

## GEOMORPHOLOGY

### DISTRICT—SAWAI MADHOPUR

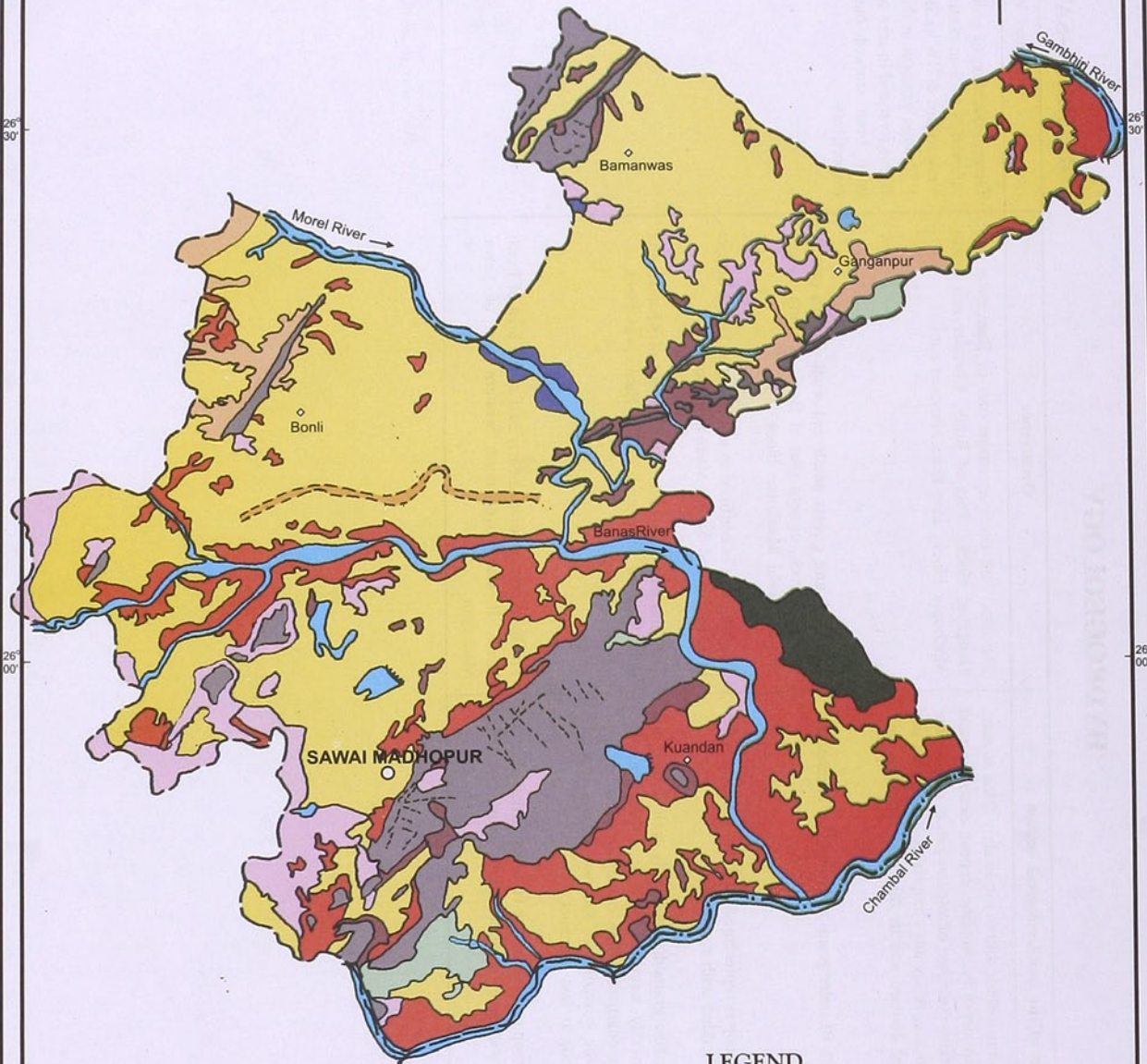
Landform Units	Symbol	Lithology / Material / Description	Occurrence in district	Land use/Land cover
<b>Fluvial Origin</b> Alluvial Plain	AP	Mainly undulating land scape formed due to fluvial activity, consists of gravels, sand, silt and clay. Terrain mainly undulating, produced by extensive deposition of alluvium by river system.	Almost entire district.	Double crop, single crop (Rabi / Kharif), fallow.
Valley Fill	VF	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.	South i.e. near Ghamira and Dangarwara village.	Marginal double crop, single crop (Rabi).
Palaeochannel	PLC	Mainly buried on abandoned stream/river courses, comprising of coarse textured material of variable sizes.	Central part above river Banas.	Double crop.
Flood Plain	FP	The surface or strip of relatively smooth land, adjacent to a river channel, formed by river and covered with water when river over flows its bank. Normally subject to periodic flooding.	Along river Banas.	Marginal double crop, single crop (Rabi / Kharif).
Ravine	RV	Small, narrow, deep, depression, smaller than gorges, larger than gully, usually carved by running water.	Along river Chambal and Banas.	Marginal Kharif crop, open scrub.
<b>Denudational Origin</b> Pediment	P	Broad gently sloping rock flooring, erosional surface of low relief between hill and plain, comprises of varied lithology, criss crossed by fractures & faults.	Around all major structural hills & denudational hills.	Marginal Kharif crop, open scrub, fallow.
Buried Pediment	BP	Pediment covered essentially with relatively thicker alluvial, colluvial or weathered materials.	Mainly concentrated in west and south west.	Marginal double crop, single crop (Rabi), fallow, open scrub.
Intermontane Valley	IV	Depression between mountains, generally broad & linear, filled with colluvial deposit.	Near Heerapur in east of district.	Single crop (Rabi / Kharif), fallow, open scrub.
<b>Eolian Origin</b> Sandy Plain	SP	Formed by aeolian activity, wind blown sand with gentle sloping to undulating plain, comprising of coarse sand, fine sand, silt & clay.	East of Gangapur town & North of Mahapura village in west.	Marginal Kharif crop, fallow land, with or without scrub.
<b>Structural Origin</b> Plateau	PT	Formed over varying lithology with extensive, flat, landscapes, bordered by escarpment on all sides. Essentially formed over horizontally layered rocky marked by extensive flat top and steep slopes. It may be criss crossed by lineament.	North east of Bajoli village in east of district.	Marginal single crop (Kharif / Rabi), open scrub.
<b>Hills</b> Denudational Hill	DH	Steep sided, relict hills undergone denudation, comprising of varying lithology with joints, fractures and lineaments.	In south west near village Bhedoli.	Forest, open scrub.
Structural Hill	SH	Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc.	In eastern part of Sawai Madhopur town.	Forest, open scrub.
Linear Ridge	LR	Long narrow low-lying ridge usually barren having high run-off may form over varying lithology with controlled strike.	In east near village Morpa & in west near village Naglao.	Open scrub.



