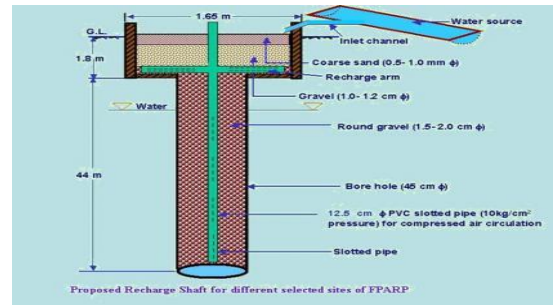




CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA



Excavated/dugout farm pond



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

Western Region, Jaipur
December 2016

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

Plan at a Glance

1.	Area of the Siwana Block	2025.24 sq. km.
2.	Area identified for Artificial Recharge	1425 sq km
3.	Dynamic Ground Water Resources (as on 31.03.2011)	
	Net Ground Water Availability	46.76 MCM
	Annual Ground Water Draft	65.04 MCM
	Stage of Ground Water Development	139.09%
4.	Volume of water to be harnessed	3.336 MCM
	Volume of water available for recharge through RS	2.728 MCM
	Volume of water available for recharge through PT	0.40 MCM
5.	Volume of unsaturated aquifer zone available for recharge	3051.25 MCM
6.	Total number of structures to be proposed	
	Recharge structures	78 shafts in 78
	Existing village pond with recharge shaft/ well	Nos. of existing
		village ponds
	Percolation Tanks	02 Nos
	Sprinkler Irrigation	300 ha
	Expected Annual GW recharge	2.502 MCM
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	0.24
	Total recharge/ saving of ground water	2.742 MCM
7.	Estimated Cost	6.825 crore
	Artificial Recharge Plan	4.70 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.30 crore
	Operation and maintenance	0.325 crore

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

Introduction

The **Siwana 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 **139.09%**.

Location of the block

The Siwana Block of Barmer District covering an area of 2025.24 Sq. Km. falls in eastern part of Barmer District and is located between North latitudes 25°23' & 25°58' and East longitudes 72°7' & 72°51'.

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 3.336 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	Siwana	2025.2	1425	AI	212.5	0.1	35.46	32.46	689.78
				Old-AI	1212.5	0.06	35.46	32.46	2361.47

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_Bandi (Hemawas)_004_RJ0506_AL	Bandi (Hemawas)	SR	0.514	0.000	N	0	0
Luni_Jawai_014_RJ0506_AL	Jawai	SR	80.886	0.257	Y	2	1
Luni_Luni_064_RJ0506_AL	Luni	SR	412.966	0.085	Y	2	0
Luni_Luni_066_RJ0506_AL	Luni	SR	746.509	2.107	Y	59	0
Luni_Luni_067_RJ0506_AL	Luni	SR	116.630	0.033	Y	1	0
Luni_Luni_068_RJ0506_AL	Luni	SR	397.973	0.729	Y	12	1
Luni_Luni_077_RJ0506_AL	Luni	SR	200.753	0.119	Y	2	0
Luni_Mithari_085_RJ0506_AL	Mithari	SR	3.325	0.003	Y	0	0
Luni_Sukri (Sayala)_094_RJ0506_AL	Sukri (Sayala)	SR	35.872	0.000	Y	0	0
Luni_Sukri_089_RJ0506_AL	Sukri	SR	86.647	0.002	Y	0	0
				3.336		78	2

