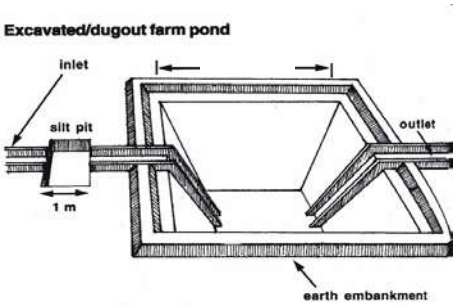
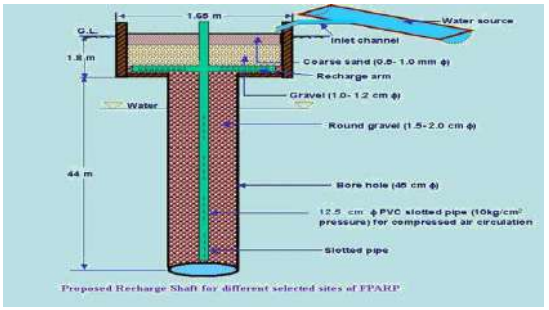
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF NEEM KA THANA BLOCK, DISTRICT SIKAR, RAJASTHAN

Western Region, Jaipur
January, 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN BLOCK NEEM KA THANA, DISTRICT SIKAR

Plan at a Glance

1.	**Area of the Neem Ka Thana Block**	**1197.12 Sq.Km.**
2.	**Area identified for Artificial Recharge**	**875.18 Sq.Km.**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**29.38 MCM**
	Annual Ground Water Draft	**39.92 MCM**
	Stage of Ground Water Development	**135.85 %**
4.	**Runoff available in the block** **Volume of water recharged** **Volume of water conserved for other interventions**	**4.9375 MCM** **4.9375 MCM** **nil**
5.	**Volume of unsaturated aquifer zone available for recharge**	**627.633 MCM**
6.	**Total number of structures to be proposed**	
	Recharge structures **Existing village pond with recharge shaft/ well** **Percolation tank** **Water Conservation** **Farm pond**	 **98 shafts in 80 Nos. of existing village ponds** **10 Nos.** **nil**
	Expected Annual GW recharge	**3.4566 MCM**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**nil**
	Total recharge/ saving of ground water	**3.4566 MCM**
7.	**Estimated Cost** Artificial Recharge Plan Water conservation measures Piezometer construction Operation and maintenance	**7.707 crore** 6.86 crore nil 0.48 crore 0.367 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN BLOCK NEEM KA THANA, DISTRICT SIKAR

1 INTRODUCTION

The demand of fresh water for agriculture, drinking and industrial uses etc. has significantly increased due to population growth and socio-economic development. As surface water resources in the State of Rajasthan are meagre, the dependability on ground water resources in the State has increased substantially. This has resulted in over exploitation of ground water resources vis a vis depletion of ground water levels in various parts of the State.

The **Neem Ka Thana Block, district Sikar** 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 **135.85%.** In view of over exploitation of ground water resources in the block, ground water resources in the area are under continuous depletion. Thus there is urgent need for taking up suitable water management interventions based on integrated approach, which on one hand includes augmentation of ground water resources through appropriate techniques, and on the other hand requires the adoption of suitable water conservation measures, such as ensuring water use efficiency through creation of additional water storage facility, maintenance/ renovation of existing water bodies etc. Water awareness and capacity building of the stakeholders are also the important attributes of water management interventions as envisaged in the National Water Policy.

Artificial recharge to ground water is one of the most efficient, scientifically proven and cost effective technology to mitigate the problems of over exploitation of ground water resources. The technology serves as a means for restoring the depleted ground water storage, ameliorate the ground water quality problems and also enhance the sustainability of wells in the affected areas. A detailed knowledge of geology, hydrogeology, land use pattern, geomorphology and hydro-meteorological features are however, essential for selection of appropriate artificial recharge techniques as well as design and sites of ground water recharge structures.

As per directions of Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India and in pursuance to letter no 16-24/M(SML)/CGWB/ARP- OE Blocks/2015-6957, dated 13.7.2015 & 3.8.2015 & letter no 39(43)/TC/CHN/CGWB/2015-7929,dated 4.9.2015 from Central Headquarters, Central Ground Water Board, **the preparation of Artificial Recharge and Rainwater harvesting Plan for the Over exploited blocks in the State of Rajasthan has been taken up** on priority by the Western Region, Central Ground Water Board, Sikar. Each Plan discusses the broad framework of ground water situation in the block, status of water availability (both surface and ground water), identification of feasible areas for interventions, feasibility of artificial recharge and other water conservation structures, their design considerations, numbers and cost estimates. The expected outcomes of the proposed interventions have also been elucidated in the report.

The GIS layers used in the Plan include administrative (upto village level), Hydrogeology, Depth to Water level (pre and post monsoon), geomorphic, drainage, water bodies and the map of tentative locations of proposed interventions.

Methodology:

As per Ground Water Department, Government of Rajasthan direction the basin wise availability of surplus run off is calculated after taking into account 75 % dependability on the rain water for all uses. In furtherance, the sub basins with surplus run off available for recharge were taken into consideration. The block area falling in particular sub basin was taken into account and a proportionate area of the sub-basin draining the block was calculated. Based on this area of sub-basin draining the block, proportionate surplus run off, in the block by the sub basin, for recharge was calculated. Thus was calculated the final amount of surplus run off available for recharge in particular block by one particular sub-basin. The available run off was considered for Recharge through Recharge Shaft (@ 0.03 MCM) and Percolation tank (@ 0.2 MCM). If after allocating water for Recharge through Recharge Shaft, large amount of surface run off was left then the Water conservation through Farm Ponds, along with recharge through Percolation Tanks, was also taken into account. Besides the available run off the Average Water Level for the time span of ten years (Nov., 2005 to Nov. 2014) and the Decadal Water Level trend (Nov., 2005 to Nov. 2014) were also taken into account. The blocks showing average water level more than 5 m bgl and declining water level trend were considered suitable for Artificial Recharge Plan

1.1 Location of the block

The Neem Ka Thana Block covering an area of 1197.12 Sq. Km. falls in eastern part of Sikar District and is located between North latitudes 27°25’ & 27°56’ and East longitudes 75°35’ & 76°06’. As per 2011 census, the total population of the Block is 363680 persons consisting of 190457 males & 173223 females. Location map is shown in **Fig 1**.

1.2 Source wise Irrigated Area

The dug wells/ Tubewells are the main source of irrigation in Neem Ka Thana Block. There is no area that falls under canal & pond irrigation. The wells irrigate total 145.21 Sq.Km. area in this Block. And an area of 74.92 Sq.Km. is irrigated through other sources.

