



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

PLAN ON

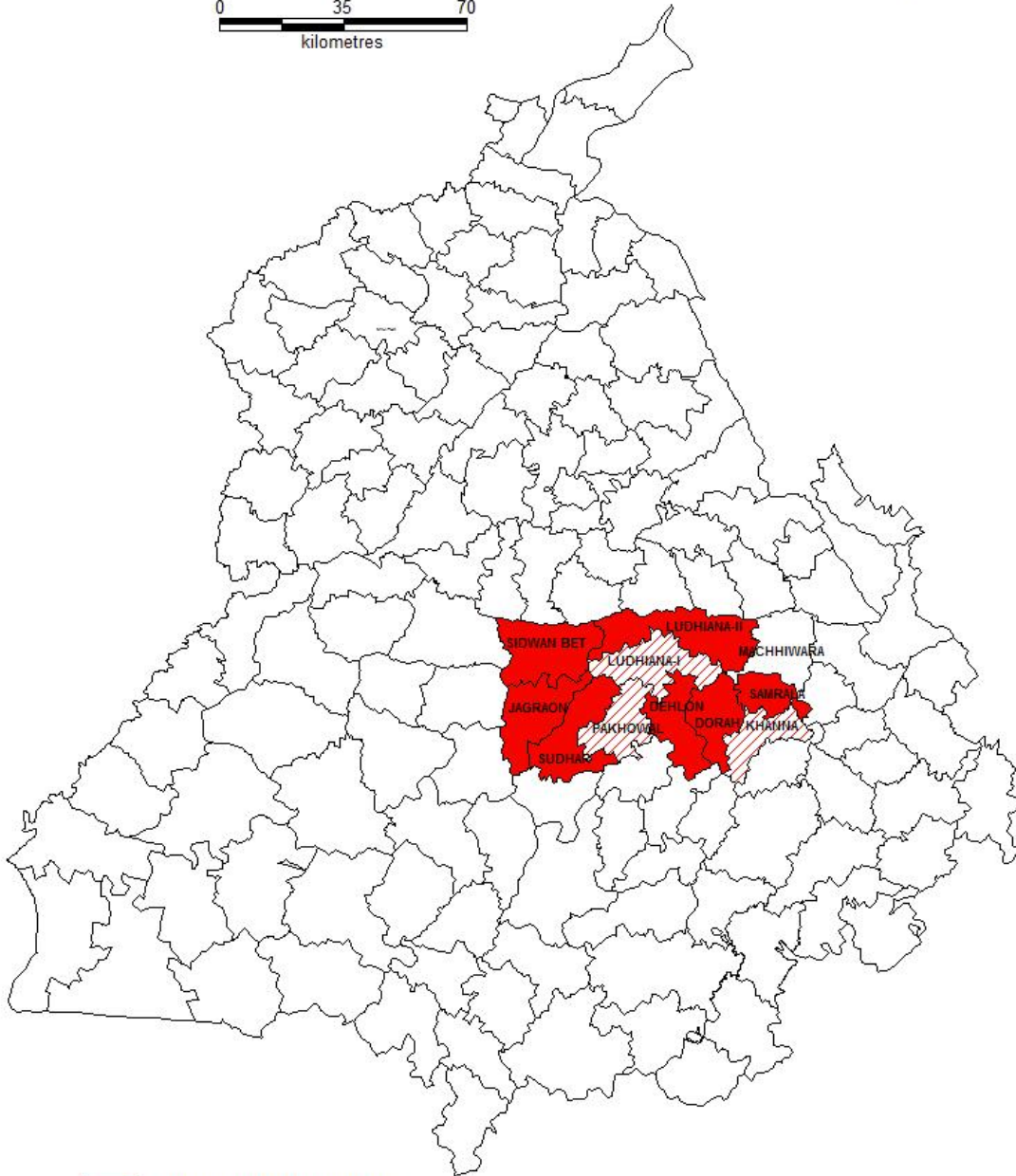
**ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION IN
OVEREXPLOITED BLOCKS OF LUDHIANA DISTRICT, PUNJAB**

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

PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS DISTRICT LUDHIANA, PUNJAB



0 35 70
kilometres



-  OVER EXPLOITED BLOCKS
-  NOTIFIED BLOCKS

PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT LUDHIANA PUNJAB

INTRODUCTION

Ludhiana district falls in central part of Punjab. The district is bounded between North latitude $30^{\circ} 33'$ and $31^{\circ} 01'$ and East longitude $75^{\circ} 25'$ and $76^{\circ} 27'$. The Satluj forms the border of the district in the North with Jalandhar and Hoshiarpur districts. Ropar and Fatehgarhsahib districts marks the eastern and south eastern boundaries. The western border is adjoining Moga and Ferozpur districts. The geographical area of the district is 3790 sq.kms. Administratively Ludhiana district falls under Patiala division. The district has four subdivisions viz-Ludhiana, Khanna, Samrala and Jagraon and eleven development blocks viz.- Ludhiana, Mangat, Doraha, Khanna, Dehlon, Pokhwal, Samrala, Machiwara, Jagraon, Sidhwanbet and Sudhar.

RAINFALL & CLIMATE

The climate of Ludhiana district can be classified as tropical steppe, hot and semi-arid which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrate into the district. The normal annual rainfall of the district is 681 mm which is unevenly distributed over the area in 34 days. The south west monsoon, sets in from last week of June and withdraws in end of September, contributed about 78% of annual rainfall. July and August are the wettest months. Rest 22% rainfall is received during non-monsoon period in the wake of western disturbances and thunder storms. Generally rainfall in the district increases from southwest to northeast.

GEOMORPHOLOGY & SOIL TYPE

The district area is occupied by Indo-Gangetic alluvium. And there are no surface features worth to mention except that area is plain and major drains are Satluj and its tributaries and Budha nala. Soil is the end product of the parent material resulting from the consistent influence of climate, topography and the natural vegetation over a long period of time. In the district soil characteristics are influenced to a very limited extent by the topography, vegetation and parent rock. The variations in soil profile characteristics are much more pronounced because of the regional climatic differences. The soil of this zone has developed under semi-arid condition. The soil is sandy loam to clayey with normal reaction (pH from 7.8 to 8.5).

HYDROGEOLOGY

The district area is occupied by Indo-Gangatic alluvium of Quaternary age. The subsurface geological formations of the area comprise of sand, silt, clay and kankar in various proportions. In general the Ground water of the district is fresh except in and around Ludhiana city where the ground water is polluted due to industrial effluents. The aquifer disposition of the area is revealed by drilling data carried out down to 408 m by Central Ground Water Board and state govt. The lithological data of these boreholes indicate the presence of many sand beds forming the principal aquifers separated by clay beds at various depths. The data indicates presence of about 5 prominent sand horizons down to 400 m depth separated by thick clay horizons. The first aquifer generally occurs between 10 and 30m. The second is between 50 and 120m. Third between 150-175m. For the fourth between 200-250m and the fifth between 300-400m. The aquifers are giving discharge from 3-52 lps with 4.3×10^{-4} - 6.98×10^{-4} storativity and transmissivity is ranges between 628-1120 m^2/day . The sand content in the aquifer in the district varies from 50 to 80%. Clay beds though thick at places occur mostly as lens and pinches out laterally. The granular material becomes coarser with depth. The aquifer at deeper levels acts as semi-confined to confined. The depth to water level in the area ranges between 9-26 m bgl. In the north eastern part 'Machhiwara' block area it ranges between 5-10 m bgl and 10-20 m in north central part of the district in Ludhiana city and Bhaini raian . In rest of the area of the district it ranges between 20-30 meters. During the pre monsoon period depth to water level varies between 4.32 to 31.22 m bgl and in post monsoon it ranges between 2.89-27.30 m bgl. The long term water trend indicates that the water level showing decline ranges from 0.11 m /y -1.34 m/year.

GROUND WATER RESOURCES

The Ground Water resources of the district were done for each individual block as per GEC 1997 norms as on March 2011. Perusal of the estimates reveals overall stage of ground water development in the district is of the order of 167 %. The stage of ground water development ranges between 111% (Doraha) to 269% (Samrala). Net ground water availability of the district is 208139ham.

GROUND WATER QUALITY

Present data of chemical analysis of water samples collected from shallow aquifers (NHS-2006) indicates that ground water is slightly alkaline in nature (pH varies between 7.25-7.90). also ground water is fresh to moderate saline (Ec varies between 550-1320micromomhos/cm at 25⁰C. All the chemical parameters are well with in the permissible limits for safe drinking water set by BIS 1991 revised in 2007 exfcept for NO₃ at Bhalolpur (52 mg/l), Muskabad (8 mg/l), Kohara (104 mg/l), Begowal (56mg/l) , and Serian (57 mg/l).

Bicarbonate is the dominant anion while calcium or calcium along with magnesium is the dominant cation in he waters. By and large , quality ground water is suitable for drinking except at few places mentioned above due to high value of NO₃ exceeding 45 mg/l. The suitability of ground water for Irrigation is generally assessed by the factors of salinity (EC), Sodium absorption ratio (SAR) & Residual Sodium carbonate (RSC). These parameters range between 550-1320 microsiemens /cm at 25⁰ C, 0.29-3.64 and (-) 1.68 to 4.08 respectively. Based upon the plot of EC Vs SAR on the USSL diagram for rating Irrigation Waters, C₂₅ & C₃S₁, classes of waters have been observed, Such waters will cause problems of neither salinity nor sodium hazard when used for customary Irrigation.

