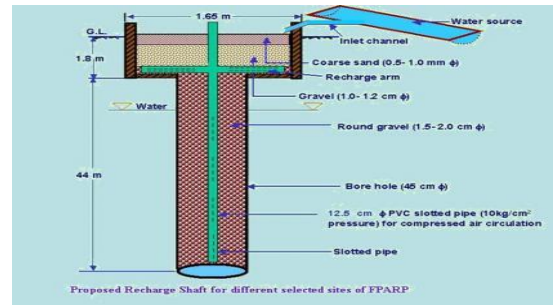




CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA



Excavated/dugout farm pond



**ARTIFICIAL RECHARGE TO GROUND WATER AND
WATER CONSERVATION PLAN OF UMRAIN
BLOCK, DISTRICT ALWAR, RAJASTHAN**

Western Region, Jaipur
October 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF UMRain BLOCK, DISTRICT ALWAR

Plan at a Glance

1.	Area of the Umrain Bas Block	906.39 sq. km.
2.	Area identified for Artificial Recharge	796.81 sq km
3.	Dynamic Ground Water Resources (as on 31.03.2011)	
	Net Ground Water Availability	100.7996 MCM
	Annual Ground Water Draft	174.4451 MCM
	Stage of Ground Water Development	173.06 %
4.	Volume of water to be harnessed	17.376 MCM
	Volume of water available for recharge through RS	0.315 MCM
	Volume of water available for recharge through PT	1.60 MCM
5.	Volume of unsaturated aquifer zone available for recharge	2460.04 MCM
6.	Total number of structures to be proposed	
	Recharge structures	9 shafts in 5 Nos. of existing village ponds
	Existing village pond with recharge shaft/ well	
	Percolation Tanks	8 nos.
	Sprinkler Irrigation	300 ha
	Expected Annual GW recharge	1.53 MCM
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	0.24 MCM
	Total recharge/ saving of ground water	1.77 MCM
7.	Estimated Cost	5.439 crore
	Artificial Recharge Plan	3.65 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.03 crore
	Operation and maintenance	0.259 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF UMRAIN BLOCK, DISTRICT ALWAR

Introduction

The **Umrain Block, district Alwar** is one of the over exploited blocks of Rajasthan and is under severe stress, as evident from the stage of ground water development, which has attained an alarming level of **173.06 %**.

Location of the block

The Umrain Block covers an area of 906.39 sq. km. and falls in central part of Alwar district. It is located between North latitudes 27°18' & 27°45' and East longitudes 76°21' & 76°46'.

Surface Water Availability

As per the studies carried out by Water Resources Department (WRD), Government of Rajasthan there is very little surplus water available for further development at 75% dependability. Based on the data made available from GWD, the surplus runoff available at 75% dependability level has been worked out for the zones as part of watershed within the block. The nature of aquifer (Alluvium/ Hard rock) is also considered while computing the number of Artificial Recharge structures feasible.

Accordingly about 17.376 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Volume of Aquifer available for Artificial Recharge is given in **Table.1**

Supply Side Management

Feasible Artificial Recharge and Water Conservation Structures

About 0.035 MCM/year surplus has been considered for each recharge shaft and 0.2 MCM/year for percolation tank wherever feasible. The areas with shallow water level (<5m) have not been considered for construction of Artificial Recharge Structures

The number of Recharge Shaft is decided based on the number of suitable ponds available within the zone. If still some surplus remained unallocated, than few Percolation tanks are proposed at suitable locations. However, in some of the blocks entire available surplus cannot be utilized due to non availability of ponds for Recharge shaft or suitable location for Percolation tanks. Zone wise number of Recharge Structures proposed to be constructed is given in **Table 2**.

Table 1: Volume of Aquifer available for artificial recharge

District	Block	Area of Block (Sq. km.)	Potential area suitable for recharge (Sq. km.)	Type of Aquifer	Area feasible for artificial recharge (Sq km)	Sp Yield	Average DTW (mbgl) NOV 2013	Thickness of unsaturated zone 3 m below ground level (m)	Volume of sub surface storage space available for artificial recharge (MCM)
Alwar	Umren	906.39	796.81	HR	106.77	0.02	5.93	2.93	6.26
				SR	690.04	0.1	38.56	35.56	2453.78

