DISTRICT GROUND WATER INFORMATION BOOKLET

UJJAIN DISTRICT

MADHYA PRADESH

Ministry of Water Resources

Central Ground Water Board

North Central Region

Government of India

BHOPAL

2013

UJJAIN DISTRICT PROFILE

S.No.	Items	Statistics	
1.	**General Information**		
	i) Geographical area	613023 ha	
	ii) Administrative Divisions Number of Tehsil/Blocks Number of Panchayats Number of Villages	 07/06 612 1117	
	iii) Population (Census 2011)	1,986,597	
	iv) Normal Rainfall	914.5 mm	
2.	**Geomorphology**		
	1. Major Physiographic Units:	i. Malwa plateau	
	2. Major Drainage:	**Ganga Basin** I. Kshipra River II. Chhoti Kali Sindh III. Gambhir River IV. Chamla River	
3.	**Land Use**	('000ha)	
	a) Forest area b) Cultivable area c) Net area sown	3.1 489.025 489.1	
4.	**Major Soil Types**	Black cotton soil and Regur (Red and Yellow)	
5.	**Principal Crops**	Soyabean, Gram, Wheat	
6.	**Irrigation by Different Sources**	No.	Area irrigated ('000ha)
	Dug wells Tube wells/Bore wells Tanks/Ponds Canals Other Sources Net Irrigated Area Gross irrigated area	33390 47753 43 34 - - -	44.26 131.27 0.92 3.57 19.77 199.8 199.8
7.	**Number 0f Ground Water Monitoring Wells of CGWB (As on 31.3.2013)**		
	Number of Dug Wells Number of Piezometers	19 26	
8	**Predominant Geological Formations**	1. Alluvium 2. Deccan Trap basalts	
9	**Hydrogeology**		

	Major Water Bearing Formation	Alluvium Weathered, vesicular and fractured basalt.
	Pre-monsoon depth to water level range during 2012	5.05 to 30.99 m bgl
	Post-monsoon depth to water level range during 2012	0.80 to 10.48 mbgl
	Long-term water level trend in 10 years (2003-2012)	0.08 to 0.12 m/yr (fall)
10.	**Ground Water Exploration By CGWB (As on 31.3.2013)**	
	No of wells drilled (EW, OW, PZ, Total)	(EW-39, OW-30, PZ-31)
	Depth Range	116.6 to 203.45 m. bgl
	Discharge	0.3 to 20.5 lps
	Specific Capacity	-
	Transmissivity	-
11.	**Ground Water Quality**	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC -707to 3680 µs/cm at 25^0C. Nitrate- 22 to 113 Flouride-0.45 to 1.88
12	**Dynamic Ground Water Resources (2009)**	ham
	Net Annual Ground Water availability	81209
	Existing Gross Ground Water Draft	80079
	Projected Demand for Domestic and Industrial uses up to 25 years	3764
	Stage of Ground Water Development	99%
13	**Awareness and Training Activity**	
	Mass Awareness Programme Organised	Two
	Water Management Training Programme	One
14	**Efforts of Artificial Recharge & Rainwater Harvesting**	
	Projects completed by CGWB	Nil
	Projects under technical guidance of CGWB	Artificial Recharge through Dug well Artificial Recharge under Central Sector scheme in Narwar watershed Artificial recharge through recharge Shaft in Shipra Watershed
15	**Ground Water Control and Regulation**	
	Number of Over-Exploited Blocks	3, Ujjain, Ghatia and Badnagar
	Number of Semi-Critical Blocks	2, Mahidpur and Khachrod
	Number of Safe Blocks	1, Tarana
16	**Major Groundwater Problems and Issues**	1. Depletion of groundwater levels, 2. Over- Exploitation of G.W. 2. Quality of groundwater at Nagda

1.0 INTRODUCTION

Ujjain district is situated in the northwestern part of Madhya Pradesh. It is located in the heart of Malwa Plateau and is a pilgrim city. The district is bounded in the north by Mandsaur and Shajapur district, on the south by Indore and Dewas district, on the west by Dhar and Ujjain district and again by Dewas and Shajapur district in the east. The district area extends between the parallels of latitude 22^0 50' and 23^0 46' North and between the meridians of longitude 75^0 08' and 76^0 16' East, and is falling in the Survey of India Topo Sheet No. 46M, 46N and 55 A. Ujjain district is mainly agriculture-based district and its cropping pattern is diversified. The district is well connected by roads and rail.

