Ground Water Department,
Rajasthan

Hydrogeological Atlas of Rajasthan

Sikar District

European Union
State Partnership Programme

2013

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Hydrogeological Atlas of Rajasthan

Sikar District

Contents:

2013

ADMINISTRATIVE SETUP

DISTRICT – SIKAR

Location:

Sikar district is located in the northeastern part of Rajasthan. It is bounded in the north by Jhunjhunun district, in the east state of Haryana, southeast by Jaipur district and southwest by Nagaur whereas the western boundary is shared with Churu district. It stretches between 27° 07' 01.57" to 28° 12' 12.56" north latitude and 74° 40' 48.23'' to 76° 05' 47.66'' east longitude covering area of 7,726.9 sq kms. Systematic drainage system is lacking in western half of the district which is part of an 'Outside' Basin whereas the remaining part of the district is drained by Shekhawati River along with a small part in the east by Sabi RIver.

Administrative Set-up:

Sikar district is administratively divided into eight blocks. The following table summarizes the basic statistics of the district at block level.

S. No.	Block Name	Population (Based on 2001 census)	Area (sq km)	% of District Area	Total Number of Towns and Villages
1	DantaRamgarh	2,87,544	1,152.3	14.9	158
2	Dhond	2,09,919	914.5	11.8	109
3	Fatehpur	3,00,393	1,245.5	16.1	145
4	Khandela	2,41,036	797.2	10.3	132
5	Lachhmangarh	2,44,367	1,028.0	13.3	141
6	NeemKa Thana	3,46,597	1,186.9	15.5	152
7	Piprali	3,91,387	820.8	10.6	96
8	Srimadhopur	2,62,404	581.7	7.5	68
Total		**22,83,647**	**7,726.9**	**100.0**	**1,001**

Sikar district has 1,001 towns and villages, of which eight are block headquarters as well.

Climate:

The district is largely part of semi-arid region and is typically characterized by hot summer, fairly good rainfall, a chilly winter season. Humidity levels are quite low resulting into general dryness in the air, except in the brief monsoon season when the humidity reaches upto maximum of 60%. The months of March to June are summers when the maximum temperature approaches 47°C to 48°Cwhereas the winter months witness extremely cold nights with temperature dropping to about 1°C. The average temperature around the year is about 16 to 20 °C. The average rainfall in this district is just about 363.7mm, mostly received from the south-west monsoon during the months of July to September.

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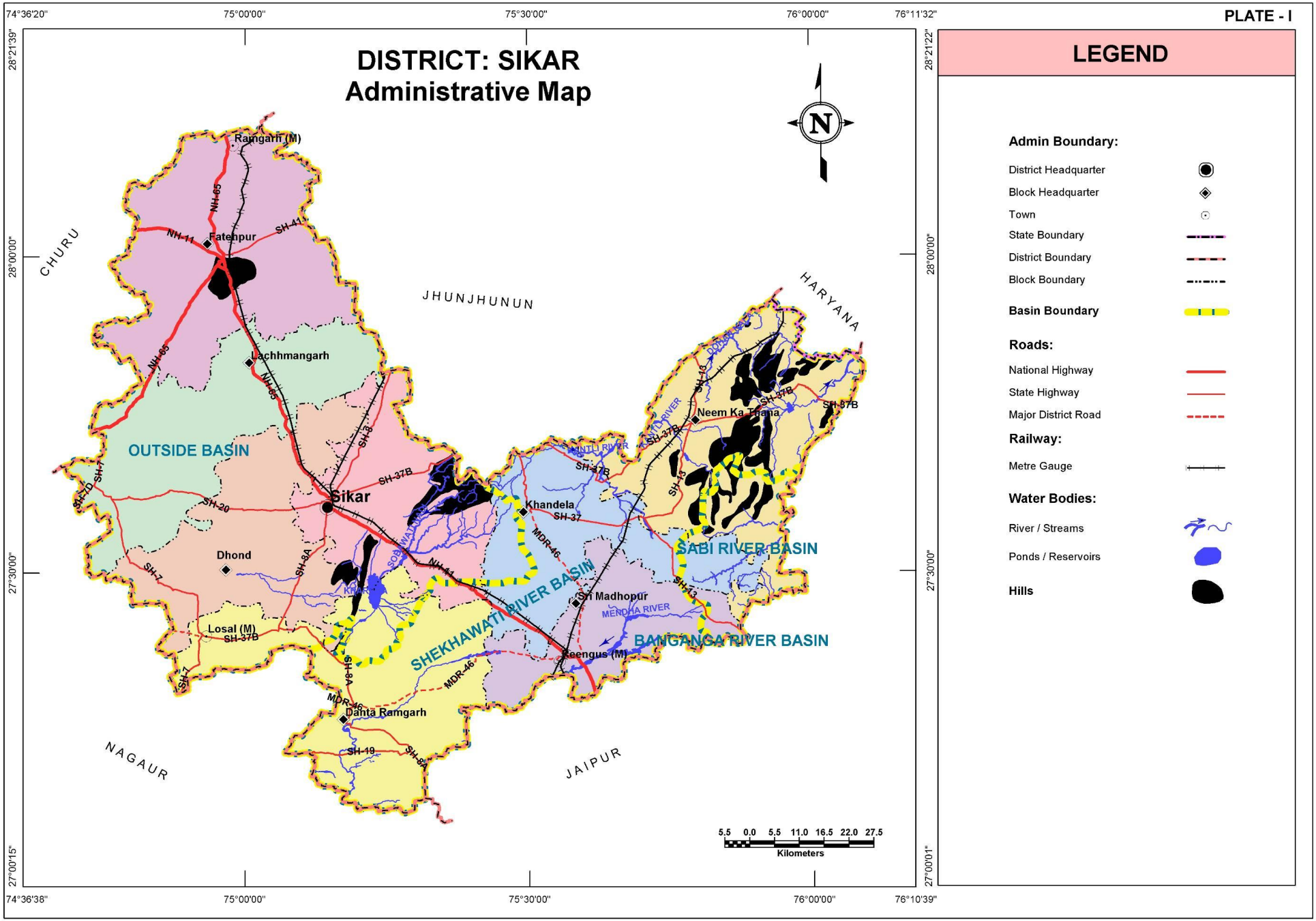
PLATE - I



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:

- National Highway
- State Highway
- Major District Road

Railway:

- Metre Gauge

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**

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TOPOGRAPHY

DISTRICT – SIKAR

The district can be divided into two distinct physiographic units, viz. sandy plains in west and the eastern half, NE-SW trending hill ranges. The major river of the district is Kantli and Mendha. Significant part of the district falls within 'Outside Basin' which does not have a systematic drainage system. The general topographic elevation in the district ranges between 375m to 500m above mean sea level in the district. Elevation ranges from a minimum of 294m amsl in Fatehpur block in the NW part of the district to a maximum of 1,032m amsl in Piprali block in northern part of the district.

Table: Block wise minimum and maximum elevation

S. No.	Block Name	Minimum Elevation (m amsl)	Maximum Elevation (m amsl)
1	Danta Ramgarh	375.1	641.7
2	Dhond	358.9	901.3
3	Fatehpur	294.0	374.3
4	Khandela	419.4	899.1
5	Lachhmangarh	332.7	408.2
6	NeemKa Thana	333.2	825.4
7	Piprali	392.9	1,032.0
8	Srimadhopur	450.0	716.1

RAINFALL

Though the rainfall in the district is generally scanty but appears to have received very good rainfall in the year 2010. The general distribution of rainfall in the year 2010 can be visualized from isohyets presented in the Plate – III where most of the district received rainfall in the range of 600-900mm. Rainfall is highest in the east and gradually reduces towards west reaching lowest in the southernmost and northwestern parts of the district. The annual average rainfall was 797.8 mm based on the data of available blocks. Highest annual rainfall was noticed in Neem ka Thana block (1,225.3mm) whereas lowest was in Danta Ramgarh block (552.7mm).

Table: Block wise annual rainfall statistics (derived from year 2010 meteorological station data)

Block Name	Minimum Annual Rainfall(mm)	Maximum Annual Rainfall(mm)	Average Annual Rainfall (mm)
DantaRamgarh	552.7	789.8	659.2
Dhond	630.7	861.9	750
Fatehpur	654.6	743.2	689.7
Khandela	744.4	1,032.50	880.8
Lachhmangarh	650.9	786.7	715.2
NeemKa Thana	788.8	1,225.30	1,046.80
Piprali	684.4	892.3	805.6
Srimadhopur	698.6	965.3	835

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PLATE - II

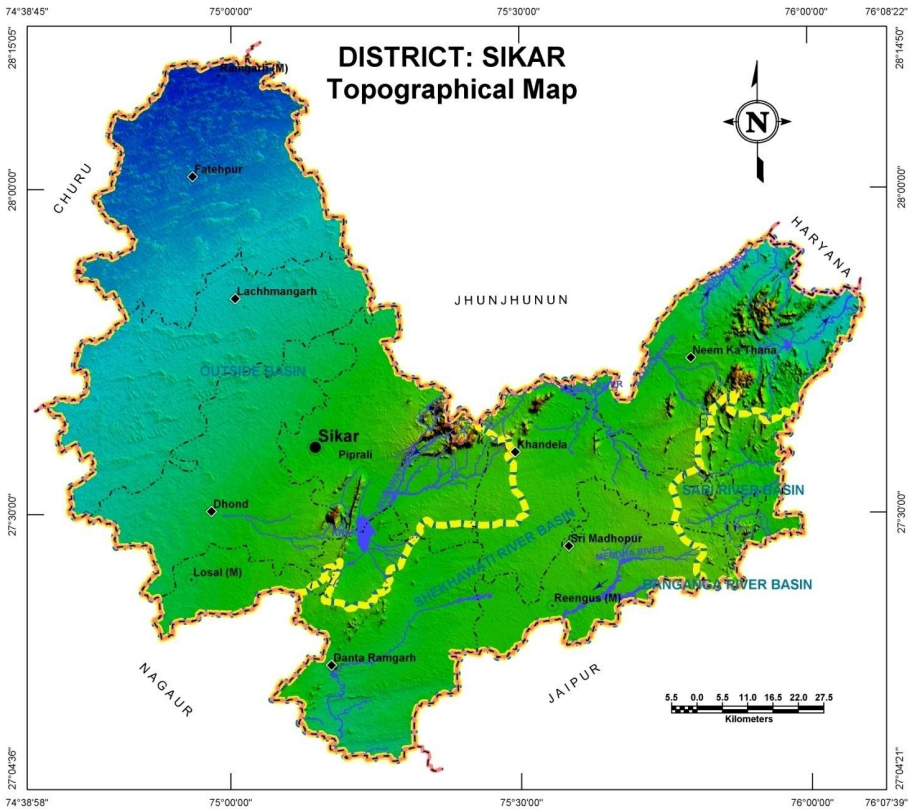
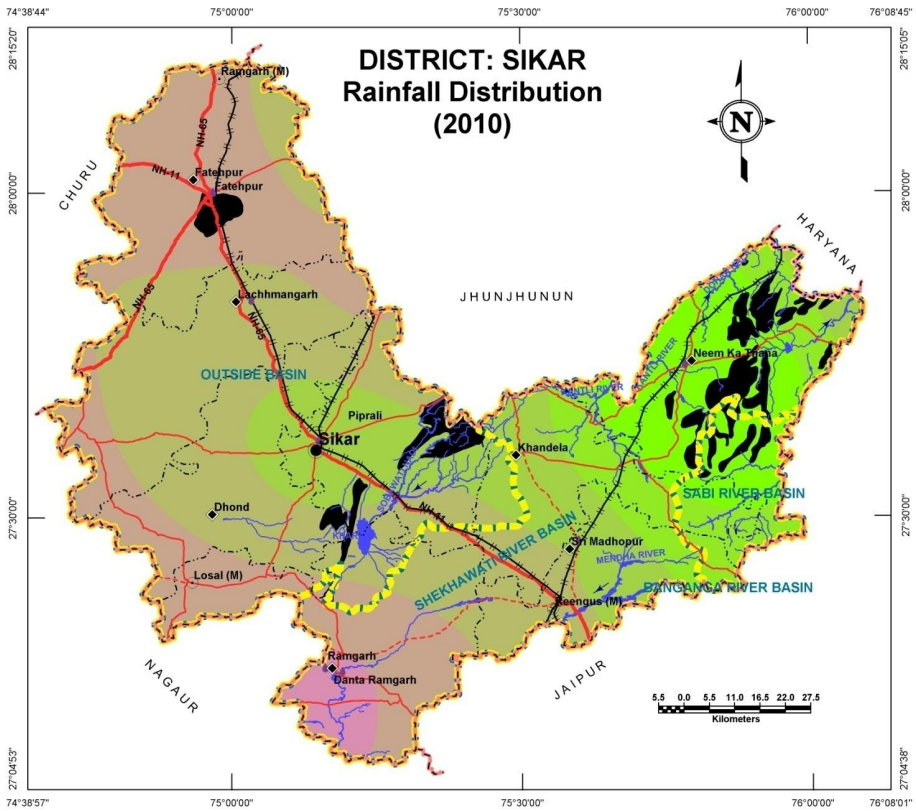