Table 2: Number of recharge structure

ZoneCode	Sub_Basin	Type of Aquifer	Zone-Area (sq. km.)	Total Surplus (MCM)	Water Level >5m	Feasible RS_Prop	Feasible PT_Prop
Banganga_Banganga_004_RJ0209_AL	Banganga	SR	12.631	0.028	N	0	0
Banganga_Banganga_005_RJ0209_AL	Banganga	SR	10.628	0.030	Y	1	0
Ruparail_Ruparail_002_RJ0209_AL	Ruparail	SR	0.034	0.002	N	0	0
Ruparail_Ruparail_003_RJ0209_AL	Ruparail	SR	192.138	12.715	Y	8	7
Ruparail_Ruparail_003_RJ0209_HR	Ruparail	HR	69.509	4.600	Y	0	1
Ruparail_Ruparail_004_RJ0209_AL	Ruparail	SR	54.363	0.000	Y	0	0
Ruparail_Ruparail_004_RJ0209_HR	Ruparail	HR	40.615	0.000	Y	0	0
Ruparail_Ruparail_004_RJ0209_HR	Ruparail	HR	37.354	0.000	Y	0	0
Ruparail_Ruparail_004_RJ0209_HR	Ruparail	HR	17.855	0.000	Y	0	0
Ruparail_Ruparail_005_RJ0209_AL	Ruparail	SR	0.237	0.000	N	0	0
Ruparail_Ruparail_007_RJ0209_AL	Ruparail	SR	184.506	0.000	Y	0	0
Ruparail_Ruparail_007_RJ0209_HR	Ruparail	HR	37.310	0.000	Y	0	0
Ruparail_Ruparail_007_RJ0209_HR	Ruparail	HR	22.482	0.000	Y	0	0
Ruparail_Ruparail_007_RJ0209_HR	Ruparail	HR	7.981	0.000	Y	0	0
Ruparail_Ruparail_007_RJ0209_HR	Ruparail	HR	16.351	0.000	Y	0	0
Ruparail_Ruparail_008_RJ0209_AL	Ruparail	SR	67.575	0.000	Y	0	0
Ruparail_Ruparail_013_RJ0209_AL	Ruparail	SR	18.947	0.000	Y	0	0
Ruparail_Ruparail_014_RJ0209_AL	Ruparail	SR	149.454	0.000	Y	0	0
Ruparail_Ruparail_014_RJ0209_AL	Ruparail	SR	79.645	0.000	Y	0	0
Sabi_Sabi_002_RJ0209_HR	Sabi	HR	6.473	0.000	N	0	0
Sabi_Sabi_011_RJ0209_HR	Sabi	HR	12.964	0.000	N	0	0
				17.376		9	8

Recharge Shaft

It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

Table 3: Tentative locations of village for village pond with recharge shaft

S.No.	Village	Long	Lat	Watershed	No of Shafts	Unit cost (Rs in lac)	Total cost (Rs in lac)
1	Bharkol	76.729	27.362	Banganga_Banganga_005_RJ0209_AL	1	5	5
2	Ghatla	76.623	27.733	Ruparail_Ruparail_003_RJ0209_AL	3	5	15
3	Chandoli	76.599	27.716	Ruparail_Ruparail_003_RJ0209_AL	1	5	5
4	Rundh Bhakhera	76.582	27.569	Ruparail_Ruparail_003_RJ0209_AL	3	5	15
5	Kesharpur	76.597	27.516	Ruparail_Ruparail_003_RJ0209_AL	1	5	5
				Total	9		45

