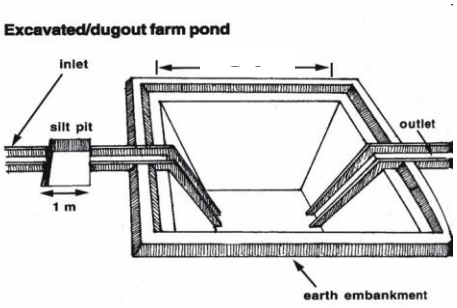
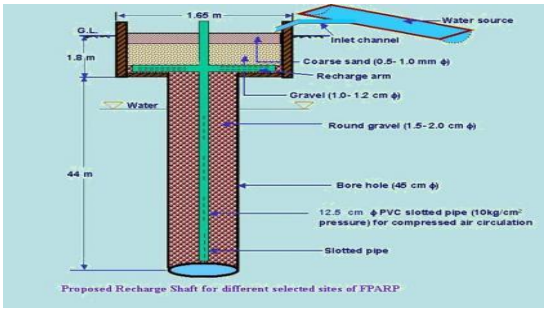
CENTRAL GROUND WATER BOARD

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





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

Western Region, Jaipur
October 2016

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

Plan at a Glance

1.	**Area of the Tijara Bas Block**	**673.48 Sq. km.**
2.	**Area identified for Artificial Recharge**	**611.52 sq km**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**88.9232 MCM**
	Annual Ground Water Draft	**135.0218 MCM**
	Stage of Ground Water Development	**151.84 %**
4.	**Volume of water to be harnessed** **Volume of water available for recharge through RS** **Volume of water available for recharge through PT**	**4.90 MCM** **0.98 MCM** **3.14 MCM**
5.	**Volume of unsaturated aquifer zone available for recharge**	**1475.90 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures Existing village pond with recharge shaft/ well Percolation Tanks Sprinkler Irrigation	**28 shafts in 27 Nos. of existing village ponds** **16 nos.** **300 ha**
	Expected Annual GW recharge	**3.30 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**0.24 MCM**
	Total recharge/ saving of ground water	**3.54 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Sprinkler Irrigation Piezometer construction Operation and maintenance	**9.891 crore** 7.80 crore 1.50 crore 0.12 crore 0.471 crore

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

Introduction

The **Tijara 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 **151.84%.**

Location of the block

The Tijara Block covers an area of 526.46 Sq. km. and falls in northern part of Alwar district. It is located between North latitudes 27°48' & 28°13' and East longitudes 76°43' & 76°58'.

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 4.90 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	Tijara	673.48	611.52	SR	611.52	0.15	19.09	16.09	1475.90

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_001_RJ0208_AL	Ruparail	SR	138.347	3.245	Y	14	14
Sabi_Sabi_003_RJ0208_AL	Sabi	SR	96.629	0.600	Y	6	2
Sabi_Sabi_004_RJ0208_AL	Sabi	SR	59.345	0.240	Y	1	0
Sabi_Sabi_005_RJ0208_AL	Sabi	SR	106.025	0.029	Y	1	0
Sabi_Sabi_006_RJ0208_AL	Sabi	SR	139.694	0.235	Y	6	0
Sabi_Sabi_007_RJ0208_AL	Sabi	SR	8.301	0.019	N	0	0
Sabi_Sabi_009_RJ0208_AL	Sabi	SR	100.609	0.010	Y	0	0
Sabi_Sabi_010_RJ0208_AL	Sabi	SR	30.122	0.005	Y	0	0
Sabi_Sabi_018_RJ0208_AL	Sabi	SR	9.108	0.519	Y	0	0
				4.902		**28**	**16**