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	Bhagwa	72.436	25.484	Luni_Jawai_014_RJ0506_AL	1	5	5
2	Kumahroon Ki Dhani	72.459	25.491	Luni_Jawai_014_RJ0506_AL	1	5	5
3	Samdari	72.548	25.834	Luni_Luni_064_RJ0506_AL	1	5	5
4	Deoliyali	72.524	25.823	Luni_Luni_064_RJ0506_AL	1	5	5
5	Arjiyana	72.479	25.659	Luni_Luni_066_RJ0506_AL	1	5	5
6	Khetasar	72.464	25.633	Luni_Luni_066_RJ0506_AL	1	5	5
7	Bhati Khera	72.459	25.725	Luni_Luni_066_RJ0506_AL	1	5	5
8	Ratri	72.709	25.752	Luni_Luni_066_RJ0506_AL	1	5	5
9	Dheeran	72.455	25.532	Luni_Luni_066_RJ0506_AL	1	5	5
10	Maylawas	72.517	25.608	Luni_Luni_066_RJ0506_AL	1	5	5
11	Baloo	72.498	25.681	Luni_Luni_066_RJ0506_AL	1	5	5
12	Dewandi	72.460	25.655	Luni_Luni_066_RJ0506_AL	1	5	5
13	Siwana	72.418	25.687	Luni_Luni_066_RJ0506_AL	1	5	5
14	Ambon Ka Bara	72.619	25.757	Luni_Luni_066_RJ0506_AL	1	5	5
15	Karmawas	72.567	25.783	Luni_Luni_066_RJ0506_AL	1	5	5
16	Mangi	72.404	25.517	Luni_Luni_066_RJ0506_AL	1	5	5
17	Mawri	72.454	25.631	Luni_Luni_066_RJ0506_AL	1	5	5
18	Sooili	72.561	25.771	Luni_Luni_066_RJ0506_AL	1	5	5
19	Arjiyana	72.463	25.665	Luni_Luni_066_RJ0506_AL	1	5	5
20	Sooili	72.566	25.767	Luni_Luni_066_RJ0506_AL	1	5	5
21	Mokalsar	72.558	25.626	Luni_Luni_066_RJ0506_AL	1	5	5
22	Meli	72.451	25.748	Luni_Luni_066_RJ0506_AL	1	5	5
23	Siwana	72.406	25.673	Luni_Luni_066_RJ0506_AL	1	5	5
24	Meli	72.470	25.733	Luni_Luni_066_RJ0506_AL	1	5	5
25	Sanwarda	72.570	25.726	Luni_Luni_066_RJ0506_AL	1	5	5
26	Mokalsar	72.554	25.614	Luni_Luni_066_RJ0506_AL	1	5	5
27	Maylawas	72.530	25.628	Luni_Luni_066_RJ0506_AL	1	5	5
28	Dewandi	72.455	25.653	Luni_Luni_066_RJ0506_AL	1	5	5
29	Phoolan	72.492	25.716	Luni_Luni_066_RJ0506_AL	1	5	5
30	Dabli	72.602	25.645	Luni_Luni_066_RJ0506_AL	1	5	5
31	Mokalsar	72.561	25.590	Luni_Luni_066_RJ0506_AL	1	5	5
32	Rakhi	72.550	25.690	Luni_Luni_066_RJ0506_AL	1	5	5
33	Kuseep	72.385	25.693	Luni_Luni_066_RJ0506_AL	1	5	5
34	Siwana	72.425	25.670	Luni_Luni_066_RJ0506_AL	1	5	5
35	Bhati Khera	72.466	25.726	Luni_Luni_066_RJ0506_AL	1	5	5
36	Kuseep	72.395	25.705	Luni_Luni_066_RJ0506_AL	1	5	5
37	Mokalsar	72.541	25.607	Luni_Luni_066_RJ0506_AL	1	5	5
38	Bhooti	72.543	25.748	Luni_Luni_066_RJ0506_AL	1	5	5
39	Rojiyon Ki Dhani	72.594	25.630	Luni_Luni_066_RJ0506_AL	1	5	5
40	Rojiyon Ki Dhani	72.593	25.629	Luni_Luni_066_RJ0506_AL	1	5	5
41	Motisara	72.591	25.639	Luni_Luni_066_RJ0506_AL	1	5	5

