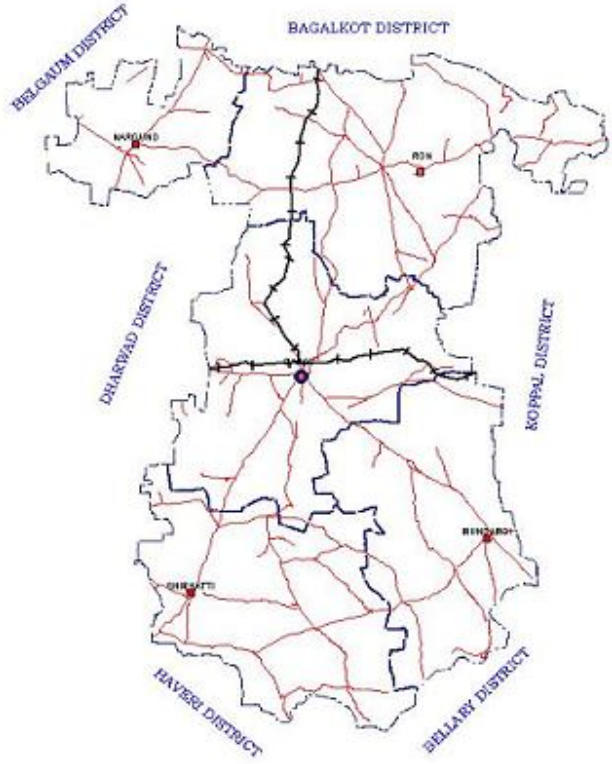
जल वर्ष 2007 Water Year 2007

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
GADAG DISTRICT, KARNATAKA



SOUTH WESTERN REGION
BANGALORE
FEBRUARY 2013

सुशील गुप्ता
अध्यक्ष
केन्द्रीय भूमि जल बोर्ड,
जल संसाधन मंत्रालय,
भारत सरकार,
भूजल भवन, एन एच. - 4,
फरीदाबाद.

Sushil Gupta
Chairman
Central Ground Water Board,
Ministry of Water Resources,
Government of India,
Bhujal Bhawan, NH-IV,
Faridabad.

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.

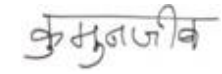
Sushil Gupta
CHAIRMAN

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, 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 27 districts of Karnataka state, of which six of the districts fall under farmers' distress category.

The Gadag 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 Shri G.Krishnamurthy Scientist-C, Central Ground Water Board, South Western Region, Bangalore. The figures were prepared by Sri. J.Shivaramakrishnan, Assistant Hydrogeologist. 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, hydrogeologists and engineers to plan the water resources management in a better way in the district.



Dr.K.Md.Najeeb
Regional Director

GADAG DISTRICT AT A GALANCE

Sl No	ITEMS	Statistics	
1.	**GENERAL INFORMATION**		
	i) Geographical area (Sq.km)	4651	
	ii) Administrative Divisions		
	a) Number of Taluk	5	
	b) Number of panchayat/S	106	
	iii) Population (As on 2011Census)	1065235	
	iv) Average Annual Rainfall (mm)	493	
2.	**GEOMORPHOLOGY**		
	Major physiographic units	02	
	Major Drainages	02	
3.	**LAND USE (Ha)**		
	a) Forest area	32614	
	b) Net area sown hect	3866	
	c) Cultivable area		
4.	**MAJOR SOIL TYPES**	2, (a)granitic soils and (b)sandy to clayey soils	
5	**AREA UNDER PRINCIPAL CROPS (Ha)**	Jowar	93659
		Turdal & other pulses	2784
		Groundnut	57846
		Cotton	59813
		Paday	1543
		Wheat	36348
		Maize	22621
6.	**IRRIGATION BY DIFFERENT SOURCES (Ha)**		
	Dug wells	2008	
	Bore wells	26856	
	Tanks	1246-	
	Canals	20016	
	Other sources	5246	
	Lifts	1309	
	Gross irrigation area	62766	
7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB**		
	No of Dug wells	19	
	No of Piezometers	8	
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	, Granites & Gneisses Dharwar super group of schists, metagrey wacks, ferruginous cherts	
9.	**HYDROGEOLOGY**		
	Major water bearing formation	Granites , Gneisses& Dharwar schist	
	Pre-monsoon Depth to water level range during-2011	1.54 - 24.60 mbgl.	

	Post-monsoon Depth to water level range during-2011	1.24 – 24.90 mbgl.	
	Long term water level trends for the period January 2002 to 1December - 2011	Long term water level trends available for 19 stations	13 Rising trends range between 0.0015 and 2.419 m/year. 6 falling trends range between 0.027 and 2.330 m/year.
10.	**GROUND WATER EXPLORATION BY CGWB (As on 31.3.2007)**		
	No of wells drilled (EW, OW, PZ, SH, Total Depth range (m)	15- EW 17-OW	19.55 - 196.95 m 60.0 –105.85 m
	Discharge (litres per second)	nil – 6.60 lps	
	Specific capacity lmin/m	3.12-68.99	
	Transmissivity (m^2 /day)	1.07-94.93	
11.	**GROUND WATER QUALITY**		
	Presence of chemical constituents more than the permissible limit (e.g. EC, F, As, Fe)	Electrical Conductivity, Nitrates and Fluoride.	
	Type of water	Potable to Brackish	
12.	**DYNAMIC GROUND WATER RESOURCES (2004) IN MCM**		
	Annual Replenishable GW resources	24605	
	Net Annual Ground Water Draft	22102	
	Projected Demand for Domestic and industrial uses up to 2025	3033	
	Stage of G W Development	94%	
13.	**AWARENESS AND TRANING ACTIVITY**	nil	
	Mass Awareness Programme organised and No. of participants	nil	
14	**EFFORTS OF ARITIFICIAL RECHARGE & RAINWATER HARVESTING**	Display of posters, Distribution of pamphlets, brochures & stickers, Organising drawing competitions in schools, conducting awareness and training programmes, Delivering lectures, and presenting through power points and showing documentaries	
	Projects completed by CGWB (No & amount spent)	nil	
	Projects under technical guidance of	nil	

	CGWB (Numbers)	
15.	**GROUND WATER CONTROL AND REGULATION**	nil
	OE Area in %	71% in Gadag85% in Naragund& Ron taluks
	Critical area in %	-
	No of Blocks notified	Nil
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Rainfall is erratic, drought prone district Application of traditional farming and irrigation methods, unscientific develop ment of groundwater, Brackishness and salinity of groundwater, fluoride problem

1.0 INTRODUCTION

Gadag district is newly created on 1-11-1997, bifurcating Gadag, Mundargi, Nargund, Ron, Shirhatti taluks from the old Dharwad district. Gadag district is located in northern parts of Karnataka and situated in between north latitudes of 15° 15' and 15°45' and east longitudes of 75°20' and75°47'. It is bounded by Koppal district on east, by Baglkote district on north, by Haveri district on south and by Dharwad district on west.

1.1 Administrative divison

For administrative convenience, the district is divided in to 5 taluks with total of 337 villages. It contains 3 town municipalities, 5 town panchayaths and 11 hoblies. A map showing administrative details of the district is presented as **Fig-1**.The details are given in table -1

Table - 1 showing administrative details of Gadag district (as per 2001 census).

Sl No	Taluk	No. hoblis	Gram pancha -yats	No of un in-habited villages	No of in-habited villages	towns	municip -alities	Town Panch-ayat
1	Gadag	2	25	61	3	1	-	1
2	Mundargi	2	15	57	1	-	-	1
3	Nargund	2	12	34	1	-	1	-
4	,Ron	3	30	93	-	-	1	2
5	Shirhatti	2	24	80	7	-	1	1
	TOTAL	11	106	325	12	1	3	5

1.2 Basin and drainage

The district is a part of Krishna basin, divided in to two sub basins namely Malaprabha , and Tungabhadra. These have an area of 2768 km^2 and 1889.2 km^2 respectively. A tributary of Malaprabha river, Bennehalla flowing parellel to the main river joins Malapraba river in Ron taluk which is located north eastern part of the district. Overall drainage network is exhibiting dendritic pattern. A drainage map of the district is given as **Fig-2.**

1.3 Irrigation

Details of the area irrigated by different sources, net area irrigated is given in table-2

Table - 2 Details of the area irrigated by diffrented source in gadag district 2004-05

(in ha)

Taluks	Canals	Tanks	Wells	Bore wells,	Lift irrigation	Others soures
Gadag	-	70	219	4520	-	10
Mundargi	-	1072	-	5444	6868	-
Naragunda	33708	-	1220	1555	-	3199
Ron	861	30	-	13455	-	1871
Shirhatti	-	344	788	6054	41	1282
Total	34569	1516	2008	31028	6909	6362

