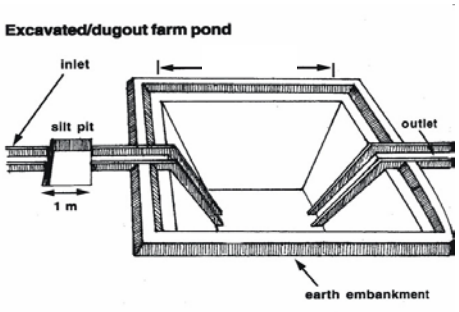
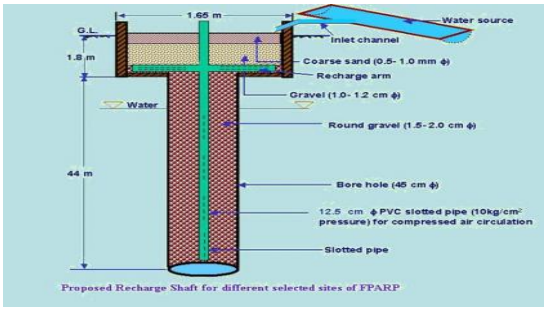
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES,
RIVER DEVELOPMENT & GANGA REJUVENATION
GOVERNMENT OF INDIA





ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN OF KHANDELLA BLOCK, DISTRICT SIKAR, RAJASTHAN

Western Region, Jaipur
January 2016

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN BLOCK KHANDELLA, DISTRICT SIKAR

Plan at a Glance

1.	**Area of the Khandella Block**	**743.46 Sq.Km.**
2.	**Area identified for Artificial Recharge**	**693.99 Sq.Km.**
3.	**Dynamic Ground Water Resources (as on 31.03.2011)**	
	Net Ground Water Availability	**29.73 MCM**
	Annual Ground Water Draft	**47.47 MCM**
	Stage of Ground Water Development	**159.68 %**
4.	**Runoff available in the block** **Volume of water recharged** **Volume of water conserved for other interventions**	**1.1347 MCM** **1.1347 MCM** **Nil**
5.	**Volume of unsaturated aquifer zone available for recharge**	**1005.25**
6.	**Total number of structures to be proposed**	
	Recharge structures **Existing village pond with recharge shaft/ well** **Percolation tank** **Water Conservation** **Farm pond)**	 **38 shafts in 38 Nos. of existing village ponds** **-** **Nil**
	Expected Annual GW recharge	**0.7944**
	Provision for supplemental irrigation, thus reducing GW withdrawal for irrigation	**Nil**
	Total recharge/ saving of ground water	**0.7944**
7.	**Estimated Cost** Artificial Recharge Plan Water conservation measures Piezometer construction Operation and maintenance	**1.6296 crore** 1.324 crore nil 0.228 crore 0.0776 crore

ARTIFICIAL RECHARGE TO GROUND WATER AND WATER CONSERVATION PLAN BLOCK KHANDELLA, 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 **Khandella 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 **159.68%.** 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 Khandella Block covering an area of 743.46 Sq. Km. falls in centre-eastern part of Sikar District and is located between North latitudes 27°22’ & 27°43’ and East longitudes 75°25’ & 75°55’. As per 2011 census, the total population of the Block is 261704 persons consisting of 135213 males & 126491 females and population density is 352 persons/ Sq. Km. Location map is shown in **Fig 1**.

1.2 Source wise Irrigated Area

More than 70% of total area of this block is irrigated through varios sorces. The dug wells/ Tubewells are one of the main sources of irrigation in Khandella Block. There is no area that falls under canal & pond irrigation. The wells irrigate total 228.85 Sq.Km. area in this Block and remaining area is irrigated through other sources.