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
1	Ludhiana	5474	12162	14761	15994	4135	52526

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
1	Ludhiana	750	3736	10120	10661	3040	28307

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
1	Ludhiana	4271	48433	23011	15485	0	91200

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/kutchha	Under ground pipe
1	Ludhiana	615	118905	0

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 x 5mt x 3mt 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)
ROOF TOP RAIN WATER HARVESTING IN RURAL AND URBEN AREAS					
1	Artificial Recharge Plan For Urban Areas.	10661	0.25	26.65	1.0555
2	Roof Top Rain Water Harvesting in Rural Areas	35464	0.25	88.66	11.058
	Total	46125	0.25	115.31	12.113
ARTIFICIAL RECHARGE IN FARMS					
1	Artificial Recharge Plan Through Recharge Pits.	31405	0.35	109.91	29.712
			Total	109.91	29.712

By the implementation of the proposed recharge structures there will be a reduction of 1.79% in stage of ground water development as tabulated below

Expected effect of Artificial Recharge on the status of Gross ground water draft

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	3480.57	-1451.31	41.825	3438.743	167%	165.21 %	1.79 %

**ARTIFICIAL RECHARGE PLAN THROUGH RECHARGE PITS IN OVER EXPLOITED
BLOCKS OF LUDHIANA DISTRICT**

Block Name	Total area of the village (in hectares)	10%of village area taken for farm recharge (hectares)	Total number of recharge pits	Annual recharge (MCM)= (Area*Runoff 15%*Rainfall)	Cost of Pit @ Rs.35000/- (crores)
LUDHIANA -II	50389.30	5039	5039	4.996	17.64
JAGRAON	37334	3733	3733	3.069	13.07
SUDHAR	13515.60	1352	1352	1.121	4.73
RAIKOT	26736	2674	2674	2.282	9.36
PAKHOWA L	26932	2693	2693	2.452	9.43
LUDHIANA -I	22053	2205	2205	2.187	7.72
DEHLON	27014	2701	2701	2.666	9.45
DORAH	24055	2406	2406	2.439	8.42
SAMRALA	17681.20	1768	1768	1.896	6.19
SIDWANBE T	43086	4309	4309	4.136	15.08
KHANNA	25254	2525	2525	2.468	8.84
			31405	29.712	109.92

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)

**ROOF TOP RAINWATER HARVESTING IN RURAL AREAS OF LUDHIANA
DISTRICT OF PUNJAB**

Name of District	Sr.no	Name of CD Block	Total area of the village (in hectares)	Number of households (2011 census)	No of Houses taken for Artificial Recharge	Total No of AR Structures	Total recharge in MCM	Cost @ 0.25 Lacs/structure (Crores)
LUDHIANA	1	LUDHIANA-II	50389.30	43338	4338	4338	7.339	10.85
	2	JAGRAON	37334	28697	2870	2870	0.177	7.18
	3	SUDHAR	13515.60	10764	1076	1076	0.189	2.69
	4	RAIKOT	26736	19574	1957	1957	0.071	4.89
	5	PAKHOWAL	26932	20751	2075	2075	0.134	5.19
	6	LUDHIANA-I	22053	32241	3224	3224	1.512	8.06
	7	DEHLON	27014	25189	2519	2519	0.256	6.30
	8	DORAH	24055	18715	1872	1872	0.199	4.68
	9	SAMRALA	17681.20	16366	1637	1637	0.152	4.09
	10	SIDWANBET	43086	24644	2464	2464	0.140	6.16
	11	KHANNA	25254	114322	11432	11432	0.889	28.58
		Total	314050.10		35464	35464	11.058	88.66

ARTIFICIAL RECHARGE PLAN FOR URBAN AREAS OF DISTRICT LUDHIANA PUNJAB

District	Block	Town Name	Total Households	Total Population of Town	Households taken for Artificial Recharge (10%)	Total Roof Top Area (sqm)	Vol of water available for recharge (MCM)	Cost @ Rs.0.25 lakh (Crores)
LUDHIANA	DORAHA	PAYAL (MCL)	1537	7923	154	30740	0.017	0.39
	DORAHA	MALoud (NP)	1488	7567	149	29760	0.016	0.37
	DORAHA	DORAHA (MCL)	5291	25424	529	105820	0.057	1.32
	LUDHIANA-II	SAHNEWAL (NP)	4766	22484	477	95320	0.050	1.19
	LUDHIANA-II	LUDHIANA (M .Corp)	344333	1618879	5000	1000000	0.529	12.50
	LUDHIANA-II	BHAMIAN KALAN (CT)	2552	13174	255	51040	0.027	0.64
	JAGRAON	MULLANPUR DHAKA (NP)	3287	16356	329	65740	0.029	0.82
	JAGRAON	JODHAN (CT)	755	3845	76	15100	0.007	0.19
	JAGRAON	GILL (CT)	5890	28884	589	117800	0.052	1.47
	JAGRAON	THARIKE (CT)	2579	12294	258	51580	0.023	0.65
	JAGRAON	BHATIAN (CT)	2171	11066	217	43420	0.019	0.54
	JAGRAON	PARTAP SINGHWALA (CT)	2167	10843	217	43340	0.019	0.54
	JAGRAON	BADDOWAL (CT)	1377	6825	138	27540	0.012	0.35
	JAGRAON	JAGRAON (MCL)	13236	65240	1324	264720	0.0116	3.31
	RAIKOT	RAIKOT(MCL)	5739	28734	574	114780	0.052	1.44
	RAIKOT	HALWARA (CT)	2138	9761	214	42760	0.019	0.54
	RAIKOT	AKALGARH (CT)	1612	7678	161	32240	0.116	0.40
		TOTAL	400918	1896977	10661	2131700	1.0556	26.65

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 91200 operated by farmers for irrigation through unlined/Katcha (99.48%) open channel system in district where water from the tubewell 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 Ludhiana district is estimated at 3332.30 MCM. It is expected that around 46.76% 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 2443.86 MCM assuming there is no crop diversification by the farmers.

The benefit will lead to saving of precious ground water resources in overexploited blocks of Ludhiana Districts. The measure if implemented will bring down the ground water overdraft from 162% to 115 %. 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 tubewells 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 crop per drop.**












POTENTIAL FOR REDUCTION IN OVERDRAFT BY ENHANCING THE GROUND WATER USE EFFICIENCY IN IRRIGATION TUBEWELLS, LUDHIANA 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 [#])	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)X100) (%)	Reduction in stage of development after constructing pucca canal (Col9-Col10) (%)
1	2	3	4	5	6	7	8	9	10	11
2126.70	3438.40	3332.30	106	99.48	994.49	2337.81	2443.86	162	115	46.76

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 hecter(in cr) =Total irrigated area (by ground water scheme) of the block *0.5*Col 5	Total Cost in Rs.Cr. District wise
1	2	3	4	5	6	7
LUDHIANA	DELHON	21933	99.48	21819	109.09	1134.44
	DORAHA	19137	99.48	19037	95.19	
	JAGRAON	2503	99.48	2490	12.45	
	KHANNA	21045	99.48	20936	104.68	
	LUDHIANA	16006	99.48	15923	79.61	
	MACHIWARA	24307	99.48	24181	120.90	
	MANGAT	37848	99.48	37651	188.26	
	PAKHOWAL	19827	99.48	19724	98.62	
	RAIKOT	17999	99.48	17905	89.53	
	SAMRALA	14473	99.48	14398	71.99	
	SIDWANBET	23113	99.48	22993	114.96	
	SUDHAR	9882	99.48	9831	49.15	