Fig- 1

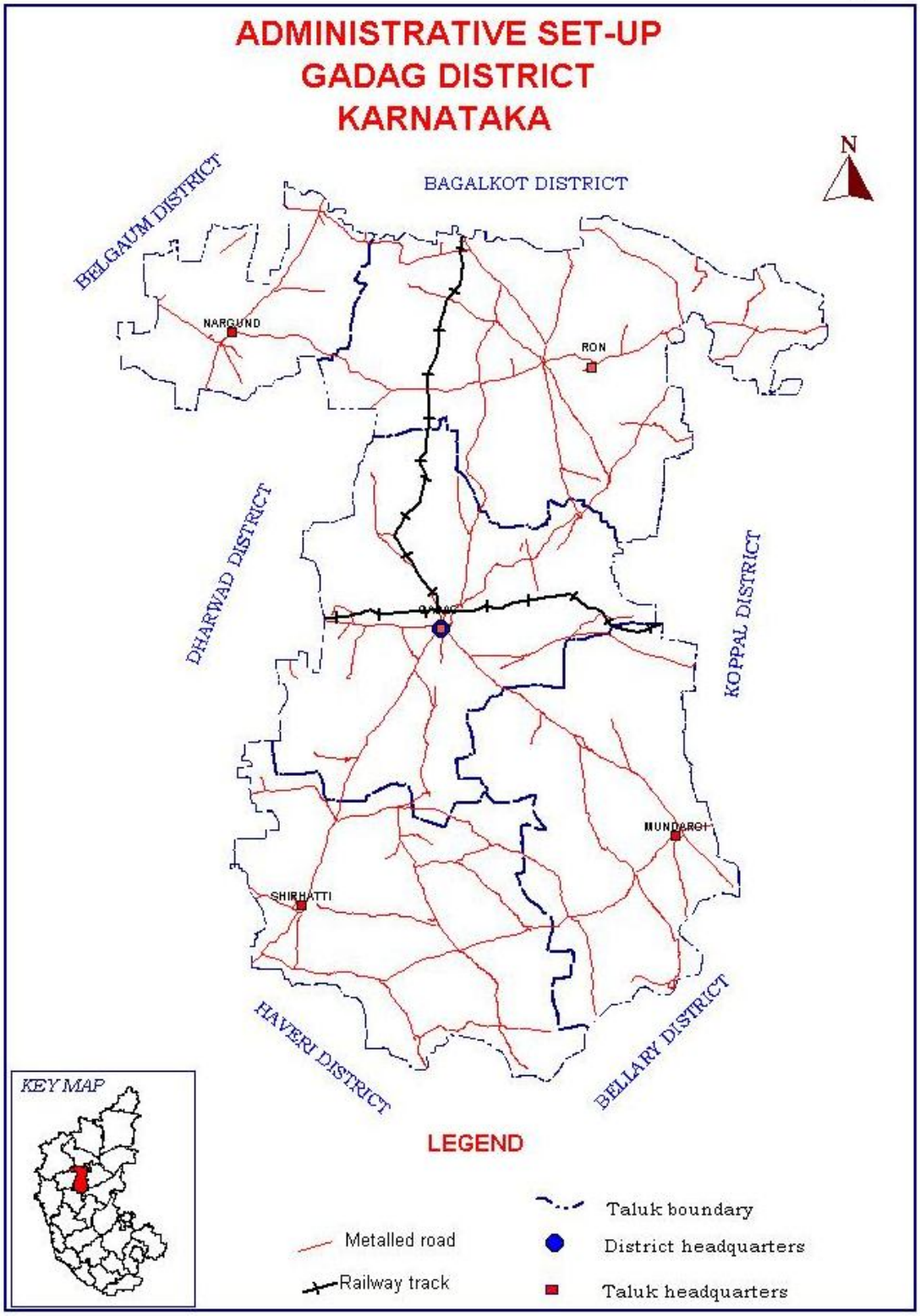
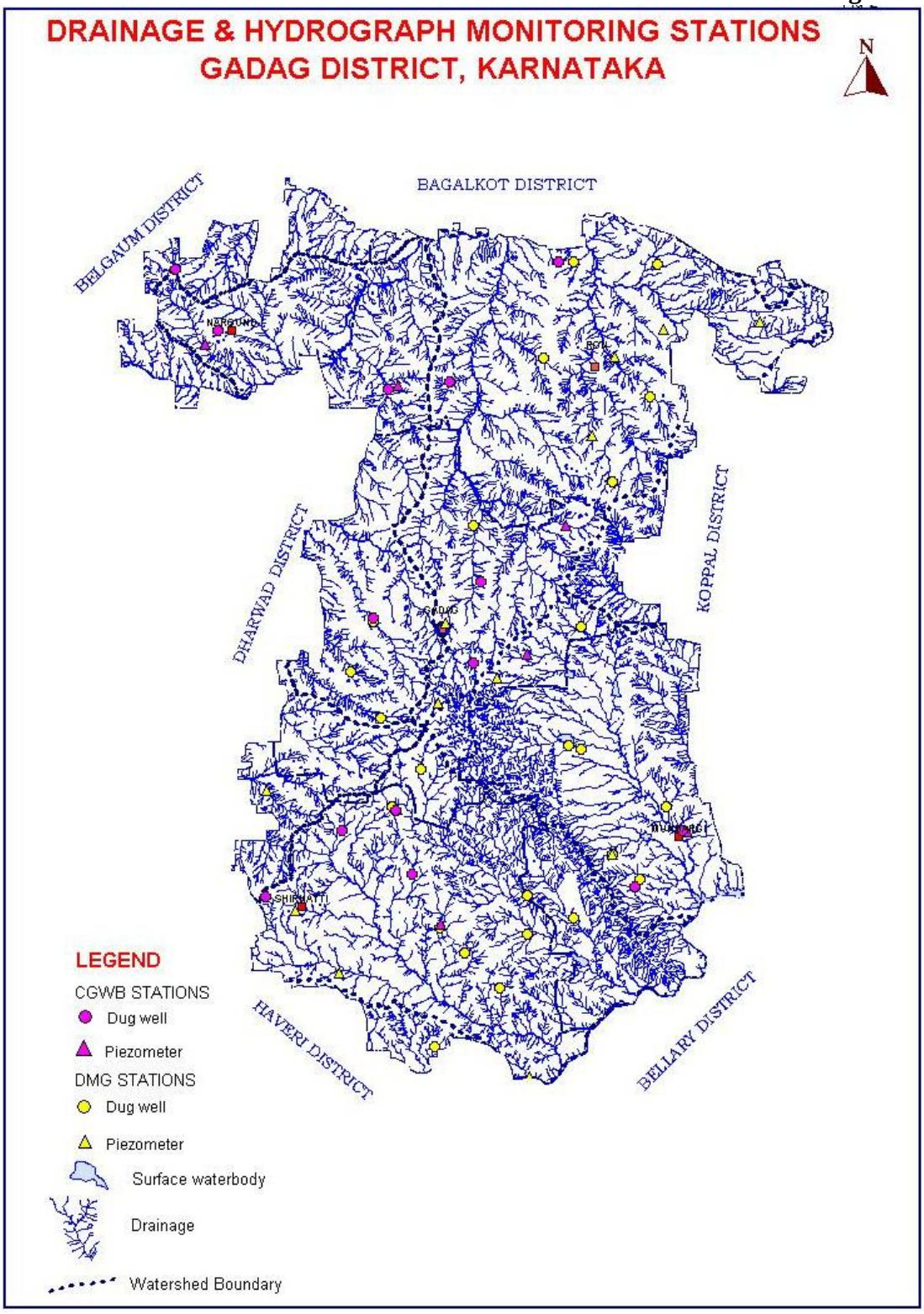

ADMINISTRATIVE SET-UP
GADAG DISTRICT
KARNATAKA
N
BAGALKOT DISTRICT
BELGAUM DISTRICT
NARGUND
RON
DHARWAD DISTRICT
KOPPAL DISTRICT
MUNDARGI
SHIRHATTI
HAVERI DISTRICT
BELLARY DISTRICT
KEY MAP
LEGEND
Taluk boundary
Metalled road
District headquarters
Railway track
Taluk headquarters

Fig. 2


DRAINAGE & HYDROGRAPH MONITORING STATIONS
GADAG DISTRICT, KARNATAKA
N
BAGALKOT DISTRICT
BELGAUM DISTRICT
DHARWAD DISTRICT
KOPPAL DISTRICT
HAVERI DISTRICT
BELLARY DISTRICT
GADAG
SHIRHATTI
LEGEND
CGWB STATIONS
Dug well
Piezometer
DMG STATIONS
Dug well
Piezometer
Surface waterbody
Drainage
Watershed Boundary

The table- 3 reveals that about 60% of the area was irrigated by surface water sources ie- through canals, tanks, lift irrigation, and other sources. Remaining 40% area was irrigated through ground water source like dug wells and bore wells during 2004- 05

1.4 Landuse

In the district during 2003-04 about 80% area is net irrigated, about 7% of the area is covered by forest and net sown area is about 83% of geographical area. the details of land utilization given in table –3.

Table no-3 showing land utilization in Gadag district during 2003-04 in hectares

Taluk	Geo-graphical area	Forest	Cultivable Waste	Barren Current	Permanent Pasture	Net area sown	Area sown more than once
Gadag	109751	1749	291	18302	1054	85004	15366
Mundargi	88398	17646	163	8126	280	57031	-
Naragund	43562	-	-	2996	52	36205	1003
Ron	129091	276	370	-	428	120588	3701
Shirhatti	94913	12943	186	388	778	74368	15984
Total	465715	32614	1010	29812	2592	373196	36054

1.5 Main crops

In the district as per district at a glance of 2004-05 total net area sown is 386666 ha. It is 84% of total geographical area. Principal crops in the district are Jawar occupying 24%, groundnut 14%, sunflower 22%, cotton15% and wheat 9% of the net sown area and other crops like paddy, ragi, turgram, vegetables are also grown. Normally in command areas of the district crops like sugarcane, maize and jawar, wheat, gram, paddy and pulses are grown while in non-command areas sunflower, groundnut, chillies, millet and pulses are grown. And normally in command areas of the district crops are grown like sugarcane maize, jawar, wheat, gram, paddy and pulses while in non command areas sun flower, groundnut, chillies, millet and pulses are grown.