Fig: 1

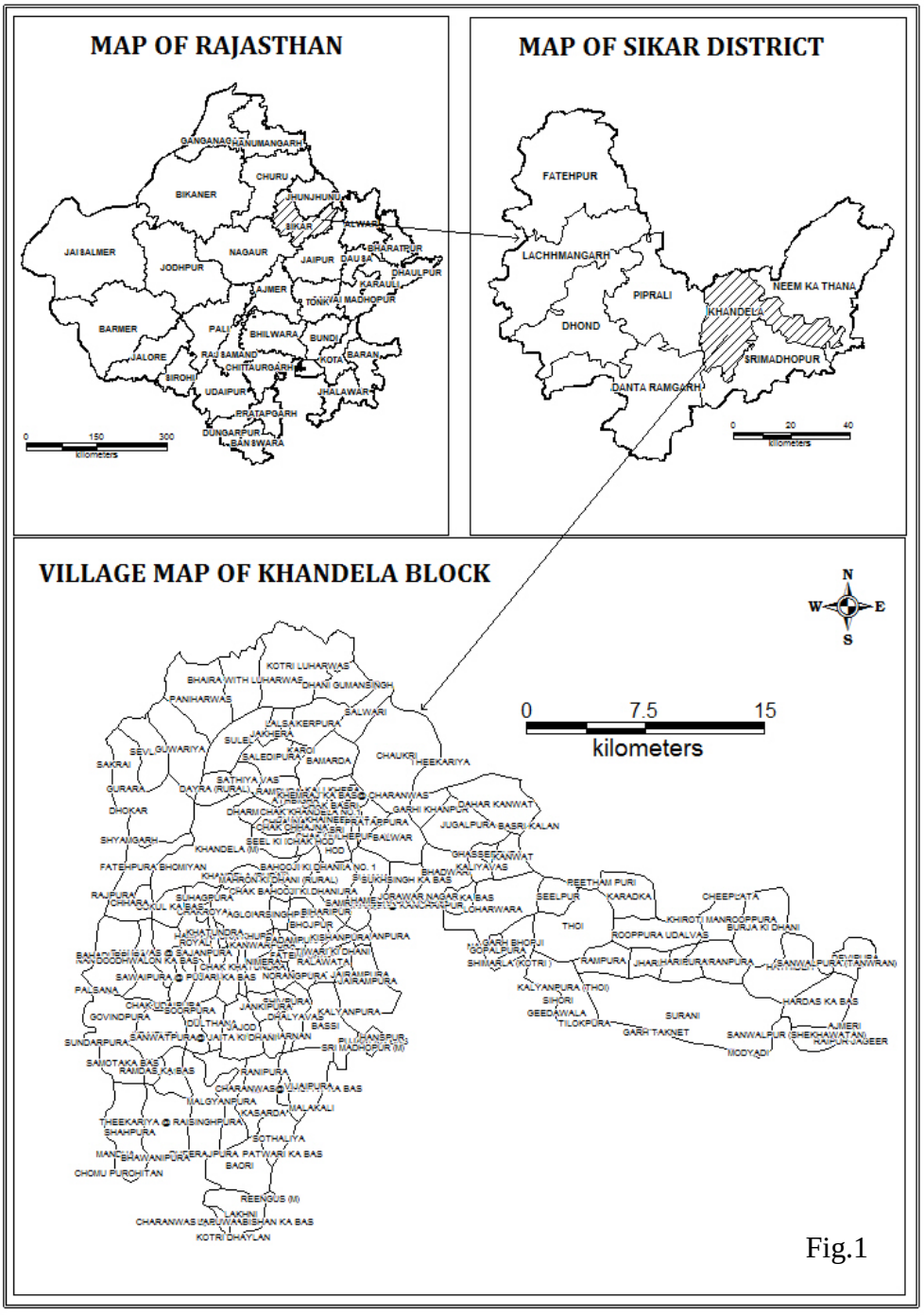


Fig.1

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 419.4 m.

amsl and 899.1 m. amsl, respectively.

There is no perennial river flowing in this Block. It is drained by ephemeral Kantli river in northern & north eastern part. The eastern part of block is drained by Sabi. The major part of block falls under Shekhawati (Mendha) basin except eastern part that falls under Sabi basin. The map showing drainage and water bodies in the Khandella block is shown in **Fig. 3**.

