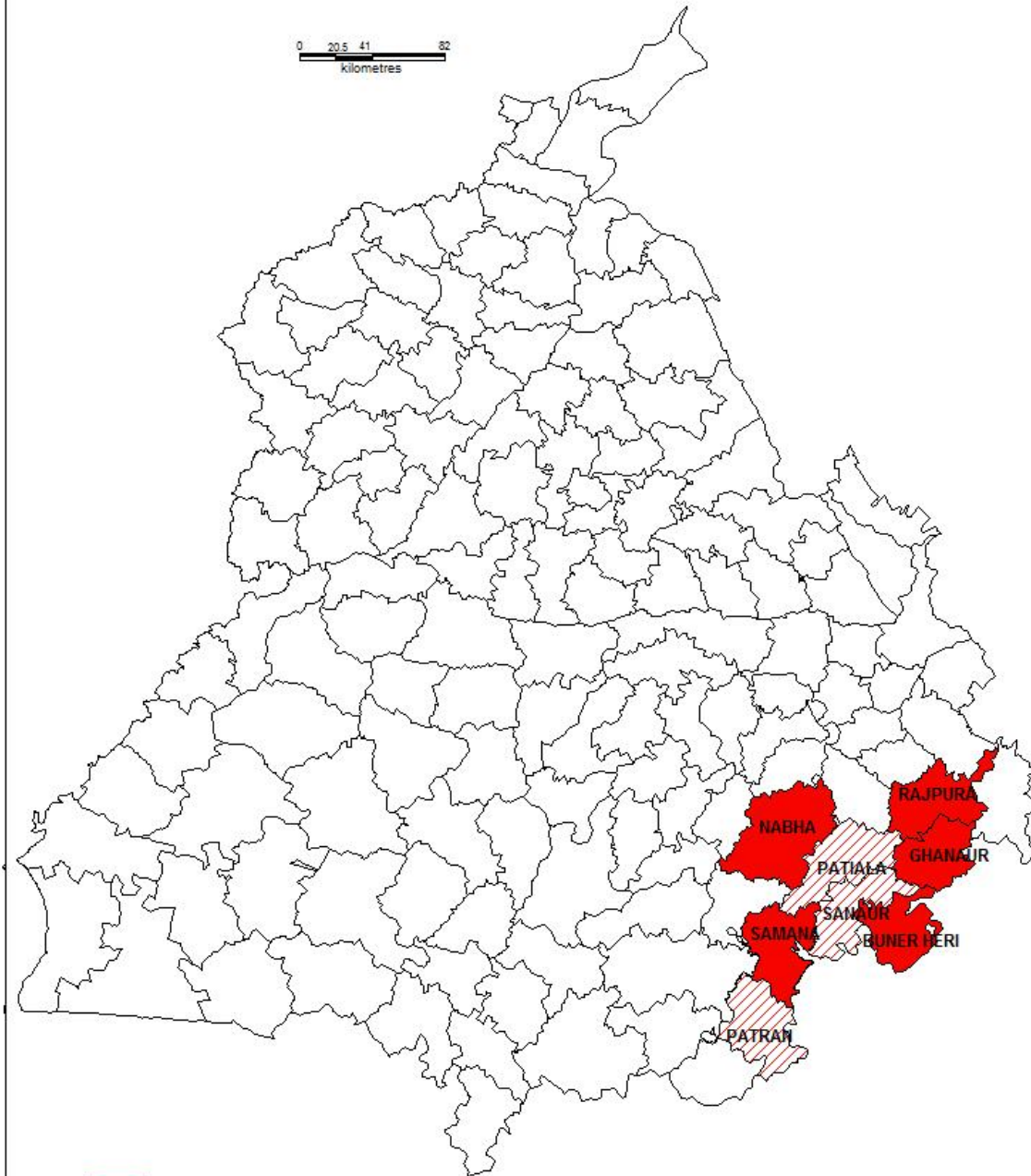
**ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION IN  
OVEREXPLOITED BLOCKS OF PATIALA DISTRICT, PUNJAB**

**Central Ground Water Board  
North Western Region  
Chandigarh**

# PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS DISTRICT PATIALA PUNJAB



0 20.5 41 82  
kilometres



-  OVER EXPLOITED BLOCKS
-  NOTIFIED BLOCKS

# **PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT PATIALA PUNJAB**

## **INTRODUCTION**

Patiala district of Punjab state lies between 29° 49' and 30°40' north latitudes and 75° 58' and 76° 48' east longitudes. Total geographical area of the district is 3218 sq.km. The Patiala district is divided into five sub-divisions (tehsils) namely Patiala, Nabha, Ghanaur, Rajpura and Samana comprising eight-community development blocks viz. Patiala, Nabha, Sanaur, Bhunerheri, Rajpura, Ghanaur, Samana and Patran for the purpose of administration. The district headquarter, Patiala town falls in Patiala Tehsil

## **RAINFALL & CLIMATE**

The climate of Patiala district can be classified as tropical steppe, Semi-arid and hot which is mainly dry with very hot summer and cold winter except during monsoon. The normal monsoon and annual rainfall of the district is 547 mm and 677 mm, respectively which is unevenly distributed over the area 29 days. The mean minimum and maximum temperature in the area ranges from 7.1° C to 40.4° C during January and May or June respectively.

## **GEOMORPHOLOGY AND SOIL TYPES**

The district area is occupied by Indo-Gangetic alluvial plain and consists of three types of region viz. the Upland plain, the Cho-infested Foothill Plain and the Floodplain of the Ghaggar river. The elevation of land ranges from 240 to 278 m amsl. Due to arid climate, the soils are light coloured. Tropical arid brown soils exist in the major parts of the district. These are calcareous in nature and in most cases kankar layers occur.

## **HYDROGEOLOGY**

The district is occupied by Indo-Gangetic alluvial plain of Quaternary age, and falls in Ghaggar basin. The ground water occurs in alluvium formations comprising fine to coarse sand, which forms the potential aquifers. In the shallow aquifer (up to 50m) ground water occurs under unconfined/water table conditions, where as in deeper aquifer, semi-confined/confined conditions exist. sand and occasionally coarse sand and gravel. Their lateral and vertical extent is limited. The borehole data reveals that clay group of formations dominate over the sand group in the district area. Ground water in the district occurs in the alluvium under water table and semi confined to confined conditions. The discharge of deep tube well in the area varies between 2400 and 2680 lpm.

The transmissivity values ranges from 154 to 9410 m<sup>2</sup>/day and storativity ranges from 1.95\*10<sup>-3</sup> to 4.7\*10<sup>-3</sup>.

The depth to water level ranges from 4.43 to 20.62 m bgl during pre monsoon period and 6.99 to 24.28 m bgl during post monsoon period. The seasonal fluctuation varies from 0.03 to (-) 3.66 m in the area. The long-term water levels trend indicates average fall of 0.50 m/year. The long term water level trend is also showing little rise being 0.24 m/year around majauli, which insignificant with respect to entire area.

The elevation of the water table in the district varies from 230 m to 300 m above mean sea level. The highest elevation is in the northeastern part and the lowest in the southwestern part and reflects the topographic gradients. The hydraulic gradient in the northern eastern part is steep, whereas, in the southwestern part, it is gentle. The overall flow of ground water is from

North-east to south-west direction.

## **GROUND WATER RESOURCES**

The block-wise ground water resource potential in the district has been assessed as per GEC-97. The stage of ground water development ranges between 150% (Ghanaur & Nabha ) to 412% (Patran).The net ground water resource of Patiala district have been estimated to be 1494.51 MCM and the gross ground water draft of the district is 2929.79 mcm leaving behind a shortfall of 1458.55 MCM. The stage of ground water development in the district is 196%.

## **GROUND WATER QUALITY**

CGWB has carried out studies for chemical quality of ground water in the area. The ground water of the district is alkaline in nature. The EC in the area ranges from 687 to 4100 Micromhos /cm. Nitrate values ranges between 0.40 to 200 mg/l and fluoride concentration ranges from 0.20 to 2.8 mg/l. At few places high fluoride and nitrate have been observed, thus the ground water in these places is harmful for human consumption.

## GROUND WATER IRRIGATION SCENARIO

As per the data available from minor irrigation census 2006-07 the detailed number of shallow, deep, tubewells, lined, unlined water distribution system, land holdings of wells are given below for reference

### Distribution of Shallow Tubewells According to Owner's Holding Size

No. of shallow tube wells by size class of individual owner							
Sr.no	district	Marginal (0-1 ha)	Small (1-2 ha)	Semi-Medium (2-4 ha)	Medium (4-10ha)	Big (>=10 ha)	Total
<b>1</b>	<b>Patiala</b>	<b>1375</b>	<b>8586</b>	<b>27111</b>	<b>27871</b>	<b>6002</b>	<b>70945</b>

### Distribution of Deep Tubewells According to Owner's Holding Size

No. of deep tube wells by size class of individual owner							
Sr.no	district	Marginal (0-1 ha)	Small (1-2 ha)	Semi-Medium (2-4 ha)	Medium (4-10ha)	Big (>=10 ha)	Total
<b>1</b>	<b>Patiala</b>	<b>19</b>	<b>565</b>	<b>2262</b>	<b>4480</b>	<b>1753</b>	<b>9079</b>

### Distribution of Shallow Tubewells According to Depth of tube well

No. by the depth of shallow Tube well							
Sr.no	district	(0-20 mts)	(20-40 mts)	(40-60 mts)	(60-70 mts)	(>70 mts)	Total
<b>1</b>	<b>Patiala</b>	<b>738</b>	<b>2876</b>	<b>4172</b>	<b>63166</b>	<b>0</b>	<b>70952</b>

### Number of Ground Water Schemes and Potential Utilized by water distribution device

Ground Water Schemes according to water Distribution System				
Open Water Channel				
Sr.no	District	Lined/pucca	Unlined/kutchra	Under ground pipe
<b>1</b>	<b>Patiala</b>	<b>968</b>	<b>77704</b>	<b>853</b>

## **PLAN OF THIS REPORT**

In this plan 2 types of the recharge structures are proposed such as Roof Top Rain water harvesting in rural & urban areas and Recharge pits in agriculture lands of 5mt x5mt x3mt size. The pit will be surrounded by angle irons and barbed fencing. The size and depth depend on the availability of the land. The extra water available on the field will be stored in the pit and that will also be recharged to the ground water.