Fig: 1

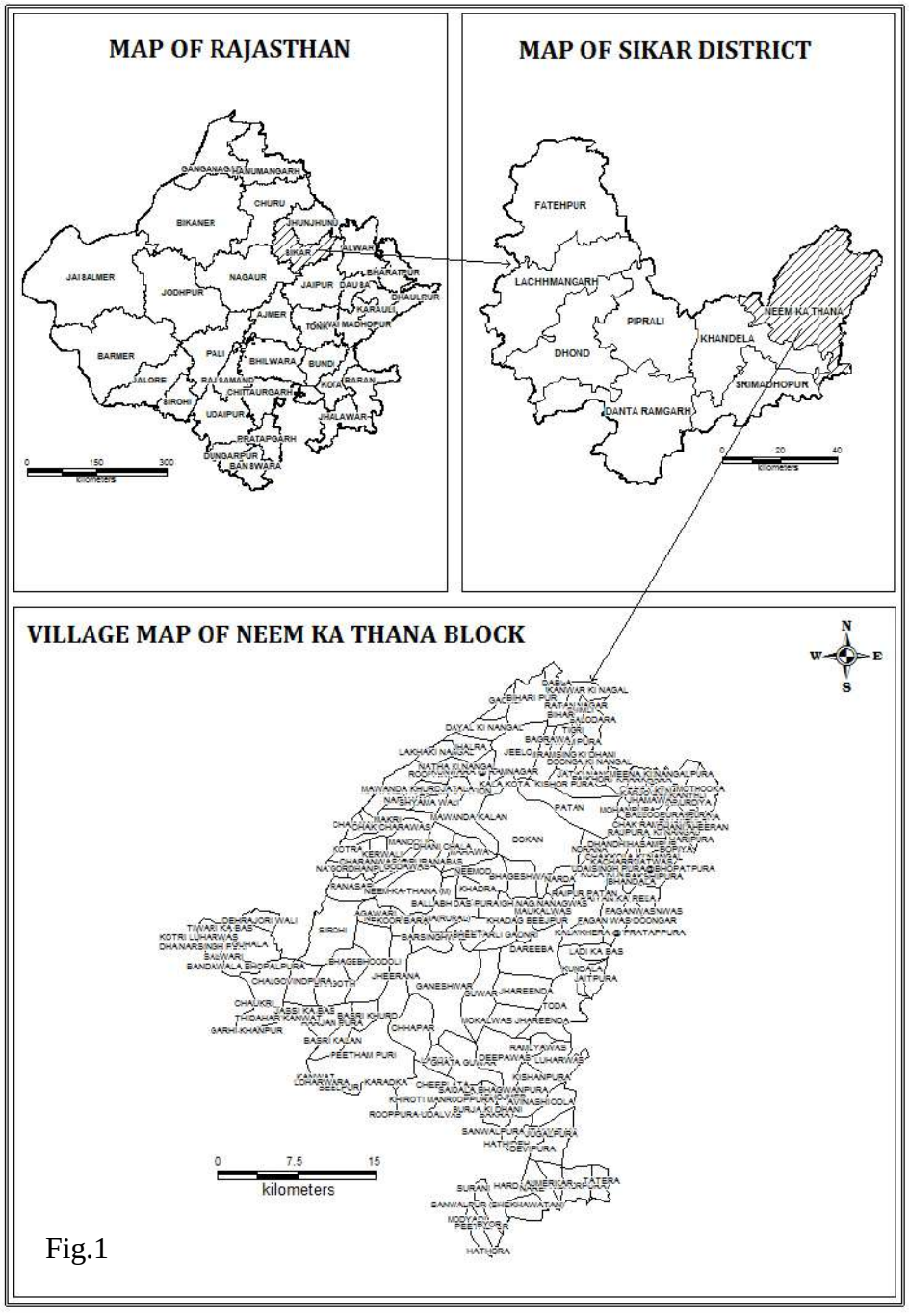

MAP OF RAJASTHAN
GANGANAGAR
HANUMANGARH
CHURU
BIKANER
JHUNJHUNU
SIKAR
ALWAR
JAISALMER
NAGAUR
JAIPUR
BHARATPUR
DAUSA
JODHPUR
AJMER
KARAULI
TONK
SAWAI MADHOPUR
BARMER
PALI
BHILWARA
BUNDI
JALORE
RAJSAMAND
KOTA
BARAN
SIROHI
CHITTAURGARH
UDAIPUR
JHALAWAR
PRATAPGARH
DUNGARPUR
BANSWARA
0 150 300
kilometers
MAP OF SIKAR DISTRICT
FATEHPUR
LACHHMANGARH
PIPRALI
NEEM KA THANA
KHANDELA
DHOND
SIKAR
DANTA RAMGARH
0 20 40
kilometers
VILLAGE MAP OF NEEM KA THANA BLOCK
N
W
E
S
DOKAN
PATAN
KHADRA
NEEM-KA-THANA
0 7.5 15
kilometers

Fig.1

1.3 Physiography & Drainage

Physiographically **(Fig 2**), the block is characterized by presence of alluvial plains, buried pediments & hills. The minimum and maximum elevation of Block is 333.2 m. amsl and 825.4 m. amsl, respectively.

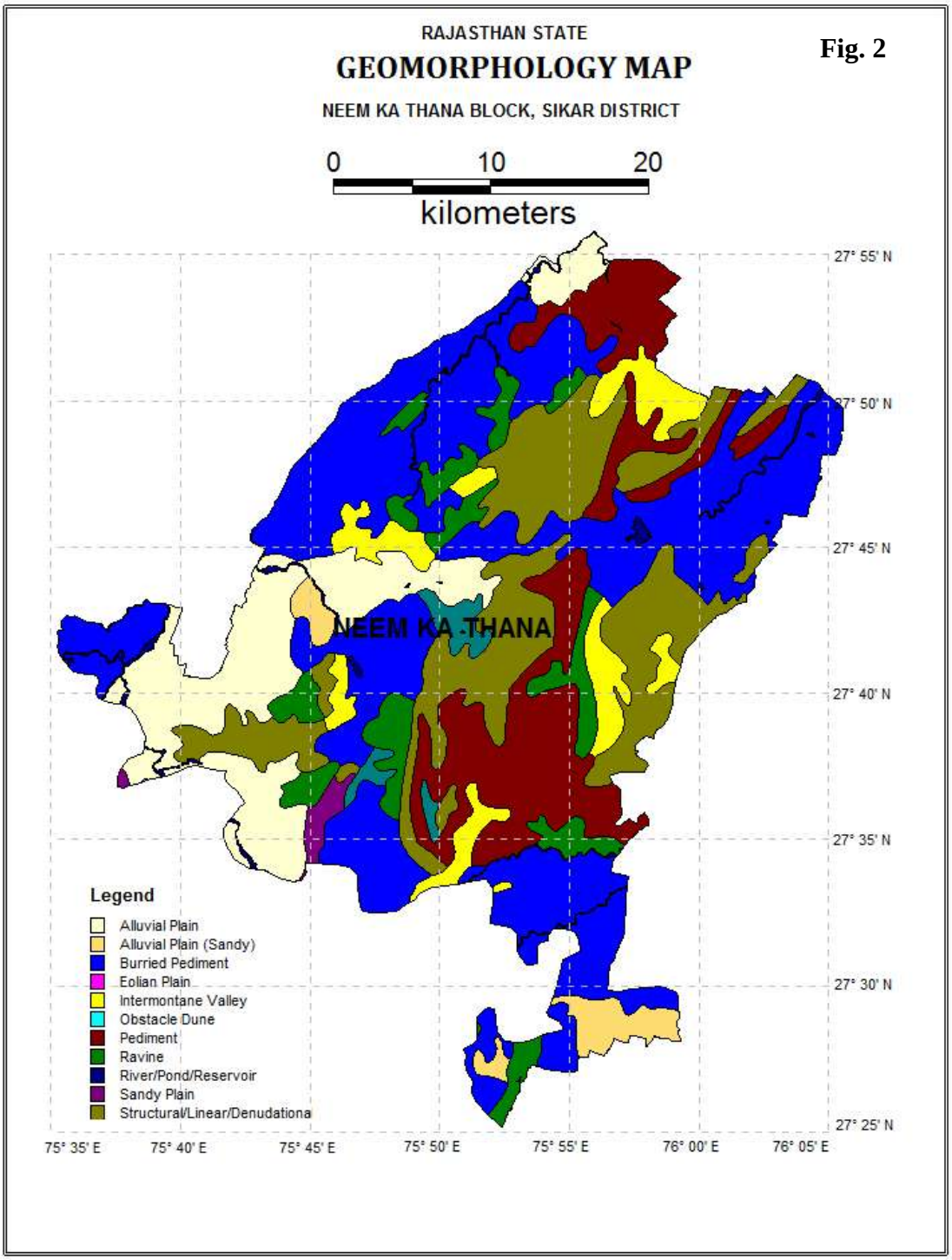


Fig. 2

There is no perennial river flowing in this Block. It is drained by ephemeral Krishnawati in north eastern part and Sabi in south eastern part. The western half of block falls under Shekhawati (Mendha) basin and eastern half falls under Sabi basin. The map showing drainage and water bodies in the Neem Ka Thana block is shown in **Fig. 3**.