Fig: 2

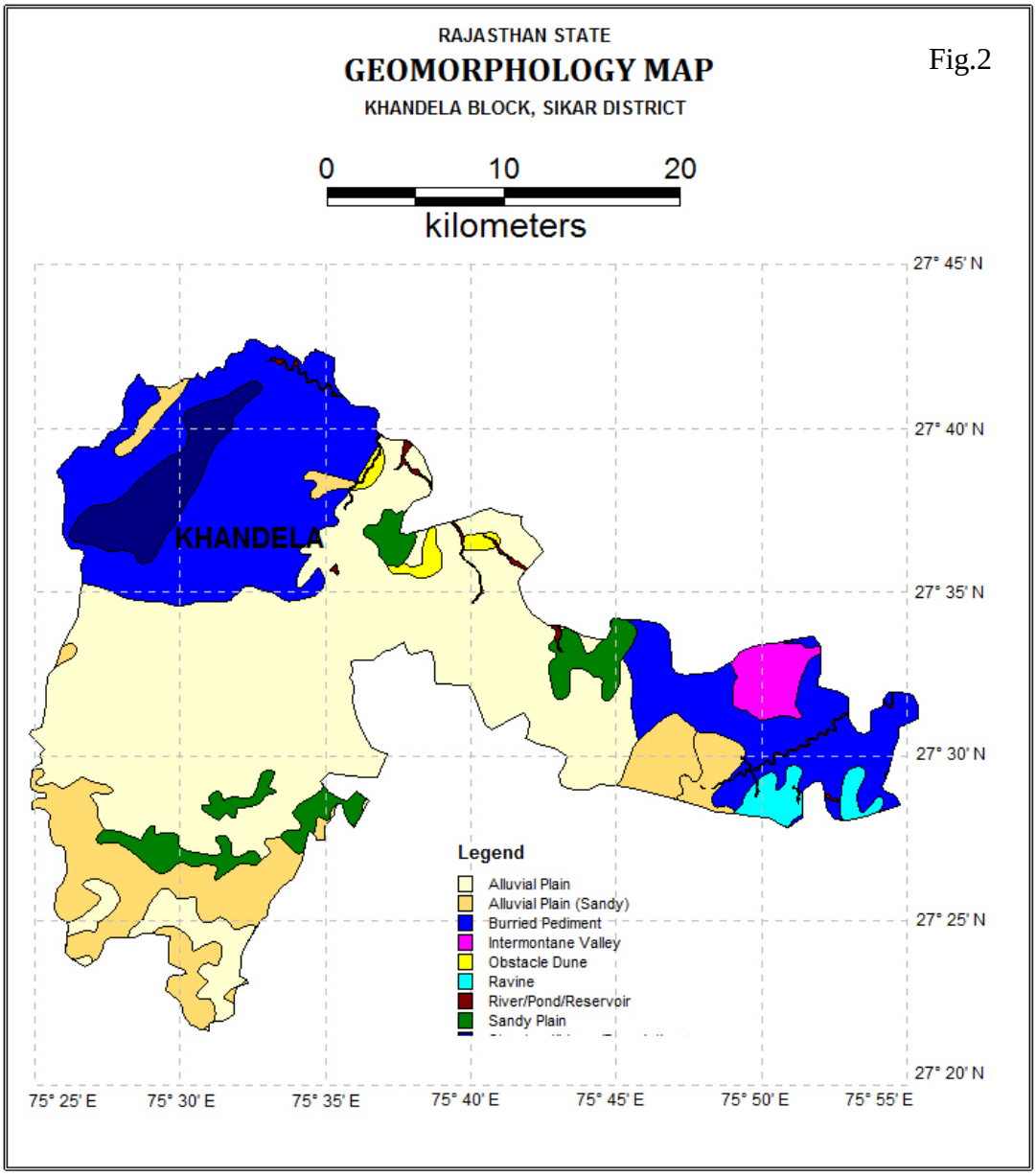


Fig: 3

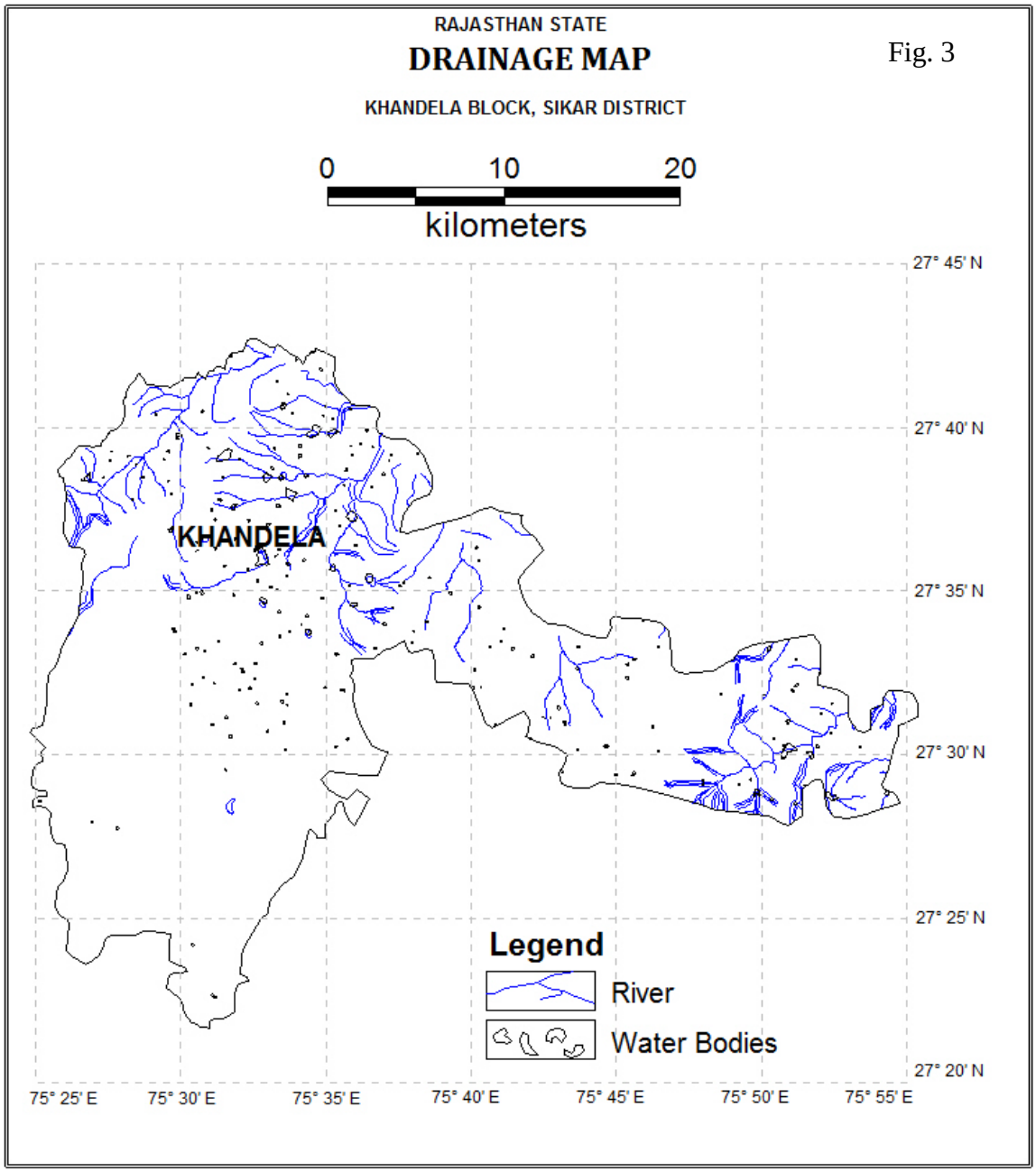

RAJASTHAN STATE
DRAINAGE MAP
KHANDELA BLOCK, SIKAR DISTRICT
0
10
20
kilometers
KHANDELA
27° 45' N
27° 40' N
27° 35' N
27° 30' N
27° 25' N
27° 20' N
75° 25' E
75° 30' E
75° 35' E
75° 40' E
75° 45' E
75° 50' E
75° 55' E
Legend
River
Water Bodies