Table -4 Taluk wise area under different principal crops in Gadag district

Taluks	Jowar	Maize	Wheat	Ground nut	Sun flower	Safflower	Tur	Cotton
Gadag	21067	921	8427	14490	13906	1471	464	19763
Mundargi	15011	11202	4225	9524	20048	707	893	9024
Naragund	11187	11202	8066	247	8660	258	91	633
Ron	27357	4802	13064	12486	29475	1873	798	17626
Shirhatti	19037	2297	2566	21099	12017	833	538	12817
Total	93659	22621	36348	57846	84106	5142	2784	59813

1.6 Work carried out by CGWB

The central ground water board has carried out systematic Hydrogeological surveys Reappraisal Hydro geological surveys and Malaprabha and Tungabhadra canal command area surveys, ground water exploration and ground water regime monitoring etc.

2.0 GEOMARPHOLOGY&SOIL TYPES

The district falls in the semi arid tracts of Karnataka. The annual rainfall is generally less than 750mm. It lies to the east of the westerern ghats in the rain – shadow region. Hence receives low rainfall and generally drought prone and it is a part of Krishna major basin the district drained by two main rivers namely Malaprabha and Tungabhadra. Malaprabha along with its tributary Bennihalla drains northern parts and two rivers join at Ron taluk. The Malaprabha and Tungabhadra sub basins have the area of 2768 sq km and 1889.2 sq km respectively. The area of the district is plain to gently undulating terrain varies in altitude from 508m-740m amsl. Malaprabha river sub basin is sloping towards north- east direction. And Tungabhadra river sub basin slopes towards south-east to east –north-east direction. Master slope is 1.25m/km where as Malaprabha river has 0.5m/km slope. Both rivers show a seasonal regime varying from lean sluggish flow during summer to torrential muddy flow during the monsoon. The area of the district is generally covered by medium to deep black soils and extends up To1.80 m b.g.l. Average being 1.10 mbgl. The constant rate of infiltration in sandy to clayey residuum ranges between 0.5 to 4.5cm/hr. Phyllitic soils are confined To hilly region.

3.0 RAINFALL AND CLIMATE

The district falls under semi arid tract of the state and it is categorized as draught prone. And normal rainfall is 613 mm. The north-east monsoon contributes nearly 24.8% and prevails from October to early December. And about 54.7% precipitation takes place during south –west monsoon period from June to September. And remaining 20.5% takes place during rest of the year. In the district from December to February month is winter season, During April to May temperature reaches up to 42°C and December and January temperature will go down up to 16°C. The standard deviation of rainfall in the district varies from 1.3 to 263.5mm from west to east. The average standard deviation for the district is about 146 mm. South West monsoon is dominant followed by north-east monsoon. Taluk wise rainfall details are shown in table –5.

Table – 5 Taluk wise rainfall details in gadag district,Karnataka

Seasonal & Annual Nornmal Rainfall for the period 2001-2010 Gadag District, Karanataka				
Station	**Pre-Monsoon**	**SW Monsoon**	**NE Monsoon**	**Annual**
	Rainfall (mm)			
Gadag	142	384	147	673
Mundargi	129	303	121	553
Nargund	124	347	126	597
Ron	138	391	158	687
Shirahatti	127	351	158	636

DISTRICT AND TALUK WISE RAINFALL FOR THE YEAR 2011, GADAG DISTRICT, KARNATAKA																	
		Rainfall (mm)															
	DISTRICTS/ TALUKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**PRE**	**JUN**	**JUL**	**AUG**	**SEPT**	**SWM**	**OCT**	**NOV**	DEC	**NEM**	**ANNUAL**
	GADAG	**0**	**1**	**1**	**74**	**63**	**138**	**63**	**74**	**106**	**32**	**274**	**79**	**1**	**0**	**80**	**493**
1	GADAG	0	3	1	70	63	137	92	59	160	31	342	60	1	0	61	540
2	MUNDARGI	0	0	0	97	66	163	25	74	75	30	204	51	0	0	51	418
3	NARAGUND	0	0	0	79	19	98	88	46	110	26	270	82	0	0	82	450
4	RON	0	0	0	50	81	131	56	130	73	4	263	32	0	0	32	426
5	SHIRAHATTI	0	1	4	73	85	163	55	59	112	67	293	170	4	0	174	630

4.0 GROUND WATER SCEINARIO

4.1 Hydrogeology

The district is underlain by hard rock formations like granites, gneisses, and schists. These rocks have no primary porosity or permeability. Ground water occurs under phreatic conditions in weathered zone of these formations. At higher depths ground water occurs under confined to semi-confined conditions in fractures and joints as well as formation contacts, its movement is controlled by the interconnectivity and geometry of the structurally week zones called lineaments. In the district the ground water is developed through dugwells and dug cum– bore wells up to 20 m depth. a hydrogeological map of the area is given as **Fig-3.**

4.1.1 Depth to water levels

Pre-monsoon (May-2011) depth to water level of 1.54 mbgl minimum and 24.60 mbgl is maximum, patches of 2-5 mbgl water level category is noticed in Mundargi taluk and a small patch in Shirhatti taluk has recorded more than 20mbgl depth to water level. Parts of Gadag, Mundargi and Shirhatti taluks are showing 5-10m range. A patch of Nargund taluk showing 5-10mbgl range. Major

Fig- 3

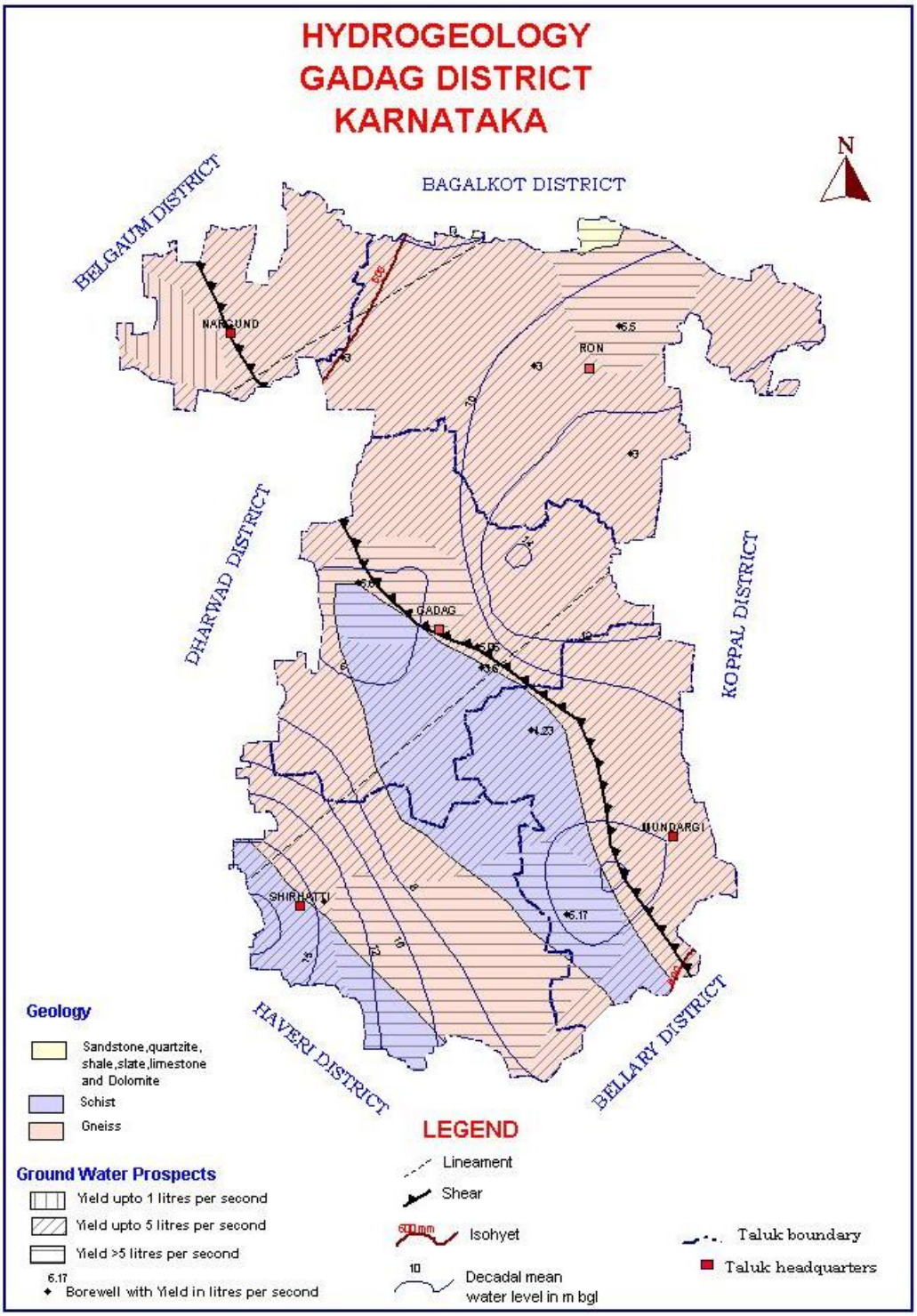

HYDROGEOLOGY
GADAG DISTRICT
KARNATAKA
N
BAGALKOT DISTRICT
BELGAUM DISTRICT
DHARWAD DISTRICT
KOPPAL DISTRICT
HAVERI DISTRICT
BELLARY DISTRICT
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
Geology
Sandstone,quartzite, shale,slate,limestone and Dolomite
Schist
Gneiss
Ground Water Prospects
Yield upto 1 litres per second
Yield upto 5 litres per second
Yield >5 litres per second
6.17
Borewell with Yield in litres per second
LEGEND
Lineament
Shear
600mm
Isohyet
10
Decadal mean water level in m bgl
Taluk boundary
Taluk headquarters