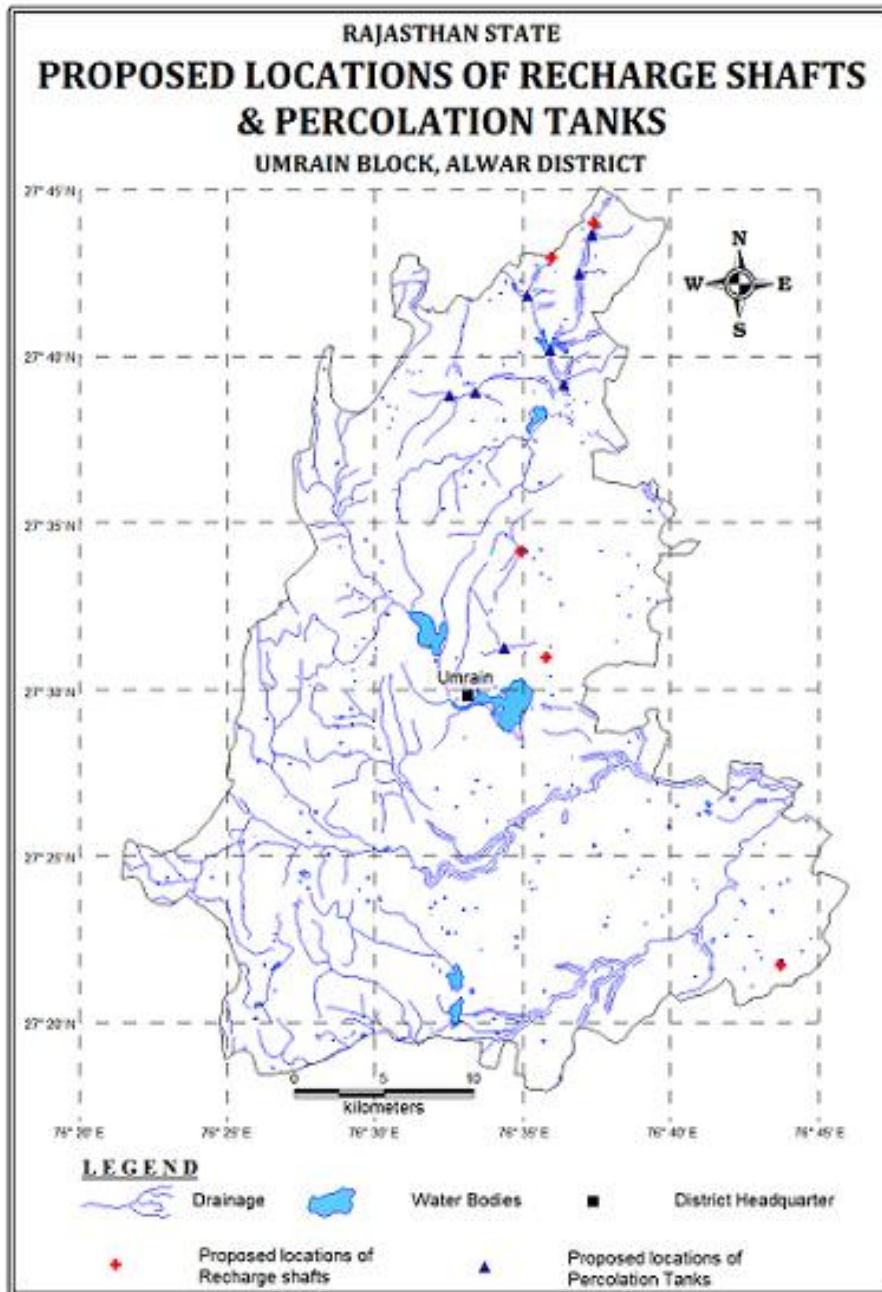
Percolation Tank

The tentative location of villages for construction of percolation tank and their cost estimates are shown in Fig 1 and Table 4

Table 4: Tentative locations of village for Percolation Tanks

S. No.	Village	Longitude	Latitude	Micro Watershed	Unit Cost (Rs. In lacs)
1	Chandoli	76.586	27.697	Ruparail_Ruparail_003_RJ0209_AL	40
2	Ghatla	76.622	27.727	Ruparail_Ruparail_003_RJ0209_AL	40
3	Jhadoli	76.616	27.708	Ruparail_Ruparail_003_RJ0209_AL	40
4	Bhandwara	76.599	27.670	Ruparail_Ruparail_003_RJ0209_AL	40
5	Thekra	76.606	27.653	Ruparail_Ruparail_003_RJ0209_AL	40
6	Bala Dahra	76.557	27.649	Ruparail_Ruparail_003_RJ0209_AL	40
7	Rundh Shahpur	76.542	27.647	Ruparail_Ruparail_003_RJ0209_AL	40
8	Rundh Bhakhera	76.573	27.521	Ruparail_Ruparail_003_RJ0209_HR	40
				Total	320

Figure 1: Showing Tentative location of the Recharge Shaft and Percolation Tank



Demand Side Management

Efficient Irrigation:

In Flood/ furrow irrigation method more than 50% of applied water is wasted through seepage to deeper levels, local inundation causes loss through evaporation and it leaches out the nutrients from the plants. While through drip and sprinkler irrigation method, wastage through irrigation losses could be minimized. Ground water usage can be minimized drastically by using HDPE pipes. Initially the scheme can be proposed to be started in 300 ha area, which is worst affected showing deepest water level and declining trends. The area is to be finalized based on land holdings, willingness of farmers and No Objection certificate from the land owner.

Impact Assessment and Monitoring

Assessment of impact of the artificial recharge schemes implemented is essential to assess the efficacy of structures constructed. It helps in identification of cost-effective recharge mechanisms for optimal recharge into the ground water system. It also helps to make necessary modifications in site selection, design and construction of structures in future.

It is proposed to construct 5 piezometers, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure.

Revival, Repair of Water Bodies

The existing ponds and tanks with time loose their storage capacity as well as the natural ground water recharge through these water bodies has also become negligible due to siltation and encroachment by farmers for agriculture purposes. There are several such villages where ponds/ tanks are in dilapidated condition. These existing village tanks, which are normally silted and damaged, can be modified to serve as recharge structure in case these are suitably located to serve as percolation tanks. Through desilting, coupled with providing proper waste weir, the village tanks can be converted into recharge structure.

Financial Outlay of the Plan

The total estimated cost of the Plan is Rs. 5.439 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 5 & 6. The unit rates are as followed by the Govt. of Rajasthan (BSR).

Table 5: Cost of the recharge structures

Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)	Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost of Sprinkler irrigation in Rs (Unit cost 0.005 cr/ha)
Soft rock – 0.45	3.20	1.50

Table 6: Tentative cost of different activities

Feasible Artificial Recharge & Water Conservation structures/ activities	Tentative Design	Quantity (in nos. or area in ha)	Rainwater harvested (MCM) or No. of sprinklers (/ha)	Tentative unit cost (in Rs lakh)	Total tentative cost (in Rs lakh)	Expected Annual GW recharge/ conservation (MCM) @ 0.8 MCM/structure
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12” with filter pit	9	0.315	5	45	0.252
	Hard rock: Depth –60m, Dia 10-12”with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	8	1.60	40	320	1.28
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			515	1.77
Impact assessment & Monitoring						
Piezometer	50 – 80 m	5		0.6	3	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					25.90	
TOTAL					543.90	1.77

Note: Type, number and cost of structure may vary according to site after ground verification