PLATE - III



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Elevation (m amsl):
1,032 / 1,000 / 875 / 750 / 625 / 500 / 375 / 294

Source : SRTM DEM

LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- Raingauge Stations
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Isohyets (mm):
- 500-600
- 600-700
- 700-800
- 800-900
- 900-1000
- > 1000

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GEOLOGY

DISTRICT – SIKAR

The major part of the district is covered with alluvial and eolian sand layers. The eastern part of the district is occupied by hills of the Aravali range. The rock types exposed in the area belong to Delhi Super Group of meta-sediments whose exposures are seen in Neem ka Thana block in eastern part of the district. The Delhi Super Group rocks are divided into Alwar and Ajabgarh Groups and are seen in the eastern part of the district characterized by quartzite, slate; marble, schist and phyllite. Sandmata complex belongs to Bhilwara Super Group which consist migmatitic, gneiss, schist and dolomitic marble. Bhilwara Super Group is exposed in eastern part of the district within the Sri Madhopur, Khandela and Neem ka Thana blocks.

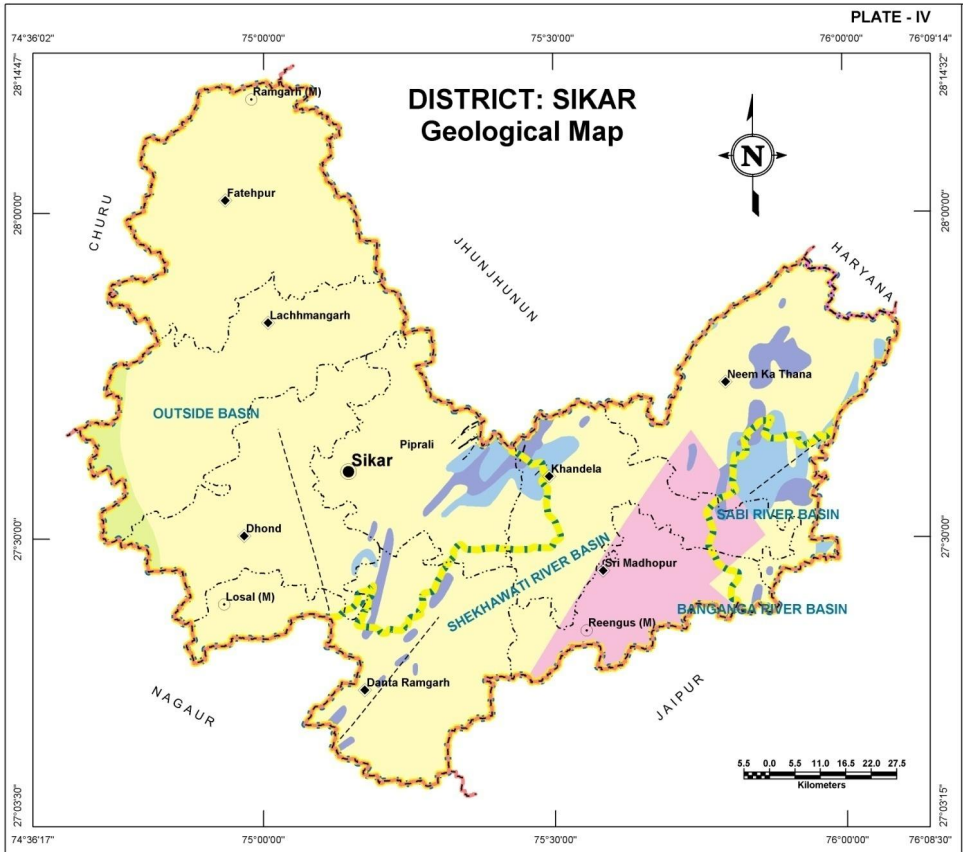
Super Group	Group	Formation
	Recent to Sub-Recent	Sand dunes-Aeolian sand, river flood deposit & valley fill deposit Kankar, clay, Gravel & Sand
Delhi	Ajabgarh	Schist, dolomite, phyllite, marble etc.
	Alwar	Quartzite, conglomerate, schist etc.
Bhilwara	Sandmata Complex	Migmatite, gneiss, schist, dolomitic marble etc.
	Erinpura	Granite & Gneiss

GEOMORPHOLOGY

Table: Geomorphologic units, their description and distribution

Origin	Landform Unit	Description
Aeolian	Eolian Plain	Formed by aeolian activity, with sand dunes of varying height, size, slope. Long stretches of sand sheet. Gently sloping flat to undulating plain, comprised of fine to medium grained sand and silt. Also scattered xerophytic vegetation.
	Interdunal Depression	Slightly depressed area in between the dunal complex showing moisture and fine sediments.
	Obstacle Dune	Formed on windward/leeward sides of obstacle like isolated hills or continuous chain of hills, dune to obstruction in path of sand laden winds. Badly dissected well cemented and vegetated.
	Sandy Plain	Formed of aeolian activity, wind-blown sand with gentle sloping to undulating plain, comprising of coarse sand, fine sand, silt and clay.
Denudational	Buried Pediment	Pediment covers essentially with relatively thicker alluvial, colluvial or weathered materials.
	Intermontane Valley	Depression between mountains, generally broad & linear, filled with colluvial deposits.
	Pediment	Broad gently sloping rock flooring, erosional surface of low relief between hill and plain, comprised of varied lithology, criss-crossed by fractures and faults.
Fluvial	Alluvial Plain	Mainly undulating landscape formed due to fluvial activity, comprising of gravels, sand, silt and clay. Terrain mainly undulating, produced by extensive deposition of alluvium.
	Alluvial Plain (Sandy)	Flat to gentle undulating plain formed due to fluvial activity, mainly consists of gravels, sand, silt and clay with unconsolidated material of varying lithology, predominantly sand along river.
	Paleochannel	Mainly buried on abandoned stream/river courses, comprising of coarse textured material of variable sizes.
	Valley Fill	Formed by fluvial activity, usually at lower topographic locations, comprising of boulders, cobbles, pebbles, gravels, sand, silt and clay. The unit has consolidated sediment deposits.
	Ravine	Small, narrow, deep, depression, smaller than gorges, larger than gulley, usually carved by running water.
	Salt Encrustation/Playa	Topographical depression comprising of clay, silt, sand and soluble salts, usually undrained and devoid of vegetation.
Hills	Denudational, Structural Hill, Linear Ridge	Steep sided, relict hills undergone denudation, comprising of varying lithology with joints, fractures and lineaments. Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc. Long narrow low-lying ridge usually barren, having high run off may form over varying lithology with controlled strike.

PLATE - IV



LEGEND

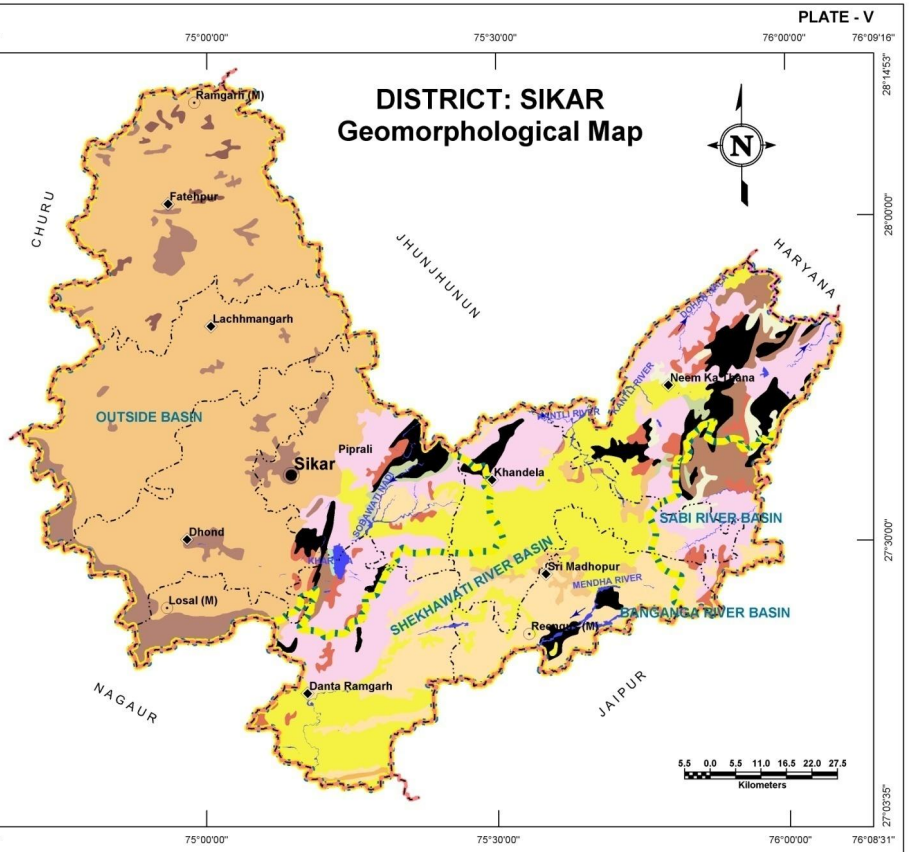
Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Structural Features:
- Fault
- Lineament
- Shear

Geology:
- Alluvium and Wind blown sand
- Ajabgarh Group
- Alwar Group
- Sand Mata Complex
- Erinpura Granite & Gneiss

Source: District Resource Map of Rajasthan - GSI

PLATE - V



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:
- River/Ponds/Reservoirs

Structural Features:
- Fault/Fractures/Lineament

Hills:
- Structural/Denudational/Linear Ridge

Landform Units:

Fluvial Origin:
- Alluvial Plain
- Alluvial Plain (Sandy)
- Valley Fill
- Ravine
- Palaeochannel
- Salt Encrustation/Playa

Denudational Origin:
- Pediment
- Burried Pediment
- Intermontane Valley

Aeolian Origin:
- Sandy Plain
- Eolian Plain
- Obstacle Dune
- Interdunal Depression

Source: Ground Water Atlas of Rajasthan - SRSAC & GWD, Rajasthan

AQUIFERS

DISTRICT – SIKAR

The district is predominantly sandy in nature both in lateral and vertical extents. The thick alluvial cover rests over bedrock and aquifers are formed both in alluvium and in hardrocks. Quartzites aquifers occupy about 17% of the district area and occur as patches in eastern and central parts of the district adjacent to hills. Joints and fractured openings contribute to aquifer formation in quartzite formations. While Younger alluvium constitutes only 2% of aquifer area, the Older alluvium is the most widespread aquifer in the district with about 76% of area distributed in the whole of western half of the district as also large parts in between quartzite aquifers in the eastern part.