Fig. 4

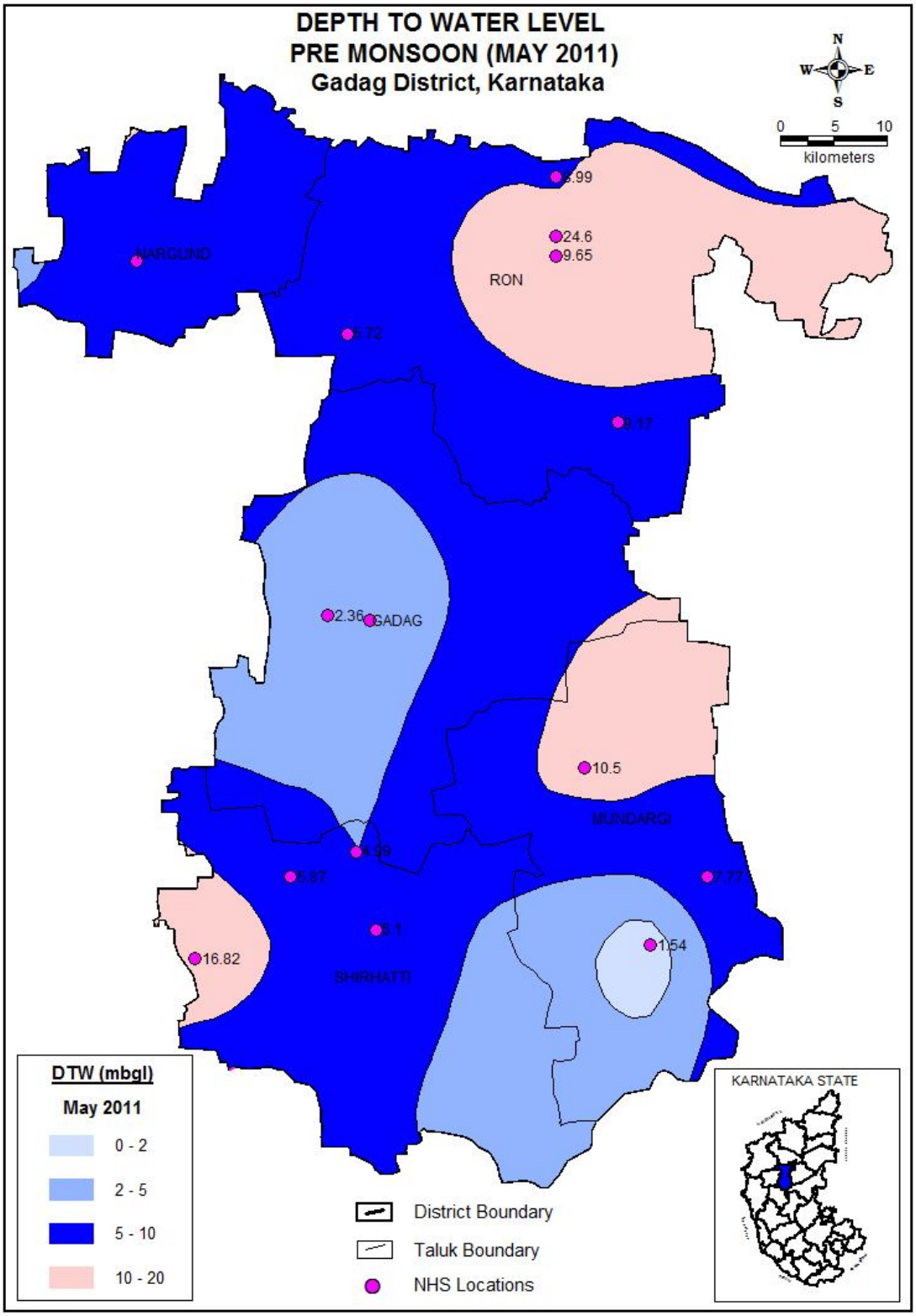
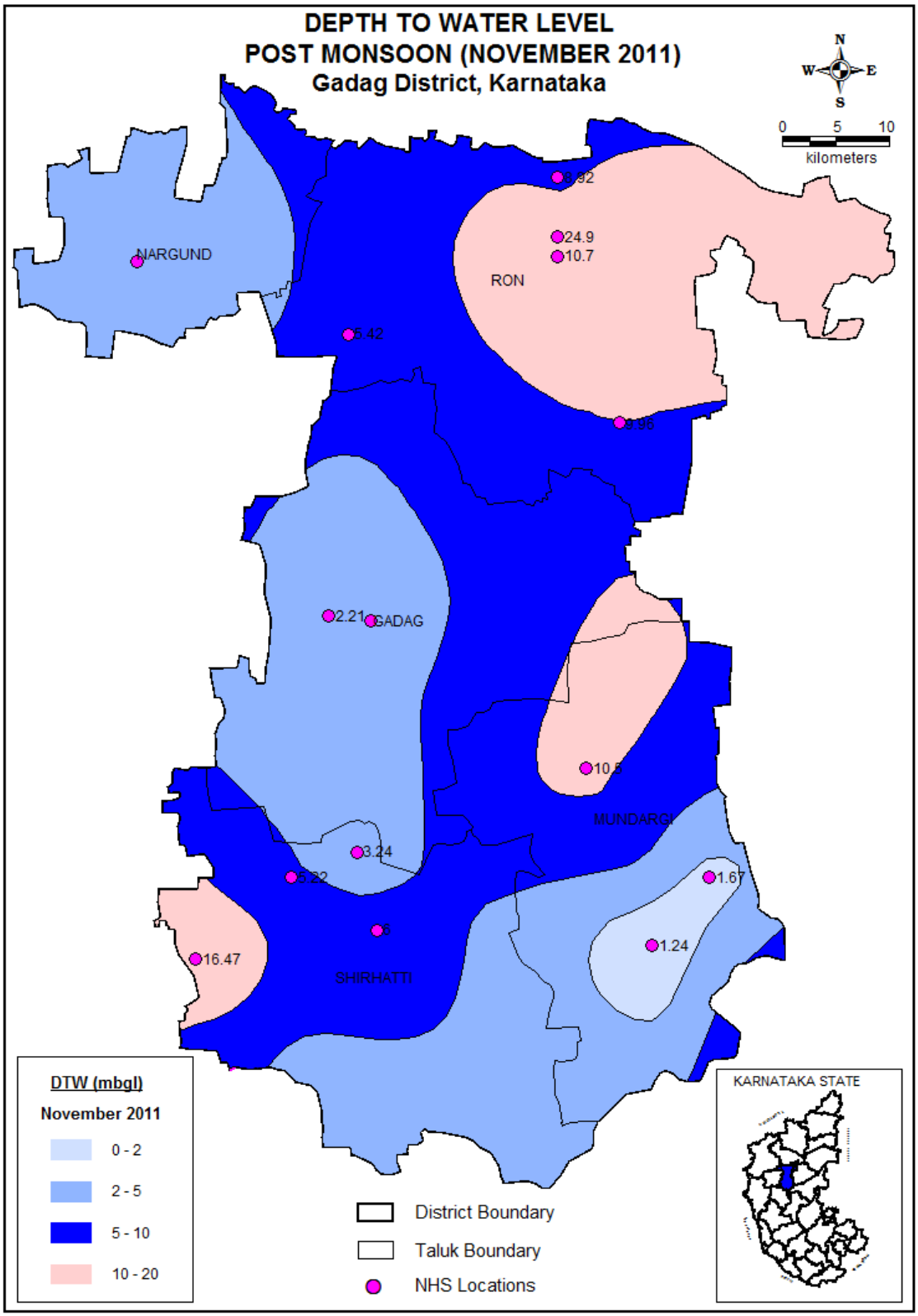

DEPTH TO WATER LEVEL
PRE MONSOON (MAY 2011)
Gadag District, Karnataka
N
W
E
S
0 5 10
kilometers
24.6
9.65
RON
2.36
GADAG
10.5
MUNDARGI
16.82
SHIRHATTI
1.54
DTW (mbgl)
May 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig. 5


DEPTH TO WATER LEVEL
POST MONSOON (NOVEMBER 2011)
Gadag District, Karnataka
N
W
E
S
0 5 10
kilometers
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
3.92
24.9
10.7
5.42
2.21
10.2
3.24
5.22
1.67
16.47
1.24
DTW (mbgl)
November 2011
0 - 2
2 - 5
5 - 10
10 - 20
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

parts of the district occupied by 10-20mbgl range. A premonsoon depth to water level map is presented as Fig-4. During post monsoon (Nov 2011) ground water levels ranges from minimum of 1.24 mbgl at Kalkeri station to maximum of 24.900m at Kotbal station, 2-5mbgl depth to water level category is observed in parts of Mundargi and Shirhatti taluks. 5-10mbgl water level category is observed in major parts in Shirhatti, Gadag, Mundargi and Nargund taluks. 10-20mbgl depth water level category is observed in major part in Ron taluk and parts of Gadag, Mundargi, Shirhatti, Nargund taluks. . A postmonsoon depth to water level map is presented as Fig-5.

