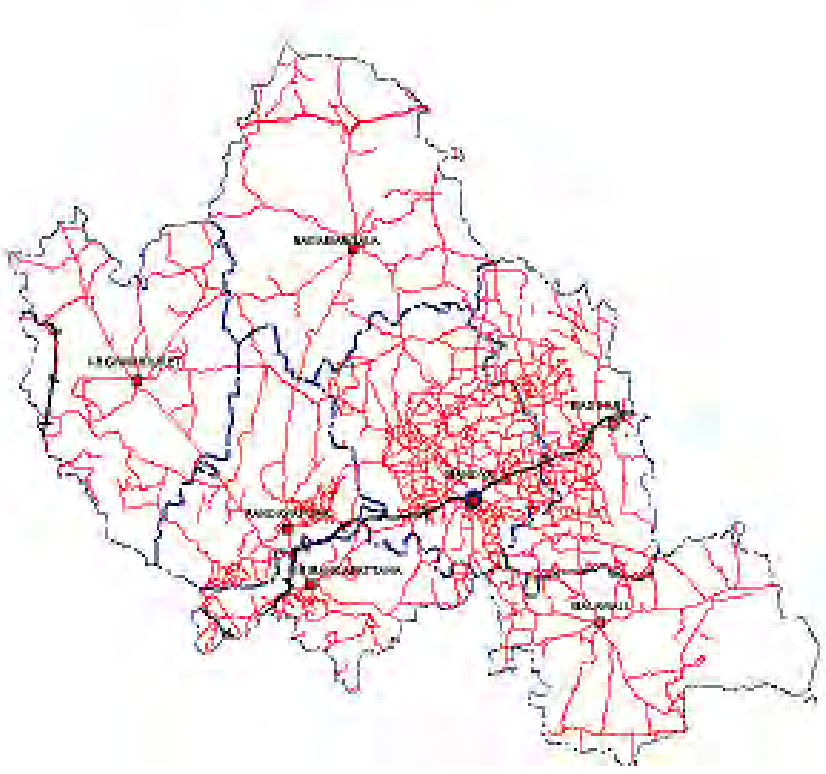
जल वर्ष 2007 Water Year 2007

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
MANDYA DISTRICT, KARNATAKA



SOUTH WESTERN REGION
BANGALORE
AUGUST, 2012

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अध्यक्ष
भारत सरकार
केन्द्रीय भूमि जल बोर्ड
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भूजल भवन
एन.एच. 4 फरीदाबाद
मो न. : 9868218549
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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, resource estimation, 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 during the annual action plan of 2012-13.

The Mandya 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 scientists of Central Ground Water Board with utmost care and dedication. This booklet has been prepared by Smt. Sangita P. Bhattacharjee, Assistant Hydrogeologist, under the guidance of Dr. K.R. Sooryanarayana, Scientist-D. 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 the water resources management in a better way in the district in coming years.

Sd/
Dr. K.Md. Najeeb)
Regional Director

MANDYA DISTRICT AT A GLANCE

Sl. No	ITEMS	STATISTICS	
1	**GENERAL INFORMATION**		
	i) Geographical area (hectare)	496100	
	ii) Administrative Divisions	2	
	Number of Taluks and Hoblies	7/ 31	
	No. of Panchayat /villages	232/1479	
	iii) Population (As on 2011 Census)	1,808,680 (Male 909441, Female 899239)	
	iv) Annual rainfall (mm) (in 2011)	750 mm	
2	**GEOMORPHOLOGY**		
	Major Physiographic Units	Plain with undulating topography at places	
	Major Drainages	Cauvery Hemavathi Shimsha Lokapavani Veeravaishnavi	
3	**LAND USE** (in Hectare) as per Annual season crop report of 2009-10		
	Forest area	24765	
	Net area sown	250207	
	Total Fallow Land	63461	
	Area sown more than once	39041	
	Gross area under cultivation	230184	
	Net irrigated area	140916	
4	**MAJOR SOIL TYPES**	Red sandy loam soil, Red clay loam soil, Medium black soil, and Lateritic soil.	
5	**AREA UNDER PRINCIPAL CROPS** (2009-10)	**Crop**	**Area** (Hectare)
		Paddy	79889
		Ragi	65588
		Jowar	0
		Maize	4073
		Pulses	37847
		Oil seeds	8128
		Sugar cane	47944
		Fruit	5062
		Vegetable	5471

6	**IRRIGATION BY DIFFERENT SOURCES** (As per District at a glance ,2009-10)		Area (Hectare)
	Dug wells		8157
	Bore wells		5002
	Lift		470
	Tanks		21799
	Canals		102806
	Other Sources		2682
	Net irrigated area		140916
7	**NUMBER OF GROUND WATER MONITORING STATIONS OF CGWB** (As on 30.6.2012) Number Dug wells Number of Peizometer		 41 8
8	**PREDOMINANT GEOLOGICAL FORMATIONS**		
	Age		**Formation**
	Recent to sub recent		Alluvium
	Algonkian?		Dolerite dyke, Pegmatite vein, Quartz vein
		Dharwar super group	Schist, Phyllite, Ampibolite, Charnokite
	Archaean	Peninsular gneissic complex	Granite, Granite gneiss.
9	**HYDROGEOLOGY**		
	Major Water Bearing Formations -		
	Shallow aquifers of alluvium along the stream courses and weathered zones of schist, Granites, Granite gneiss, etc occurring between the depths of 3 to 25 m bgl.		
	Moderately deep aquifers of Weathered and fractured zones of schist, Granites ,Granite gneiss, etc occurring between the depths of 25 to 50 mbgl		
	Moderately deep aquifers of fractured and jointed zones of schists, Granites, Granite gneiss etc occurring between the depths of 50 to 200 mbgl		
	Pre monsoon Water levels during 2010-11(m bgl) Post monsoon Water levels during 2010-11 (m bgl) Long term water level trends (2001 to 2010) m/year Rising trend Falling trend		0.38 -8.07 0.20 -23.41 0.029 -0.844 0.009 -0.638

10	**GROUND WATER EXPLORATION BY C.G.W.B** (As on 30.6.2012)	**Phase I** **Phase II**
	No of wells drilled (EW/OW)	20/6 20/6
	Depth range (m)	15.95 – 92.50 123.24-200
	Discharge (litres /second)	0.095 – 6.1 0.014-16.4
	Transmissivity (m2/day)	1- 125 0.276-291
11	**GROUND WATER QUALITY**	
	Presence of chemical constituent more than the permissible limit	Nitrate and Fluoride in pockets
	Type of water	Alkaline type
12	**DYNAMIC GROUND WATER RESOURCES** (As on March/2009) (HAM)	
	Net annual ground water availability	91343
	Existing gross ground water draft for all uses	40114
	Allocation for domestic and industrial use for next 25 years	5047
	Net ground water availability for future irrigation development	53841
	Net Ground water available for future irrigation	53841
13	**AWARENESS AND TRAINING ACTIVITY**	
	Mass awareness programme arranged	
	Date Place No of participants	Nil Nil Nil
	Water Management training programme organized	26.07.2003 : Mandya town 32 participants from different state govt. departments participated.
14	**EFFORTS OF ARTFICIAL RECHARGE AND RAIN WATER HARVESTING**	
	Projects completed by CGWB (No and amount spent)	Nil
	Projects under technical guidance of C.G.W.B (numbers)	Dug well Recharge scheme with 1660 nos of structure
15	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE taluks with % area Number of critical taluk Number of taluks notified	Parts of Nagamangala(50%), K.R.Pet (21%) pandavpura(30%) Malavalli(15%) Nil Nil
16	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	
		Ground water quality problem is terms of nitrate and Fluoride is reported from pockets. In terms of ground water development, over exploitation is reported from some parts of the taluks.

MANDYA DISTRICT

1.0 Introduction

Mandya district was created from Mysore on 1st July, 1939. It is called as the *land of sugar* because of its famous sugarcane cultivation. The district is considered one of the fertile districts of Karnataka.

