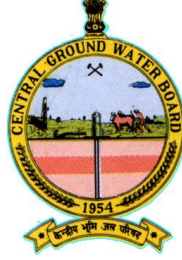


# DISTRICT GROUND WATER INFORMATION BOOKLET



## AIIRAJPUR DISTRICT MADHYA PRADESH



**Ministry of Water Resources**

**Central Ground Water Board**

**North Central Region**

**BHOPAL**

**2013**

## ALIRAJPUR DISTRICT PROFILE

S.No.	Items	Statistics	
1.	<b>General Information</b>		
	i) Geographical area	3318 Sq km	
	ii) Administrative Divisions Number of Tehsil/Blocks Number of Villages	3/6 544	
	iii) Population (Census 2011)	728,677	
	iv) Normal Rainfall (mm)	912.8	
2.	<b>Geomorphology</b>		
	1. Major Physiographic Units:	i. Denudational hills of Granites ii. Extension of Malwa plateau iii. Pediments over Traps, Lameta and Granites	
	2. Major Drainage:	i. Mahi River & Anas River ii. Narmada River & its tributaries Hatni, Orsang & Bagh Rivers	
3.	<b>Land Use</b>		('000 ha)
	a) Forest area d) Net area sown f) Gross cropped area	131.7 359.46 414.139	
4.	<b>Major Soil Types</b>		Alluvium, black cotton soil and sandy soil
5.	<b>Principal Crops</b>		a) Soyabean b) Gram c) Maize d) Wheat e) Jowar f) Rice g) Urad h) Cotton i) Groundnut
6.	<b>Irrigation by Different Sources</b>		No.      Area irrigated ('000ha')
	Dug wells Tube wells/Bore wells Tanks/Ponds Canals Other Sources Net Irrigated Area Gross Irrigated Area	11441 954 307 170 - - -	11.132 .721 5.682 4.773 11.449 31.639 33.757

7.	<b>Number Of Ground Water Monitoring Wells of CGWB (As on 31.3.2013)</b>	
	Number of Dug Wells	9
	Number of Piezometers	2
8	<b>Predominant Geological Formations</b>	Recent alluvium, Deccan Trap basalts, Bagh Beds and Archaeans Granites.
9	<b>Hydrogeology</b>	
	Major Water Bearing Formation	Sandy alluvium, Weathered/vesicular basalt, Sand and Limestone of Lameta beds and Weathered and fractured Granites.
	Pre-monsoon depth to water level during 2012	3.45-14.95 m bgl
	Post-monsoon depth to water level during 2012	2.00 – 11.10 m bgl
	Long-term water level trend in 10 years (2003-2012) cm/year	1.26 to 18.93 (Rise)
10.	<b>Ground Water Exploration By CGWB (As on 31.3.2013)</b>	
	No of wells drilled (EW, OW, PZ, Total)	(EW-15, OW-15 Pz -2)
	Depth Range	68.75 – 213.27 m. bgl
	Discharge	Meager – 400 lpm
	Specific Capacity	-
	Transmissivity	-
11.	<b>Ground Water Quality</b>	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC (646-1545) $\mu\text{s/cm}$ at 25 <sup>0</sup> C Nitrate-5.6-198 mg/l F (0.39-0.98) mg/l
12	<b>Dynamic Ground Water Resources (2009)</b>	
	(MCM)	
	Net Annual Ground Water Availability	201.48
	Gross Ground Water Draft	54.28
	Projected Demand for Domestic and Industrial uses up to 2035	28.46
	Stage of Ground Water Development	27%
13	<b>Awareness and Training Activity</b>	
	Mass Awareness Programme Organised	Nil
	Water Management Training Programme	Nil
14	<b>Efforts of Artificial Recharge &amp; Rainwater Harvesting</b>	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Technology Mission on drinking water
15	<b>Ground Water Control and Regulation</b>	
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Notified Blocks	Nil
		All blocks are under safe category
16	<b>Major Ground Water Problems and Issues</b>	Fluoride contamination in Ground Water

## **1.0 INTRODUCTION**

Alirajpur district derived its name from Alirajpur State, formerly a princely state of India, under the Bhopawar Agency in Central India. It lies in the Malwa region of Madhya Pradesh, near the border with Gujarat and Maharashtra. The district is hilly, and consists of tribal people as majority of population who live in small villages near Alirajpur. However, the towns population mainly consists of general people. It was under British administration from time to time. The Victoria Bridge at Alirajpur was built to commemorate the Diamond Jubilee in 1897. The Rajwara fort is situated in the centre of the town attached with a beautiful playground known as Fateh Club. Alirajpur is also the hub for dolomite business.