4.1.2 Long term trends of water levels

Long term water level trends for the period January 2002 to 1December 2011 were studied to know the changes in water levels in last ten years period. Premonsoon trends were available for 19 stations out of which at 13 network stations have rising trends ranging between 0.0015 and 2.419 m/year and water levels at 6 network stations have falling trends in the range of 0.027 and 2.330 m/year. Change in water level during pre monsoon and post monsoon period with respect to decadal mean is shown in fig 6 and 7

4.1.3 Ground water exploration

In the district central ground water board drilled 15 exploration wells with depth range of 19.55m to196.95 mbgl and 9 Observation wells with depth range of 60.0 to 105.85mbgl. It reveals that these wells recorded specific capacity in the range of 3.12 to 68.99 l/min/m drawdown and transmissivity range between 1.07 to 94.93 m2/day. The discharge of these wells were recorded almost nil to 6.60lps. The groundwater exploratory locations are shown in fig.8

4.2 Ground Water Resources

Ground water is an important source to meet the water requirement of like domestic and minor irrigation, industries. The development of ground water requires precise of quantitative assessment based on scientific principles. By application of ground water estimation methodology-1997 (GEMS-97) is shown in following table.

Table-6A

Taluk	Recharge from rainfall during monsoon (ham)	Recharge from rainfall during non monsoon (ham)	Recharge from other source during monsoon	Recharge from other source during non monsoon	Annual replinhable G.W .resource	Net G.W. availability
Gadag	2971	724	858	911	5463	5710
Mundargi	3160	700	396	514	4697	4848
Nargund	743	153	287	226	1412	1474
Nargund (poor)	670	600	590	592	2531	619
Ron	3031	985	765	1099	5896	6128
Shirhatti	2690	911	618	413	4606	4754
Toatal	13265	4073	3514	3755	24605	23533

Table-6B

Taluk	Irrigation draft in ham	Domestic& Industrial draft in ham	Total G.W.draft in ham	Projected draft for domestic & industrial draft for year 2025 in ham	G.W. availability for irrigation in ham	Stage of development.in %	Categarisation of area in % based on stage of development			
							Safe	semicritical	Critical	Over exploited
Gadag	4615	499	5114	708	1726	90	18	11	-	71
Mundargi	3936	291	4228	443	582	87	27	73	-	-
Nargund	1524	169	1693	237	459	115	15			85
Nargund (poor)	0	0	0	0	0	0	-	-	-	-
Ron	7203	765	7968	1062	642	130	-	-	-	100
Shirhatti	2688	411	3099	584	1603	65	100			
Total	19966	2135	22102	3034	5012	93.92				

4.3 Ground Water Quality

To assess the ground water quality of shallow aquifers of the district the chemical analysis data of water samples from national hydrograph network stations of May 2004 were used. As per this ground water is mild alkaline, E.C. ranges from 650 to 8010 in micro mhos /cm at 25°C. The Nitrate pollution is also noticed in the district up to 450ppm at ramgiri Station, fluoride content in the ground water in the district varies from 0.2 to2.55 ppm minimum is recorded at Mallapur and maximum at Shirhatti.Station.

4.4 Status Of Ground Water Development

Based on GEMS 1997 methodology the dynamic ground water resources as on march 2004 is computed and same is presented in the table and fig. 9. As per this total annual replinishable ground water resource is estimated as 24605 ham, and draft for irrigation during the period is estimated as 19966 ham. The stage of development O.E Ron taluk and Gadag is 71%,Nargund taluk %85 , Shirhatti taluk is safe. According to minor irrigation census 2000-01 , it is recorded 2201 dug wells,6772 shallow bore wells,57 dug cum bore wells are present.

4.5 Groundwater Vulnerability area

Groundwater 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 it's susceptibility to various stress factors the district wise vulnerability map is prepared on a regional scale considering the following factors viz.

Fig.6

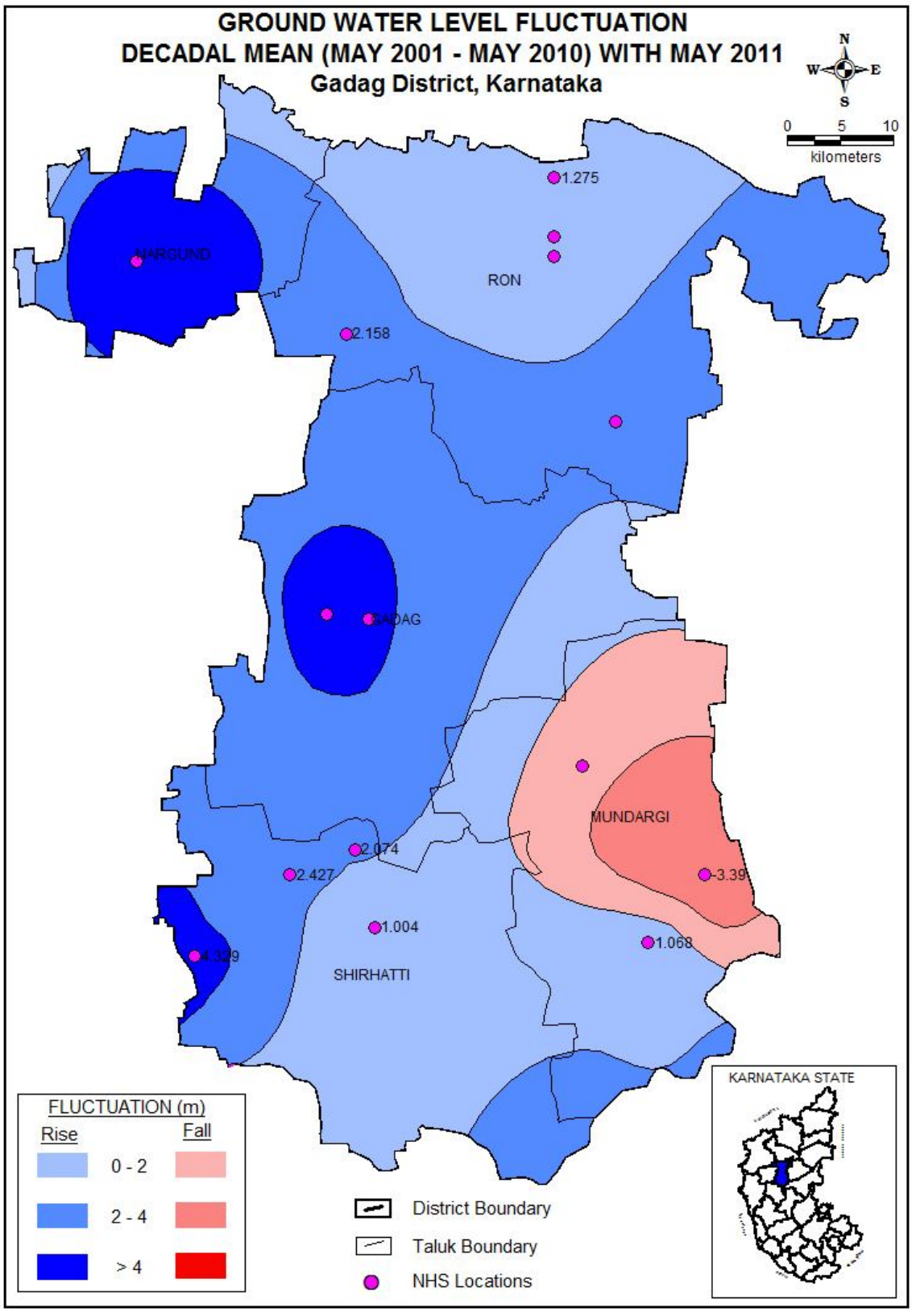

GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (MAY 2001 - MAY 2010) WITH MAY 2011
Gadag District, Karnataka
N
W
E
S
0 5 10
kilometers
1.275
RON
2.158
GADAG
MUNDARGI
-3.39
2.074
2.427
1.004
1.068
SHIRHATTI
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig. 7