42	Mokalsar	72.557	25.601	Luni_Luni_066_RJ0506_AL	1	5	5
43	Mokalsar	72.544	25.596	Luni_Luni_066_RJ0506_AL	1	5	5
44	Mokalsar	72.543	25.596	Luni_Luni_066_RJ0506_AL	1	5	5
45	Karmawas	72.589	25.784	Luni_Luni_066_RJ0506_AL	1	5	5
46	Karmawas	72.588	25.786	Luni_Luni_066_RJ0506_AL	1	5	5
47	Karmawas	72.582	25.774	Luni_Luni_066_RJ0506_AL	1	5	5
48	Rojiyon Ki Dhani	72.578	25.624	Luni_Luni_066_RJ0506_AL	1	5	5
49	Motisara	72.587	25.642	Luni_Luni_066_RJ0506_AL	1	5	5
50	Motisara	72.587	25.644	Luni_Luni_066_RJ0506_AL	1	5	5
51	Motisara	72.574	25.638	Luni_Luni_066_RJ0506_AL	1	5	5
52	Motisara	72.573	25.635	Luni_Luni_066_RJ0506_AL	1	5	5
53	Kamon Ka Bara	72.669	25.762	Luni_Luni_066_RJ0506_AL	1	5	5
54	Loodrara	72.554	25.657	Luni_Luni_066_RJ0506_AL	1	5	5
55	Loodrara	72.550	25.656	Luni_Luni_066_RJ0506_AL	1	5	5
56	Jalampura	72.635	25.700	Luni_Luni_066_RJ0506_AL	1	5	5
57	Sewali	72.642	25.723	Luni_Luni_066_RJ0506_AL	1	5	5
58	Sanwarda	72.586	25.733	Luni_Luni_066_RJ0506_AL	1	5	5
59	Rakhi	72.588	25.680	Luni_Luni_066_RJ0506_AL	1	5	5
60	Rakhi	72.587	25.677	Luni_Luni_066_RJ0506_AL	1	5	5
61	Bhati Khera	72.454	25.720	Luni_Luni_066_RJ0506_AL	1	5	5
62	Bhati Khera	72.453	25.721	Luni_Luni_066_RJ0506_AL	1	5	5
63	Maylawas	72.483	25.610	Luni_Luni_066_RJ0506_AL	1	5	5
64	Goliya Chaudhariyan	72.666	25.654	Luni_Luni_067_RJ0506_AL	1	5	5
65	Thapan	72.290	25.705	Luni_Luni_068_RJ0506_AL	1	5	5
66	Goongrot	72.373	25.591	Luni_Luni_068_RJ0506_AL	1	5	5
67	Thapan	72.299	25.685	Luni_Luni_068_RJ0506_AL	1	5	5
68	Goongrot	72.406	25.594	Luni_Luni_068_RJ0506_AL	1	5	5
69	Moothli	72.282	25.696	Luni_Luni_068_RJ0506_AL	1	5	5
70	Dev Pura	72.231	25.602	Luni_Luni_068_RJ0506_AL	1	5	5
71	Nal	72.303	25.610	Luni_Luni_068_RJ0506_AL	1	5	5
72	Dharna	72.230	25.587	Luni_Luni_068_RJ0506_AL	1	5	5
73	Thapan	72.288	25.688	Luni_Luni_068_RJ0506_AL	1	5	5
74	Peeploon	72.315	25.593	Luni_Luni_068_RJ0506_AL	1	5	5
75	Siwana	72.385	25.628	Luni_Luni_068_RJ0506_AL	1	5	5
76	Siwana	72.381	25.628	Luni_Luni_068_RJ0506_AL	1	5	5
77	Kankhi	72.258	25.449	Luni_Luni_077_RJ0506_AL	1	5	5
78	Kundal	72.331	25.505	Luni_Luni_077_RJ0506_AL	1	5	5
				Total	78		390

