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

PLAN ON

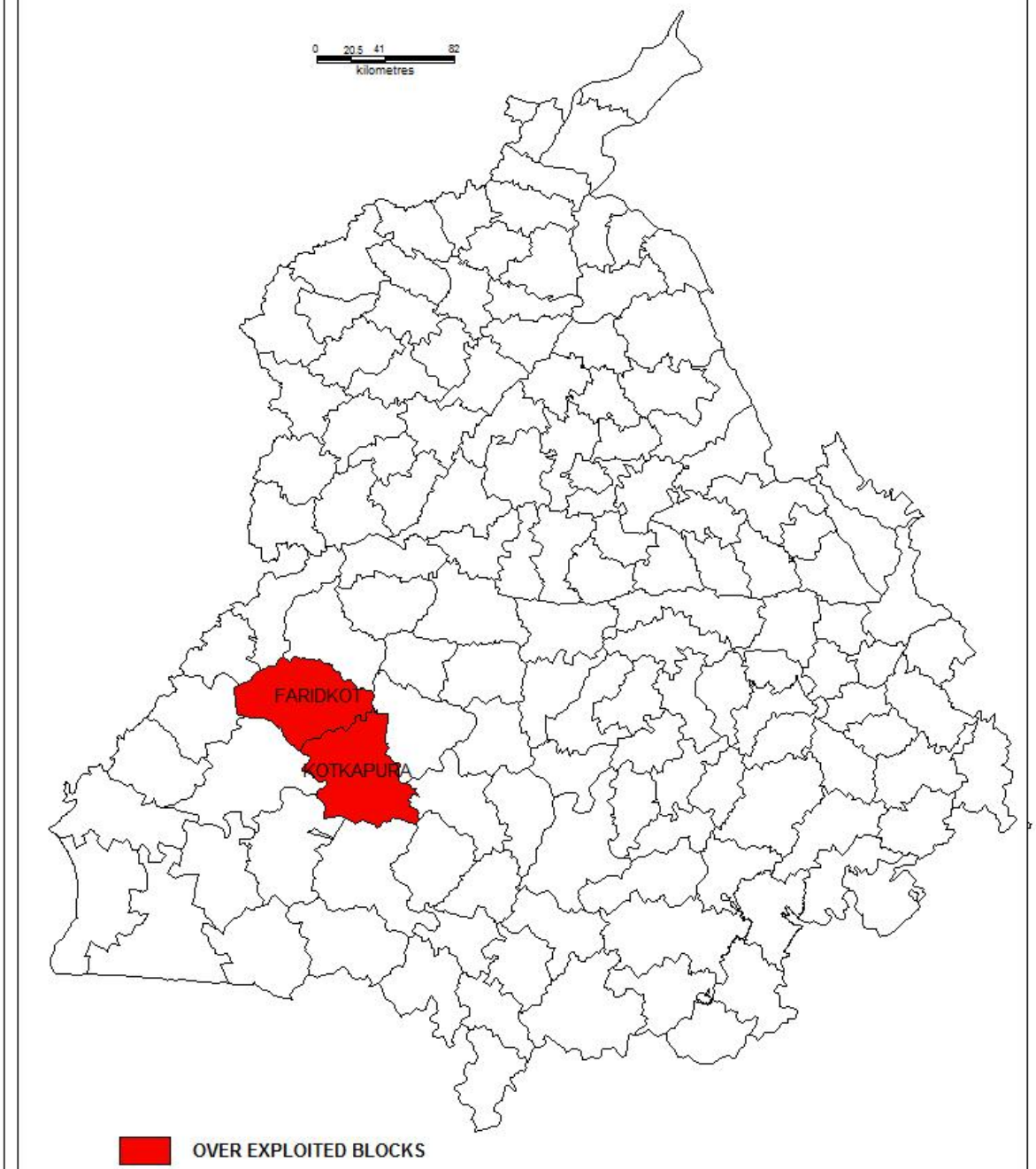
ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION

IN OVEREXPLOITED BLOCKS OF

FARIDKOT DISTRICT, PUNJAB

Central Ground Water Board
North Western Region
Chandigarh

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



PLAN OF ARTFICIAL RECHARGE TO GROUND WATER IN OVER EXPLOITED BLOCKS, DISTRICT FARIDKOT PUNJAB

INTRODUCTION

Faridkot district is created by Punjab Government by re-orienting parts of the adjoining Moga, Muktsar, and Bhatinda districts. The district with an area of 1419 Sq. Km. has the unique distinction of being one of the smallest districts in the state. The areal extent of Faridkot district is confined within Northern latitudes of $29^0$54'00" to $34^0$54'00" and the Eastern longitudes of 74^0 15 '00" to $75^0$25'00" located in the southwestern parts of Punjab state with Faridkot city as its district headquarters.

. It is elevated at 204.33 m amsl. The district headquarters Faridkot, is connected with Ferozpur and Bhatinda by broad guage railway line and by metalled road.

CLIMATE & RAINFALL

The climate of the district is classified as sub-tropical steppe, semi arid and hot which is mainly dry except in rainy months and characterized by intensely hot summer and cold winter. During three months of monsoon season from July to September the moist air of oceanic origin penetrate into the district and causes high humidity, cloudiness and monsoon rainfall. The normal annual rainfall of Faridkot District is 449 mm in 24 days which is unevenly distributed over the district.

GEOMORPHOLOGY

Faridkot district is a part of Punjab Malwa plain and is sub-divided into the following three regions on the basis of soil, topography, climate and natural vegetation.