According to the 2011 census Alirajpur district has a population of 728,677, roughly equal to the nation of Bhutan or the US state of Alaska. The district has a population density of 229 inhabitants per square kilometre (590 /sq mi). Its population growth rate over the decade 2001–2011 was 19.4 per cent. Alirajpur has a sex ratio of 1,009 females for every 1,000 males, and a literacy rate of 37.22 per cent, the lowest in India.

### **1.1 Divisions**

This district comprises three tehsils: Alirajpur, Jobat and Bhabra.

### **1.2 Communications:**

Alirajpur is connected to Dohad station of Western Railway on Ratlam-Baroda Section by 70 km. and 65 km. long all weather roads respectively. Jobat is also connected to Meghnagar station of Western Railway on the same section by 80 km. all weather road. Alirajpur is 33 km. from Jobat and from Indore by 135 km.

### **1.3 Topography:**

The area included extremely hilly area comprising number of parallel ranges rising abruptly from the level ground. The area is undulating with a number of small hillocks rising 10 to 30 m. above the surrounding country. The highest point here is 1430 ft. above M.S.L.

### **1.4 Drainage:**

The Orsang river flows in a southerly direction, Hatni river has south-easterly flow and Dohi River has southerly course along with most of their tributaries. Areas has a general slope towards south.

## **2.0 RAINFALL AND CLIMATE**

Climate is generally moderate and seasons are well defined. The summers are hot, winters are short and the monsoon season is generally pleasant. The average annual rainfall in the district is about 912.8mm. Most of the rainfall occurs in monsoon season while there is also a little of rainfall in winter season.

A hot summer and general dryness characterize the climate of Alirajpur district, except during 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 middle of June is the hot 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 temperature starts rising from the beginning of February and reaching maximum in the month of May. The normal annual mean maximum temperature is 32.8<sup>0</sup>C and normal annual mean minimum temperature is 19.1<sup>0</sup>C.

### 3.0 GEOMORPHOLOGY & SOIL TYPES

Alirajpur district is mainly a hilly region covered with a chain of hills known as “The Vindhyaachal” which extends northwards towards Udaipur in Rajasthan. The maximum density of the hills is in the southern part of the district in Alirajpur tehsil. The maximum elevation of 777 m. amsl is recorded near Mathwar village in Sondwa block. The general trends of the hills are in east-west direction.

Alirajpur district lies in the major basins, the Mahi in the north and the Narmada in the south. The Narmada River forms the southern boundary of the district with a westerly flow of water. The major tributaries having their confluence with the Narmada are Hatni, Ankhar, Sukar, Orsang, Heran, Kara and Bagh. Narmada River, 50 km long in the district, along with its tributaries drains 48% of the geographical area.

### 4.0 GEOLOGY

The area forms a part of the south-eastern extension of the Archaeans of Rajasthan. The Archaean group is overlain unconformably by Cretaceous sedimentary deposits. A major part of the area included is covered by granites and the other types such as dolomitic marble and granulites and the other types occupied by chlorite and other schists, granites and associated gneisses and sedimentaries (Bagh beds ?)

The stratigraphic sequence worked out in the area is presented below:

Cretaceous	Bagh (?) Beds	Limestone (highly siliceous and fossiliferous) Grits and sandstone (often calcareous and ferruginous. Conglomerate
-----Unconformity-----		
	Intrusives	Dolerites Pegmatite and Quartz veins. Migmatites. Granites Amphibolites and granulites.
Archaeans	Metasediments	Quartzites Calciphyres Dolomitic Marbles Chlorite schists often garnetiferous. Talc chlorite schists Graphite schists

### 4.1 Hydrogeology

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

#### 4.1.1 Archaeans

The Archaean group of rocks is exposed in the central, northwestern parts of the district. The groundwater generally occurs under phreatic conditions in the weathered, jointed and

fractured horizons of different rock units. The pink and grey granites are exposed mainly in Alirajpur tehsil are generally hard and compact and are poorly permeable rocks. The gneissic granites are susceptible to weathering with jointed and fractured zones extending about 5 to 15 m below ground level. The occurrence of groundwater in the granites and gneissic granites depend on the depth of weathering. The phyllites and schist are moderately permeable. The occurrence of groundwater is dependant on the intensity of fractures and disposition of foliation planes. The dolomitic marble and limestone occurring as bands, generally occurring occupy small hill ranges and as such their geographic locations is unfavorable for ground water development. Krastic limestone supports good yields from phreatic aquifer.

