

DISTRICT GROUND WATER INFORMATION BOOKLET



NEEMUCH DISTRICT MADHYA PRADESH



**Central Ground Water Board
North Central Region
Ministry of Water Resources
Government of India**

**BHOPAL
2013**

NEEMUCH DISTRICT PROFILE

S.No.	Items	Statistics	
1.	General Information		
	Location	Latitude(N) 24°14'-25°02' Longitude(E) 74°44'-75°33'	
	i) Geographical area	4000.44 km ²	
	ii) Administrative Divisions (As on 2011) Number of Tehsil/Blocks Number of Panchayats/Villages	3/3 239/678	
	iii) Population (Census 2011)	826067	
	iv) Average Annual Rainfall (mm)	797.96	
2.	Geomorphology		
	1. Major Physiographic Units 2. Major Drainage	i. Extension of Vindhyan range ii. Extension of Malwa plateau i Retam ii Chambal	
3.	Land Use (Km²)		
	i) Forest area:	944.87	
	ii) Net area sown:	1868.4	
	iii) Cultivable area:	2901.1	
4.	Major Soil Types		Black cotton soil
5.	Principal Crops		Wheat, cotton etc.
6.	Irrigation By Different Sources		No. Area irrigated km ²
	Dug wells	50029	472
	Tube wells/Bore wells	6410	172
	Tanks/Ponds	22	42
	Canals	15	31
	Other Sources	-	
	Net Irrigated Area	-	757
	Gross Irrigated Area)	-	759
7.	Number Of Ground Water Monitoring Wells of CGWB (As on 31.3.2013)		
	No. of Dug Wells	21	
	No. of Piezometers	14	
8	Predominant Geological Formations		Deccan Trap basalts and Vindhyan sandstone
9	Hydrogeology Major Water Bearing Formation		Weathered/vesicular basalt, flow contacts and fractured sandstone.
	Pre-monsoon depth to water level range during 2012		5.3 - 18.9 m bgl

	Post-monsoon depth to water level range during 2012	1.15 - 22.75 m bgl
	Long Term water level trend in 10 years (2003-2012) in m/year	Pre-monsoon 0.19 - 0.48 m/annum fall
10.	Ground Water Exploration By CGWB (As on 31.3.2013)	
	No of wells drilled (EW,OW,PZ,SH, Total)	18(4EW & 14PZ)
	Depth Range (m)	61.6 – 201.3
	Discharge (liters per second)	Meager – 12
	Specific Capacity lpm/m	1 - 12
	Transmissivity (m ² /day)	1.82 to 149.5
11.	Ground Water Quality	
	Presence of chemical constituents (e.g. EC in μScm^{-1})	EC: 361- 4040 mmhos/cm at 25° C Nitrate: 23-132 mg/l Fluoride: 0.33 -1.62 mg/l
	Type of Water	C ₃ -S ₁ (High Salinity & Low sodium)
12	Dynamic Ground Water Resources (2009) in ham	
	Net Ground Water Availability	39133
	Gross Annual Ground Water Draft	31672
	Projected Demand for Domestic and Industrial Uses upto 2035	1894
	Stage of Ground Water Development	81%
13	Awareness and Training Activity	
	Mass Awareness Programmes Organised	Nil
	Water Management Training Programmes	Nil
14	Efforts of Artificial Recharge & Rainwater Harvesting	
	No. of Projects completed by CGWB	One
	Projects under technical guidance of CGWB (Numbers)	Nil
15	Ground Water Control and Regulation	
	Number of Safe Blocks	1
	Number of Critical Blocks	2
	Number of Notified Blocks	1
16	Major Groundwater Problems and Issues	Salinity and over exploitation of Ground water resources

1.0 INTRODUCTION

Neemuch district, spreading over an area of about 4000.44 km², lies in the northwestern part of the state of Madhya Pradesh. Prior to independence of India, it was a part of Ujjain division, M.P. Govt. has declared Neemuch as a separate district as on 30th, June 1998. Earlier, it was a part of the Mandsaur district. Three tehsils of undivided Mandsaur district fall under this new district namely

Neemuch, Jawad and Manasa. The district is bounded by Mandsaur district on the southeast and Rajasthan state on the northeast. The district lies between North latitude 24°14' and 25°02' and East longitude 74°44' and 75°33', falling in Survey of India part of topo sheet No. 45L/13,14,15 and 45P/1,2,3,6&7.