A summery outline of the artificial recharge plan for the entire district of each block is given at the beginning in tabular forms. This is followed by the salient features of each block along with the detailed structure-wise recharge plan and cost estimates.

Details of the block wise type of suitable recharge structures and volume of water assured for annual recharge for each block, schematic design of recharge structures are annexed at annexure I & II.

This plan is focusing on the technical aspects of the ground water recharge through various means so that various implementing agencies may get the appropriate technical guidelines. The existing/ongoing schemes of the central or state govt. like MANERGA, IWSP, PMKVY, NABARD funded schemes, Urban Development schemes, departmentally funded projects etc. may be benefitted from the recharge plan by incorporating the input in the operational guidelines/ design and for locating the specific sites.

Agriculture university, engineering Collages, Academic and Research Institution, NGO may also take up the pilot or demonstrative projects in the blocks suitable to them to plan at local level as per local conditions.

Sr.no.	Type of Structure	No. of structures	Unit cost in Lakhs	Total cost of structure in Lakhs	Annual Recharge (MCM)
<b>ROOF TOP RAIN WATER HARVESTING IN RURAL AND URBEN AREAS</b>					
1	<b>Artificial Recharge Plan For Urban Areas.</b>	10422	0.25	<b>26.055</b>	<b>0.6797</b>
2	<b>Roof Top Rain Water Harvesting in Rural Areas</b>	19397	0.25	<b>48.4925</b>	<b>1.473</b>
	<b>Total</b>	24309	<b>0.25</b>	<b>60.7725</b>	<b>2.1527</b>
<b>ARTIFICIAL RECHARGE IN FARMS</b>					
1	<b>Artificial Recharge Plan Through Recharge Pits.</b>	30931	0.35	108.2585	28.881
			<b>Total</b>	<b>108.2585</b>	<b>28.881</b>

By the implementation of the proposed recharge structures there will be a reduction of 2.04% in stage of ground water development as tabulated below.

Sr. no.	Total Draft (present) (mcm)	Overdraft (mcm)	Additional Recharge through proposed structures (mcm)	Draft Reduced due to Recharge (mcm)	Stage of development (present)	Stage of development after recharge	Reduction in stage of development after recharge
1	2929.79	-1458.55	31.033	2898.757	196 %	193.96 %	2.04 %

**ARTIFICIAL RECHARGE PLAN THROUGH RECHARGE PITS IN OVER EXPLOITED BLOCKS  
PATIALA DISTRICT**

<b>Block Name</b>	<b>Total area of the village (in hectares )</b>	<b>10%of village area taken for farm recharge (in hectares )</b>	<b>Total number of recharge pits</b>	<b>Annual recharge (MCM)= (Area*Runoff 15%*Rainfall )</b>	<b>Cost of Pit @ Rs.0.35 lakh (Crores)</b>
PATRAN	38752	3875	3875	2.935	13.56
NABHA	60506	6051	6051	5.509	21.17
PATIALA	36469	3647	3647	3.501	12.76
BHUNER HERI	37593	3759	3759	3.609	13.15
SAMANA	39371	3937	3937	3.260	13.77
SANAUR	4936.40	3593	3593	3.330	12.57
GHANAUR	32643	3265	3265	3.633	11.42
RAJPURA	28043.80	2804	2804	3.104	9.81
			<b>30931</b>	<b>28.881</b>	<b>108.21</b>

*Number of Recharge pits are based on following factors:*

Availability of Irrigation wells In the farmer land

Area of sandy strata at shallow depth identified

Type of structure will be recharge pit/ Recharge well( where top three meters is clay)



<b>ROOF TOP RAINWATER HARVESTING IN RURAL AREAS OF PATIALA DISTRICT OF PUNJAB</b>								
<b>Name of District</b>	<b>Sr.no</b>	<b>Name of CD Block</b>	<b>Total area of the village ( in hectares )</b>	<b>Number of households (2011 census)</b>	<b>No of Houses taken for Artificial Recharge ( 10% of total households)</b>	<b>Total No of AR Structures ( one structure for each house )</b>	<b>Total recharge in MCM</b>	<b>Cost @ 0.25 Lacs/structure (Crores)</b>
<b>PATIALA</b>	1	PATRAN	38752	26277	2628	2628	0.159	6.57
	2	NABHA	60506	37100	3710	3710	0.270	9.27
	3	PATIALA	36469	23700	2370	2370	0.182	5.92
	4	BHUNER HERI	37593	22691	2269	2269	0.179	5.67
	5	SAMANA	39371	25063	2506	2506	0.166	6.26
	6	SANAUR	4936.40	5932.7	593	593	0.044	1.48
	7	GHANAUR	32643	25957	2596	2596	0.231	6.49
	8	RAJPURA	28043.80	27250	2725	2725	0.241	6.81
		Total	278314.20	193971	19397	19397	1.473	48.47

**ARTIFICIAL RECHARGE PLAN FOR URBAN AREAS OF DISTRICT PATIALA PUNJAB**

<b>District</b>	<b>Block</b>	<b>Town Name</b>	<b>Total Households</b>	<b>Total Population of Town</b>	<b>Households taken for Artificial Recharge (10%)</b>	<b>Total Roof Top Area (sqm)</b>	<b>Vol of water available for recharge (MCM)</b>	<b>Cost @Rs.0.25 lakh (Crores)</b>
<b>PATIALA</b>	<b>PATRAN</b>	<b>Patran (MCL), Ghagga (NP)</b>	<b>7412</b>	<b>38125</b>	<b>741</b>	<b>148240</b>	<b>0.06</b>	<b>1.85</b>
	<b>NABHA</b>	<b>Nabha (MCL), Bhadson (NP) Ahorán (CT)</b>	<b>17124</b>	<b>85450</b>	<b>1712</b>	<b>342480</b>	<b>0.0167</b>	<b>4.28</b>
	<b>PATIALA</b>	<b>Patiala (MCL + OG), Rurki Kasba (CT)</b>	<b>96033</b>	<b>456755</b>	<b>4223</b>	<b>844560</b>	<b>0.431</b>	<b>10.55</b>
	<b>SAMANA</b>	<b>Samana (MCL)</b>	<b>10853</b>	<b>54072</b>	<b>1085</b>	<b>217060</b>	<b>0.096</b>	<b>2.71</b>
	<b>SANAUR</b>	<b>Sanaur (MCL)</b>	<b>4120</b>	<b>21201</b>	<b>412</b>	<b>82400</b>	<b>0.041</b>	<b>1.03</b>
	<b>GHANAUR</b>	<b>Ghanaur (NP)</b>	<b>1418</b>	<b>6985</b>	<b>142</b>	<b>28360</b>	<b>0.017</b>	<b>0.35</b>
	<b>RAJPURA</b>	<b>Rajpura (MCL)</b>	<b>21074</b>	<b>100692</b>	<b>2107</b>	<b>421480</b>	<b>0.018</b>	<b>5.26</b>
	<b>Total</b>		<b>158034</b>	<b>763280</b>	<b>10422</b>	<b>2084580</b>	<b>0.6797</b>	<b>26.054</b>

## **B. POTENTIAL FOR REDUCTION IN OVERDRAFT BY ENHANCING THE GROUND WATER USE EFFICIENCY OF IRRIGATION TUBE WELLS**

The micro level transformation in the ground water management have vast impact potential to counter extensive ground water depletion faced by the state of Punjab, particularly in overexploited blocks. There are around 80031 tube wells operated by farmers for irrigation through unlined/Katcha (97.08%) open channel system in Patiala district where water from the tube-well is discharge to the agricultural field. In this process huge quantity of ground water is wasted in soil moisture and evaporation losses.

Dynamic ground water resources (2011) indicate that Gross ground water draft for irrigation in Patiala district is estimated at 2855.3 MCM. It is expected that around 54% of over draft can be brought down by switching over to underground/surface pipeline based distribution from the prevailing unlined open channels. Thereby gross draft will be reduced to the tune of 2067.04 MCM assuming there is no crop diversification by the farmers.

The benefit will lead to saving of precious ground water resources in overexploited blocks Patiala Districts. The measure if implemented will bring down the ground water overdraft from 189% to 135 %. The category of the blocks will also improve drastically resulting in boosting of agriculture and industrial development otherwise not sustainable in majority of the blocks in the state.

