जल वर्ष 2007 Water Year 2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER INFORMATION BOOKLET
DAVANAGERE DISTRICT, KARNATAKA

SOUTH WESTERN REGION
BANGALORE
September 2012

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अध्यक्ष
भारत सरकार
केन्द्रीय भूमि जल बोर्ड
जल संसाधन मंत्रालय
भूजल भवन
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Foreword

Groundwater is an essential component of the environment and economy. It sustains the flow in our rivers and plays an important role in maintaining the fragile ecosystems. The groundwater dependence of agrarian states like Karnataka is high. Recent studies indicate that 26 percent of the area of Karnataka State is under over exploited category and number of blocks is under critical category. In view of the growing concerns of sustainability of ground water sources, immediate attention is required to augment groundwater resources in stressed areas. Irrigated agriculture in the state is putting additional stress on the groundwater system and needs proper management of the resources.

Central Ground Water Board is providing all technical input for effective management of ground water resources in the state. The groundwater scenario compiled on administrative divisions gives a better perspective for planning various ground water management measures by local administrative bodies. With this objective, Central Ground Water Board is publishing the revised groundwater information booklet for all the districts of the state.

I do appreciate the efforts of Dr. K.Md.Najeeb, Regional Director and his fleet of dedicated Scientists of South Western Region, Bangalore for bringing out this booklet. I am sure these brochures will provide a portrait of the groundwater resources in each district for planning effective management measures by the administrators, planners and the stake holders.

Dr. S. C. Dhiman

PREFACE

Ground water contributes to about eighty percent of the drinking water requirements in the rural areas, fifty percent of the urban water requirements and more than fifty percent of the irrigation requirements of the nation. Central Ground Water Board has decided to bring out district level ground water information booklets highlighting the ground water scenario, its resource potential, quality aspects, recharge – discharge relationship, vulnerability area etc., for all the districts of the country. As part of this, Central Ground Water Board, South Western Region, Bangalore, is preparing such booklets for all the 30 districts of Karnataka state, incorporating the data up to the period 2011-12.

The Uttara Kannada district Ground Water Information Booklet has been prepared based on the information available and data collected from various state and central government organisations by several hydro-scientists of Central Ground Water Board with utmost care and dedication. This booklet has been prepared by Dr. A. Asokan, Scientist-C, Central Ground Water Board, South Western Region, Bangalore. The figures were prepared by Sri. J. Sivaramakrishnan, Assistant Hydrogeologist and the rainfall data provided by Shri H.P.Jayaprakash Scientist-C. The efforts of Report processing section in finalising and bringing out the report in this format are commendable

I take this opportunity to congratulate them for the diligent and careful compilation and observation in the form of this booklet, which will certainly serve as a guiding document for further work and help the planners, administrators, academicians, hydrogeologists and engineers to plan and manage the water resources in a better way in the district.

(K.Md.Najeeb)
Regional Director

DAVANGERE DISTRICT AT A GLANCE

Sl.No	Items	Statistics	
1	GENERAL INFORMATION i) Geographical area (Sq km) ii) Administrative Divisions (As on 31/3/2008) Number of Taluks Numbers of Villages iii) Population (As on 2011 census) iv) Average Annual rainfall (mm)	 5975.97 6 923 19,46,905 674.14 mm (Av. 10 years: 1998-2007)	
2	GEOMORPHOLOGY i) Major physiographic units ii) Major Drainages	 Undulating plains, interspersed with sporadic ranges, Isolated dusters of low ranges of rocky hills. Tungabhadra & ChikkaHagari	
3	LAND USE (Sq.km) i) Forest area: ii) Net area sown: iii) Cultivable area:	 899.18 3880.36 4700.22	
4	MAJOR SOIL TYPES	Red sandy soil & Black soil	
5	AREA UNDER PRINCIPAL CROPS in Ha (As on 2006-07)	Paddy	124868
		Ragi	22732
		Jowar	30003
		Maize	169498
		Groundnut	14949
		Sunflower	19170
6	IRRIGATION BY DIFFERANT SOURCES (Area in Ha) Dugwells Tube wells/Borewells Tanks/Ponds Canals Others sources Net Irrigated Area Gross Irrigated Area	 950 66258 1526 60384 10776 146468 146468	
7	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (as on 31-3-2012) No of Dug wells No of Piezometers	 30 13	
8	PREDOMINENT GEOLOGICAL FORMATIONS	Granites, Gneiss & Schist	
9	HYDROGEOLOGY Major water bearing formation (Pre-monsoon Depth to water level during 2011)	 Weathered & fractured Gneiss and Granites and schists. Min 1.50 mbgl Max 14.84 mbgl Min 1.20 mbgl-Max 11.59 mbgl	

Sl.No	Items	Statistics
	(Post-monsoon Depth to water level during 2011) Long term water level trend in 10 years (2002-2011) in m/yr.	Rise: Min 0.024 m/yr to Max 1.410 m/yr Fall: Min 0.021 m/yr to Max 1.330 m/yr
10	GROUND WATER EXPLORATION BY CGWB (As on 31-03-2012) No of well drilled (EW, OW, PZ, Total) Depth range (m) Discharge (lps) Storativity (S) Transmissivity (m2/day)	 43, 14,13, 70 26-200 0.07 to 9.9lps. - 0.1 to 260 m^2/day
11	GROUND WATER QUALITY Presence of Chemical constituents more than permissible limits Type of water	 Ec & Cl (only in shallow aquifers) Carbonate & Bicarbonate
12	DYNAMIC GROUND WATER RESOURCES (2009)- in mcm Annual replenish able Ground water Resources Net Annual Ground Water draft Projected Demand for Domestic and Industrial Uses upto 2025 Stage of Ground Water Development in %	 557.06 499.51 40.71 91
13	AWARENESS AND TRAINING ACTIVITY Mass Awareness Programmes organized Date Place No of participants	 28 October 2010 30 Jagalur 200
	Water Management Training Programmes organized Date Place No of participants	 26-27, October 2010 Davanagere 34
14	EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING Projects completed by CGWB (No & Amount spent) Projects under technical guidance of CGWB (Numbers)	 Nil 2 (During the FSP 1999-2000)
15	GROUND WATER CONTROL AND REGULATION Number of OE Blocks No of Semi Critical Blocks No of Blocks notified	 5 1 Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	1. Major parts of Channagiri, Davangere, Harpanahalli, Harihar and Jagalur taluks fall under over exploited category.

Sl.No	Items	Statistics
		2. Few parts of Channagiri, Davangere, Harihar and Honnali taluks affected from intensive cultivation and application of fertilizers. 3. Fluoride concentration beyond permissible limit has been found to occur in a few samples collected from Davangere, Harpanahalli, Harihar and Jagalur taluks. 4. Nitrate content beyond permissible limit has been found to occur in a few samples collected from small parts in each taluks

1.0 Introduction:

Davangere district covers a geographical area of 5975.97 sq.kms and comprises of six taluks (Fig-1). Major part of the district lies in Krishna basin and is drained by Tungabhadra & Chikka Hagari Rivers. The other major streams in the district are Janagahalla and Haridra Nandi. Agriculture is the main source of income of the people in the district. Shantisagar tank constructed across Haridra stream is a source for irrigation in the district. Part of command area of Bhadra reservoir project falls within the district. Two irrigation canals viz., Davangere Branch canal and Harihar Branch canal of the Bhadra reservoir provide irrigation facilities to the people of Davangere and Harihar taluks. In the noncanal command area agriculture is dependant on rainfall. The drainage in the district is shown in the figure –2.

Central Ground Water Board has carried out Systematic & Reappraisal hydrogeological surveys in the district. Exploratory drilling was carried out during 1975-76, 1988-90 & 2004-07 in the district. Seventy bore wells were drilled by CGWB under ground water exploration programme. Further thirty bore wells were drilled by CGWB through out sourcing for water supply in the hardcore villages of Harpanahalli and Jagalur taluks during the year 2004-05 (Fig-3).

2.0 Rainfall & Climate:

The district enjoys semi arid climate, dryness in the major part of the year and hot summer. In general, southwest monsoon contributes 58 % of total rainfall and northeast monsoon contributes 22 % rainfall. The remaining 20 % rainfall is received as sporadic rains in summer months. It receives low to moderate rainfall. Normal annual rainfall varies between 556 mm in Jagalur and 808 mm in Channagiri taluk.

The normal annual rainfall in the district based on 70 years is 644 mm. However in the last decade (2002-2011) the district received an average annual rainfall of the 674.14 mm. Further analysis of the rainfall data indicate that there was deficient rainfall in the years 2003, whereas the year 2010 received excess rainfall. Jagalur taluk received deficit rainfall during the years 2002-2003. Most of the other taluks had deficit rainfall during the year 2003. Rainfall is the lowest in Jagalur taluk and the highest in Channagiri taluk (Table-1).

The district falls under central dry agro-climatic zone of the Karnataka state and is categorized as drought prone. Normal climatic parameters of Davangere district are increasing temperature from March to May, usually maximum in April month and minimum temperature that is coldest month during month of December.

3.0 Geomorphology & Soil Types:

The geomorphology of the district is characterised by vast stretches of undulated plains interspersed with sporadic ranges or isolated clusters of low ranges of rocky hills. This may be broadly divided into two regions. The eastern hilly region consisting of Jagalur and north –eastern parts of Harpanahalli taluks and the plain region consisting of Harihar, Davangere, Honnali, Channagiri and parts of Harpanahalli taluks. Dalba Ranga Gudda (1013mamsl) in Honnali taluk

Table 1: 10 years rainfall details of Davangere district

Sl No	Taluk	Actual rainfall in mm										
		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
1	Channagiri	581.8	590.8	762.0	1033.9	609.7	1169.0	854.0	1129.0	1230.0	730.0	869
2	Davangere	559.7	388.6	524.8	890.1	480.0	798.5	824.0	1102.0	1036.0	544.0	715
3	H P Halli	421.7	344.0	652.3	742.0	595.1	723.3	561.0	1028.0	968.0	653.0	669
4	Harihar	540.7	350.8	470.3	1082.4	589.6	877.8	670.0	844.0	990.0	459.0	687
5	Honnali	541.3	478.1	671.8	821.4	662.9	746.0	791.0	1054.0	1101.0	640.0	751
6	Jagalur	367.3	373.8	615.9	704.2	603.5	629.8	530.0	868.0	863.0	385.0	594
	Total	502.1	421.0	616.2	879.0	590.1	824.1	705.0	1004.1	1031.3	568.5	674