Neemuch is well connected with all parts of country by Rail and roads. It lies on Ajmer-Khandwa main railway line. Mhow Neemuch state Highway passes through the district. As per 2011 census, the population of

Neemuch district is about 8,26,067. For administrative purposes the district is divided into 3 tehsil and 3 blocks. It has only one city (i.e. district Hqr. Neemach), two towns (Manasa & Jawad) and 678 villages.

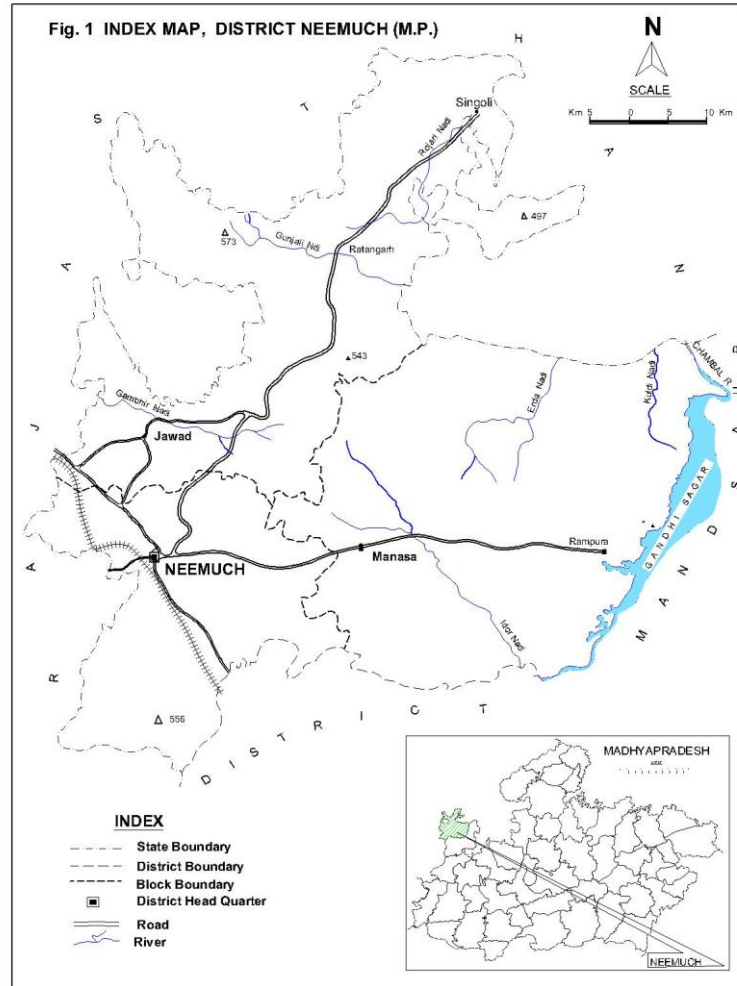


Table: Administrative units of Neemach district, M.P.

S.No	Tehsil	Block	Area (Km ²)	No villages	of	No city/towns	of
1.	Neemuch	Neemuch	855.1	187		2	
2.	Jawad	Jawad	1570.3	267		4	
3.	Manasa	Manasa	1517.3	222		2	

Central Ground Water Board (CGWB) ACTIVITIES:

- In the most part of the district, the comprehensive Hydrogeological surveys were conducted during 1981-82 and 91-92.
- Mr. Ch. R. K. Reddy, conducted systematic hydrogeological surveys in district during 1982-83. Sh Tejdeep Singh, conducted systematic hydrogeological surveys in the remaining part of the district during 1988-89. Reappraisal survey of the area was carried out during 1991-92.
- Central Ground Water Board has drilled 4 exploratory wells in the district. all boreholes were drilled in basaltic terrain, Thickness of Basalt is increasing from north to southwards.
- In Neemuch district neither mass-awareness and nor groundwater management-training programme have been organized by CGWB.