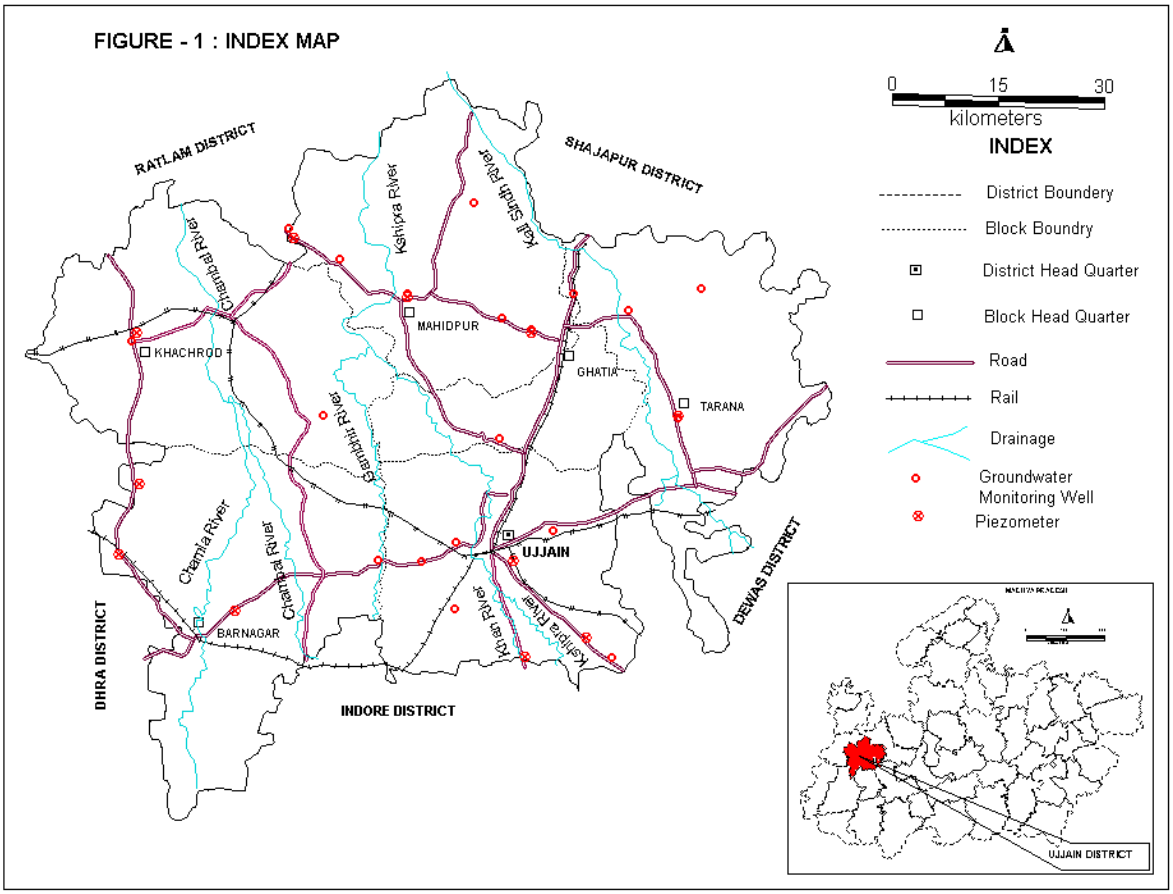
The total geographical area of the district is 6,130.23 Sq. Km and divided in seven tehsil and six blocks with a population of 1,986,597 as per census 2011. The details of administrative units are given in Table.

Table: Administrative units of Ujjain district, Madhya Pradesh.