Fig.1

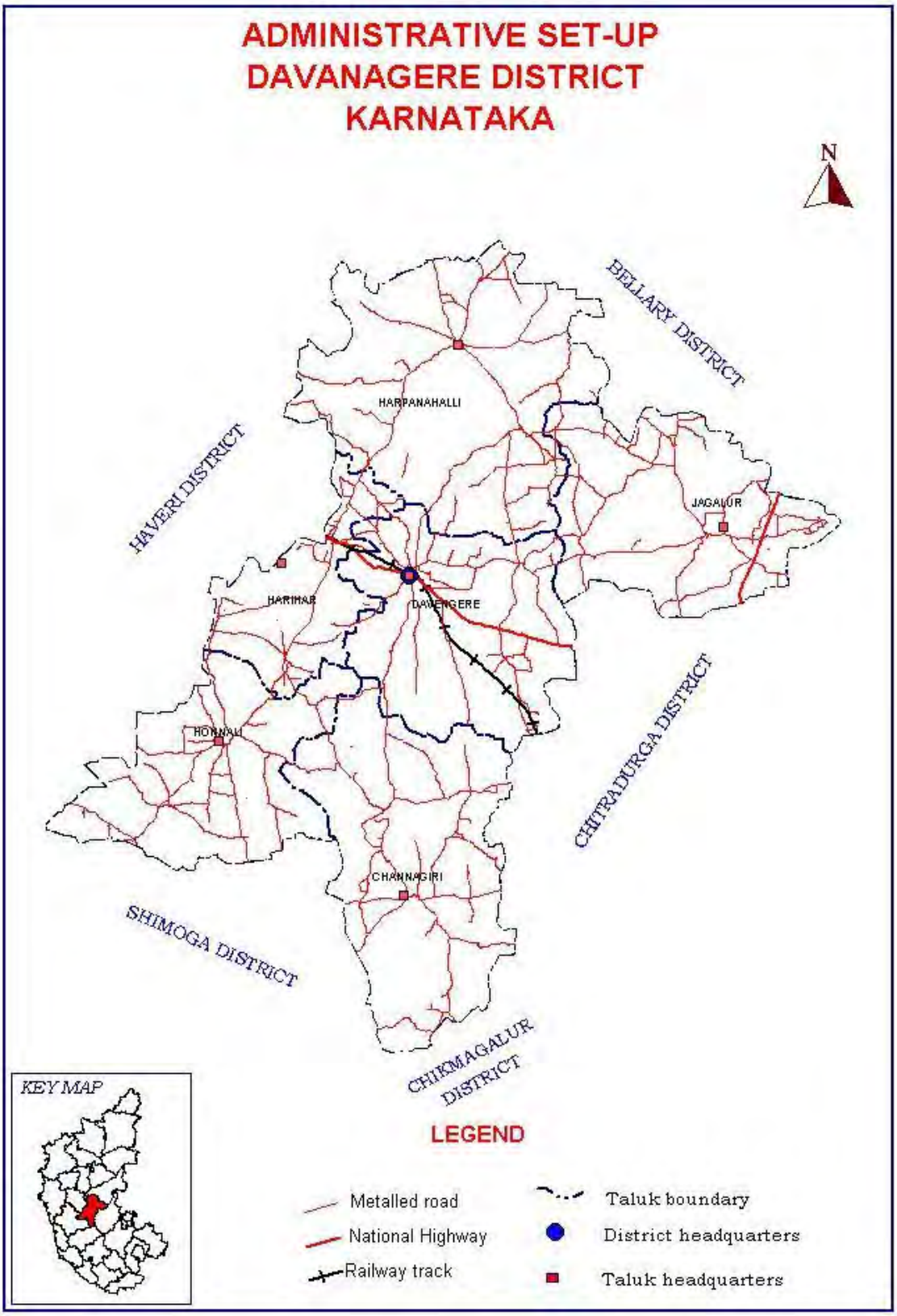

ADMINISTRATIVE SET-UP
DAVANAGERE DISTRICT
KARNATAKA
N
BELLARY DISTRICT
HAVERI DISTRICT
HARPANAHALLI
JAGALUR
HARIHAR
DAVENGERE
HONNALI
CHITRADURGA DISTRICT
CHANNAGIRI
SHIMOGA DISTRICT
CHIKMAGALUR DISTRICT
KEY MAP
LEGEND
Metalled road
National Highway
Railway track
Taluk boundary
District headquarters
Taluk headquarters

Fig. 2

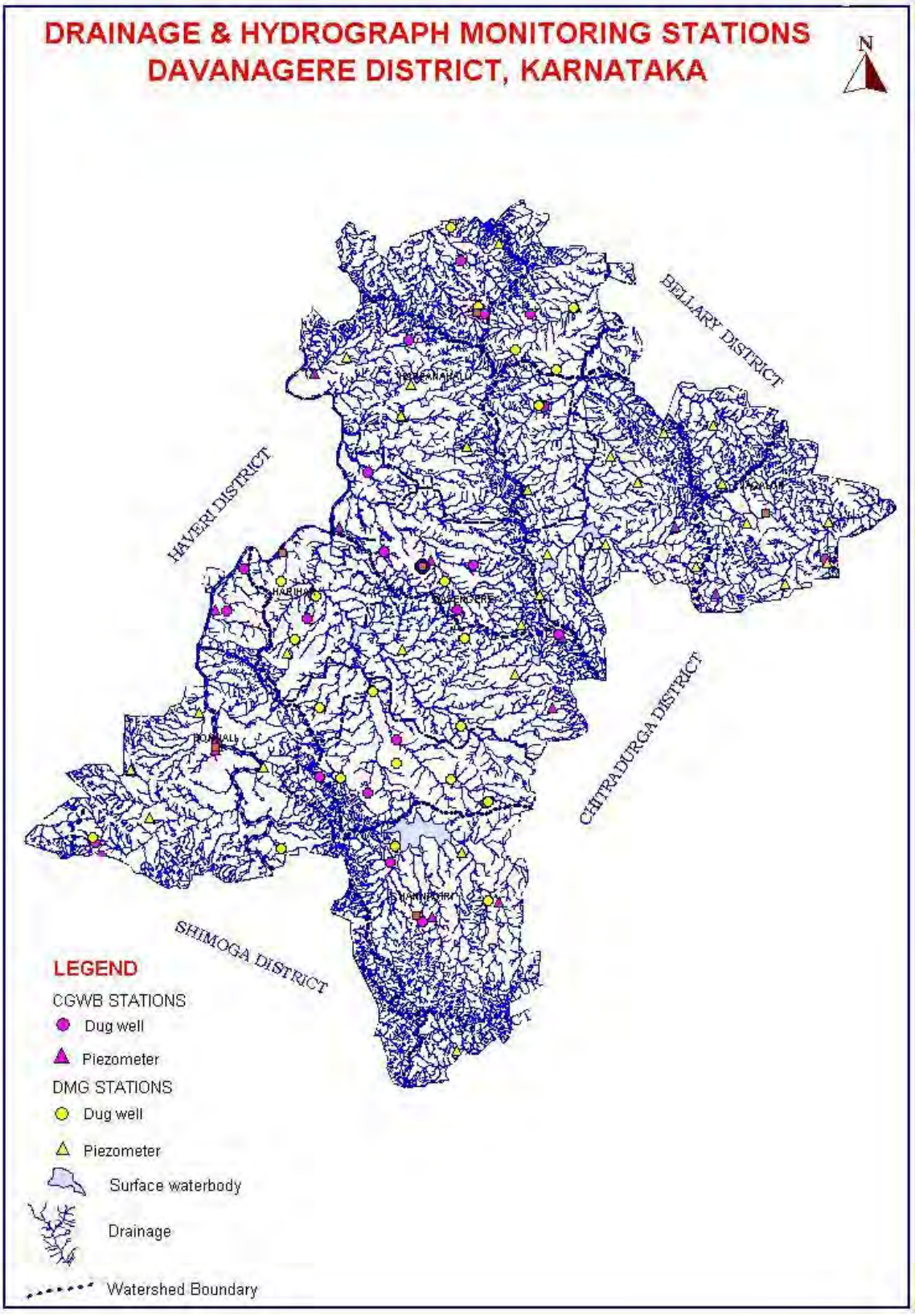
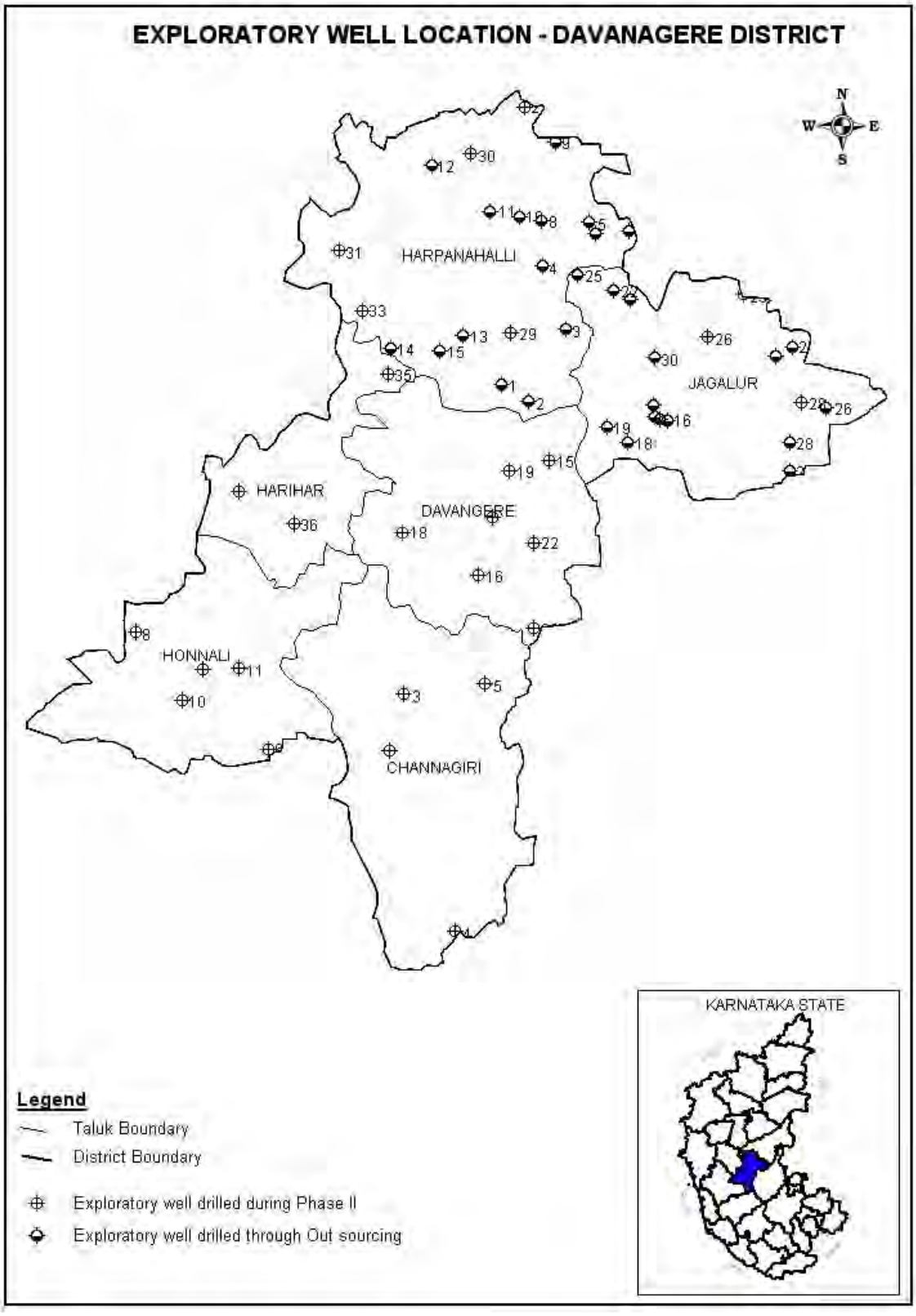