1.1 Location

The Mandya district lies between North latitude 12^{o} 13" to 13^{0} 04' and East longitudes 76 ^{0}19' to 77^{0} 20' falling in the survey of India degree sheet Nos –57 H and 57D. The district is bounded on northern and northwest side by Hassan district. To the north and northeast side lies the Tumkur district, on the east of Mandya district, lie Ramnagara and Bangalore district and to the south and south western side lies Chamarajnagara and Mysore districts.

1.2 Administrative Setup

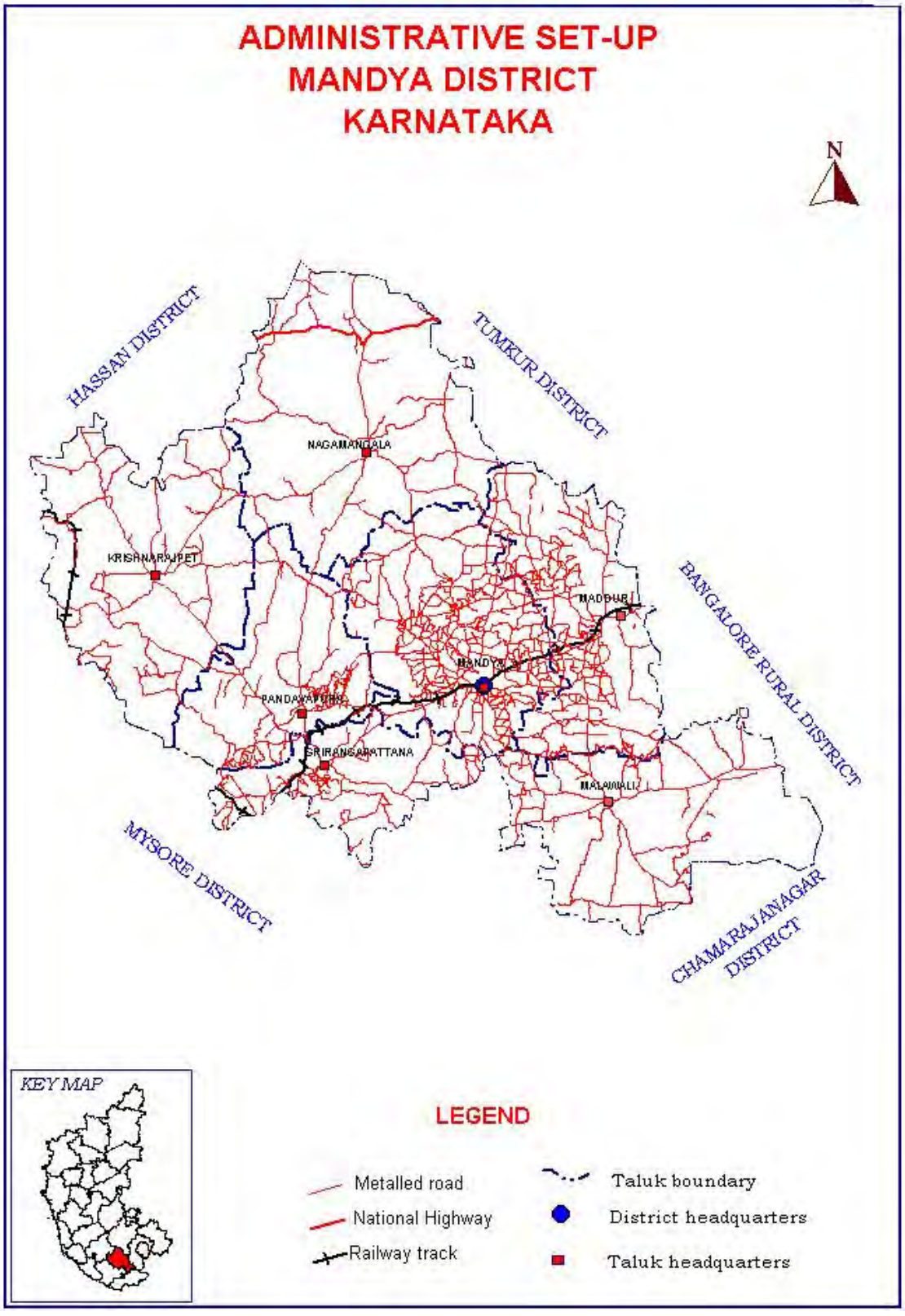
The total geographical area of the district is 496100 hectare with its district headquarter at Mandya. The district is divided in to seven taluks coming under two sub divisions namely Mandya and Pandavpura. The Mandya sub division comprises of Mandya, Maddur and Malavalli taluks. The Pandavapura sub division comprises of Pandavapura, S.R.Patna, Nagamangala and K.R.Pet taluks.The Administrative Setup is shown in fig- 1

1.3 Population

As per 2011 census, the total population in the district is around 1,808680 with a population density of 365 persons per sq km. The total male and female in the district is 909441 and 899239 respectively. The average literacy of the district is 70.14% and the sex ratio is 989 among 1000 males.

The rural population is 1499891 constituting 82.92% and urban population is 308849 comprising 17.08% of the total population.

Fig- 1



1.4 Drainage

The Cauvery river system drains the district towards the Bay of Bengal. The important rivers in the district are Cauvery, Hemanvathy, Shimsha, Lokapavani and

Viravaishnavi all of which flow towards south and finally eastwards cutting through eastern range of hills. Apart from these rivers the district is endowed with number of streams, which along with the rivers form sub dendritic drainage pattern. The district is characterized by sub dendritic drainage probably dissected by numerous streams. The drainage density in the district ranges from 1.12 to 2.73 km sq km. The drainage pattern is shown in fig- 2

1.5 Land use pattern

The land use pattern of Mandya district is presented in table 1 (As per Annual season crop report of 2009-10)

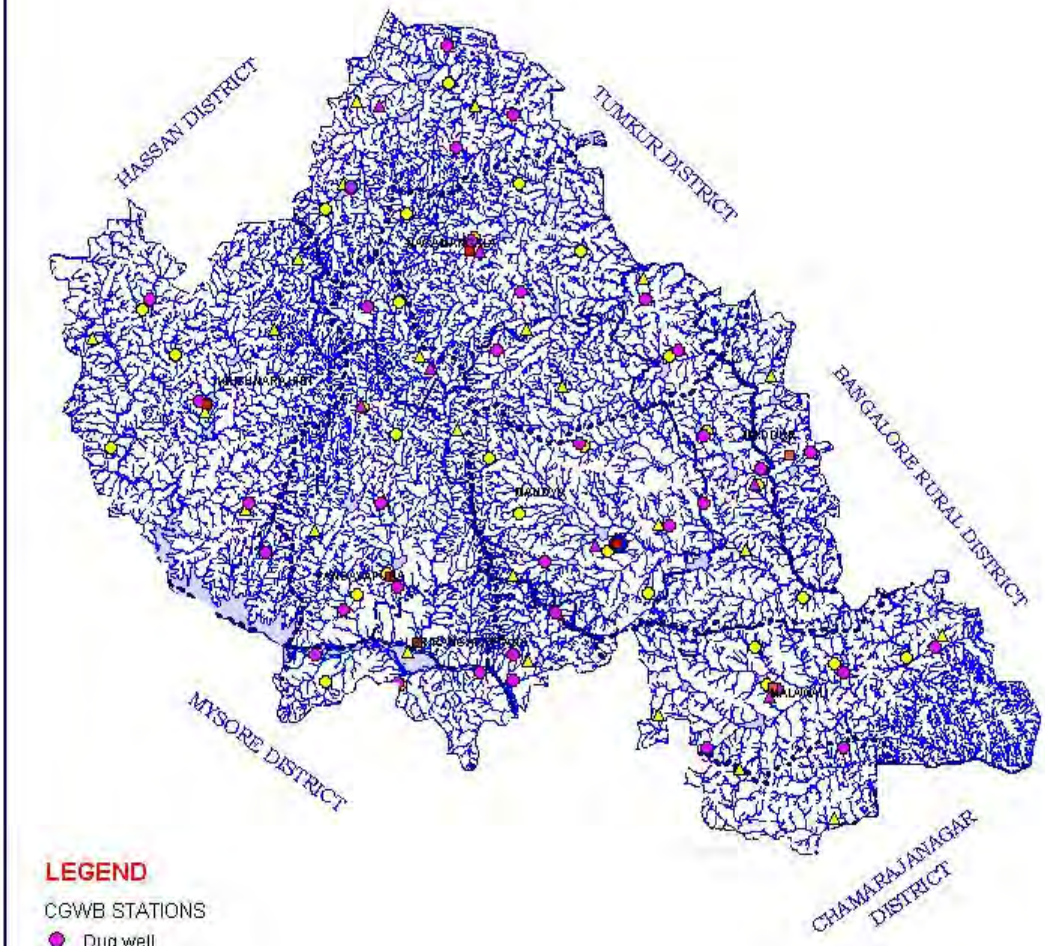
Table 1: Land use pattern of Mandya district.