S.No	**Tehsil**	Area in Sq Km	No. of	No. of	No. of
S.No	**Block**	Area in Sq Km	Villages	Panchayats	Panchayats
1	Badnagar	1229.50	187	107	1
1	Badnagar	1229.50	187	107	1
2	Khachrod	636.12	109	130	1
2	Khachrod	1233.10	109	130	1
3	Nagda	650.98	109	-	-
3	Mahidpur	1133.56	222	120	1
4	Mahidpur	1137.30	222	120	1
4	Tarana	1040.03	211	110	1
5	Tarana	1041.10	211	110	1
5	Ujjain	671.28	130	76	1
6	Ujjain	782.60	130	76	1
6	Ghatia	612.55	128	69	1
7	Ghatia	612.55	128	69	1

Drainage

Entire Ujjain district falls in Ganga basin. The main river of the district is Chambal River whose tributaries are the Kshipra, Chhoti Kalisindh, Gambhir and Chamla River. The main river Chambal originates from a place known as Janapaspur at an elevation of 854 m above mean sea level in the Indore district. The left bank tributaries of Chambal River are Bageri join the Chambal River Nagda and Kurel River near Uri. The Chamla River originating from Dhar district join Chambal River near Piploda Sagoti Mata in Khachrod tehsil. Kshipra River originates from Kokri Bardi hill, which about 11 km southeast of Indore. Kha n Rive r joins Cha mba l Rive r near Ujjai n and Ga mbh ir Rive r near Mah idpu r. The drai nag e system of Ujjain district has been depicted in the.



Irrigation

The irrigation facilities in Ujjain district are moderate. Surface water irrigation in the district is in the developing stage. Groundwater is the main source of irrigation in the district. There are 33,390 open wells and 47,753 bore wells in the district for irrigation.

Central Ground Water Board (CGWB) activities

- S/Shri Venkat Gopal, Asst. Hydrogeologist, and N. Ranga Rao Jr. Hydrogeologist conducted systematic hydrogeological surveys in Ujjain district during 1988-89.

- S/Shri Parvinder Singh, Jr. Hydrogeologist and M. L. Parmar Asst. Hydrogeologist conducted Reappraisal Hydrogeological surveys in Ujjain district during 1995-96.
- S/Shri M. L. Parmar, Jr. Hydrogeologist and D. K. Rai Jr. Hydrogeologist attended exploratory drilling in the district during the year 1997-98.

- S/Shri Rakesh Singh, Asst. Hydrogeologist, attended exploratory drilling in the district during the year 1998-2000.

- During the ground water exploration in Ujjain district a total 24 number of exploratory well has been drilled.

- S/Shri Pratul Saxena, Jr. Hydrogeologist and S. K. Srivastava, Asst. Hydrogeologist carried out ground water management studies in the district during the year 2005-06.

- S/Shri Pratul Saxena, Jr. Hydrogeologist and M. L. Parmar, Jr. Hydrogeologist carried out ground water management studies in the district during the year 2005-06.

- Under accelerated exploratory drilling 10 numbers of exploratory wells were drilled in Ujjain district for water supply. The exploration work was carried out by S/Shri Pratul Saxena, Jr. Hydrogeologist and M. L. Parmar Jr. Hydrogeologist

- Under the World Bank assisted Hydrology Project 3 shallow piezometer and 11 deep piezometers had been constructed in Ujjain district.

2.0 RAINFALL AND CLIMATE

The normal annual rainfall of Ujjain district is 914.5 mm. Ujjain district receive maximum rainfall during southwest monsoon period i.e. June to November. About 92.1% of annual rainfall is received during monsoon season. The surplus water for groundwater recharge is available only during the southwest monsoon period

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1 Geomorphology

The district lies on Malwa Plateau at a general elevation of 500 meter above mean sea level. The variation in altitude ranges from 450 m above mean sea level to in the north to 558 m above mean sea level in the south. On the whole the area is a broad undulating plateau with no marked hill ranges. The general slope is from south to north marked by a number of small rivers, which latter joins the Chambal River.

