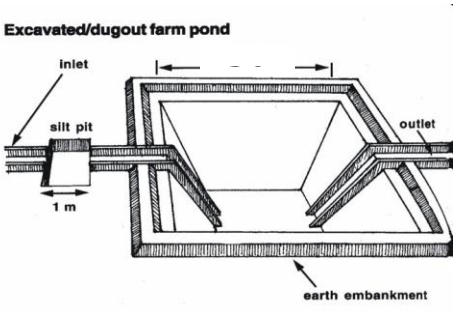
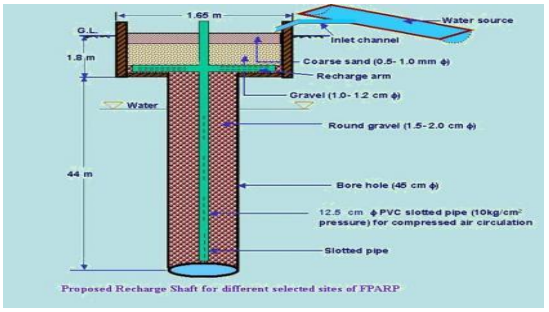
CENTRAL GROUND WATER BOARD

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





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KAMAN BLOCK, DISTRICT BHARATPUR, RAJASTHAN

Western Region, Jaipur
January 2017

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KAMAN BLOCK, DISTRICT BHARATPUR

Plan at a Glance

1.	**Area of the Kaman Block**	**562.49 sq. km.**
2.	**Area identified for Artificial Recharge**	**492.93 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**64.12 MCM**
	Annual Ground Water Draft	**62.37 MCM**
	Stage of Ground Water Development	**97.28%**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**7.523 MCM** **2.79 MCM** **--**
5.	**Volume of unsaturated aquifer zone available for recharge**	**253.37 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**80 shafts in 64 Nos. of existing village ponds** **--** **300 ha**
	Expected Annual GW recharge	**2.232 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24**
	Total recharge/ saving of ground water	**2.472 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**6.09 crore** 4.00 crore 1.50 crore 0.30 crore 0.29 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KAMAN BLOCK, DISTRICT BHARATPUR

Introduction

The **Kaman Block, district Bharatpur** is one of the critical blocks of Rajasthan and provides favourable conditions for artificial recharge, with stage of ground water development of 97.28%. 492.93 sq. km. area is potential zone area and thus feasible for artificial recharge.

Location of the block

The Kaman Block of Bharatpur District covering an area of 562.49 Sq. Km. falls in northern part of Bharatpur District and is located between North latitudes 27°32' & 27°49' and East longitudes 76°59' & 77°21'.

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 7.523 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)
Bharatpur	Kaman	562.49	492.93	SR	492.93	0.1	8.14	5.14	253.37

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
Ruparail_Ruparail_006_RJ0603_AL	Ruparail	SR	3.875	0.052	N	0	0
Ruparail_Ruparail_009_RJ0603_AL	Ruparail	SR	328.245	5.462	Y	47	0
Ruparail_Ruparail_010_RJ0603_AL	Ruparail	SR	66.464	0.970	Y	28	0
Ruparail_Ruparail_011_RJ0603_AL	Ruparail	SR	6.314	0.108	N	0	0
Ruparail_Ruparail_012_RJ0603_AL	Ruparail	SR	169.426	0.931	Y	5	0
				7.523		**80**	**0**

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.