2.0 RAINFALL AND CLIMATE

The climate of Neemuch district is generally dry except the southwest monsoon season. The year can be divided in to four seasons. The winter commences from middle of November and lasts till the end of February. The period from March to about first week of June is the summer season. May is the hottest month of the year. The southwest monsoon starts from middle of June and lasts till end of September. October and middle of November constitute the post monsoon or retreating monsoon season.

The normal annual rainfall of Neemuch district is 797.96mm. District received maximum rainfall during south west monsoon period i.e. June to September. About 90.5 % of the annual rainfall received during monsoon season. Only 9.5 % of the annual rainfall takes place between October to May period. Thus surplus water for ground water recharge is available only during the southwest monsoon period.

The normal maximum temperature received during the month of May is 39.8⁰ C and minimum during the month of January is 9.8⁰ C. The normal daily mean monthly maximum temperature is 31.6⁰ C and daily mean minimum temperature is 19.0⁰ C. The summer season is the driest period of the year. The relative humidity generally exceeds 87% in the month of August. The average normal annual wind velocity of the district is 9.2 km./hr.

3.0 GEOMORPHOLOGY & SOIL TYPES

Neemuch district forms the part of Malwa plateau. It can broadly be divided into two physical divisions; northern plateau consists of Vindhyan rocks and southern Malwa plateau, under trap with gentle sloping topography. The highest elevation of 573 m amsl in the district is recorded at northwestern corner of the district in Jawad tehsil, comprising of upper Vindhyan rocks. The lowest elevation in the district is recorded about 410 m amsl located near village Latwas (24° 20' – 75° 25') in Neemuch block occupied by basaltic rocks.

Almost entire district is falling under Chambal sub-basins area of the Ganga Basin. A very small area to the south west of Jiran in Neemuch block flows into Jakam a tributary of Mahi and drains into Arabian Sea. The river Chambal is flowing in eastern part of the district in northeast direction. The Retam, Idar, Erda, Rupa, Bamm, Gangali & Rajori are main tributaries of the Chambal River and all are flowing either east or northeast direction. Gambhir River flowing north of Jawad town in northwest part of the district is only westerly flowing river.

Table: Summarized data of main drainage in Neemuch district.

S.No.	Name of river	Catchment area in district (1000 ha)	Surface water availability in m ³ per sq. km area	Total volume of available water in m ³
1	Chambal	6055.11	0.458	1050.71
2	Retam	1159.87	0.0128	148.46
Total		7214.98	0.4186	119.917

The district is generally covered with black cotton soils covering almost three fourths of the area. This part is occupied by Deccan Basalts. The rest part has red-yellow mixed soils derived from sandstone, shale, and gneiss. The alluvial soils are found along the river courses. The higher elevations i.e. the hilly regions have a cover of murum, which is made up of small rounded pieces of weathered basalts. The Vindhyan and Bijawars have a thin cover of sandy loams. The alluvium is derived from hill slopes by numerous streams and watercourses.

4.0 GROUND WATER SCENARIO

4.1 Geology

The general geological successions in the district are given in table-4.

Table-4: General Geological successions of Neemuch district.

Age	Stratigraphic Unit	Lithology
Quaternary to Recent	Laterite	Ferruginous limonite
Upper Cretaceous to Lower Eocene	Deccan Trap	Basaltic lava flows
----- Unconformity -----		
Proterozoic	Upper Vindhyan	Bhander Series: Shales, limestone & sand stone Kaimur series: Sand stone & shale
----- Unconformity -----		
	Lower Vindhyan	Semri series: Nimbahera limestone & shale
----- Unconformity -----		
	Delhi System	Jhiran sand stone

4.1.1 Delhi System

Jhiran sandstones is the oldest formation of the area. These are occurring in southwest corner of the district. Cudduphas are represented by Delhi system of the rock in the area; sandstones are resembles the Kaymore sandstone to some extent and were originally described as Delhi quartzites.

4.1.2 Lower Vindhya

Nimbahera limestone & shale: Nimbahera shales of Semri series are exposed in north west part of the district in parts of Jawad block, Shales are overlain by Nimbahera limestones. Nimbahera limestones are exposed in northwest part of the district in Jawad block area overlying Nimbahera shales. Out crop are seen on Neemuch – Chittorgarh road. Nayagaon cement plant & Vikram cement are using this limestone as raw material.