3.2 Soils

Black cotton soils with heavy to light texture are found in the whole area. Light textured silty ‘Kankar’ and admixtures of clay in the form of alluvium occur along the bank of major streams. The district faces considerable problem of soil erosion, which is aided and abetted by faulty forming practices and also by natural agents like wind and water.

4.0 GROUNDWATER SCENARIO

4.1 Hydrogeology

Deccan Trap basaltic rock occupies the entire Ujjain district. The different flows of basaltic rock are mostly of ‘Aa’ type but pahoehoe and intermediate type are also present.

The soft amygdaloidal varieties usually occupy the flanks and valley floors. Geodes with chalcedony, zeolites, agate and calcite are found in amygdaloidal trap. At time basalts are porphyritic and exhibits lath shaped phenocrysts of feldspar. The traps are invariably jointed. Vertical and inclined joints are also present. The trends of major joints are approximately NW-SE and NE-SW. The low knolls, elongated mounds erected ridges as seen from Marooda to Kanchankheri via Khachrod around Gopalpur, Dhanoria to Nagpura (Mahidpur block) appear to be formed by dykes.

Weathering of basalt in initial stage has given rise to pale brown fragmented material with admixture of brownish yellow or pale yellow soil but with intensive weathering yellowish brown and black cotton soil. Usually the “Red bole” and vesicular basalt are prone to weathering and give rise extensive black cotton soil. These black cotton soil vary in thickness from a few centimetres to as much as 60 to 90 centimetres and are normally underlain with ‘Kankar”.

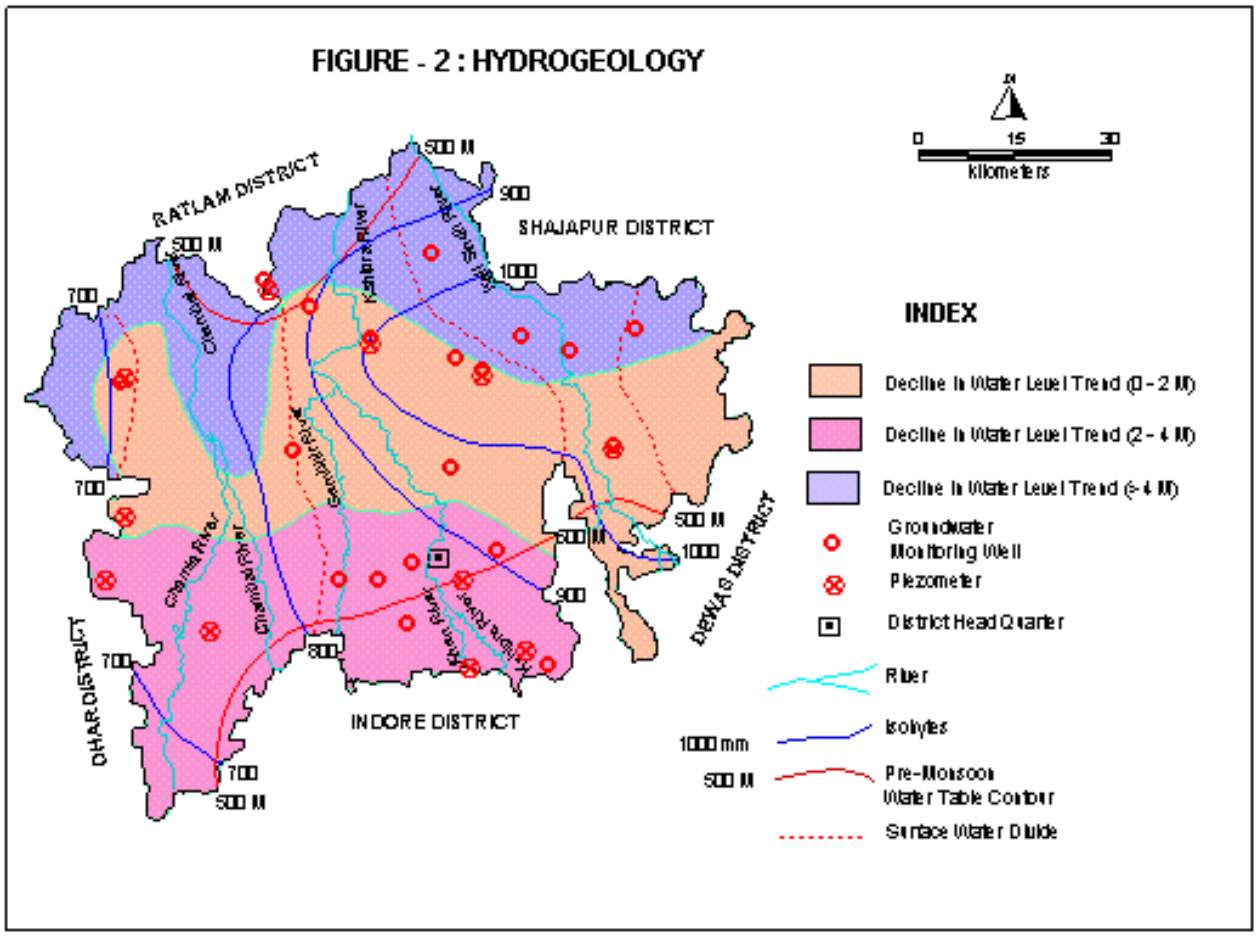
The various flows of basalts are at times inter bedded with fossiliferous inter-trappean. At places alluvium is found in the valley and stream course of Kshipra and Chambal Rivers. Geological Survey of India has mapped these lava flows are presented in Table.