# SAWAI MADHOPUR DISTRICT

## GEOMORPHOLOGY

Scale 0 5 10 15 20 km.



### LEGEND

#### Limeament

- FAULTS/FRACTURE/JOINTS OF VARYING LENGTH AND WIDTH

#### Water Bodies

- RIVER/POND/RESERVOIR

#### Hills

- STRUCTURAL/DENUDATIONAL/LINEAR RIDGE

#### Landform Units :

##### Fluvial Origin :

- Alluvial Plain
- Valley Fill
- Flood Plain
- Palaeochannel
- Ravine

##### Denudational Origin :

- Pediment
- Burried Pediment
- Intermontane Valley

##### Aeolian Origin :

- Sandy Plain

##### Structural Origin :

- Plateau



## HYDROGEOLOGY

### DISTRICT—SAWAI MADHOPUR

Hydrogeological units	Description of the unit/Geological section	Occurrence	Ground Water flow
Older Alluvium (Quaternary)	The Quaternary sediments include thin to moderately thick aeolian, alluvial, scree and talus deposits. Aeoline deposit occur as sand dunes while scree and talus consisted of angular pieces of quartzite and finer clastic sediments. Alluvium comprising sand, clay and kanker occupy drainage courses and its thickness increases upto 125 m.	The litho unit occupies major part of Bamanwas and Gangapur blocks. Part of Bonli, Khandar and Sawai Madhopur blocks also have alluvium aquifer.	General direction of ground water flow has been inferred N to S in northern part; W to E in the western part & NW to SE in the southern portion. Hydraulic gradient in the western part along the Banas river and in area south of Sawai Madhopur have been worked out 2.67 and 2.4 m/km. respectively
Limestone. (Vindhyan Super Group)	The litho unit represents Bhandar group and occurs as interbedded with sandstone.	The litho unit covers south and south eastern part of Khandar block, eastern part of Bonli & north eastern part of Sawai Madhopur block.	
Shale (Vindhyan Super Group)	The Vindhyan Super Group is represented by Rewa group of rocks comprising shale interbedded with sandstone.	The litho unit is confined to southern part of the district in Khandar and Sawai Madhopur blocks.	
Quartzite (Delhi and Bhilwara Super Group)	The Delhi Quartzite is fine grained, hard, fairly well jointed and thickly bedded. It directly overlies the gritty quartzite. The Bhilwara Super Group quartzites often occurs in association of mica schist. Amongst the quartzites of the two groups, quartzite of Bhilwara Super Group is less compact.	The litho unit occurs as localised part of Khandar and north western peripheral area in Bamanwas block.	
Phyllite and Schist (Bhilwara Super Group)	The Bhilwara Super Group represented by Hindauli group of rocks comprise interbedded sequence of shale, slate, schist, quartzite, phyllite etc.	The litho unit occupies nearly half of the area of Bonli block. It also cover north western part of Sawai Madhopur.	