LAND USE	**Area (in Hectare)**
Forest area	24765
Net area sown	250207
Total Fallow Land	63461
Area sown more than once	39041
Gross area under cultivation	230184
Net irrigated area	140916

The agriculture land utilization of the district is that 46.3% is the gross area under cultivation, 50.4% is net area sown, 5% comprises of forest area, 13.5% is the total fallow land and 30% is net irrigated area.

Fig- 2

DRAINAGE & HYDROGRAPH MONITORING STATIONS MANDYA DISTRICT, KARNATAKA



1.6 Agriculture and Principal Crops

Agriculture is the main occupation of the people of the district. The agro climatic zone is Southern dry zone and following are the main crops grown (District Profile, 2011

Karnataka State Agricultural Produce Processing and Export)

- Cereals: Ragi, Paddy, Maize, Jowar
- Pulses: Cowpea, Green gram, Red gram, Tur
- Oilseeds: Groundnut, sesame, Castor, Soyabean
- Commercial crop: Sugarcane

Among horticulture product, plantation crops, vegetables, fruits, spices and flower are grown like

- Plantation crops: Coconut, Arecanut
- Vegetables: Tomato, Lady finger, Brinjal, chilli, Bean
- Spices: Tamarind, Coriander, Ginger, Turmeric
- Fruits: Banana, Mango, Guava, Chickoo
- Flower: Jasmine, Marigold, Crossandra

The following table 2 shows the area (in hectare) under the respective principal crops.

Table 2: Area (Hectare) under principal crops (2009-10)

Crop	**Area** (Hectare)
Paddy	79889
Ragi	65588
Jowar	0
Maize	4073
Pulses	37847
Oil seeds	8128
Sugar cane	47944
Fruit	5062
Vegetable	5471

District at a Glance, 2009-10

In recent years, sericulture has also been initiated and area under mulberry cultivation is gradually increasing.

1.7 Irrigation:

As Mandya district is one of the most fertile districts of the state, agriculture is the main occupation. Different sources tapping the surface water and ground water plays an important role in irrigating. The net irrigated area is 140916 hectare. Table 3 depicts the taluk wise status of irrigation by different sources.

Table 3: Taluk wise irrigation status by various sources

Sl No.	Taluk	Net area irrigated (hectare)						
		canal	tank	wells	Bore well	Lift irrigation	Other sources	Total
1	KR pet	11950	5500	1400	1337	134	180	20501
2	Maddur	17600	3000	850	200	149	364	22163
3	Malavalli	15850	2559	2200	710	47	357	21723
4	Mandya	24020	2880	1200	460	0	390	28950
5	Nagamangala	7085	3600	960	1000	0	1000	13645
6	Pandavpura	14100	3830	1010	260	140	290	19630
7	Srirangapatna	12201	430	537	1035	0	101	14304
	Total	102806	21799	8157	5002	470	2682	140916

District at a glance, 2009-10

1.8 Industries

The main industries of the district are sugar mill, several khandasari sugar units, jiggery producing units, rice, oil and solvent extract units. The sugar factory at Mandya is one of the biggest in India. Others in Pandavapura, K.M.doddi and Koppa are also significant. Chemical and Paper mill at Belagula near to Mandya town, Milk dairy at Gejjalagere, BPL battery factory and several small scale industries are there in the district.

Among the major industries are;

- Sugar Industry
- Garments and Textiles
- Engineering based
- IT & BT based industries

Thus the main thrust areas in agriculture field for the district are

- Area expansion of vegetables
- Composite orchards/ dry land Horticulture.
- Micro irrigation
- Crop intensification in coconut garden
- Organic farming

1.9 Studies carried out by CGWB

The Central Ground Water Board has carried out Systematic hydrogeological surveys and Ground water exploration in the district. The C.G.W.B has conducted exploratory drilling of 20 exploratory bore well and 6 observation wells in the first phase of exploration. In the second phase of exploration drilling 20 exploratory bore well and 6 observation wells were drilled.

The Systematic hydrogeological surveys were carried out by Shri. N.R.Bhagat, Shri. T.M.Hunse, Shri. K.R.Sooryanarayana and Shri.V.Saivasan.

The Reappraisal hydrogeological surveys were carried out by Shri. A.Suresha and Shri N.Jyoti kumar.

The C.G.W.B. and Department of mines and geology Govt. Karnataka has carried out ground water resource evaluation of all taluks as per Groundwater estimation Committee (GEC), 2009.

During the AAP of 2011-12, groundwater management studies in over exploited blocks of Mandya, Malavalli and Maddur taluks was carried out by Sri K.N. Nagaraja, Sc-D and Dr K. Rajarajan, AHG.

2.0 Rainfalls and Climate.

The district enjoys tropical to sub-tropical climate with temperatures ranging between 16^0 and 35^0 C. April is the hottest month and with the onset of southwest monsoon in June, the temperature drops considerably. December is the coldest month.

The rainfall in the district is accounted by Pre monsoon (PRE) South west monsoon (SWM), northwest monsoon (NEM). The taluk wise Seasonal & Annual Normal Rainfall for the period 2001-2010 for Mandya district is presented in Table 4.

Table 4: Seasonal & Annual Normal Rainfall for the period 2001-2010 of Mandya

2001-2010				
Taluk	**Pre-Monsoon**	**SW Monsoon**	**NE Monsoon**	**Annual**
	Rainfall (mm)			
KR pet	167	265	239	651
Maddur	226	370	273	868
Malavalli	183	290	196	668
Mandya	179	284	233	696
Nagamangala	201	349	260	809
Pandavapura	201	289	224	714
Srirangapatna	197	266	215	678

India Meteorology Department.

The annual normal rainfall during the period from 2001 to 2010 is highest for Maddur taluk which is 868 mm and 651 mm for KR pet taluk. The taluk wise rainfall for the year 2011 is shown below in table 5 and the annual rainfall is 750 mm.

Table 5: Taluk wise rainfall for 2011 of Mandya district

	DISTRICTS/ TALUKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC	ANN.
	MANDYA	0	25	17	118	135	15	35	68	32	185	119	0	750
1	KRISHNARAJAPET	0	22	7	114	125	21	13	40	29	262	157	0	790
2	MADDUR	2	8	23	89	268	0	39	85	59	281	90	0	944
3	MALAVALLI (TMG)	0	30	4	41	156	0	34	54	26	99	66	0	510
4	MANDYA	0	2	40	166	42	24	44	72	16	133	148	0	687
5	NAGAMANGALA	0	1	1	120	84	10	35	30	44	195	149	0	669
6	PANDAVAPURA	0	83	29	96	163	18	38	88	24	202	143	0	884
7	SRIRANGAPATNA	0	30	13	199	108	35	44	106	27	124	81	0	767

As per Directorate of Economics and statistics department data of February, 2012, there was excess rainfall in 4 taluks, normal 3 taluks during the pre-monsoon period. The rainfall pattern of South-West monsoon was found to be normal in 1 taluk, deficit in 4 taluks and scanty in 2 taluks. During the North-East monsoon, 4 taluks had excess and 2 taluks had normal rainfall and deficit in 1 taluk. The annual rainfall pattern shows that, 3 taluks received excess, 3 taluks received normal rainfall and deficit in 1 taluk. The annual rainfall of the district was 750 mm, 4 percent more than the normal rainfall of 722 mm**.**

In the South west monsoon, the dry weeks ranging between 9 to 15 weeks in all the taluks. The weekly rainfall during North-East monsoon season was good in first month of October and first week of December and in the remaining weeks it was practically dry.