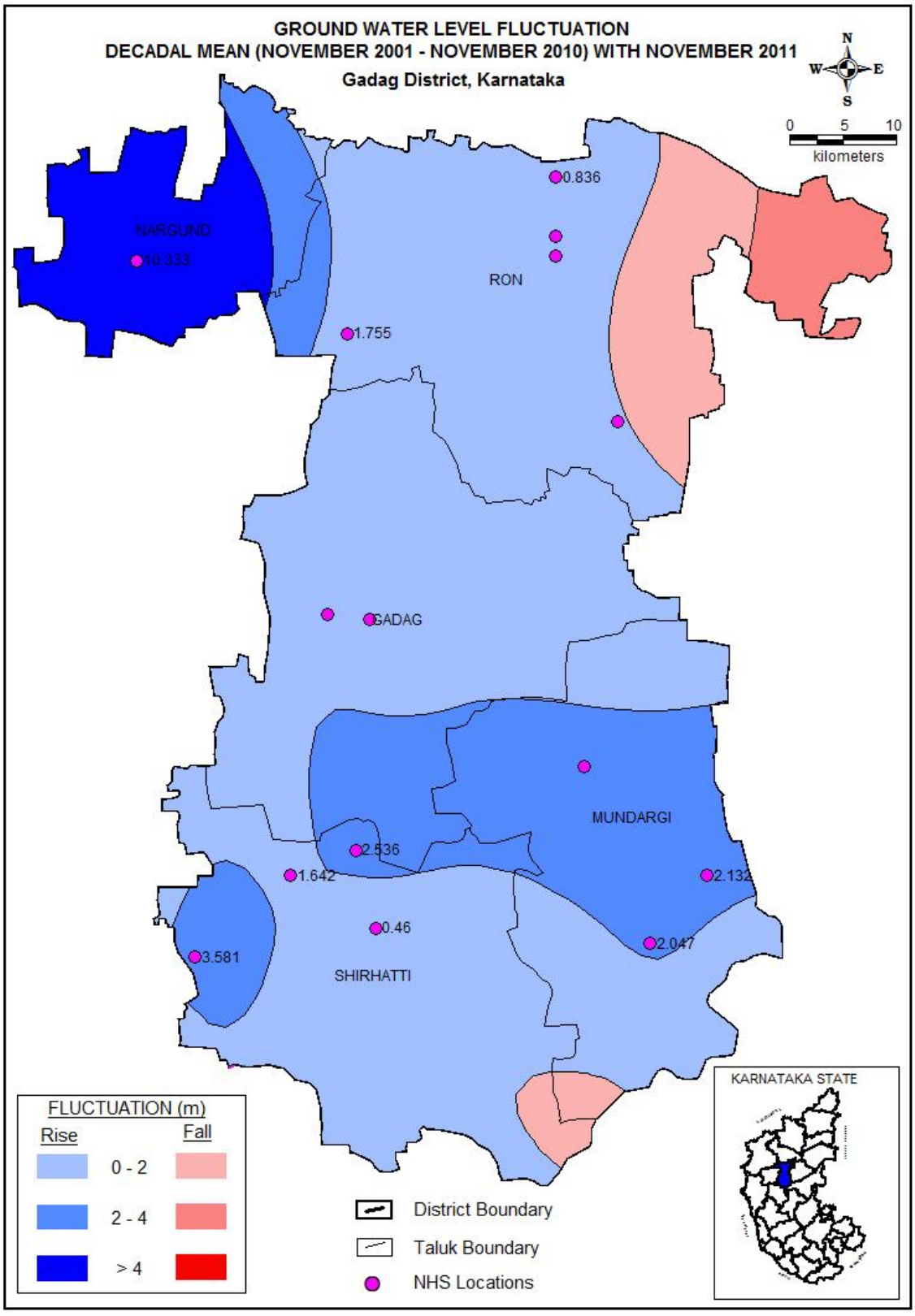

GROUND WATER LEVEL FLUCTUATION
DECADAL MEAN (NOVEMBER 2001 - NOVEMBER 2010) WITH NOVEMBER 2011
Gadag District, Karnataka
N
W
E
S
0 5 10
kilometers
NARGUND
10.333
0.836
RON
1.755
GADAG
MUNDARGI
2.536
1.642
2.132
0.46
2.047
3.581
SHIRHATTI
FLUCTUATION (m)
Rise
Fall
0 - 2
2 - 4
> 4
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig. 8

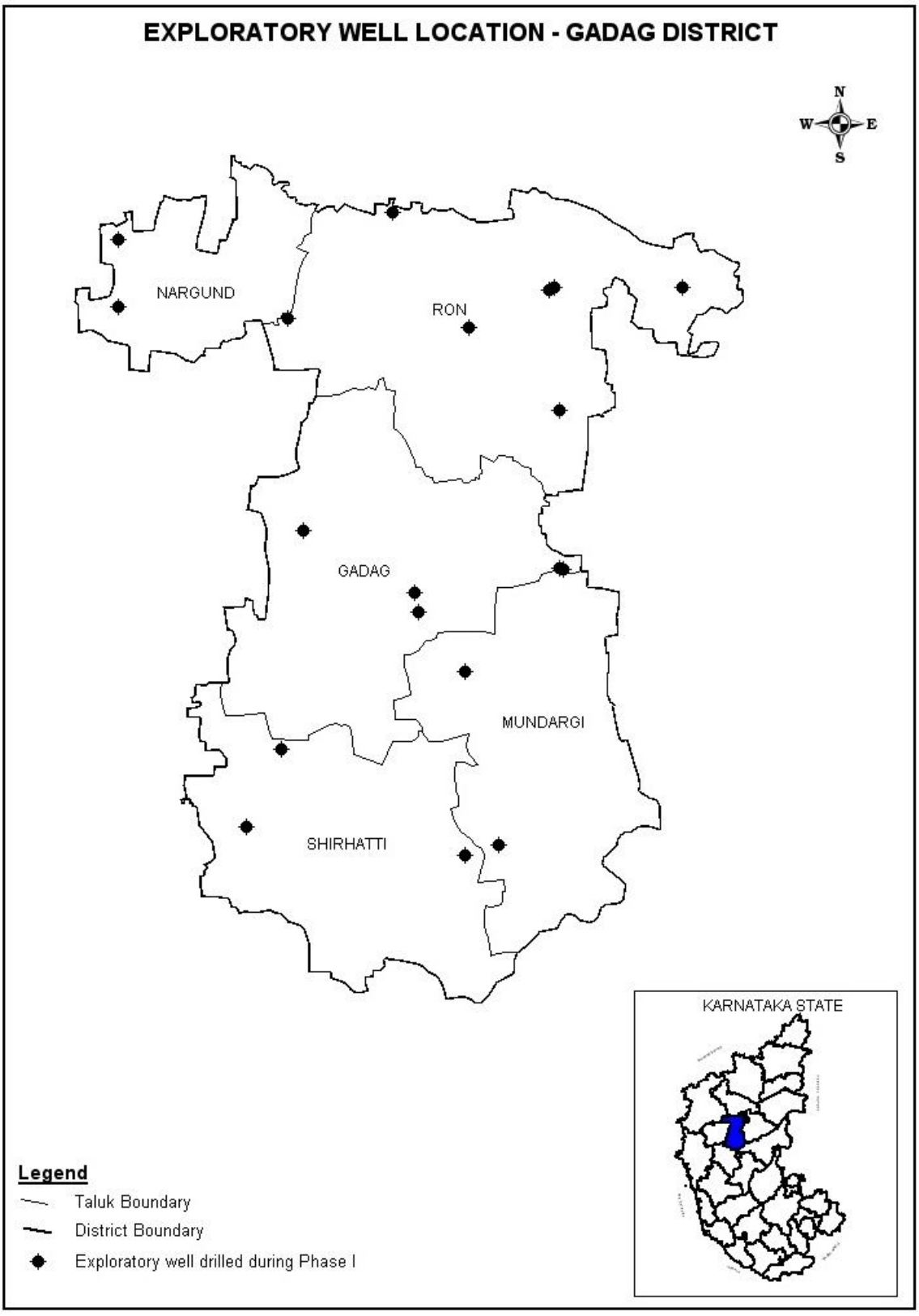
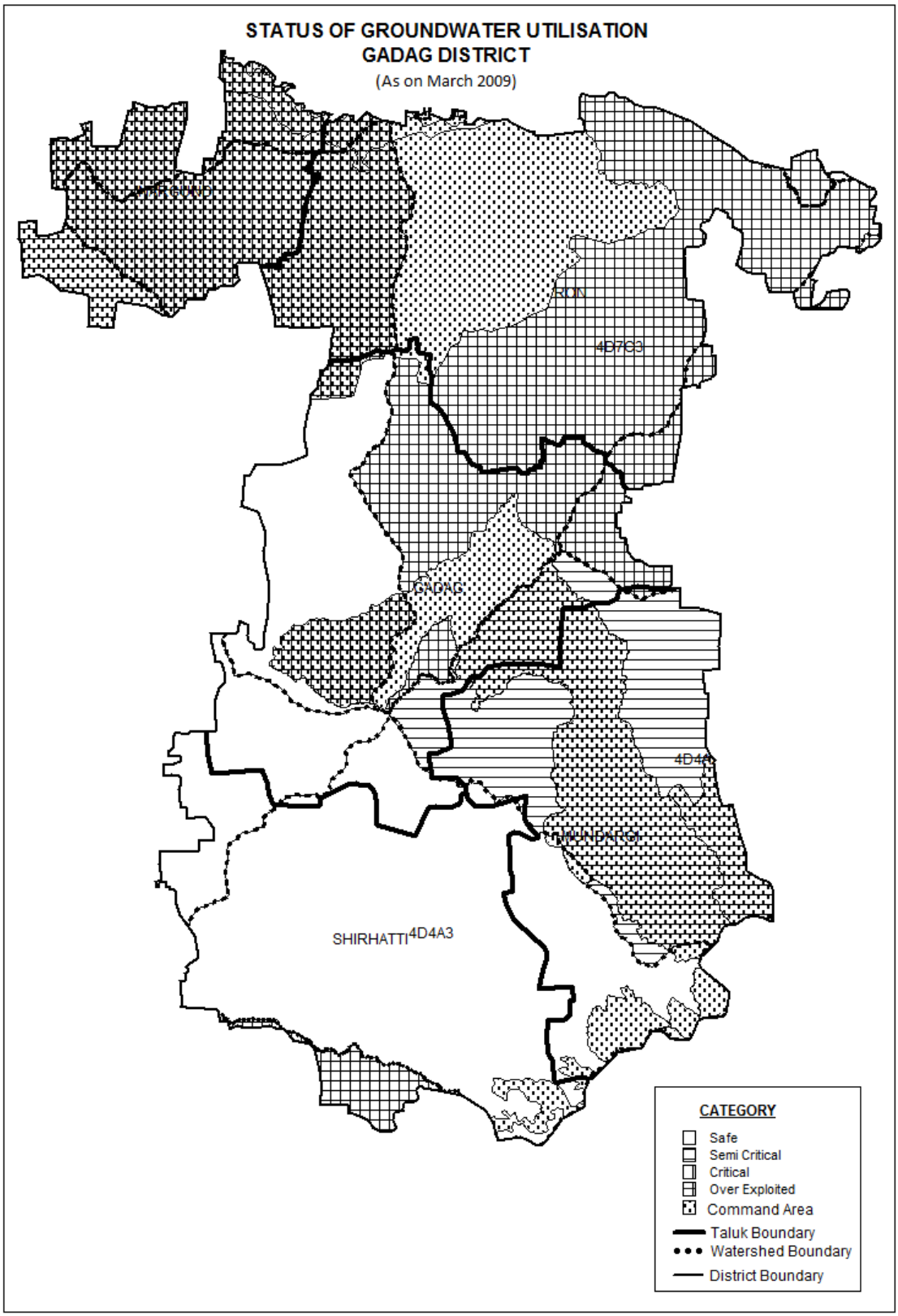