The tube wells also consume enormous electricity which is subsidized and government incurs significant revenue on this account. The measures therefore will result in saving of energy and money. Pollution impact will be reduced whenever diesel engines are used by the farmers. The environmental and ecological condition in the irrigated land will improve. Unwanted weed growth will also be controlled inside the farm land. This will also be useful in the waterlogged/ shallow water table areas as the seepage losses in these areas also aggravate the water logging.

**Government should make/launch a mission mode program for installing the underground pipe lines instead of having *katcha* channel in the entire Punjab.** Heavy ground water overdraft can be reduced by these efforts. This will ensure **more crops per drop.**

**POTENTIAL FOR REDUCTION IN OVERDRAFT BY ENHANCING THE GROUND WATER USE EFFICIENCY IN IRRIGATION TUBEWELLS, PATIALA DISTRICT**













Net Annual Ground Water Availability (mcm)	Total Draft (present) (mcm)	Gross Irrigation Draft (present) (mcm)	Gross Ground Water Draft for Domestic and industrial supply (mcm)	Percentage of unlined channel	Wastage through unlined channel, (mcm) (Col 3 X Col5 X 0.30 <sup>#</sup> )	Potential of Reduced irrigation overdraft (Col3-col6) (mcm)	Gross draft after saving of water (mcm) (Col 7+Col4)	Present Stage of development (%)	Stage of development afterwards((Col 8/Col1)X 100) (%)	Reduction in stage of development after constructing pucca canal (Col9-Col10) (%)
1	2	3	4	5	6	7	8	9	10	11
1531.10	2898.6	2855.3	43.3	97.08	831.58	2023.72	2067.04	189	135	54

*# losses from open kuchha channel are around 30%.*

**COST ESTIMATE OF UNDERGROUND PIPE LINE**

District	Block	Irrigated area by ground water scheme (ha)	Percentage of Unlined Channel (%)	Area under unlined Channels	Total cost @Rs.0.50 lack per hector(in cr ) =Total irrigated area (by ground water scheme) of the block *0.5 *Col4	Total Cost in Rs. Crores. District wise
1	2	3	4	5	6	7
<b>PATIALA</b>	Patran	32311	97.08	31368	156.84	1135.19
	Samana	25377	97.08	24636	123.18	
	Nabha	45840	97.08	44501	222.51	
	Patiala	28334	97.08	27507	137.53	
	Sanaur	27341	97.08	26543	132.71	
	Bhunerheri	28386	97.08	27557	137.79	
	Ghanaur	23673	97.08	22982	114.91	
	Rajpura	22604	97.08	21944	109.72	

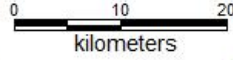
### SALIENT FEATURES OF HYDROGEOLOGY OF DISTRICT PATIALA

Wells Feasible	Rigs Suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures
Tube Wells	Direct and Reverse Rotary	60 - 300	1300 - 2500	Recharge Shaft with Injection Well
Tube Wells	Direct and Reverse Rotary	50 - 160	1000 - 1300	Recharge Shaft with Injection Well
Tube Wells	Direct and Reverse Rotary	20 - 70	600 - 1000	Recharge Shaft with Injection Well
DEPTH TO WATER LEVEL				
	2.00 - 5.00 mbgl	 National Highway	 International Boundary	
	5.00 - 10.00 mbgl	 Canals	 State Boundary	
	10.00 - 20.00 mbgl	 Water Bodies	 Block Boundary	
	20.00 - 40.00 mbgl	 Major Drainage	 Block Headquarters	

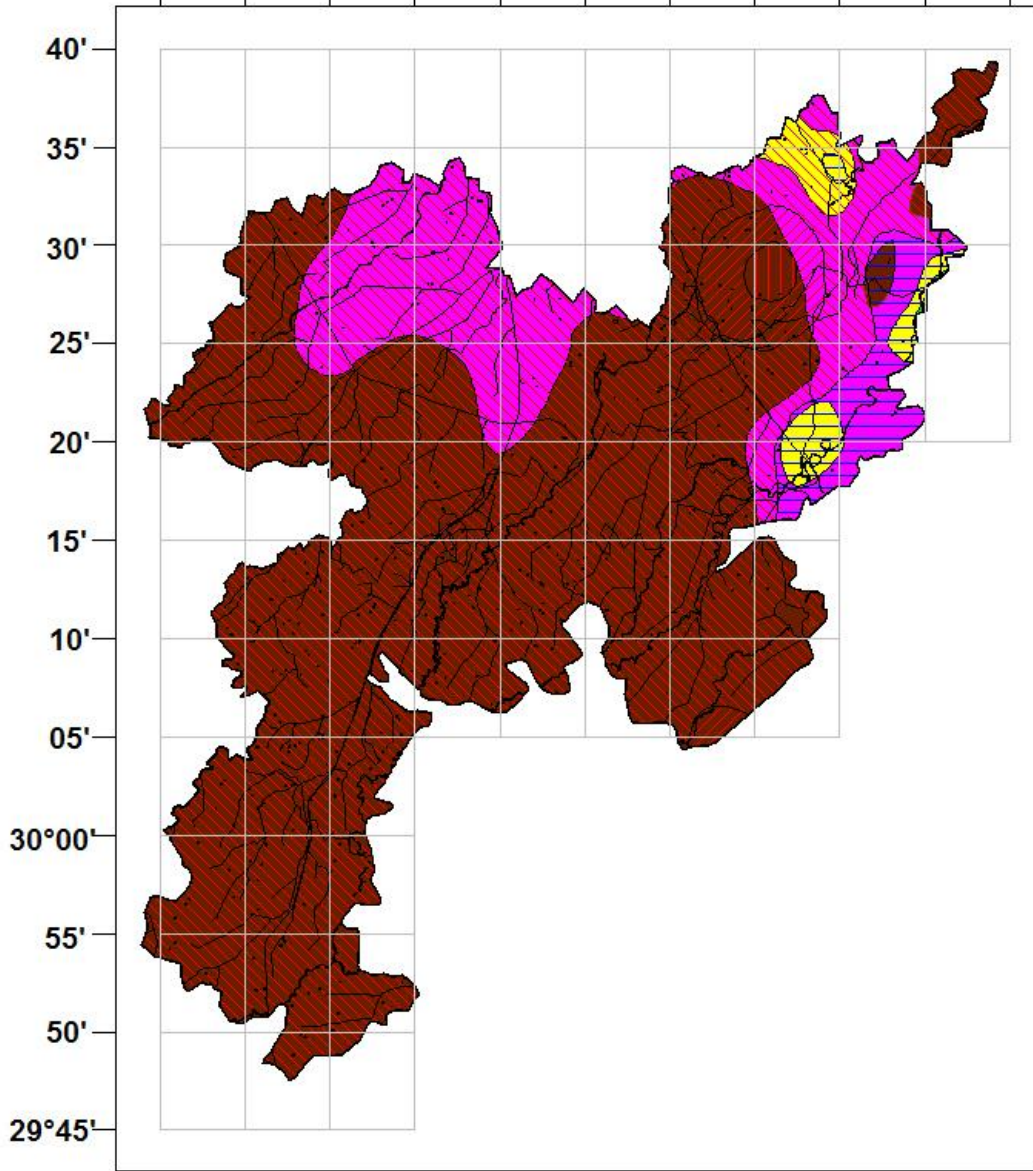
### OTHER INFORMATION

Name of State	Punjab
Name of District	Patiala
Geographical Area	3218 sq.km
Major Geological Formation	Alluvium
Major Drainage System	Ghaggar
Population (as on 2011)	18,92,282
Total Number of Blocks	8
Existing Major/Medium Irrigation Projects	Bhakra Canal
Utilizable Ground Water Resources 2011	1494.51 mcm
Net Ground Water Draft	2929.79 mcm
Stage of Ground Water Development	196 %
Average Annual Rainfall	677 mm
Range of Mean Daily Temperature	7° - 40°
Over Exploited Blocks	PATIALA, BUNER HERI NABHA, SAMANA GHANAUR, RAJPURA PATRAN, SANAUR

**PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER  
DISTRICT PATIALA, PUNJAB**



76°00' 05' 10' 15' 20' 25' 30' 35' 40' 45' 50'