3.0 Geomorphology and Soil types

3.1 Geomorphology

The district is located in the southern maidan region of the state. The surface topography is in the form of undulating plain situated at an average elevation of 750-900m amsl. There are few sporadic out crops of rocks as hills and few fertile shallow valleys. In the southeastern part of the district the Biligirirangana bett ranges extending from Mysore District tapers off here. In this portion Cauvery river breaks through the hill ranges and forms the famous Gaganachukkiand and Barachukki waterfalls. The Melukote range of hills fallen a broken series of conspicuous peaks, which reach the altitude of 1159m amsl, 1064m amsl, 1050m amsl and 1046m amsl. The Hulikere-Kartigatta hill range near S.R.Patna and bold rugged low peaks near

Sindhugatta are also conspicuous. The general slope in the district is in southeast direction.

3.2 Soil types

The soil of Mandya district is derived from granites and gneisses interpreted with occasional patches of schist in SR Patna, Mandya and Pandavapura taluks. The soils range from red sandy loams to red clay loam very thin in ridges and higher elevations and comparatively thick in valley portions. The soils in Mandya, Malavalli, Maddur and Nagamangala taluks are thin gravelly and underlain with a murrum zone containing weathered rock. The soils are highly leached and poor in bases. The water holding capacity is low. On the othere hand the soil under the old channel areas of Malavalli, Pandavapura and S.R. Patna are high in clay. The infiltration rates of red loamy and red soils are 2 to 12 cm/ hr and 1 to 3 cm/ hr.

4.0 Ground Water scenario

4.1.1 Occurrence of Ground Water

Mandya district is covered by the geological formations ranging in age from Archaean, Granitic gneiss, Dharwar etc to recent alluvium. Various intrusive later traverse these formations. Based on the hydro geological conditions in different rock types occurring in the district, the entire district can be categorized under hard rock area except for areas adjacent to the major streams and rivers where alluvium occurs as local pockets. The ground water occurs in the secondary porosity of weathered formations like granitic gneiss, granite and schists etc under water table conditions at shallow depth up to 25 m and generally under semi-confined to confined conditions in the jointed and fractured portions of the above rocks down to the depth of 200 m bgl. The ground water also occurs in the inter-granular spaces in the alluvial patches along the stream courses under water table conditions at shallow depth.

Hydrogeological features are shown in fig -3

The regional ground water flow systems of Mandya districts described under three zones as shallow, moderately deep, and deep zone.

Shallow zone: The aquifers occurring within the depth of 25 m below ground level are constituted of weathered and fractured granite gneisses, granites and schist. Ground water occurs in the open spaces of weathered and fractured formations under water table conditions. Ground water of this zone is utilized through structures

like dug wells, dug cum bore wells and shallow bore wells. In the 12% of the areas of the district the weathered zone thickness is less than 5 m falling in parts of northeastern K.R.Pet, southwestern Nagamangala and north and western parts of Pandavapura taluks.In 64% areas of the district the weathered thickness is in the range of 5 to 10 m. In the remaining 24% areas of the district falling in parts of southern K.R.Pet, eastern Maddur, eastern Malavalli, small portion in eastern part of Nagamangala, southern part of

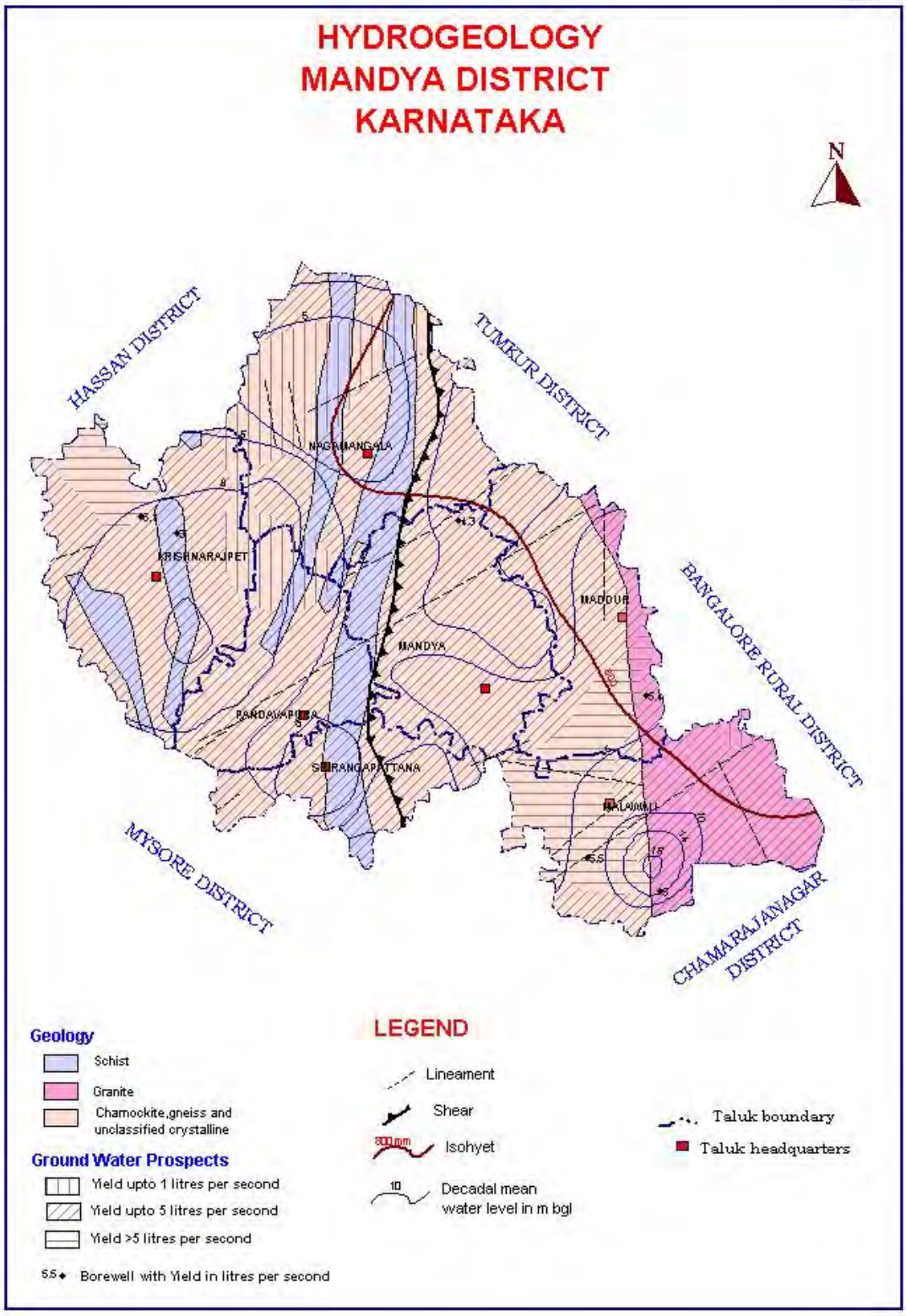
Moderately deep zone: The aquifers occurring within the depth of 50 m below ground levels are grouped in this category. The aquifers of this category constituted of weathered and fractured granite gneisses, granites and schist. Ground water occurs in the open spaces of weathered and fractured formations under semi-confined conditions.