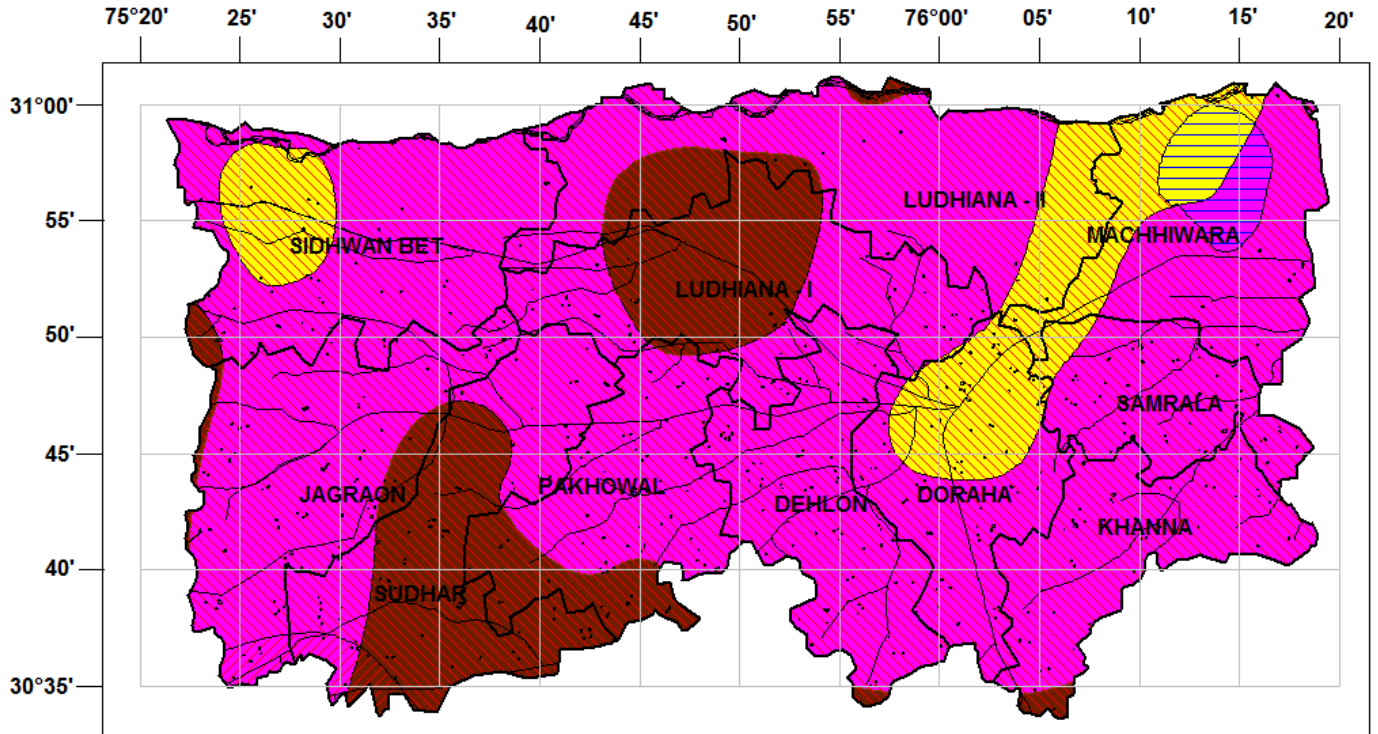
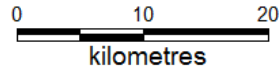
SALIENT FEATURES OF HYDROGEOLOGY OF DISTRICT LUDHIANA

Wells Feasible	Rigs Suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures
Tube Wells	Direct and Reverse Rotary	50 - 330	1300 - 3000	Recharge Trench with Injection Wells
Tube Wells	Direct and Reverse Rotary	50 - 75	1000 - 1300	Recharge Trench with Injection Wells
Tube Wells	Direct and Reverse Rotary	40 - 70	600 - 1000	Recharge Trench with Injection Wells
DEPTH TO WATER LEVEL NOVEMBER 2014		 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	Ludhiana
Geographical Area	3860 sq.km
Major Geological Formation	Alluvium
Major Drainage System	Sutlej
Population (as on 2011)	34,87,882
Total Number of Blocks	12
Existing Major/Medium Irrigation Projects	Sirhind and Bhakra Canal
Utilizable Ground Water Resources 2011	2081.39 (mcm)
Net Ground Water Draft	3480.57 (mcm)
Stage of Ground Water Development	167 %
Average Annual Rainfall	681 mm
Range of Mean Daily Temperature	5° - 40° C
Over Exploited Blocks	LUDHIANA-I, LUDHIANA-II SIDWAN BET, JAGRAON SUDHAR, RAIKOT PAKHOWAL, DEHLON DORAH, SAMRALA KHANNA

PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER DISTRICT LUDHIANA, PUNJAB



Legend

Refer Salient Features of Hydrogeology

BLOCK
WISE PLAN OF
DISTRICT
LUDHIANA
PUNJAB

(11 OE BLOCKS)

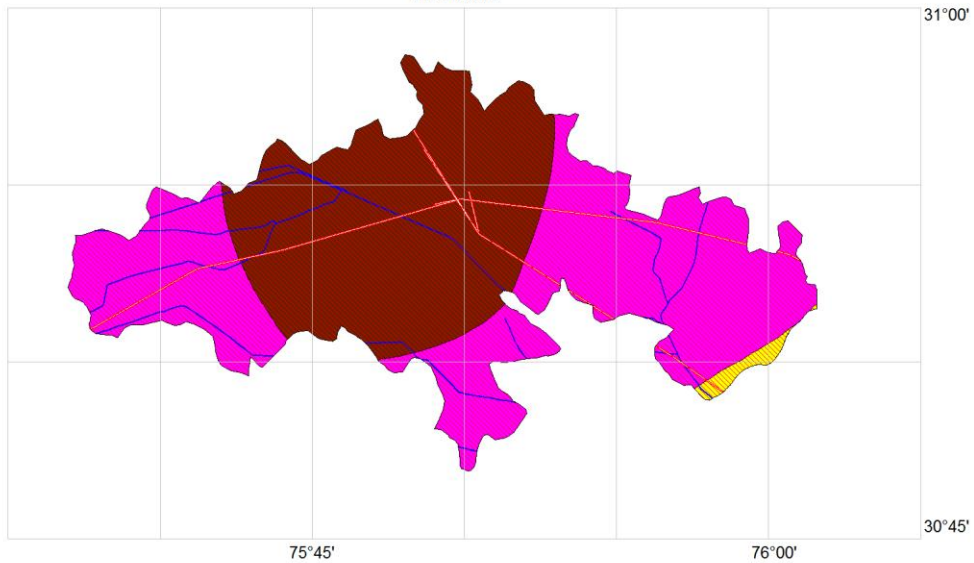
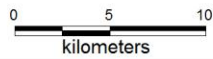
Ground Water Scenario of Block

Block Name:- Ludhiana -II		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	507.3
	• Number of Villages inhabited • Un-inhabited	-- 0
	ii) Average Annual Rainfall (mm)	645
	iii) Area feasible for Artificial Recharge	507.3
	iv) Village identified under scarcity of Water	--
	v) Village covered under water supply	--
	vi) Water Tank exists in the village	--
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	---
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	---
	• Net Area Sown (Sq.Km)	---
	• Area Sown More than Once (Sq.Km)	--
	• Total Cropped Area (Sq.Km)	--
	• Cropping Intensity • 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)	
	<ul style="list-style-type: none"> •Pre- monsoon: (May 2015) •12.00-28.80 (mbgl) 	10.00- 40.00(mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •11.50 – 27.00 (mbgl) 		
6.	GROUND WATERN EXPLORATION BY CGWB (As on 31.03.2015)		
<i>1</i>	•No of wells drilled	--	
<i>a</i>	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m2/day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	---	----
	•NO3 (mg/l)	---	----
	•F (mg/l)	---	---
	•As (mg/l)	0.0041	0.0041
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	272.85	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	349.09	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	9.60	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	358.69	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	12.43	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	- 88.67	
	•Stage of Ground Water Development / Over draft(%)	131	
	•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)			718.75
11.	Volume of water required for recharge (MCM)			955.92
12.	Volume of surplus water available for recharge(MCM)			6.37
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	5039	17.637	4.996
14	RWH Rural @ Rs. 25000/-	4338	10.845	7.339
15	RWH Urban@ Rs. 25000/-	5732	14.330	0.606
16	Underground pipe line (area in hectares)	37651	188.255	103.06
	TOTAL		231.067	116

BLOCK: LUDHIANA-I DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL LUDHIANA-I , DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)

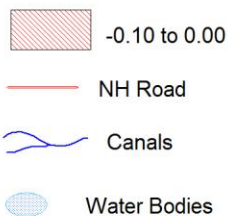


LEGEND

Decadal Mean Water Level
(m.bgl)



Decadal Mean Trend
(m)



3224	No. of Recharge Structures in Rural Villages
--	No. of Recharge Structures in Urban Towns
2205	No. of Recharge Pits in Agriculture land
--	Thickness of Sand

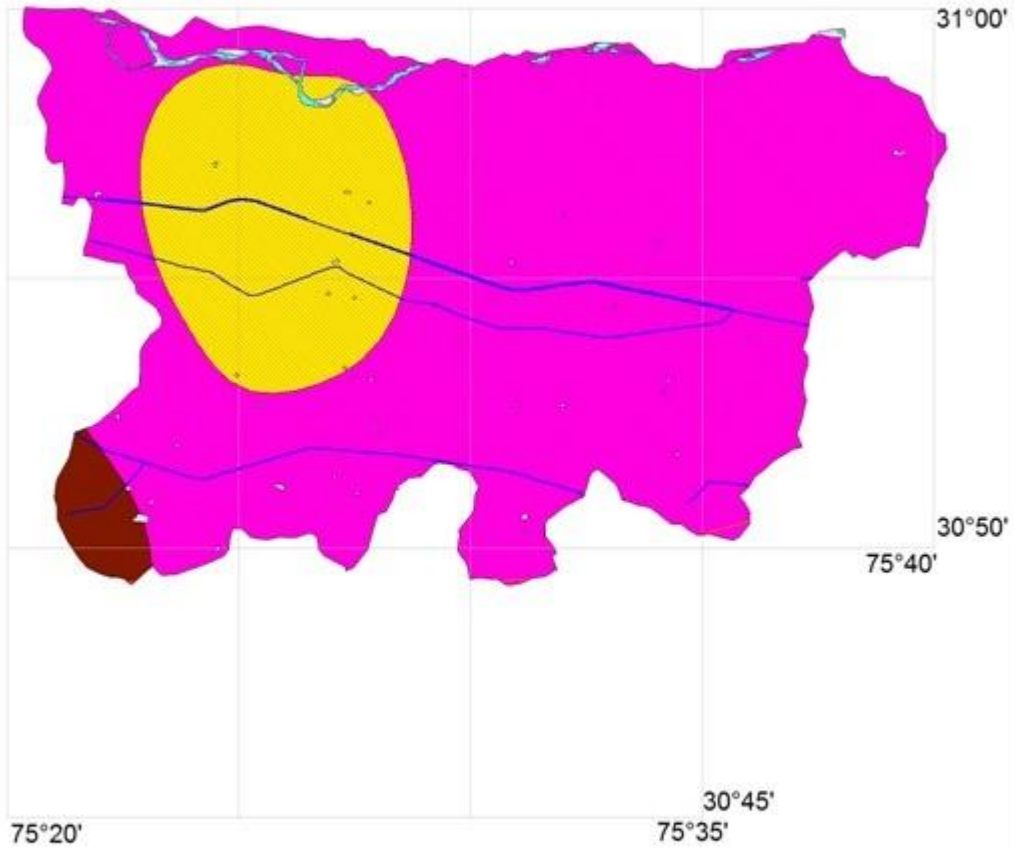
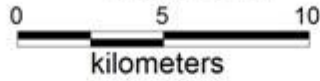
Ground Water Scenario of Block