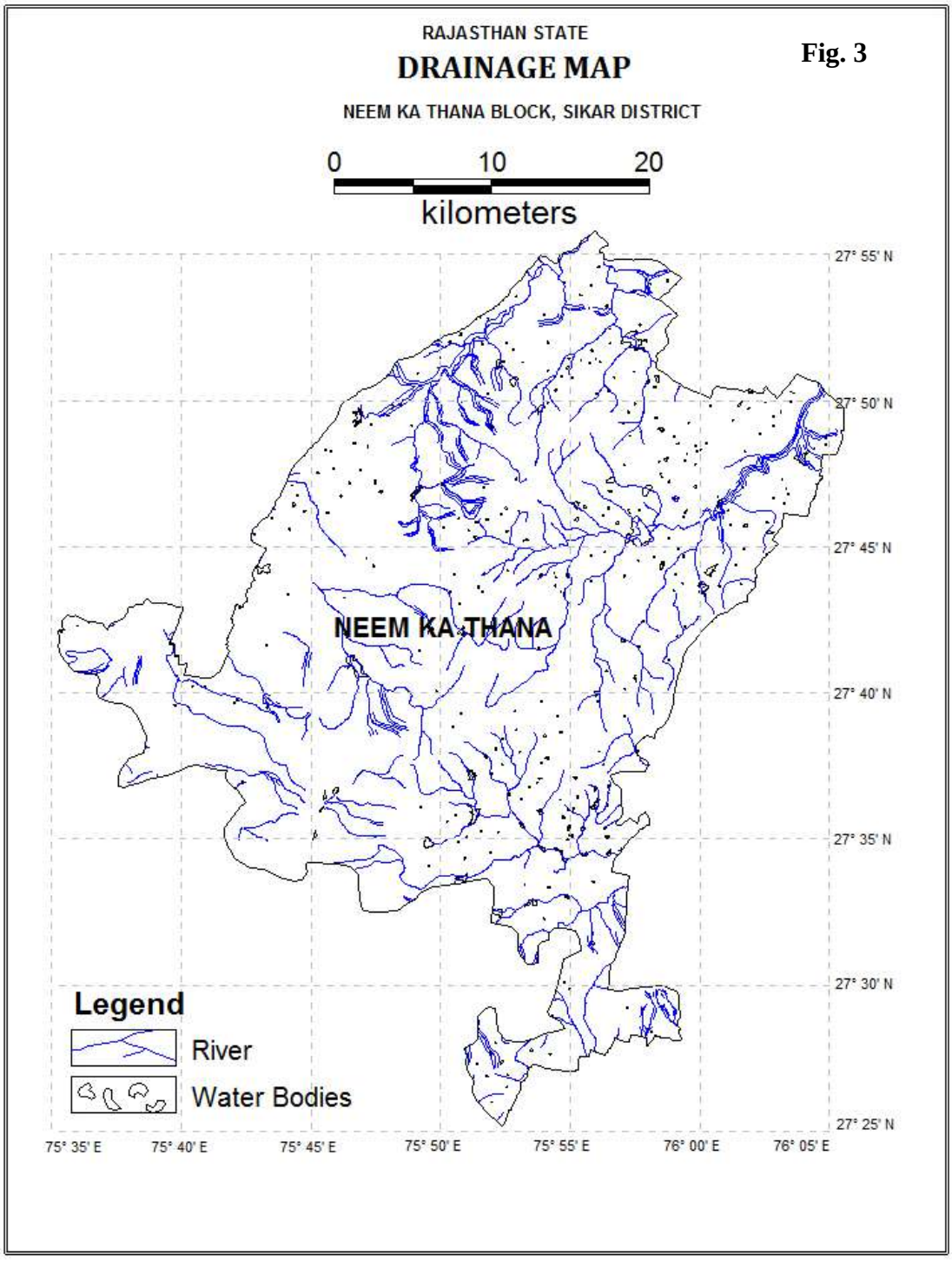


Fig. 3

1.4 Rainfall

The climate of the block is semi arid. The Normal annual rainfall of block is 512.66mm. Failure of rains has observed several times. The available data of rainfall indicates that larger part of annual rainfall is received through SW monsoon during July to September. In March, there is transition to summers. The summer months of April to June are the hottest months and temperature upto 48°C is reached. From end of June to September, south western monsoon is received. The months of July and August are the wettest months, receiving about 70% of total annual rainfall. Winter season starts from November and lasts upto February. Average temperature during these months remains between 15° to 18°C, however from end of December to mid January, temperature remains in the range of 5° to 10°C.

1.5 Hydrogeology of the Area

The availability, occurrence and movement of ground water are mainly controlled by the topographic features, physical characteristics and structural features present in the geological formations. Ground water occurs under unconfined to semi-confined condition. The principal aquifer in the area is Quaternary sediments covering major part of the block whereas quartzite, schist, phyllite, limestone and dolomitic limestone of Delhi Super Group also constitute important aquifers. Out of total geographical area of 1197.12 Sq. Km, areas of 215.18 Sq. Km. (17.97%) under Older alluvium & 660.0 Sq,Km. (55.13%) under Quartzites form potential zones and remaining 81.48 Sq. Km.(9.72%) area is represented by hills. Ground water occurs in the pore spaces and interstitial openings of Quaternary alluvium while in hard rock formations, occurrence and movement of ground water is controlled by secondary porosity i.e. through the bedding planes, fissures, joints, fractures, solution cavities and other structurally weaker planes. In general yield of wells tapping alluvial aquifers varies from 0.46 to 1.04 lps depending on the thickness of saturated granular zones and yield of the wells tapping hard rock aquifers in ranges from 0.12 to 0.35 lps. The map showing aquifer system in the Neem Ka Thana block is shown in **Fig. 4**

Fig: 4

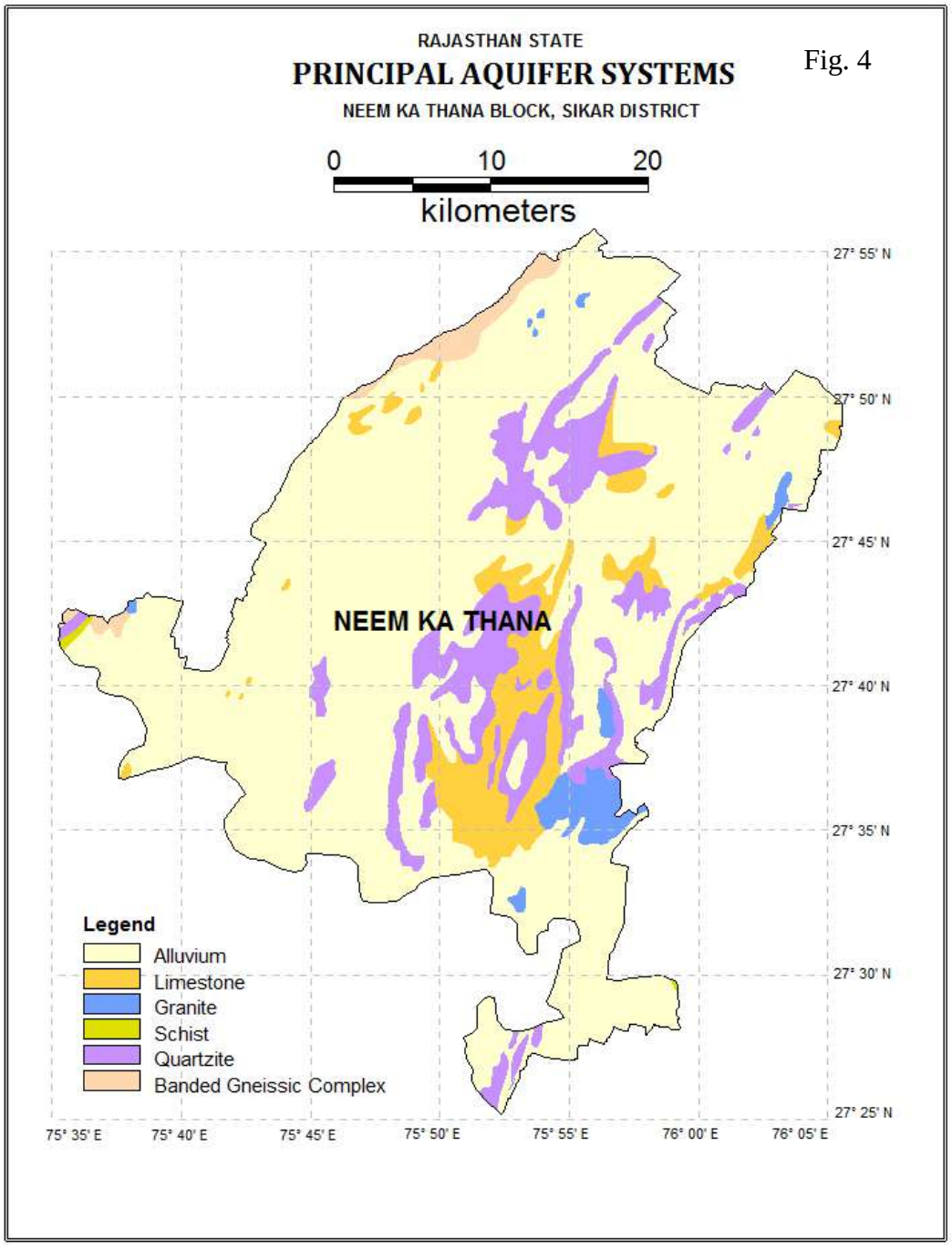


Fig. 4

Ground Water Level:

As per Average decadal depth to water level (from November, 2005 to November, 2014), the block majorly falls in water level range 10-20 and 20-50 m bgl range. **(Fig 5)**

The average decadal depth to water level is 12.86 mbgl for Pre monsoon & 11.55 mbgl for Post monsoon. According to depth to water level maps of May 2014 & Nov 2014, the depth to water level ranges between 10 to 40 mbgl in the major parts of block. However in the central parts of block, shallower water levels have been observed. The Map showing Depth to water level for May, 2014 and November, 2014 is shown in **Fig 6 & 7.**