Deep zone: The aquifers occurring within the depth of 200 m below ground levels are grouped in this category. The aquifers of this category constituted of fractured and jointed granite gneisses, granites and schist. Ground water occurs in the open spaces of fractured and jointed formations under semi-confined to confined conditions.

4.1.2 Depth to water levels

Out of 41 national hydrograph stations in Mandya district, during May 2011, 2 stations were dry and during November 2011 no stations were dry. The depth to water levels in the national hydrograph stations (dug wells) recorded during May/2011 was in the range of 0.38 to 21.28 m bgl. The depth to water levels in the national hydrograph stations (dug wells) recorded during November /2011 were in the range of 0.20 in Sivasamundram to 23.41 m bgl in Hebbani. In the district there are totally eight piezometers national hydrograph stations. The water levels in the four measured piezometers ranges from 0.20 to 18.53 m bgl during May 2011 and the water level in the five peizometer ranged from 0.03 to 17.67 m bgl during November 2011.

Fig-3



Pandavapur and major part of S.R.Patna taluk the weathered thickness is more than 10m.

Depth to water levels of May and November 2011 are shown in fig- 4 and 5 respectively.

4.1.3 Seasonal water level fluctuation

The seasonal water level fluctuation for the year 2011 was in the range of 0.6 to 5.73 for water level raise category and was in the range of –2.58 to –0.47 m for water level fall category. The seasonal water level fluctuation for the year 2011 is available for piezometer hydrograph network stations in the range between 0.20 to 18.53 m.

4.1.4 Long-term water level trends (from year 2001 to 2010)

Out of 29 pre monsoon Long term water level trend data for the period from year 2002 to 2010 available for national hydrograph network stations, 26 are showing rising trends in the range of 0.056m/year to 1.055/year and remaining 3 are showing falling trends in the range of 0.149 m/year to 0.324 m/year. Out of 31 post monsoon long term water level trend data for the period from year 2002 to 2010 available for national hydrograph network stations, 20 are showing rising trends in the range of 0.029 m/year to 0.844m/year and the remaining 11 are showing falling trends in the range of 0.005 m/year to 0.638 m/year.

4.1.5 Results of Ground water exploration

On the basis of the hydro geological surveys followed by resistivity surveys, a total of 26 sites were recommended for the drilling of exploratory wells to a depth of 100m bgl in the first phase of ground water exploration in Mandya district. The depth of the wells ranged from 15.95 to 92.50 m bgl. The discharge during PYT ranged from 0.095 to 6.1 liter per second (lps). The transmissivity during PYT ranged from 1.2 to 126$m^{2/}$day. The drilling results indicated that 35% of the wells, discharge during PYT was >3 lps. In the second phase of ground water exploration in Mandya district total of 26 exploratory wells were drilled to a depth maximum of 200m bgl. The depth of the wells ranged from 123.24 to 200.00 m bgl. The drilling discharge ranged from 0.014 to 16.4 lps The discharge during PYT ranged from 55.2 to 438 lpm. The transmissivity ranged from 0.276 to 291$m^{2/}$day. The drilling results indicated that 65% of the wells, the drilling discharge was >3 lps. The deep fractures were encountered at a depth 150 to 200 mbgl. The locations of the exploratory wells constructed by CGWB are show in fig 6.