Fig. 3

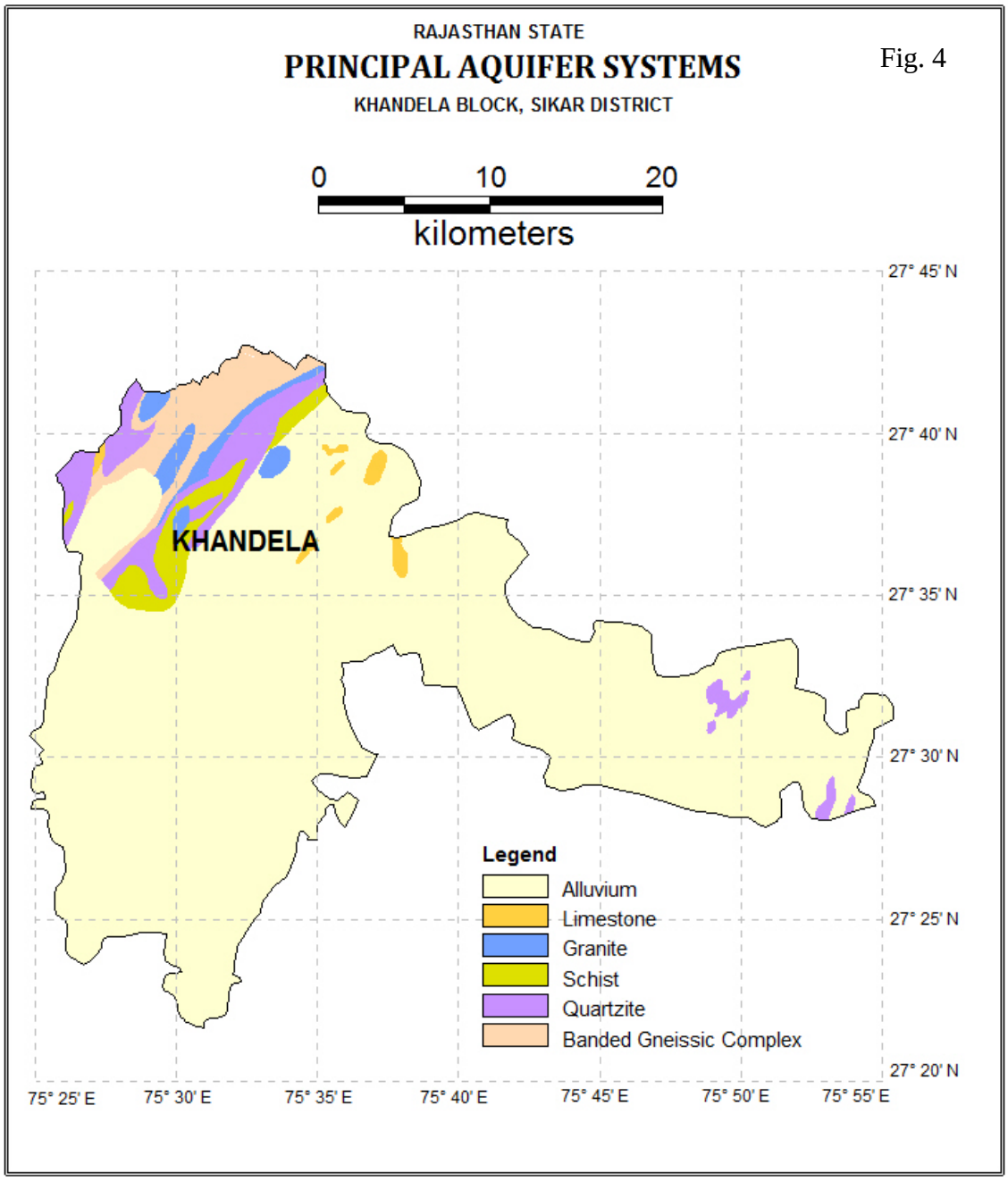
1.4 Rainfall

The climate of the block is semi arid. The Normal annual rainfall of block is 481.17mm. 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 743.46 Sq. Km, areas of 508.81 Sq. Km. (68.44%) under Older alluvium & 185.18 Sq,Km. (24.91%) under Quartzites form potential zones and remaining 49.47 Sq. Km.(6.65%) 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 Khandella block is shown in **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 20-50 m bgl range and the Central-western part also shows range of 50-60 m bgl. **(Fig 5)**

The average decadal depth to water level is 33.63 mbgl for Pre monsoon & 31.40 mbgl for Post monsoon. According to depth to water level maps of May 2014 & November 2014, the depth to water level is more than 40 mbgl in major part of block except western, north western parts and southern parts where water level varies from 20 to 40 mbgl. The Map showing Depth to water level for May, 2014 and November, 2014 is shown in **Fig 6 & 7.**