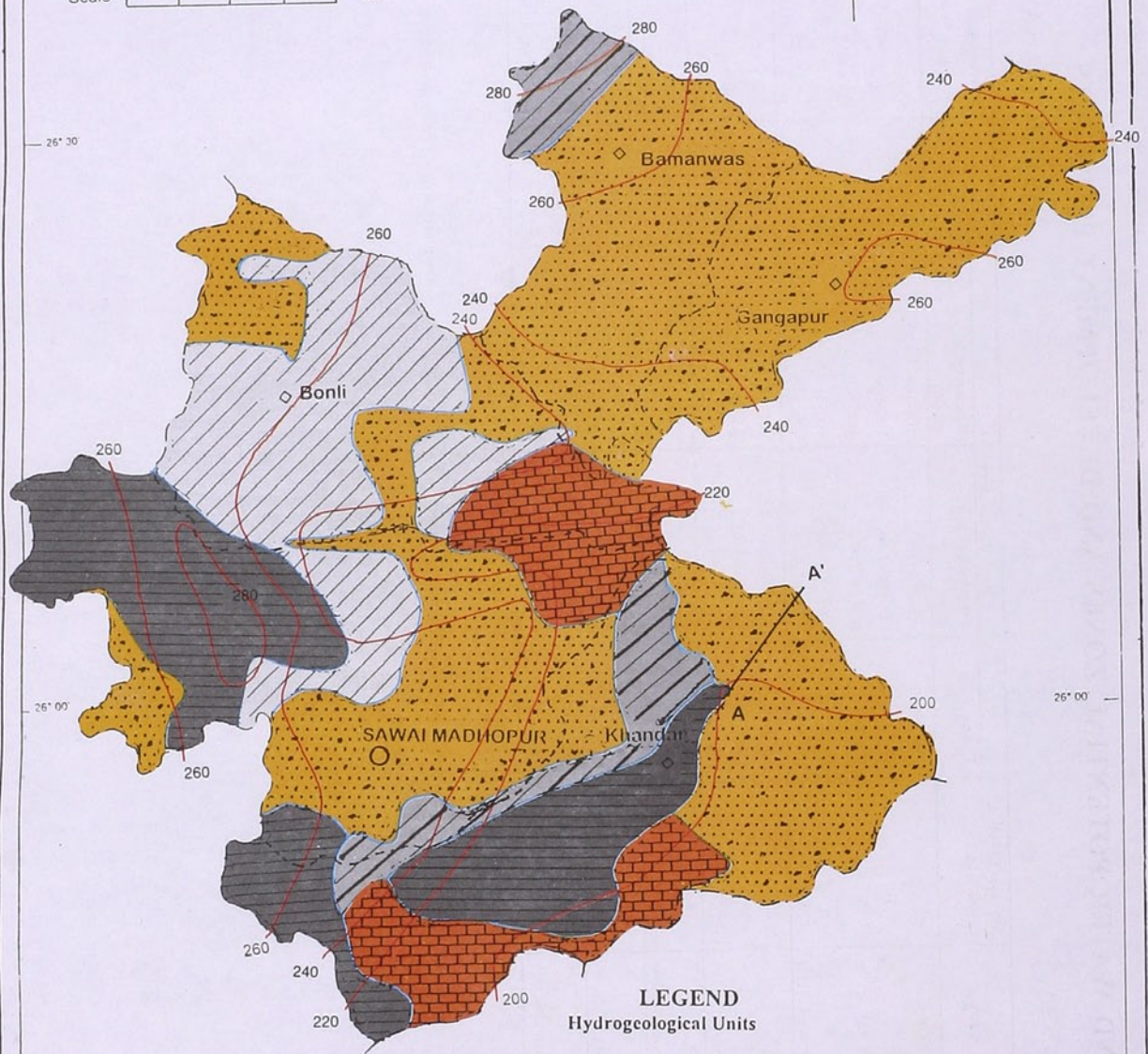
*For cross section(s) please see page no. 549*











# SAWAI MADHOPUR DISTRICT

# HYDROGEOLOGY

Scale 0 5 10 15 20 km.



### LEGEND Hydrogeological Units

-  Older Alluvium
-  Quartzite
-  Lime stone
-  Shale
-  Phyllite/ Schist
-  Water table Contour
-  Section line
-  Hills