Block Name:- Ludhiana – I		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	316.8
	<ul style="list-style-type: none"> • Number of Villages inhabited • Un-inhabited 	65 1
	ii) Average Annual Rainfall (mm)	666
	iii) Area feasible for Artificial Recharge	316.8
	iv) Village identified under scarcity of Water	72
	v) Village covered under water supply	66
	vi) Water Tank exists in the village	64
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Satluj 100%
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	264.26
	• Net Area Sown (Sq.Km)	188.70
	• Area Sown More than Once (Sq.Km)	123.67
	• Total Cropped Area (Sq.Km)	312.37
	• Cropping Intensity	166
	• Area under Thur and Sem (Sq.Km)	--
4.	PREDOMINANT GEOLOGICAL FORMATIONS	Recent alluvium
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"> •Pre- monsoon: (May 2015) •21.75-28.80 (mbgl) 	10.00-40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •21.15 – 27.90 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
<i>1</i>	•No of wells drilled	2	
<i>a</i>	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	488	488
	•NO3 (mg/l)	61	61
	•F (mg/l)	0.26	0.26
	•As (mg/l)	0.002	0.002
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	121.91	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	267.46	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	46.47	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	313.93	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	72.81	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-218.36	
	•Stage of Ground Water Development / Over Draft(%)	258	
	•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> 40	Percentage % 80	
10	Volume of unsaturated zone available for recharge (MCM)	448.85		
11.	Volume of water required for recharge (MCM)	596.96		
12.	Volume of surplus water available for recharge(MCM)	3.98		
RECHARGE/ CONSERVATION STRUCTURES		Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
Farm Recharge @Rs. 35000/-		2205	7.718	2.187
RWH Rural @ Rs. 25000/-		3224	8.060	1.512
RWH Urban@ Rs. 25000/-		-	-	-
Under ground pipe line (area in hectares)		15923	79.615	78.96
TOTAL			95.39	82.659

BLOCK: SIDHWAN BET DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL SIDHWAN BET, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND

Decadal Mean Water Level
(m.bgl)

- 5.00 to 10.00
- 10.00 to 20.00
- 20.00 to 40.00
- NH Road

Decadal Mean Trend
(m)

- 0.10 to 0.00
- Canals
- River
- Water Bodies

2464	No. of Recharge Structures in Rural Villages
--	No. of Recharge Structures in Urban Towns
4309	No. of Recharge Pits in Agriculture land
20	Thickness of Sand

Ground Water Scenario of Block

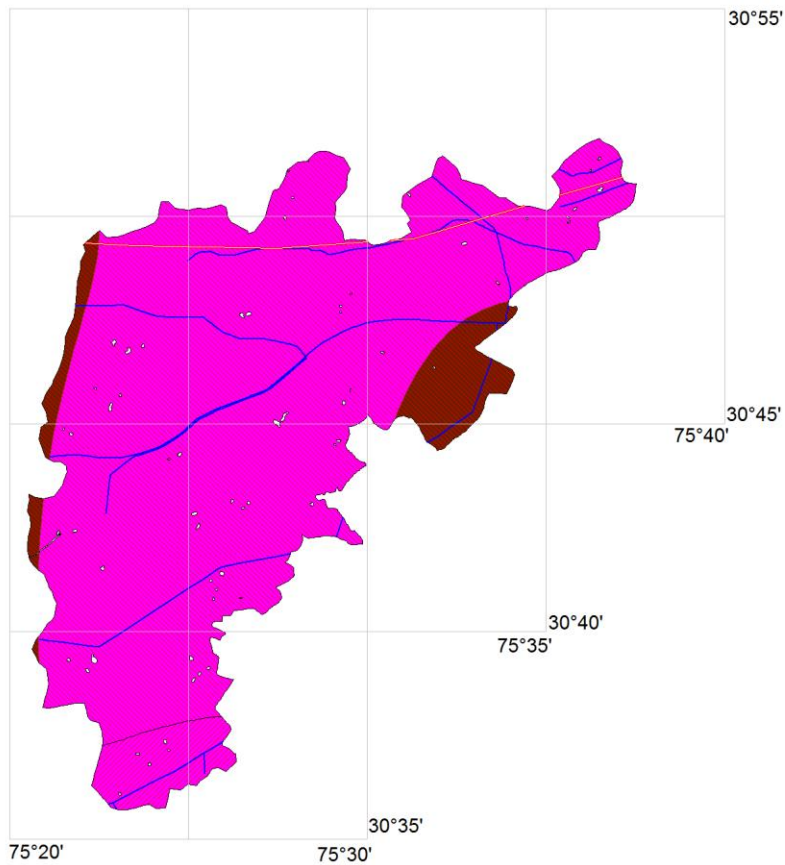
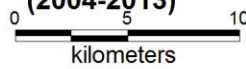
Block Name:- Sidwanbet		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	401.7
	•Number of Villages inhabited •Un-inhabited	88 0
	ii)Average Annual Rainfall (mm)	605
	iii)Area feasible for Artificial Recharge	401.7
	iv) Village identified under scarcity of Water	63
	v)Village covered under water supply	63
	vi) Water Tank exists in the village	51
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Satluj 100%
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	265.64
	•Net Area Sown (Sq.Km)	234.41
	•Area Sown More than Once (Sq.Km)	375.93
	•Total Cropped Area (Sq.Km)	610.34
	•Cropping Intensity •Area under Thur and Sem (Sq.Km)	260 --
4.	PREDOMINAT GEOLOGICAL FORMATIONS	Recent alluvium
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"> •Pre- monsoon: (May 2015) • 8.05-21.79(mbgl) 	5.00 – 20.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •7.26-23.30(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
<i>l</i>	•No of wells drilled	4	
<i>a</i>	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	875	875
	•NO3 (mg/l)	65	65
	•F (mg/l)	0.32	0.32
	•As (mg/l)	---	---
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	225.23	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	354.28	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	6.43	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	360.71	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	8.40	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-137.46	
	•Stage of Ground Water Development / Over Draft(%)	160	

	•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> 20	Percentage %	40
10	Volume of unsaturated zone available for recharge (MCM)	569.14		
11.	Volume of water required for recharge (MCM)	756.94		
12.	Volume of surplus water available for recharge(MCM)	5.05		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	4309	15.082	4.136
14	RWH Rural @ Rs. 25000/-	2464	6.160	0.14
15	RWH Urban@ Rs. 25000/-	0	0	0
16	Under ground pipe line (area in hectares)	22993	114.965	104.61
	TOTAL		136.207	108.886

BLOCK: JAGRAON DISTRICT: LUDHIANA STATE: PUNJAB

**DEPTH TO WATER LEVEL JAGRAON, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)**



LEGEND

Decadal Mean Water Level
(m.bgl)

- 10.00 to 20.00
- 20.00 to 40.00

NH Road

Water Bodies

Decadal Mean Trend
(m)

- 0.20 to -0.10
- 0.10 to 0.00

Canals

2870 No. of Recharge Structures
in Rural Villages

3148 No. of Recharge Structures
in Urban Towns

3733 No. of Recharge Pits
in Agriculture land

-- Thickness of Sand

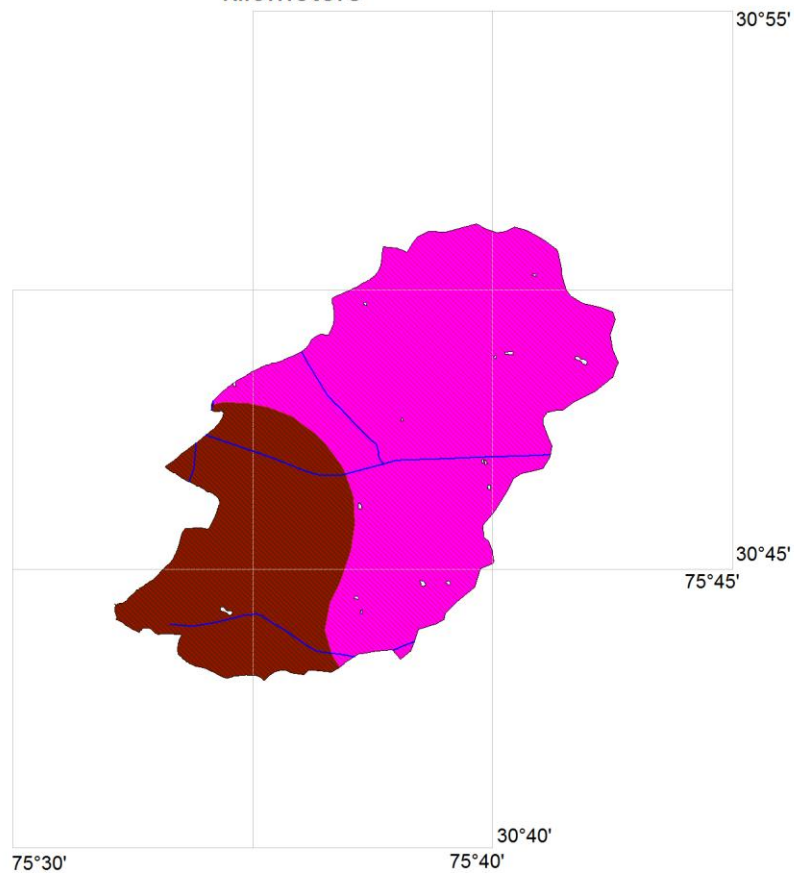
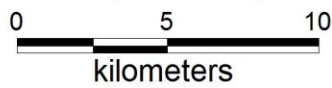
Ground Water Scenario of Block