Faridkot Hathar- Sadiq- Sandy Plain

This part extends over Sadiq part of the district commonly known as Hathar area. This part of the district has a large numbers of sand dunes and wind erosion has its own effect on the fertility of soil.

FARIDKOT: Uttar- Dhudhi- sandy-loamy

This part of Faridkot district extends over Dhudhi, Kot Sukhia, Tehna and is known as Uttar area. The soil is sandy loam. Due to extension of agriculture and irrigation there is apparent disappearance of sand dunes to a great extent which have been leveled up generally.

Jaitu Area: Sandy Loam to Loam

This region extends over and around Jaitu tehsil. The texture of the soil is sandy loam to loam. This area is known for the best staple of cotton.Most of the area is covered under sandy soil followed by clayey

soil except some patches where there is appreciable thickness of top clay layer varying from 6.7 to 16.7m.

IRRIGATION

Irrigation in the district is carried out both by surface water as well as ground water. As major parts of the district are underlain by saline water, so canal water is major source of irrigation. In some parts where fresh water is available as fresh water lenses, than irrigation is done by skimming wells known as multiple well point system. Faridkot district is a good example of conjunctive use of canal water and ground water for irrigation.

Canal water irrigation

Major source of irrigation is canal where water from Sirhind canal is utilized for irrigation. Important distributories are abohar Branch, Dhoolkot distributary system, Mari distributary system, Faridkot distributary , Kotkapura distributary , Jaitu distributary, Rupana and Doda distributary system. The total length of above distributaries which serve in Faridkot district is 228.44k.m. out of which 206.49 k.m. are lined and 21.85 km are unlined. Gross irrigated area of all the channels are 223021acre and cultural command area is 198343 acres with 294 no. of outlets. Intensity of irrigation is 140%.

HYDROGEOLOGY

The Faridkot district falls in the Sutlej basin. The Sutlej in the historic period formed a tributary of Saraswati which followed the path of present Ghaggar river and later the Sutlej took an easterly trend to form part of Indus drainage. The alluvial deposits underlying Faridkot district form a part of Sutlej/ Saraswati deposits and are located away from the present course of Sutlej river. The area falls within alluvial tract composed of fine sands, silt, and silty clay. There are occasional bands and patches of sand with mica flakes. Relative compact bands of silty clay and thin kankar beds are also reported in some of the well sections in the district. Clay occurs in the form of lenticular bodies at various depths. Principal aquifer in the district is Alluvium and major aquifers in the district are older alluvium, Aeolian alluvium and younger alluvium.

It has been observed that in the eastern part of the district water levels are in the range of 10 to 20 m, in the central part of the district the water levels are in the range of 5 to 10 m bgl and in western part of the district the water levels are shallower in the range of 2 to 5 meters range. Pre monsoon (May 2011) water levels ranges from 3.50 to 15.35 m bgl and post monsoon water levels ranges from 1.94 to 16.1 m bgl. Seasonal water level fluctuation map (Plate-III) shows a rise and fall in the range of 0.00 to 2.00 meters in western and eastern part of the districts respectively.

GROUND WATER QUALITY

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

Range Of Chemical Constituents

EC (µmhos at 25^0C) : 591-4540

F (mg/l) : 0.28-4.35

As (mg/l) : nd-0.0076

Fe (mg/l) : 0.12-2.73

The distribution of various constituents varies greatly in the district. In some cases higher limits of certain important parameters exceed the maximum permissible limit

GROUND WATER RESOURCE

Ground water resources of Faridkot district has been computed according as per GEC-97.

Net ground water availability of the district is 610.61 million cubic meter(mcm), ground water draft for all users is 950.63 mcm, whereas net ground water availability for future irrigation development is -36485 mcm. All the blocks in the district, the stage of ground water development is more than 100%. All the two blocks fall in Over-exploited categories i.e stage of groundwater development is 160 %.

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
1	**Faridkot**	**1100**	**4029**	**10069**	**14576**	**5314**	**35088**

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	**Faridkot**	**29**	**197**	**596**	**1188**	**468**	**2478**

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	**Faridkot**	**3507**	**9947**	**9998**	**11636**	**0**	**35088**

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/kutcha**	**Under ground pipe**
1	**Faridkot**	**2093**	**35455**	**15**

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 Crores	Annual Recharge (MCM)
ROOF TOP RAIN WATER HARVESTING IN RURAL AND URBEN AREAS					
1	**Artificial Recharge Plan For Urban Areas.**	4417	0.25	**11.042**	**0.284**
2	**Roof Top Rain Water Harvesting in Rural Areas**	7679	0.25	19.197	**0.372**
	Total	12096	**0..25**	**30.239**	**0.656**
ARTIFICIAL RECHARGE IN FARMS					
1	**Artificial Recharge Plan Through Recharge Pits.**	14709	0.35	51.481	8.931
			Total	**51.481**	**8.931**

By the implementation of the proposed recharge structures there will be a reduction of 1.82% 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	**975.46**	**-364.85**	**9.587**	**965.873**	**160%**	**158.18%**	**1.82%**

ARTIFICIAL RCEHARGE PLAN THROUGH RECHARGE PITS IN OVER EXPLOITED BLOCKS OF FARIDKOT DISTRICT

Block Name	**Total area of the village (in hectares)**	**10%of village area taken for farm recharge(ha)**	**Total number of recharge pits**	**Annual recharge (MCM)= (Area*Runoff 15%*Rainfall**	**Cost of Pit @Rs35 000 (Crores)**
FARIDKOT	**72390**	**7239**	**7239**	**4.550**	**25.336**
KOTKAPURA	**74700**	**7470**	**7470**	**4.381**	**26.145**
			14709	**8.931**	**51.481**