DRAINAGE & HYDROGRAPH MONITORING STATIONS
DAVANAGERE DISTRICT, KARNATAKA
N
BELLARY DISTRICT
HAVERI DISTRICT
CHITRADURGA DISTRICT
SHIMOGA DISTRICT
LEGEND
CGWB STATIONS
Dug well
Piezometer
DMG STATIONS
Dug well
Piezometer
Surface waterbody
Drainage
Watershed Boundary

Fig. 3


EXPLORATORY WELL LOCATION - DAVANAGERE DISTRICT
N
W
E
S
HARPANAHALLI
JAGALUR
HARIHAR
DAVANGERE
HONNALI
CHANNAGIRI
KARNATAKA STATE
Legend
Taluk Boundary
District Boundary
Exploratory well drilled during Phase II
Exploratory well drilled through Out sourcing

is the highest peak in the district. The other prominent peaks of the district are Jaikal Gudda (863mamsl), and Anaburu (916mamsl).

Major part of the district is covered by red sandy soil and followed by black soil. Red sandy soil is spread through out the district except in a small area in the northeastern part of the district where the area is covered by black soil. The Red Sandy soil comprises of red loams, red sandy, sandy loams and medium black soils.

4.0 Ground Water Scenario:

4.1 Hydrogeology:

Groundwater occurs under phreatic and semi-confined conditions in the weathered and fractured rock formations of the 'Peninsular Gneissic Group' of rocks comprising of granites, gneisses and schist (Fig-4). The thickness of weathered zone varies from 4.0 – 36.74 m. The main source of ground water occurring in the district is through precipitation and return flow from applied irrigation.

In **Channagiri** taluk granites, granitic-gneisses and schists are the main water bearing formations. Ground water exploration reveals the existence of 3 to 5 potential fracture zones between the depths of 21 mbgl to 170 mbgl. In Channagiri taluk exploratory bore wells were drilled from a minimum depth of 100 mbgl to a maximum of 200mbgl. Depth of weathered zone ranges from 10.3 mbgl to 23.10 mbgl. Yeild ranges from<1.0 to 9.9 lps. Specific Capacity ranges from 5.2 lpm/m to 707 lpm/m.

During May 2011 (Pre-monsoon) the minimum depth to water level and maximum depth to water level was 2.03 mbgl and 14.84 mbgl respectively (Fig-5). During November 2011 (Post-monsoon) water levels ranged from 2.00 mbgl to 11.59 mbgl (Fig-6).

In **Davangere** taluk fractured granitic-gneisses, gneisses and hornblende-schists are the main water bearing formations. Ground water occurs within the weathered and fractured rocks under water-table conditions and semi-confined conditions. Ground water exploration reveals that aquifers are encountered between the depths of 8.46 and 32 mbgl. In Davangere taluk bore wells were drilled from a minimum depth of 35 to a maximum of 200mbgl. Depth of weathered zone ranges from 5.5 mbgl to 30 mbgl. Yeild ranges from 1.5 to 4.0 lps. Transmissivity ranges from 5.27 to 110.67 m^2/day. Specific capacity ranges from 4.54 to 36.0 lpm/m draw down.

During May 2011 (Pre-monsoon) the minimum and maximum depth to water level was 3.21 mbgl and 7.30 mbgl respectively. During November 2011 (Post-monsoon) water level ranged from 2.82 mbgl to 5.60 mbgl.

In **Harpanahalli** taluk, gneisses and schists are the main water bearing formations. Ground water occurs within the weathered and fractured rocks. Ground water occurs under water-table condition and semi-confined condition. Ground water exploration reveals that aquifers were encountered between the

Fig. 4

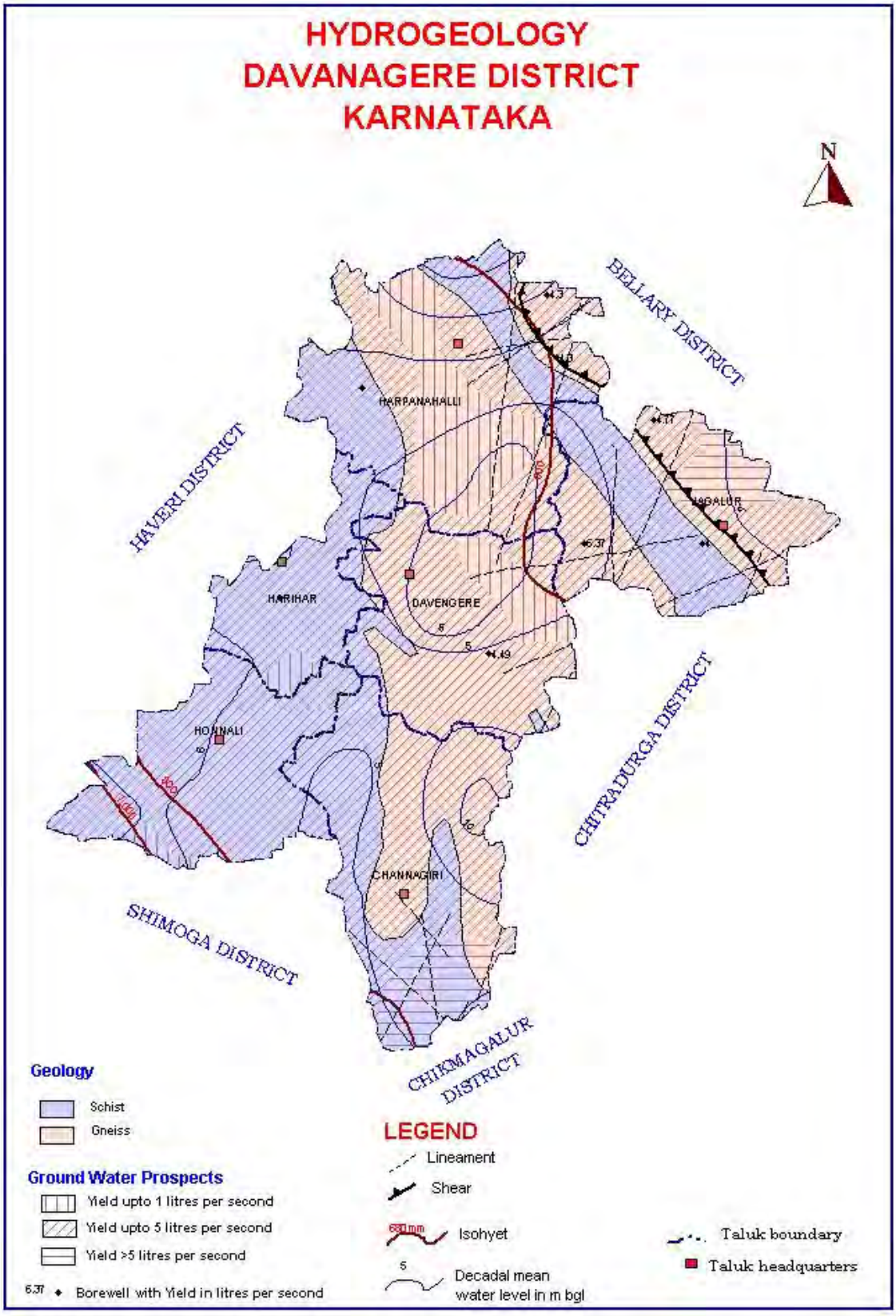

HYDROGEOLOGY
DAVANAGERE DISTRICT
KARNATAKA
N
BELLARY DISTRICT
HAVERI DISTRICT
CHITRADURGA DISTRICT
SHIMOGA DISTRICT
CHIKMAGALUR DISTRICT
HARPANAHALLI
HARIHAR
DAVENGERE
HONNALI
CHANNAGIRI
JAGALUR
Geology
Schist
Gneiss
Ground Water Prospects
Yield upto 1 litres per second
Yield upto 5 litres per second
Yield >5 litres per second
6.37 Borewell with Yield in litres per second
LEGEND
Lineament
Shear
Isohyet
Decadal mean water level in m bgl
Taluk boundary
Taluk headquarters