Recharge Shaft

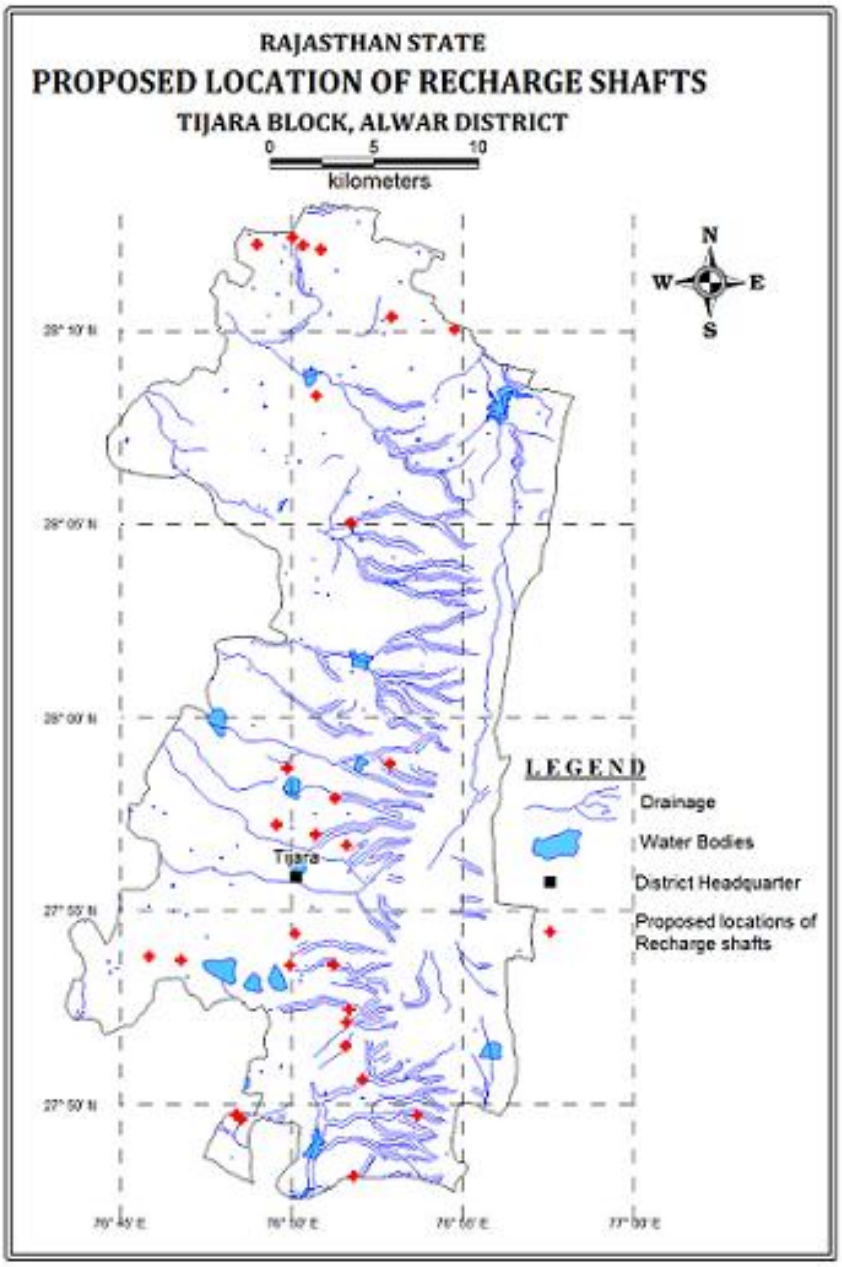
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Ram Nagar	76.764	27.897	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
2	Bhindoosi	76.779	27.895	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
3	Khalilpuri	76.835	27.907	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
4	Bilaspur	76.833	27.893	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
5	Maliyar Jatt	76.854	27.893	Ruparail_Ruparail_001_RJ0208_AL	2	5	10
6	Raipur	76.861	27.874	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
7	Raipur	76.860	27.869	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
8	Phullabas	76.860	27.859	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
9	Gol	76.868	27.844	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
10	Jairoli	76.895	27.828	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
11	Bai	76.806	27.829	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
12	Bai	76.809	27.827	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
13	Andhaka	76.864	27.802	Ruparail_Ruparail_001_RJ0208_AL	1	5	5
14	Bhiwadi (CT)	76.817	28.204	Sabi_Sabi_003_RJ0208_AL	1	5	5
15	Bhiwadi (CT)	76.834	28.207	Sabi_Sabi_003_RJ0208_AL	1	5	5
16	Bhiwadi (CT)	76.839	28.204	Sabi_Sabi_003_RJ0208_AL	1	5	5
17	Bhiwadi (CT)	76.848	28.202	Sabi_Sabi_003_RJ0208_AL	1	5	5
18	Gadpur	76.882	28.173	Sabi_Sabi_003_RJ0208_AL	1	5	5
19	Kheri	76.913	28.167	Sabi_Sabi_003_RJ0208_AL	1	5	5
20	Chhapar	76.846	28.139	Sabi_Sabi_004_RJ0208_AL	1	5	5
21	Nibaheri	76.862	28.084	Sabi_Sabi_005_RJ0208_AL	1	5	5
22	Kharkhara	76.881	27.980	Sabi_Sabi_006_RJ0208_AL	1	5	5
23	Rambas Jhonpri	76.831	27.978	Sabi_Sabi_006_RJ0208_AL	1	5	5
24	Baliyawas	76.854	27.965	Sabi_Sabi_006_RJ0208_AL	1	5	5
25	Ibrahimpur @ Virampur	76.826	27.954	Sabi_Sabi_006_RJ0208_AL	1	5	5
26	Ibrahimpur @ Virampur	76.845	27.950	Sabi_Sabi_006_RJ0208_AL	1	5	5
27	Tijara (M)	76.860	27.945	Sabi_Sabi_006_RJ0208_AL	1	5	5
				Total	**28**		**140**