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 FARIDKOT 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 (10% of total households)**	**Total No of AR Structures (one structure for each house)**	**Total recharge in MCM**	**Cost @ Rs. 25000/structure (crores)**
FARIDKOT	1	FARIDKOT	**72395**	**33995**	**3404**	**3405**	**0.171**	**8.512**
	2	KOTKAPURA	**75176**	**42737**	**4274**	**4274**	**0.201**	**10.685**
		Total	**147571**	**76732**	**7678**	**7679**	**0.372**	**19.197**

ARTIFICIAL RECHARGE PLAN FOR URBAN AREAS OF DISTRICT FARIDKOT 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 @Rs25000 (crores)
FARIDKOT	**FARIDKOT**	**FARIDKOT (MCI+OG)**	**17927**	**87695**	**1793**	**358540**	**0.120**	**896.50**
	KOTKAPURA	**KOTKAPURA (MCI)**	**19008**	**91979**	**1901**	**380160**	**0.119**	**950.50**
	KOTKAPURA	**JAITU (MCI+OG)**	**7230**	**37377**	**723**	**144600**	**0.045**	**361.50**
		TOTAL	**44165**	**319427**	**4417**	**883300**	**0.284**	**11.0425**

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 37566 tubewells operated by farmers for irrigation through unlined/Katcha (94.38%) open channel system in Faridkot 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 Faridkot district is estimated at 975.46 MCM. It is expected that around 37.49% 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 227.38 MCM assuming there is no crop diversification by the farmers.

The benefit will lead to saving of precious ground water resources in overexploited blocks Faridkot Districts. The measure if implemented will bring down the ground water overdraft from 160% to 122.51 %. 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, FARIDKOT 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)	Pecentage 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
610.61	975.46	956.03	19.43	94.38	277.38	728.65	748.08	160	122.51	37.49

 # 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**
FARIDKOT	Faridkot	6159.20	94.38	5813	29	**49**
	Kotkapura	4277.80	94.38	4037	20	