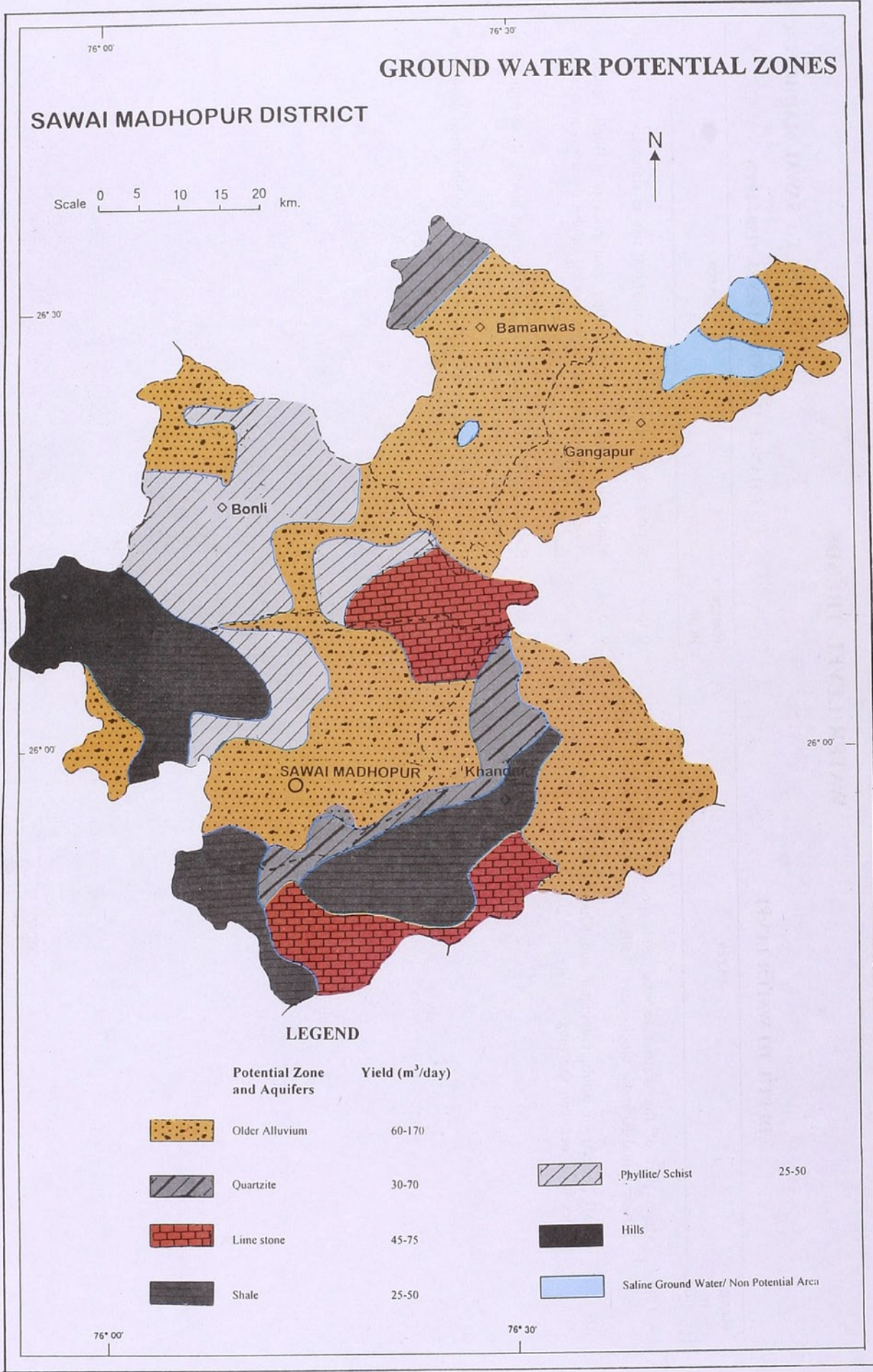
# GROUND WATER POTENTIAL ZONES AND DEVELOPMENT PROSPECTS

## DISTRICT - SAWAI MADHOPUR

Aquifer in the Potential Zone (Area in Km <sup>2</sup> )	Occurrence * Block (Area in Km <sup>2</sup> )	Water Level (1997) in m.	Type	Well Parameters		E.C. X10 <sup>-6</sup> stem/cm	Development Prospects
				Proposed depth in m	Discharge in m <sup>3</sup> /day		
Alluvium (2256.29)	* Bamanwas (579.06)	<10	TW/DW	65-100/20-40	100-300	<2,2-4	Safe
	* Bonli (349.90)	<10	TW/DW	65-100/20-40	100-300	<2	Safe
	* Gangapur (498.92)	<15	TW/DW	65-100/20-40	100-300	<2,2-6	Critical
	* Khandar (407.90)	<20	TW/DW	65-100/20-40	100-300	<2	Safe
	* Sawai Madhopur (420.51)	<25	TW/DW	65-100/20-40	100-300	<2	Safe
Limestone (583.93)	* Bonli (185.50)	<25	TW/DW	100-150/30-40	100-400	<2,2-4	Safe
	* Khandar (276.84)	<30	TW/DW	100-150/35-50	100-400	<2	Safe
	* Sawai Madhopur (121.59)	<25	TW/DW	100-150/30-50	100-400	<2	Safe
Shale (529.64)	* Khandar (406.35)	<15	DW	20-35	20-30	<2	Safe
	* Sawai Madhopur (123.29)	<10	DW	20-35	20-30	<2	Safe
Quartzite (164.89)	* Bamanwas (77.49)	<15	TW/DW	80-100/25-40	150-200	<2,2-4	Safe
	* Khandar (87.40)	<10	TW/DW	80-100/25-40	150-200	<2	Safe
Phyllite & Schist (790.88)	* Bonli (447.98)	<15	DW	30-40	30-45	<2,2-4	Safe
	* Sawai Madhopur (342.90)	<20	DW	30-40	30-45	<2	Semi Critical

TW - Tube wells    DW - Dug wells    Safe - <65% stage of development    Semi Critical - 65-85% development    Critical - 85-100% development    Over exploited - >100% development