Fig: 5

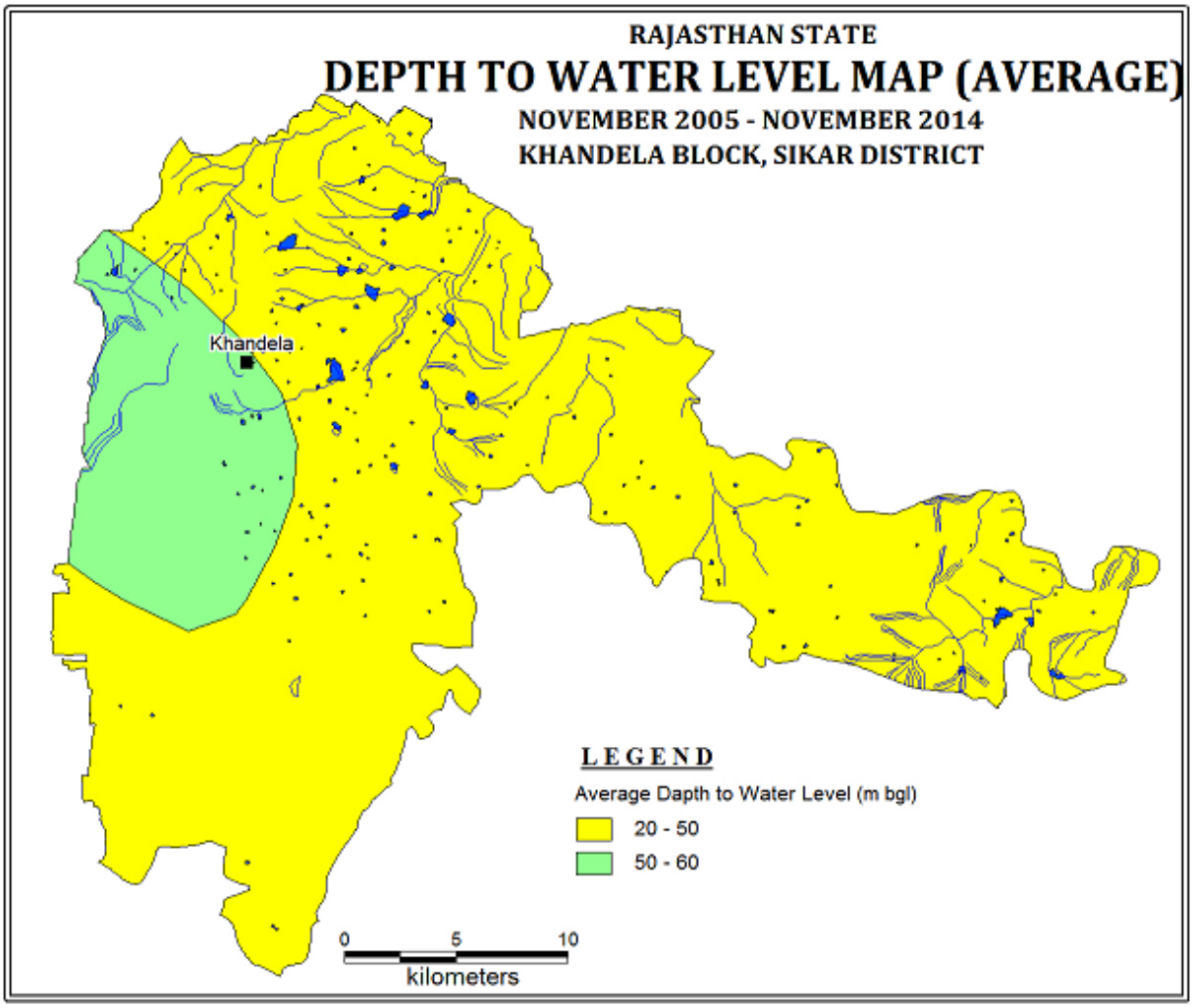


Fig: 6

Fig 6

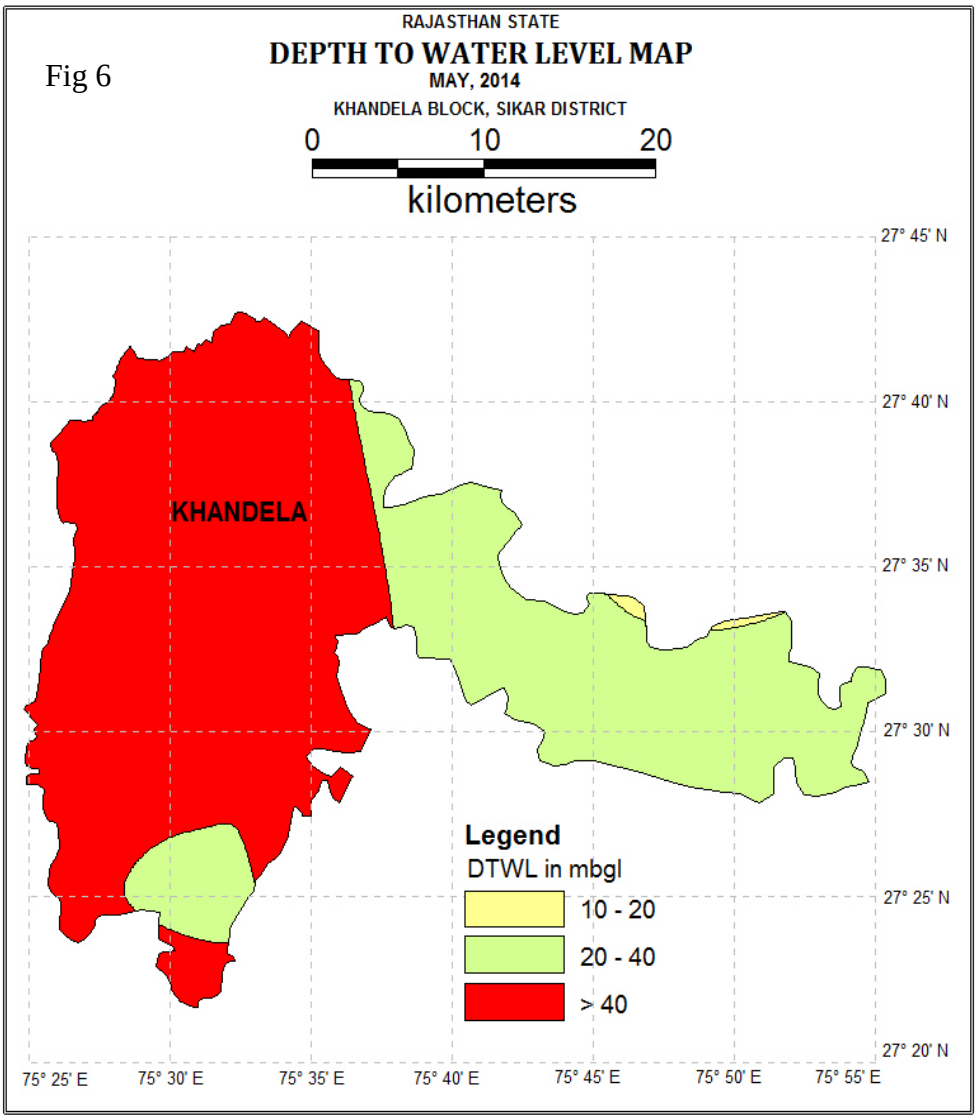
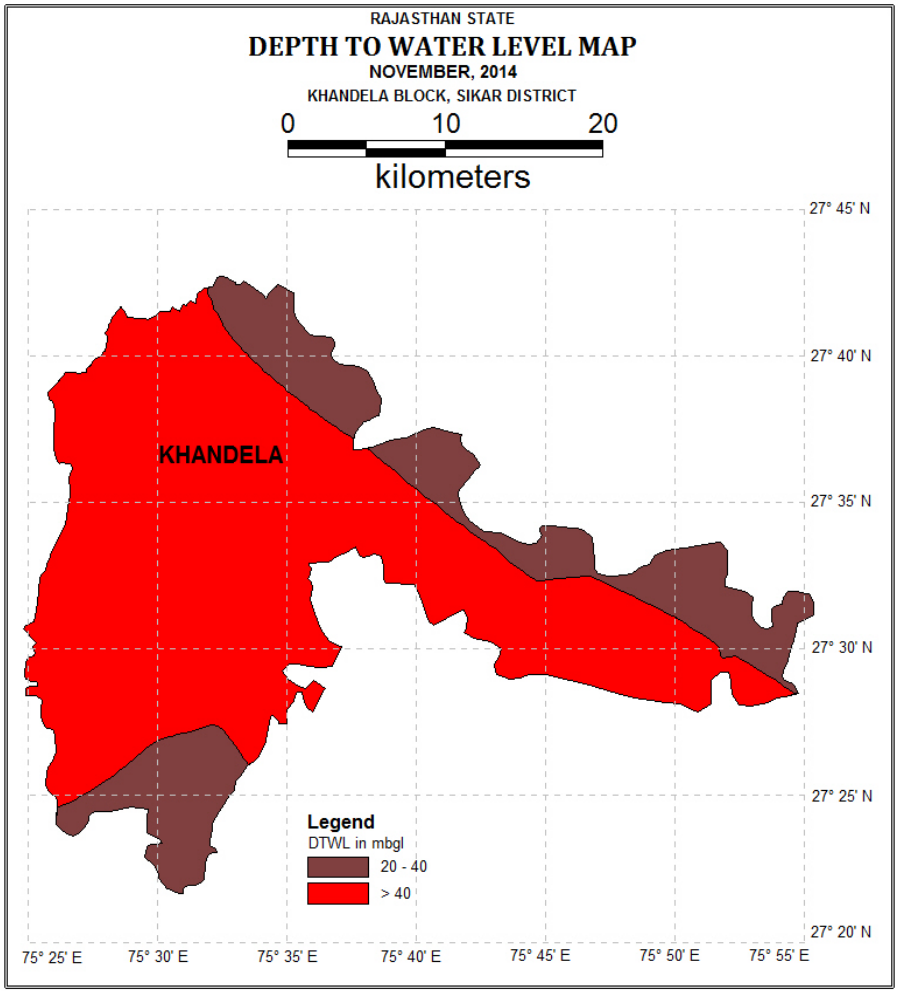

RAJASTHAN STATE
DEPTH TO WATER LEVEL MAP
MAY, 2014
KHANDELA BLOCK, SIKAR DISTRICT
0
10
20
kilometers
KHANDELA
27° 45' N
27° 40' N
27° 35' N
27° 30' N
27° 25' N
27° 20' N
75° 25' E
75° 30' E
75° 35' E
75° 40' E
75° 45' E
75° 50' E
75° 55' E
Legend
DTWL in mbgl
10 - 20
20 - 40
> 40