Table: aquifer potential zones their area and their description

Aquifer in Potential Zone	Area (sq km)	% age of district	Description of the unit/Occurrence
Younger Alluvium	165.6	2.1	It is largely constituted of Aeolian and Fluvial sand, silt, clay, gravel and pebbles in varying proportions.
Older Alluvium	5,879.4	76.1	This litho unit comprises of mixture of heterogeneous fine to medium grained sand, silt and kankar.
Quartzite	1,328.6	17.2	Medium to coarse grained and varies from feldspathic grit to sericitic quartzite.
Hills	353.3	4.6	
Total	**7,726.9**	**100.0**	

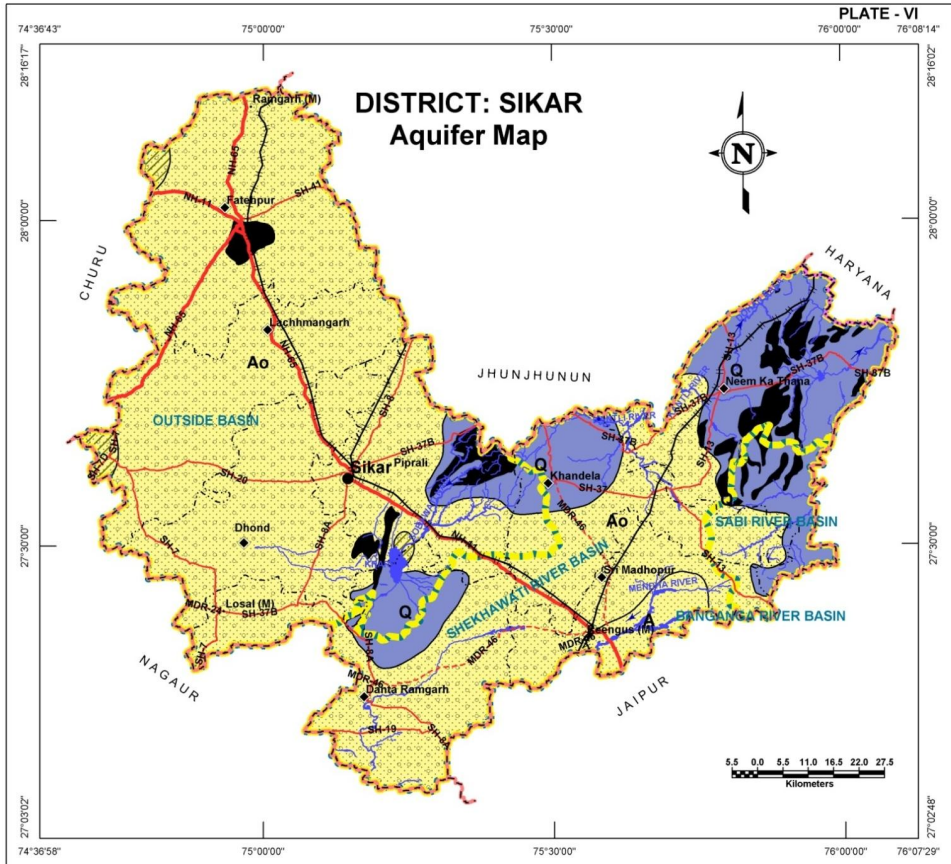
STAGE OF GROUND WATER DEVELOPMENT

Ground water resources are under stress in the district as indicated by resource assessment studies and further categorization of blocks on the basis of stage of development. Except for Fatehpur block which is in Semi-Critical category (resource development between 70-90%), six other blocks constituting significant part of the district fall within 'Over Exploited' category implying that more than 100% development has already taken place and the dynamic ground water resources in the aquifers of these blocks are exhausted. More grim is the scenario in Srimadhopur and Dhond which have been notified against any further development.

Categorization on the basis of stage of development of ground water	Block Name
Semi-Critical	Fatehpur
Over Exploited	Lachhmangarh, Piprali, Khandela, Neem Ka Thana, Danta Ramgarh
Notified	Srimadhopur, Dhond

Basis for categorization: Ground water development <= 70 – 90% Semi critical and >100% - Over-Exploited. In Notified blocks development of GW is not permitted any more.

PLATE - VI



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Roads:
- National Highway
- State Highway
- Major District Road

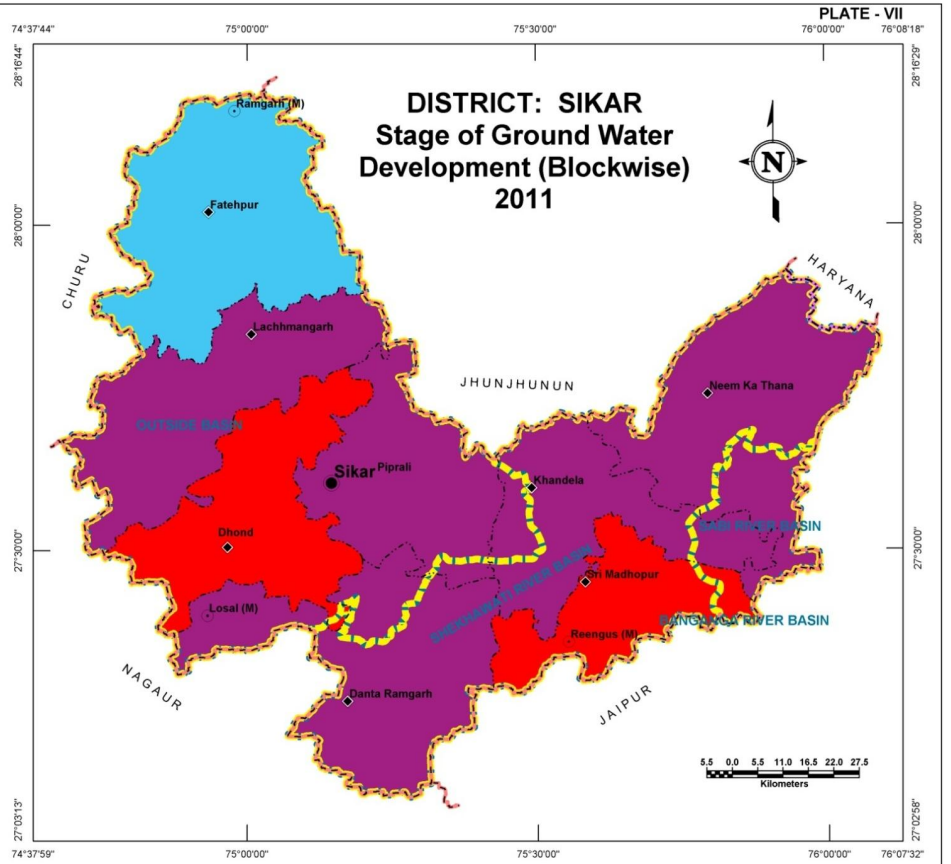
Railway:
- Metre Gauge

Water Bodies:
- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Saline Area**

Aquifer:
- Younger Alluvium
- Older Alluvium
- Quartzite

Source: Ground Water Potential Zone Map - GWD, Rajasthan

PLATE - VII



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Stage of Ground Water Development:
- Semi-Critical
- Over-Exploited
- Notified

Source: Ground Water Department, Rajasthan

LOCATION OF EXPLORATORY AND GROUND WATER MONITORING WELLS DISTRICT – SIKAR

Sikar district has a large number of well distributed exploratory wells (438) network and ground water monitoring stations (241) in the district owned by RGWD (379 and 203 respectively) and CGWB (59 and 38 respectively). The exploratory wells have formed the basis for delineation of subsurface aquifer distribution scenario in three dimensions. Benchmarking and optimization studies suggest that ground water level monitoring network is sufficiently distributed for appropriate monitoring but for water quality, 223 wells are recommended to be added to existing network for optimum monitoring of the aquifers.

Table: Block wise count of wells (existing and recommended)

Block Name	Exploratory Wells			Ground Water Monitoring Stations			Recommended additional wells for optimization of monitoring network	
	CGWB	RGWD	Total	CGWB	RGWD	Total	Water Level	Water Quality
DantaRamgarh	9	52	**61**	7	37	**44**	0	38
Dhond	7	37	**44**	5	18	**23**	0	37
Fatehpur	10	42	**52**	7	11	**18**	0	32
Khandela	4	28	**32**	2	20	**22**	0	23
Lachhmangarh	13	53	**66**	5	17	**22**	0	37
NeemKa Thana	-	15	**15**	5	38	**43**	0	14
Piprali	10	128	**138**	6	41	**47**	0	26
Srimadhopur	6	24	**30**	1	21	**22**	0	16
Total	**59**	**379**	**438**	**38**	**203**	**241**	**0**	**223**

DEPTH TO WATER LEVEL (PRE MONSOON – 2010)

Depth to ground water levels in Sikar district are shown in Plate – IX. Depth to water level varies from less than 10m below ground level to more than 70mbgl. In western part of the district i.e., Dhond and Piprali region and in southern part of Danta Ramgarh deeper water levels in the range of 30m - 60m are generally encounteredthat occasionally reaches to >70m bgl. Northwestwards, the water level is moderately deep around (30-50m bgl) as can be seen in Fatehpur block. In northeastern part i.e., in Neem Ka Thana–Khandela–Sri Madhopur region, the water level is quite shallow occurring 10m-20m bgl occasionally even less than 10m bgl in Khandela block.

Depth to water level (mbgl)	Block wise area coverage (sq km) *								Total Area (sq km)
	DantaRamgarh	Dhond	Fatehpur	Khandela	Lachhmangarh	NeemKa Thana	Piprali	Srimadhopur	
< 10	-	-	-	0.1	-	-	-	-	**0.1**
10-20	96.0	-	-	18.8	-	211.2	24.5	4.5	**355.0**
20-30	318.0	3.0	-	201.3	0.4	577.8	25.4	83.1	**1,209.0**
30-40	280.5	15.7	622.0	346.3	151.3	173.0	88.0	122.6	**1,799.4**
40-50	109.3	56.0	564.8	195.6	399.4	17.1	191.5	246.5	**1,780.2**
50-60	151.3	332.8	18.3	34.5	366.9	-	280.9	125.0	**1,309.7**
60-70	182.7	461.5	-	-	109.9	-	121.5	-	**875.6**
> 70	3.1	36.3	-	-	-	-	5.0	-	**44.4**
Total	**1,140.9**	**905.3**	**1,205.1**	**796.6**	**1,027.9**	**979.1**	**736.8**	**581.7**	**7,373.4**

* The area covered in the derived maps is less than the total district area since the hills have been excluded from interpolation/contouring.