4.1.3 Upper Vindhya

Kaimur series

Kaimur quartzitic sandstone and shales occurs on hills in northern part of Manasa, Neemuch and Jawad blocks.

Rewa series

Sand stone & shales occurs in northern part of Jawad block. The Rewa series unconfirmably overlying the Kaymore series. The Rewa series occurring near Rattangarh consists of sandstones & shales.

Bhander Series

Consists of Shales, limestone & sand stone, exposed in extreme northern end of the district. In Jawad block area forming small pocket.

4.1.4 Deccan Trap

Different basaltic rocks belonging to Deccan trap occupy major southern part of the district. They are northwestern extension of Malwa traps.

4.1.5 Laterite

Laterite forms capping on Deccan traps near north of Neemuch town Laterites are occurring in patches at different part of the district. These are brownish red rocks consisting essentially limonite minerals. Laterites are residual deposits formed under typical climatic conditions in tropical regions.

4.2 Hydrogeology

The general hydrogeological conditions of the district are depicted in figure-2 and formation wise settings are discussed below.

4.2.1 Sand stone

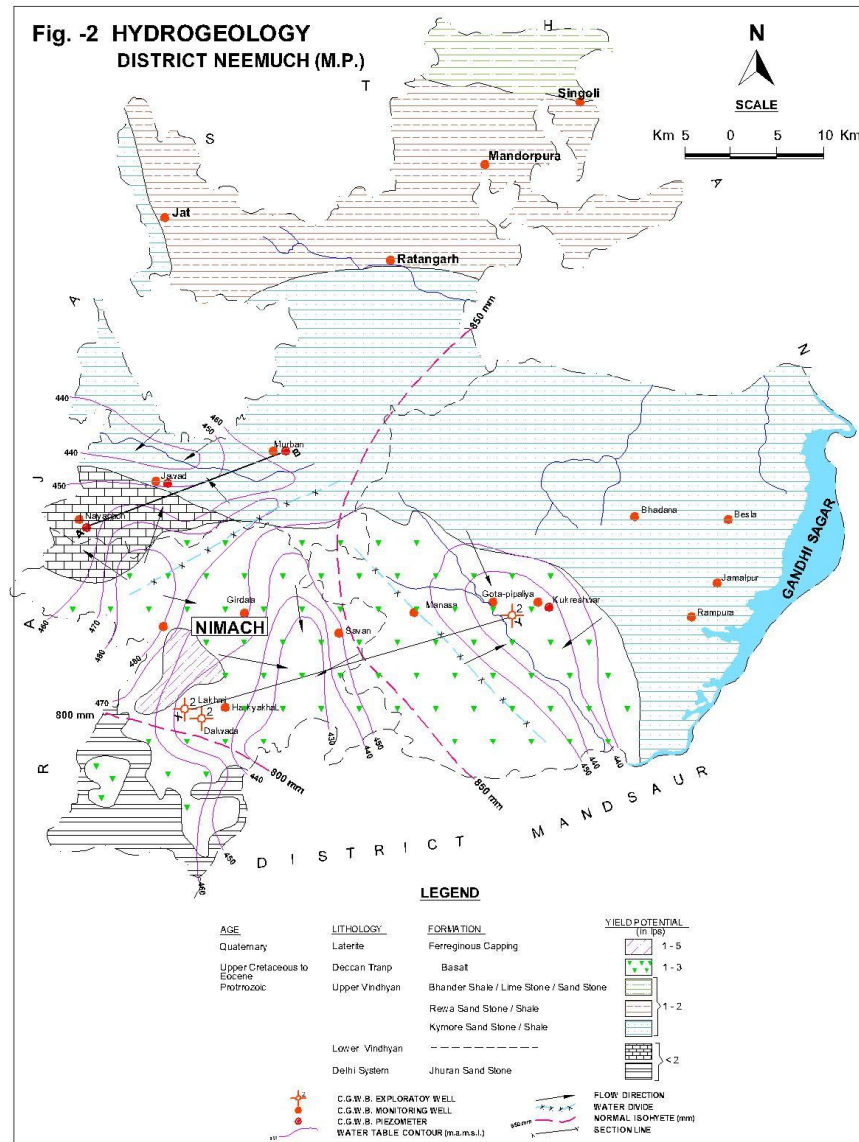
Jhiran sandstone of Delhi system is occurring in southwest corner of Neemuch block. These are forming hilly area due to differential weathering as these are hard and compact in nature and are poor aquifer, Northern part of the district is occupied by Kaymore, Rewa and Bhander series is poor repository of groundwater. In Sandstone, the joints and fractures control the occurrence of groundwater in areas located in topographical depression and