Fig - 4

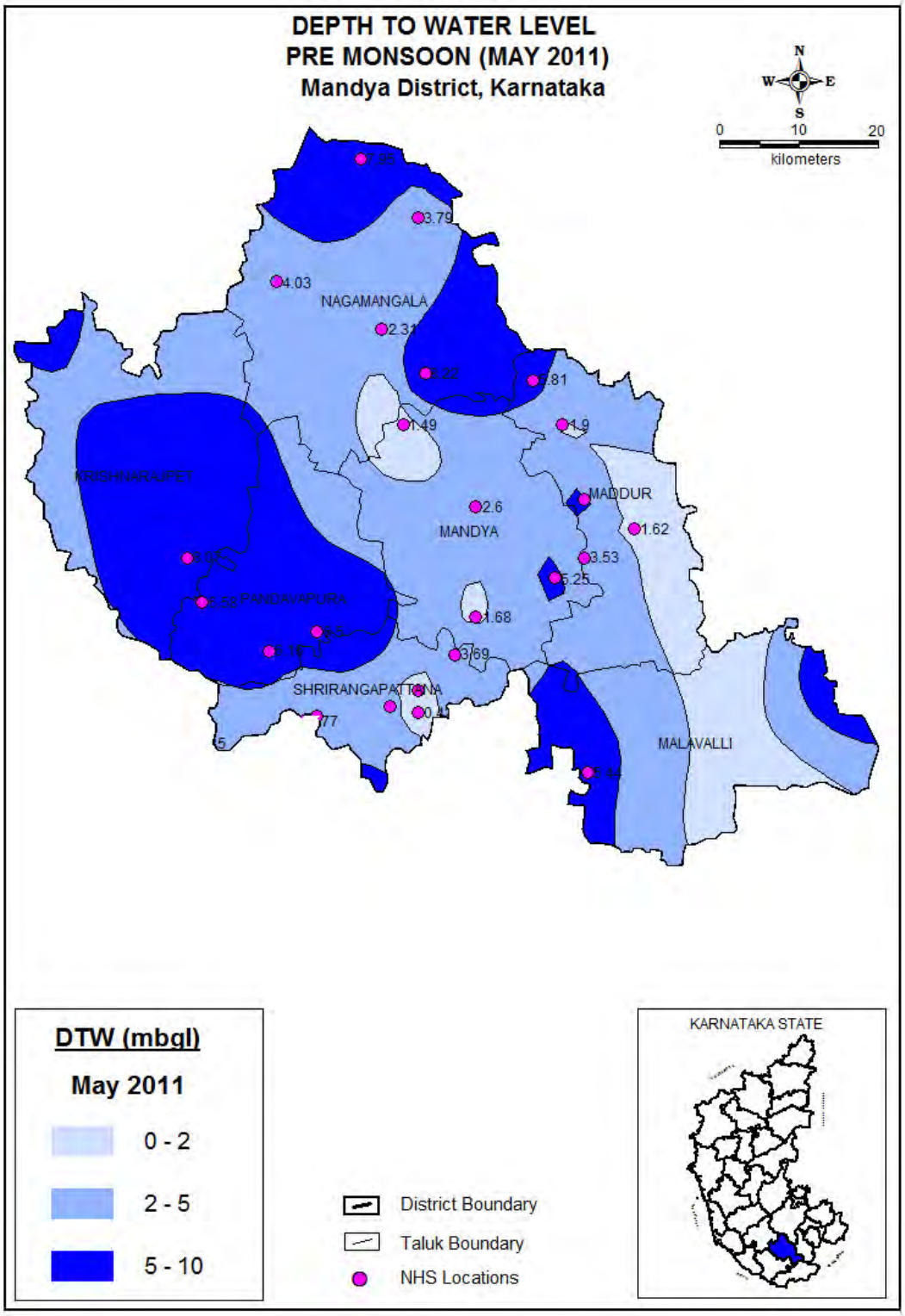
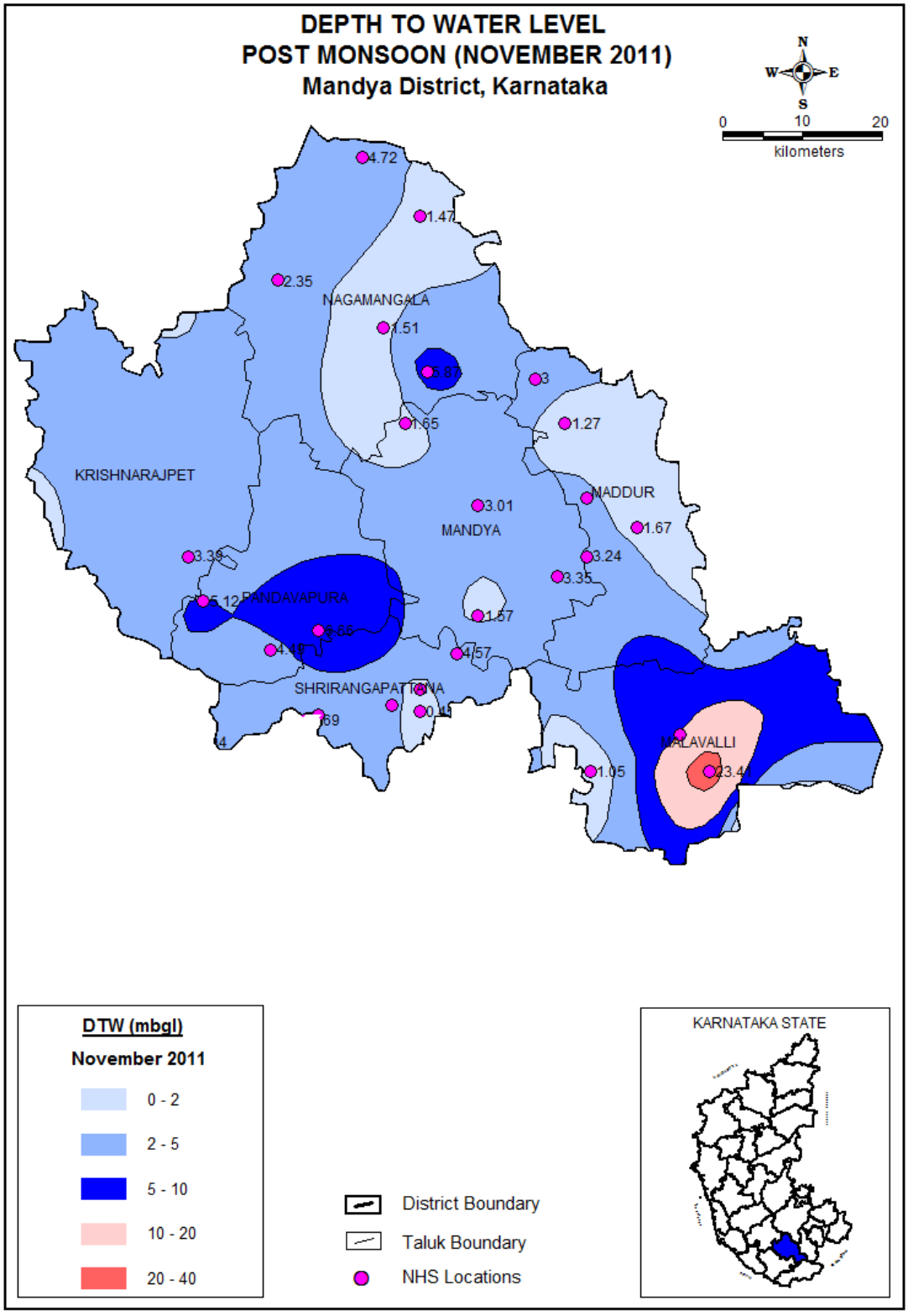
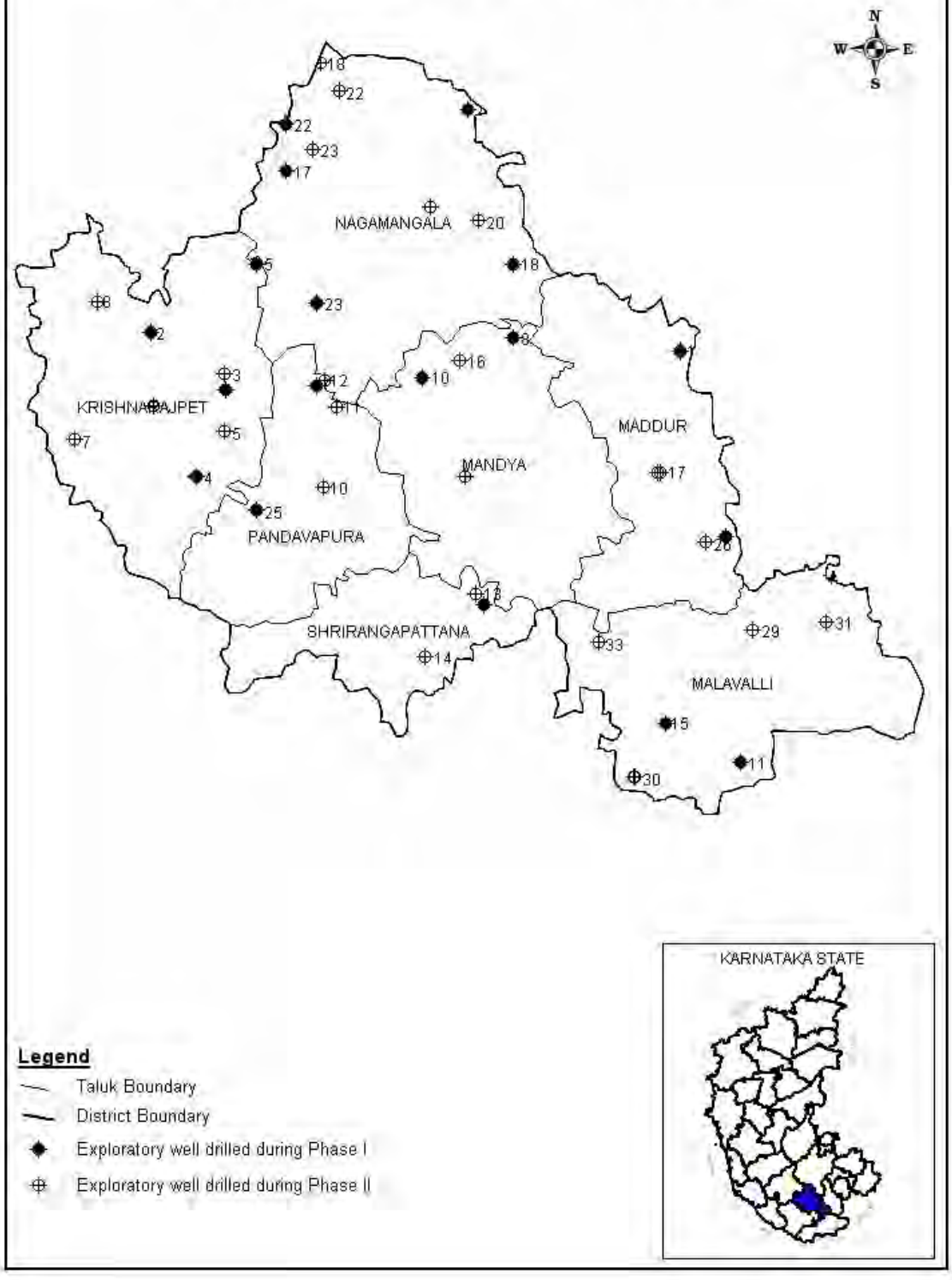

DEPTH TO WATER LEVEL
PRE MONSOON (MAY 2011)
Mandya District, Karnataka
N
W
E
S
0
10
20
kilometers
7.85
3.79
4.03
NAGAMANGALA
2.31
2.22
7.81
1.49
1.9
KRISHNARAJPET
MADDUR
2.6
MANDYA
1.62
3.53
5.25
PANDAVAPURA
1.68
3.69
SHRIRANGAPATTANA
0.44
MALAVALLI
5.44
DTW (mbgl)
May 2011
0 - 2
2 - 5
5 - 10
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

Fig - 5


DEPTH TO WATER LEVEL
POST MONSOON (NOVEMBER 2011)
Mandya District, Karnataka
N
W
E
S
0
10
20
kilometers
4.72
1.47
2.35
NAGAMANGALA
1.51
5.87
3
1.65
1.27
KRISHNARAJPET
MADDUR
3.01
MANDYA
1.67
3.39
3.24
3.35
5.12
PANDAVAPURA
1.67
4.57
SHRIRANGAPATTANA
69
MALAVALLI
1.05
23.44
DTW (mbgl)
November 2011
0 - 2
2 - 5
5 - 10
10 - 20
20 - 40
District Boundary
Taluk Boundary
NHS Locations
KARNATAKA STATE

EXPLORATORY WELL LOCATION - MANDYA DISTRICT



4.2 Ground Water Resources

The ground water resource estimation shows that, (Fig 7 and Table 6) total annual ground water recharge is 99520 HAM and net annual ground water availability is 91343 HAM as on year 2010. Existing gross ground water draft for domestic and industrial water supply uses is 2751 HAM and for irrigation purposes the draft computed is 37364 HAM. Total existing gross ground water draft for all uses is 40114 HAM. The net ground water availability for future irrigation development is 53841 HAM, after allocating 5047 HAM of ground water for domestic and industrial uses for the next 25 years.