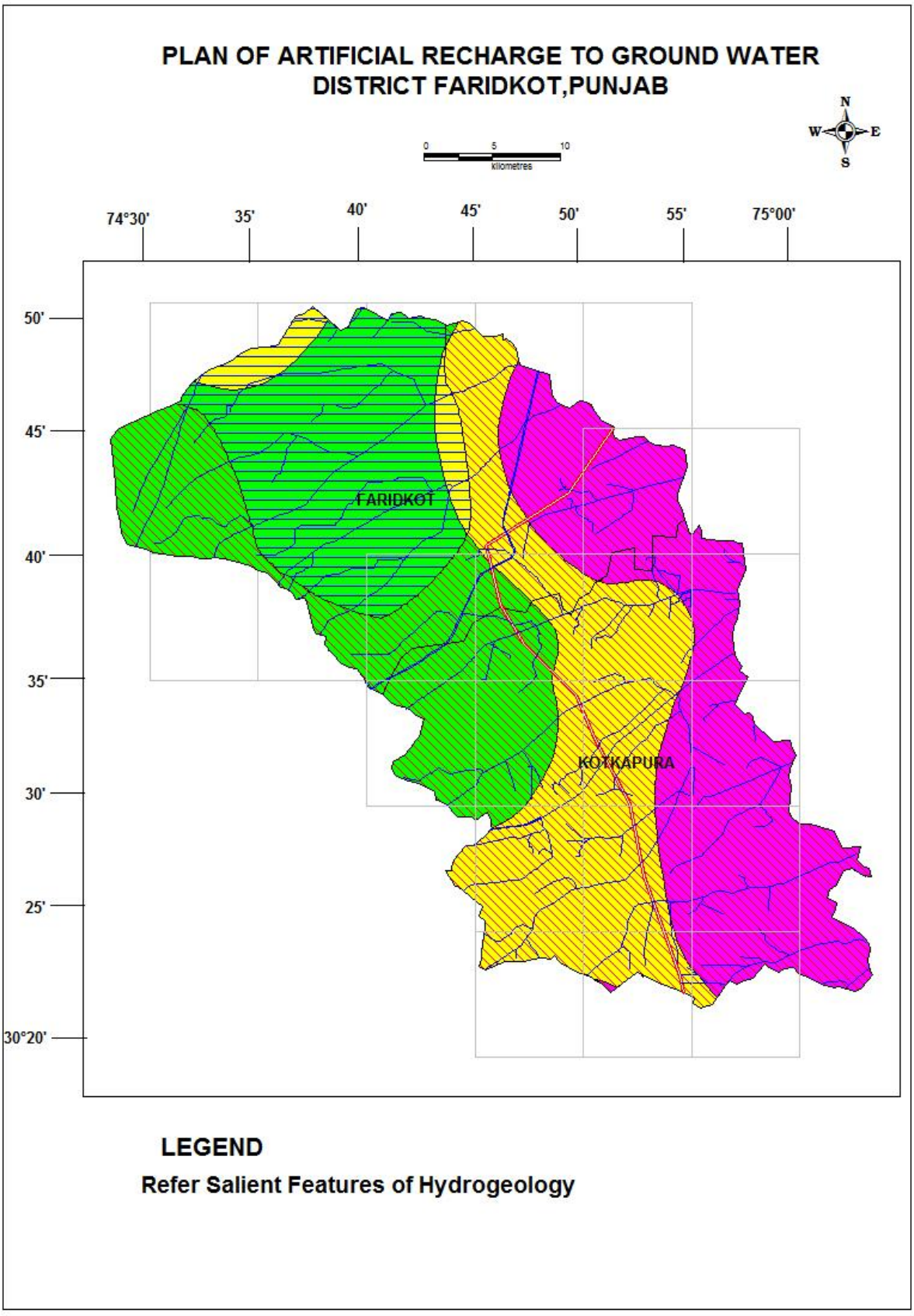
SALIENT FEATURES OF HYDROGEOLOGY OF DISTRICT FARIDKOT

Wells Feasible	Rigs Suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures
Tube Wells	Direct and Reverse Rotary	40 - 105	1300 - 2000	Recharge Trench with Injection Well
Tube Wells	Direct and Reverse Rotary	30 - 100	1000 - 1300	Recharge Trench
Tube Wells	Direct and Reverse Rotary	20 -70	400 - 1000	Recharge Trench

DEPTH TO WATER LEVEL NOVEMBER 2014		
	National Highway	International Boundary
0.00 - 5.00 mbgl	Canals	State Boundary
5.00 - 10.00 mbgl	Water Bodies	Block Boundary
10.00 - 20.00 mbgl	Major Drainage	Block Headquarters

OTHER INFORMATION

Name of State	Punjab
Name of District	Faridkot
Geographical Area	1419 sq.km
Major Geological Formation	Alluviam