Fig: 5

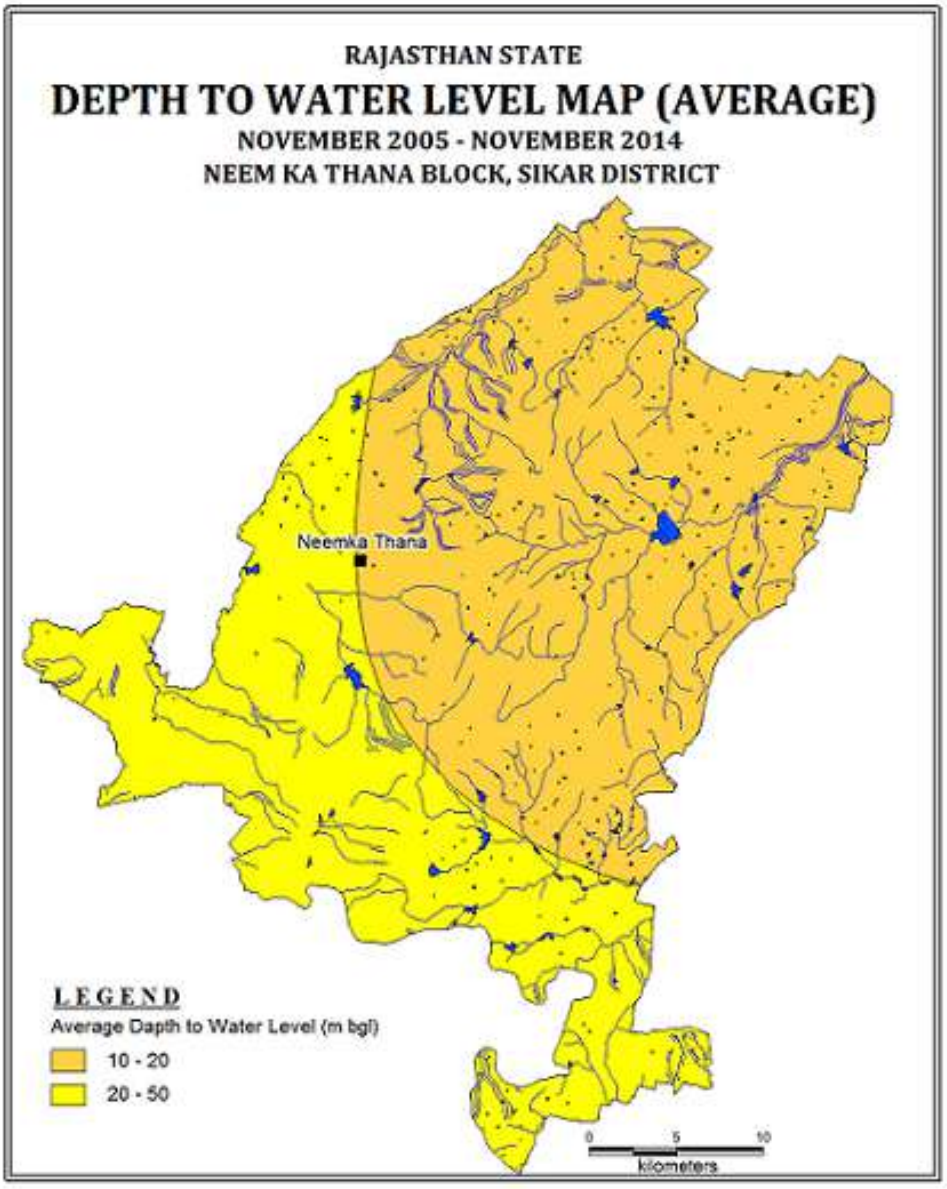


Fig: 6

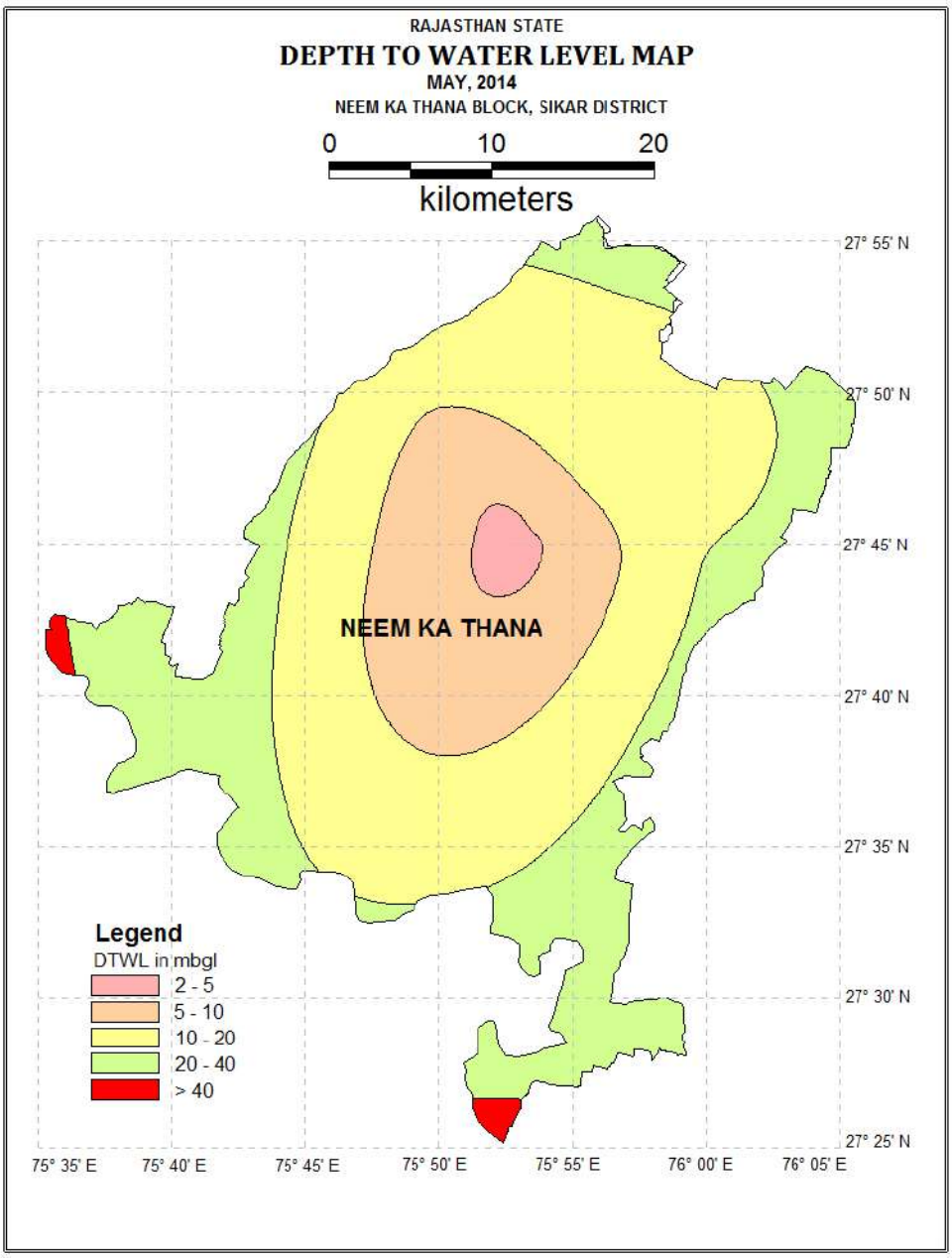
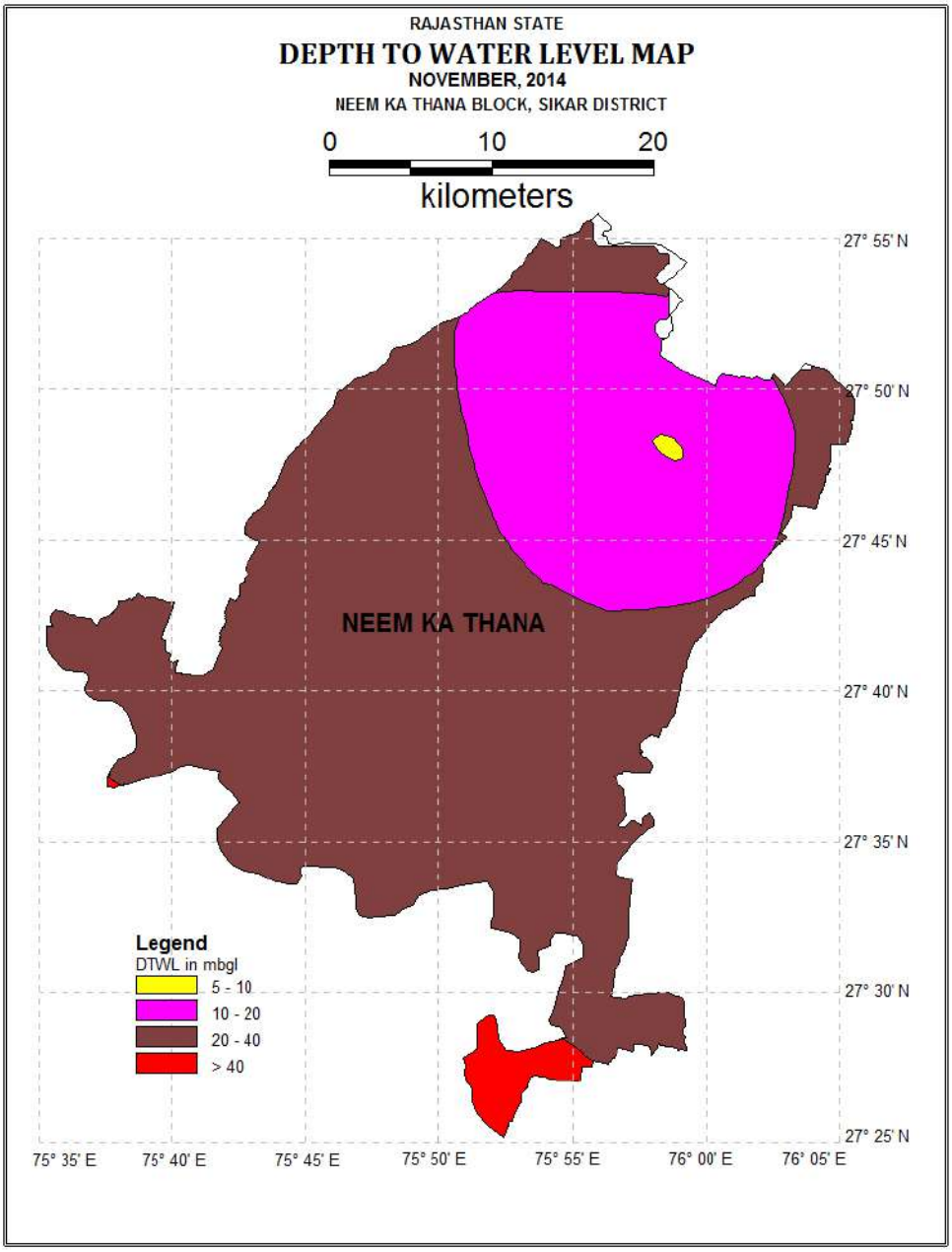