Fig-7

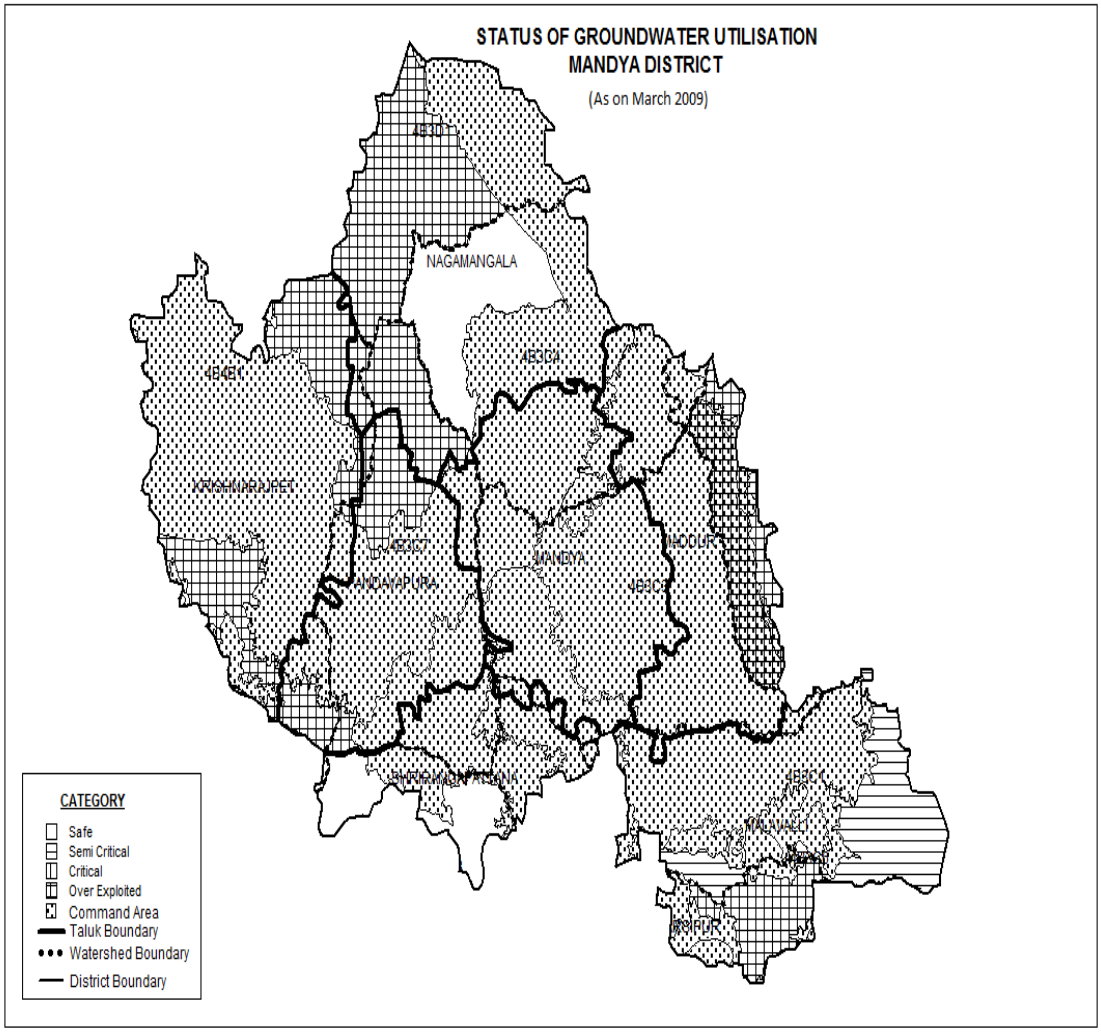


Table- 6: Ground water resources of Mandya district as on March, 2009

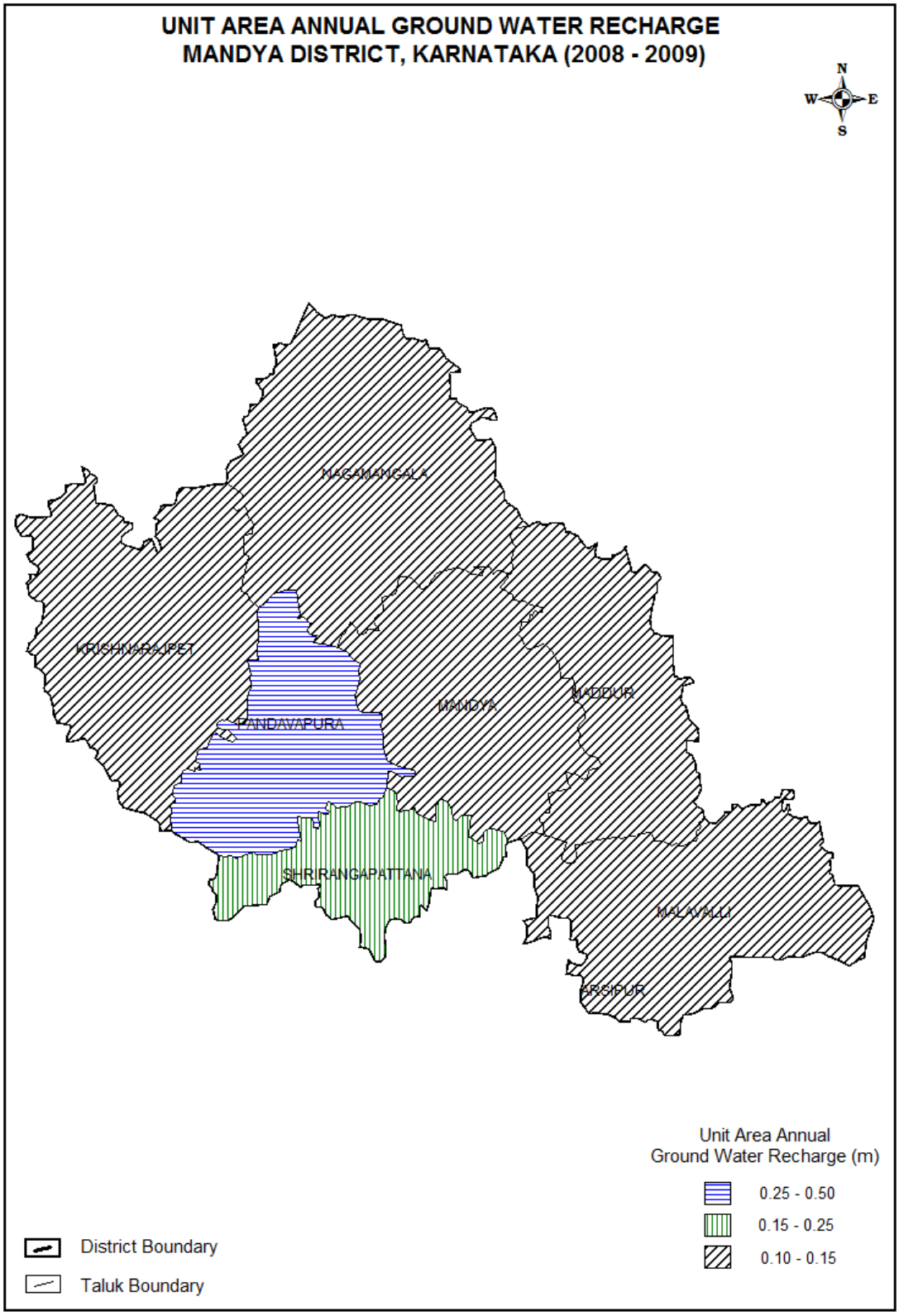
Taluk	Net annual ground water availability	Existing gross ground water draft for all uses	Allocation for domestic and industrial use for next 25 years	Net ground water availability for future irrigation development	Stage of ground water development	Taluk wise Categorisation of areas as on March, 2009			
						Safe area	Semi Critical area	Critical area	O.E. area
	HAM	HAM	HAM	HAM	(%)	(%)	(%)	(%)	(%)
K.R.Pet	11606	7277	405	5917	63	79	---	---	21
Maddur	8908	4205	1009	4360	47	70	30	---	---
Malavalli	13521	7852	867	5421	58	60	25	---	15
Mandya	12641	4051	1007	8165	32	99	---	---	1
Nagamangala	16561	9779	893	8773	59	50	---	---	50
Pandavapura	20599	5113	481	15740	25	70	---	---	30
S.R.patna	7507	1837	385	5465	24	99	---	---	1
Total	**91343**	**40114**	**5047**	**53841**					