Block Name:- Jagraon		State:- PUNJAB
District:- Ludhiana		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	344.3
	<ul style="list-style-type: none"> • Number of Villages inhabited • Un-inhabited 	54 0
	ii) Average Annual Rainfall (mm)	553
	iii) Area feasible for Artificial Recharge	344.3
	iv) Village identified under scarcity of Water	68
	v) Village covered under water supply	67
	vi) Water Tank exists in the village	66
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages	
	Basin	<i>Satluj 100%</i>
	Sub-Basin	
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	478.29
	• Net Area Sown (Sq.Km)	412.16
	• Area Sown More than Once (Sq.Km)	254.84
	• Total Cropped Area (Sq.Km)	667.00
	• Cropping Intensity	162
	• 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)	
	<ul style="list-style-type: none"> •Pre- monsoon: (May 2015) •16.12-25.90(mbgl) 	10.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •15.65-26.60(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	2	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	---	----
	•NO3 (mg/l)	---	----
	•F (mg/l)	---	---
	•As (mg/l)	0.002	0.002
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	232.70	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	305.05	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	----	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	313.62	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	12.05	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-84.39	
	•Stage of Ground Water Development / Over draft(%)	135	
	•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)	487.81		
11.	Volume of water required for recharge (MCM)	648.78		
12.	Volume of surplus water available for recharge(MCM)	4.33		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	3733	13.07	4.996
14	RWH Rural @ Rs. 25000/-	2870	10.05	7.339
15	RWH Urban@ Rs. 25000/-	3148	11.02	0.606
16	Underground pipe line (area in hectares)	2490	8.72	90.06
	TOTAL		42.84	103.001

BLOCK: SUDHAR DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL SUDHAR, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND

Decadal Mean Water Level (m.bgl)

- 10.00 to 20.00
- 20.00 to 40.00

Decadal Mean Trend (m)

- 0.10 to 0.00
- Canals
- Water Bodies

- 1076 No. of Recharge Structures in Rural Villages
- No. of Recharge Structures in Urban Towns
- 1352 No. of Recharge Pits in Agriculture land
- Thickness of Sand

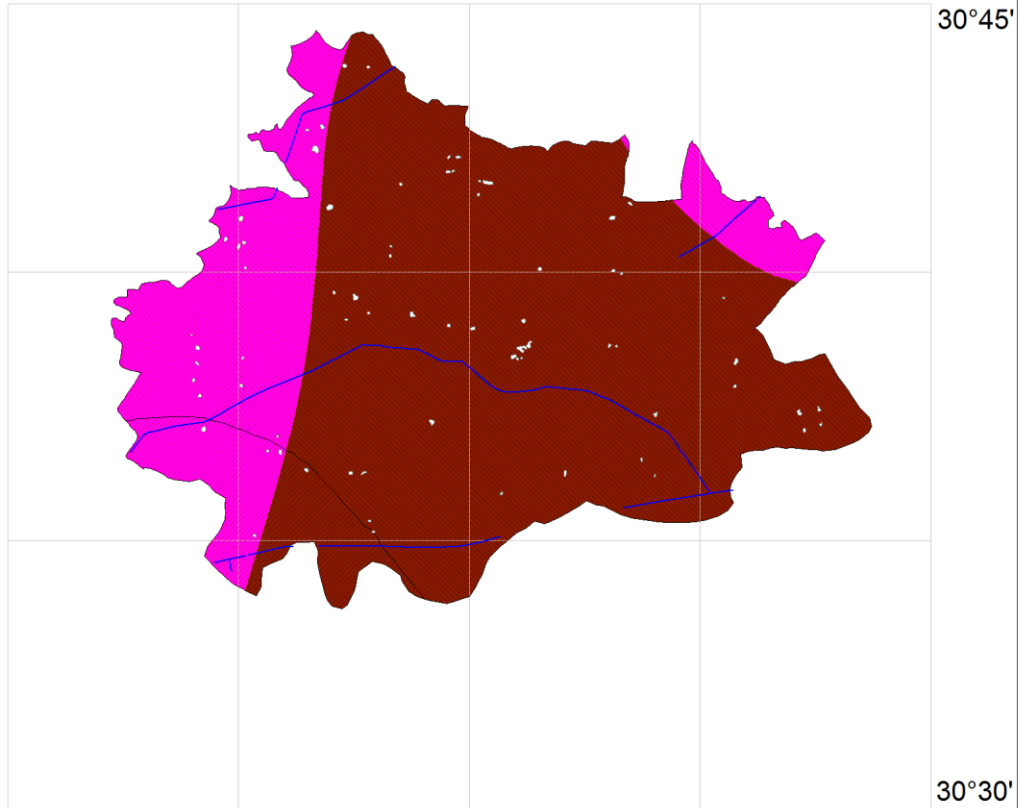
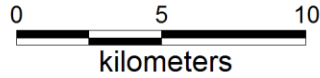
Ground Water Scenario of Block

Block Name:- Sudhar		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	144.47
	•Number of Villages inhabited •Un-inhabited	54 0
	ii)Average Annual Rainfall (mm)	557
	iii)Area feasible for Artificial Recharge	144.47
	iv) Village identified under scarcity of Water	44
	v) Village covered under water supply	37
	vi) Water Tank exists in the village	27
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Satluj 100%
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	269.94
	•Net Area Sown (Sq.Km)	228.09
	•Area Sown More than Once (Sq.Km)	154.90
	•Total Cropped Area (Sq.Km)	382.99
	•Cropping Intensity	168
•Area under Thur and Sem (Sq.Km)	--	
4.	PREDOMINAT GEOLOGICAL FORMATIONS	Recent alluvium
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"> •Pre- monsoon: (May 2015) •19.50-27.10(mbgl) 	20.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •18.85-27.35(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	--	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	---	----
	•NO3 (mg/l)	---	----
	•F (mg/l)	---	---
	•As (mg/l)	0.0041	0.0041
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	101.71	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	141.25	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	4.11	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	145.36	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	6.27	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-45.81	
	•Stage of Ground Water Development / Over Draft (%)	143	
	•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)	204.69		
11.	Volume of water required for recharge (MCM)	272.23		
12.	Volume of surplus water available for recharge(MCM)	1.82		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	1352	4.732	1.121
14	RWH Rural @ Rs. 25000/-	1076	2.690	0.189
15	RWH Urban@ Rs. 25000/-	-	-	-
16	Under ground pipe line (area in hectares)	9831	49.155	41.70
	TOTAL		56.577	43.01

BLOCK: RAIKOT DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL RAIKOT , DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND


Decadal Mean Water Level
(m.bgl)


 10.00 to 20.00


 20.00 to 40.00

 Canals

Decadal Mean Trend
(m)

 -0.20 to -0.10

 -0.10 to 0.00

 Water Bodies

1957 No. of Recharge Structures
in Rural Villages

949 No. of Recharge Structures
in Urban Towns

2674 No. of Recharge Pits
in Agriculture land

-- Thickness of Sand

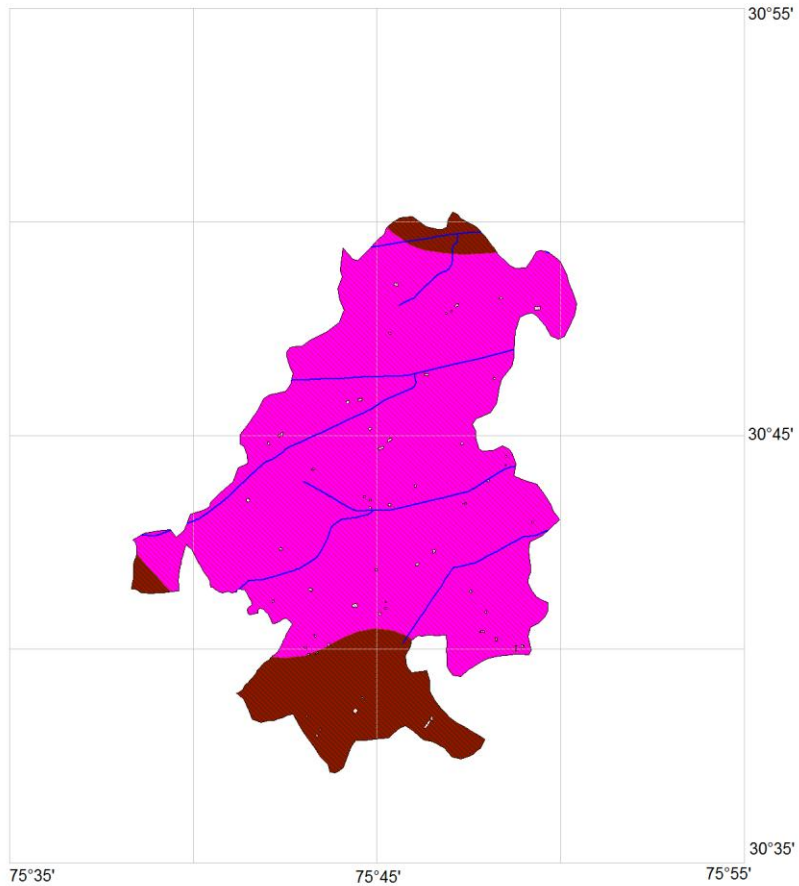
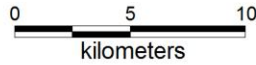
Ground Water Scenario of Block