RAJASTHAN STATE
DEPTH TO WATER LEVEL MAP
MAY, 2014
NEEM KA THANA BLOCK, SIKAR DISTRICT
0
10
20
kilometers
NEEM KA THANA
Legend
DTWL in mbgl
2 - 5
5 - 10
10 - 20
20 - 40
> 40
27° 55' N
27° 50' N
27° 45' N
27° 40' N
27° 35' N
27° 30' N
27° 25' N
75° 35' E
75° 40' E
75° 45' E
75° 50' E
75° 55' E
76° 00' E
76° 05' E

Fig: 7



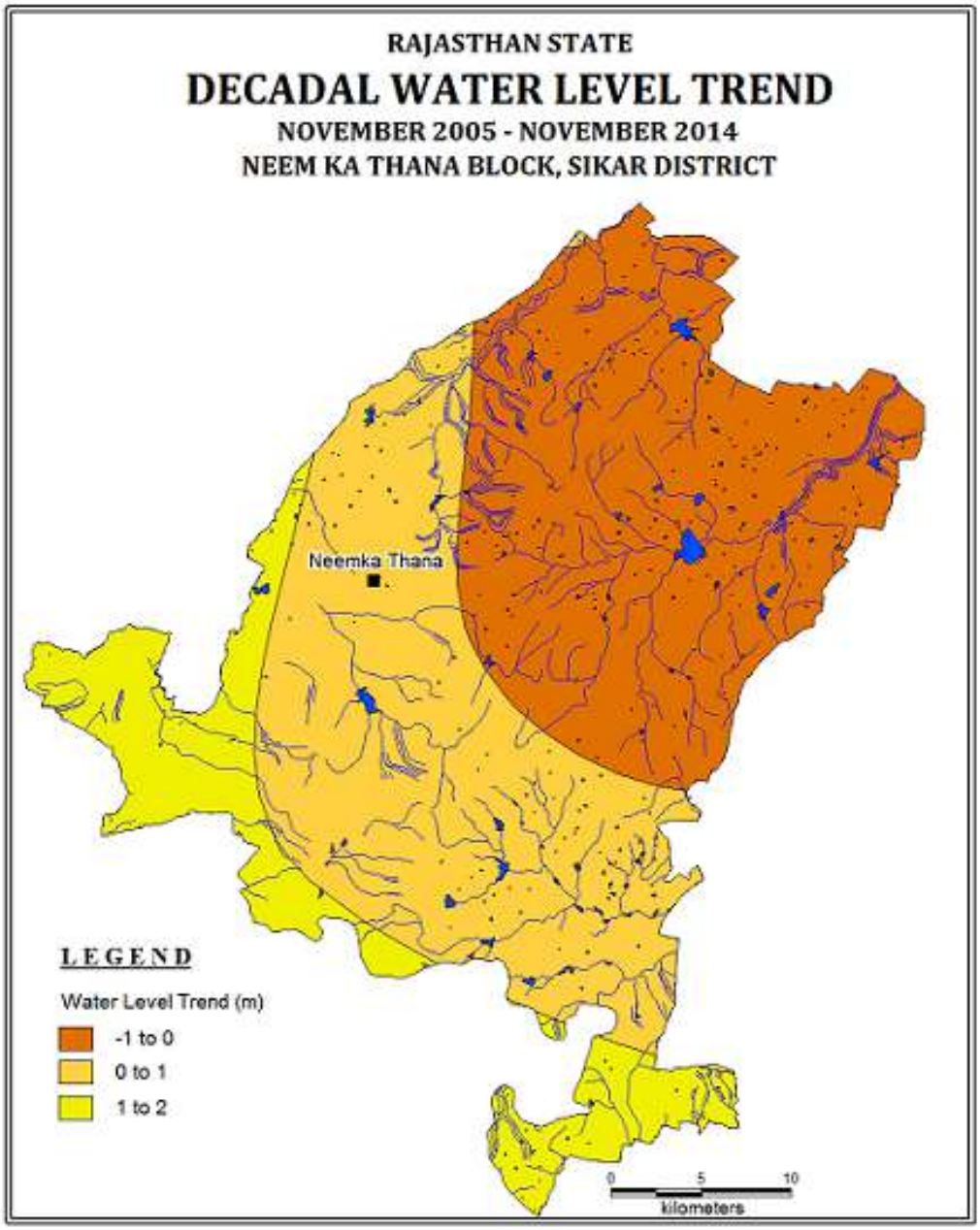
Water Level Trend:

The hydrographs of wells monitored by CGWB & GWD from 1997 to 2010 shows declining water level trend. At Patan station, water level rise of 0.44 m/year during pre monsoon and 0.57 m/year during post monsoon has been observed. At Bherala Mod

station, water level fall of 0.16 m/year during pre monsoon and 0.06 m/year during post monsoon has been observed.

As per the Decadal Water level trend (from November, 2005 to November, 2014), the declining trend is visible in the block. The fall majorly show trend of -1 to 0 and 0 to 1 with few area showing trend of 1 to 2 m/year. The map of Decadal Water Level Trend is shown in **fig. 8**.

Fig: 8



1.6 Subsurface Hydrogeology

As inferred from borehole data of the Neem Ka Thana Block; Alluvium, Schist, Phyllite & Quartzite form the aquifers. However, the ground water in Schist, Phyllite, Quartzite only occurs in shallow weathered parts or fractures due to absence of primary porosity. The depth of drilling ranges from 15.05 to 48.77 mbgl and the average discharge ranges from 1.25 to 21.33 lps. The quality of water has 2 major problems, i.e., Salinity & Fluoride. Transmissivity value varies between 120 to 775 m^2/day and Stortivity value is 0.0004.

1.7 Dynamic Ground Water Resource

The Ground water Resources for the block are given in Table 1 as per 31.03.2011 Ground Water Resource Assessment. The Net Ground water Availability of Block is 7449.03 ham and Annual Ground water draft is 18234.90 ham. Due to this excessive draft over recharge, stage of Ground water development has reached 244.80%.

Table 1: Ground Water Availability, Utilization and Stage of Development
Neem Ka Thana Block, Sikar District

Natural Discharge During Non Monsoon Period	206.06 ham
Net Ground Water Availability	2938.23 ham
Annual Ground Water Draft	3991.64 ham
Net Ground water Availability for Future Irrigation Use	-1154.26am
Stage of Ground Water Development	135.85%
Source: Ground Water Resource Assessment 31.03.2011	

Proposal for Artificial Recharge

Generally the Artificial recharge structures suitable in this type of area are Check dams/ Anicuts/ Percolation tanks and Recharge Shafts/ Recharge wells. Since the water levels are quite deep in the block (upto 40 mbgl), the structures like Percolation tanks and Check dams are not very suitable. Besides a large number of Check dams/ Anicuts have already been constructed by different State Government Agencies at most of the feasible locations. Considering this aspect it is felt that Recharge Shaft/ Recharge wells are the most suitable structures.

Almost all the villages in the State of Rajasthan have one or two village ponds & other ponds. With time, these ponds get silted & hardly any water percolates downward. Also, any excess water coming into the pond goes away as a run off due to limited storage capacity. This surplus runoff can very well be utilized for recharging the ground water. Since natural recharge from these ponds is limited due to siltation and ground water levels are deep, the most effective ground water structure would be Recharge Shaft/ Recharge well constructed within the pond itself.

Such a Recharge well needs to be designed in a manner that maximum surplus water is utilized for recharge as well as sufficient water is retained in the pond for local use.
The design of typical Recharge well is given in Figure 9a and 9b. The major features required are.

1. The well should have sufficient diameter for recharge- 10 to 12 inch diameter well with bottom screen/ opening just above the highest water level.
2. The well should have screen/ opening at the top, which should be at least 1.5m above the bed level of the pond.
3. The upper opening should be surrounded with filter pack comprising graded filter media of medium, coarse sand & gravel, so that the Recharge well does not get silted.