Figure 1: Showing Tentative location of the Recharge Shaft



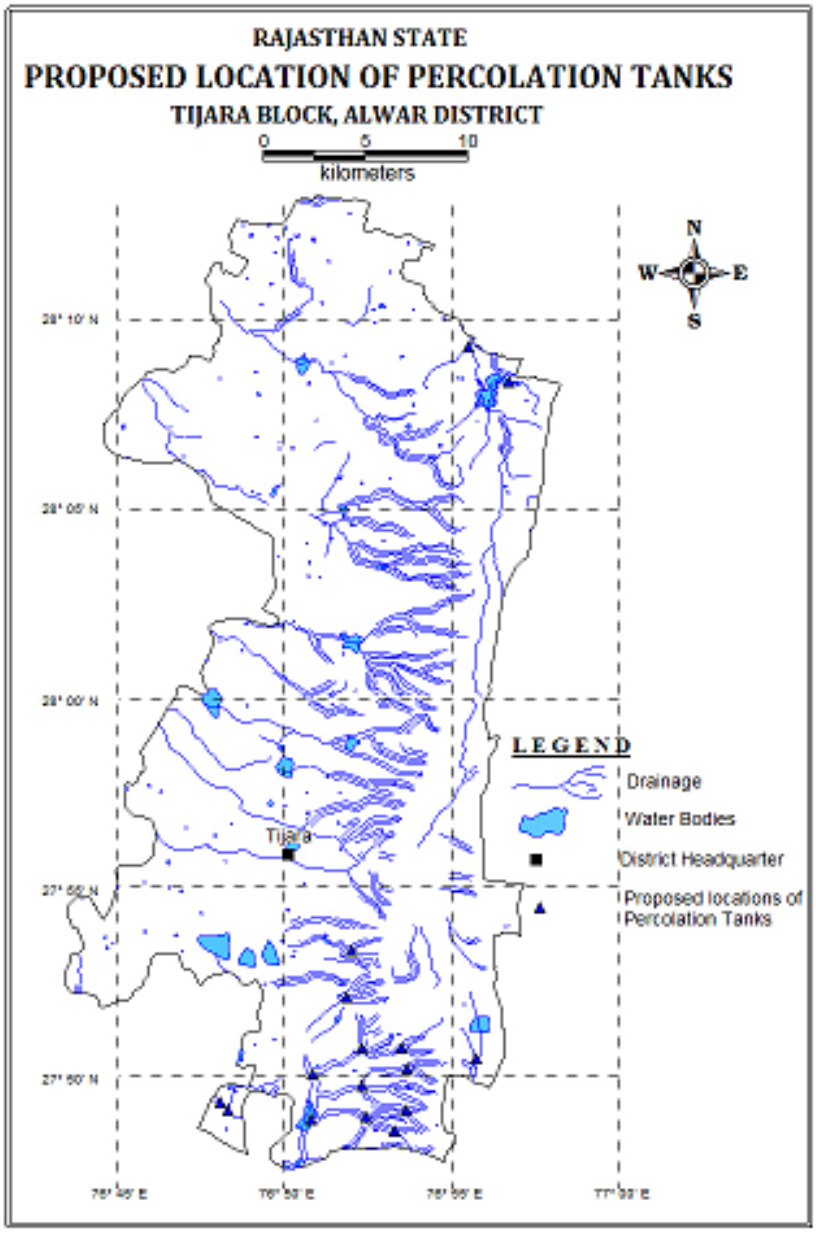
Percolation Tank

The tentative location of villages for construction of percolation tank and their cost estimates are shown in Fig 2 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	Raipur	76.864	27.868	Ruparail_Ruparail_001_RJ0208_AL	40
2	Maliyar Jatt	76.867	27.889	Ruparail_Ruparail_001_RJ0208_AL	40
3	Gol	76.872	27.846	Ruparail_Ruparail_001_RJ0208_AL	40
4	Jairoli	76.846	27.815	Ruparail_Ruparail_001_RJ0208_AL	40
5	Berla	76.847	27.835	Ruparail_Ruparail_001_RJ0208_AL	40
6	Jairoli	76.872	27.829	Ruparail_Ruparail_001_RJ0208_AL	40
7	Jairoli	76.874	27.815	Ruparail_Ruparail_001_RJ0208_AL	40
8	Jairoli	76.894	27.818	Ruparail_Ruparail_001_RJ0208_AL	40
9	Pahar Samlat @ Rundh Baghor	76.895	27.837	Ruparail_Ruparail_001_RJ0208_AL	40
10	Gol	76.892	27.846	Ruparail_Ruparail_001_RJ0208_AL	40
11	Neemli	76.929	27.841	Ruparail_Ruparail_001_RJ0208_AL	40
12	Jairoli	76.888	27.809	Ruparail_Ruparail_001_RJ0208_AL	40
13	Bai	76.806	27.818	Ruparail_Ruparail_001_RJ0208_AL	40
14	Bai	76.802	27.822	Ruparail_Ruparail_001_RJ0208_AL	40
15	Sare Kalan	76.925	28.155	Sabi_Sabi_003_RJ0208_AL	40
16	Mahandika	76.945	28.139	Sabi_Sabi_003_RJ0208_AL	40
				Total	**640**

Figure 2: Showing Tentative location of the 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 20 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. 9.891 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 – 1.40	6.40	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	28	0.98	5	140	0.78
	Hard rock: Depth –60m, Dia 10-12"with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	16	3.20	40	640	2.56
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			**930**	**3.58**
Impact assessment & Monitoring						
Piezometer	50 – 80 m	20		0.6	12	
Impact assessment will be carried out by implementing agency						
O & M - 5% of total cost of the scheme					47.10	
TOTAL					**989.10**	**3.58**

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