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Rajasthan

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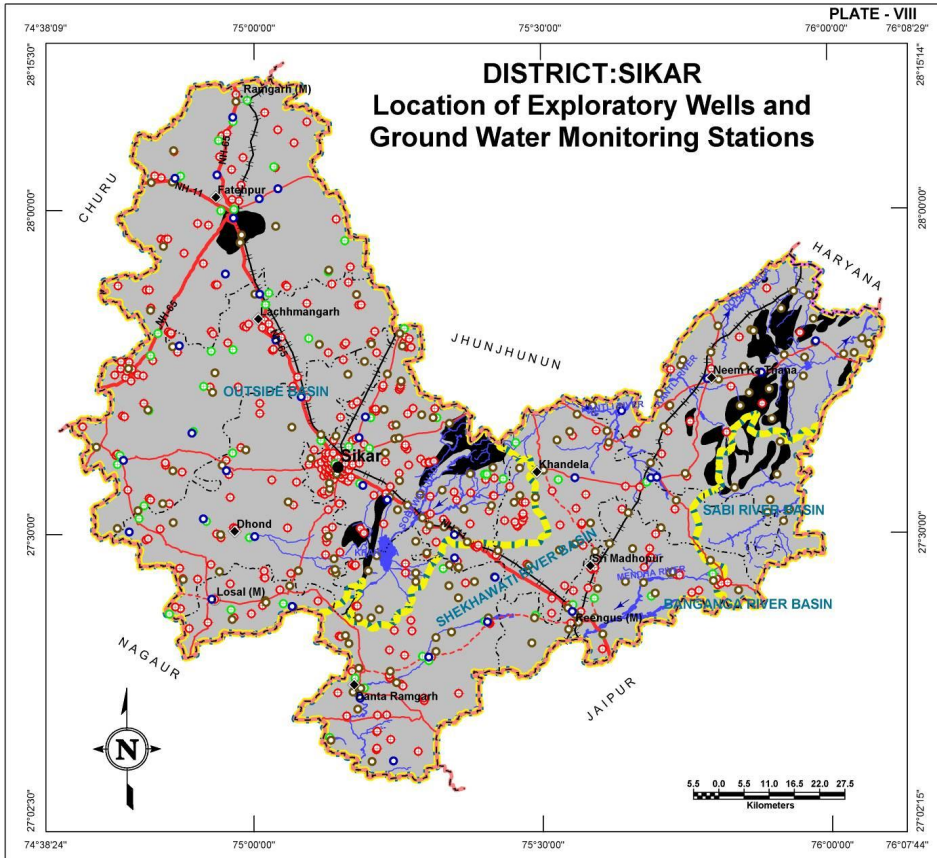
PLATE - VIII



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Roads:
- National Highway
- State Highway
- Major District Road

Railway:
- Metre Gauge

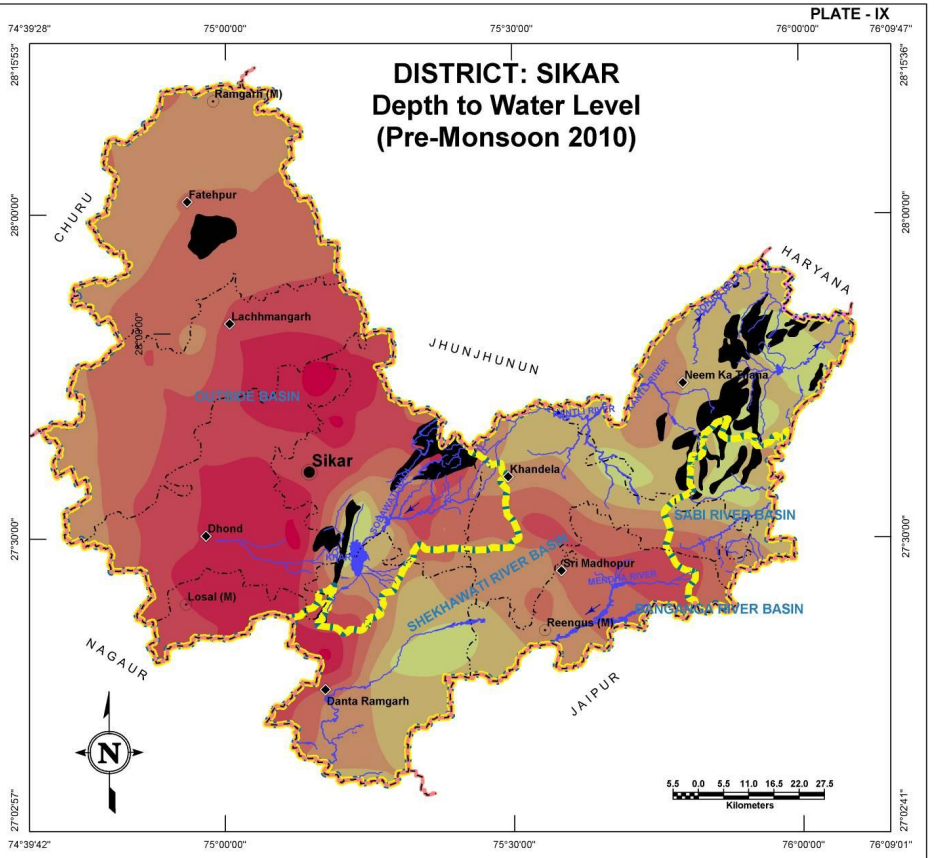
Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Exploratory Wells:
- CGWB
- RGWD

Ground Water Monitoring Stations:
- CGWB
- RGWD

PLATE - IX



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Depth to Water Level (m bgl):
- < 10
- 10 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- > 70

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WATER TABLE ELEVATION (PRE MONSOON – 2010) DISTRICT – SIKAR

The regional ground water flow direction as seen in Plate – X is from east to west and then northwestwards. The area within Outside basin shows southeast to northwestwards flow of ground water whereas the area within the Shekhawati basin has ground water level high in the eastern part of the district and then the flow is diverted in both northeast and southwestwards. The Sabi basin part shows an easterly ground water flow. Water table elevation is highest in Khandela, Neem ka thana and Sri Madhopur blocks of the district (>480m amsl) whereas lowest elevation (<280m amsl) is seen in Fatehpur block.

Table: Block wise area covered in each water table elevation range

Block Name	Block wise area coverage (sq km) within water table elevation range (m amsl)										Total Area (sq km)
	< 280	280 - 300	300 - 320	320 - 340	340 - 360	360 - 380	380 - 400	400 - 440	440 - 480	> 480	
DantaRamgarh	-	-	-	-	38.0	260.6	256.4	585.3	0.6	-	**1,140.9**
Dhond	-	-	-	148.5	262.2	265.6	96.7	132.3	-	-	**905.3**
Fatehpur	539.0	562.0	104.1	-	-	-	-	-	-	-	**1,205.1**
Khandela	-	-	-	-	-	-	-	292.4	504.2	-	**796.6**
Lachhmangarh	-	53.0	597.7	298.4	78.8	-	-	-	-	-	**1,027.9**
NeemKa Thana	-	-	-	16.6	65.4	75.5	189.8	340.7	289.6	1.5	**979.1**
Piprali	-	-	-	20.2	36.7	50.4	139.1	485.7	4.7	-	**736.8**
Srimadhopur	-	-	-	-	-	-	0.9	257.6	323.2	-	**581.7**
Total	**539.0**	**615.0**	**701.8**	**483.7**	**481.1**	**652.1**	**682.9**	**2,094.0**	**1,122.3**	**1.5**	**7,373.4**

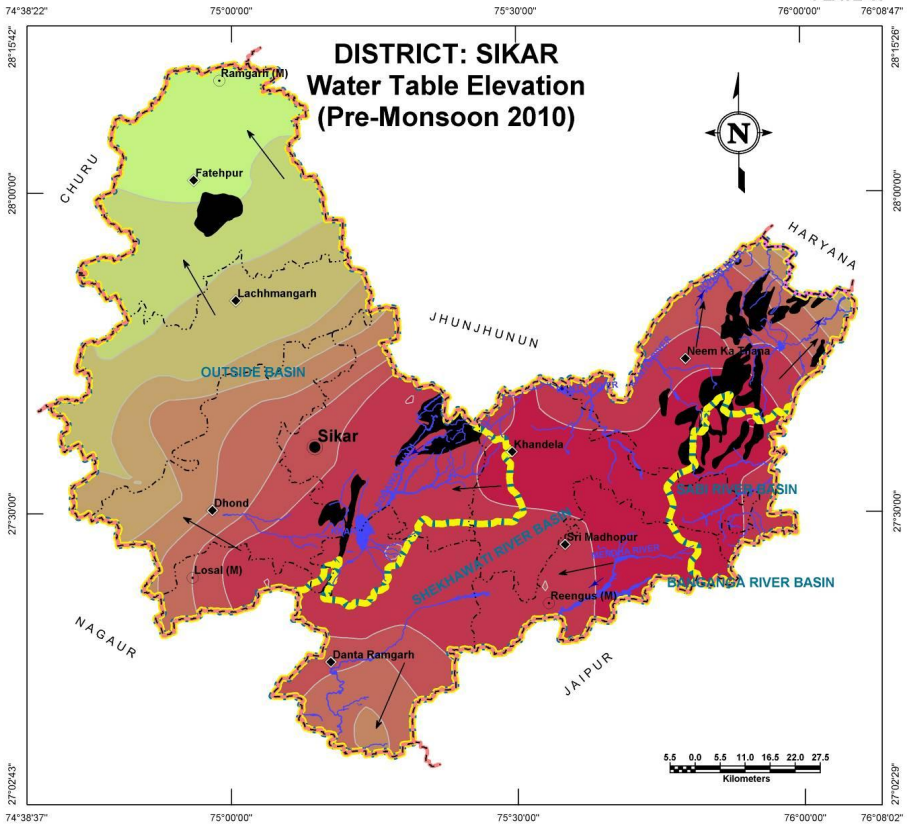
WATER LEVEL FLUCTUATION (PRE TO POST MONSOON 2010)

In this district, the ground water level fluctuation is very high as it is seen to vary between -6 m to +18m (Plate – XI). Apart from some localized high negative fluctuation areas, nearly half of the district shows general decline of ground levels by about 2m in post monsoon season with respect to pre monsoon levels. Rest of the district, largely in the eastern part has shown a general rise of upto 4m and occasionally by significantly high levels of 18m ass noticed in northeastern part of Neem Ka Thana block adjacent to hills.

Table: Block wise area covered in each water fluctuation zone

Block Name	Block wise area coverage (sq km) within water level fluctuation range (m)														Total Area (sq km)
	< -6	-6 to -4	-4 to -2	-2 to 0	0 to 2	2 to 4	4 to 6	6 to 8	8 to 10	10 to 12	12 to 14	14 to 16	16 to 18	> 18	
DantaRamgarh	-	-	-	569.2	560.0	11.7	-	-	-	-	-	-	-	-	**1,140.9**
Dhond	-	-	1.5	856.8	47.0	-	-	-	-	-	-	-	-	-	**905.3**
Fatehpur	3.9	11.2	22.4	454.4	713.2	-	-	-	-	-	-	-	-	-	**1,205.1**
Khandela	-	-	-	144.3	219.8	105.0	97.4	78.8	56.0	45.3	45.7	4.3	-	-	**796.6**
Lachhmangarh	-	5.5	34.8	692.5	295.1	-	-	-	-	-	-	-	-	-	**1,027.9**
NeemKa Thana	-	-	-	-	266.7	167.6	95.2	127.1	111.4	105.5	72.5	21.1	10.3	1.7	**979.1**
Piprali	-	0.5	27.7	416.0	265.1	23.9	3.6	-	-	-	-	-	-	-	**736.8**
Srimadhopur	-	-	-	481.0	97.3	3.4	-	-	-	-	-	-	-	-	**581.7**
Total	**3.9**	**17.2**	**86.4**	**3,614.2**	**2,464.2**	**311.6**	**196.2**	**205.9**	**167.4**	**150.8**	**118.2**	**25.4**	**10.3**	**1.7**	**7,373.4**