adjacent to surface water bodies. The soil and weathered profile developed on the Vindhyan is generally thin and as a result groundwater occurs at shallow depth under unconfined conditions in the areas where the rock is jointed, fractured and weathered.

4.2.2 Deccan Trap

The Deccan trap basalts occur in the district as lava flow infillings in the valleys of pre-existing Vindhyan topography. The Vindhyan sandstone show 'baking effect' due to the hot lava coming in contact with sandstones

The lava flows are mostly 'Pahoehoe' character and less of 'A_a' character. The individual lava flow range from 10 to 30 m in thickness and consist generally of two units i.e. the upper most vesicular/ amygdaloidal basalts with their weathering top portion often overlain by gray or red clay and the massive thin amygdular layer (with pipe amygdulars) towards the bottom.



Shallow groundwater occurs in the weathered, vesicular, jointed and fractured basalt under unconfined conditions. In areas where the weathered basalt layer is extensive a continuous phreatic aquifer can be traced to some distance. However, due to low permeability of weathered basalts the aquifer sustains limited groundwater withdrawal, mainly through open wells. On higher ground the weathered basalts may be thin or even absent. In such condition groundwater occurrence is restricted to the joints and fractures. The

groundwater in Deccan traps at deeper levels occurs under semi-confined to confine conditioned, at the different lava flow contacts, at Deccan trap and underlying Vindhyan contact or in the deeper jointed/fractured and vesicular amygdular basaltic horizons.

The thickness of the individual aquifers varies from a few centimeters to a few meters and is generally restricted in their regional extent. The recharge to the deep aquifers takes place from the phreatic aquifers through deep joints, faults and contact zones. The red bole horizons (clay) generally act as semi confining or confining layers for the deeper aquifers. Maximum thickness of Basalts in the district is 90.5m inferred from the CGWB exploratory well data and the yields in the area is reported low to moderate(1-5lps).

4.2.3 Laterite

Laterite forms on Deccan trap basalt near north of Neemuch town. Laterites are occurring in patches at different part of the district. These are brownish red rock consisting essentially of limonite mineral. Laterites are residual deposits formed under typical climatic conditions in tropical regions.

4.3 Water Levels

Variation of groundwater levels in an area is an important component of hydrological cycle because it is a physical reflection of aquifer systems. As the change in groundwater level is directly related to groundwater balance its continuous records provide direct information to subsurface geo-environmental changes due to withdrawal of groundwater. To monitor the seasonal and year-by-year change in quantity and quality of groundwater, CGWB has established 19 National Hydrograph Stations (Jat, Jawad, Morban, Patan, Ratangarh, Singoli, Besla, Chachaor, Gota pipaliya, Jamalpura, Kukrashwar, Kundaliya, Girdola, Harkiyakhal, Nayagaon, Neemuch, Savan & Manasa) and 4 deep Piezometers (Jawad, Kukreshwar, Morban & Nayagaon) in Neemuch district. The monitoring of groundwater levels in these wells is being done by CGWB during the month of May, August, November and January every year since seventies. It is felt that due to large-scale ground water development in the district the phreatic aquifers are being overexploited which results in erratic water level record from monitoring dug well.

4.3.1 Pre-monsoon (May 2012)

The pre-monsoon depth to water level in Neemuch district ranges between 5.3 m bgl and 18.90m bgl. Major part of the district have water level in the range of 5-12 m bgl during the pre monsoon.

4.3.2 Post-monsoon (November 2012)

During post-monsoon period, water level varies from 1.15m bgl to 22.75m bgl. In major part of the district, water level lies between 3 & 10 m bgl.