**Legend**

Refer Salient Features of Hydrogeology

**Decadal mean water level trend (m)**



***BLOCK***

***WISE PLAN OF***

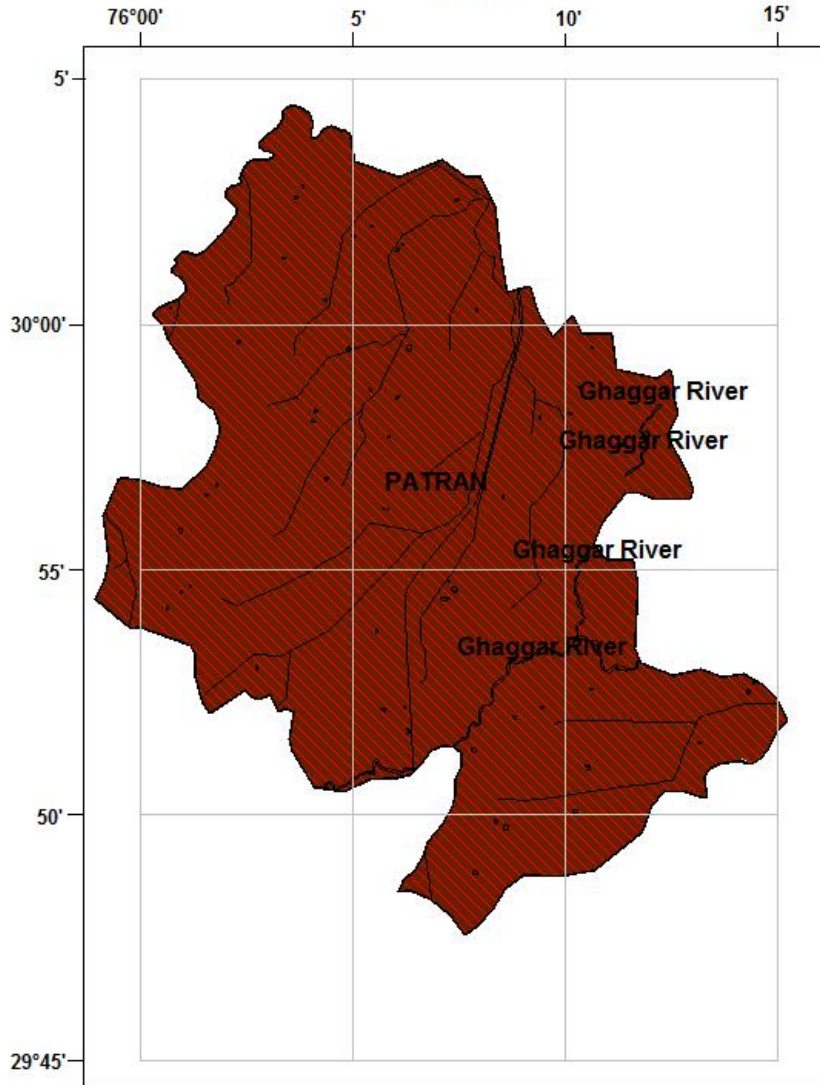
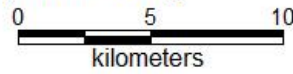
***DISTRICT***

***PATIALA***

***PUNJAB***

***(8 OE BLOCKS)***

**BLOCK PATRAN DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**




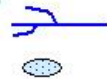
**Legend**

Decadal mean water level (post monsoon)

 20.00 - 40.00 mbgl

Decadal mean water level trend (m)

 - 0.1 - 0.00



**Canal Network**

**Water Bodies**

2628

**No. of Recharge Structures  
in Rural Villages**

741

**No. of Recharge Structures  
in Urban Towns**

3875

**Recharge Pits in  
Agricultural Land**



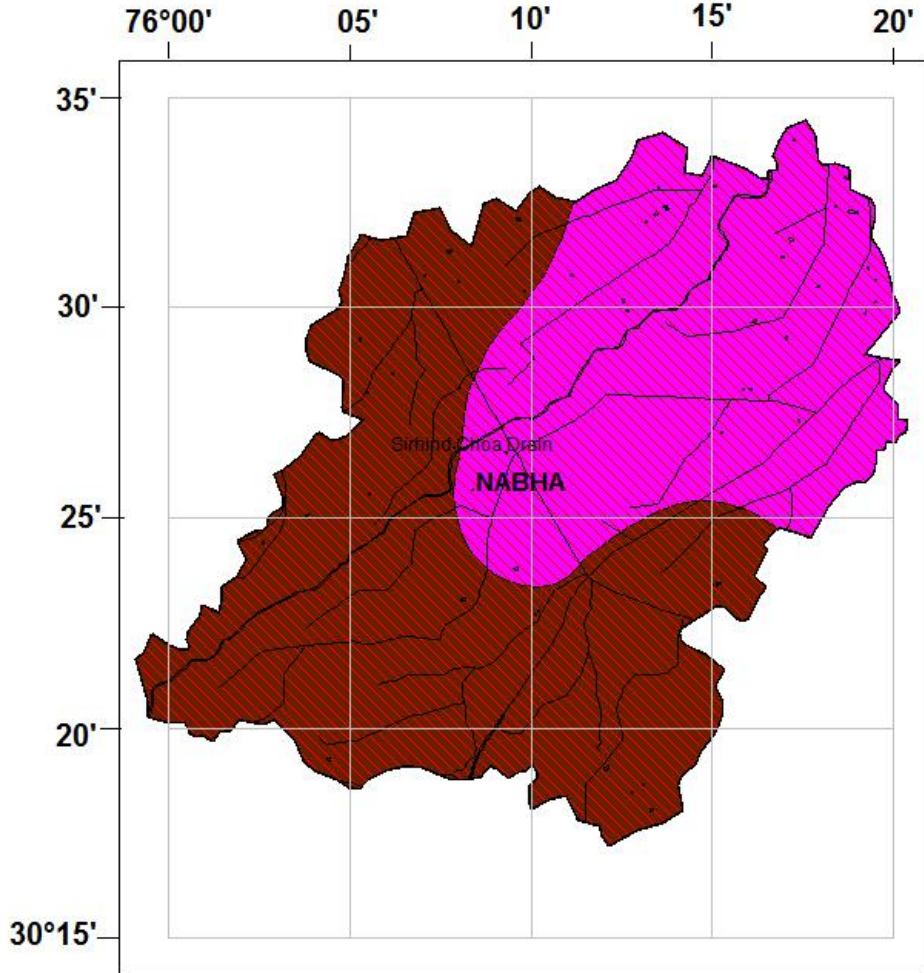
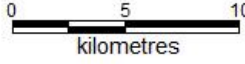
## Ground Water Scenario of Block

<b>Block Name:- Patran</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	372.3
	• Number of Villages inhabited • Un-inhabited	81 0
	ii) Average Annual Rainfall (mm)	511
	iii) Area feasible for Artificial Recharge	372.3
	iv) Village identified under scarcity of Water?	57
	v) Village covered under water supply?	57
	vi) Water Tank exists in the village?	27
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	395.50
	• Net Area Sown (Sq.Km)	330.98
	• Area Sown More than Once (Sq.Km)	3.23
	• Total Cropped Area (Sq.Km)	334.21
	• Cropping Intensity	101
	• Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	• Pre- monsoon: (May 2015) • 36.51-37.97 (mbgl)	20.00-40.00 (mbgl)

	<ul style="list-style-type: none"> <li>•Post –monsoon: (Nov2014)</li> <li>•36.10-36.69(mbgl)</li> </ul>		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	2	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	$1.95*10^{-3}$ to $4.7*10^{-3}$	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in $\mu\text{S}/\text{cm}$ at 25 <sup>0</sup> c	1065	1065
	•NO <sub>3</sub> (mg/l)	70	70
	•F (mg/l)	0.56	0.56
	•As (mg/l)	0.0013	0.0013
8.	DYANMIC GROUND WATER RESOURCES in MCM	<b>2011</b>	
	•Net Ground Water Availability (Mcm)	112.27	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	459.32	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	3.77	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	463.09	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.84	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-352.79	
	•Stage of Ground Water Development / Over Draft (%)	4.12	
	•Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive irrigation</i>	Extensive irrigation
9.	Percentage of sand thickness up to 50 m depth (Average)	Thickness(m)	Percentage %
		--	--
10	Volume of unsaturated zone available for recharge (MCM)	668.97	

11.	Volume of water required for recharge (MCM)	889.78		
12.	Volume of surplus water available for recharge(MCM)	14.60		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3875	<b>13.56</b>	<b>2.935</b>
14	RWH Rural @ Rs. 25000/-	2628	<b>6.57</b>	<b>0.159</b>
15	RWH Urban@ Rs. 25000/-	741	<b>1.85</b>	<b>0.06</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	31368	<b>156.84</b>	<b>132.32</b>
	<b>TOTAL</b>		<b>178.83</b>	<b>135.47</b>

**BLOCK NABHA DISTRICT PATIALA, PUNJAB**  
**DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON**  
**VS**  
**DECADAL MEAN TREND POST MONSOON**  
**(2004-2013)**



**Legend**

**Decadal mean water level (post monsoon)**

- 10.00 - 20.00 mbgl
- 20.00 - 40.00 mbgl

**Decadal mean water level trend (m)**

- 0.1 - 0.00

- No. of Recharge Structures in Rural Villages**
- No. of Recharge Structures in Urban Towns**
- Recharge Pits in Agricultural Land**
- Thickness of Sand**
- Canal Network**
- Water Bodies**