EXPLORATORY WELL LOCATION - GADAG DISTRICT
N
W
E
S
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
KARNATAKA STATE
Legend
Taluk Boundary
District Boundary
Exploratory well drilled during Phase I

Fig. 9


STATUS OF GROUNDWATER UTILISATION
GADAG DISTRICT
(As on March 2009)
RON
4D7C3
GADAG
4D4A
SHIRHATTI4D4A3
CATEGORY
Safe
Semi Critical
Critical
Over Exploited
Command Area
Taluk Boundary
Watershed Boundary
District Boundary

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 fertilisers/ 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 groundwater is vulnerable due to more than one of the above parameters, while in some others the entire district is free from vulnerability in Gadag district.(fig.10)

4.6Unit area annual groundwater recharge

Sustainability of groundwater resource depends mainly on two factors viz. Annual groundwater recharge and annual groundwater draft. The annual groundwater recharge depends on the quantity and intensity of rain fall, the infiltration characteristics of the soil, the depth to groundwater level, the slope of the area and the geomorphology. The groundwater recharge is assessed separately for the monsoon and non monsoon period due to rainfall as well as due to other sources. The annual groundwater 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 Gadag district the unit area annual recharge is in the range of 0.025 -0.10 in parts (fig.11)

5.0 GROUND WATER MANAGEMENT STRATEGY

Since, the district with the major part of the domestic water and agriculture demand met from groundwater the water management aspect become an integral part for all round socio economical development of the region, in addition to that the environmental management and ecological stability. Hence, a proper groundwater management strategy is essential to make most economical, efficient and judicious use of water to achieve sustainable development of the resource.

The development of water supply model should be resource based and should be from the point of view of total supply and demand.

Fig. 10

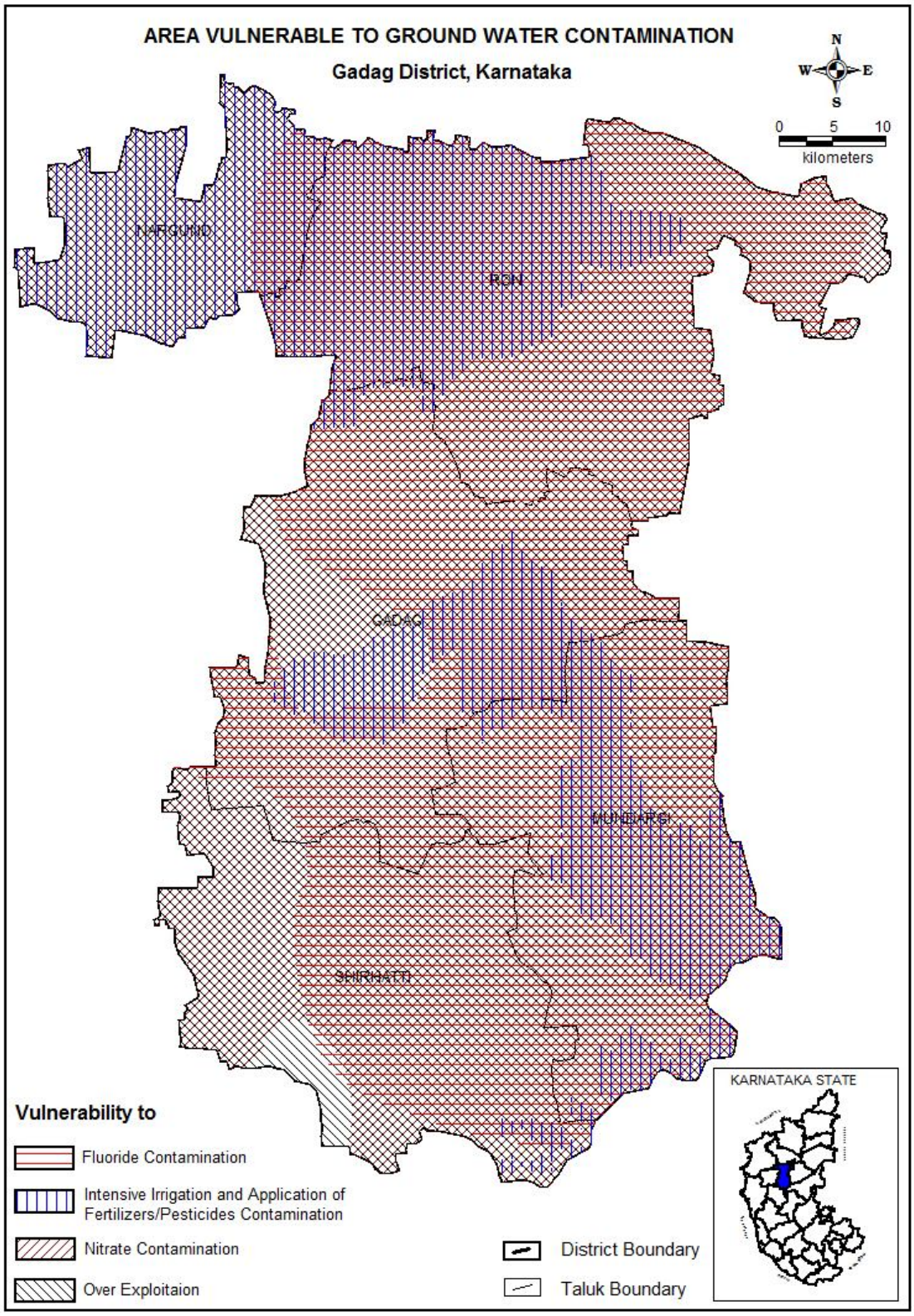

AREA VULNERABLE TO GROUND WATER CONTAMINATION
Gadag District, Karnataka
N
W
E
S
0 5 10
kilometers
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
KARNATAKA STATE
Vulnerability to
Fluoride Contamination
Intensive Irrigation and Application of Fertilizers/Pesticides Contamination
Nitrate Contamination
Over Exploitaion
District Boundary
Taluk Boundary