PLATE -X



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

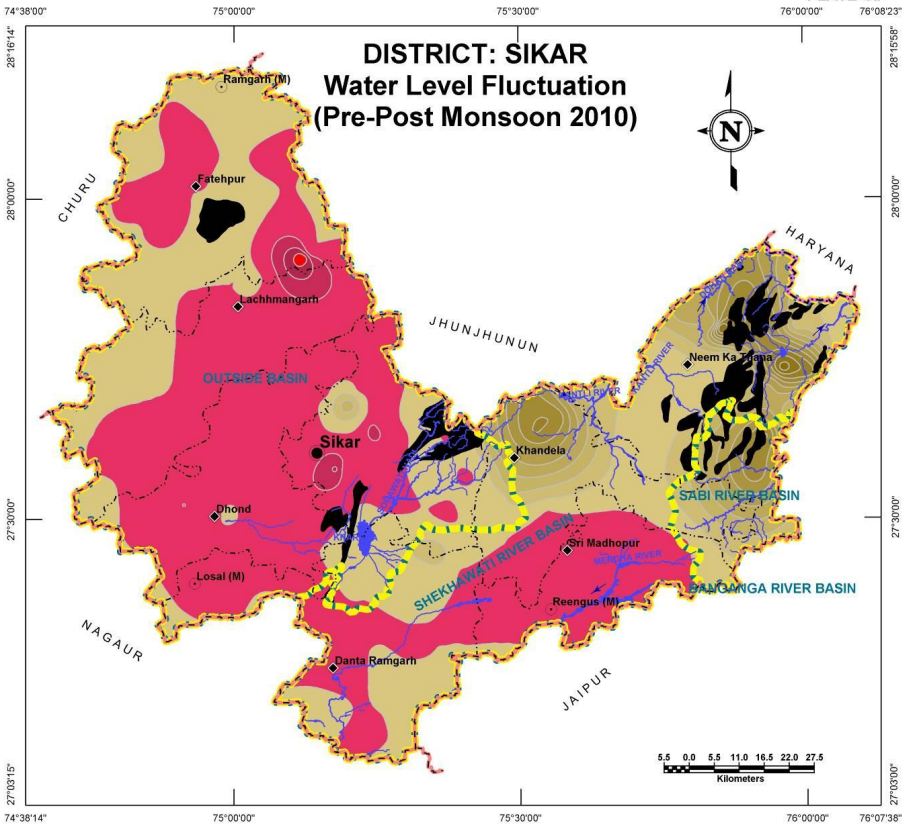
Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**
- **Water Table Elevation**

Water Table Elevation (m amsl):

- < 280
- 280 - 300
- 300 - 320
- 320 - 340
- 340 - 360
- 360 - 380
- 380 - 400
- 400 - 440
- 440 - 480
- >480

PLATE -XI



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**

Water Bodies:

- River / Streams
- Ponds / Reservoirs
- **Hills**

Water Level Fluctuation (m):

- < -6
- -6 to -4
- -4 to -2
- -2 to 0
- 0 to 2
- 2 to 4
- 4 to 6
- 6 to 8
- 8 to 10
- 10 to 12
- 12 to 14
- 14 to 16
- 16 to 18
- > 18

GROUND WATER ELECTRICAL CONDUCTIVITY DISTRIBUTION

DISTRICT – SIKAR

Plate – XII depicts the Electrical conductivity (at 25°C) distribution map. The ground water quality in the district is by and large good as the areas with low EC values in ground water (<2000 µS/cm, yellow color) and occupies almost 71% of the district. The areas with moderately high EC values (2000 -4000 µS/cm) are shown in green color and occupy approximately 26% of the district area, largely in the northwestern part of the district. Remaining small part of the district approximately 3% has high EC values in ground water (>4000 µS/cm) which is shown in red color, largely western fringe of the district in Fatehpur and Lachhmangarh blocks where the ground water is unsuitable for domestic purpose.

Table: Block wise area of Electrical conductivity distribution

Electrical Conductivity Ranges (µS/cm at 25°C) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	DantaRamgarh		Dhond		Fatehpur		Khandela		Lachhmangarh		NeemKa Thana		Piprali		Srimadhopur		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 2000	815.7	71.5	844.0	93.2	176.7	14.7	696.8	87.5	489.7	47.6	901.6	92.1	724.1	98.3	581.7	100.0	**5,230.3**
2000-4000	285.8	25.0	58.6	6.5	889.9	73.8	98.9	12.4	497.0	48.4	77.5	7.9	12.7	1.7	-	-	**1,920.4**
>4000	39.4	3.5	2.7	0.3	138.5	11.5	0.9	0.1	41.2	4.0	-	-	-	-	-	-	**222.7**
Total	**1,140.9**	**100.0**	**905.3**	**100.0**	**1,205.1**	**100.0**	**796.6**	**100.0**	**1,027.9**	**100.0**	**979.1**	**100.0**	**736.8**	**100.0**	**581.7**	**100.0**	**7,373.4**

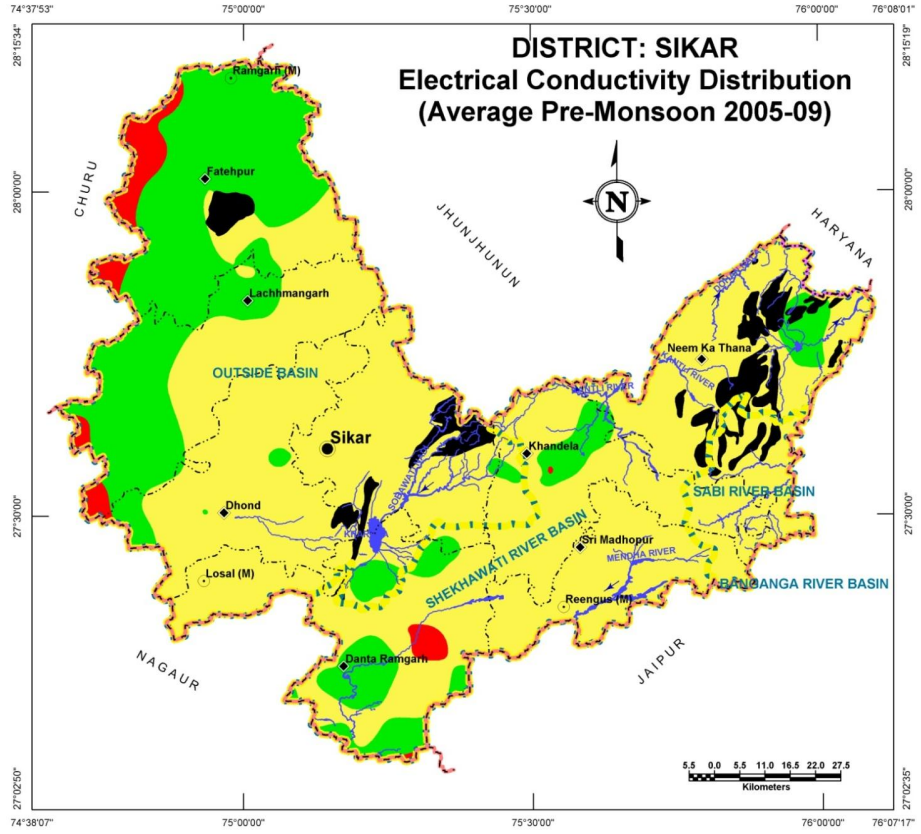
GROUND WATER CHLORIDE DISTRIBUTION

The yellow colored regions in Plate – XIII are the areas where chloride concentration is low (<250 mg/l) which occupy approximately 62% of the district area. The ground water in this region is suitable for domestic purposes. The areas with moderately high chloride concentration (250-1000mg/l) are shown in green color and occupy approximately 37% of the district area, largely in the central part around Danta Ramgarh and in the northwestern part of the district in Fatehpur and Lachhmangarh blocks. The high chloride concentration areas are very small in spatial extent and occupy just 1% of the district area in Fatehpur block in the northwestern part of the district.

Table: Block wise area of Chloride distribution

Chloride Concentration Range (mg/l) (Ave. of years 2005-09)	Block wise area coverage																Total Area (sqkm)
	DantaRamgarh		Dhond		Fatehpur		Khandela		Lachhmangarh		NeemKa Thana		Piprali		Srimadhopur		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 250	516.0	45.0	777.8	86.0	263.3	22.0	580.4	73.0	434.4	42.0	731.9	75.0	691.9	94.0	581.4	100.0	**4,577.1**
250-1000	619.0	54.0	127.5	14.0	885.6	73.0	215.8	27.0	593.5	58.0	247.2	25.0	44.9	6.0	0.3	-	**2,733.8**
> 1000	5.9	1.0	-	-	56.2	5.0	0.4	-	-	-	-	-	-	-	-	-	**62.5**
Total	**1,140.9**	**100.0**	**905.3**	**100.0**	**1,205.1**	**100.0**	**796.6**	**100.0**	**1,027.9**	**100.0**	**979.1**	**100.0**	**736.8**	**100.0**	**581.7**	**100.0**	**7,373.4**

PLATE - XII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

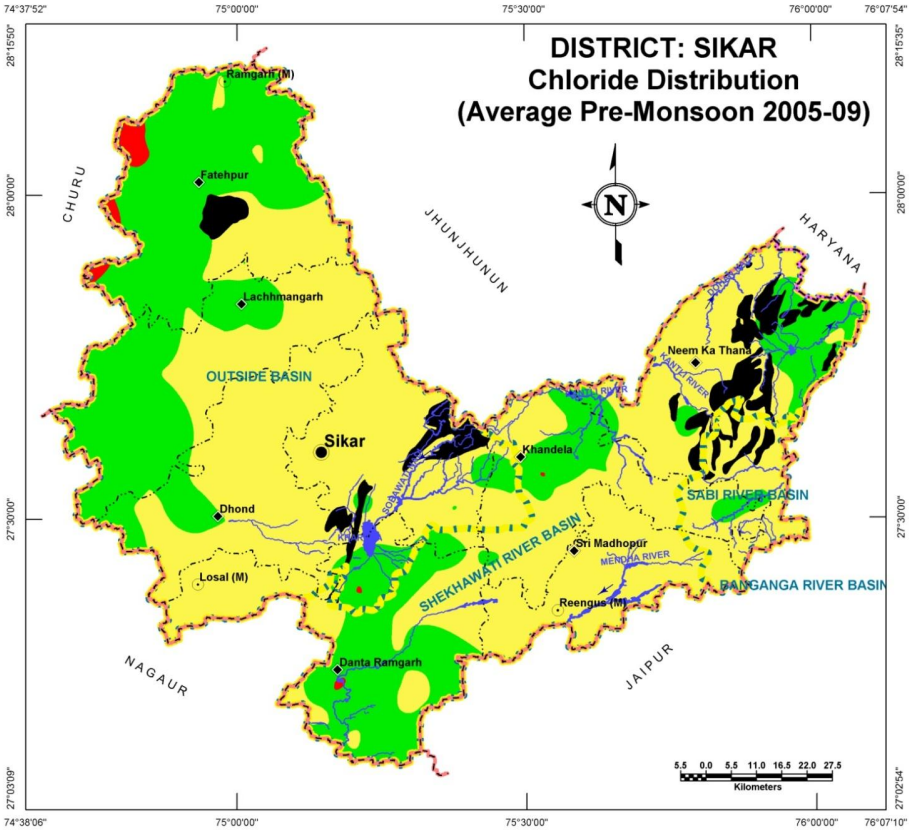
- River / Streams
- Ponds / Reservoirs

Hills

Electrical Conductivity (µS/cm at 25°C):

- < 2000
- 2000-4000
- >4000

PLATE - XIII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:

- River / Streams
- Ponds / Reservoirs

Hills

Chloride Concentration (mg/l):

- < 250
- 250 - 1000
- > 1000

GROUND WATER FLUORIDE DISTRIBUTION

DISTRICT – SIKAR

The Fluoride concentration map is presented in Plate – XIV.The areas with low concentration (i.e.,>1.5 mg/l) are shown in yellow color and occupies almost 63% of the district area in central and eastern part of the district where the ground water is suitable for domestic purpose. The areas with moderately high concentration (1.5-3.0 mg/l) are shown in green color and occupy approximately 31%of the district area. These are seen as NE-SW trending belts in the western and central parts of the district. Remaining part of the district approximately 6% has high Fluoride concentration (>3.0 mg/l), which is shown in red color, largely northern part of Fatehpur, The ground water in this region is not suitable for domestic purpose.