#### ***4.1.2 Lameta and Bagh Beds***

Overlying unconformably the Archaeans, are the infra-trappean represented by the Lameta and the Bagh beds. The main exposures are seen in the southeastern and central parts of the district. The outcrops occur in widely separated patches and the litho-stratigraphy differs from place to place. In general, the rock units lower arenaceous and upper calcareous facies. Nimar sandstone, the basal units of the Bagh beds in the area are horizontally bedded and compact in nature with an average thickness of 12 to 18 meters. Though hard and compact, they are well jointed and fractured and act as groundwater repository. Nimar sandstone is overlain by nodular limestone and coralline limestone. The groundwater occurs generally under phreatic conditions in the Intra-trappean sandstone and limestone. Limestone Solution activities these rocks act as promising horizons for groundwater storage. Dug wells tapping the Bagh beds in the lower elevation generally give good discharge. The Intra-trappean beds underlying the Deccan traps when encountered during drilling exhibit confined /semi confined conditions.

#### ***4.1.3 Deccan Traps***

The northern and north western parts of the district covering mainly Thandla, Petlawad and Rama blocks and southern parts covered by Sondwa block are occupied by the basaltic lava flows of Cretaceous to Eocene age. More than 12 number lava flows have been demarcated in the district with average thickness of flow being 25-30 m. The bottom most parts of the flows are generally massive, hard and compact in nature. They often show columnar jointing and spheroidal weathering. The overlying vesicular basalts comprise has rounded to oval shaped vesicle, which is generally filled, with zeolites, calcite and quartz. Vesicular horizons are limited in thickness or absent there by reducing the chances of the good aquifer for the storage for groundwater storage. The weathered zones, joints, fracture and vesicular zones form the main water bearing horizons. The open dug well located in the geographic low often yields 50-100 m<sup>3</sup>/day. The bore well tapping different vesicular horizons yield moderate quantity of water (100-200 m<sup>3</sup>/day).