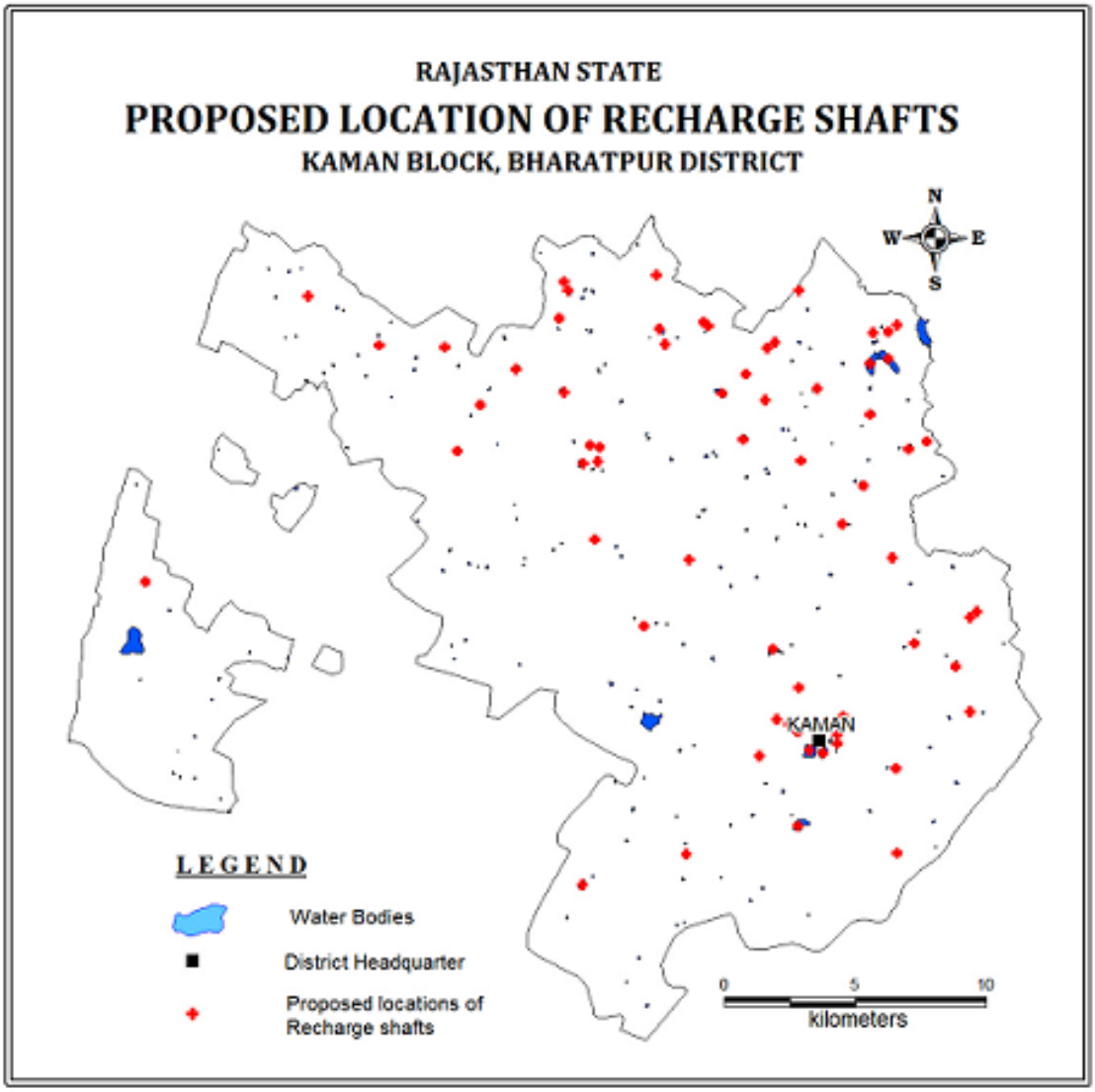
. The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 1 and Table 3.