Fig: 7

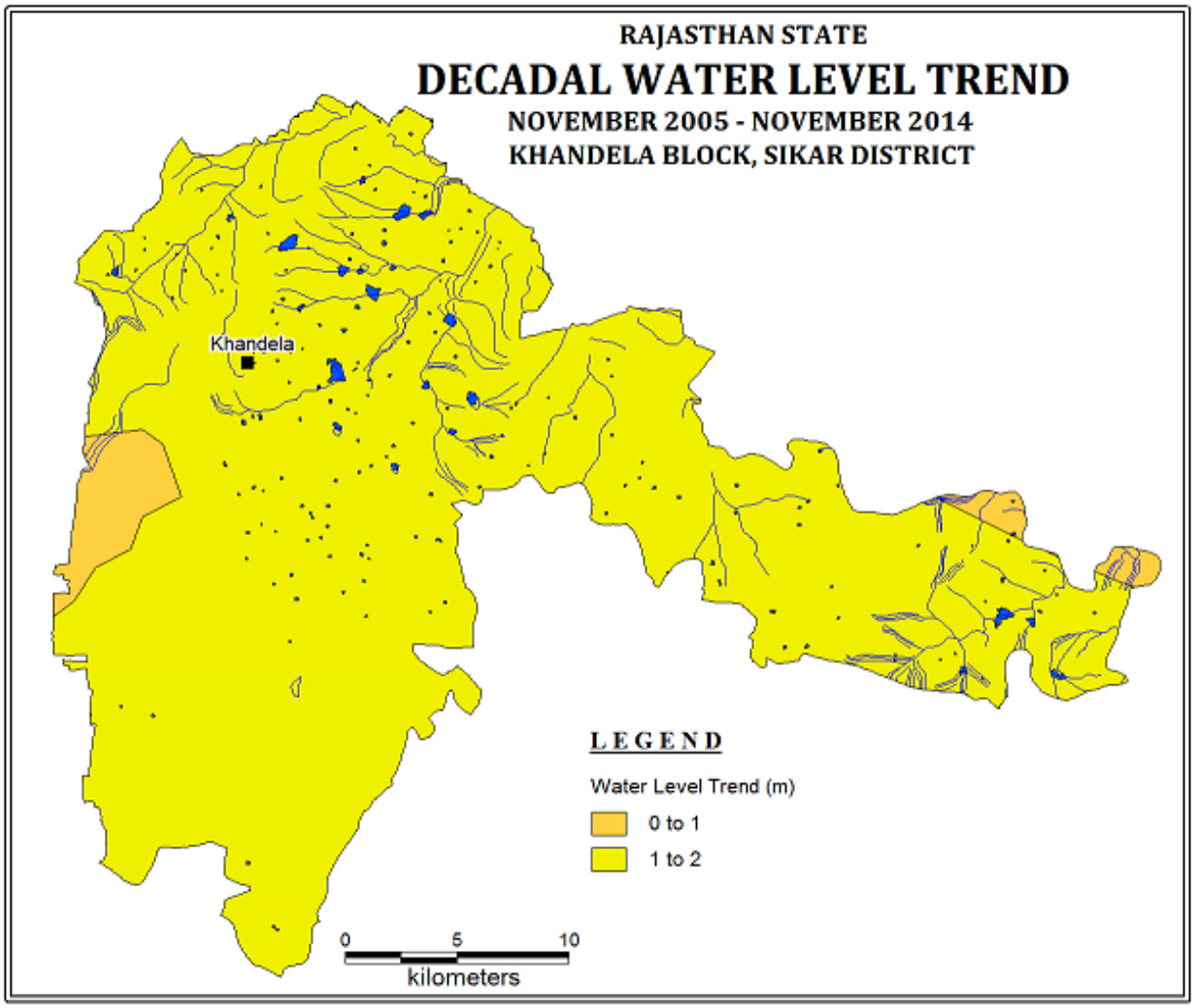


Water Level Trend:

The hydrographs of wells monitored by CGWB & GWD from 1997 to 2010 shows declining water level trend. A water level fall varying from 2.08 to 2.09 m/year during pre monsoon and 1.84 to 2.41 m/year during post monsoon has been observed for this period.

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 2. 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 Khandella 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 21.7 to 136 mbgl and the average discharge ranges from 1.37 to 19.63 lps. The quality of water has 2 major problems, i.e., Salinity & Fluoride. Transmissivity value varies between 5 to 430 m^2/day and Stortivity varies from 0.000096 to 0.0036.

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 2972.54 ham and Annual Ground water draft is 4746.54 ham. Due to this excessive draft over recharge, stage of Ground water development has reached 159.68%.

Table 1: Ground Water Availability, Utilization and Stage of Development Khandella Block, Sikar District

Natural Discharge During Non Monsoon Period	330.29 ham
Net Ground Water Availability	2972.54 ham
Annual Ground Water Draft	4746.54 ham
Net Ground water Availability for Future Irrigation Use	-1835.18 ham
Stage of Ground Water Development	159.68%
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 1.1347 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	KHANDELLA	RJ3001	743.46	693.99	alluvium	508.81	0.080
SIKAR	RJ30	KHANDELLA				hard rock	185.18	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)
26.13	23.13	941.502	Mendha	0.1062	0.1062	4	0	0
			Kantli	0.308	0.308	10	0	0
25.95	22.95	63.748	Kantli	0.7205	0.7205	24	0	0
			Total	**1.1347**	**1.1347**	**38**	**0**	**0**

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 743.46 sq km practically 693.99 sqkm 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

Khandella 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 159.68%. The Khandella 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 aspect the proposal for Recharge Shaft/ Recharge wells and percolation tanks have been firmed up in the present Planare the most suitable structures in Khandella block.