Major Drainage System	Sutlej
Population (as on 2011)	6,18,008
Total Number of Blocks	2
Existing Major/Medium Irrigation Projects	Sirhind Feeder and Sirhind Canal
Utillizable Ground Water Resources 2011	610.61 (mcm)
Net Ground Water Draft	975.46 (mcm)
Stage of Ground Water Development	160 %
Average Annual Rainfall	449 mm
Range of Mean Daily Temperature	5° - 42° C
Over Exploted Blocks	FARIDKOT KOTKAPURA


PLAN OF ARTIFICIAL RECHARGE TO GROUND WATER
DISTRICT FARIDKOT,PUNJAB
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kilometres
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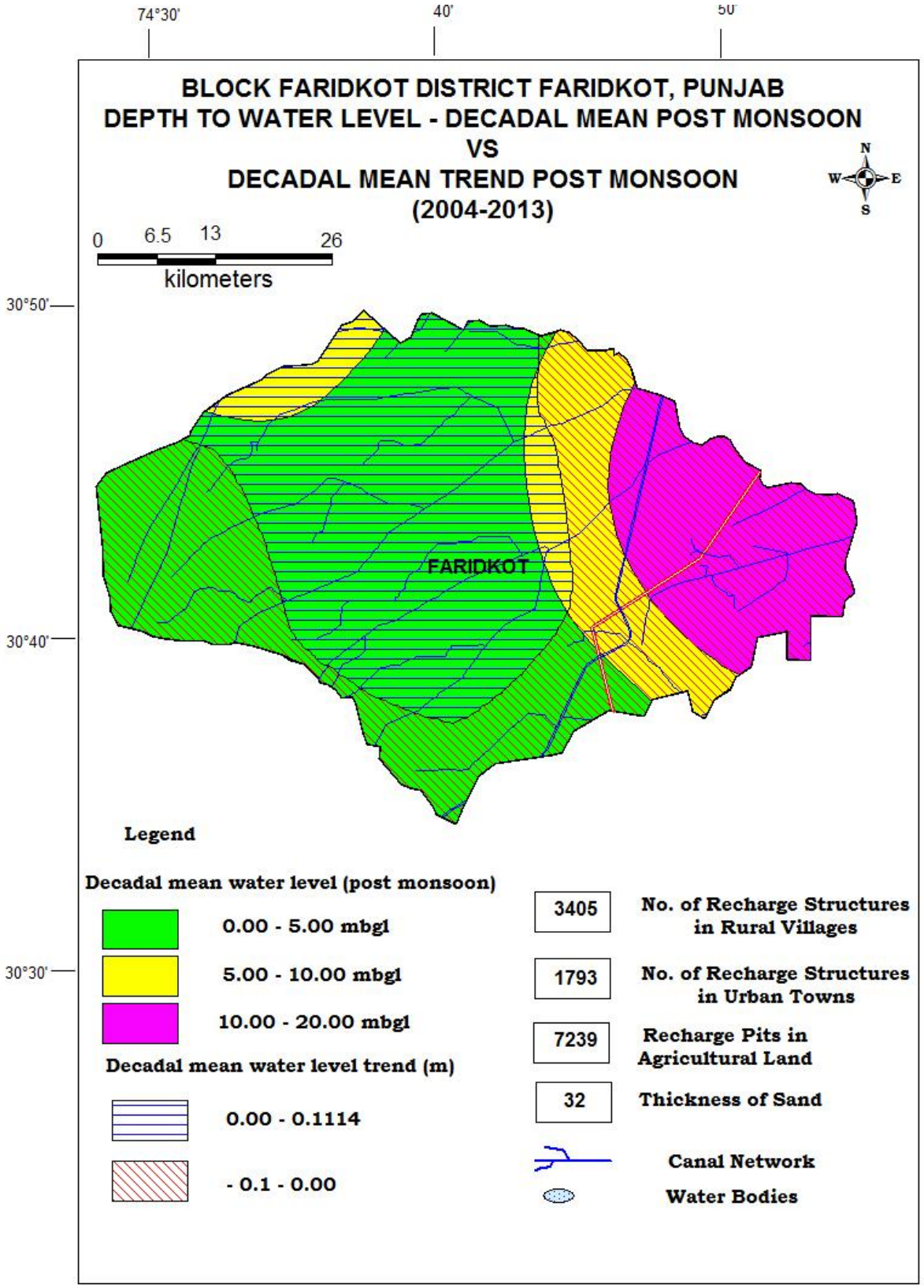
35'
40'
45'
50'
55'
75°00'
50'
45'
40'
35'
30'
25'
30°20'
FARIDKOT
KOTKAPURA
LEGEND
Refer Salient Features of Hydrogeology

