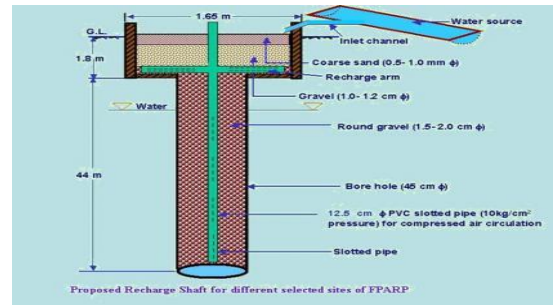




CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA



Excavated/dugout farm pond



**ARTIFICIAL RECHARGE TO GROUND WATER AND
WATER CONSERVATION PLAN OF BALOTRA
BLOCK, DISTRICT BARMER, RAJASTHAN**

Western Region, Jaipur
November 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BALOTRA BLOCK, DISTRICT BARMER

Plan at a Glance

1.	Area of the Balotra Block	3513.87 sq.km.
2.	Area identified for Artificial Recharge	852.32 sq km
3.	Dynamic Ground Water Resources (as on 31.03.2011)	
	Net Ground Water Availability	18.98 MCM
	Annual Ground Water Draft	34.11 MCM
	Stage of Ground Water Development	179.69%
4.	Volume of water to be harnessed	1.195 MCM
	Volume of water available for recharge through RS	1.155 MCM
	Volume of water available for recharge through PT	--
5.	Volume of unsaturated aquifer zone available for recharge	1439.70 MCM
6.	Total number of structures to be proposed	
	Recharge structures	33 shafts in 33
	Existing village pond with recharge shaft/ well	Nos. of existing
		village ponds
	Percolation Tanks	--
	Sprinkler Irrigation	300 ha
	Expected Annual GW recharge	0.924MCM
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	0.24
	Total recharge/ saving of ground water	1.164 MCM
7.	Estimated Cost	3.478 crore
	Artificial Recharge Plan	1.65 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.162 crore
	Operation and maintenance	0.166 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF BALOTRA BLOCK, DISTRICT BARMER

Introduction

The **Balotra Block, district Barmer** 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 **179.69%**.

Location of the block

The Balotra Block of Barmer District covering an area of 3513.87 Sq. Km. falls in north-eastern part of Barmer District and is located between North latitudes 25°37' & 26°20' and East longitudes 71°51' & 72°42'.

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 1.195 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)
Barmer	Balotra	3513.9	852.32	SR	760.13	0.06	34.00	31.00	1413.73
				HR	92.19	0.015	21.78	18.78	25.97

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
Luni_Luni_051_RJ0501_AL	Luni	SR	129.878	0.028	Y	1	0
Luni_Luni_053_RJ0501_AL	Luni	SR	2.317	0.001	Y	0	0
Luni_Luni_055_RJ0501_AL	Luni	SR	229.694	0.009	Y	0	0
Luni_Luni_057_RJ0501_AL	Luni	SR	51.406	0.016	Y	0	0
Luni_Luni_058_RJ0501_AL	Luni	SR	344.284	0.078	Y	2	0
Luni_Luni_059_RJ0501_AL	Luni	SR	511.614	0.096	Y	3	0
Luni_Luni_061_RJ0501_AL	Luni	SR	320.150	0.067	Y	2	0
Luni_Luni_063_RJ0501_AL	Luni	SR	64.882	0.027	Y	0	0
Luni_Luni_064_RJ0501_AL	Luni	SR	859.153	0.177	Y	5	0
Luni_Luni_065_RJ0501_AL	Luni	SR	71.116	0.011	Y	0	0
Luni_Luni_068_RJ0501_AL	Luni	SR	338.723	0.620	Y	18	0
Luni_Luni_069_RJ0501_AL	Luni	SR	547.389	0.066	Y	2	0
				1.195		33	0