Block Name:- Raikot		State:- PUNJAB
District:- Ludhiana		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	266.2
	•Number of Villages inhabited •Un-inhabited	45 2
	ii)Average Annual Rainfall (mm)	574
	iii)Area feasible for Artificial Recharge	266.2
	iv) Village identified under scarcity of Water	42
	v) Village covered under water supply	37
	vi) Water Tank exists in the village	21
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	---- -----
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	243.04
	•Net Area Sown (Sq.Km)	220.23
	•Area Sown More than Once (Sq.Km)	232.05
	•Total Cropped Area (Sq.Km)	452.28
	•Cropping Intensity	205
	•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"> •Pre- monsoon: (May 2015) •21.15-29.40(mbgl) 	20.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •20.20-28.35(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	---	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	--	---
	•NO3 (mg/l)	---	---
	•F (mg/l)	--	---
	•As (mg/l)	---	----
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	116.68	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	267.46	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	3.44	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	270.90	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	5.58	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-156.36	
	•Stage of Ground Water Development / over Draft(%)	232	
	•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)	377.16		
11.	Volume of water required for recharge (MCM)	501.61		
12.	Volume of surplus water available for recharge(MCM)	3.34		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2674	9.36	2.282
14	RWH Rural @ Rs. 25000/-	1957	4.89	0.071
15	RWH Urban@ Rs. 25000/-	949	0.00	0.187
16	Under ground pipe line (area in hectares)	17905	89.53	78.96
	TOTAL		103.78	81.5

BLOCK: PAKHOWAL DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL PAKHOWAL , DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)

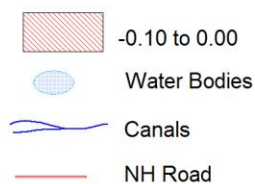


LEGEND

Decadal Mean Water Level
(m.bgl)



Decadal Mean Trend
(m)



2075	No. of Recharge Structures in Rural Villages
--	No. of Recharge Structures in Urban Towns
2693	No. of Recharge Pits in Agriculture land
33	Thickness of Sand

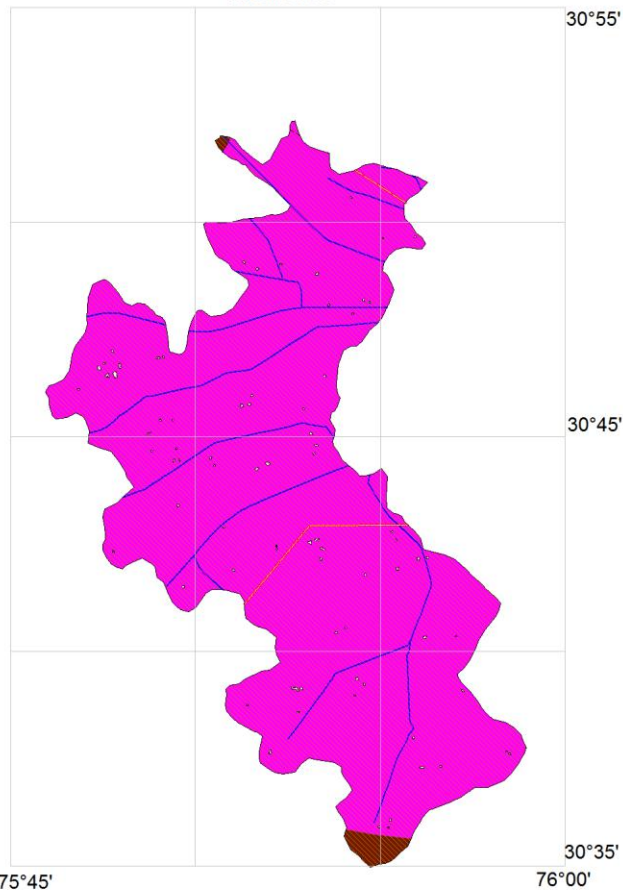
Ground Water Scenario of Block

Block Name:- Pakhowal		State:- PUNJAB
District:- Ludhiana		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	210.83
	•Number of Villages inhabited •Un-inhabited	50 1
	ii)Average Annual Rainfall (mm)	612
	iii)Area feasible for Artificial Recharge	210.83
	iv) Village identified under scarcity of Water	38
	v) Village covered under water supply	33
	vi) Water Tank exists in the village	14
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Satluj 110% -----
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	208.65
	•Net Area Sown (Sq.Km)	183.97
	•Area Sown More than Once (Sq.Km)	178.11
	•Total Cropped Area (Sq.Km)	362.08
	•Cropping Intensity	197
•Area under Thur and Sem (Sq.Km)	--	
4.	PREDOMINAT GEOLOGICAL FORMATIONS	Recent alluvium
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"> •Pre- monsoon: (May 2015) • 13.33-25.25(mbgl) 	10.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •13.05-25.68(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	---	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	325	325
	•NO3 (mg/l)	8.2	8.2
	•F (mg/l)	0.3	0.31
	•As (mg/l)	---	----
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	108.38	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	242.95	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	4.19	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	247.14	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	6.32	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-140.89	
	•Stage of Ground Water Development / Over Draft (%)	228	
	•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> 33	Percentage % 66
10	Volume of unsaturated zone available for recharge (MCM)			298.71
11.	Volume of water required for recharge (MCM)			39727
12.	Volume of surplus water available for recharge(MCM)			2.65
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2693	9.43	2.45
14	RWH Rural @ Rs. 25000/-	2075	5.19	0.13
15	RWH Urban@ Rs. 25000/-	0	0	0
16	Underground pipe line (area in hectares)	19724	98.62	71.73
	TOTAL		113.23	74.32

BLOCK: DEHLON DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL DEHLON, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND


Decadal Mean Water Level
(m.bgl)

 10.00 to 20.00

 20.00 to 40.00

 NH Road

Decadal Mean Trend
(m)

 -0.10 to 0.00

 Water Bodies

 Canals

 2519 No. of Recharge Structures
in Rural Villages

 -- No. of Recharge Structures
in Urban Towns

 2701 No. of Recharge Pits
in Agriculture land

 15 Thickness of Sand

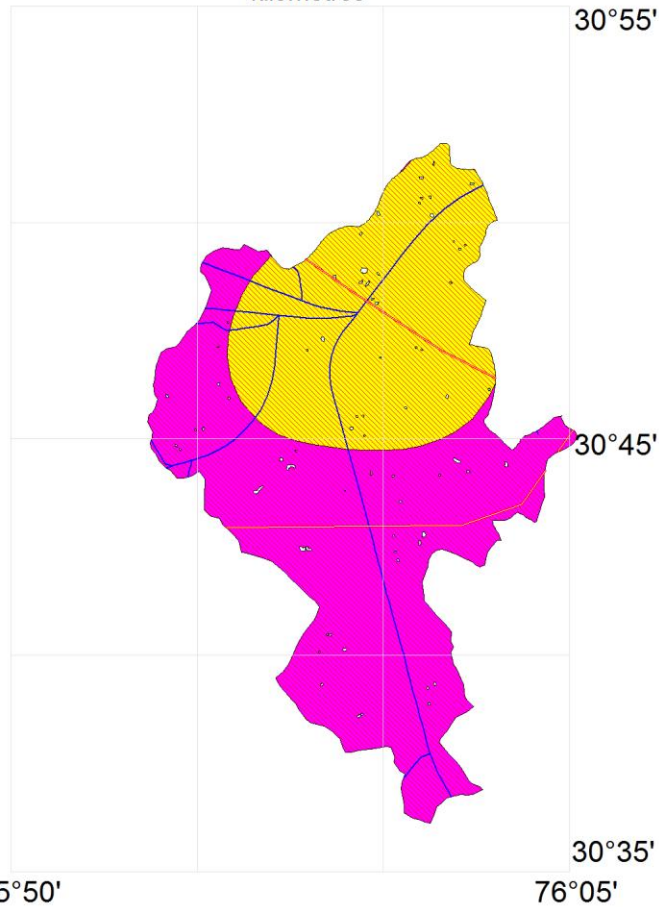
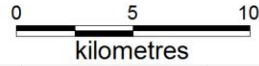
Ground Water Scenario of Block