Details of Ground Water Recharge Measures

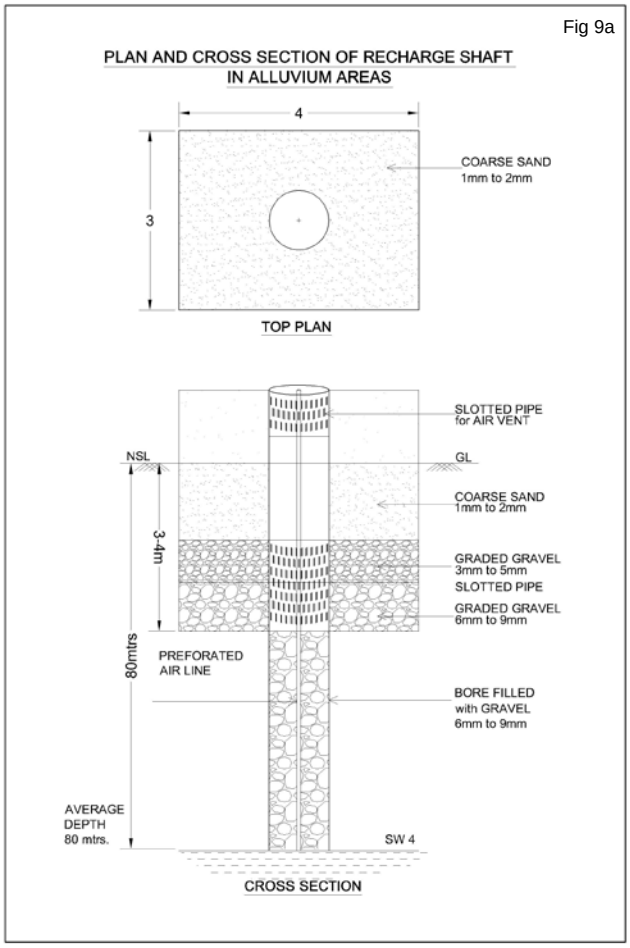
1. Existing Village Pond with recharge shaft/wells

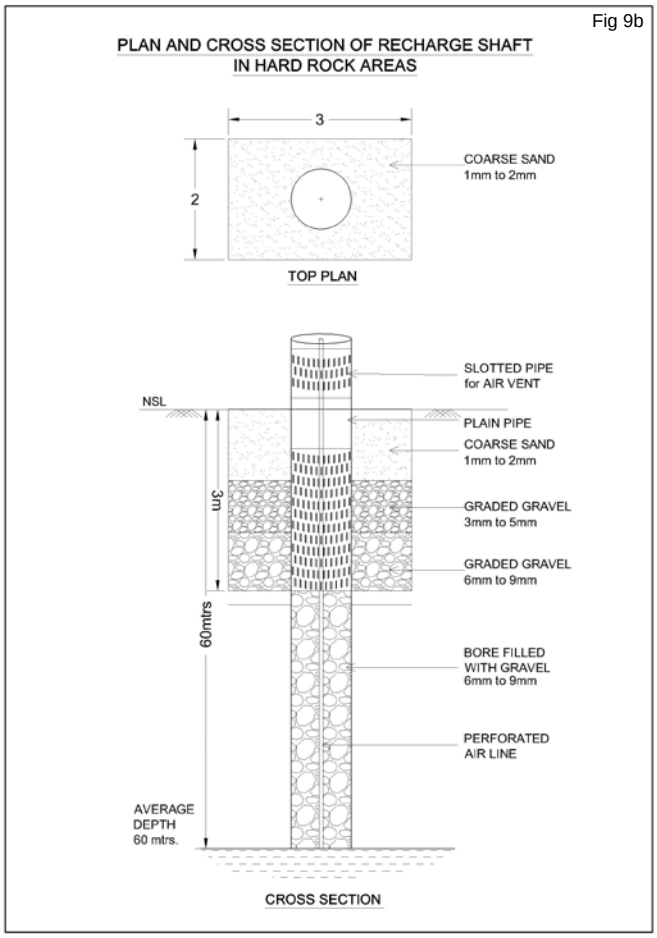
Almost all the villages in the State of Rajasthan have one or two village ponds & other ponds. With time, these ponds get silted & hardly any water percolates downward. Also, any excess water coming into the pond goes away as a runoff due to limited storage capacity. This surplus runoff can very well 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.

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.

Fig: 9





Tentative location of Recharge Shaft:

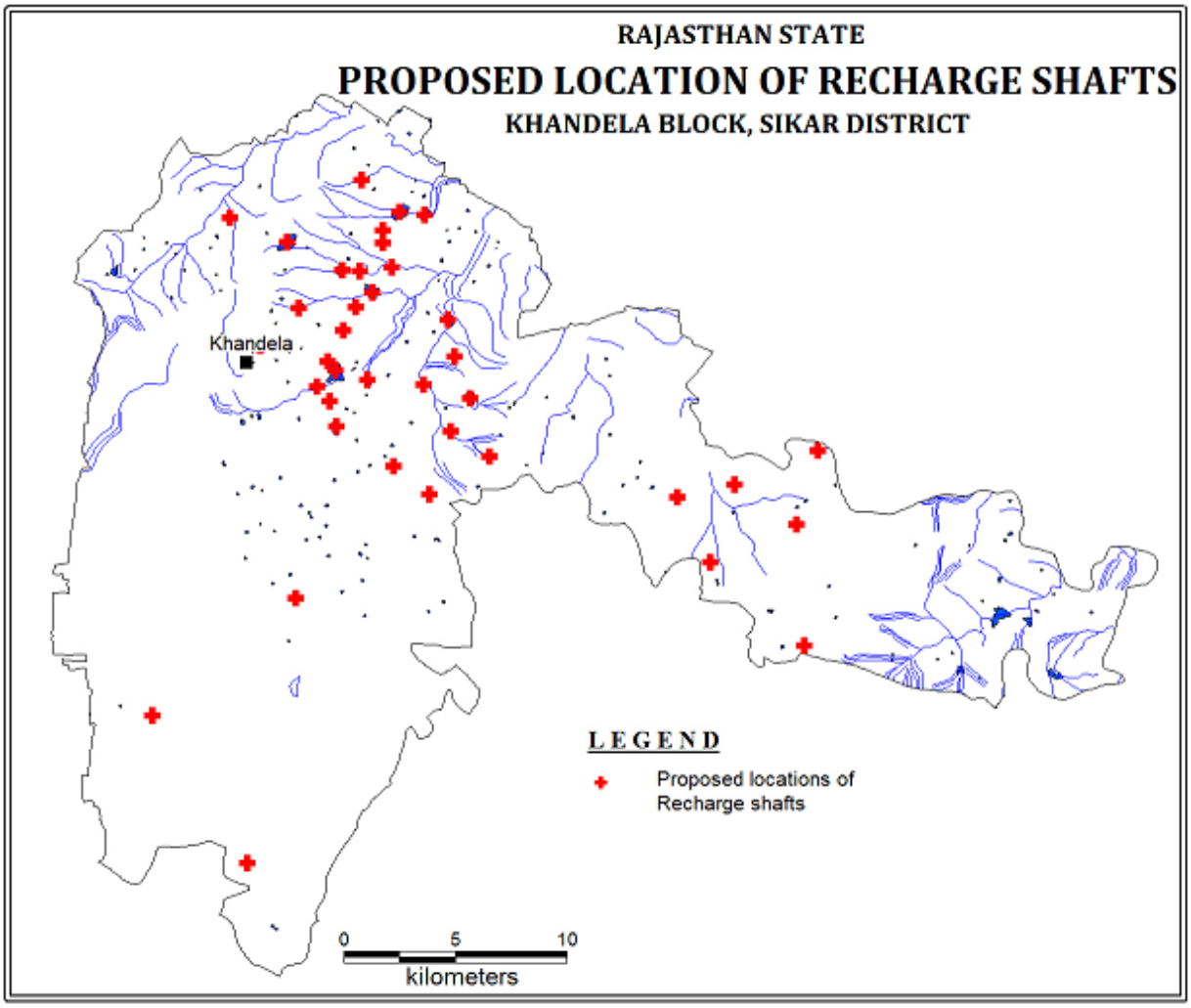
The tentative location of villages for construction of recharge shaft/well in existing village pond and their cost estimates are shown in Fig 10 and Table 3. The plan proposes construction of 38 recharges shafts/ wells in 38 identified existing village ponds at an estimated cost of 132.4 lacs.