The opening for inflow to the well has been proposed at 1.5m above Bed level of pond. This is necessary to ensure that the pond retains sufficient water for use by villages. However, this may necessitate further deepening of pond itself so that the pond is 3-4 m deep. A Single well as discussed above would be suitable for a pond upto area of about 2.5 ha. Therefore, more number of such Recharge wells may be required for larger ponds.

Surface water availability

As per the studies carried out by Water Resources Department, Govt of Rajasthan there is hardly any surplus water available for further development at 75% dependability. However, after taking into account the availability of source water in the basins of Rivers flowing in the State proportionate amount of surplus runoff available in particular block by particular sub basin was calculated.

Accordingly about 4.9375 MCM has been considered for recharge plan in the block. Optimum utilization of rainwater runoff depends on availability of land, feasible conditions, etc. Surface water availability, allocation and number of structures are presented in table 2.

Table 2: Source water for artificial recharge and number of recharge structure

District	District code	Block	Block code	Area of Block (Sq.km.)	Potential area suitable for recharge (Sq.km.)	Type of Aquifer	Area feasible for artificial recharge (Sq km)	Sp Yield
SIKAR	RJ30	**NEEM KA THANA**	RJ3002	1197.12	875.18	alluvium	215.18	0.080
SIKAR	RJ30	**NEEM KA THANA**				hard rock	660	0.015

Table 2 (contd): Source water for artificial recharge and number of recharge structure

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)	Sub Basin	Surplus available in the block (in Mm3)	Surplus water used in Recharge Shaft (RS)	No. of RS 0.03 MCM/RS	Remaining Surplus water for Percolation tank (PT)	No. of PT (0.2 MCM/ PT)
33.45	30.45	524.178	Kantli	1.128	0.39	13	0	0
13.45	10.45	103.455	Kantli		0.33	11	0.408	2
			Dohan	3.81	2.22	74	1.590	8
		Total		**4.938**	**2.94**	**98**	**1.998**	**10**

Feasible Artificial Recharge and water conservation structures

A wide spectrum of techniques is in vougue, which are being implemented to recharge the ground water reservoir, conserve the utilizable rainfall and enhance the water use efficiency. Based on prevailing field conditions, out of total block area of 1197.12 sq km practically 875.18 Sq. km area is feasible for implementing recharge measures. Based on available information about the area such as ground water scenario, hydrogeology, hydrology, topography, rainfall pattern, drainage, soil cover, utilizable rainfall etc. scope for various interventions has been studied and assessment of suitable areas, tentative design and costs of structures has been worked out in the present plan.

Identification of feasible areas

Neem Ka Thana block is having ground water level about 40m below ground level and as per dynamic ground water resource estimation, the block is over exploited with stage of ground water development at 135.85%. The Neem Ka Thana block is feasible for recharge due to presence of permeable zone above water table, favorable land slope and availability of water from rainfall.
Generally the Artificial recharge structures suitable in this type of area are Check dams/ Anicuts/ Percolation tanks and Recharge Shafts/ Recharge wells. Since the ground water levels are quite deep in the block, the structures like ani-cuts and Check dams are not suitable and also their construction is regulated. Considering these aspects the proposal for Recharge Shaft/ Recharge wells and percolation tanks have been firmed up in the present Plan are the most suitable structures in Neem Ka Thana block.

Details of Ground Water Recharge Measures

1. Existing Village Pond with recharge shaft/wells

Almost all the villages in the State of Rajasthan have one or two village ponds & other ponds. With time, these ponds get silted & hardly any water percolates downward. Also, any excess water coming into the pond goes away as a run off due to limited storage capacity. This surplus runoff can very well be utilized for recharging the ground water and also for enhancing conservation of water that can be further used for irrigation, thereby saving ground water withdrawal. Since natural recharge from these ponds is limited due to siltation and ground water levels are deep, the most effective ground water structure considered under the Plan is Recharge Shaft/ Recharge well constructed within the pond itself.

The above mentioned recharge well has been designed in a manner that maximum surplus water would likely to be utilized for recharge as well as sufficient water is retained in the pond for local use.
The model design of recharge well has been worked out in consultation with Ground Water Department, Government of Rajasthan and presented in Fig 9a & 9b. The major features required are:

1. The well should have sufficient diameter for recharge- 10 to 12 inch diameter well with bottom screen/ opening just above the highest ground water level.
2. The well should have screen/ opening at the top, which should be at least 1.5m above the bed level of the pond.
3. The upper opening should be surrounded with filter pack comprising graded filter media of medium, coarse sand & gravel, so that the Recharge well does not get silted.

Fig 9a

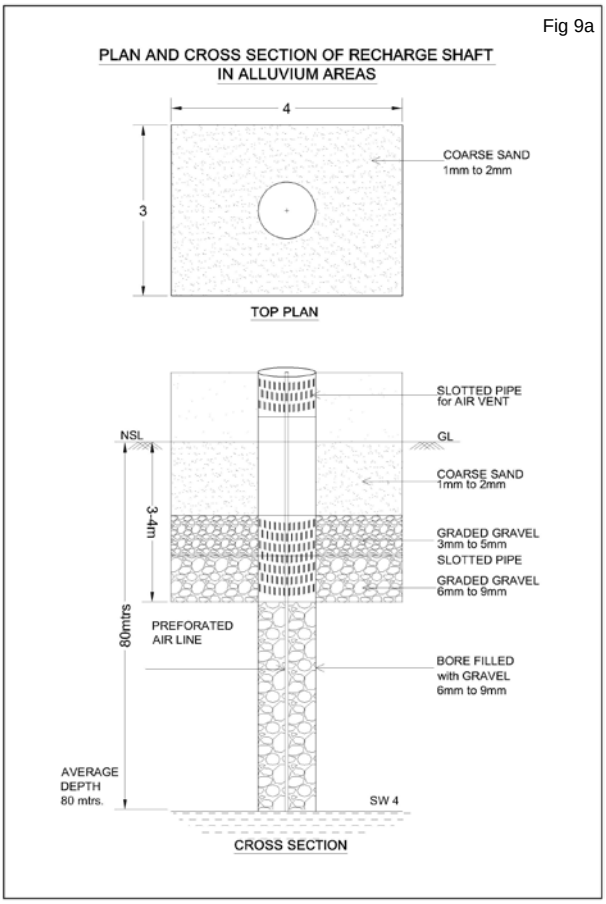
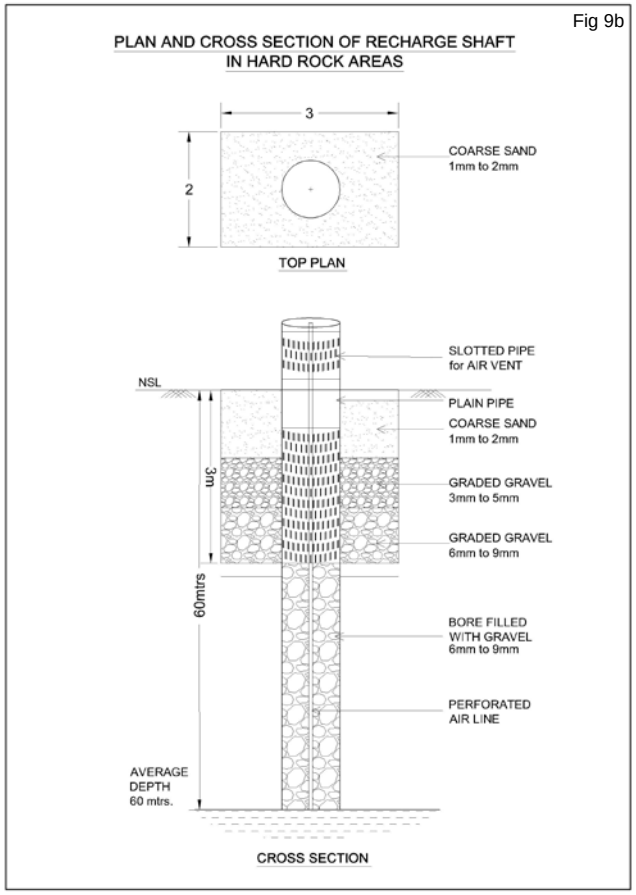


Fig 9b



The opening for inflow to the well has been proposed at 1.5m above Bed level of pond. This is necessary to ensure that the pond retains sufficient water for use by local consumers. However, this may necessitate further deepening of pond itself so that the pond is 3-4 m deep. A Single well as discussed above would be suitable for a pond upto area of about 5ha. Therefore, more number of such Recharge wells is envisaged for larger ponds.

Tentative Locations of the Recharge Shaft

The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 10 and Table 3. The plan proposes construction of 98 recharges shafts/ wells in 80 identified existing village ponds at an estimated cost of 286 lacs.

