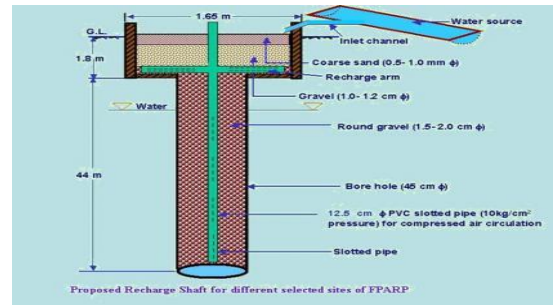




CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA



Excavated/dugout farm pond



**ARTIFICIAL RECHARGE TO GROUND WATER AND
WATER CONSERVATION PLAN OF NAGAR PAHADI
BLOCK, DISTRICT BHARATPUR, RAJASTHAN**

Western Region, Jaipur
January 2017

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

Plan at a Glance

1.	Area of the Nagar Pahadi Block	623.80 sq. km.
2.	Area identified for Artificial Recharge	291.36 sq km
3.	Dynamic Ground Water Resources (as on 31.03.2011)	
	Net Ground Water Availability	47.94 MCM
	Annual Ground Water Draft	46.51 MCM
	Stage of Ground Water Development	97.02%
4.	Volume of water to be harnessed	4.199 MCM
	Volume of water available for recharge through RS	0.525 MCM
	Volume of water available for recharge through PT	--
5.	Volume of unsaturated aquifer zone available for recharge	178.60 MCM
6.	Total number of structures to be proposed	
	Recharge structures	15 shafts in 15
	Existing village pond with recharge shaft/ well	Nos. of existing
		village ponds
	Percolation Tanks	--
	Sprinkler Irrigation	300 ha
	Expected Annual GW recharge	0.42 MCM
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	0.24 MCM
	Total recharge/ saving of ground water	0.66 MCM
7.	Estimated Cost	2.457 crore
	Artificial Recharge Plan	0.75 crore
	Sprinkler Irrigation	1.50 crore
	Piezometer construction	0.09 crore
	Operation and maintenance	0.117 crore

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

Introduction

The **Nagar Pahadi Block, district Bharatpur** one of the critical blocks of Rajasthan and is under severe stress, as evident from the stage of ground water development, which has attained an alarming level of **97.02%**. 291.36 sq. km. area is potential zone area and thus feasible for artificial recharge.

Location of the block

The Nagar Pahadi Block of Bharatpur District covering an area of 623.80 Sq. Km. falls in Bharatpur District and is located between North latitudes 27°21' & 27°45' and East longitudes 76°53' & 77°12'.

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 4.199 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	Nagar Pahadi	623.8	291.36	SR	291.36	0.1	9.13	6.13	178.60

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_003_RJ0606_AL	Banganga	SR	202.349	0.111	Y	3	0
Banganga_Banganga_006_RJ0606_AL	Banganga	SR	0.378	0.001	N	0	0
Ruparail_Ruparail_002_RJ0606_AL	Ruparail	SR	13.785	0.885	Y	1	0
Ruparail_Ruparail_005_RJ0606_AL	Ruparail	SR	43.861	0.000	Y	0	0
Ruparail_Ruparail_006_RJ0606_AL	Ruparail	SR	127.715	1.706	Y	3	0
Ruparail_Ruparail_009_RJ0606_HR	Ruparail	HR	2.002	0.033	Y	0	0
Ruparail_Ruparail_012_RJ0606_AL	Ruparail	SR	266.291	1.463	Y	8	0
Ruparail_Ruparail_012_RJ0606_HR	Ruparail	HR	0.000	0.000	N	0	0
				4.199		15	0