BLOCK WISE PLAN OF DISTRICT FARIDKOT PUNJAB

(2OE BLOCKS)


74°30'
40'
50'
BLOCK FARIDKOT DISTRICT FARIDKOT, PUNJAB
DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
VS
DECADAL MEAN TREND POST MONSOON
(2004-2013)
N
W
E
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0 6.5 13 26
kilometers
30°50'
30°40'
30°30'
FARIDKOT
Legend
Decadal mean water level (post monsoon)
0.00 - 5.00 mbgl
5.00 - 10.00 mbgl
10.00 - 20.00 mbgl
Decadal mean water level trend (m)
0.00 - 0.1114
- 0.1 - 0.00
3405
No. of Recharge Structures in Rural Villages
1793
No. of Recharge Structures in Urban Towns
7239
Recharge Pits in Agricultural Land
32
Thickness of Sand
Canal Network
Water Bodies

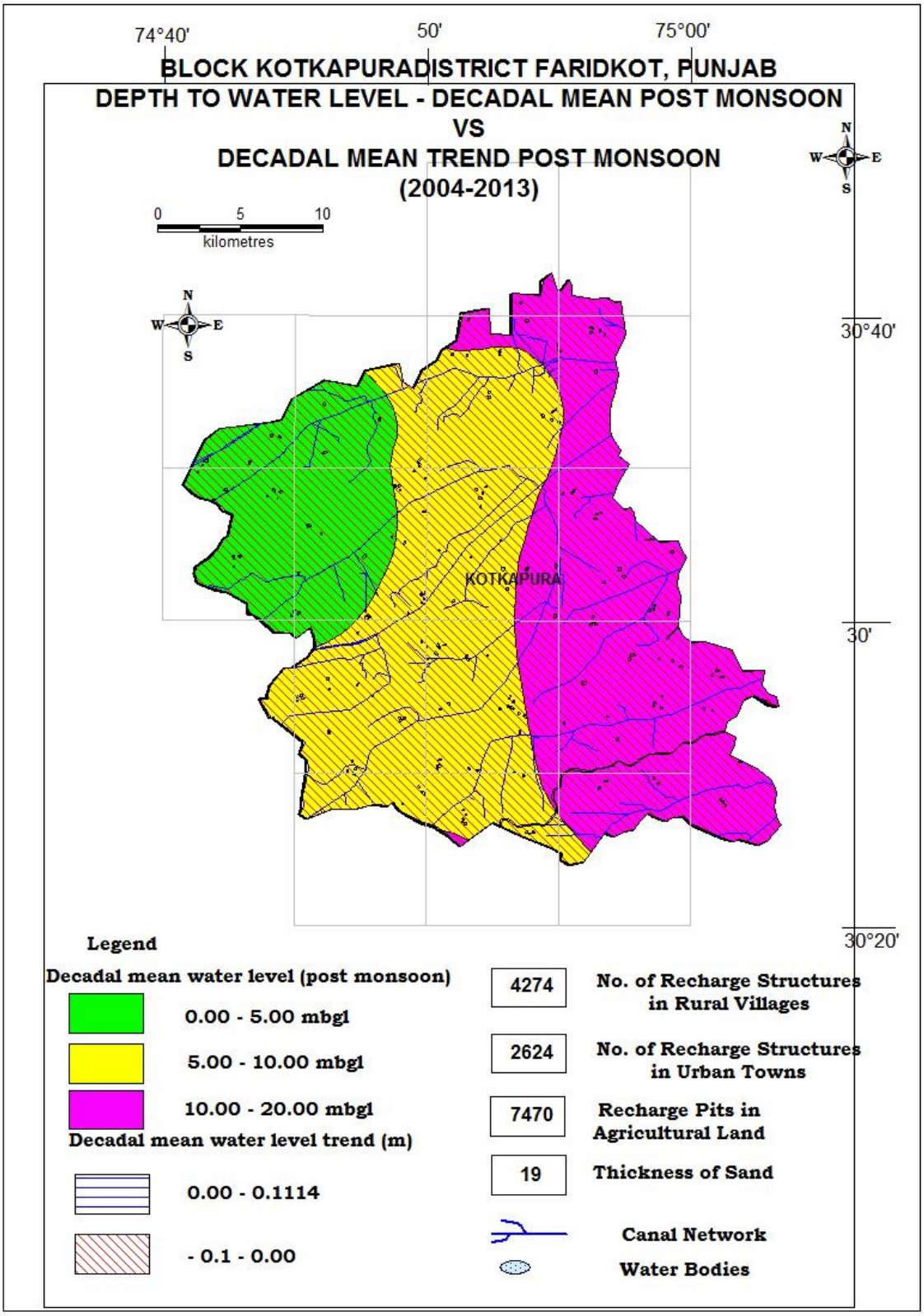
Ground Water Scenario of Block

Block Name:- Faridkot **District:- Faridkot** **State:- PUNJAB**		
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	*752.1*
	• Number of Villages inhabited • Un-inhabited	*88* *7*
	ii) Average Annual Rainfall (mm)	*424*
	iii) Area feasible for Artificial Recharge	*@ 30% of the area* *225.63sq.km*
	iv) Village identified under scarcity of Water?	*90*
	v) Village covered under water supply?	*76*
	vi) Water Tank exists in the village?	*92*
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	 *Satluj 100%*
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	724.44
	• Net Area Sown (Sq.Km)	599.80
	• Area Sown More than Once (Sq.Km)	6.62
	• Total Cropped Area (Sq.Km)	606.42
	• Cropping Intensity	101
	• 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)	
	• Pre- monsoon: (May 2015) *1.45-15.22(mbgl)*	*2.00-20.00(mbgl)*	
	• Post –monsoon: (Nov2014) *1.02-16.40(mbgl)*		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	• No of wells drilled	*8*	
	• Depth Range (m)	*343.78-350.0*	
	• Discharge (Ipm)	*3010-4840*	
	Aquifer Parameters		
	• Transmissivity (m2/day)	*977-2790*	
	• Storativity	*1.38*10^{-3} to 6..4*10^{-4}*	
	• Specified yield	*0.072*	
7.	GROUND WATER QUALITY	Min	Max
	• EC in µS/cm at 25^{0}c	*300*	*1892*
	• NO3 (mg/l)	*4.6*	*109*
	• F (mg/l)	*0.29*	*2.89*
	• As (mg/l)	---	0.0046
8.	DYANMIC GROUND WATER RESOURCES in MCM	**2011**	
	• Net Ground Water Availability (MCM)	345.85	
	• Existing Gross Ground Water Draft for Irrigation (MCM)	534.19	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (MCM)	8.98	
	• Existing Gross Ground Water Draft for all Uses (MCM)	543.17	

	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (MCM)	8.98	
	• Net Ground Water Availability for Future Irrigation Development (MCM)	-197.31	
	• Stage of Ground Water Development / Over Draft (%)	157	
	• 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)* *32*	Percentage % 64
10	Volume of unsaturated zone available for recharge (MCM)	288.86	
11.	Volume of water required for recharge (MCM)	384.27	
12.	Volume of surplus water available for recharge(MCM)	10.01	

RECHARGE/ CONSERVATION STRUCTURES		**Total Number of Recharge Structures**	**Total Cost (Rs. in crores)**	**Total Recharge/ Water saving in MCM**
13	Farm Recharge @Rs. 35000/-	7239	25.336	4.009
14	RWH Rural @ Rs. 25000/-	3405	8.512	0.208
15	RWH Urban@ Rs. 25000/-	1793	4.482	0.079
16	Underground pipe line (area in hectares) @ Rs. 50000/-	5813	29	127.05
	TOTAL		**67.33**	**131.346**


74°40'
50'
75°00'
BLOCK KOTKAPURADISTRICT FARIDKOT, PUNJAB
DEPTH TO WATER LEVEL - DECADAL MEAN POST MONSOON
VS
DECADAL MEAN TREND POST MONSOON
(2004-2013)
0 5 10
kilometres
N
W E
S
KOTKAPURA
30°40'
30'
30°20'
Legend
Decadal mean water level (post monsoon)
0.00 - 5.00 mbgl
5.00 - 10.00 mbgl
10.00 - 20.00 mbgl
Decadal mean water level trend (m)
0.00 - 0.1114
- 0.1 - 0.00
4274
No. of Recharge Structures in Rural Villages
2624
No. of Recharge Structures in Urban Towns
7470
Recharge Pits in Agricultural Land
19
Thickness of Sand
Canal Network
Water Bodies