## WATER LEVEL TRENDS

### DISTRICT : SAWAI MADHOPUR

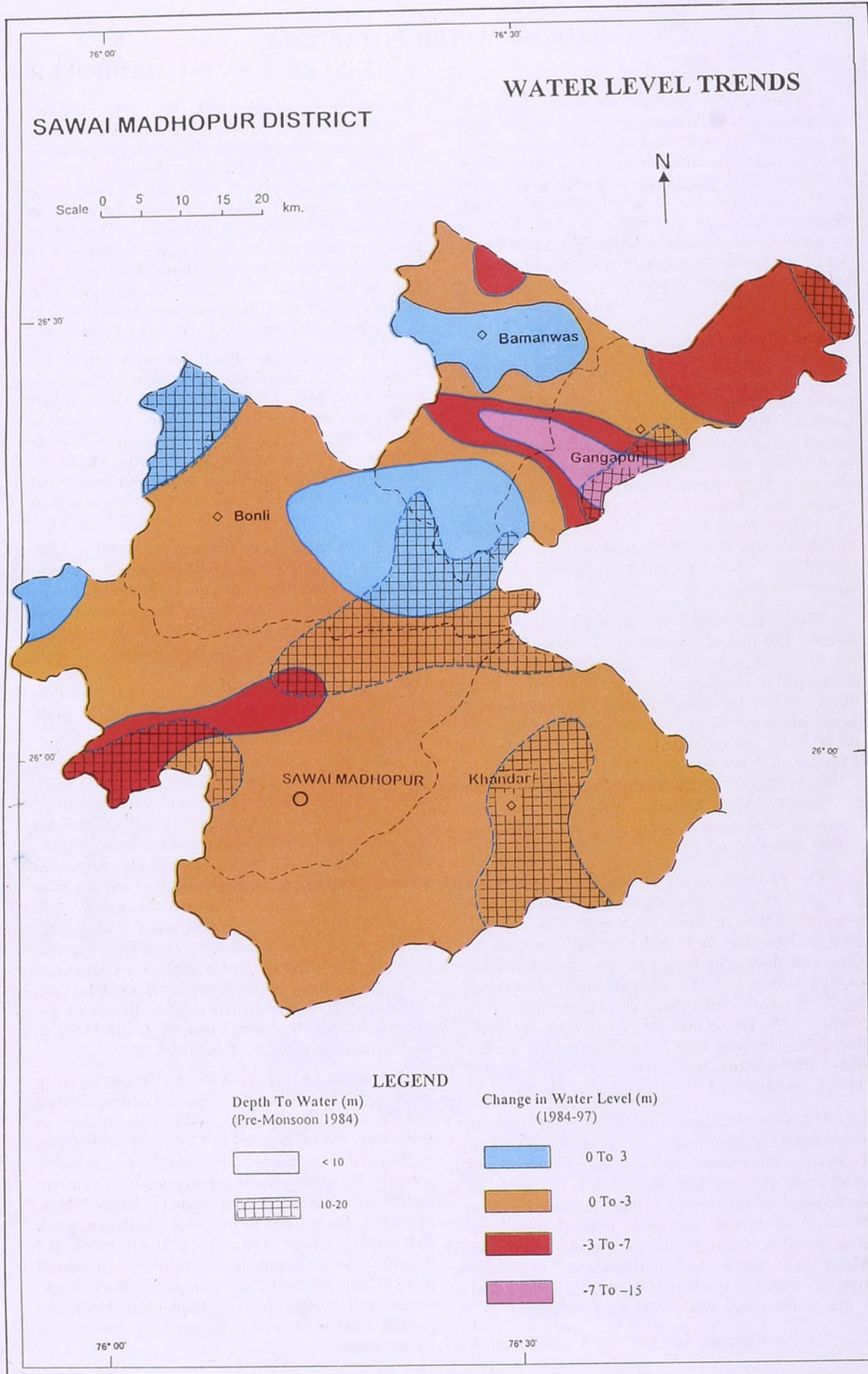
#### DEPTH TO WATER LEVEL

Range in m	Area
< 10	Major part of the district leaving aside pockets scattered in Bonli, Gangapur and Khandar blocks have shallow water level less than 10 cm.
10 to 20	Small pockets in Bonli, Gangapur and Khandar blocks have depth to water level between the range.

#### CHANGE IN WATER LEVEL (1984-1997)

Range in m	Area
0 to 3	A pocket in Bonli block show marginal rise in water level upto 3 m.
0 to -3	Major part of the district, excluding small pockets in Bonli, Bamanwas, Gangapur, and Sawai Madhopur blocks, exhibit depletion in water level less than 3 m.
-3 to -7	Pockets in Khandar, Bamanwas and Gangapur blocks show depletion in water level between the range.
-7 to -15	Area around Gangapur and west of Bamanwas exhibit steep depletion in water level between the range.







## GROUND WATER POTABILITY

### DISTRICT SAWAI MADHOPUR

In the district the ground water is mostly characterised by bicarbonate and mixed type of water in which 43% is bicarbonate and 43% is mixed type. In bicarbonate type of water sodium bicarbonate type is 19%; calcium-magnesium bicarbonate type water is 21% and rest 3% water is of mixed cationic character. This type of water is generally fresh in nature with electrical conductivity (EC) generally less than 1500  $\mu\text{S}/\text{cm}$ . However, the EC of the water is more at some places such as village Phulwara (2100  $\mu\text{S}/\text{cm}$ ) in Bamanwas block, Ghata (1700  $\mu\text{S}/\text{cm}$ ) and Pipalda (1800  $\mu\text{S}/\text{cm}$ ) in Bonli block and Wazirpur (2400  $\mu\text{S}/\text{cm}$ ) in Gangapur block. The mixed type of water constitutes 43% of ground water in which 20% is calcium-magnesium mixed type and 21% is sodium mixed type. This type of water is having EC range between 1500-3000  $\mu\text{S}/\text{cm}$  but sometime it may exceed upto 4000  $\mu\text{S}/\text{cm}$  and become more mineralised from fresh water. The Bonli block is mostly characterised by sodium mixed type and the Khandar block is characterised by Ca-Mg mixed type of water. The 14% of ground water in the district is characterised as chloride type of water in which 5.5% has calcium-magnesium, 7% sodium and 1.5% counted as mixed type of water.

The ground water is characterised by low to high salinity. The area of low salinity i.e. below 2000  $\mu\text{S}/\text{cm}$  occurs in most part of the district except the central part of Gangapur block, southern part of Bonli block, around Bamanwas proper, southwest part of Sawai Madhopur block and the area around Khandar proper. The ground water at villages Barnoda and Khandar in Khandar block, Bilopa and Sinoli in Sawai Madhopur block, Kodyal and Pipalwara in Bonli block, Binegu, Chaliadai, Wazirpur, Badhkeyala, Phulwara in Gangapur and Bamanwas blocks have higher values of salinity.

The bar diagram of salinity shows that fresh ground water of the EC range below 2000  $\mu\text{S}/\text{cm}$  is available in 93% of Sawai Madhopur, 77% in Bonli, 89% in Khandar, 41% in Bamanwas and 54% in Gangapur blocks. Similarly, the next range of medium to high salinity i.e. 2000-4000  $\mu\text{S}/\text{cm}$  is represented by 7% in Sawai Madhopur, 23% in Gangapur, 9% in Bonli, 25% in Bamanwas and 11% in Khandar block. The ground water of high to very high salinity i.e. EC above 4000  $\mu\text{S}/\text{cm}$  is represented by 23% in Gangapur, 14% in Bonli and 34% in Bamanwas blocks.

The map of nitrate distribution shows that the high concentration of nitrate i.e. more than 100 mg/L occurs in western part of Bamanwas block, centraleast part of Gangapur block, a patch in centralwest of Bonli and central part of Khandar block. Area around Nayagaon, Bhadoli, Pandhera, Ranthambore, Sawai Madhopur, Padana, Sinoli and Mainpura in Sawai Madhopur block also have such type of water. The rest part of the district have ground water of the range below 100 mg/L of nitrate.

The bar diagram shows different concentration

of nitrate in groundwater. 60%, 46%, 58%, 70% and 55% of the samples in Sawai Madhopur, Gangapur, Bonli, Bamanwas and Khandar blocks respectively represents nitrate upto 50 mg/L. Similarly, 33% in Sawai Madhopur, 27% in Gangapur, 21% in Bonli and 28% samples in Khandar block have nitrate concentration between 51-100 mg/L. The higher concentration of nitrate (>100 mg/L) is observed at Sawai Madhopur, Gangapur, Bonli, Bamanwas and Khandar blocks as 7%, 27%, 21%, 30% and 17% samples respectively. The maximum nitrate is seen in village Bassi-banesingh (1100 mg/L) of Bonli block.