Fig. 5

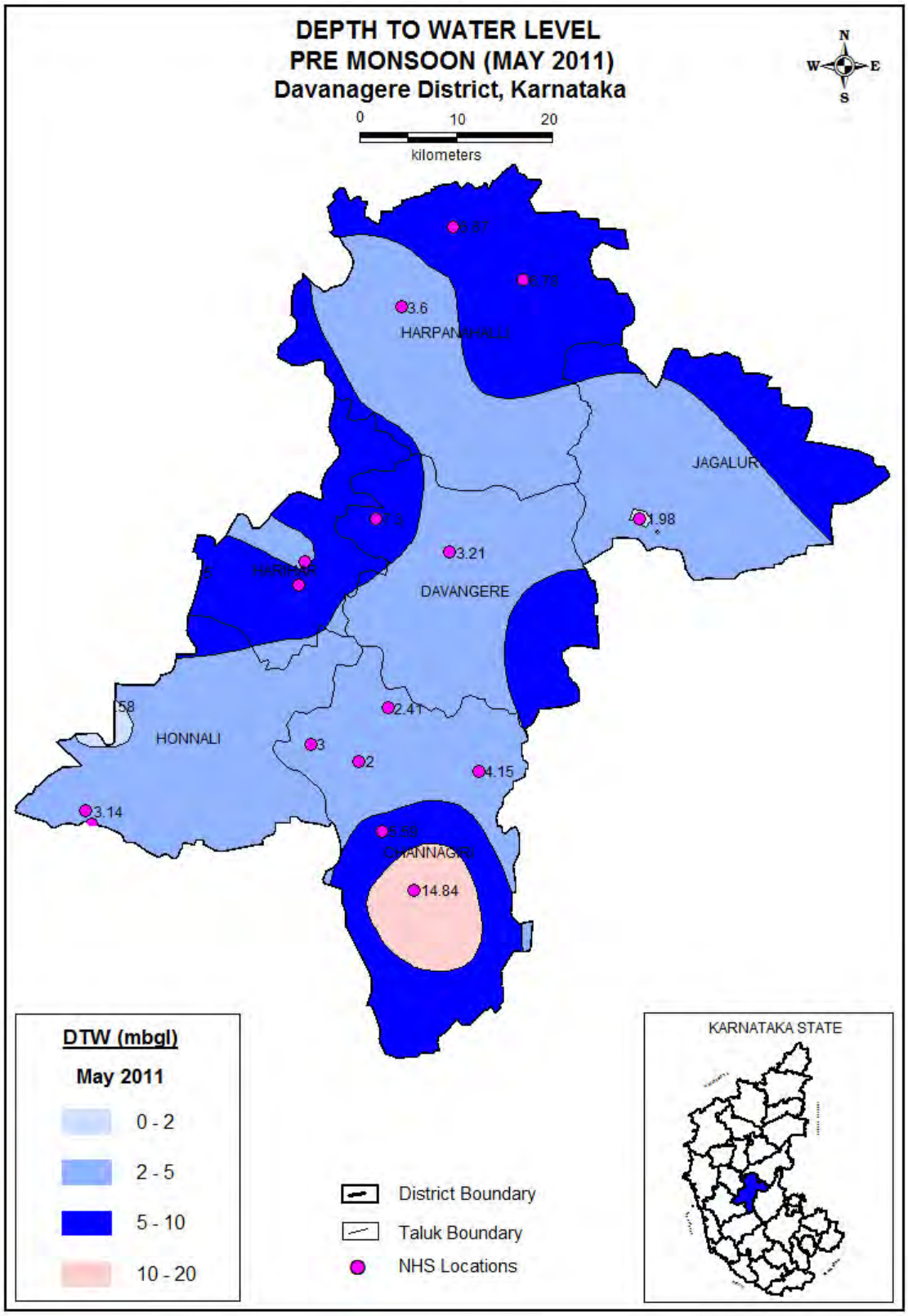
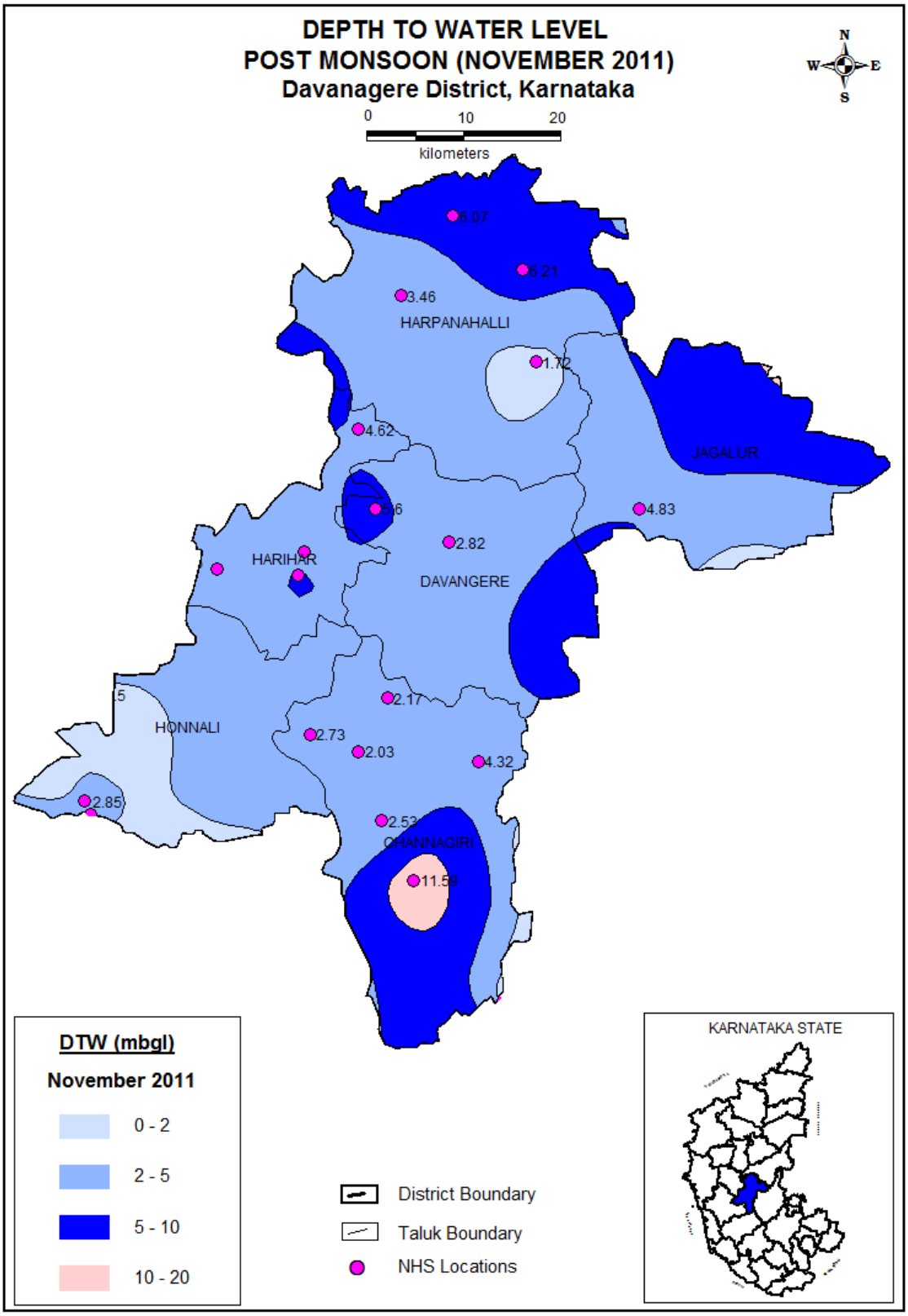

DEPTH TO WATER LEVEL
PRE MONSOON (MAY 2011)
Davanagere District, Karnataka
0
10
20
kilometers
N
W
E
S
3.6
HARPANAHALLI
JAGALUR
1.98
3.21
DAVANGERE
HARIHAR
HONNALI
2.41
3
2
4.15
3.14
5.59
CHANNAGIRI
14.84
DTW (mbgl)
May 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig. 6


DEPTH TO WATER LEVEL
POST MONSOON (NOVEMBER 2011)
Davanagere District, Karnataka
N
W
E
S
0
10
20
kilometers
6.07
6.21
3.46
HARPANAHALLI
1.72
4.62
JAGALUR
5.6
4.83
2.82
HARIHAR
DAVANGERE
2.17
HONNALI
2.73
2.03
4.32
2.85
2.53
CHANNAGIRI
11.59
DTW (mbgl)
November 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

depth of 41 mbgl and 190 mbgl. In Harpanahalli taluk bore wells were drilled from a minimum depth of 120.8 mbgl to a maximum of 200.1mbgl. Depth of weathered zone ranges from 5.55 mbgl to 25.7mbgl. Yield ranges from 0.08 to18.56 lps.

During May 2011 (Pre-monsoon) the minimum depth to water level and maximum water level was 1.84 mbgl to 6.78 mbgl respectively. During November 2011 (Post- monsoon) water level ranged from 1.72 mbgl to 6.21 mbgl.

In **Harihar** taluk schists are the main water bearing formation. Ground water occurs within the weathered and fractured rocks. Ground water exploration reveals that aquifer systems are encountered from depth of 21 mbgl to 51 mbgl. In Harihar taluk bore wells were drilled from a minimum depth of 86.55 mbgl to maximum of 200 mbgl. Depth of weathered zone ranges from 23 mbgl to 25 mbgl. Yeild ranged from 0.07 to 3.28 lps. Transmissivity ranged from 1.0 to 8.0 m^2/day.

During May 2011 (Pre-monsoon) the minimum depth to water level and maximum water level was 1.50 mbgl and 5.51 mbgl respectively. During November 2011 (Post- monsoon) water level ranged from 1.20 mbgl to 5.08 mbgl.

In **Honnali** taluk schists are the main water bearing formation. Ground water occurs within the weathered and fractured schists under water-table condition and semi-confined condition. In Honnali taluk bore wells were drilled from a minimum depth of 64 mbgl to a maximum of 200.10mbgl. Depth of weathered zone ranges from 10.6 mbgl to 22.2.0 mbgl. Ground water exploration reveals that aquifer systems are encountered from depth of 21 mbgl to 155 mbgl. Yield ranges from 0.64 to 5.5 lps. Transmissivity ranges from 0.5 m^2/day to 75.88m^2/day. Storativity ranges from 0.07 to 0.21.

During May 2011 (Pre-monsoon) the minimum and maximum depths to water level was 2.83 mbgl and 3.14 mbgl respectively. During November 2011 (Post-monsoon) depth to water level ranged from 1.56 mbgl to 2.85 mbgl.

In **Jagalur** taluk, granitic-gneisses and schists are the main water bearing formations. Ground water occurs within the weathered and fractured granitic-gneisses and schists under water table condition and semi-confined condition. Ground water exploration reveals that aquifers were encountered between the depth of 4.1 mbgl and 200 mbgl. In Jagalur taluk bore wells were drilled from a minimum depth of 26 mbgl to a maximum of 200 mbgl. Depth of weathered zone ranges from 5.7 mbgl to 36.74 mbgl. Yield ranges from 0.21 to 18.56 lps.

During May 2011 (Pre-monsoon) and November 2011 (Post-monsoon) depths to water levels were more than 23.00 mbgl.

Ground Water Level Fluctuation

Subsequent to seasonal rainfall, ground water level records a rise, indicating recharge to ground water. During pre-monsoon period there is depletion of ground water level due to exploitation, natural discharge and no recharge. This is manifested as fall in ground water level during pre-monsoon period. Therefore, ground water level in general shows a receding trend from December to May.

Seasonal water level fluctuation (May & November 2011) as observed in 15 NHS dug wells indicate that in 87% of NHS there is rise in ground water level in the range of 0.12 to 3.25m, whereas in 13% of NHS there is fall in ground water level in the range of 0.03 to 0.17m.