Block Name:- Dehlon		State:- PUNJAB
District:- Ludhiana		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	285.6
	•Number of Villages inhabited •Un-inhabited	70 4
	ii)Average Annual Rainfall (mm)	664
	iii) Area feasible for Artificial Recharge	285.6
	iv) Village identified under scarcity of Water	55
	v) Village covered under water supply	69
	vi) Water Tank exists in the village	59
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	<i>Satluj 85%</i> <i>Ghaggar 15%</i>
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	309.23
	• Net Area Sown (Sq.Km)	262.35
	• Area Sown More than Once (Sq.Km)	174.91
	• Total Cropped Area (Sq.Km)	537.26
	• Cropping Intensity	205
• 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"> •Pre- monsoon: (May 2015) • 6.75-25.30 	10.00 – 40.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) • 6.49-26.32(mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	---	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	---	---
	•NO3 (mg/l)	---	--
	•F (mg/l)	---	---
	•As (mg/l)	---	---
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	159.94	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	332.20	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	5.65	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	337.84	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	7.70	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-180.36	
	•Stage of Ground Water Development / Over draft(%)	212	
	•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)	404.64		
11.	Volume of water required for recharge (MCM)	538.17		
12.	Volume of surplus water available for recharge(MCM)	3.59		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2701	9.45	2.67
14	RWH Rural @ Rs. 25000/-	2519	6.30	0.26
15	RWH Urban@ Rs. 25000/-	0	0.00	-
16	Underground pipe line (area in hectares)	21819	109.10	98.09
	TOTAL		124.85	101.01

BLOCK: DORAHA DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL DORAHA, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND

Decadal Mean Water Level (m.bgl)

- 5.00 to 10.00
- 10.00 to 20.00
- 20.00 to 40.00

Decadal Mean Trend (m)

- 0.10 to 0.00
- Water Bodies
- Canals
- NH Road

- 1872** No. of Recharge Structures in Rural Villages
- 832** No. of Recharge Structures in Urban Towns
- 2406** No. of Recharge Pits in Agriculture land
- 40** Thickness of Sand

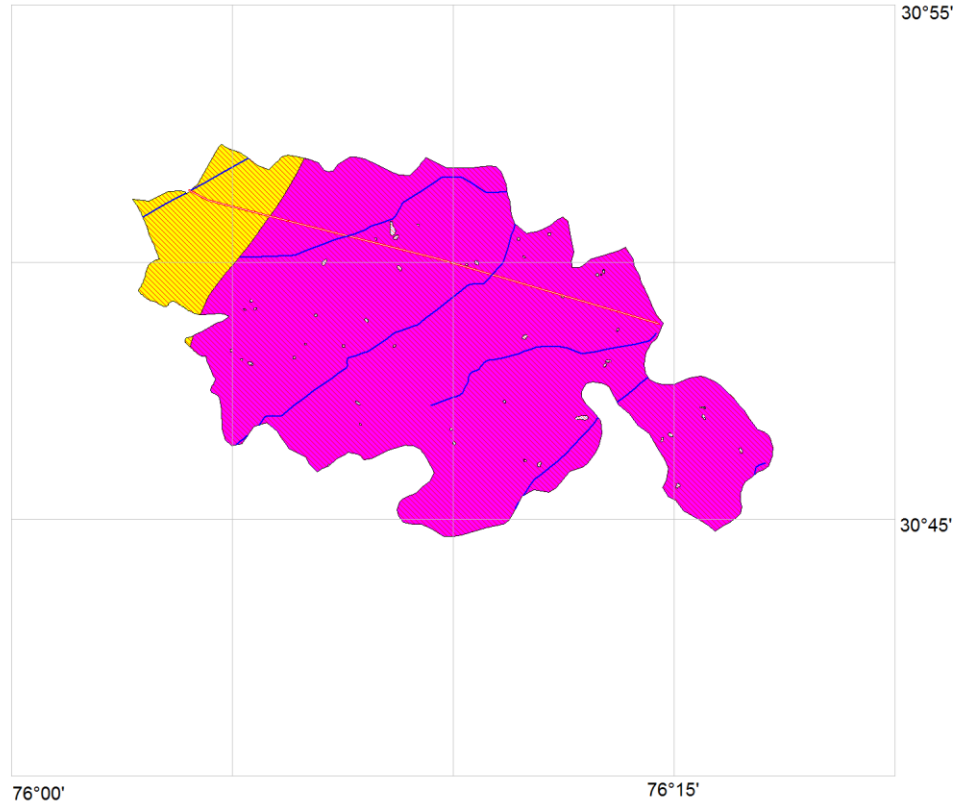
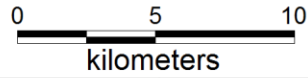
Ground Water Scenario of Block

Block Name:- Doraha		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	224.8
	•Number of Villages inhabited •Un-inhabited	56 2
	ii)Average Annual Rainfall (mm)	681
	iii)Area feasible for Artificial Recharge	224.8
	iv) Village identified under scarcity of Water	55
	v) Village covered under water supply	55
	vi) Water Tank exists in the village	37
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	<i>Beas 90%</i> <i>Satluj 10%</i>
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	236.15
	•Net Area Sown (Sq.Km)	204.55
	•Area Sown More than Once (Sq.Km)	182.88
	•Total Cropped Area (Sq.Km)	387.43
	•Cropping Intensity	189
•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"> •Pre- monsoon: (May 2015) •8.43-16.60 (mbgl) 	5.00 – 20.00(mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •7.32 – 16.40 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	4	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in $\mu\text{S/cm}$ at 25 ⁰ c	480	1025
	•NO ₃ (mg/l)	0.8	18
	•F (mg/l)	0.1	0.46
	•As (mg/l)	0.0023	0.0023
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	272.26	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	298.35	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	5.20	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	305.55	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	7.38	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-33.47	
	•Stage of Ground Water Development / Over Draft (%)	111	
	•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> 40	Percentage % 80
10	Volume of unsaturated zone available for recharge (MCM)			318.50
11.	Volume of water required for recharge (MCM)			423.60
12.	Volume of surplus water available for recharge(MCM)			2.82
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2406	8.42	2.439
14	RWH Rural @ Rs. 25000/-	1872	4.68	0.199
15	RWH Urban@ Rs. 25000/-	832	0.00	0.009
16	Under ground pipe line (area in hectares)	19037	95.19	88.1
	TOTAL		108.29	90.747

BLOCK: SAMRALA DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL SAMRALA , DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND

Decadal Mean Water Level
(m.bgl)

- 5.00 to 10.00
- 10.00 to 20.00

- NH Road
- Canals

Decadal Mean Trend
(m)

- 0.10 to 0.00
- Water Bodies

1637	No. of Recharge Structures in Rural Villages
--	No. of Recharge Structures in Urban Towns
1768	No. of Recharge Pits in Agriculture land
15.5	Thickness of Sand

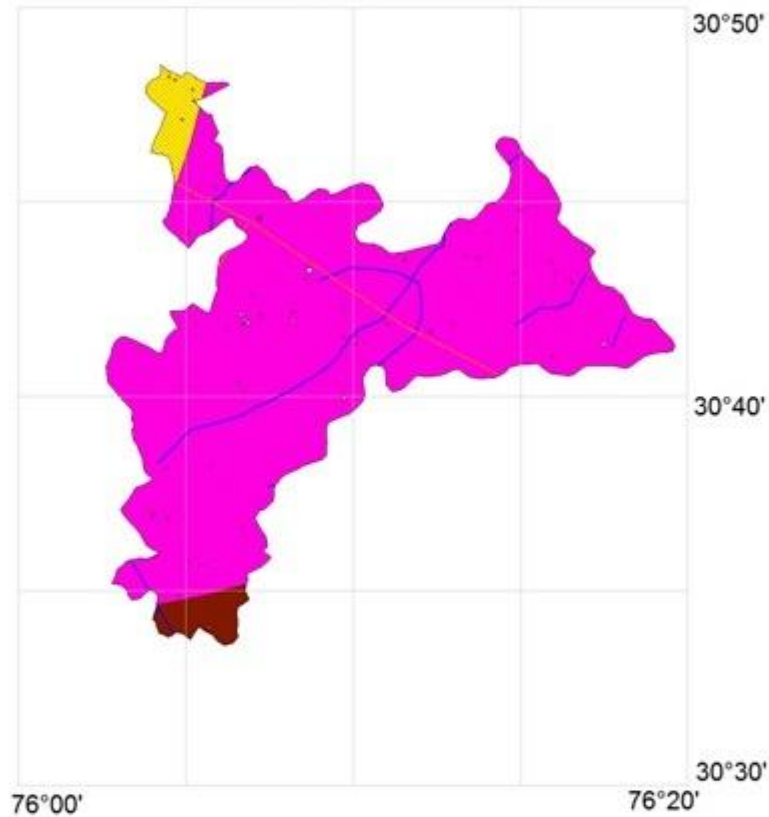
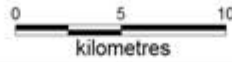
Ground Water Scenario of Block