Table: Block wise area of Fluoride distribution

Fluoride concentration range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	DantaRamgarh		Dhond		Fatehpur		Khandela		Lachhmangarh		NeemKa Thana		Piprali		Srimadhopur		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 1.5	892.7	78.2	714.5	78.9	237.8	19.7	394.2	49.5	476.0	46.3	847.4	86.6	733.6	99.5	348.7	59.9	**4,644.9**
1.5-3.0	163.0	14.3	183.6	20.3	699.5	58.1	378.2	47.5	499.5	48.6	128.5	13.1	2.6	0.4	233.0	40.1	**2,287.9**
> 3.0	85.2	7.5	7.2	0.8	267.8	22.2	24.2	3.0	52.4	5.1	3.2	0.3	0.6	0.1	-	-	**440.6**
Total	**1,140.9**	**100.0**	**905.3**	**100.0**	**1,205.1**	**100.0**	**796.6**	**100.0**	**1,027.9**	**100.0**	**979.1**	**100.0**	**736.8**	**100.0**	**581.7**	**100.0**	**7,373.4**

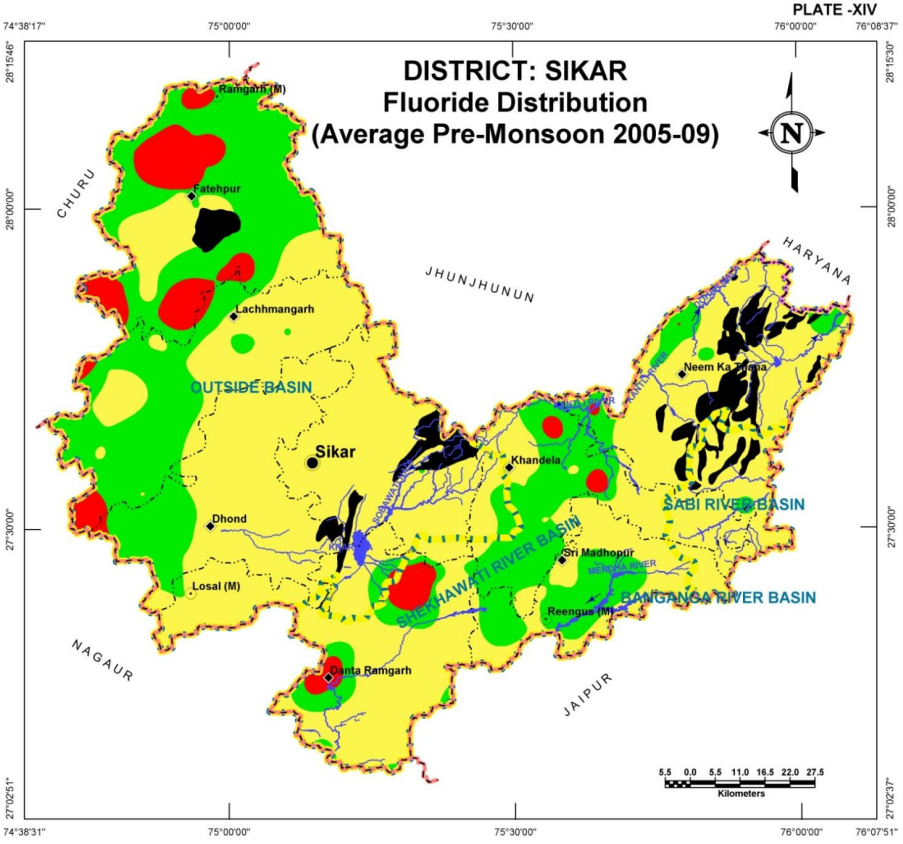
GROUND WATER NITRATE DISTRIBUTION

High nitrate concentration in ground water renders it unsuitable for agriculture purposes. Plate – XV shows distribution of Nitrate in ground water of Sikar district. Low nitrate concentration (<50 mg/l) is shown in yellow color occupies approximately 37% of the district area, which is suitable for agriculture purpose. The areas with moderately high nitrate concentration (50-100 mg/l) are shown in green color and occupy approximately 39% of the district area. Remaining part of the district is covered with high nitrate concentration (>100 mg/l) which is shown in red colored patches which are prominent in western part of the district and also seen in the central and eastern part. The ground water in this 24% part of the district is unsuitable for agriculture purpose.

Table: Block wise area of Nitrate distribution

Nitrate concentration Range(mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)																Total Area (sq km)
	DantaRamgarh		Dhond		Fatehpur		Khandela		Lachhmangarh		NeemKa Thana		Piprali		Srimadhopur		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 50	558.4	48.9	377.5	41.7	166.9	13.8	355.5	44.6	160.0	15.6	315.4	32.2	319.1	43.3	439.5	75.6	**2,692.3**
50-100	478.5	41.9	326.6	36.1	406.1	33.7	320.5	40.2	360.0	35.0	464.8	47.5	351.1	47.7	134.3	23.0	**2,841.9**
>100	104.0	9.2	201.2	22.2	632.1	52.5	120.6	15.2	507.9	49.4	198.9	20.3	66.6	9.0	7.9	1.4	**1,839.2**
Total	**1,140.9**	**100**	**905.3**	**100**	**1,205.1**	**100**	**796.6**	**100**	**1,027.9**	**100**	**979.1**	**100**	**736.8**	**100**	**581.7**	**100**	**7,373.4**

PLATE -XIV



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

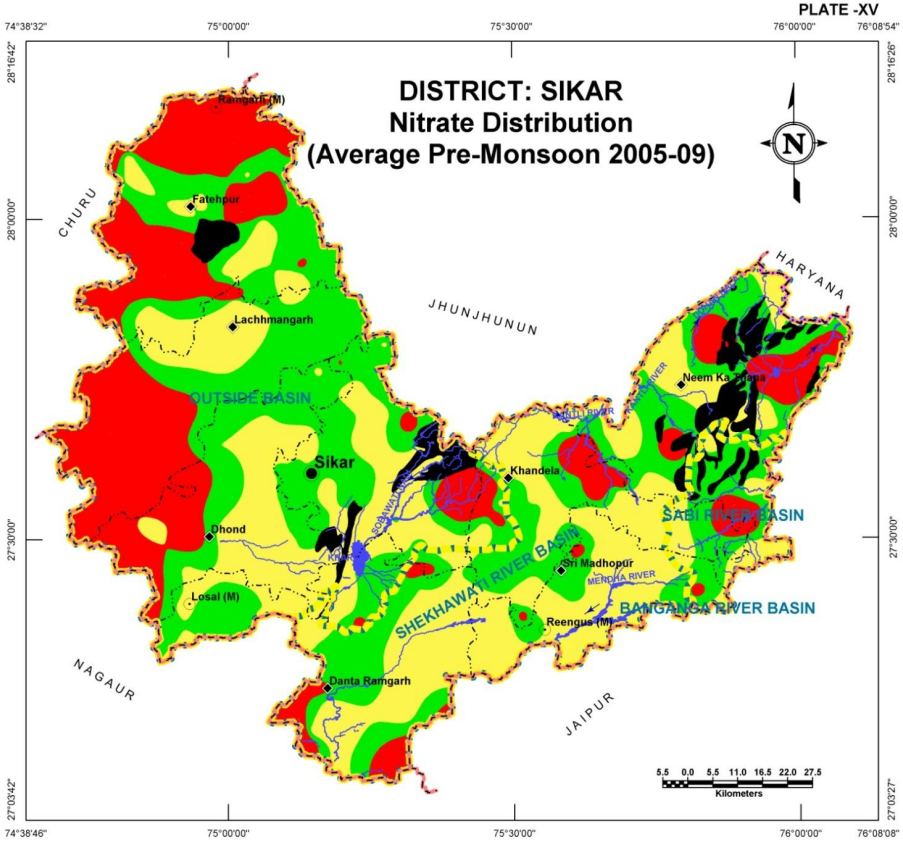
Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Fluoride Concentration (mg/l):
- < 1.5
- 1.5-3.0
- >3.0

PLATE -XV



LEGEND

Admin Boundary:
- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary

Basin Boundary

Water Bodies:
- River / Streams
- Ponds / Reservoirs

Hills

Nitrate Concentration (mg/l):
- < 50
- 50-100
- >100

DEPTH TO BEDROCK

DISTRICT – SIKAR

Depth to bedrock map of Sikar district (Plate – XVI) reveals wide variation of more than 100m in occurrence of bedrock in different areas of the district. Deeper bedrock of more than 100m isseen in the western, southern and northern part of the district. Areas around Danta Ramgarh, Dhond, Fatehpur, Khandela, Lachhmangarh and Piprali indicate the occurrence of bedrock at very deep levels i.e., in between 100 to 120m bgl and even in some patches seen with more than 120m depth bgl. In the central part of Fatehpur, Piprali and Danta Ramgarh, southern fringe of Dhond and Khandela and a small patch in Srimadhopur, moderately deep bedrock depths are encountered in between 80m bgl to 100m bgl. Shallow bedrock depths (less than 40m bgl) are mostly found in northeastern part of the district in Khandela and Neem Ka Thana blocks.

Depth to bedrock (mbgl)	Block wise area coverage (sq km)																Total Area (sq km)
	DantaRamgarh		Dhond		Fatehpur		Khandela		Lachhmangarh		NeemKa Thana		Piprali		Srimadhopur		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
< 40	-	-	-	-	-	-	70.5	8.8	-	-	549.7	56.0	-	-	-	-	**620.2**
40-60	325.0	28.5	-	-	-	-	273.6	34.4	0.1	-	378.0	39.0	73.3	10.0	173.9	30.0	**1,223.9**
60-80	504.4	44.2	23.1	3.0	-	-	307.8	38.6	193.5	19.0	48.8	5.0	186.9	25.0	393.7	68.0	**1,658.2**
80-100	260.7	22.8	265.6	29.0	443.9	36.8	94.0	11.8	550.0	54.0	2.6	-	114.9	16.0	14.1	2.0	**1,745.8**
100-120	39.6	3.5	576.5	64.0	724.9	60.2	32.3	4.1	260.5	25.0	-	-	251.8	34.0	-	-	**1,885.6**
> 120	11.2	1.0	40.1	4.0	36.3	3.0	18.4	2.3	23.8	2.0	-	-	109.9	15.0	-	-	**239.7**
Total	**1,140.9**	**100.0**	**905.3**	**100.0**	**1,205.1**	**100.0**	**796.6**	**100.0**	**1,027.9**	**100.0**	**979.1**	**100.0**	**736.8**	**100.0**	**581.7**	**100.0**	**7,373.4**

UNCONFINED AQUIFER

Alluvial areas

Most part of the district has thick cover of alluvium both Younger and Older. In unconfined conditions the alluvial aquifer attains a thickness of more than 70m. Perusal of Plate – XVII reveals an in general, moderate thickness of upto 40m bgl in the area with pockets of more thick (>70m) unconfined alluvial aquifer material in the DantaRamgarh, Dhond and Piprali region. Rest of the blocks have moderate to low thickness of aquifers in alluvial zone. The general thickness of alluvium in the district ranges in between less than 10m to 40m.