Recharge Shaft

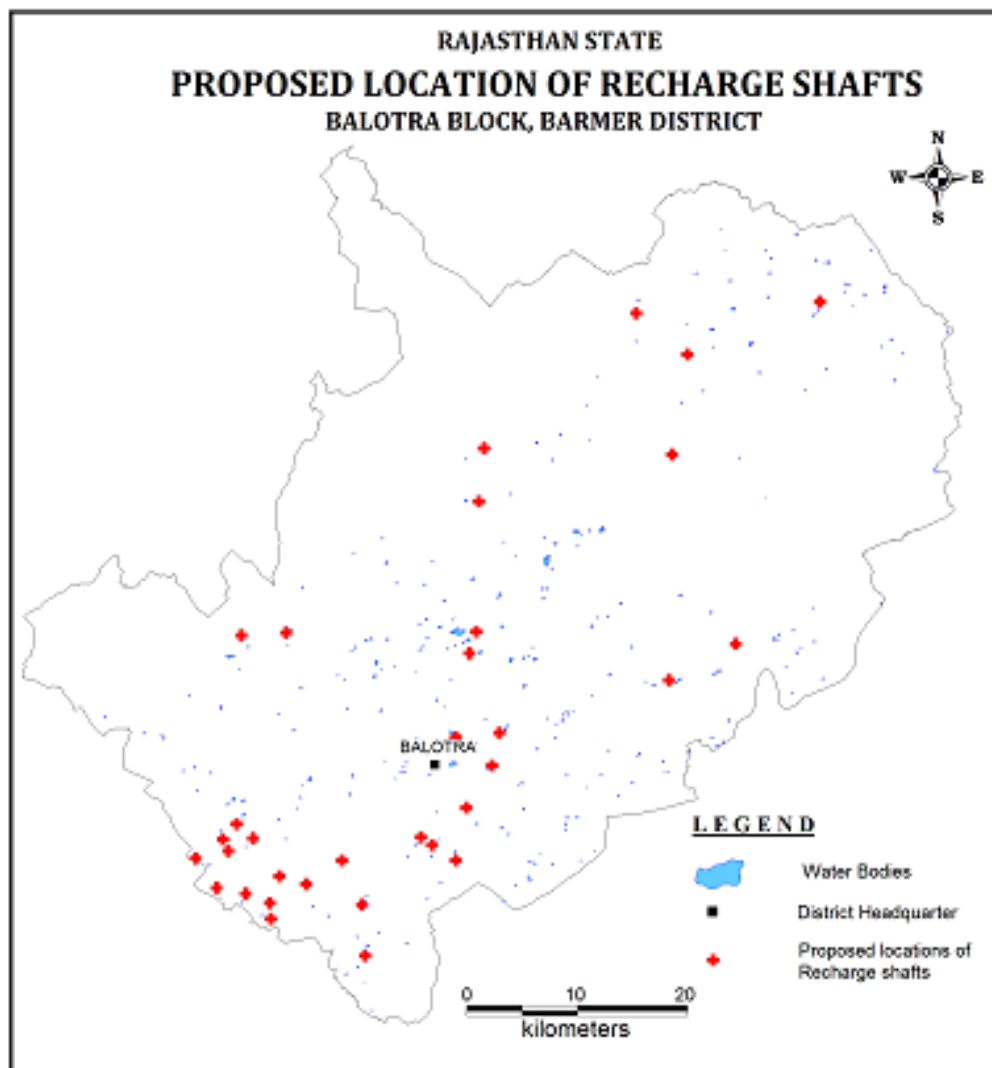
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Wariyon Ki Dhani	72.569	26.206	Luni_Luni_051_RJ0501_AL	1	5.00	5.00
2	Koduka	72.262	26.037	Luni_Luni_058_RJ0501_AL	1	5.00	5.00
3	Patodi	72.266	26.081	Luni_Luni_058_RJ0501_AL	1	5.00	5.00
4	Tirsingri Sodha	72.437	26.079	Luni_Luni_059_RJ0501_AL	1	5.00	5.00
5	Baniyawas	72.449	26.161	Luni_Luni_059_RJ0501_AL	1	5.00	5.00
6	Durgapura	72.402	26.194	Luni_Luni_059_RJ0501_AL	1	5.00	5.00
7	Borawas	72.090	25.926	Luni_Luni_061_RJ0501_AL	1	5.00	5.00
8	Bagundi	72.050	25.923	Luni_Luni_061_RJ0501_AL	1	5.00	5.00
9	Balotra (M)	72.246	25.844	Luni_Luni_064_RJ0501_AL	1	5.00	5.00
10	Hotloo	72.280	25.821	Luni_Luni_064_RJ0501_AL	1	5.00	5.00
11	Moongra	72.286	25.848	Luni_Luni_064_RJ0501_AL	1	5.00	5.00
12	Umarlai Jageer	72.438	25.894	Luni_Luni_064_RJ0501_AL	1	5.00	5.00
13	Pindaran	72.498	25.925	Luni_Luni_064_RJ0501_AL	1	5.00	5.00
14	Kitpala	72.037	25.756	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
15	Simaliya	72.049	25.768	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
16	Kitpala	72.042	25.747	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
17	Rikarlai	72.013	25.740	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
18	Kaloori	72.089	25.727	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
19	Simaliya	72.064	25.757	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
20	Bithooja	72.257	25.786	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
21	Asara	72.216	25.761	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
22	Asotara	72.227	25.755	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
23	Kitpala	72.032	25.716	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
24	Kaloori	72.059	25.712	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
25	Kaloori	72.082	25.691	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
26	Kaloori	72.081	25.704	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
27	Panotrinadi	72.113	25.720	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
28	Tapra	72.164	25.705	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
29	Jagsa	72.168	25.663	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
30	Asara	72.248	25.743	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
31	Bhakhri Khera	72.145	25.741	Luni_Luni_068_RJ0501_AL	1	5.00	5.00
32	Pachpadra	72.263	25.931	Luni_Luni_069_RJ0501_AL	1	5.00	5.00
33	Pachpadra	72.257	25.912	Luni_Luni_069_RJ0501_AL	1	5.00	5.00
				Total	33		165

Fig: 1: Tentative location of Recharge Shaft and Percolation Tanks



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 27 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. 3.478 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 – 1.65	-	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	33	1.155	5	165	0.924
	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			315	1.164
Impact assessment & Monitoring						
Piezometer	50 – 80 m	27		0.6	16.20	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					16.56	
TOTAL					347.76	1.164

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