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	Bas Laddooka	77.217	27.604	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
2	Bas Karmooka	77.245	27.638	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
3	Kaman (M)	77.260	27.646	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
4	Kaman (M)	77.252	27.650	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
5	Kaman (M)	77.261	27.661	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
6	Kaman (M)	77.278	27.652	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
7	Kaman (M)	77.276	27.645	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
8	Kaman (M)	77.276	27.642	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
9	Kanwara	77.298	27.634	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
10	Dhana	77.327	27.653	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
11	Ghata	77.299	27.605	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
12	Udaka	77.305	27.677	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
13	Dhilawati	77.327	27.686	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
14	Dhilawati	77.329	27.688	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
15	Akata	77.321	27.669	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
16	Unchera	77.261	27.739	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
17	Anchwara	77.286	27.731	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
18	Satwas	77.277	27.717	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
19	Palri	77.297	27.706	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
20	Saumka	77.182	27.712	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
21	Undhan	77.218	27.705	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
22	Nagla Mukariv	77.201	27.683	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
23	Thalchana	77.137	27.758	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
24	Bamanwari	77.170	27.763	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
25	Kathaul	77.128	27.743	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
26	Sahsan	77.177	27.739	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
27	Sahsan	77.180	27.745	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
28	Sahsan	77.183	27.744	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
29	Sahsan	77.183	27.739	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
30	Ghoseenga	77.170	27.801	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
31	Ghoseenga	77.171	27.798	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
32	Kherli Nanoo	77.168	27.788	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
33	Kanchanner	77.151	27.771	Ruparail_Ruparail_009_RJ0603_AL	1	5	5
34	Kalawata	77.251	27.675	Ruparail_Ruparail_009_RJ0603_AL	2	5	10
35	Kaman (M)	77.257	27.649	Ruparail_Ruparail_009_RJ0603_AL	2	5	10

36	Kaman (M)	77.270	27.639	Ruparail_Ruparail_009_RJ0603_AL	2	5	10
37	Kaman (M)	77.265	27.640	Ruparail_Ruparail_009_RJ0603_AL	4	5	20
38	Sablana	77.260	27.614	Ruparail_Ruparail_009_RJ0603_AL	4	5	20
39	Sonokhar	77.239	27.747	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
40	Pathwari	77.288	27.755	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
41	Sahera	77.303	27.743	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
42	Nagla Bhongra	77.310	27.746	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
43	Jurhara	77.205	27.803	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
44	Jurhara	77.209	27.779	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
45	Jurhari	77.224	27.787	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
46	Jurhari	77.226	27.786	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
47	Nagla Doobokhar	77.240	27.769	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
48	Kherli Gumani	77.248	27.760	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
49	Bamni	77.248	27.778	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
50	Bamni	77.251	27.780	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
51	Gaonri	77.268	27.764	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
52	Nogawan	77.260	27.798	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
53	Naunera	77.289	27.783	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
54	Naunera	77.295	27.784	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
55	Naunera	77.299	27.786	Ruparail_Ruparail_010_RJ0603_AL	1	5	5
56	Jurhara	77.207	27.785	Ruparail_Ruparail_010_RJ0603_AL	2	5	10
57	Pai	77.231	27.763	Ruparail_Ruparail_010_RJ0603_AL	2	5	10
58	Naunera	77.288	27.773	Ruparail_Ruparail_010_RJ0603_AL	3	5	15
59	Naunera	77.295	27.774	Ruparail_Ruparail_010_RJ0603_AL	4	5	20
60	Bijasana	77.007	27.698	Ruparail_Ruparail_012_RJ0603_AL	1	5	5
61	Manchi	77.177	27.594	Ruparail_Ruparail_012_RJ0603_AL	1	5	5
62	Gadhaner	77.070	27.796	Ruparail_Ruparail_012_RJ0603_AL	1	5	5
63	Kanwari	77.098	27.779	Ruparail_Ruparail_012_RJ0603_AL	1	5	5
64	Khallooka	77.124	27.778	Ruparail_Ruparail_012_RJ0603_AL	1	5	5
				Total	**80**		**400**

Fig: 1: Tentative location of 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 loses 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 50 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. 6.09 cr. The tentative cost estimates of the various activities of the Plan are shown in Table 4 & 5. The unit rates are as followed by the Govt. of Rajasthan (BSR).

Table 4: 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 – 4.00	--	1.50

Table 5: 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	80	2.79	5	400	2.232
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	-	-	-	-	-
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**550**	**2.472**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	50		0.6	30	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					29	
TOTAL					**609**	**2.472**

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