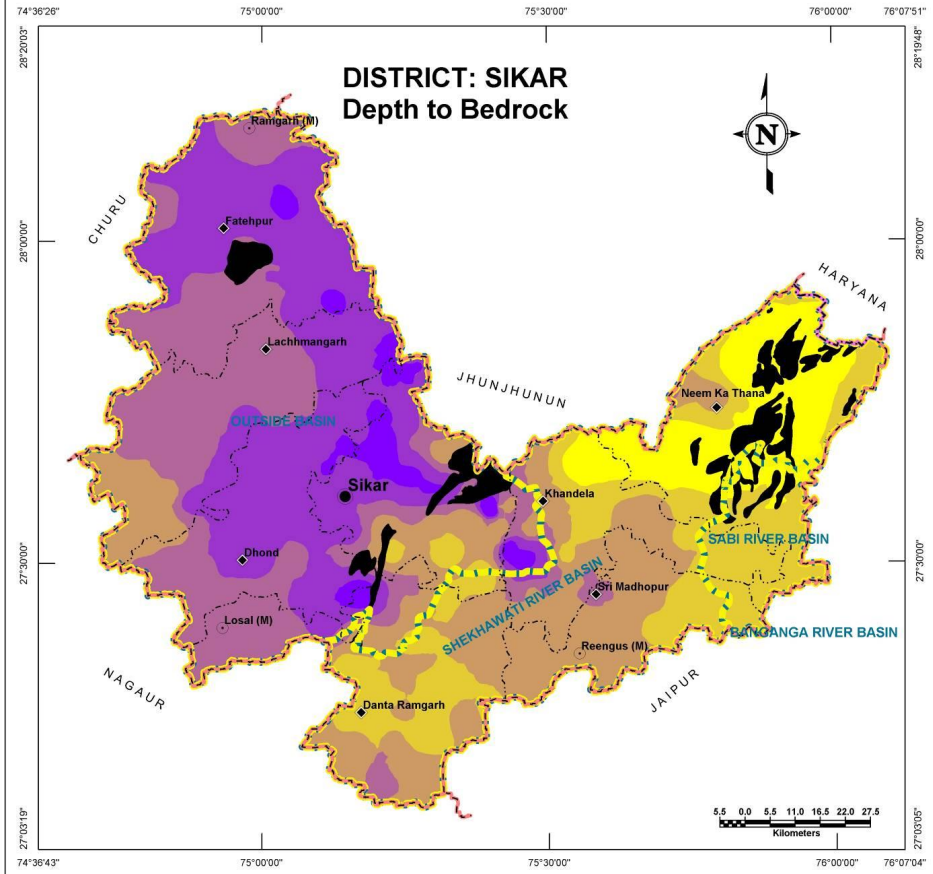
Hard rock areas

Weathered, fractured and jointed rock formations occurring at shallower depths constitute good unconfined aquifers. Such zonesare seen to occur in patches around hills in northeastern and central parts of the district varying in thickness from less than 10 meter to about 70m.In Neem Ka Thana block thickest zone of weathered/fractured hardrock is seen. These aquifers are primarily formed in quartzite rocks.

Unconfined aquifer Thickness (m)	Block wise area coverage (sq km)								Total Area (sq km)
	Danta Ramgarh	Dhond	Fatehpur	Khandela	Lachhman-garh	Neem Ka Thana	Piprali	Sri-madhopur	
< 10	205.7	227.3	102.0	205.9	251.9	181.2	114.2	227.9	**1,516.1**
10-20	286.3	217.4	317.5	243.3	314.0	35.3	172.5	235.0	**1,821.3**
20-30	319.4	221.3	209.6	86.2	261.9	11.4	159.6	101.1	**1,370.5**
30-40	72.2	152.9	202.8	3.5	157.8	1.9	112.7	12.0	**715.8**
40-50	24.1	40.2	281.9	-	27.1	-	57.6	-	**430.9**
50-60	7.6	36.3	89.6	-	12.0	-	16.4	-	**161.9**
60-70	4.6	4.9	1.7	-	3.2	-	4.7	-	**19.1**
> 70	5.5	0.1	-	-	-	-	3.6	-	**9.2**
Total	**925.4**	**900.4**	**1,205.1**	**538.9**	**1,027.9**	**229.8**	**641.3**	**576.0**	**6,044.8**

Unconfined aquifer Thickness (m)	Block wisearea coverage(sq km)								Total Area (sq km)
	Danta Ramgarh	Dhond	Fatehpur	Khandela	Lachhman-garh	Neem Ka Thana	Piprali	Sri-madhopur	
<10	215.5	4.9	-	120.3	-	270.5	95.1	5.7	**712.0**
10-20	-	-	-	70.8	-	407.8	0.4	-	**479.1**
20-30	-	-	-	59.9	-	42.9	-	-	**102.8**
30-40	-	-	-	6.7	-	20.0	-	-	**26.7**
40-50	-	-	-	-	-	5.8	-	-	**5.8**
50-60	-	-	-	-	-	2.2	-	-	**2.2**
> 60	-	-	-	-	-	0.1	-	-	**-**
Total	**215.5**	**4.9**	**-**	**257.7**	**-**	**749.3**	**95.5**	**5.7**	**1,328.6**

PLATE - XVI



LEGEND

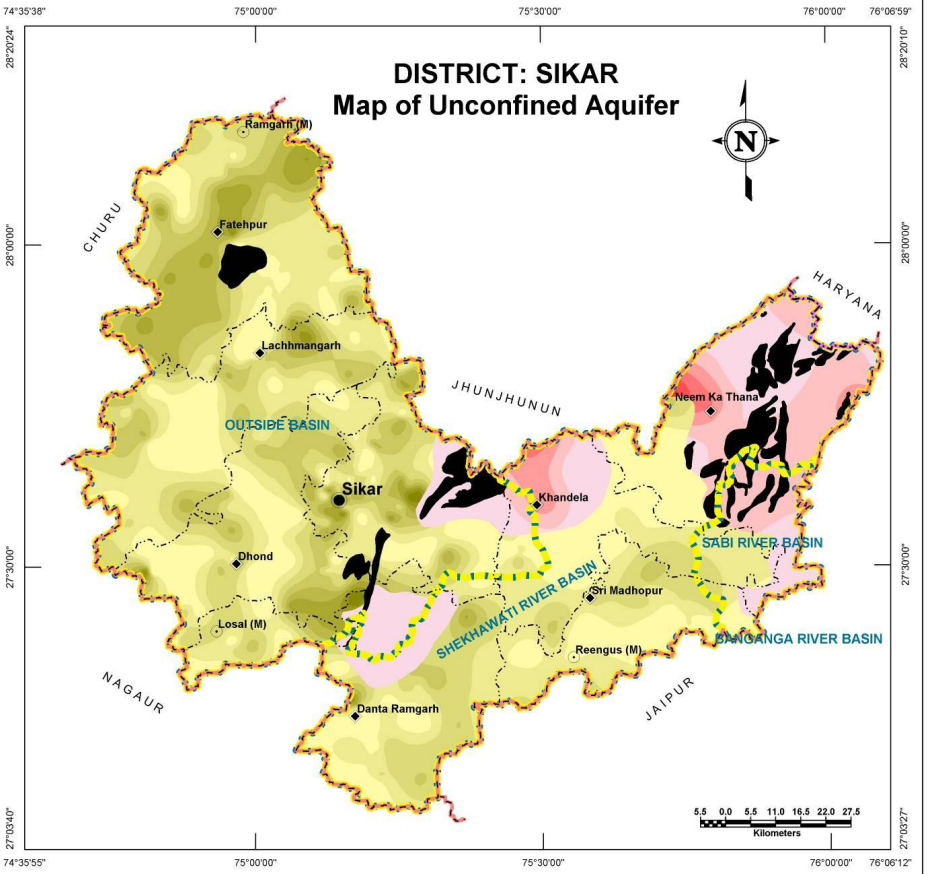
Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**

Depth to Bedrock (m bgl):

- <40
- 40-60
- 60-80
- 80-100
- 100-120
- >120

PLATE - XVII



LEGEND

Admin Boundary:

- District Headquarter
- Block Headquarter
- Town
- State Boundary
- District Boundary
- Block Boundary
- **Basin Boundary**
- **Hills**

Aquifer Thickness (m):

Alluvial Area	Weathered & Fractured Zone in Hardrock Area
<10	<10
10-20	10-20
20-30	20-30
30-40	30-40
40-50	40-50
50-60	50-60
60-70	>60
>70	

Glossary of terms

S. No.	Technical Terms	Definition
1	AQUIFER	A saturated geological formation which has good permeability to supply sufficient quantity of water to a Tube well, well or spring.
2	ARID CLIMATE	Climate characterized by high evaporation and low precipitation.
3	ARTIFICIAL RECHARGE	Addition of water to a groundwater reservoir by man-made activity
4	CLIMATE	The sum total of all atmospheric or meteorological influences principally temperature, moisture, wind, pressure and evaporation of a region.
5	CONFINED AQUIFER	A water bearing strata having confined impermeable overburden. In this aquifer, water level represents the piezometric head.
6	CONTAMINATION	Introduction of undesirable substance, normally not found in water, which renders the water unfit for its intended use.
7	DRAWDOWN	The drawdown is the depth by which water level is lowered.
8	FRESH WATER	Water suitable for drinking purpose.
9	GROUND WATER	Water found below the land surface.
10	GROUND WATER BASIN	A hydro-geologic unit containing one large aquifer or several connected and interrelated aquifers.
11	GROUNDWATER RECHARGE	The natural infiltration of surface water into the ground.
12	HARD WATER	The water which does not produce sufficient foam with soap.
13	HYDRAULIC CONDUCTIVITY	A constant that serves as a measure of permeability of porous medium.
14	HYDROGEOLOGY	The science related with the ground water.
15	HUMID CLIMATE	The area having high moisture content.
16	ISOHYET	A line of equal amount of rainfall.
17	METEOROLOGY	Science of the atmosphere.
18	PERCOLATION	It is flow through a porous substance.
19	PERMEABILITY	The property or capacity of a soil or rock for transmitting water.
20	pH	Value of hydrogen-ion concentration in water. Used as an indicator of acidity (pH < 7) or alkalinity (pH > 7).
21	PIEZOMETRIC HEAD	Elevation to which water will rise in a piezometers.
22	RECHARGE	It is a natural or artificial process by which water is added from outside to the aquifer.
23	SAFE YIELD	Amount of water which can be extracted from groundwater without producing undesirable effect.
24	SALINITY	Concentration of dissolved salts.
25	SEMI-ARID	An area is considered semiarid having annual rainfall between 10-20 inches.
26	SEMI-CONFINED AQUIFER	Aquifer overlain and/or underlain by a relatively thin semi-pervious layer.
27	SPECIFIC YIELD	Quantity of water which is released by a formation after its complete saturation.
28	TOTAL DISSOLVED SOLIDS	Total weight of dissolved mineral constituents in water per unit volume (or weight) of water in the sample.