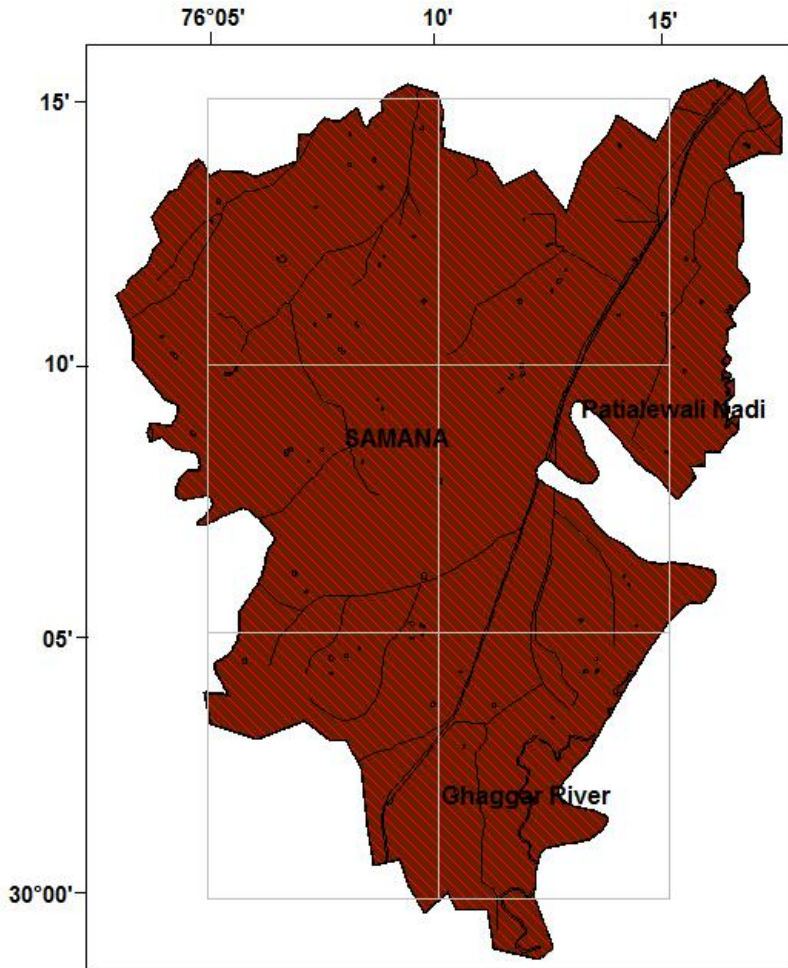
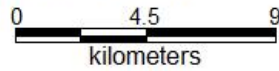
# Ground Water Scenario of Block

<b>Block Name:- Nabha</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	548.2
	•Number of Villages inhabited •Un-inhabited	168 2
	ii) Average Annual Rainfall (mm)	609
	iii) Area feasible for Artificial Recharge	548.2
	iv) Village identified under scarcity of Water?	170
	v) Village covered under water supply?	162
	vi) Water Tank exists in the village?	42
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	618.29
	•Net Area Sown (Sq.Km)	502.20
	•Area Sown More than Once (Sq.Km)	4.98
	•Total Cropped Area (Sq.Km)	507.18
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	•Pre- monsoon: (May 2015) •22.94-26.18 (mbgl)	20.00-40.00 (mbgl)
	•Post –monsoon: (Nov2014) •22.70-26.99(mbgl)	








6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	5	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	1.95*10 <sup>-3</sup> to 4.7*10 <sup>-3</sup>	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY		Min      Max
	•EC in µS/cm at 25 <sup>0</sup> c	690	1530
	•NO <sub>3</sub> (mg/l)	--	--
	•F (mg/l)	0.44	1.36
	•As (mg/l)	0.0002	0.0074
8.	DYANMIC GROUND WATER RESOURCES in MCM		<b>2011</b>
	•Net Ground Water Availability (Mcm)	414.79	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	613.47	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	7.65	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	621.12	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	11.26	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-209.93	
	•Stage of Ground Water Development/ Over draft (%)	150	
	•Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation
	9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> 34
10	Volume of unsaturated zone available for recharge (MCM)	985.03	
11.	Volume of water required for recharge (MCM)	1310.17	

12.	Volume of surplus water available for recharge(MCM)	21.50		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	6051	<b>21.18</b>	<b>5.509</b>
14	RWH Rural @ Rs. 25000/-	3710	<b>9.28</b>	<b>0.27</b>
15	RWH Urban@ Rs. 25000/-	1712	<b>4.28</b>	<b>0.0167</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	44501	<b>222.51</b>	<b>176.74</b>
	<b>TOTAL</b>		<b>257.24</b>	<b>182.5357</b>

**BLOCK SAMANA DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**



**Legend**

<b>Decadal mean water level (post monsoon)</b>		20.00 - 40.00 mbgl		<b>No. of Recharge Structures in Rural Villages</b>
<b>Decadal mean water level trend (m)</b>		- 0.1 - 0.00		<b>No. of Recharge Structures in Urban Towns</b>
		- 0.2 .. - 0.1		<b>Recharge Pits in Agricultural Land</b>
		<b>Water Bodies</b>		<b>Thickness of Sand</b>
		<b>Canal Network</b>		



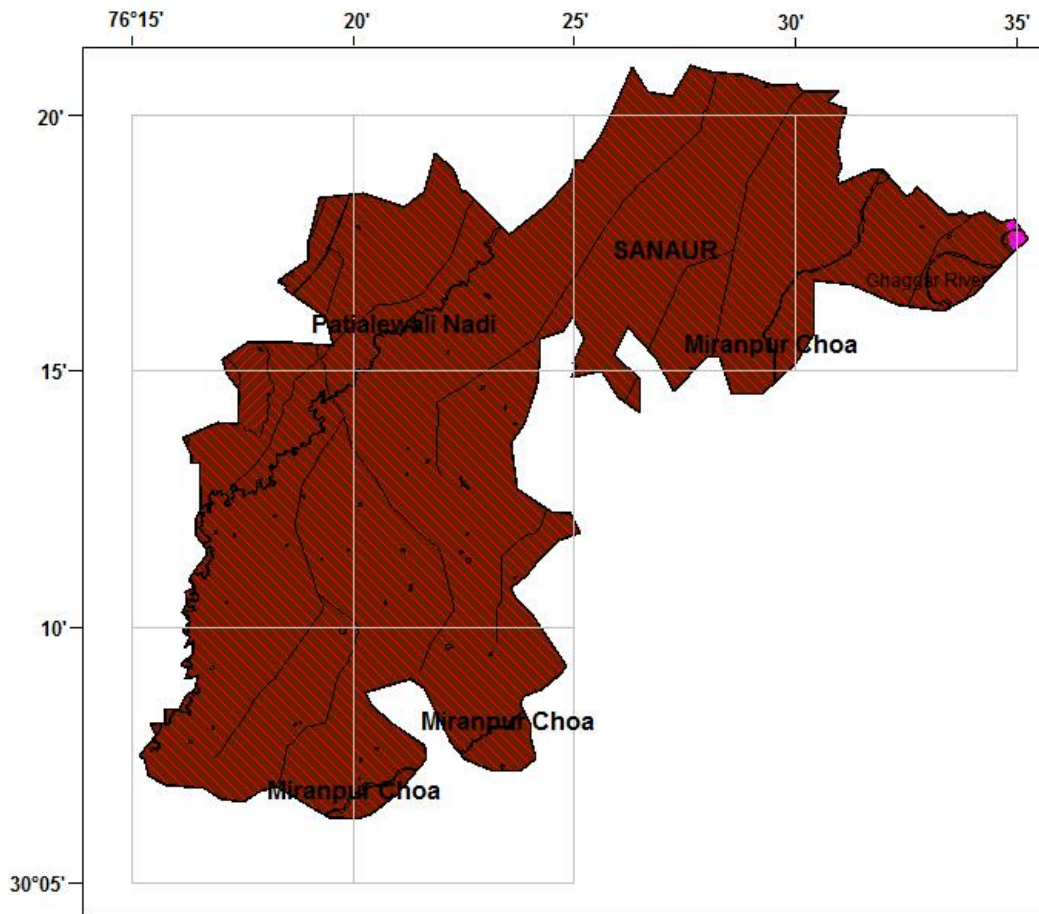
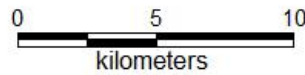
## Ground Water Scenario of Block

<b>Block Name:- Samana</b>		<b>State:- PUNJAB</b>
<b>District:- Patiala</b>		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	396.5
	•Number of Villages inhabited •Un-inhabited	86 0
	ii) Average Annual Rainfall (mm)	558
	iii) Area feasible for Artificial Recharge	396.5
	iv) Village identified under scarcity of Water?	79
	v) Village covered under water supply?	79
	vi) Water Tank exists in the village?	31
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	398.02
	•Net Area Sown (Sq.Km)	348.69
	•Area Sown More than Once (Sq.Km)	3.46
	•Total Cropped Area (Sq.Km)	351.73
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	•Pre- monsoon: (May 2015) •17.30-34.90 (mbgl)	20.00 -40.00 (mbgl)
	•Post –monsoon: (Nov2014) •24.80-34.20(mbgl)	

6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)			
	•No of wells drilled		1	
	•Depth Range (m)		49.0-309.42	
	•Discharge (Ipm)		606-5700	
	Aquifer Parameters			
	•Transmissivity (m <sup>2</sup> /day)		154-9400	
	•Storativity		1.95*10 <sup>-3</sup> to 4.7*10 <sup>-3</sup>	
	•Specified yield		0.072	
7.	GROUND WATER QUALITY		Min	Max
	•EC in $\mu\text{S/cm}$ at 25 <sup>0</sup> c		265	765
	•NO <sub>3</sub> (mg/l)		--	77
	•F (mg/l)		0.26	0.72
	•As (mg/l)		---	---
8.	DYANMIC GROUND WATER RESOURCES in MCM		2011	
	•Net Ground Water Availability (Mcm)		139.52	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)		269.81	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)		4.15	
	•Existing Gross Ground Water Draft for all Uses (Mcm)		273.96	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)		6.43	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)		-136.72	
	•Stage of Ground Water Development/ Over Draft (%)		196	
	•Category of Block		OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level		Extensive Irrigation	Extensive irrigation
	9.	Percentage of sand thickness up to 50 m depth (Average)	Thickness(m) 13	Percentage % 26
10	Volume of unsaturated zone available for recharge (MCM)	712.45		