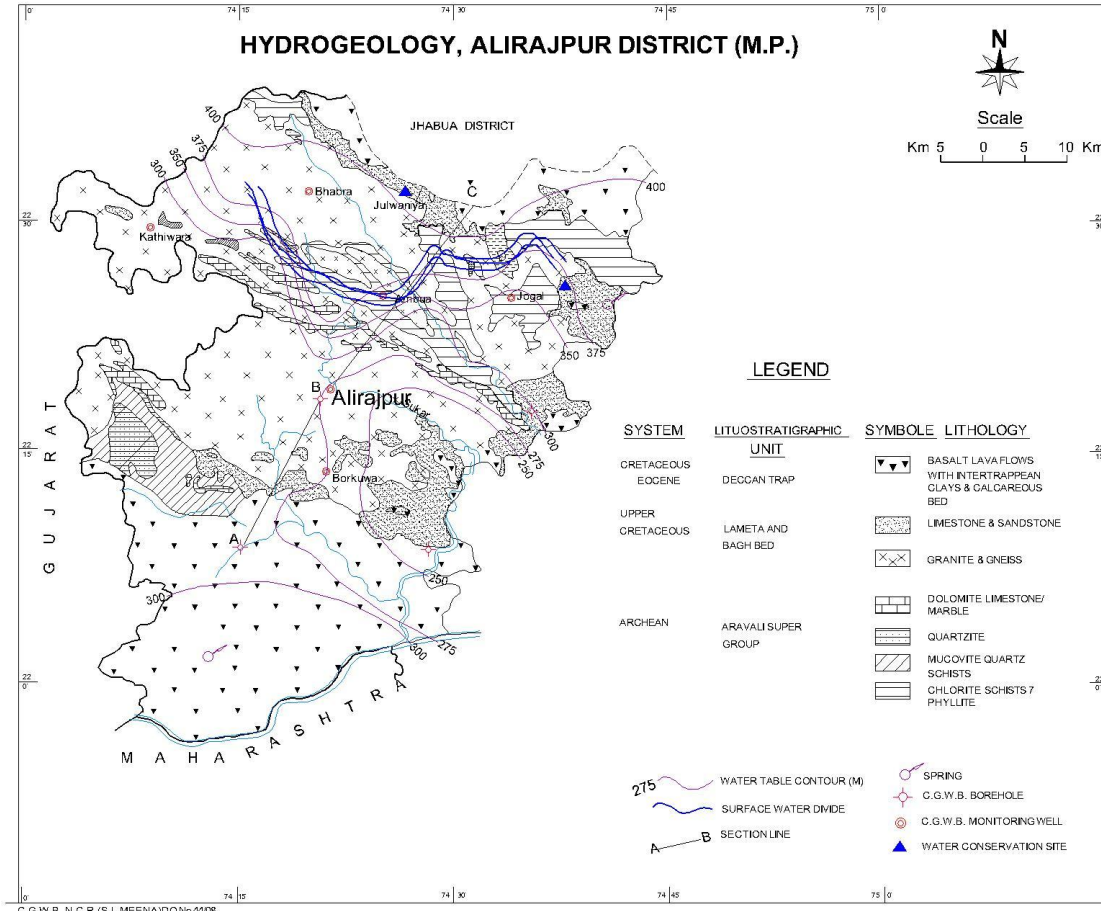
#### ***4.1.4 Alluvium and Laterite***

Localized patches of alluvium cover occur along the banks of major and minor rivers and streams in the district. In general it is difficult to differentiate between alluvium and product of black cotton soil underlain by yellow clay with kankar. The thickness of alluvium varies from few meters to 15 m. Laterite capping on top of Deccan trap basalt are seen in localized patches. The rocks are generally bouldery in nature, highly ferruginous and weathered to yellowish red soil.

The groundwater resources of the area are poor. Only those wells situated very close to some rivulet or river or near the contact of different rock types receive their recharge through out the year. A part of the recharged water passes off as seepages. Thus the only source of water in the area is the gravel and sand accumulations in the stream beds.

## 4.2 Aquifer Parameters

The exploratory drilling has been carried out in areas occupied by Deccan Trap basalt underlain by Lameta limestone and granite and gneissic rocks. The vesicular, weathered and fractured basalt form the aquifers while in Granites and gneissic rocks weathering and fractures forms aquifer. These exploratory wells have been drilled down to the maximum depth of 213.27 m bgl and their yields have been recorded.