Pre-monsoon water level fluctuation (Decadal mean of May 2001-2010 with May 2011) as observed in 17 NHS dug wells indicate that in 94% of wells there is rise in ground water level in the range of 0.75 to 5.81m, whereas in 6% of wells there is fall in ground water level in the range of 0.39m (Fig-7).

Post-monsoon water level fluctuation (Decadal mean of November 2001-2010 with November 2011) as observed in 20 NHS dug wells indicate that in 65% of wells there is rise in ground water level in the range of 0.13 to 3.98m, whereas in 35% of wells there is fall in ground water level in the range of 0.07 to 1.93m (Fig-8).

Long Term Water Level Trend

Pre-monsoon ground water level data for NHS in Davanagere district, water level trend (2002 - 2011) of 94% of wells show rise in the range of 0.178 to 1.41 m/year. 6% of wells show a falling trend in the range of 0.049 m/year. Rising water level trend during pre – monsoon period may be attributed to less ground water draft and recharge through canal, tanks or reservoir.

Post – monsoon water level trend (2002 - 2011) indicate that in 75% of wells there is rise in the range of 0.024 to 1.241 m/year. Similarly, water level trend of 25% of wells show fall in the range of 0.021 to 1.33 m/year. Falling water level trend during post – monsoon period may be attributed to poor recharge to ground water and excessive ground water draft.

4.2 Ground Water Resources:

The resource estimation and categorization is carried out as per the recommendations of GEM-97. As per ground water resource estimation studies (GEM-97), the district is over exploited with a groundwater draft of 49951 ham as against the available resource of 55706 ham. Thus the stage of ground water development in the district is 91 %. Major part of the district is falling under over-exploited category (Fig-9). However very small part of the district falls in semi critical and some parts fall under safe category where there is scope for further development.

In **Channagiri** taluk, major part is over exploited, a small part in the southwest is **safe** where further ground water development can be taken up and

Fig. 7

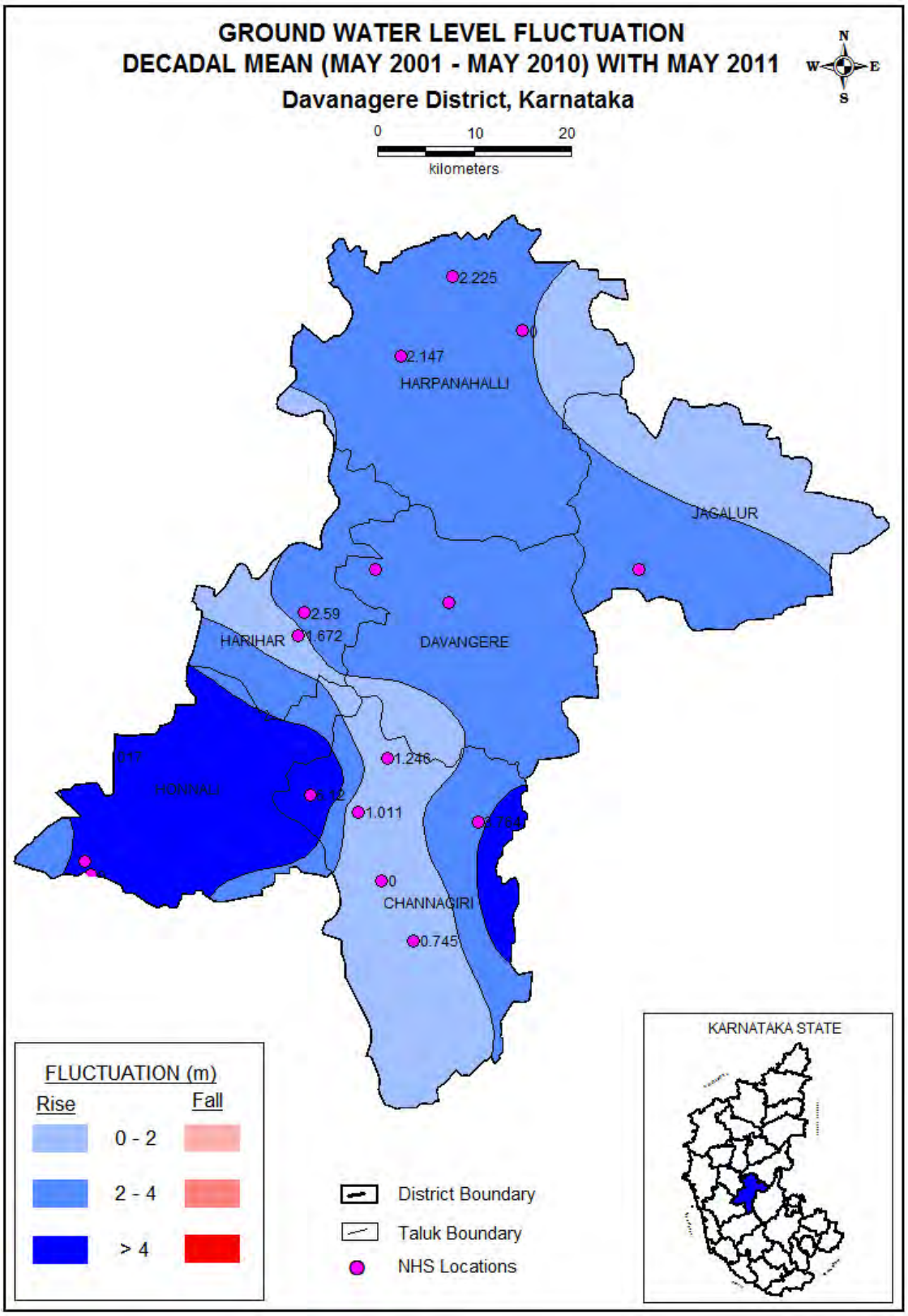

GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (MAY 2001 - MAY 2010) WITH MAY 2011
Davanagere District, Karnataka
N
W
E
S
0
10
20
kilometers
2.225
0
2.147
HARPANAHALLI
JAGALUR
2.59
1.672
HARIHAR
DAVANGERE
1.246
HONNALI
1.011
0.764
0
CHANNAGIRI
0.745
KARNATAKA STATE
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations

Fig. 8

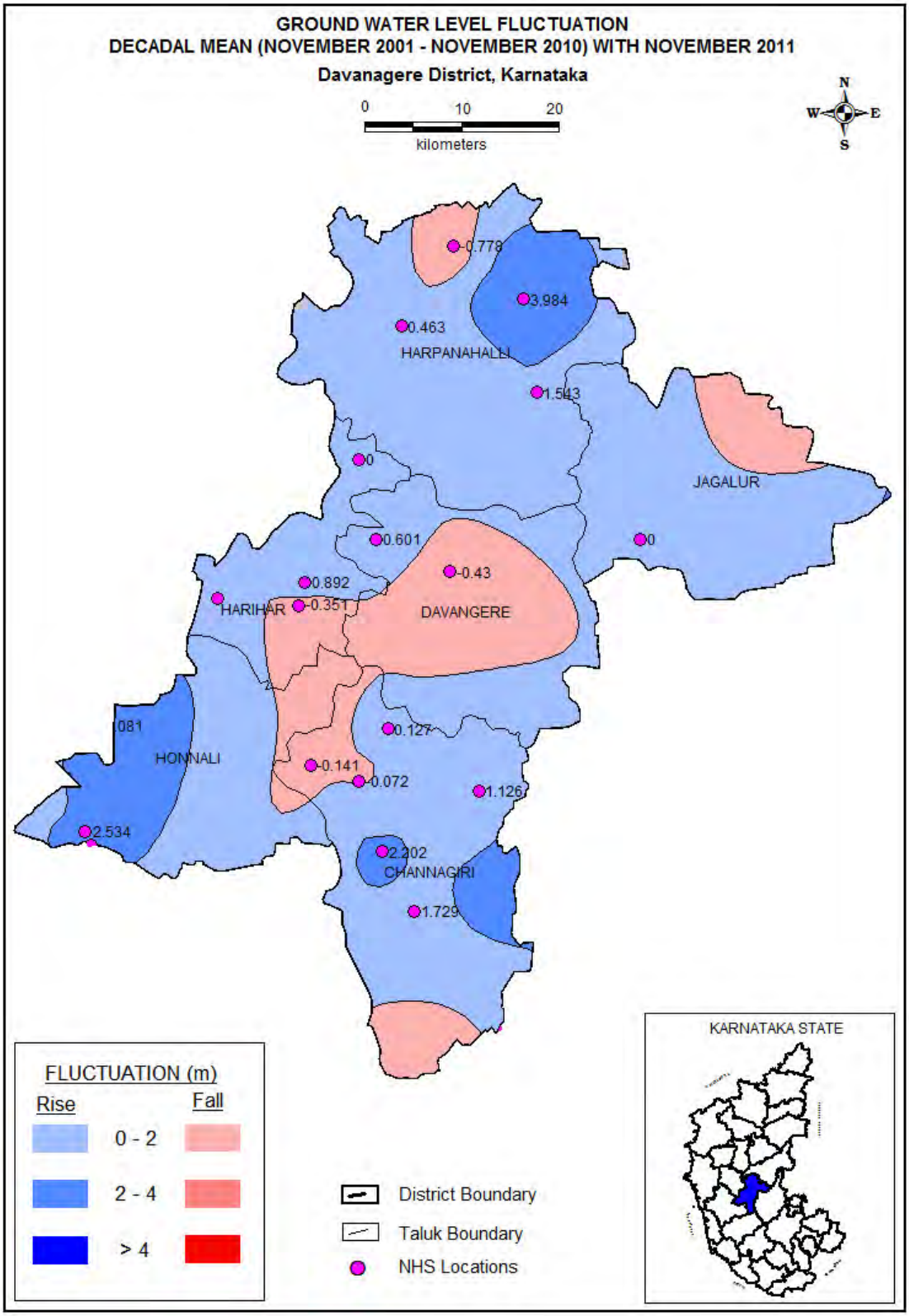
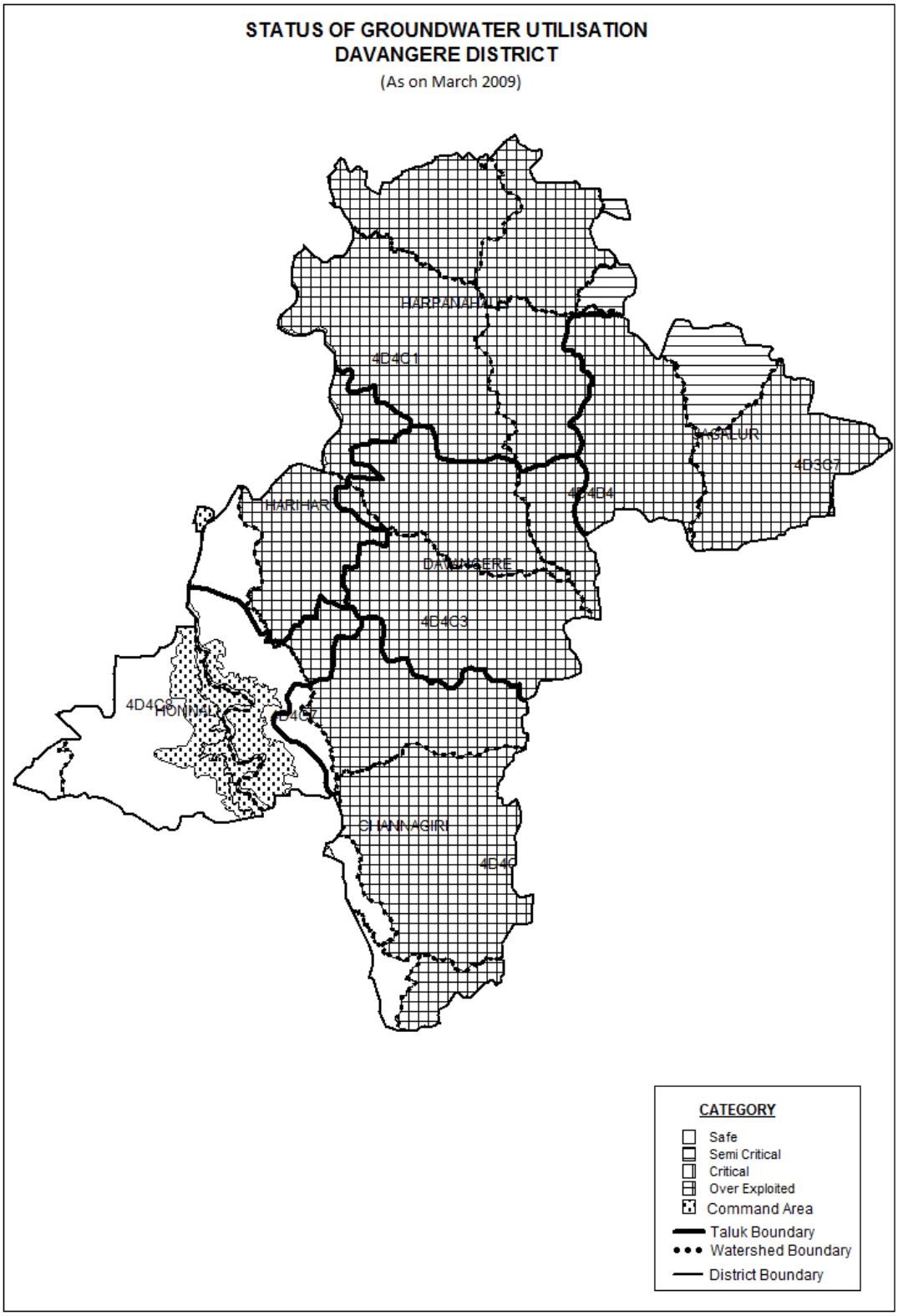

GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (NOVEMBER 2001 - NOVEMBER 2010) WITH NOVEMBER 2011
Davanagere District, Karnataka
0
10
20
kilometers
N
W
E
S
-0.778
3.984
0.463
HARPANAHALLI
1.543
0
JAGALUR
0.601
0
0.892
-0.43
HARIHAR
-0.351
DAVANGERE
.081
HONNALI
0.127
-0.141
-0.072
1.126
2.534
2.302
CHANNAGIRI
1.729
KARNATAKA STATE
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations

Fig. 9


STATUS OF GROUNDWATER UTILISATION
DAVANGERE DISTRICT
(As on March 2009)
HARPANAHALLI
4D4C1
HARIHAR
4D4C4
4D3G7
DAVANGERE
4D4C3
4D4C8
HONNALI
4D4C7
CHANNAGIRI
4D4C
CATEGORY
Safe
Semi Critical
Critical
Over Exploited
Command Area
Taluk Boundary
Watershed Boundary
District Boundary

a small part in the south bordering Chikmagalur district is suitable for artificial recharge. Major parts of **Davangere, Harpanahalli, Harihar** and **Jagalur** fall under over exploited category**.** Major parts of **Honnali** taluk falls under safe category where further ground water development can be taken up falls and a very small area in the northeastern part is over exploited (Table-2).

Table 2: Talukwise ground water resources and categorization of Davangere district as on 31st March 2009

Taluk	Net annual GW availability	Existing Gross GW draft for Irrigation	Existing Gross GW draft for Domestic and Industrial water supply	Existing gross GW draft for all uses	Provision for domestic and industrial requirement supply to 2025	Net GW availability for future irrigation development	Existing Stage of development (%)	% Taluk Area falling in category			
								Safe	Semicritical	Critical	Over Exploited
	ham	ham	ham	ham	ham	ham					
Channagiri	11905	12839	596	13435	692	1527	113	20			80
Davangere	7818	6958	699	7657	906	1708	98				100
Harihar	5354	3372	312	3684	486	1696	69	35			35
H P Halli	9244	10215	831	11046	865	251	119	1	10		89
Honnali	13164	5064	324	5388	604	7568	41	85			15
Jagalur	8221	8258	483	8741	518	443	106		20		80

4.3 Unit Area Annual Ground Water Recharge

Sustainability of ground water resource depends mainly on two factors viz. Annual ground water recharge and annual ground water draft. The annual ground water recharge depends on the quantity and intensity of rain fall, the infiltration characteristics of the soil, the depth to ground water level, the slope of the area and the geomorphology. The ground water recharge is assessed separately for the monsoon and non monsoon period due to rainfall as well as due to other sources. The annual ground water recharge includes all the above.

The recharge from other sources includes return seepage from irrigated area, seepage from canals, seepage from water bodies, seepage from influent rivers etc. The recharge can be expressed in metres. In the state of Karnataka, the unit area recharge is grouped into four categories viz. 0.025-0.10m, 0.10-0.15m, 0.15-0.25m and 0.25-0.50m. In Davanagere district the unit area annual recharge is in the range of 0.025-0.10m in Davanagere, Harihar and Jagalur taluks, 0.10-0.15m in Channagiri & Harpanahalli and in the range of 0.15-0.25m in Honnali taluk (Fig-10).

4.3 Ground Water Quality:

Ground Water Quality in the district is generally potable and suitable for irrigation and domestic purposes. Electrical conductivity of ground water in general ranges from 584 to 2720 micro mhos /cm at 25 °C (Fig-11). In general

Fig. 10

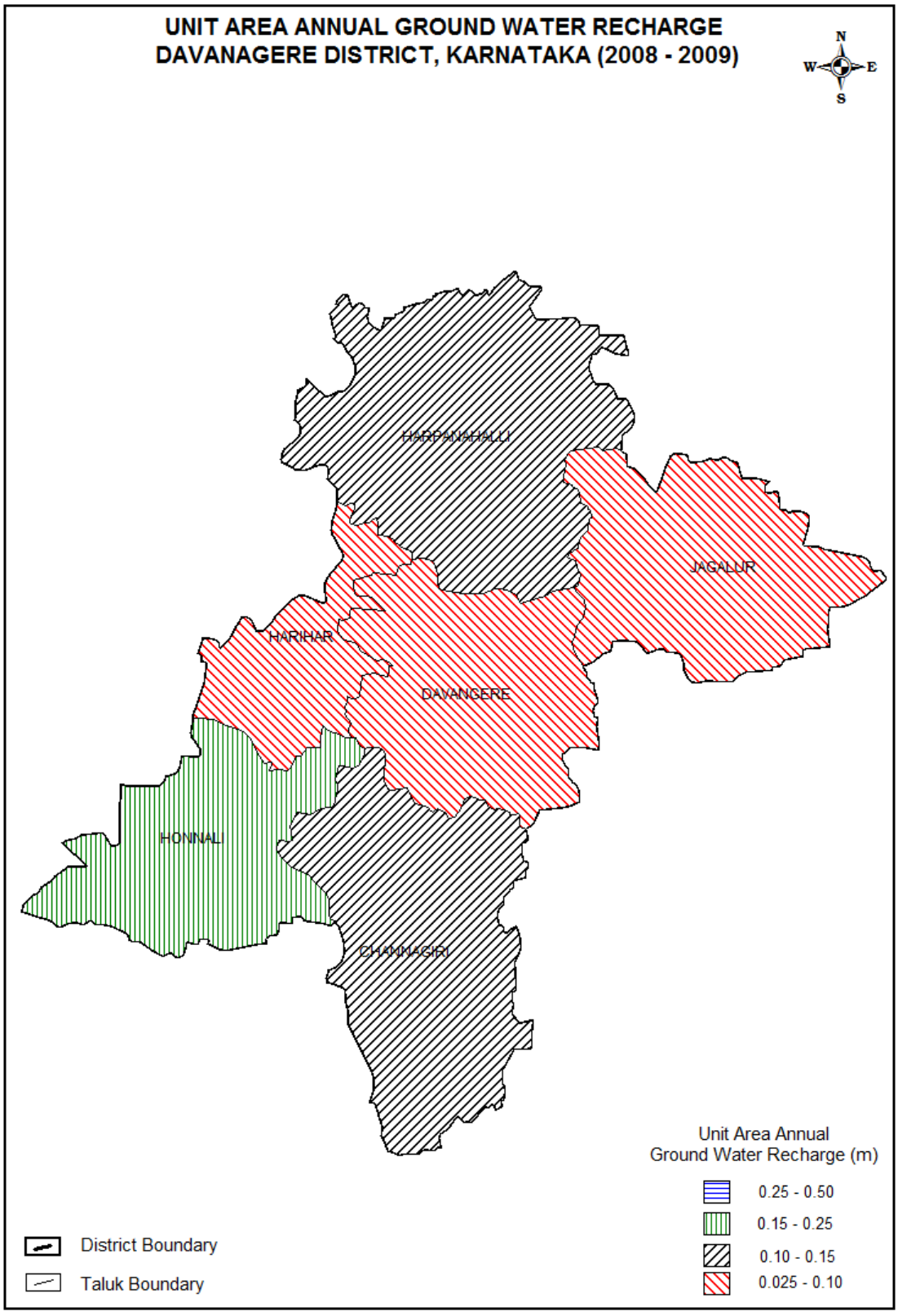
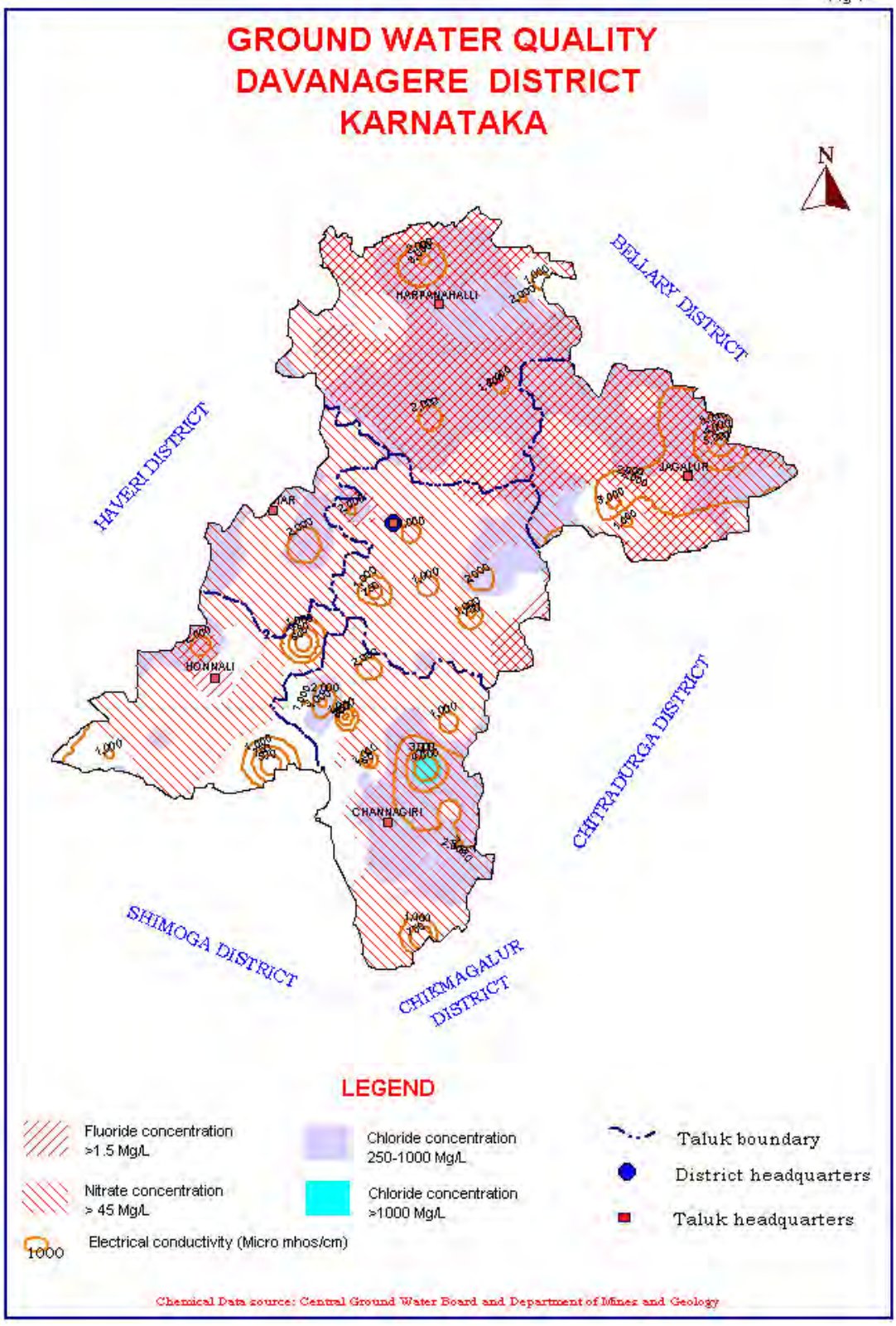