4.3.3 Groundwater level trend (May 2003 to May 2012)

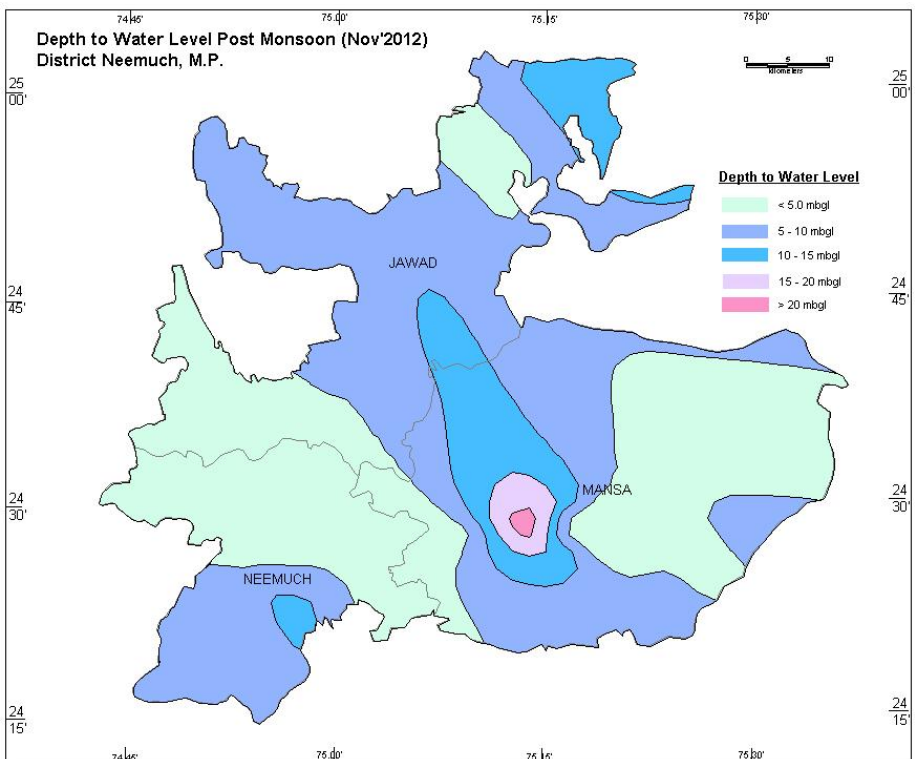
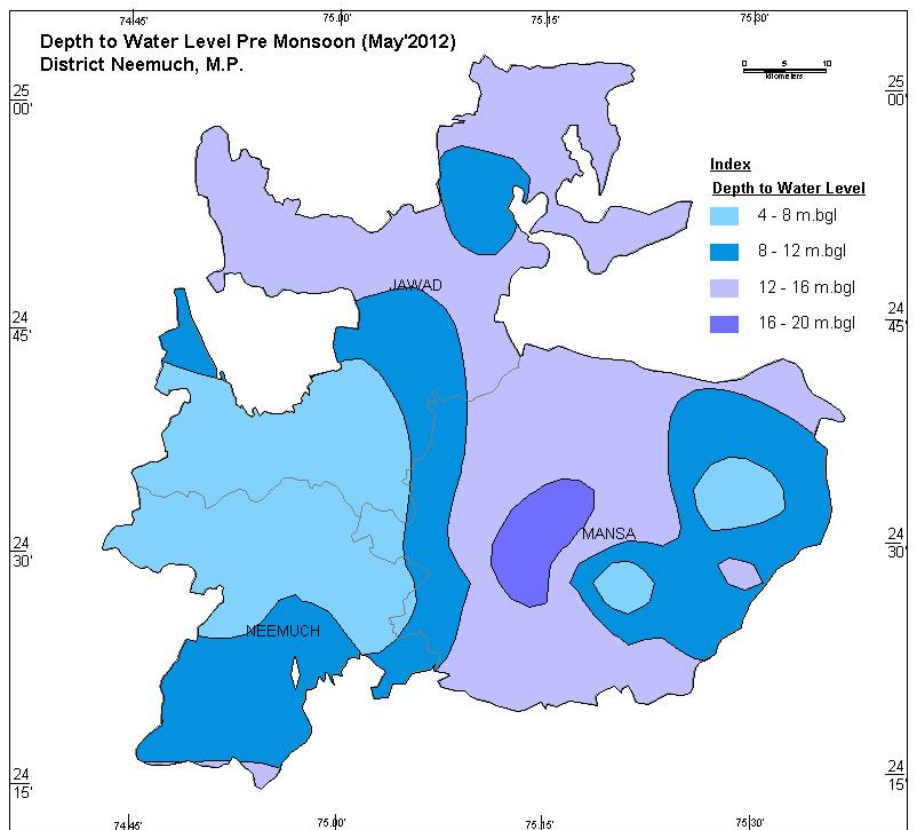
Analyses of Groundwater level data of pre-monsoon period indicate that there is declining trend in the range of 0.19 - 0.48 m/yr.