Recharge Shaft

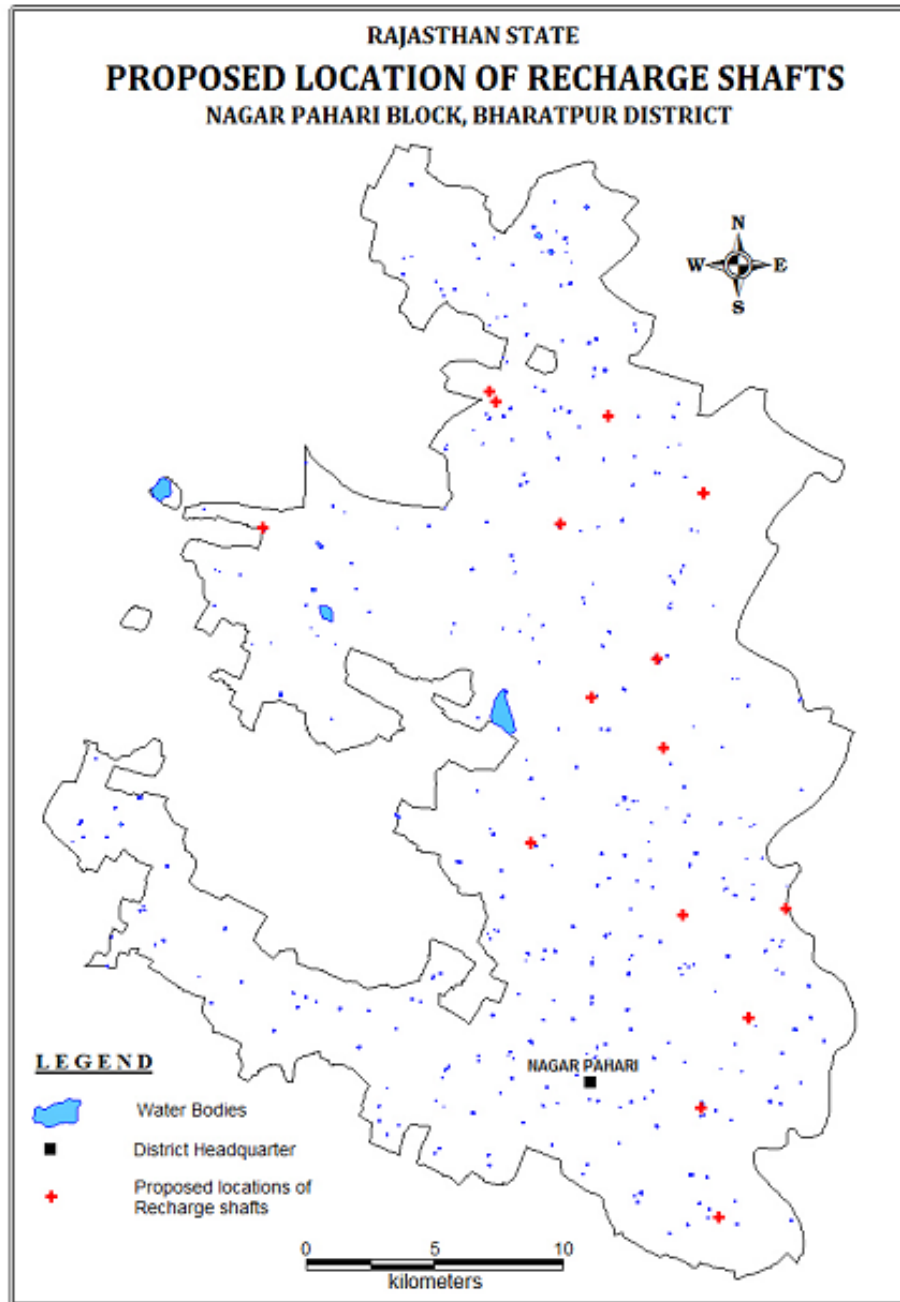
It is proposed to construct Recharge Shaft in existing ponds. The selected ponds should be atleast 3m deep and shallow ponds will be deepened accordingly. It is proposed that the inlet for the Recharge Shaft should be atleast 1m above bed of pond so that the pond retains adequate water for use by villagers.

. 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	Dunawal	77.160	27.441	Banganga_Banganga_003_RJ0606_AL	1	5	5
2	Sundrawali	77.141	27.409	Banganga_Banganga_003_RJ0606_AL	1	5	5
3	Pathroda	77.148	27.371	Banganga_Banganga_003_RJ0606_AL	1	5	5
4	Dhanota	76.968	27.612	Ruparail_Ruparail_002_RJ0606_AL	1	5	5
5	Berroo	77.074	27.502	Ruparail_Ruparail_006_RJ0606_AL	1	5	5
6	Padalwas	77.134	27.476	Ruparail_Ruparail_006_RJ0606_AL	1	5	5
7	Banaini Toda	77.175	27.478	Ruparail_Ruparail_006_RJ0606_AL	1	5	5
8	Gopalgarh	77.058	27.660	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
9	Gopalgarh	77.060	27.656	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
10	Pathrali	77.104	27.651	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
11	Peepal Khera	77.085	27.613	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
12	Ranph	77.142	27.624	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
13	Dawak	77.124	27.566	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
14	Punay	77.098	27.552	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
15	Gulpara	77.126	27.535	Ruparail_Ruparail_012_RJ0606_AL	1	5	5
				Total	15		75

Fig: 1: Tentative location of Recharge Shaft



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 15 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 Nagar Pahadi, the village tanks can be converted into recharge structure.

Financial Outlay of the Plan

The total estimated cost of the Plan is Rs. 2.457 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 – 0.75	-	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	15	0.525	5	75	0.42
	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			225	0.66
Impact assessment & Monitoring						
Piezometer	50 – 80 m	15		0.6	9	
<i>Impact assessment will be carried out by implementing agency</i>						
O & M - 5% of total cost of the scheme					11.7	
TOTAL					245.70	0.66

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