Fig. 11

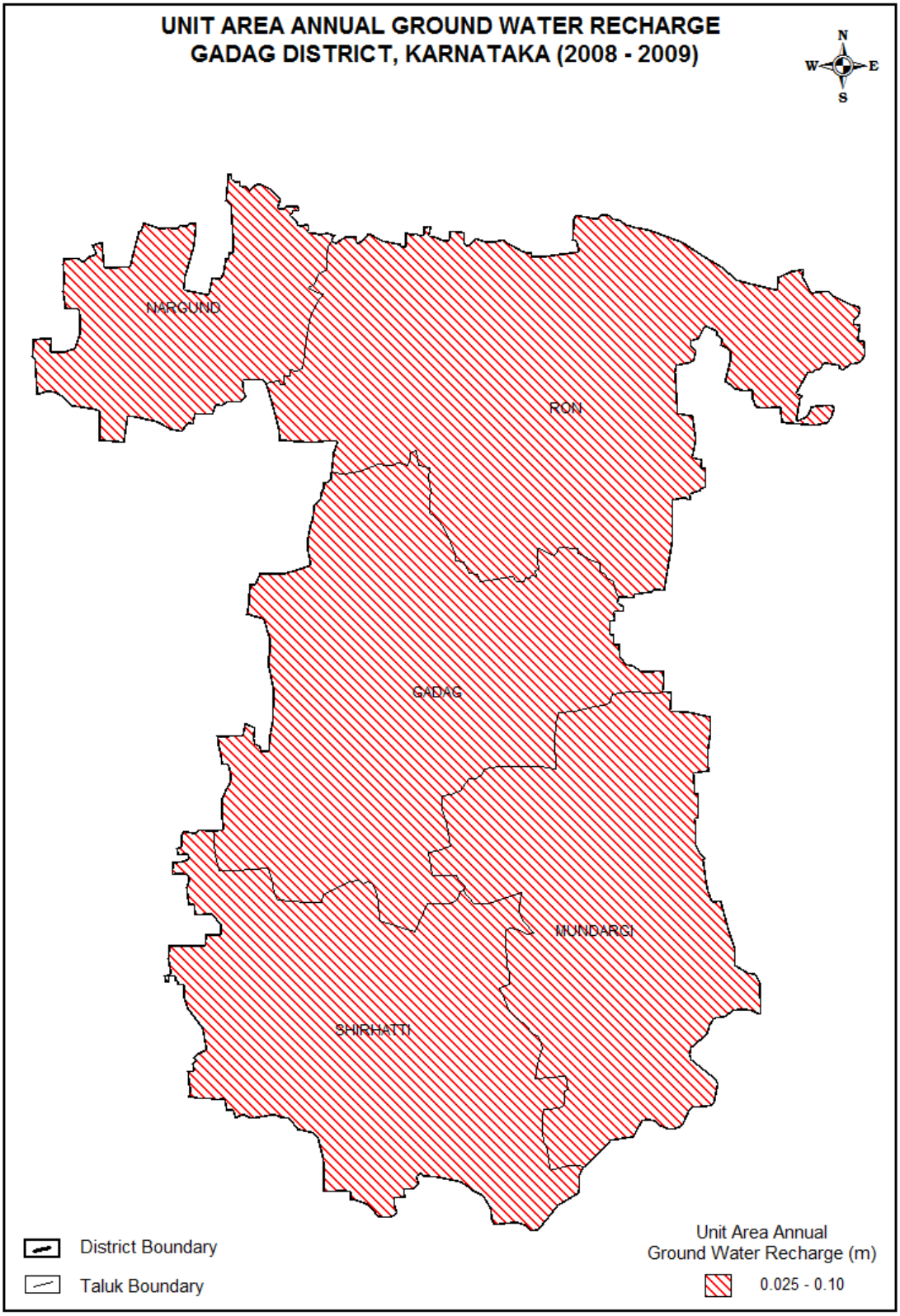
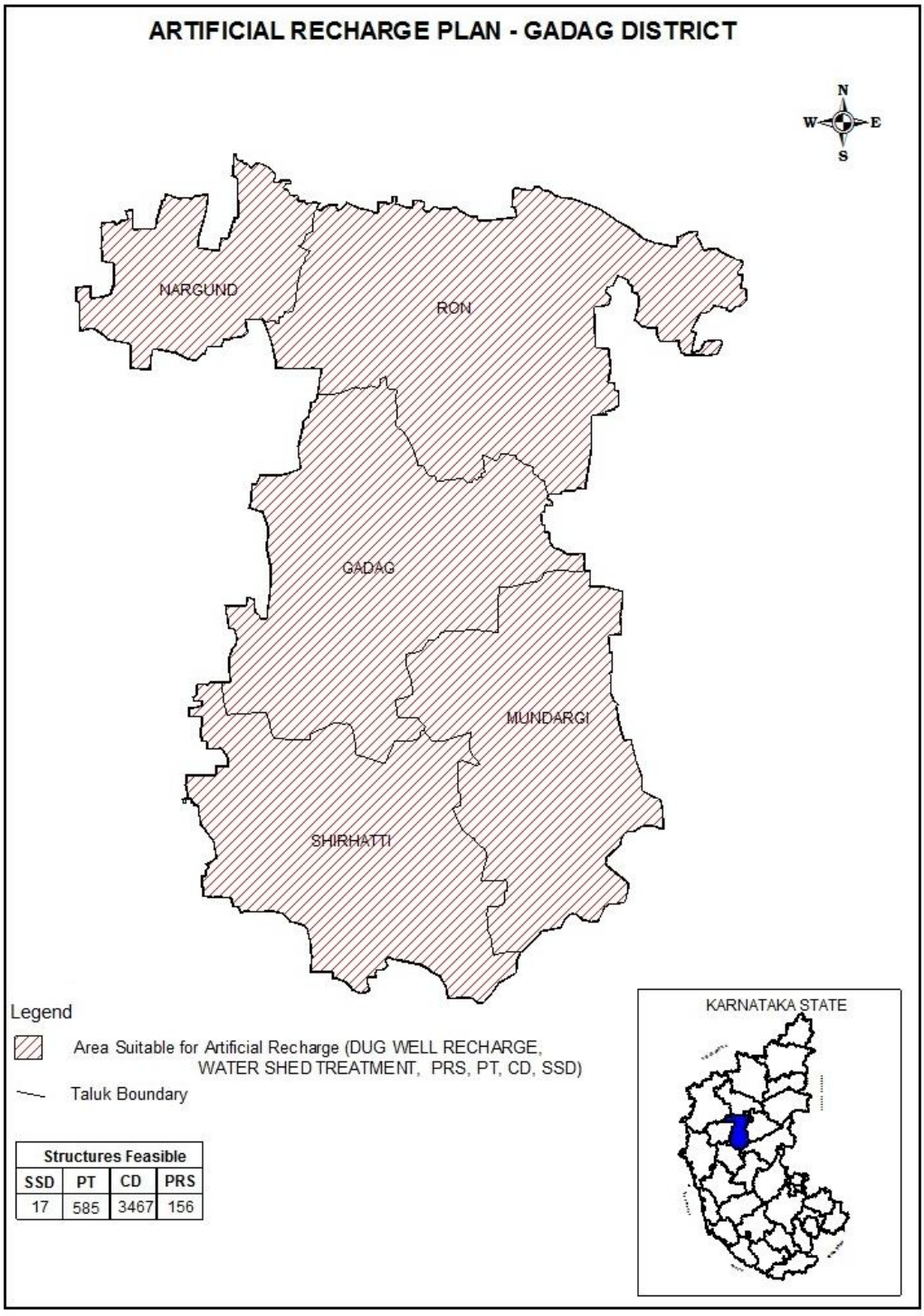

UNIT AREA ANNUAL GROUND WATER RECHARGE
GADAG DISTRICT, KARNATAKA (2008 - 2009)
N
W
E
S
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
District Boundary
Taluk Boundary
Unit Area Annual
Ground Water Recharge (m)
0.025 - 0.10

Fig.12


ARTIFICIAL RECHARGE PLAN - GADAG DISTRICT
N
W
E
S
NARGUND
RON
GADAG
MUNDARGI
SHIRHATTI
Legend
Area Suitable for Artificial Recharge (DUG WELL RECHARGE, WATER SHED TREATMENT, PRS, PT, CD, SSD)
Taluk Boundary
Structures Feasible
SSD PT CD PRS
17 585 3467 156
KARNATAKA STATE

Keeping in view, with the statistical data of water resources, population growth and its utilization pattern, additional demand within the priority areas of Drinking, Irrigation and Industrial sector can be identified. And, hence the resource allocation becomes handy to ensure the optimum distribution of resources in the needy areas.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS.

Though the study area enjoys a low to moderate annual rainfall resulted in drought (R.F.deficiency) condition and saline nature of ground water especially in parts of Nargund taluk experiencing shortage of safe water for domestic use. As per the ground water estimation studies the whole of Ron taluk, 85% of Nargund taluk and 71 % of area of Gadag taluk are overexploited, as indicated in Fig.-12.The quality deterioration in many parts of the district can be attributed partly to the natural means of decomposing of host rock/aquifer by prevailing weather condition over the year or indiscriminate dumping of wastes on the land and usage of chemical fertilizers in the agricultural land by human activities also leads to groundwater deterioration.

The wells sunk in schistose rock aquifers and highly weathered granitic as well as gneissic rock aquifers in the eastern parts the wells go dry for several months during summer periods. The present water supply to Gadag and other semi-urban areas in the district are reported to be inadequate especially during summer months. This scarcity is not only because of limited source but also because of leakage and other losses through pipeline network.

7.0 RECOMMENDATIONS

1. Diamensions of recommended Wells may be as per topographical conditions. In general, the diameter of the dug wells may be 3-4m with a depth of 10-12m in granites gneisses
2. Where as in schistose formation diameter may extended up to 5m, depth may be kept up to 12-15m and to increase the yield in shallow wells bore wells may be constructed with a diameter of 100mm below the dug well part up to a depth of about 15-20m.
3. In phyllite formation as for as possible, dug wells may be avoided and the ground water may be developed through shallow borewells.
4. In the fractured granites, gneisses, schists and metagreywacks the borewells are recommended to a depth range of 65-120m depending upon intersecting fracture, sheers and joints etc.
5. The average spacing between two structures to avoid interference of the wells may be kept 200 m.
6. The ground water with High salinity (TDS) may be used to grow salt tolerant crops.

7. In areas with high nitrate content in ground water, the farmers may be advised to stop the indiscriminate usage of nitrate fertilizers.
8. In areas with High Fluoride content in ground water, use of ground water for human consumption may be avoided with out defluoridation or without blending with surface water in proper proportion.
9. In the ground water over exploited areas, artificial recharge may be taken up by desilting surface water bodies, by recharge through dug wells and by constructing other suitable artificial recharge structures.
10. Reassessment of ground water resources may be carried out with more refined norms.
11. In the district flood irrigation may be avoided by using ground water and micro-irrigation systems are recommended.
12. In the areas categorised as safe from stage of ground water development point (see Fig-6) ie -27% in Mundargi taluk, 18%,in Gadag taluk. 15% in Nargund taluk and 100% in Shirhatti taluk ground water may be used for irrigation by constructing suitable ground water abstraction structures with annual unit draft of 0.8ham.
13. For pin pointing dugwell/ borewell sites remote sensing data, hydrogeological survey data and geophysical survey data may be used.