The fluoride map shows that most part of the district except northwest part of Sawai Madhopur block, south part of Bonli block and northeast part of Khandar block is having fluoride concentration upto 1.5 mg/L. The higher concentration of fluoride is found in villages Singor, Padri in Khandar block, Sarsop and Thapa in Sawai Madhopur block and Mittra pura in Bonli block. The maximum concentration of fluoride is observed at Mittrapura (4.3 mg/L).

The bar diagram of fluoride shows 80%, 73%, 70%, 100% and 61% samples in Sawai Madhopur, Gangapur, Bonli, Bamanwas and Khandar blocks respectively are having fluoride concentration upto 1.5 mg/L whereas 20%, 27%, 13% and 28% samples in Sawai Madhopur, Gangapur, Bonli and Khandar blocks have fluoride concentration in the range of 1.5-3.0 mg/L. The fluoride concentration more than 3.0 mg/L is seen only in 17% ground water of Bonli and 11% of Khandar block.

The district is mainly characterised by soft ground water having hardness between 0-300 mg/L and constitutes 43% of water samples of the district. The hardness of this range is almost equally distributed in all the blocks. The next range of hardness i.e. 300-600 mg/L is found in 47% of water samples which are mostly found in Sawai Madhopur and Khandar blocks. The last range of hardness above 600 mg/L constitutes only 10% of ground water. Such waters are observed at Sawai Madhopur (775 mg/L), Khandar (905 mg/L), Talaord (610 mg/L), Bassibanasingh (2145 mg/L), Pipalwara (835 mg/L), Bararkhurd (630 mg/L) and Sonkipura (670 mg/L) villages of the district. Village Bassibanasingh of Bonli block is having maximum value of hardness.

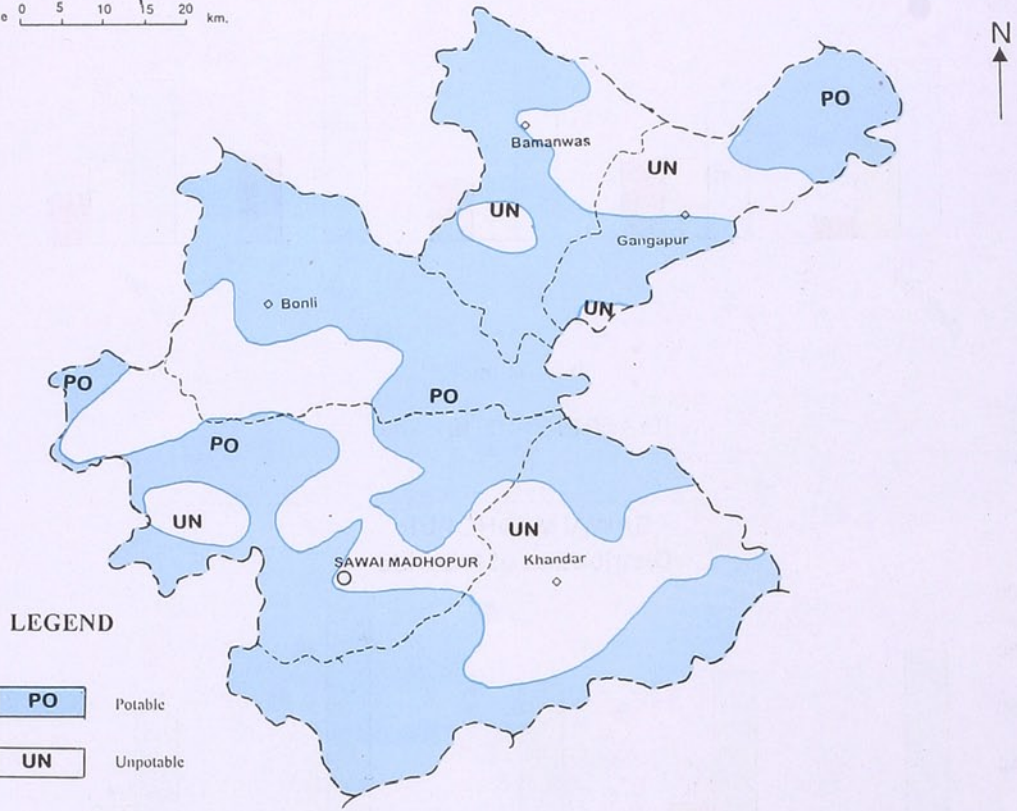
On perusing the drinking water quality map based upon the permissible values of salinity, nitrate and fluoride, it is inferred that high salinity in southwest part of Bamanwas block and central part of Gangapur block is not suitable for drinking whereas due to high fluoride concentration in eastern part of Khandar block, area around villages Bilapa, Mainpura, Jothwarakalan in Sawai Madhopur block and around village Didwari of Bonli block the ground water is unsuitable for drinking. In central part of Gangapur block, southern part of Bonli block, central and eastern part of Bamanwas block the ground water is unsuitable for drinking due to high nitrate values.