Table 3: Tentative locations of village for village pond with recharge shaft

S.N	Village	Long	Lat	Pond Area (Ha)	No of Shaft	Formation	Unit cost (Rs in lac)	Cost of Shaft (Rs in lac)
1	Guhala	75.660	27.695	3.529	1	Soft	5	5
2	Chala	75.662	27.660	1.170	1	Soft	5	5
3	Guhala	75.664	27.688	1.192	1	Soft	5	5
4	Govindpura	75.703	27.662	1.120	1	Soft	5	5
5	Ranasar	75.719	27.738	20.942	3	Soft	5	15
6	Kotra	75.736	27.760	1.379	1	Soft	5	5
7	Chak Charawas	75.739	27.774	3.229	1	Hard rock	2.6	2.6
8	Peetham Puri	75.753	27.586	5.130	1	Soft	5	5
9	Chak Mandoli	75.755	27.792	1.267	1	Hard rock	2.6	2.6
10	Peetham Puri	75.757	27.601	2.338	1	Soft	5	5
11	Peetham Puri	75.759	27.608	4.662	1	Soft	5	5
12	Kerwali	75.761	27.769	1.352	1	Hard rock	2.6	2.6
13	Peetham Puri	75.766	27.611	8.001	2	Soft	5	10
14	Kerwali	75.770	27.779	1.037	1	Hard rock	2.6	2.6
15	Mawanda Khurd	75.780	27.824	24.505	2	Hard rock	2.6	5.2
16	Jheerana	75.780	27.682	24.937	2	Hard rock	2.6	5.2
17	Mawanda Khurd	75.782	27.821	1.704	1	Hard rock	2.6	2.6
18	Mandoli	75.791	27.787	2.130	1	Hard rock	2.6	2.6
19	Mandoli	75.795	27.781	1.356	1	Hard rock	2.6	2.6
20	Dhani Chala	75.818	27.780	19.552	2	Hard rock	2.6	5.2
21	Ballabh Das Pura	75.828	27.703	1.520	1	Hard rock	2.6	2.6
22	Dhani Chala	75.835	27.786	1.416	1	Hard rock	2.6	2.6
23	Jhalra	75.839	27.867	1.067	1	Hard rock	2.6	2.6

24	Ballabh Das Pura	75.846	27.718	1.120	1	Hard rock	2.6	2.6
25	Dayal Ki Nangal	75.846	27.871	1.292	1	Hard rock	2.6	2.6
26	Gaonri	75.847	27.701	11.885	2	Hard rock	2.6	5.2
27	Neemod	75.856	27.755	2.416	1	Hard rock	2.6	2.6
28	Khadra	75.858	27.727	1.424	1	Hard rock	2.6	2.6
29	Mawanda Kalan	75.865	27.819	4.274	1	Hard rock	2.6	2.6
30	Jhalra	75.872	27.856	10.674	2	Hard rock	2.6	5.2
31	Mawanda Kalan	75.876	27.772	2.060	1	Hard rock	2.6	2.6
32	Dayal Ki Nangal	75.876	27.866	1.305	1	Hard rock	2.6	2.6
33	Jeelo	75.880	27.844	16.218	2	Hard rock	2.6	5.2
34	Dokan	75.882	27.789	1.375	1	Hard rock	2.6	2.6
35	Bhageshwar	75.889	27.754	1.141	1	Hard rock	2.6	2.6
36	Bhageshwar	75.898	27.734	1.694	1	Hard rock	2.6	2.6
37	Jhareenda	75.898	27.662	1.069	1	Hard rock	2.6	2.6
38	Patan	75.898	27.828	10.402	2	Hard rock	2.6	5.2
39	Jeelo	75.907	27.839	1.052	1	Hard rock	2.6	2.6
40	Khadag Beejpur	75.913	27.723	3.106	1	Hard rock	2.6	2.6
41	Bhageshwar	75.915	27.734	2.427	1	Hard rock	2.6	2.6
42	Jeelo	75.915	27.852	2.101	1	Hard rock	2.6	2.6
43	Dokan	75.921	27.766	2.843	1	Hard rock	2.6	2.6
44	Dokan	75.921	27.774	11.611	2	Hard rock	2.6	5.2
45	Dokan	75.926	27.773	2.149	1	Hard rock	2.6	2.6
46	Bagrawa	75.931	27.862	1.111	1	Hard rock	2.6	2.6
47	Dareeba	75.934	27.666	3.368	1	Hard rock	2.6	2.6
48	Dabla	75.935	27.910	1.249	1	Hard rock	2.6	2.6
49	Dokan	75.941	27.772	2.037	1	Hard rock	2.6	2.6
50	Dokan	75.942	27.782	1.803	1	Hard rock	2.6	2.6
51	Dokan	75.943	27.788	12.659	2	Hard rock	2.6	5.2
52	Dokan	75.947	27.764	2.058	1	Hard rock	2.6	2.6
53	Gadrata	75.950	27.697	2.868	1	Hard rock	2.6	2.6
54	Nanagwas	75.952	27.733	1.720	1	Hard rock	2.6	2.6
55	Shyam Pura	75.957	27.867	82.344	2	Hard rock	2.6	5.2
56	Ratan Nagar	75.957	27.896	1.834	1	Hard rock	2.6	2.6
57	Kundala	75.958	27.675	2.509	1	Hard rock	2.6	2.6
58	Gadrata	75.960	27.693	1.881	1	Hard rock	2.6	2.6
59	Norana	75.961	27.759	176.299	2	Hard rock	2.6	5.2
60	Salodara	75.965	27.868	1.569	1	Hard rock	2.6	2.6
61	Norana	75.966	27.782	22.525	2	Hard rock	2.6	5.2
62	Jat Ki Nangal	75.971	27.841	1.422	1	Hard rock	2.6	2.6
63	Kishor Pura	75.972	27.824	1.248	1	Hard rock	2.6	2.6
64	Doonga Ki Nangal	75.973	27.846	5.982	1	Hard rock	2.6	2.6

65	Kishor Pura	75.976	27.817	4.115	1	Hard rock	2.6	2.6
66	Raipur Patan	75.976	27.739	6.916	1	Hard rock	2.6	2.6
67	Patan	75.978	27.800	3.437	1	Hard rock	2.6	2.6
68	Dhandhela	75.985	27.778	2.074	1	Hard rock	2.6	2.6
69	Raiyan Ka Bas	75.990	27.745	1.762	1	Hard rock	2.6	2.6
70	Patan	75.990	27.799	1.029	1	Hard rock	2.6	2.6
71	Rajpura	75.997	27.784	2.184	1	Hard rock	2.6	2.6
72	Mohanpura	76.001	27.805	1.062	1	Hard rock	2.6	2.6
73	Raiyan Ka Bas	76.002	27.726	24.509	2	Hard rock	2.6	5.2
74	Bhandala	76.007	27.737	22.723	2	Hard rock	2.6	5.2
75	Rajpura	76.013	27.775	7.642	2	Hard rock	2.6	5.2
76	Meena Ki Nangal	76.026	27.832	2.892	1	Hard rock	2.6	2.6
77	Jatwas	76.029	27.762	3.316	1	Hard rock	2.6	2.6
78	Meena Ki Nangal	76.032	27.838	3.751	1	Hard rock	2.6	2.6
79	Bopiya	76.043	27.764	1.140	1	Hard rock	2.6	2.6
80	Bopiya	76.045	27.759	5.848	1	Hard rock	2.6	2.6
	Total				98			286