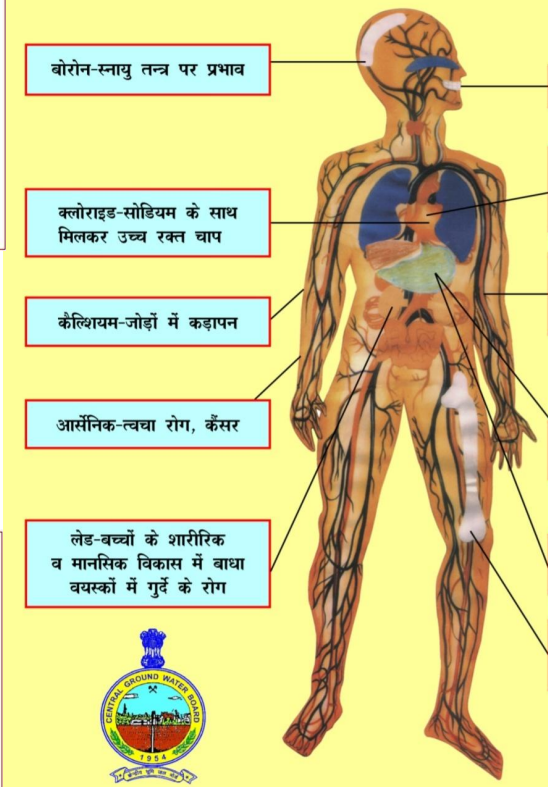
(Contd…)

S. No.	Technical Terms	Definition
29	TRANSMISSIBILITY	It is defined as the rate of flow through an aquifer of unit width and total saturation depth under unit hydraulic gradient. It is equal to product of full saturation depth of aquifer and its coefficient of permeability.
30	UNCONFINED AQUIFER	A water bearing formation having permeable overburden. The water table forms the upper boundary of the aquifer.
31	UNSATURATED ZONE	The zone below the land surface in which pore space contains both water and air.
32	WATER CONSERVATION	Optimal use and proper storage of water.
33	WATER RESOURCES	Availability of surface and ground water.
34	WATER RESOURCES MANAGEMENT	Planned development, distribution and use of water resources.
35	WATER TABLE	Water table is the upper surface of the zone of saturation at atmospheric pressure.
36	ZONE OF SATURATION	The ground in which all pores are completely filled with water.
37	ELECTRICAL CONDUCTIVITY	Flow of free ions in the water at 25C mu/cm.
38	CROSS SECTION	A Vertical Projection showing sub-surface formations encountered in a specific plane.
39	3-D PICTURE	A structure showing all three dimensions i.e. length, width and depth.
40	GWD	Ground Water Department
41	CGWB	Central Ground Water Board
42	CGWA	Central Ground Water Authority
43	SWRPD	State Water Resources Planning Department
44	EU-SPP	European Union State Partnership Programme
45	TOPOGRAPHY	Details of drainage lines and physical features of land surface on a map.
46	GEOLOGY	The science related with the Earth.
47	GEOMORPHOLOGY	The description and interpretation of land forms.
48	PRE MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer before Monsoon (carried out between 15th May to 15th June)
49	POST-MONSOON SURVEY	Monitoring of Ground Water level from the selected DKW/Piezometer after Monsoon (carried out between 15th October to 15th November)
50	PIEZOMETER	A non-pumping small diameter bore hole used for monitoring of static water level.
51	GROUND WATER FLUCTUATION	Change in static water level below ground level.
52	WATER TABLE	The static water level found in unconfined aquifer.
53	DEPTH OF BED ROCK	Hard & compact rock encountered below land Surface.
54	G.W. MONITORING STATION	Dug wells selected on grid basis for monitoring of state water level.
55	EOLIAN DEPOSITS	Wind-blown sand deposits

Ground Water Department,
Rajasthan

European Union
State Partnership Programme

भूजल में घुले मुख्य तत्वों की अधिकता का मानव शरीर पर दुष्प्रभाव



- बोरोन-स्नायु तन्त्र पर प्रभाव
- फ्लोराइड - दंत क्षरण
- क्लोराइड-सोडियम के साथ मिलकर उच्च रक्त चाप
- सोडियम-हृदय, गुर्दा व रक्त परिसंचरण रोगों से ग्रसित लोगों को हानिकारक
- कैल्शियम-जोड़ों में कड़ापन
- नाइट्रेट-नवजात शिशुओं में ब्लू बेबी बीमारी (मेथमोग्लोबिनिमिया)
- आर्सेनिक-त्वचा रोग, कैंसर
- सल्फेट-अधिकता में मैग्नेशियम के साथ मिलकर दस्तावर
- लेड-बच्चों के शारीरिक व मानसिक विकास में बाधा वयस्कों में गुर्दे के रोग
- आयरन-आयरन जीवाणु से आमाशय संबंधी रोग
- फ्लोराइड-जोड़ों में अकड़न, हड्डियों में मुड़ाव

केन्द्रीय भूमि जल बोर्ड,
पश्चिमी क्षेत्र, जयपुर
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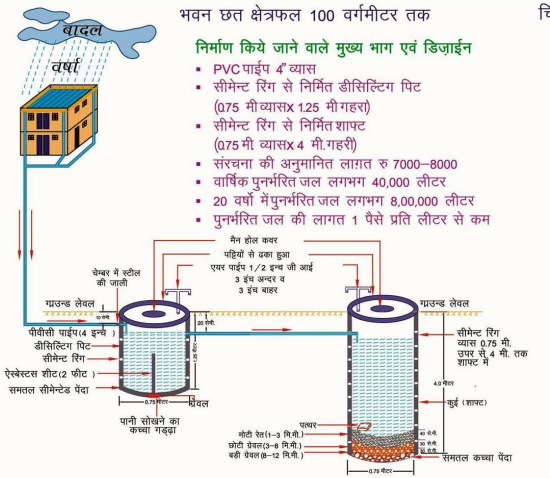
भूजल अमूल्य है इसे प्रदूषित न करें।

चित्र–1

भवन छत क्षेत्रफल 100 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 7000–8000
- वार्षिक पुनर्भरित जल लगभग 40,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 8,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

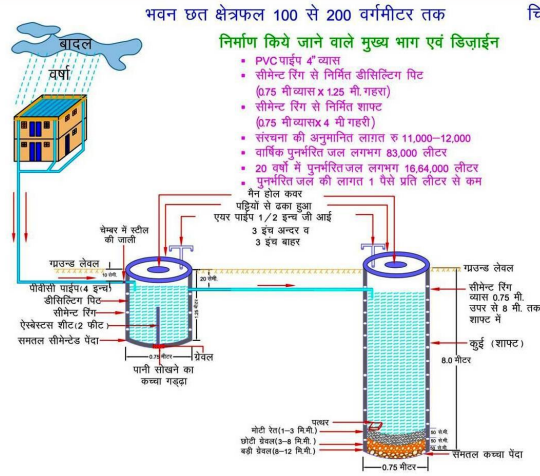


चित्र–2

भवन छत क्षेत्रफल 100 से 200 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी. गहरा)
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी गहरी)
- संरचना की अनुमानित लाग़त रु 11,000–12,000
- वार्षिक पुनर्भरित जल लगभग 83,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 16,64,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

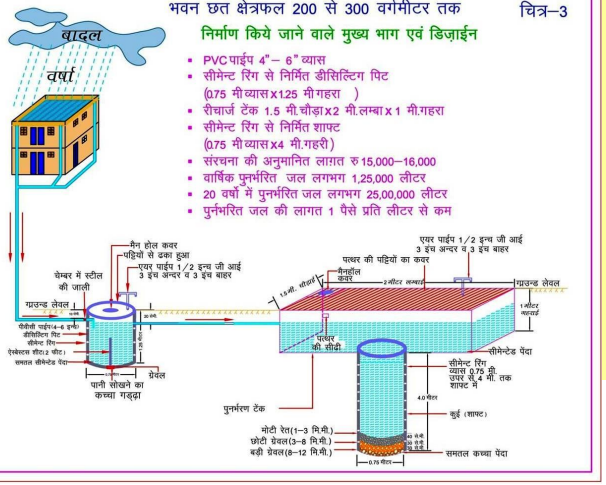


चित्र–3

भवन छत क्षेत्रफल 200 से 300 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 4"– 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.25 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 2 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरी)
- संरचना की अनुमानित लाग़त रु 15,000–16,000
- वार्षिक पुनर्भरित जल लगभग 1,25,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 25,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम

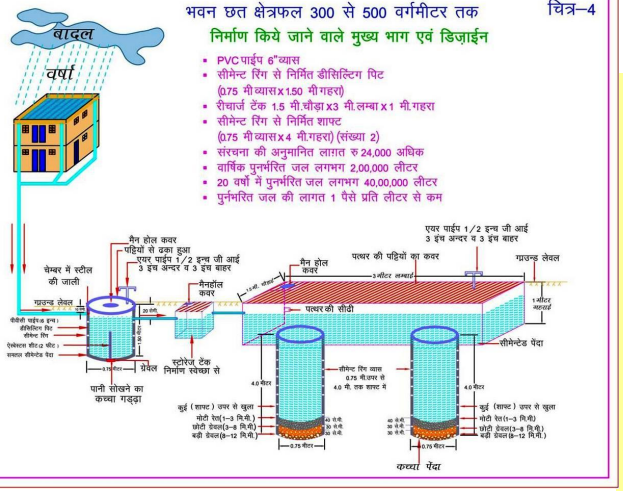


चित्र–4

भवन छत क्षेत्रफल 300 से 500 वर्गमीटर तक

निर्माण किये जाने वाले मुख्य भाग एवं डिज़ाईन

- PVC पाईप 6" व्यास
- सीमेन्ट रिंग से निर्मित डीसिल्टिंग पिट (0.75 मी.व्यास x 1.50 मी.गहरा)
- रीचार्ज टेंक 1.5 मी.चौड़ा x 3 मी.लम्बा x 1 मी.गहरा
- सीमेन्ट रिंग से निर्मित शाफ्ट (0.75 मी.व्यास x 4 मी.गहरा) (संख्या 2)
- संरचना की अनुमानित लाग़त रु 24,000 अधिक
- वार्षिक पुनर्भरित जल लगभग 2,00,000 लीटर
- 20 वर्षो में पुनर्भरित जल लगभग 40,00,000 लीटर
- पुनर्भरित जल की लागत 1 पैसे प्रति लीटर से कम



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Myths and Facts about Ground Water

S No	Myths	Facts
1	What is Ground Water • an underground lake • a net work of underground rivers • a bowl filled with water	Water which occurs below the land in geological formations/rocks is Ground water
2	Ground Water occurs everywhere beneath the Land Surface	Not really, it depends on the nature of rock formation
3	There is a relationship between ground water and surface water	Not all the places. Near streams/rivers there is relation
4	Groundwater is not renewable resource	It is renewable source and every year it is being recharged through rain/applied irrigation etc
5	Ground water is unlimited and deeper you drill more discharge	It is limited to annual recharge from rain/applied irrigation. The discharge may not increase if you go deeper
6	Ground Water moves rapidly	The movement of ground water is very slow
7	Ground water pumped from wells is thousands of years old	Generally the ground water being tapped through wells is a few years old
8	If water taste good—it is safe to drink	It may have other chemicals e.g. fluoride, nitrates etc which are harmful
9	Water from free flowing tube wells is very pure	This water can also be contaminated so test before use
10	If I recharge my TW/DW/HP it will not benefit me	It will also benefit you and also adjoing wells
11	There is no static ground water resources in Rajasthan	Rajasthan is also having Static GW resources, and being tapped in most of areas as GW annual withdrawal is more than annual recharge
12	I cannot meet annual cooking and drinking water requirement by rain water harvesting	The water requirement for drinking and cooking is only 8 lit/day. You can harvest this water for family of 5 persons from roof top or paved area of 75 Sq m to meet annual requirement
13	You can increase ground water recharge	This can be done by harvesting the rain water and storing in sub surface reservoir (GW) by constructing the recharge structures
14	You cannot use abandoned TW/HP/DW for ground water recharge	These should be used as recharge structures as harvested rain water is directly put into GW reservoir
15	Putting waste near HP/TW will not cause any problem	Such actions will pollute wells and water

ROLTA

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