Table: Elevation of basaltic lava Flows in Ujjain district

Flow No.	Elevation above mean sea level	Thickness of flow (m)	Occurrence and characteristic
5	534.84	-	Top weathered and under lying by red bole. Exposed near Barra Dhoulagiri, Umaria etc. Weathered zeolotic zone act as an aquifer.
4	503.0 - 534.84	31.84	Flow 4-cover maximum area of the district. It is amygdaloidal in nature and filled with secondary minerals and at bottom of this flow shows columnar joints.
3	457.73 - 483.0	25.27	Characterised by weathered vesicular basalt, vesicle filled with zeolites and calcite. Shows spheroidal weathering and are found as scattered hills exposed along Kshipra. Joints form the aquifer.
2	430.0 - 457.0	27.00	Big boulder on its top and boulder are vesicular and jointed. This flow has very promising water bearing zone, seen on Tarana-Ghosla road and hillock near tukrol village.
1	450 - 423	27.00	Out crops exposed at elevation between 480 and 423 m a.m.s.l and weathered to the extent of 10 m.

4.2 Occurrence of groundwater

Groundwater occurs in weathered rocks along fractures, joints and vesicles and it shows vide spatial and temporal variation due to large difference in the hydrogeological environment. Amygdaloidal nature of flow number 4 and filling of calcite, agate and



chalcedony not only control the occurrence of phreatic groundwater but also hydrodynamic response input and discharge as output by way of fluctuation in water level during the pre and post monsoon seasons.