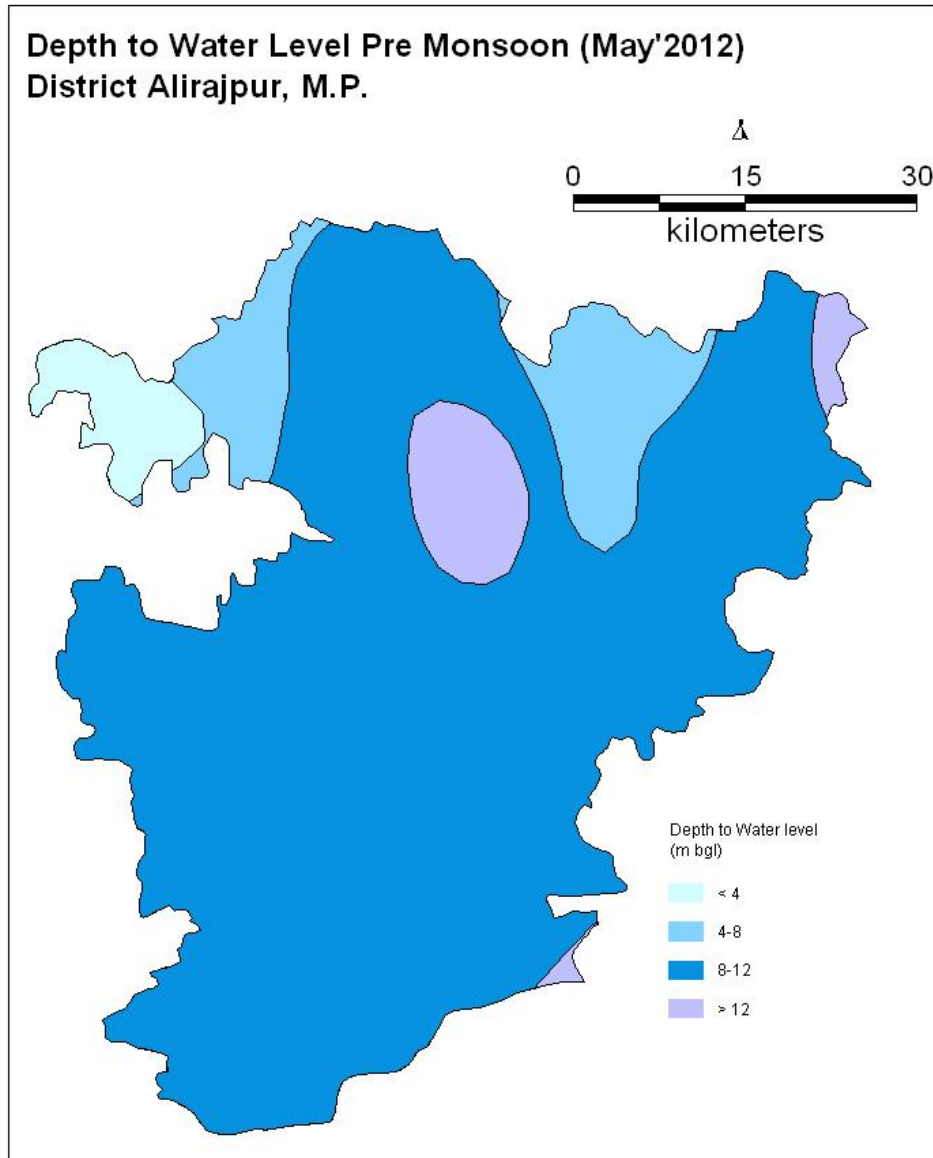


## 4.3 Ground Water Levels

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 and its continuous records provide direct information of subsurface geo-environmental changes due to withdrawal of groundwater. To monitor the seasonal and annual change in quantity and quality of groundwater, CGWB has established 9 Ground Water Monitoring Wells and 2 Piezometers in entire Alirajpur district. The monitoring of groundwater levels in these wells is being carried out by CGWB during the month of May, August, November and January. The brief details of groundwater level in Alirajpur district for the year 2012 are being discussed below:

#### 4.3.1 Pre-monsoon (May 2012)

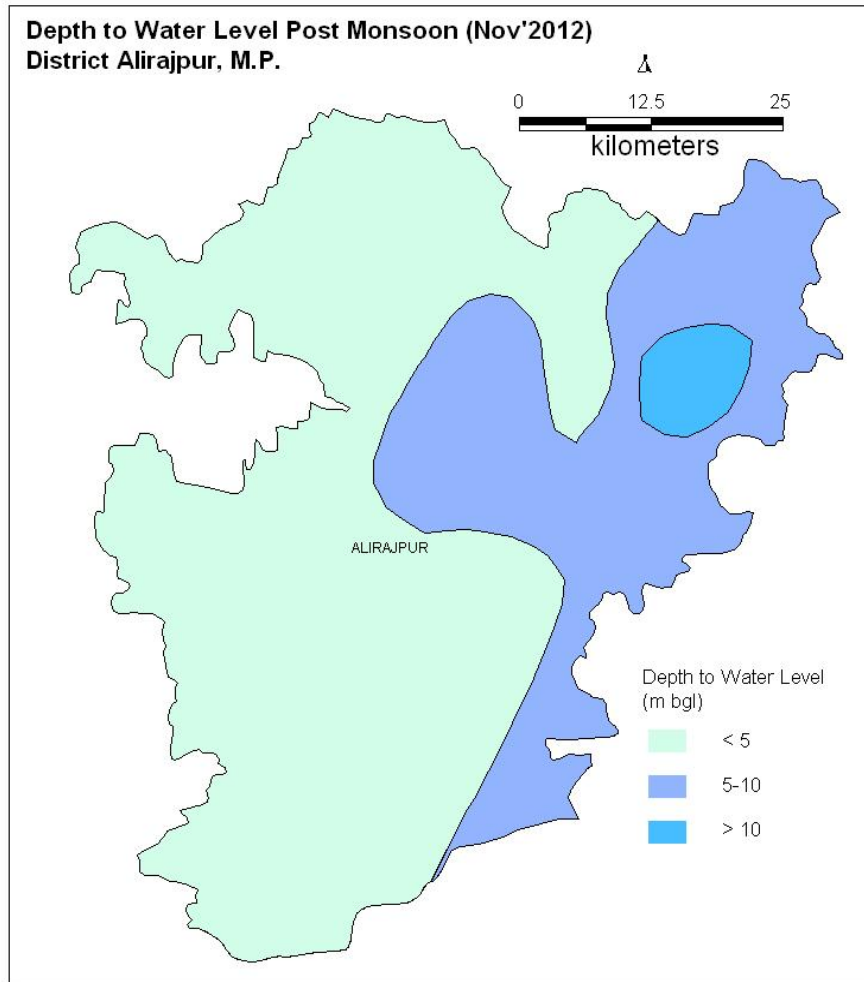
The pre-monsoon, during May 2012 depth to water level ranges from 3.45 to 14.95 m bgl. However, in major part the DTW ranges between 8 and 12 mbgl. Small patch of deeper water levels of more than 12 mbgl is observed in north-eastern part.