4.4 Ground Water Exploration

The exploratory drilling has been carried out in the district and drilled 4 exploratory wells & 14 piezometers in the Deccan.

Aquifer Parameters

In Basalt, the vesicular, weathered and fractured basalt form the aquifers while in Vindhyan, fractured sandstones are aquifer. The exploratory wells have been drilled down to the maximum depth of 19.6 m bgl and yields up to 2.17 lps discharge. The piezometers were restricted to the depth range of 82.4m, 101 m and 120 m bgl only. The aquifer parameters of Neemuch district were not determined exactly due to low yield.



4.5 Ground Water Resources

Neemuch district is underlain by mainly Basaltic lava flows of Deccan trap. Dynamic ground water resources of the district have been estimated for base year -2008/09 on block-wise basis. Out of 4,00,044 ha of geographical

area, 3,75,744 ha (96 %) is ground water recharge worthy area and 24,300 ha (4 %) is hilly area. There are three number of assessment units (block) in the district which fall under non-command. Neemuch, (over exploited in 2003/04) Jawad (semi critical in 2003/04) blocks of the district are categorized as semi critical and Manasa (same in 2003/04) as safe.

Table: Groundwater availability & stage of development (2009)

District/ Assessment Unit	Sub-unit Command/ Non-Command/	Net Annual Ground water Availability (ham)	Existing Gross Ground water Draft for Irrigation (ham)	Existing Gross Ground water Draft for Domestic & Industrial water Supply (ham)	Existing Gross Ground water Draft for All uses (11+12) (ham)	Provision for domestic, and industrial requirement supply to next 25 year (2033) (ham)	Net Ground water Availability for future irrigation d development (ham)	Stage of Ground water Development {(13/10)*100} (%)	Category
Jawad	Command								
	Non-Command	9894	9361	477	9839	477	56	99	Semi-critical
	Block Total	9894	9361	477	9839	478	55	99	Semi-critical
Manasa	Command								
	Non-Command	17236	9497	519	10017	734	7004	58	Safe
	Block Total	17236	9497	519	10017	734	7004	58	Safe
Neemuch	Command								
	Non-Command	12003	11134	682	11816	682	187	98	Semi-critical
	Block Total	12003	11134	682	11816	682	187	98	Semi-critical
	District Total	39133	29993	1678	31672	1894	7246	81	

The highest stage of ground water development is computed as 100. % in Jawad block. The net ground water availability in the district is 39,133ham and ground water draft for all uses is 31,672 ham, making stage of ground water development 81 % (92 % in 2004) as a whole for district. After making allocation for future domestic and industrial supply for next 25 years, balance available ground water for future irrigation would be 7246 ham.

4.6 Ground Water Quality

Groundwater quality of Neemuch district assessed by Central Ground Water Board based on sample collected from Hydrograph stations in the district. Ground water in the district is generally low to medium saline as the Electrical conductivity value varies between 361 to 4040 μ S/cm at 25° C. Constituent like chloride, Sulphate, calcium and magnesium were within the safe limits of drinking water as per BIS standards. Nitrate in the groundwater of Neemuch district is varying between 2 to 280 ppm. Fluoride in the district is generally below 1.5 mg/l. No arsenic has been detected in the district.