11.	Volume of water required for recharge (MCM)	947.61		
12.	Volume of surplus water available for recharge(MCM)	15.55		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3937	<b>13.78</b>	<b>3.26</b>
14	RWH Rural @ Rs. 25000/-	2506	<b>6.27</b>	<b>0.17</b>
15	RWH Urban@ Rs. 25000/-	1085	<b>2.71</b>	<b>0.10</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	24636	<b>123.18</b>	<b>77.74</b>
	<b>TOTAL</b>		<b>145.94</b>	<b>81.26</b>

**BLOCK SANAUR DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**








**Legend**

**Decadal mean water level (post monsoon)**

-  10.00 - 20.00 mbgl
-  20.00 - 40.00 mbgl

**Decadal mean water level trend (m)**

-  - 0.1 - 0.00
-  - 0.2 .. - 0.1

-  **No. of Recharge Structures in Rural Villages**
-  **No. of Recharge Structures in Urban Towns**
-  **Recharge Pits in Agricultural Land**
-  **Canal Network**
-  **Water Bodies**

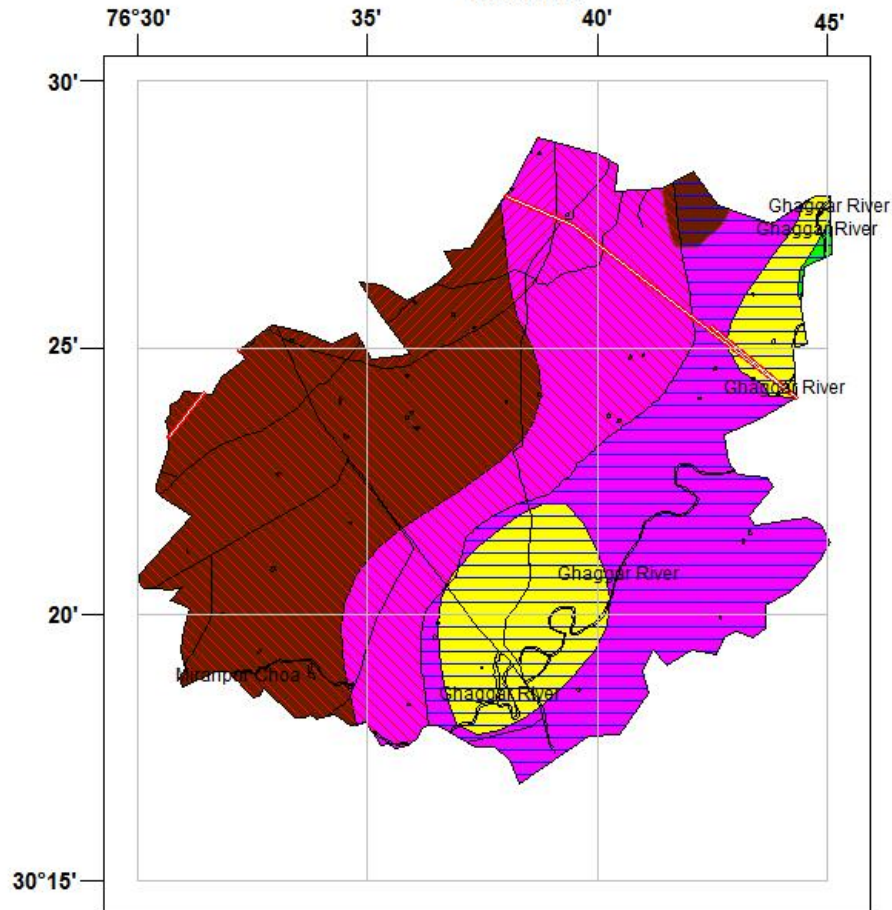
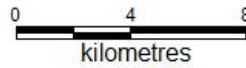
## Ground Water Scenario of Block

<b>Block Name:- Sanaur</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	339.8
	•Number of Villages inhabited •Un-inhabited	101 4
	ii) Average Annual Rainfall (mm)	627
	iii) Area feasible for Artificial Recharge	339.8
	iv) Village identified under scarcity of Water?	99
	v) Village covered under water supply?	94
	vi) Water Tank exists in the village?	33
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	341.22
	•Net Area Sown (Sq.Km)	276.39
	•Area Sown More than Once (Sq.Km)	2.71
	•Total Cropped Area (Sq.Km)	279.10
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINAT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	•Pre- monsoon: (May 2015)	20.00-40.00 (mbgl)
	•Post –monsoon: (Nov2014)	

6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled		--
	•Depth Range (m)		49.0-309.42
	•Discharge (Ipm)		606-5700
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)		154-9400
	•Storativity		$1.95*10^{-3}$ to $4.7*10^{-3}$
	•Specified yield		0.072
7.	GROUND WATER QUALITY		Min      Max
	•EC in $\mu$ S/cm at 25 <sup>0</sup> c		--      --
	•NO <sub>3</sub> (mg/l)		--      --
	•F (mg/l)		--      --
	•As (mg/l)		---      ---
8.	DYANMIC GROUND WATER RESOURCES in MCM		<b>2011</b>
	•Net Ground Water Availability (Mcm)		153.98
	•Existing Gross Ground Water Draft for Irrigation (Mcm)		341.72
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)		3.38
	•Existing Gross Ground Water Draft for all Uses (Mcm)		345.10
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)		5.23
	•Net Ground Water Availability for Future Irrigation Development (Mcm)		-192.98
	•Stage of Ground Water Development (%)		224
	•Category of Block		OE
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level		<i>Extensive Irrigation</i> Extensive Irrigation
	9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --
10	Volume of unsaturated zone available for recharge (MCM)	610.57	
11.	Volume of water required for recharge (MCM)	812.10	




12.	Volume of surplus water available for recharge(MCM)	13.33		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3593	<b>12.58</b>	<b>3.33</b>
14	RWH Rural @ Rs. 25000/-	593	<b>1.48</b>	<b>0.044</b>
15	RWH Urban@ Rs. 25000/-	412	<b>1.03</b>	<b>0.041</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	26543	<b>132.72</b>	<b>98.46</b>
	<b>TOTAL</b>		<b>147.80</b>	<b>101.875</b>

**BLOCK GHANAUR DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**






**Legend**

**Decadal mean water level (post monsoon)**

-  5.00 - 10.00 mbgl
-  10.00 - 20.00 mbgl
-  20.00 - 40.00 mbgl

**Decadal mean water level trend (m)**

-  0.00 - 0.1114
-  - 0.1 - 0.00
-  - 0.2 .. - 0.1

2596

**No. of Recharge Structures in Rural Villages**

142

**No. of Recharge Structures in Urban Towns**

3265

**Recharge Pits in Agricultural Land**

15

**Thickness of Sand**



**Canal Network**



**Water Bodies**



**National Highway**



## Ground Water Scenario of Block

<b>Block Name:- Ghanaur</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	443.2
	•Number of Villages inhabited •Un-inhabited	116 3
	ii) Average Annual Rainfall (mm)	751
	iii) Area feasible for Artificial Recharge	443.2
	iv) Village identified under scarcity of Water?	120
	v) Village covered under water supply?	120
	vi) Water Tank exists in the village?	24
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	331.35
	•Net Area Sown (Sq.Km)	262.62
	•Area Sown More than Once (Sq.Km)	2.49
	•Total Cropped Area (Sq.Km)	265.11
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	•Pre- monsoon: (May 2015) •5.26-31.80	10.00 -40.00 (mbgl)

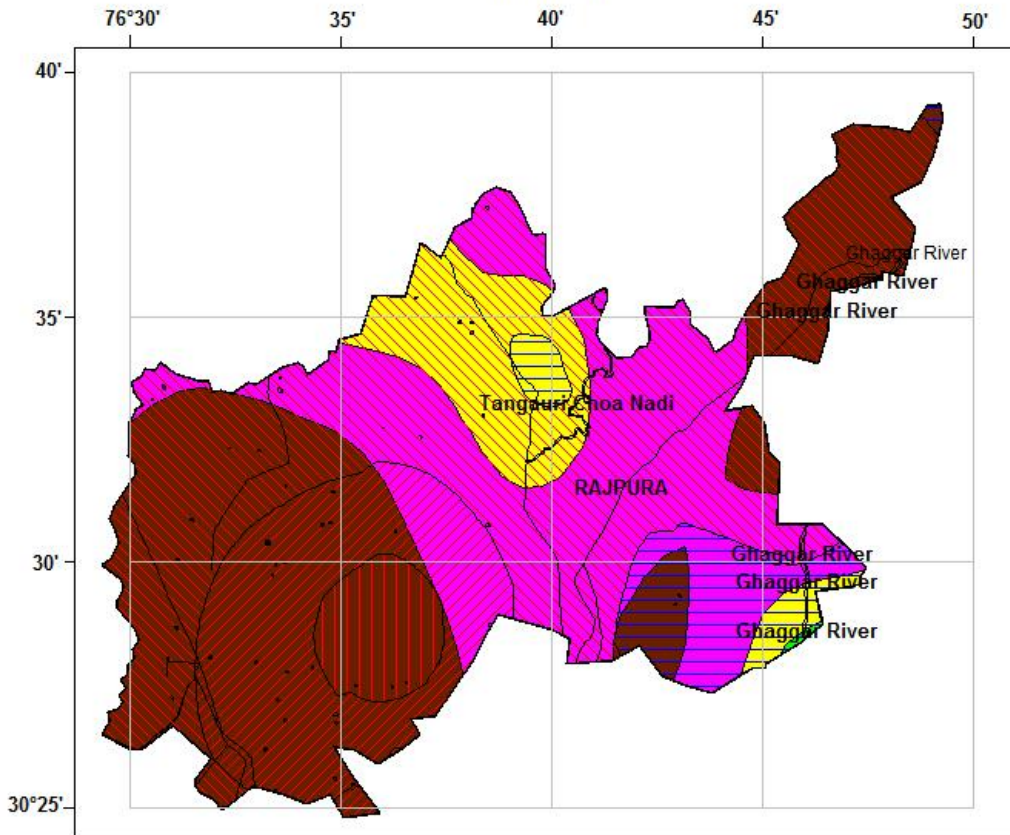
	<ul style="list-style-type: none"> <li>•Post –monsoon: (Nov2014)</li> <li>•5.57-31.65 (mbgl)</li> </ul>		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	2	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	1.95*10 <sup>-3</sup> to 4.7*10 <sup>-3</sup>	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 <sup>0</sup> c	690	1530
	•NO3 (mg/l)	--	--
	•F (mg/l)	0.44	1.36
	•As (mg/l)	0.0002	0.0074
8.	DYANMIC GROUND WATER RESOURCES in MCM	<b>2011</b>	
	•Net Ground Water Availability (Mcm)	153.07	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	226.23	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	3.48	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	229.71	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.39	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-78.55	
	•Stage of Ground Water Development / Over Draft (%)	150	
	•Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> 15	Percentage % 30
10	Volume of unsaturated zone available for recharge (MCM)	796.36	
11.	Volume of water required for recharge (MCM)	1059.23	