# SAWAI MADHOPUR DISTRICT

## GROUND WATER POTABILITY

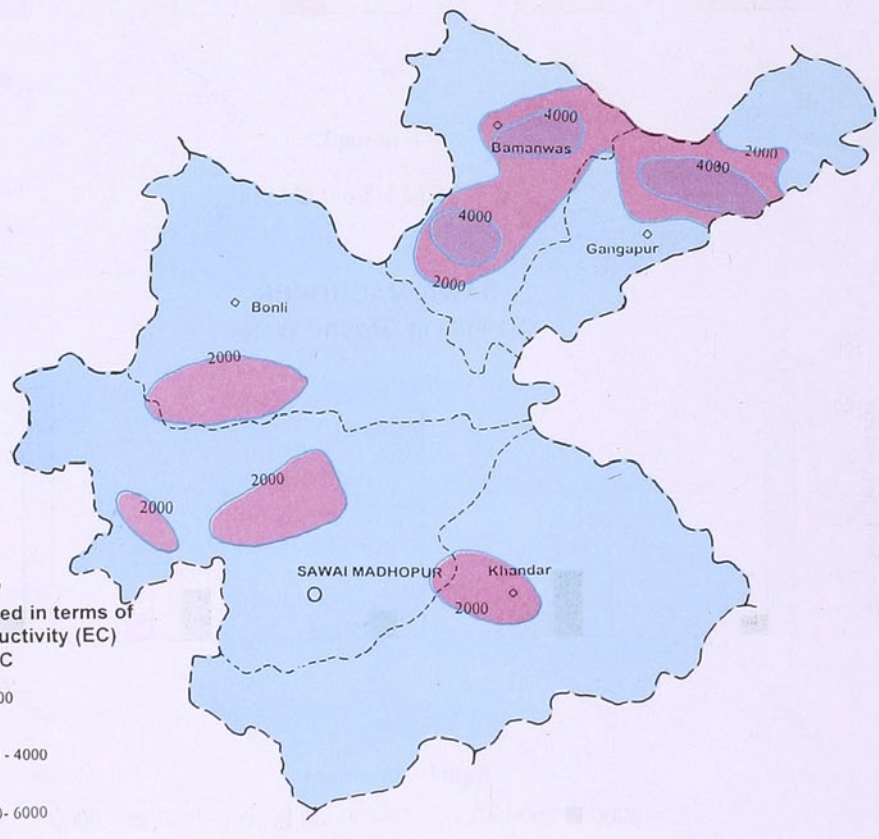
Scale 0 5 10 15 20 km.



### LEGEND

- PO Potable
- UN Unpotable

## SALINITY

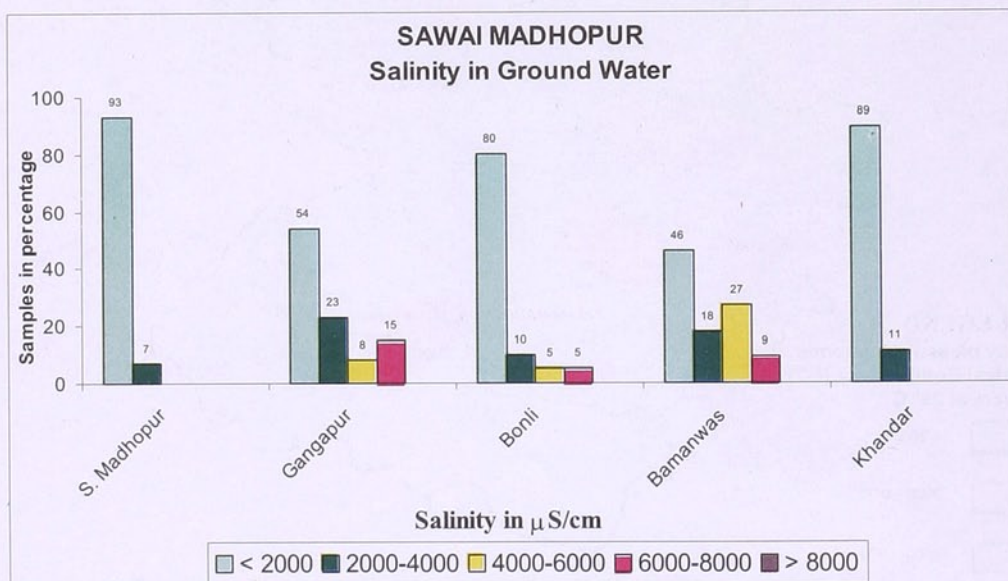
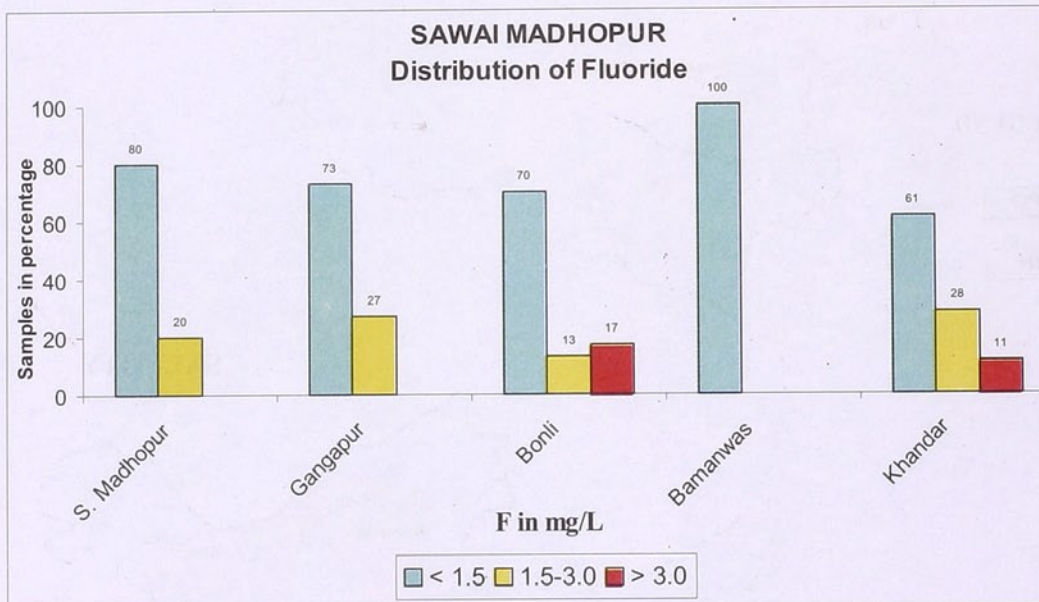
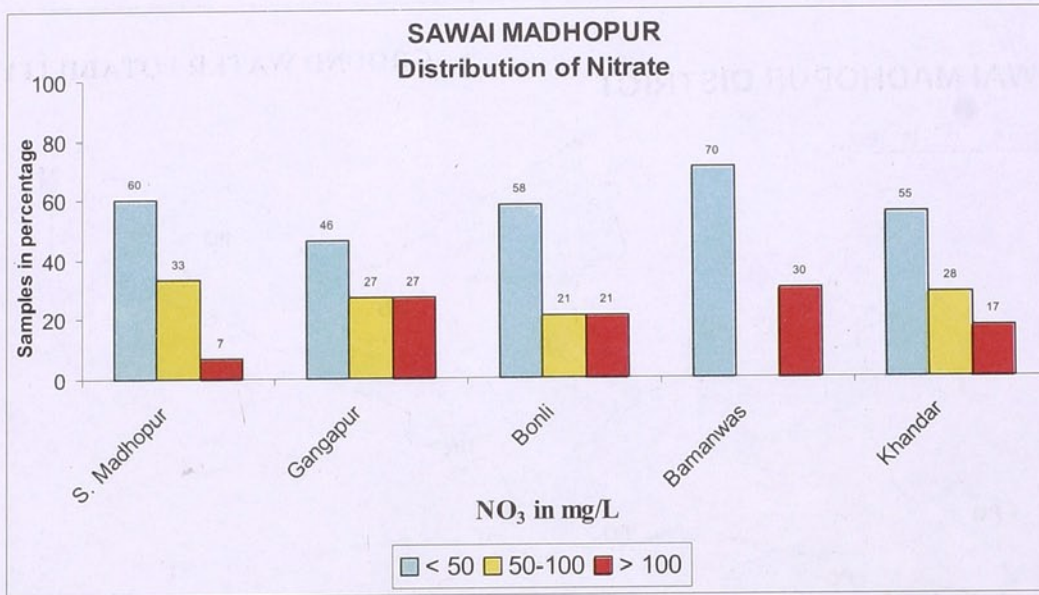