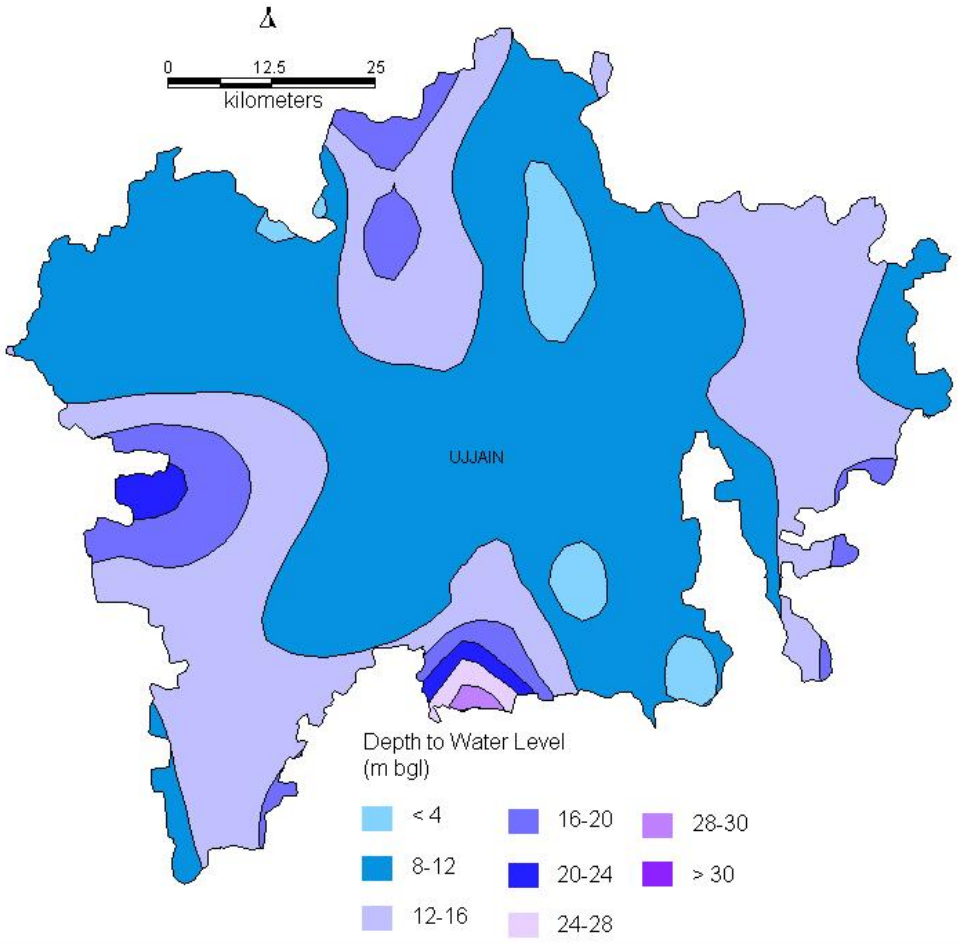
4.3 Groundwater Levels

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 19 Groundwater Monitoring Wells and 26 Piezometers in the Ujjain district. The monitoring of groundwater levels in these wells is being carried out by CGWB during the month of May, August, November and January.

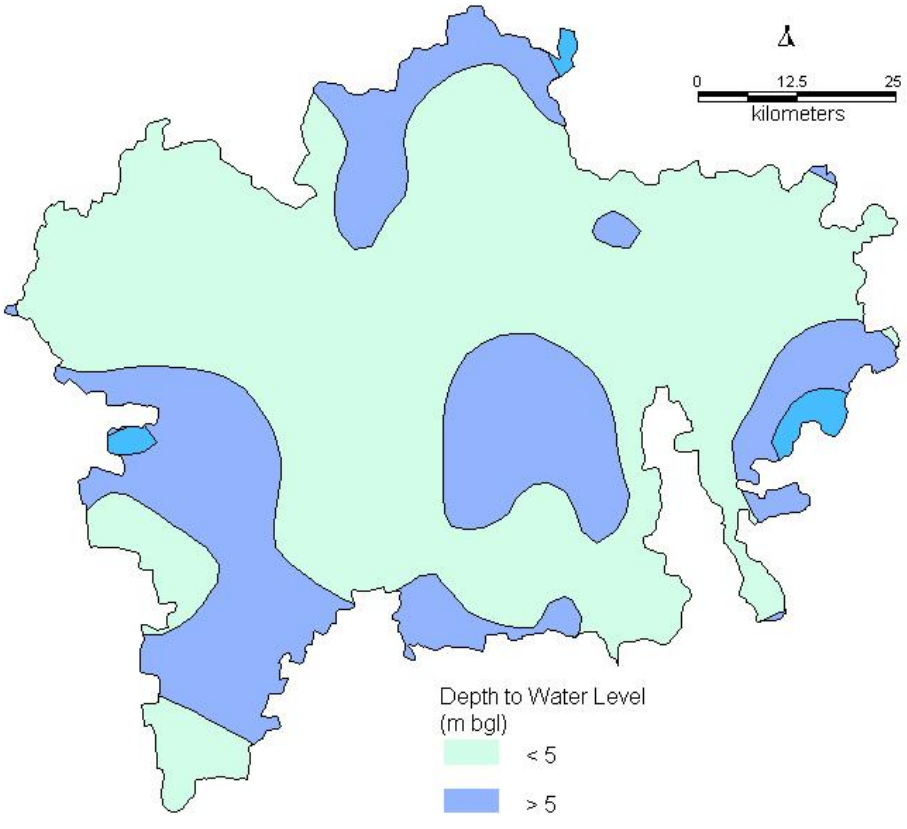
4.3.1 Pre-monsoon (May 2012)