Ground Water Scenario of Block

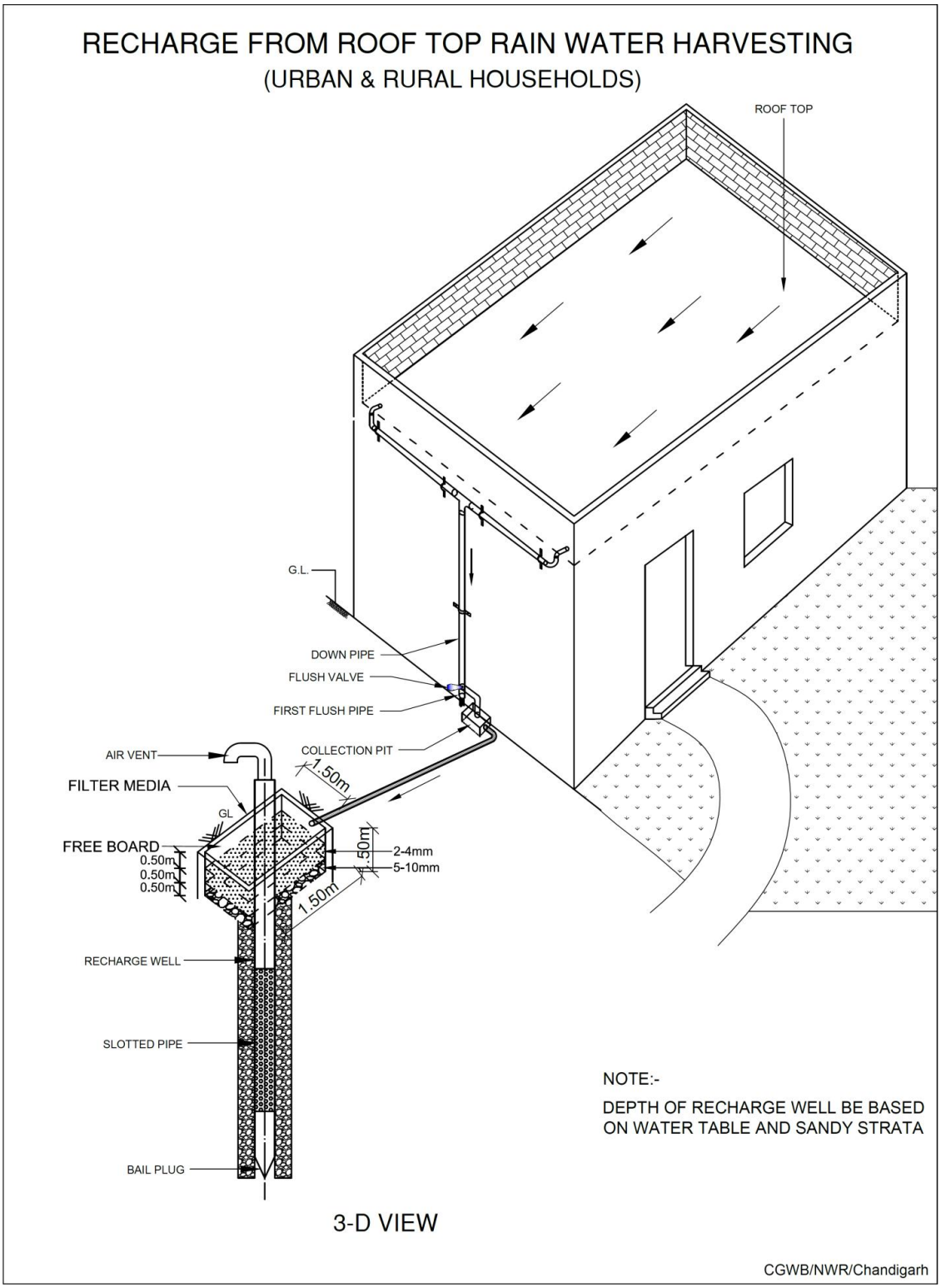
Block Name:- Kotkapura
District:- Faridkot
State:- PUNJAB