UNIT AREA ANNUAL GROUND WATER RECHARGE
DAVANAGERE DISTRICT, KARNATAKA (2008 - 2009)
N
W
E
S
HARPANAHALLI
JAGALUR
HARIHAR
DAVANGERE
HONNALI
CHANNAGIRI
Unit Area Annual
Ground Water Recharge (m)
0.25 - 0.50
0.15 - 0.25
0.10 - 0.15
0.025 - 0.10
District Boundary
Taluk Boundary

Fig. 11


GROUND WATER QUALITY
DAVANAGERE DISTRICT
KARNATAKA
N
BELLARY DISTRICT
HAVERI DISTRICT
CHITRADURGA DISTRICT
SHIMOGA DISTRICT
CHIKMAGALUR DISTRICT
HARIHARAHALLI
JAGALUR
HONNALI
CHANNAGIRI
LEGEND
Fluoride concentration >1.5 Mg/L
Nitrate concentration > 45 Mg/L
Electrical conductivity (Micro mhos/cm)
1000
Chloride concentration 250-1000 Mg/L
Chloride concentration >1000 Mg/L
Taluk boundary
District headquarters
Taluk headquarters
Chemical Data source: Central Ground Water Board and Department of Mines and Geology

ground water is of Carbonate and Bicarbonate type. Fluoride ranges from 0.2 mg/l to 2.41 mg/l. Nitrate ranges from 10 to 352 mg/l.

4.4 Ground Water Vulnerability Area

Ground water being a dynamic resource, getting recharged annually, primarily from the rainfall, is vulnerable to various developmental activities and is prone to deterioration in quality and quantity. The vulnerability is high in certain areas while in other areas it is comparatively stable. Based on its susceptibility to various stress factors the district wise vulnerability map is prepared on a regional scale considering the following factors viz.

1. Area under high stage of ground water development falling in over exploited (generally with stage of development more than100%) and critical (generally stage of development within 85-100%) category as on March 2009.
2. Area having intensive cultivation/ area falling under canal command, thus prone to pollution from fertilizers/ insecticides or water logging.
3. Area having fluoride above maximum permissible limit of 1.5ppm.
4. Area having nitrate above maximum permissible limit of 45ppm. (Even though nitrate is point source pollution due to anthropogenic activity and as such area cannot be demarcated, for the convenience of the user group, area having high incidence of pollution is marked. Within the marked area there may be points devoid of high nitrate and vice-versa.).
5. Industrial cluster as identified by Central Pollution Control Board, prone for pollution from industries.

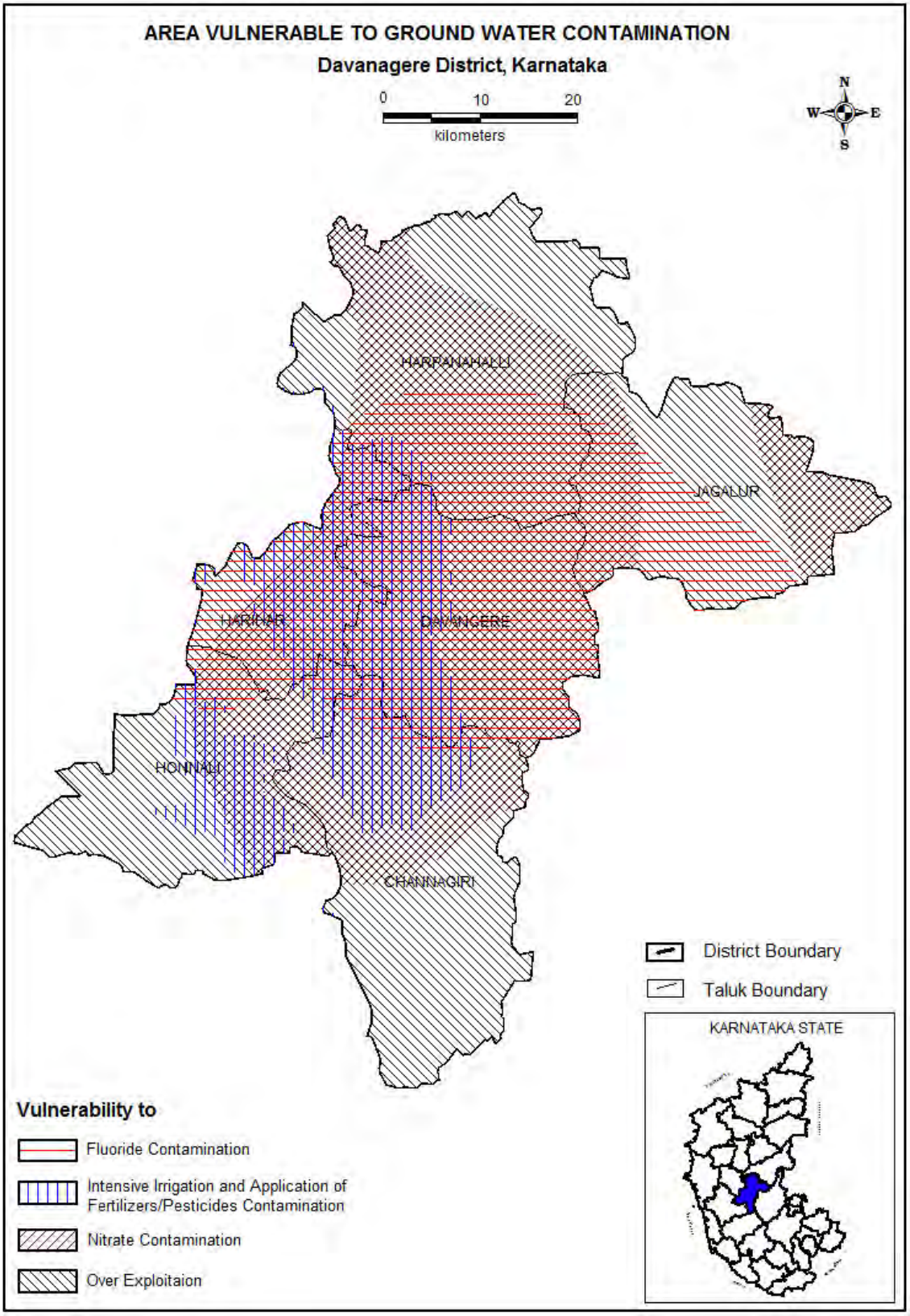
In some of the districts parts of the area ground water is vulnerable due to more than one of the above parameters, while in some others the entire district is free from vulnerability. In Davanagere district, major parts of Channagiri, Davangere, Harpanahalli, Harihar and Jagalur taluks fall under over exploited category. Few parts of Channagiri, Davangere, Harihar and Honnali taluks affected from intensive cultivation and application of fertilizers (Fig-12).

Quality of ground water in the district in general is good and potable. However, fluoride concentration beyond permissible limit has been found to occur in a few samples collected from Davangere, Harpanahalli, Harihar and Jagalur taluks. Nitrate content beyond permissible limit has been found to occur in a few samples collected from small parts in each taluks.