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	Ramdas Ka Bas	75.463	27.463	1.870	1	Soft	5	5
2	Paniharwas	75.499	27.662	5.711	1	Hard rock	2.6	2.6
3	Baori	75.507	27.403	1.695	1	Soft	5	5
4	Khandela (M)	75.512	27.611	2.261	1	Hard rock	2.6	2.6
5	Sulel	75.525	27.653	37.778	1	Hard rock	2.6	2.6
6	Nimera	75.529	27.509	1.918	1	Soft	5	5
7	Saledipura	75.530	27.626	4.471	1	Hard rock	2.6	2.6
8	Chhajna	75.538	27.595	1.779	1	Hard rock	2.6	2.6
9	Chhajna	75.543	27.605	3.578	1	Hard rock	2.6	2.6
10	Seel Ki Bara	75.544	27.589	1.717	1	Hard rock	2.6	2.6
11	Chhajna	75.547	27.601	47.274	1	Hard rock	2.6	2.6
12	Seel Ki Bara	75.547	27.579	7.879	1	Hard rock	2.6	2.6
13	Karoi	75.550	27.641	14.984	1	Hard rock	2.6	2.6
14	Rampura	75.550	27.617	2.863	1	Hard rock	2.6	2.6
15	Bamarda	75.556	27.627	3.062	1	Hard rock	2.6	2.6
16	Karoi	75.558	27.641	5.236	1	Hard rock	2.6	2.6
17	Kotri Luharwas	75.559	27.678	4.623	1	Hard rock	2.6	2.6
18	Chhajna	75.561	27.597	1.693	1	Hard rock	2.6	2.6
19	Bamarda	75.563	27.633	26.652	1	Hard rock	2.6	2.6
20	Kerpura	75.568	27.657	1.903	1	Hard rock	2.6	2.6
21	Kerpura	75.568	27.652	3.963	1	Hard rock	2.6	2.6
22	Bamarda	75.572	27.642	3.029	1	Hard rock	2.6	2.6
23	Dulhepura	75.573	27.563	7.422	1	Soft	5	5
24	Kerpura	75.576	27.665	32.268	1	Hard rock	2.6	2.6
25	Chak Dulhepura No.2	75.587	27.596	8.691	1	Hard rock	2.6	2.6
26	Dhani Gumansingh	75.587	27.664	13.478	1	Hard rock	2.6	2.6
27	Samrathpura	75.589	27.551	2.103	1	Soft	5	5
28	Chaukri	75.598	27.622	22.248	1	Hard rock	2.6	2.6
29	Sujana	75.599	27.577	6.330	1	Soft	5	5

30	Pratappura	75.601	27.607	1.649	1	Hard rock	2.6	2.6
31	Balwar	75.608	27.590	18.488	1	Soft	5	5
32	Sukhsingh Ka Bas	75.617	27.567	2.256	1	Soft	5	5
33	Loharwara	75.702	27.550	2.004	1	Soft	5	5
34	Thoi	75.717	27.524	2.227	1	Soft	5	5
35	Seelpur	75.728	27.555	1.732	1	Soft	5	5
36	Rooppura Udalvas	75.756	27.539	1.885	1	Soft	5	5
37	Surani	75.760	27.490	2.298	1	Soft	5	5
38	Karadka	75.766	27.569	2.201	1	Soft	5	5
	Total				**38**			**132.4**

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 38 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 1.6296 cr, which includes Rs 1.324 cr for ground water recharge activities, 0.228 cr for ground water monitoring (Piezometer construction) and Rs 0.0776 cr towards operation and maintenance charges. The tentative cost estimates of the various activities of the Plan are shown in Table 4 & 5.

The tentative cost for different activities is given in table 4 & 5. The unit rates are as followed by the Govt. of Rajasthan (BSR). The total estimated cost of the project is **Rs** 1.6296 **Crores**.

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)
Alluvium – 0.70
Hard rock -0.624

Table 5: 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	14	0.4142	5	70	0.29
	Hard rock: Depth – 60m, Dia 10-12"with filter pit	24	0.7205	2.6	62.4	0.5044
Sub total					132.4	0.7944
Impact assessment & Monitoring						
Piezometer	Up to 80 m bgl	38		0.6	22.8	
Impact assessment will be carried out by implemneting agency						
O & M - 5% of total cost of the scheme					7.76	
TOTAL					**162.96**	

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 6.

Table 6: 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 Khandella block, Sikar district envisages gainful utilization of 0.7944 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 155.52% from the existing 159.68%. The projected status of ground water resources and utilization scenario is presented in table 7.

Table 7: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 %)
29.7254	0.7944	30.5198	47.4654	0	47.4654	159.68	155.52

- 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.