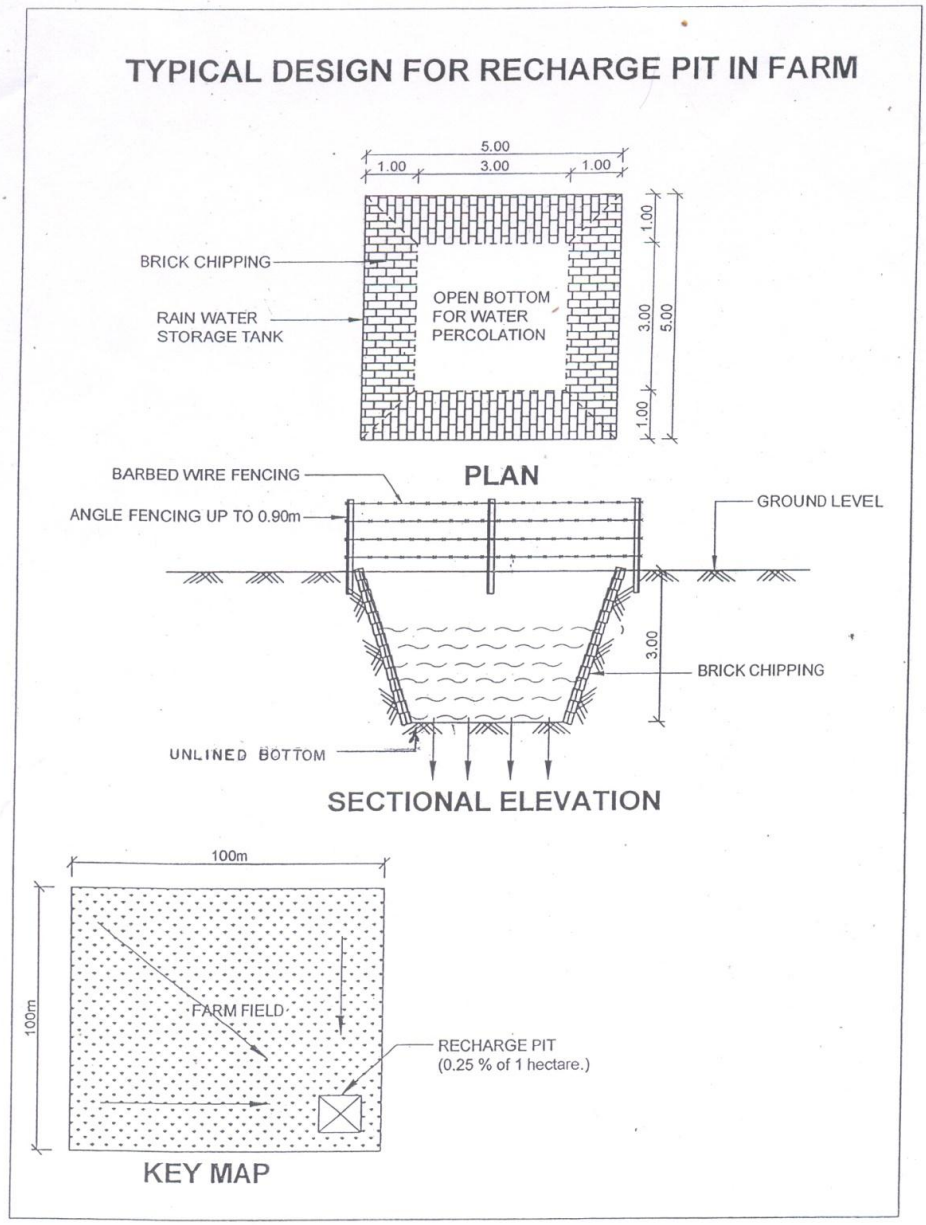
1.	GENERAL INFORMATION	
	i) Geographical area (sq km)	*666.5*
	• Number of Villages inhabited • Un-inhabited	*92* *1*
	ii) Average Annual Rainfall (mm)	*393*
	iii) Area feasible for Artificial Recharge	*@ 80% of the area* *533.2 sq.km*
	iv) Village identified under scarcity of Water?	*69*
	v) Village covered under water supply?	*67*
	vi) Water Tank exists in the village?	*50*
2.	GEOMORPHOLOGY	
	Major Physiographic	Alluvium Plain
	Major drainages Basin Sub-Basin	 *Indus* *Satluj 100%*
3.	LAND USE	
	• Area According to Village Papers (Sq.Km)	751.27
	• Net Area Sown (Sq.Km)	673.78
	• Area Sown More than Once (Sq.Km)	673.78
	• Total Cropped Area (Sq.Km)	1347.56
	• Cropping Intensity	200
	• 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)	
	• Pre- monsoon: (May 2015) *2.35-16.00(mbgl)*	*2.00 -20.00 (mbgl)*	
	• Post –monsoon: (Nov2014) *2.10-17.40(mbgl)*		
6.	GROUND WATER EXPLORATION BY CGWB (As on 31.03.2015)		
	• No of wells drilled	--	
	• Depth Range (m)	*343.78-350.0*	
	• Discharge (Ipm)	*3010-4840*	
	Aquifer Parameters		
	• Transmissivity (m2/day)	*977-2790*	
	• Storativity	*1.38*10^{-3} to 6..4*10^{-4}*	
	• Specified yield	*0.072*	
7.	GROUND WATER QUALITY	Min	Max
	• EC in µS/cm at 25^{0}c	*1261*	*5245*
	• NO3 (mg/l)	*16*	*138*
	• F (mg/l)	*0.32*	*2.68*
	• As (mg/l)	0.0012	0.0076
8.	DYANMIC GROUND WATER RESOURCES in MCM	**2011**	
	• Net Ground Water Availability (MCM)	264.76	
	• Existing Gross Ground Water Draft for Irrigation (MCM)	421.84	
	• Existing Gross Ground Water Draft for Domestic and Industrial Water Supply (MCM)	10.45	
	• Existing Gross Ground Water Draft for all Uses (MCM)	432.30	
	• Allocation for Domestic and Industrial Requirement Supply up to next 25 years (MCM)	10.45	

	• Net Ground Water Availability for Future Irrigation Development (Ham)	-167.53	
	• Stage of Ground Water Development / Over Draft (%)	163	
	• 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) 19*	Percentage % 38
10	Volume of unsaturated zone available for recharge (MCM)	255.98	
11.	Volume of water required for recharge (MCM)	340.53	
12.	Volume of surplus water available for recharge(MCM)	8.87	

RECHARGE/ CONSERVATION STRUCTURES		**Total Number of Recharge Structures**	**Total Cost (Rs. in crores)**	**Total Recharge/ Water saving in MCM**
13	Farm Recharge @Rs. 35000/-	7470	26.145	4.381
14	RWH Rural @ Rs. 25000/-	4274	10.685	0.201
15	RWH Urban @ Rs. 25000/-	2624	6.56	0.164
16	Under ground pipe line (area in hectares) @ Rs. 50000/-	4037	20.00	100.33
	TOTAL		**63.39**	**105.076**


RECHARGE FROM ROOF TOP RAIN WATER HARVESTING
(URBAN & RURAL HOUSEHOLDS)
ROOF TOP
G.L.
DOWN PIPE
FLUSH VALVE
FIRST FLUSH PIPE
COLLECTION PIT
AIR VENT
FILTER MEDIA
GL
FREE BOARD
0.50m
0.50m
0.50m
1.50m
1.50m
2-4mm
5-10mm
RECHARGE WELL
SLOTTED PIPE
BAIL PLUG
NOTE:-
DEPTH OF RECHARGE WELL BE BASED ON WATER TABLE AND SANDY STRATA
3-D VIEW
CGWB/NWR/Chandigarh


TYPICAL DESIGN FOR RECHARGE PIT IN FARM
5.00
1.00
3.00
1.00
BRICK CHIPPING
RAIN WATER
STORAGE TANK
OPEN BOTTOM
FOR WATER
PERCOLATION
1.00
3.00
5.00
1.00
PLAN
BARBED WIRE FENCING
ANGLE FENCING UP TO 0.90m
GROUND LEVEL
3.00
BRICK CHIPPING
UNLINED BOTTOM
SECTIONAL ELEVATION
100m
100m
FARM FIELD
RECHARGE PIT
(0.25 % of 1 hectare.)
KEY MAP