4.5 Status of Ground Water Development:

Generally the ground water development in the district is by dug well, dug –cum-bore well and bore well. The dug wells for irrigation use are mostly rectangular with dimension ranges of 4m x 6m and 10m x 14m. The depth of these wells ranges from 9m to 15m and some cases at the bottom of the dug well, one or two bore wells are constructed. In addition to this bore well irrigation is also common. The bore wells range in depth from 60 mbgl to 200 mbgl with diameter of 148mm to 165mm. The yield of these bore wells varies from <1 to 10 lps.

Fig. 12


AREA VULNERABLE TO GROUND WATER CONTAMINATION
Davanagere District, Karnataka
0
10
20
kilometers
N
W
E
S
HARPANAHALLI
JAGALUR
HARIHAR
DAVANGERE
HONNALI
CHANNAGIRI
District Boundary
Taluk Boundary
KARNATAKA STATE
Vulnerability to
Fluoride Contamination
Intensive Irrigation and Application of Fertilizers/Pesticides Contamination
Nitrate Contamination
Over Exploitaion

The stage of groundwater development in the district is quite high. In Channagiri taluk 80% of the area falls under over exploited and 20 % of the area falls under safe category. The stage of development of groundwater for the taluk is 113%. In Davangere taluk all the area is falling under over exploited category. The stage of development of groundwater for the taluk is 98%. In Harihar taluk 65% area falls under over exploited and 35% of the area falls under safe category. The stage of development of groundwater for the taluk is 69%. In Harpanahalli Taluk 89% area falls under over exploited category, 10% of the area falls under semi critical and 1% of the area falls under safe category. The stage of development of groundwater for the taluk is 119%, which is the highest in the district. In Honnali taluk 15% under over exploited and 85% of the area falls under safe category. The stage of development of groundwater for the taluk is 41%, which is the lowest in the district. In Jagalur taluk 80% area falls under over exploited and 20% of the area falls under semi critical category. The stage of development of groundwater for the taluk is 106%.

5.0 Ground Water Management Strategy:

5.1 Ground Water Development:

Based on the annual ground water availability for future irrigation use, it is proposed that the ground water development structure viz., dug wells, dug cum bore wells and bore wells can be constructed in those area falling under safe & semi critical category. Location of structure may be decided based on local hydrogeological condition and topography of the area after scientific surveys.

Dug wells are the ideal structures in weathered rocks. The diameter may be 4.5 to 5m and depth between 15 mbgl and 20 mbgl. In dug wells, boreholes may be drilled from the bottom to tap the weathered and fractured zones wherever feasible based on hydro geological considerations. These may be drilled with a dia of 100 to152mm up to a depth of 40 mbgl to 80 mbgl and extension bore wells can also be drilled.

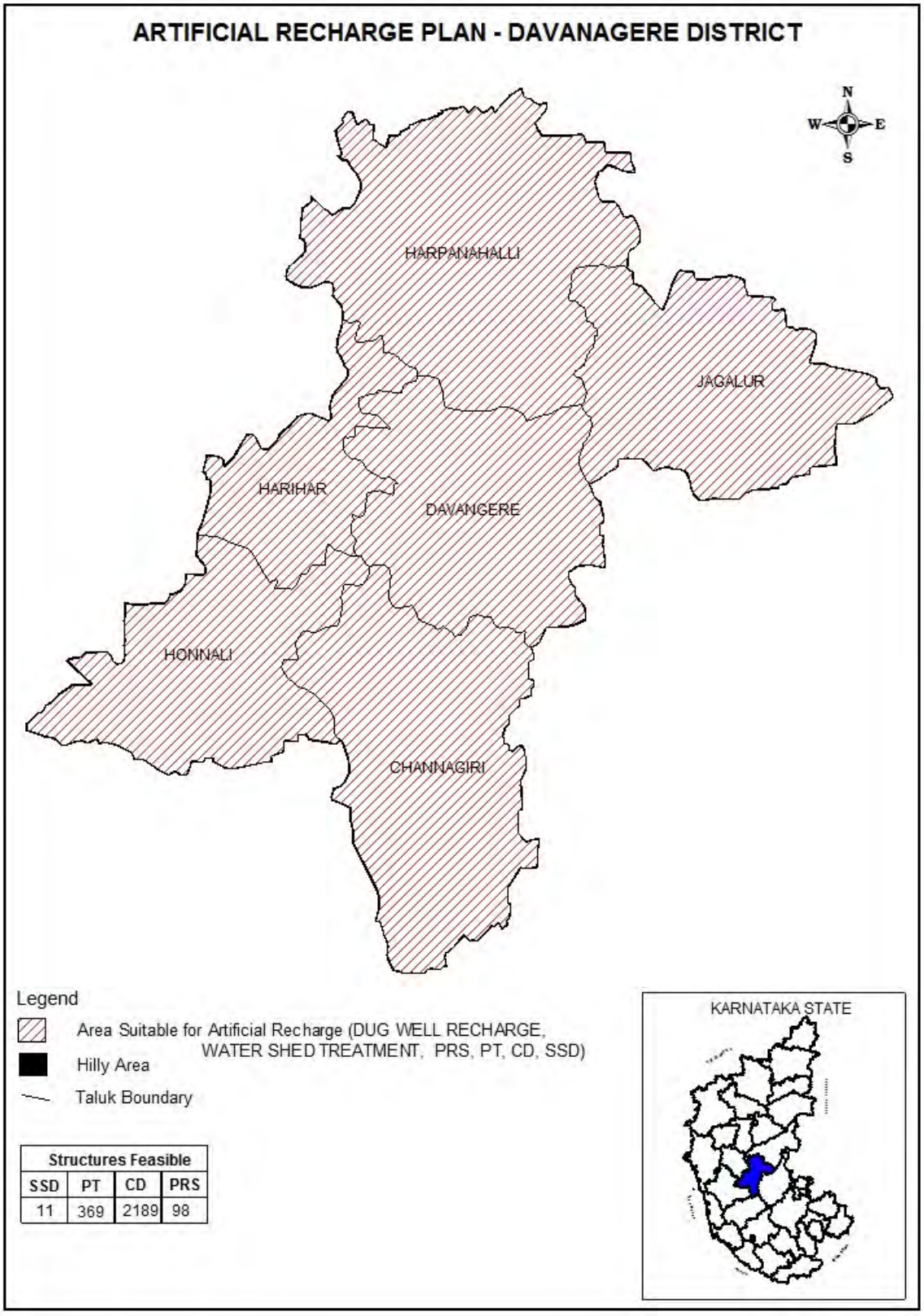
Bore wells of 152 mm diameter can be constructed from the surface by lowering the casing pipe up to the semi weathered formation and leaving rest of bore well naked. The depth of bore wells in the range of 60 mbgl to 200 mbgl yielding between 2 lps to 10 lps or more can be drilled after scientific investigations for locating the sites.

5.2 Water Conservation & Artificial Recharge:

As per the resource assessment data, major part of the district is falling under over-exploited and semi critical category. The stage of groundwater development in the district is 91% which requires immediate intervention by way of conservation and artificial recharge to ground water in order to arrest the declining trend in water level. Artificial recharge to ground water though percolation tank, check dams and nalla bunds is the apt solution to mitigate the water scarcity in plain land of the district (Fig-13). Most of the tanks in the district are silted.

The rejuvenation of these tanks by desilting and construction of additional percolation tanks will help in recharging the phreatic zone. It is the most practical solution to prolong the onset of drought. Subsurface dykes are suitable along river course wherever the thickness of the alluvium is more. In canal command

Fig. 13



Structures Feasible			
SSD	PT	CD	PRS
11	369	2189	98

area, where ever there is rising trend in water levels, it is suggested to adopt conjunctive use of both surface and ground water by drilling additional bore wells in order to arrest the conditions of water logging and salinity of the soil.

6.0 Awareness & Training Activity

6.1(a) Mass Awareness Programme (MAP)

Central Ground Water Board, South western Region, Bangalore has organized MAP at Jagalur, Jagalur taluk, Davangere district on 28.10.2010. Smt.J.M.Nagarathna, President, ZP, Davanagere was the Chief Guest. She addressed the gathering on the issues related to water management and role of women in conservation of water in rural areas. Sri S.K.Ramareddy, Member ZP, Sri Prabhuswamy, Exe.Officer, Jagalur Town Panchayat were guest of honour. Dr.K.Md Najeeb, Regional Director presided over the function. A gathering of 200 persons, which included representatives from Panchayats, Sree Shakti college students and farm community attended the programme.

As a part of the programme, drawing competition on water conservation for school students was arranged on 25.10.2010 at Jagalur town. During the MAP prizes were distributed to winners of the competition.

Lectures on various aspects of ground water development, management and legislature were delivered by the scientists of CGWB.

6.1(b) Water Management Training Programme (WMTP) by Central Ground Water Board

Central Ground Water Board, Southwestern Region, Bangalore has organized **WMTP** at ZP hall, Davanagere during 26th-27th October 2010.The training programme was inaugurated by the Chief guest, Sri P.S.Vastrad, IAS, Deputy Commissioner. Sri Gutti Jambunath, CEO was the guest of Honour and released the training volume. Dr K.Md Najeeb, Regional Director presided over the function.

Totally 34 trainees from various state departments such as DMG, Water Shed, PRED, Minor Irrigation, Academics from educational Institutions & NGO attended the training. Lectures were delivered by the officers of SWR on various topics of ground water development & management.

7.0 SUM UP:

Major part of the district is falling under over-exploited and semi critical category. The stage of groundwater development in the district is 91% which requires immediate intervention by way of conservation and artificial recharge to ground water in order to arrest the declining trend in water level. Artificial recharge to ground water though percolation tank, check dams and nalla bunds is the apt solution to mitigate the water scarcity in plain land of the district. Most of the tanks in the district are silted.

Very small area in the district is safe for the further development of ground water. Bore wells of 152 mm diameter can be constructed in the area from the surface by lowering the casing pipe up to the semi weathered formation and leaving rest of bore well naked. The depth of bore wells in the range of 60 mbgl to 200 mbgl yielding between 2 lps to 10 lps or more can be drilled after scientific investigations for locating the sites.

A minimum spacing of 300 meters may be kept between the two bore wells to avoid mutual interference and affecting the yields. However, closer spacing up to 150 meters in the tanks/canal command areas can also be attempted.

A vast area outside the canal command is dependant on rainfall and since the district comes under the semi arid tract of the country and is also drought prone, it is necessary to monitor the future development and changes in ground water regime, so that preventive measures can be taken. Therefore, it is necessary that more number of observation stations and piezometers be established in the district so that any undesirable development, such as water table depletion, water logging and deterioration in water quality can be noticed early, demarcated and suitable remedial measures taken.

'Conjunctive use' of surface and ground water may be carried out in the canal command areas to bring more area under irrigation and also to control water logging and salinity.