12.	Volume of surplus water available for recharge(MCM)	17.38		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3265	<b>11.43</b>	<b>3.633</b>
14	RWH Rural @ Rs. 25000/-	2596	<b>6.49</b>	<b>0.231</b>
15	RWH Urban@ Rs. 25000/-	142	<b>0.36</b>	<b>0.017</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	22982	<b>114.91</b>	<b>65.18</b>
	<b>TOTAL</b>		<b>133.18</b>	<b>69.061</b>

**BLOCK RAJPURA DISTRICT PATIALA, PUNJAB  
DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
VS  
DECADAL MEAN TREND POST MONSOON  
(2004-2013)**



0      5      10  
kilometers

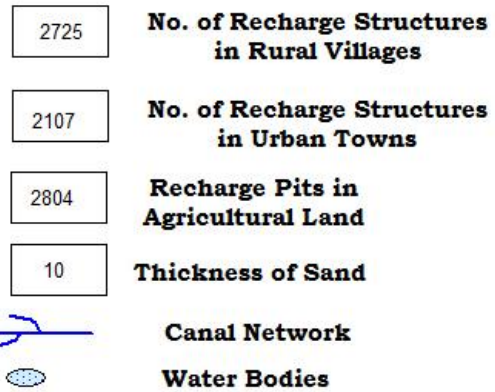
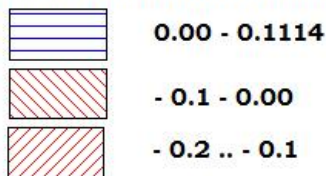


**Legend**

**Decadal mean water level (post monsoon)**



**Decadal mean water level trend (m)**



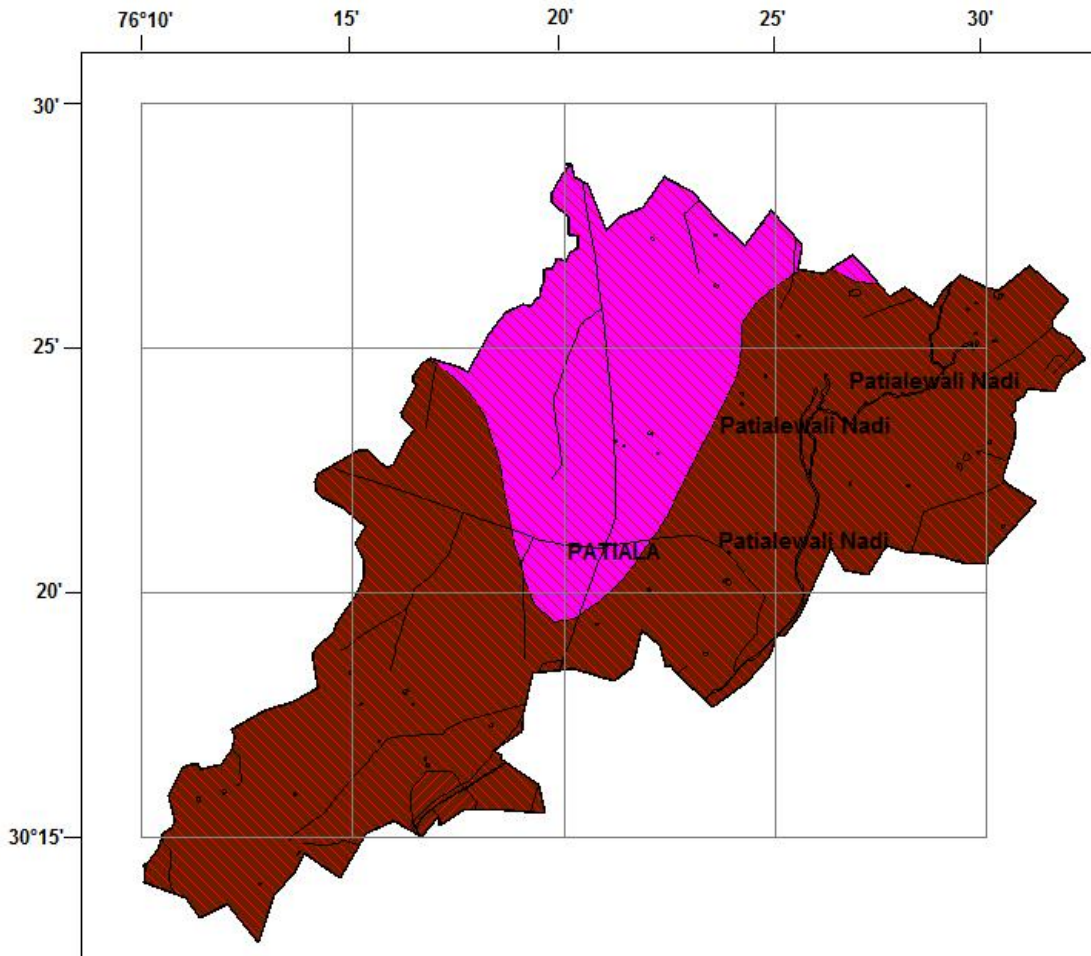
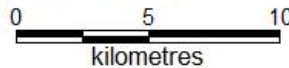
## Ground Water Scenario of Block

<b>Block Name:- Rajpura</b>		<b>State:- PUNJAB</b>
<b>District:- Patiala</b>		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	399.4
	•Number of Villages inhabited •Un-inhabited	155 1
	ii) Average Annual Rainfall (mm)	744
	iii) Area feasible for Artificial Recharge	399.4
	iv) Village identified under scarcity of Water?	114
	v) Village covered under water supply?	112
	vi) Water Tank exists in the village?	39
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	280.65
	•Net Area Sown (Sq.Km)	237.60
	•Area Sown More than Once (Sq.Km)	2.24
	•Total Cropped Area (Sq.Km)	239.84
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>
5.	HYDROGEOLOGY	
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)
	•Pre- monsoon: (May 2015) •28.87-39.20 (mbgl)	20.00 -40.00 (mbgl)
	•Post –monsoon: (Nov2014)	

	•27.22-38.30(mbgl)		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	2	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	1.95*10 <sup>-3</sup> to 4.7*10 <sup>-3</sup>	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 <sup>0</sup> c	460	5770
	•NO <sub>3</sub> (mg/l)	--	76
	•F (mg/l)	0.26	1.6
	•As (mg/l)	0.0002	0.0014
8.	DYANMIC GROUND WATER RESOURCES in MCM	<b>2011</b>	
	•Net Ground Water Availability (Mcm)	138.46	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	246.71	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	6.80	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	253.51	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	10.52	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-118.78	
	•Stage of Ground Water Development/ Over Draft (%)	183	
	•Category of Block	OE	
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> 10	Percentage % 20
10	Volume of unsaturated zone available for recharge (MCM)	717.66	
11.	Volume of water required for recharge (MCM)	954.55	

12.	Volume of surplus water available for recharge(MCM)	15.66		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	2804	<b>9.81</b>	<b>3.104</b>
14	RWH Rural @ Rs. 25000/-	2725	<b>6.81</b>	<b>0.241</b>
15	RWH Urban@ Rs. 25000/-	2107	<b>5.27</b>	<b>0.018</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	21944	<b>109.72</b>	<b>71.09</b>
	<b>TOTAL</b>		<b>131.61</b>	<b>74.453</b>

**BLOCK PATIALA DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**



**Legend**

**Decadal mean water level (post monsoon)**

- 10.00 - 20.00 mbgl
- 20.00 - 40.00 mbgl

**Decadal mean water level trend (m)**

- 0.1 - 0.00
- 0.2 .. - 0.1

- 2370 **No. of Recharge Structures in Rural Villages**
- 4223 **No. of Recharge Structures in Urban Towns**
- 3647 **Recharge Pits in Agricultural Land**
- Canal Network**
- Water Bodies**
- National Highway**