2. Percolation tanks

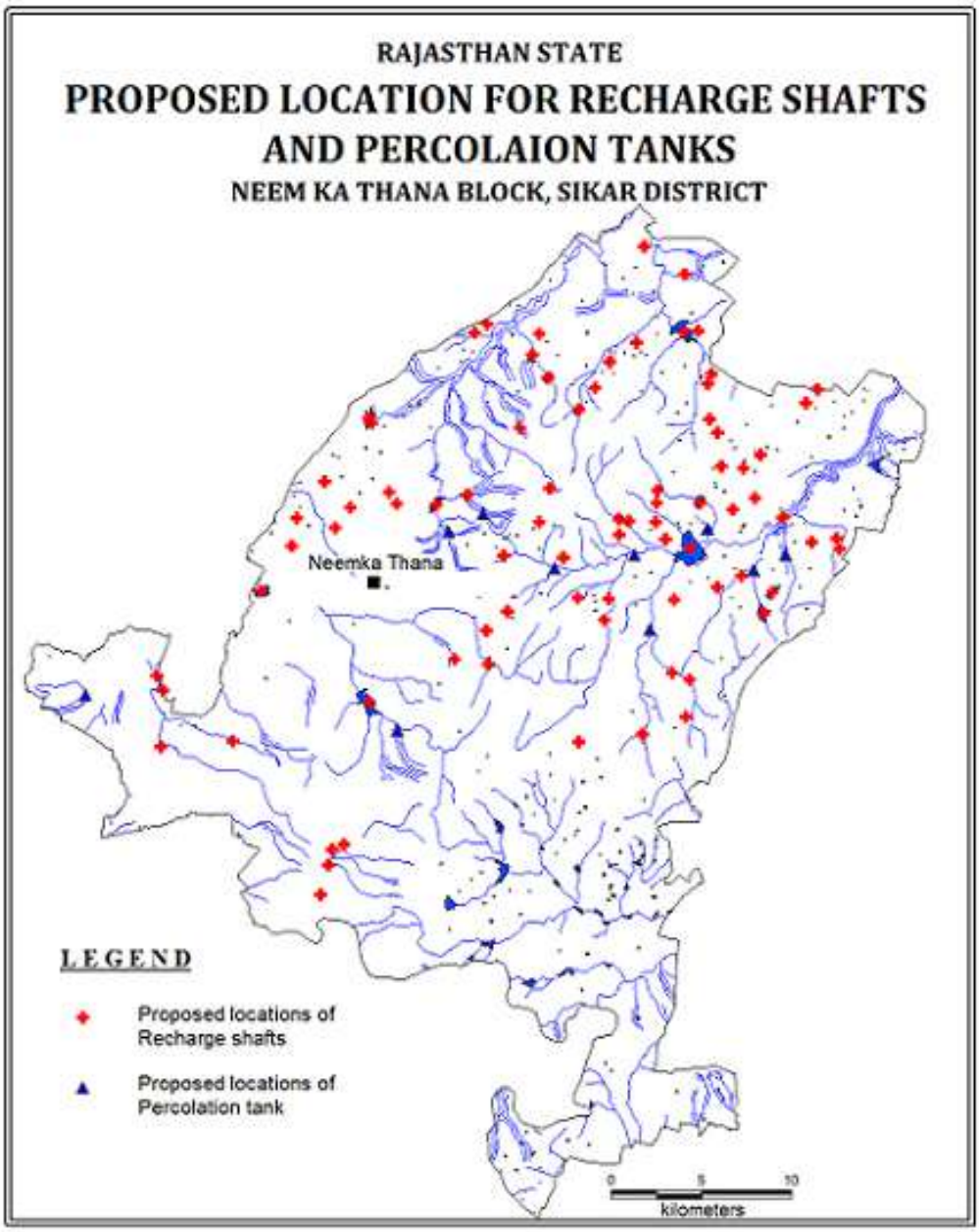
Percolation tanks are among the most common runoff harvesting structures in India. A percolation tank can be defined as an artificiallly created surface water body submerging a highly permeable land area so that the surface runoff is made percolate and recharge the ground water storage. These are not provide with sluices or outlests for discharging water from tank for irrigation or other purposes. They may, however, be provided with arrangements for spilling away the surplus water that may enter the tank so as to avoid over-topping of the tank bund. It is possible to have more than one percolation tank in a catchment if sufficient surplus runoff is available and the site characxterisitcs favor recahrge through such structures. Under the plan, 10 Nos. percolation tanks (200mx200mx1.5m) in the vicinity of respective villages. Location of percolation tanks is given in Fig 10 and Table 4.

Table 4: Tentative location of village proposed for percolation tank

SN	District	Block	Village	Longitude	Latitude
1	Sikar	Neem ka Thana	Guhala	75.620	27.686
2	Sikar	Neem ka Thana	Dhani Chala	75.825	27.767
3	Sikar	Neem ka Thana	Kola Ki Nangal	75.997	27.748
4	Sikar	Neem ka Thana	Udaisingh Pura@Bhopatpura	76.015	27.756
5	Sikar	Neem ka Thana	Norana	75.971	27.769
6	Sikar	Neem ka Thana	Dokan	75.929	27.756

7	Sikar	Neem ka Thana	Ganeshwar	75.796	27.668
8	Sikar	Neem ka Thana	Mahawa	75.844	27.776
9	Sikar	Neem ka Thana	Neemod	75.884	27.749
10	Sikar	Neem ka Thana	Nanagwas	75.938	27.718

Fig: 10



B. Revival, repair of water bodies

The existing ponds and tanks in 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.

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. The monitoring system should be designed judiciously to monitor impact of these structures individually as well as collectively. Demarcation of the zone of influence of the artificial recharge structure is one of the main objectives of monitoring.

It is proposed to utilize the existing data available with the Government of Rajasthan and CGWB baseline data. For assessment of the impact of proposed measures additional data will be generated by construction of the piezometer at suitable and strategic sites.

It is proposed to construct 80 piezometer, at suitable locations for monitoring of water levels, in the vicinity of proposed recharge structure. The depth of the piezometer may vary from 60 to 80 mbgl. This will help in assessing the impact of the project implementation.

Since the implantation of the Plan involves institutional framework, it is proposed to constitute State Level Technical Coordination Committee (SLTCC) and District Level Technical Coordination Committee (DLTCC) for proper monitoring and review of the implementation of the Plan.

Financial Outlay of the Plan

The total estimated cost of the Plan is 7.707 cr, which includes Rs 6.86 cr for ground water recharge activities, 0.48 cr for ground water monitoring (Piezometer construction) and Rs 0.367 cr towards operation and maintenance charges. The tentative cost estimates of the various activities of the Plan are shown in Table 5 & 6.

The tentative cost for different activities is given in table 5 & 6. The unit rates are as followed by the Govt. of Rajasthan (BSR). The total estimated cost of the project is **Rs 7.707 Crores**.

Table 6: Cost of the recharge structures

Cost of Percolation Tank in Rs in crs (Unit cost Rs 0.4 cr)	Cost Recharge Shaft Rs in crs (Unit cost Rs 0.05 cr for alluvium and Rs 0.026 cr for hard rock)
4	Alluvium – 0.65
	Hard rock -2.21

Table 8: Tentative cost of different activities

Feasible Artificial Recharge & Water Conservation structures/ activities	**Tentative Design**	**Quantity (in nos. or area in sq. m)**	**Rainwater harvested (mcm)**	**Tentative unit cost (in Rs lakh)**	**Total tentative cost (in Rs lakh)**	**Expected Annual GW recharge/ conservation (mcm)**
Recharge Structures/ Activities						
Recharge shaft within the pond /tanks	Alluvium – Depth 80m, Dia: 10-12" with filter pit	13	0.39	5	65	0.273
	Hard rock: Depth –60m, Dia 10-12"with filter pit	85	2.55	2.6	221	1.785
Percolation tanks (3 fillings)	200m*200m*1.5m	10	1.998	40	400	1.3986
Sub total					686	3.4566
Impact assessment & Monitoring						
Piezometer	Up to 80 m bgl	80		0.6	48	
Impact assessment will be carried out by implemneting agency						
O & M - 5% of total cost of the scheme					36.7	
TOTAL					**770.7**	

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

Time Schedule

The project is to be implemented in two years, however impact assessment will be carried out for five years**.** A time schedule for different activities is given in table 7.

Table 7: Time Schedule

Steps	1st phase	2th Phase	3rd Phase	4th Phase	5th Phase	6th Phase	7th Phase	8th Phase
Constitution of State Level Technical Coordination Committee (SLTCC) and District Level Technical Coordination Committee (DLTCC)								
Arranging meeting of SLTCC for provision available under the scheme, request to implementing agencies for submission of DPR Scrutiny, recommendations & approval of AR Projects / Schemes in DLTCC & SLTCC Forwarding the DPR to Central Ground Water Board (CHQ), New Delhi for approval and issuing of sanction from the Ministry Meeting of TCC(CHQ) and release of sanction of funds								
Construction of artificial recharge structures & Monitoring of water levels in the area locally								
Completion and Utilisation certificate								
Impact Assessment and submission of report								

Expected Benefits or outcome of the Plan

Ground water recharge and water conservation Plan of Neem Ka Thana block, Sikar envisages gainful utilization of 3.4566 MCM of surplus monsoon runoff for recharging of depleted aquifer system.

With the additional recharge and water conservation interventions as proposed in the Plan, it is anticipated that with enhanced recharge and reduction in ground water draft, the stage of ground water development will reduce to 121.55 % from the existing 135.85%. The projected status of ground water resources and utilization scenario is presented in table 8.

Table 8:Projected Status of Groundwater Resource & Utilization

Net G.W. Availability (Ham)	Additional Recharge from RWH & conservation (mcm)	Total Net G.W. Availability after intervention (mcm)	Existing G.W Draft for all purpose (mcm)	Saving of Ground water through projects (mcm)	Net GW draft after interventions (mcm)	Present stage of G.W. development (%)	Projected stage of G.W. Dev. (in %)
29.3823	3.4566	32.8389	39.9164	0	39.9164	135.85	121.55

- The implementation of the project would result in additional recharge. The other tangible/ non-tangible benefits of the project are:

- Recharging the ground water will help in arresting the rapid decline in ground water resources and will also ensure improvement in quality of ground water by way of dilution.
- Proposed structures and measures will also enhance the ground water potential and would ensure sustainability of ground water resources.
- Surface runoff water stored or harnessed can be used as supplemental irrigational resources and will reduce the stress on the ground water.
- Besides, it will also help in reducing the amount and spate of storm water being drained by river and controlling soil erosion.