### LEGEND

Salinity measured in terms of Electrical Conductivity (EC) in  $\mu\text{S/cm}$  at  $25^\circ\text{C}$

- < 2000
- 2000 - 4000
- 4000 - 6000



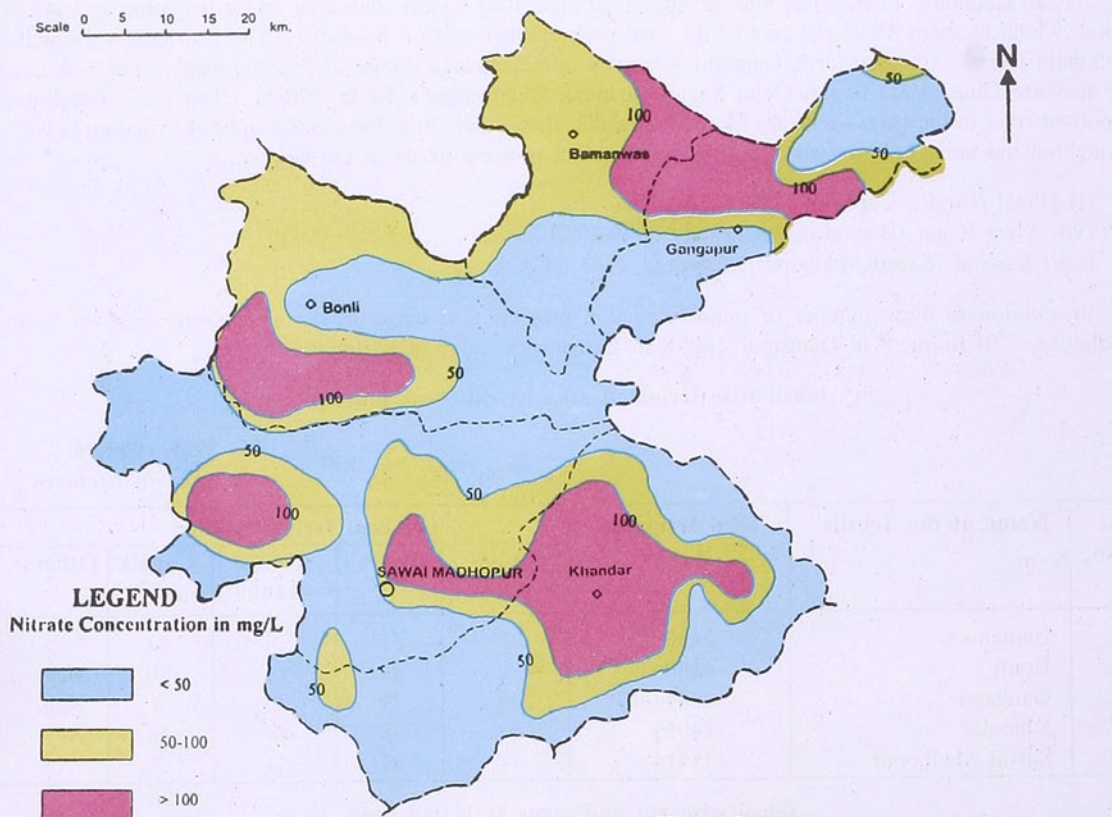




# SAWAI MADHOPUR DISTRICT

# NITRATE DISTRIBUTION

Scale 0 5 10 15 20 km.



# FLUORIDE DISTRIBUTION