#### 4.3.2 Post-monsoon (November 2012)

During post-monsoon period, November 2012, the water level ranges from 2.00m bgl to 11.10 m bgl .





In general, shallow water levels of less than 5 mbgl are observed in western part and deeper water levels are observed in western part. In major part of eastern area the DTW ranges between 5 and 10 mbgl. Deeper water levels of more than 10 mbgl are observed in isolated patches in eastern part.

#### ***4.3.3 Ground Water level trend (November 2003 to November 2012)***

Analyses of ground water level data of post-monsoon period indicate that there is rising trend in water level in entire district. In general 1.26 to 18.93 cm/year water level rise has been observed in the district.

#### **4.4 Ground Water Resources:**

All block of Alirajpur districts are come under safe category. The Net annual ground water availability in the Alirajpur district is 201.48 MCM and ground water draft from all uses is 54.28 MCM. Net ground water available for future irrigation use is 139.94 MCM and the stage of Ground water development is 27%.

Table-1. Ground water availability and stage of development in Alirajpur district

ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF MADHYA PRADESH									
Type of Assessment Unit : Block (As on March, 2009)									
S. No.	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} (%)
<b>1</b>	<b>Alirajpur</b>								
	Alirajpur	Command	-	-	-	-	-	-	-
		Non-Command	5024	653	715	1368	946	3425	27
		Block Total	<b>5024</b>	<b>653</b>	<b>715</b>	<b>1368</b>	<b>946</b>	<b>3425</b>	<b>27</b>
	Bhabra	Command	-	-	-	-	-	-	-
		Non-Command	1900	716	224	940	378	806	49
		Block Total	<b>1900</b>	<b>716</b>	<b>224</b>	<b>940</b>	<b>378</b>	<b>806</b>	<b>49</b>
	Jobat	Command	-	-	-	-	-	-	-
		Non-Command	2109	694	154	848	254	1161	40
		Block Total	<b>2109</b>	<b>694</b>	<b>154</b>	<b>848</b>	<b>254</b>	<b>1161</b>	<b>40</b>
	Kathiwada	Command	-	-	-	-	-	-	-
		Non-Command	2768	245	519	764	689	1834	28
		Block Total	<b>2768</b>	<b>245</b>	<b>519</b>	<b>764</b>	<b>689</b>	<b>1834</b>	<b>28</b>
	Sondwa	Command	-	-	-	-	-	-	-
		Non-Command	6107	608	278	886	349	5151	15
		Block Total	<b>6107</b>	<b>608</b>	<b>278</b>	<b>886</b>	<b>349</b>	<b>5151</b>	<b>15</b>
	Udaygarh	Command	-	-	-	-	-	-	-
		Non-Command	2240	391	230	622	231	1617	28
		Block Total	<b>2240</b>	<b>391</b>	<b>230</b>	<b>622</b>	<b>231</b>	<b>1617</b>	<b>28</b>
		<b>District Total</b>	<b>20148</b>	<b>3308</b>	<b>2121</b>	<b>5428</b>	<b>2846</b>	<b>13994</b>	<b>27</b>

#### 4.6 Ground Water Quality

Ground water quality of Alirajpur district is being assessed annually by CGWB on the basis of analysis of ground water samples collected from 9 number of hydrograph stations in the district.

The electrical conductivity (EC) is a measure of total dissolved solids and hence of salinity. EC range from 646 to 1545  $\mu\text{S}/\text{cm}$  at 25  $^{\circ}\text{C}$ . The nitrate concentration ranges from 5.6 to 198 mg/l. The fluoride concentration in the district ranges between 0.39 to 0.98 mg/l. There is no problem of excess fluoride in the shallow ground water of the district.