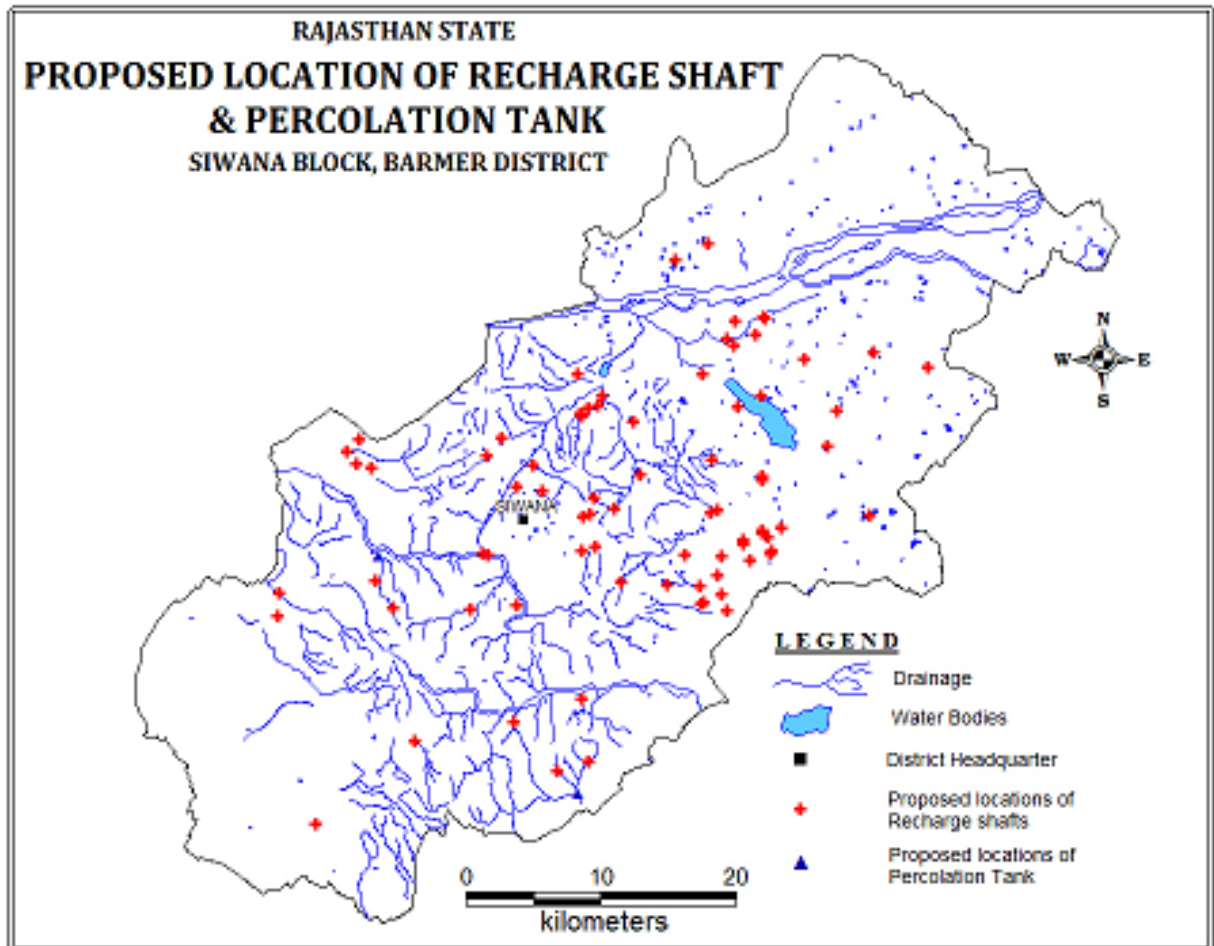
Percolation Tank

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	Bhagwa	72.452	25.467	Luni_Jawai_014_RJ0506_AL	40
2	Nal	72.306	25.625	Luni_Luni_068_RJ0506_AL	40
				Total	80

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 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 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. 6.825 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 – 3.90	0.80	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	78	2.728	5	390	2.182
	Hard rock: Depth –60m, Dia 10-12”with filter pit	-	-	-	-	-
Percolation tanks (3 fillings)	200m*200m*1.5 m	2	0.40	40	80	0.32
Water Conservation Measures	Sprinkler Irrigation	300 ha	25	0.5/ha	150	0.24
		Total			620	2.742
Impact assessment & Monitoring						
Piezometer	50 – 80 m	50		0.6	30	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					32.50	
TOTAL					682.50	2.742

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