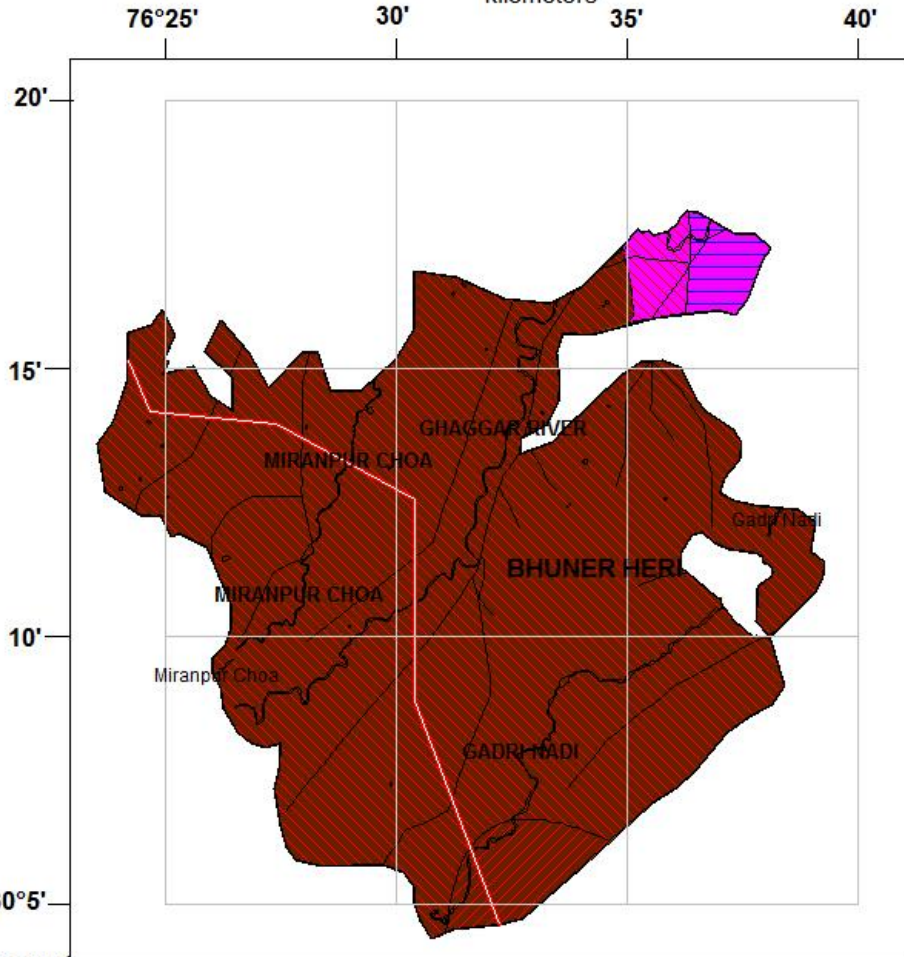
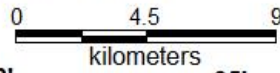
## Ground Water Scenario of Block

<b>Block Name:- Patiala</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	<i>423.1</i>
	•Number of Villages inhabited •Un-inhabited	<i>104</i> <i>2</i>
	ii) Average Annual Rainfall (mm)	<i>645</i>
	iii) Area feasible for Artificial Recharge	<i>423.1</i>
	iv) Village identified under scarcity of Water?	<i>105</i>
	v) Village covered under water supply?	<i>101</i>
	vi) Water Tank exists in the village?	<i>47</i>
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin  Sub-Basin	<i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	362.81
	•Net Area Sown (Sq.Km)	299.27
	•Area Sown More than Once (Sq.Km)	2.89
	•Total Cropped Area (Sq.Km)	302.16
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINAT GEOLOGICAL FORMATIONS	<i>Recent alluvium</i>

5.	HYDROGEOLOGY		
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)	
	<ul style="list-style-type: none"> <li>•Pre- monsoon: (May 2015)</li> <li>•22.10-28.55(mbgl)</li> </ul>	20.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> <li>•Post –monsoon: (Nov2014)</li> <li>•20.25-27.50(mbgl)</li> </ul>		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	6	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	1.95*10 <sup>-3</sup> to 4.7*10 <sup>-3</sup>	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in $\mu\text{S}/\text{cm}$ at 25 <sup>0</sup> c	--	--
	•NO <sub>3</sub> (mg/l)	--	--
	•F (mg/l)	--	--
	•As (mg/l)	--	--
8.	DYANMIC GROUND WATER RESOURCES in MCM	<b>2011</b>	
	•Net Ground Water Availability (Mcm)	187.33	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	347.90	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	11.30	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	359.21	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	17.51	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-178.08	

	•Stage of Ground Water Development / Over Draft (%)	192		
	•Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --	Percentage % --	
10	Volume of unsaturated zone available for recharge (MCM)	760.25		
11.	Volume of water required for recharge (MCM)	1011.19		
12.	Volume of surplus water available for recharge(MCM)	16.59		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3647	<b>12.76</b>	<b>3.501</b>
14	RWH Rural @ Rs. 25000/-	2370	<b>5.93</b>	<b>0.182</b>
15	RWH Urban@ Rs. 25000/-	4223	<b>10.56</b>	<b>0.431</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	27507	<b>137.54</b>	<b>100.23</b>
	<b>TOTAL</b>		<b>166.78</b>	<b>104.344</b>

**BLOCK BUNER HERI DISTRICT PATIALA, PUNJAB  
 DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON  
 VS  
 DECADAL MEAN TREND POST MONSOON  
 (2004-2013)**



**Legend**

**Decadal mean water level (post monsoon)**



10.00 - 20.00 mbgl



20.00 - 40.00 mbgl

**Decadal mean water level trend (m)**



0.00 - 0.1114



- 0.1 - 0.00



- 0.2 .. - 0.1

2269

**No. of Recharge Structures  
in Rural Villages**

3759

**Recharge Pits in  
Agricultural Land**



**Water Bodies**



**National Highway**



**Canal Network**

## Ground Water Scenario of Block

<b>Block Name:- Bhuner Heri</b>		
<b>District:- Patiala</b>		<b>State:- PUNJAB</b>
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	380.2
	•Number of Villages inhabited •Un-inhabited	146 6
	ii) Average Annual Rainfall (mm)	667
	iii) Area feasible for Artificial Recharge	380.2
	iv) Village identified under scarcity of Water?	142
	v) Village covered under water supply?	141
	vi) Water Tank exists in the village?	38
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages  Basin  Sub-Basin	  <i>Ghaggar 100%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	370.25
	•Net Area Sown (Sq.Km)	307.91
	•Area Sown More than Once (Sq.Km)	3.01
	•Total Cropped Area (Sq.Km)	310.92
	•Cropping Intensity	101
	•Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINAT GEOLOGICAL	<i>Recent alluvium</i>

	FORMATIONS		
5.	HYDROGEOLOGY		
	Major Water bearing Formation (Aquifer)	Fine to coarse Sand	
	Avg. Depth to water level (decadal)	Depth to water level May 2015(mbgl)	
	•Pre- monsoon: (May 2015) •25.55-30.16 (mbgl)	20.00-40.00 (mbgl)	
	•Post –monsoon: (Nov2014) •25.90-32.01 (mbgl)		
6.	GROUND WATERN EXPLORATION BY CGWB (As on 31.03.2015)		
	•No of wells drilled	3	
	•Depth Range (m)	49.0-309.42	
	•Discharge (Ipm)	606-5700	
	Aquifer Parameters		
	•Transmissivity (m <sup>2</sup> /day)	154-9400	
	•Storativity	1.95*10 <sup>-3</sup> to4.7*10 <sup>-3</sup>	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 <sup>0</sup> c	915	1640
	•NO3 (mg/l)	0.5	1.3
	•F (mg/l)	0.7	0.8
	•As (mg/l)	--	--
8.	DYANMIC GROUND WATER RESOURCES in MCM	<b>2011</b>	
	•Net Ground Water Availability (Mcm)	194.98	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	381.13	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	2.95	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	384.09	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	4.57	

	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-190.72		
	•Stage of Ground Water Development / over Draft (%)	197		
	•Category of Block	OE		
	Any specific reasons for high stress on ground water leading to Overexploitation and decline in ground water level	<i>Extensive Irrigation</i>	Extensive Irrigation	
9.	Percentage of sand thickness up to 50 m depth (Average)	<i>Thickness(m)</i> --	Percentage % --	
10	Volume of unsaturated zone available for recharge (MCM)	683.16		
11.	Volume of water required for recharge (MCM)	908.66		
12.	Volume of surplus water available for recharge(MCM)	14.91		
<b>RECHARGE/ CONSERVATION STRUCTURES</b>		<b>Total Number of Recharge Structures</b>	<b>Total Cost (Rs. in crores)</b>	<b>Total Recharge/ Water saving in MCM</b>
13	Farm Recharge @Rs. 35000/-	3759	<b>13.16</b>	<b>3.609</b>
14	RWH Rural @ Rs. 25000/-	2269	<b>5.67</b>	<b>0.179</b>
15	RWH Urban@ Rs. 25000/-	0	<b>0.00</b>	<b>0</b>
16	Underground pipe line (area in hectares) @ Rs. 50000/-	27557	<b>137.79</b>	<b>109.81</b>
	<b>TOTAL</b>		<b>156.61</b>	<b>113.598</b>





### TYPICAL DESIGN FOR RECHARGE PIT IN FARM