Block Name:- Samrala		State:- PUNJAB
District:- Ludhiana		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	153.5
	•Number of Villages inhabited •Un-inhabited	61 1
	ii)Average Annual Rainfall (mm)	721
	iii)Area feasible for Artificial Recharge	153.5
	iv) Village identified under scarcity of Water	62
	v) Village covered under water supply	62
	vi) Water Tank exists in the village	43
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	Satluj 85% Ghaggar 15%
3.	LAND USE	
	•Area According to Village Papers (Sq.Km)	176.84
	•Net Area Sown (Sq.Km)	150.52
	•Area Sown More than Once (Sq.Km)	143.27
	•Total Cropped Area (Sq.Km)	293.79
	•Cropping Intensity	195
•Area under Thur and Sem (Sq.Km)	--	
4.	PREDOMINAT GEOLOGICAL FORMATIONS	Recent alluvium
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"> •Pre- monsoon: (May 2015) •8.80-20.62(mbgl) 	10.00-20.00 (mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •10.00 – 20.18 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
1	•No of wells drilled	2	
a	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	382	847
	•NO ₃ (mg/l)	13	123
	•F (mg/l)	--	0.39
	•As (mg/l)	0.002	0.0071
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	76.81	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	200.92	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	5.54	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	206.45	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	7.30	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-131.41	
	•Stage of Ground Water Development / Over Draft (%)	269	
	•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> 15.5	Percentage % 31
10	Volume of unsaturated zone available for recharge (MCM)			217.48
11.	Volume of water required for recharge (MCM)			289.25
12.	Volume of surplus water available for recharge(MCM)			1.93
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	1768	6.19	1.896
14	RWH Rural @ Rs. 25000/-	1637	4.09	0.152
15	RWH Urban@ Rs. 25000/-	0	0.00	0
16	Under ground pipe line (area in hectares)	14398	71.99	59.33
	TOTAL		82.27	61.38

BLOCK: KHANNA DISTRICT: LUDHIANA STATE: PUNJAB
DEPTH TO WATER LEVEL KHANNA, DECADAL MEAN POST MONSOON
Vs
DECADAL MEAN TREND POST MONSOON
(2004-2013)



LEGEND

Decadal Mean Water Level
(m.bgl)

- 5.00 to 10.00
- 10.00 to 20.00
- 20.00 to 40.00

Decadal Mean Trend
(m)

- 0.10 to 0.00
- Water Bodies
- NH Road
- Canals

11432	No. of Recharge Structures in Rural Villages
--	No. of Recharge Structures in Urban Towns
2525	No. of Recharge Pits in Agriculture land
21	Thickness of Sand

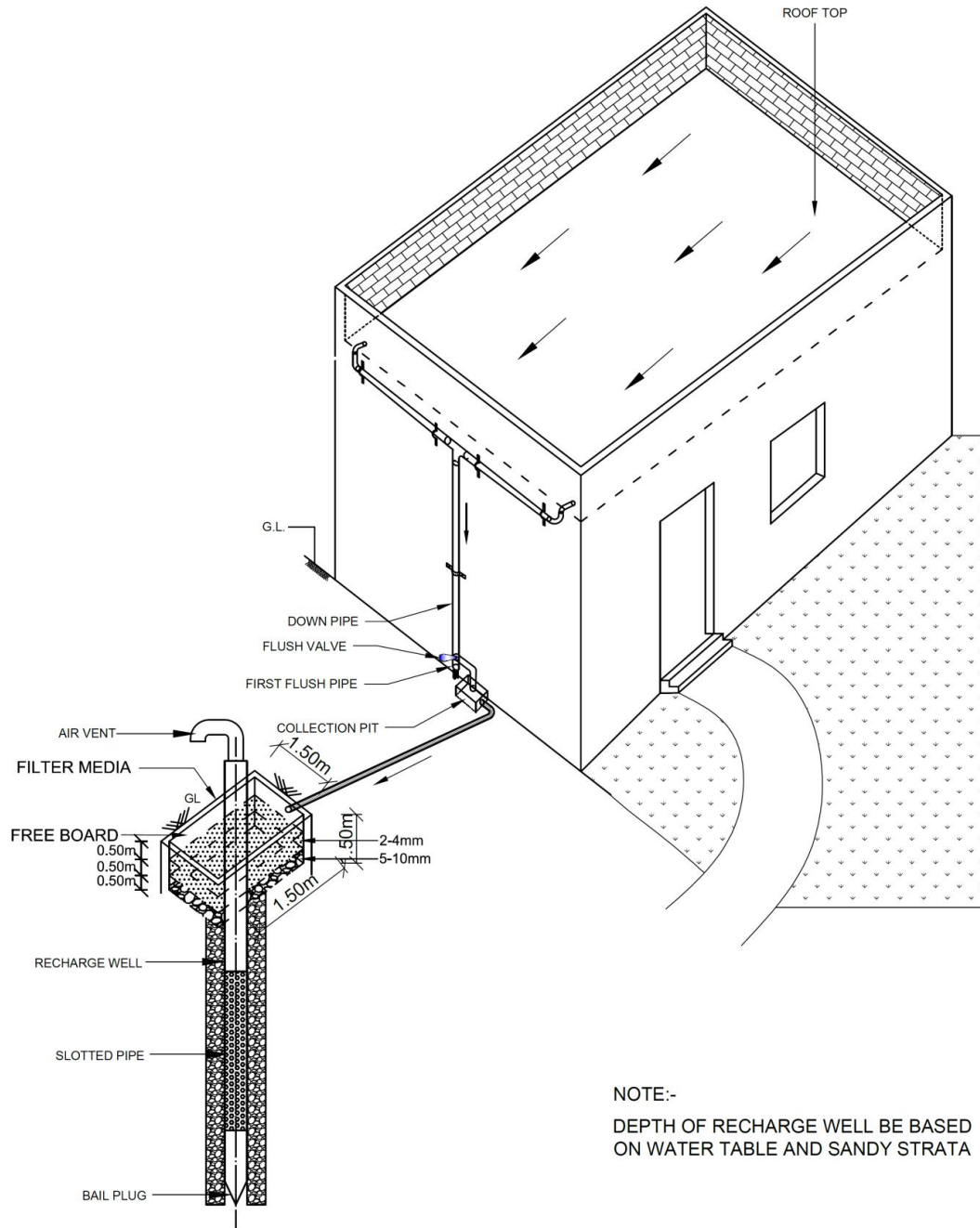
Ground Water Scenario of Block

Block Name:- Khanna		
District:- Ludhiana		State:- PUNJAB
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	365.7
	• Number of Villages inhabited • Un-inhabited	81 6
	ii) Average Annual Rainfall (mm)	654
	iii) Area feasible for Artificial Recharge	365.7
	iv) Village identified under scarcity of Water	82
	v) Village covered under water supply	76
	vi) Water Tank exists in the village	51
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	<i>Ghaggar 97%</i> <i>Satluj 03%</i>
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	250.38
	• Net Area Sown (Sq.Km)	216.54
	• Area Sown More than Once (Sq.Km)	194.70
	• Total Cropped Area (Sq.Km)	411.24
	• Cropping Intensity	190
• 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)	
	<ul style="list-style-type: none"> •Pre- monsoon: (May 2015) •10.33-23.15(mbgl) 	20.00 – 40.00(mbgl)	
	<ul style="list-style-type: none"> •Post –monsoon: (Nov2014) •10.37 – 22.30 (mbgl) 		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
<i>1</i>	•No of wells drilled	<i>1</i>	
<i>a</i>	•Depth Range (m)	25.0-408.0	
	•Discharge (Ipm)	2543	
	Aquifer Parameters		
	•Transmissivity (m ² /day)	1120	
	•Storativity	4.3*10 ⁻³	
	•Specified yield	0.072	
7.	GROUND WATER QUALITY	Min	Max
	•EC in µS/cm at 25 ⁰ c	---	---
	•NO ₃ (mg/l)	---	--
	•F (mg/l)	---	---
	•As (mg/l)	---	---
8.	DYANMIC GROUND WATER RESOURCES in MCM	2011	
	•Net Ground Water Availability (Mcm)	139.09	
	•Existing Gross Ground Water Draft for Irrigation (Mcm)	333.51	
	•Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (Mcm)	8.54	
	•Existing Gross Ground Water Draft for all Uses (Mcm)	342.05	
	•Allocation for Domestic and Industrial Requirement Supply up to next 25 years (Mcm)	11.88	
	•Net Ground Water Availability for Future Irrigation Development (Mcm)	-202.69	
	•Stage of Ground Water Development / Over draft(%)	246	
	•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> 21	Percentage % 42	
10	Volume of unsaturated zone available for recharge (MCM)	518.13		
11.	Volume of water required for recharge (MCM)	689.10		
12.	Volume of surplus water available for recharge(MCM)	4.59		
	RECHARGE/ CONSERVATION STRUCTURES	Total Number of Recharge Structures	Total Cost (Rs. in crores)	Total Recharge in mcm
13	Farm Recharge @Rs. 35000/-	2525	8.84	2.468
14	RWH Rural @ Rs. 25000/-	11432	28.58	0.889
15	RWH Urban@ Rs. 25000/-	0	0.00	0
16	Under ground pipe line (area in hectares)	20936	104.68	98.46
	TOTAL		142.10	101.817

RECHARGE FROM ROOF TOP RAIN WATER HARVESTING (URBAN & RURAL HOUSEHOLDS)



3-D VIEW

NOTE:-
DEPTH OF RECHARGE WELL BE BASED
ON WATER TABLE AND SANDY STRATA

TYPICAL DESIGN FOR RECHARGE PIT IN FARM