In pre-monsoon period, May 2012, depth to water level ranges between 5.05 m bgl to 30.99m bgl. The most part of the district have water level in the range of 9-12 m bgl during the pre-monsoon.

Depth to Water Level Pre Monsoon (May'2012) District Ujjain, M.P.



Depth to Water Level Post Monsoon (Nov'2012) District Ujjain, M.P.



4.3.2 Post-monsoon (November 2012)

During post-monsoon period, November 2012, depth to water level ranges from 0.08 m bgl to 10.48 m bgl. It is observed that in most part of the district the water level lies between 3 to 6 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 0.08 to 0.12 m/yr.

4.4 Aquifer Parameters

Central Ground Water Board has drilled EW-39, OW-30, PZ-31 in the Ujjain district. Yield of Deccan Trap basalt formation vary from 0.3 at Kharsnadkhurd to 20.5 lps at Kendriya Nagar. The draw down ranges between 2.27 at Mahakal to 80 m at Gambhir. The static water level is generally deep and varying from 2.75 m bgl at Narsinghgarh to more than 100m bgl at Kanasia.

4.5 Groundwater Resources

Ujjain 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 (table). There are six assessment units (block) in the district which fall under non-command (100 %). Mahidpur and Khachrod blocks of the district are categorized as semi critical. Badnagar, Ghatia and Ujjain blocks are categorized as over exploited. Only one block namely Tarana is Safe. The highest stage of ground water development is computed as 130 % in Ujjain block. The net ground water availability in the district is 81209 ham and ground water draft for all uses is 80080ham, making stage of ground water development 99 % (109 % in 2003/04) 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 371ham.

Table: Groundwater availability and stage of development

S. No.	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 (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 (%)	Category
1	Badnagar	Command								
		Non-Command	19025	22328	542	22870	542	-3844	120	Over Exploited
		Block Total	**19025**	**22328**	**542**	22870	**542**	**-3844**	**120**	Over Exploited
2	Ghatia	Command								
		Non-Command	9183	9459	306	9765	306	-582	106	Over Exploited
		Block Total	**9183**	**9459**	**306**	**9765**	**306**	**-582**	**106**	Over Exploited
3	Khachrod	Command								
		Non-Command	17287	12472	558	13030	859	3956	75	Semi Critical
		Block Total	**17287**	**12472**	**558**	**13030**	**859**	**3956**	**75**	Semi Critical
4	Mahidpur	Command								
		Non-Command	13620	11735	514	12249	721	1164	90	Semi Critical
		Block Total	**13620**	**11735**	**514**	**12249**	**721**	**1164**	**90**	Semi Critical
5	Tarana	Command								
		Non-Command	10987	7155	544	7699	794	3038	70	Safe
		Block Total	**10987**	**7155**	**544**	**7699**	**794**	**3038**	**70**	**Safe**
6	Ujjain	Command								
		Non-Command	11107	13925	542	14467	542	-3360	130	Over Exploited
		Block Total	**11107**	**13925**	**542**	**14467**	**542**	**-3360**	**130**	Over Exploited
		District Total	**81209**	**77074**	**3006**	**80079**	**3764**	**371**	**99**	

4.6 Groundwater Quality

Groundwater quality in Ujjain district is fresh to saline with EC value ranges from 707 to 3680 µs/cm at 25^0C. Nitrate was observed in the range of 22 to 113 mg/l whereas fluoride ranges from 0.45 to 1.88 mg/l.