Thus the taluk wise ground water development stage and % in taluk area falling in various categories can be summarized as

- KR pet : 63% (In terms of taluk area 79%is safe and 21% is over exploited)
- Maddur : 47% (In terms of taluk area 70% is safe and 30% is semi critical)
- Malavalli : 58% (In terms of taluk area 60% is safe, 25% is semi critical and 15% is over exploited.)
- Mandya : 32% (In terms of taluk area 99% is safe, 1% is over exploited)
- Nagamangala: 59%, (In terms of taluk area 50% is safe, 50% is over exploited)
- Pandavapura: 25%, (In terms of taluk area 70% is safe, 30% is over exploited)
- Srirangapatna: 24% (In terms of taluk area 99% is safe, 1% is over exploited)

For the year 2008-09, the unit area annual ground water resource of the taluks of Mandya district is calculated (Fig 8) in m. It is calculated to be 0.25 to 0.50m for Pandavpura taluk , o.15 to 0.25 m for Srirangapatna and 0.10 to 0.15 m in the remaining taluks.

Fig-8


UNIT AREA ANNUAL GROUND WATER RECHARGE
MANDYA DISTRICT, KARNATAKA (2008 - 2009)
N
W
E
S
NAGAMANGALA
KRISHNARAJPET
PANDAVAPURA
MANDYA
MADDUR
SRIRANGAPATTANA
MALAVALLI
KRSIPUR
Unit Area Annual
Ground Water Recharge (m)
0.25 - 0.50
0.15 - 0.25
0.10 - 0.15
District Boundary
Taluk Boundary

4.3 Ground water Quality

Water samples are collected from selected dug wells (National Hydrograph monitoring Stations) annually for chemical analysis. The analysis result indicates that in general the quality of ground water is potable for drinking and suitable for irrigation purposes. However high concentration of fluoride (>1.5 mg/lit) is observed around Nagamangala and Maddur as small patches. High concentration of nitrates (>45 mg/lit) is observed in major parts of all taluks except Malavalli taluk where it is seen as small patches in the southern part. This may be attributed to more use of fertilizers and canal irrigation. High chloride concentrations are observed in eastern part of Mandya and around Maddur. Electrical conductivity is in permissible range in general. In the western part of the district the Electrical conductivity values are less than 1000 micro mhos, whereas In southeastern part the electrical conductivity values varies from 1000 to 3000 micro mhos, especially in canal command areas of the district the EC values are more than 2000 micro mhos /cm.

Ground water quality map of the district is shown in Fig -9.

4.3.1 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 Mandya district vulnerability map is prepared on a regional scale considering the following factors viz.

- 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.
- Area having intensive cultivation/ area falling under canal command, thus prone to pollution from fertilizers / insecticides or water logging.
- Area having fluoride above maximum permissible limit of 1.5ppm
- 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.)

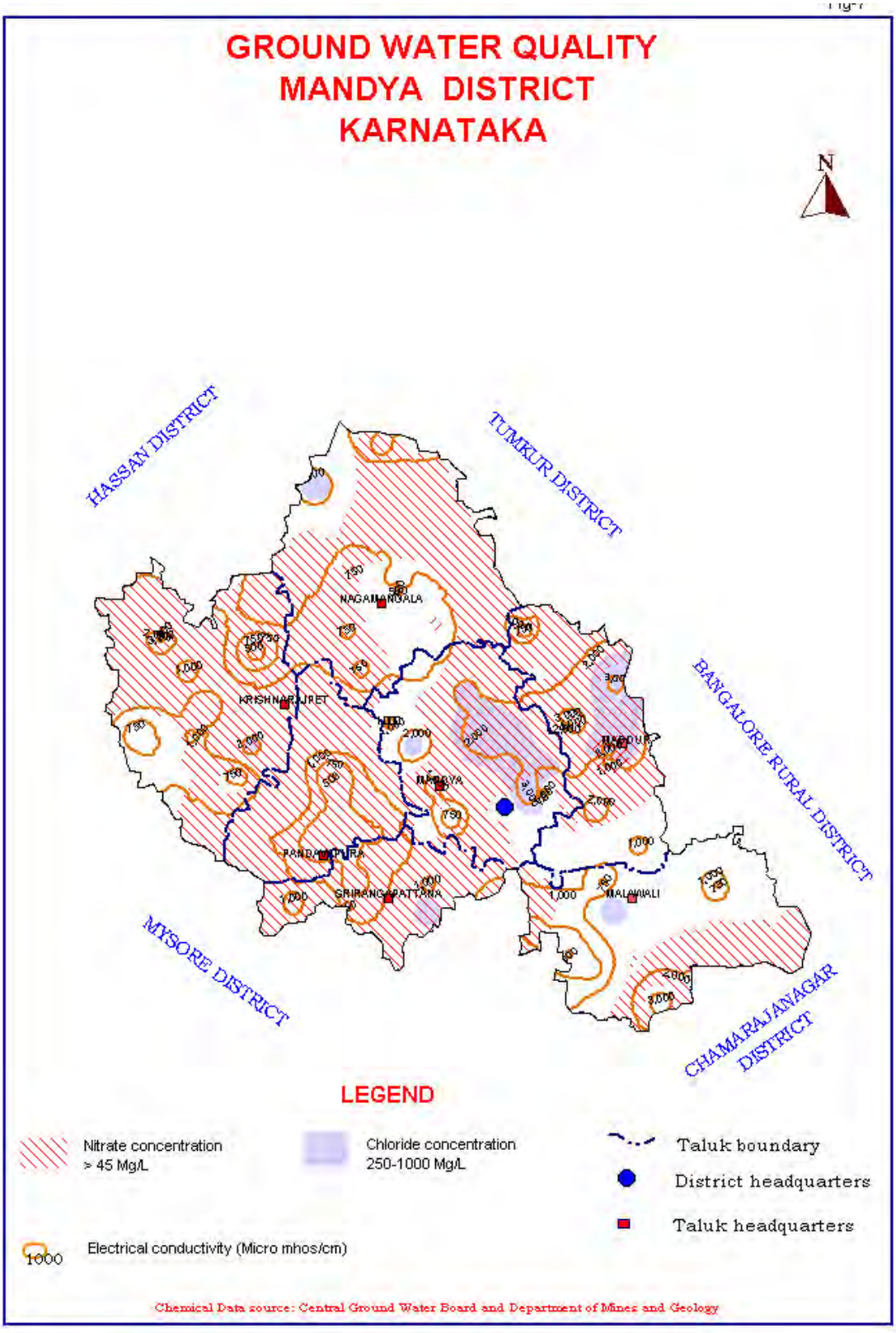
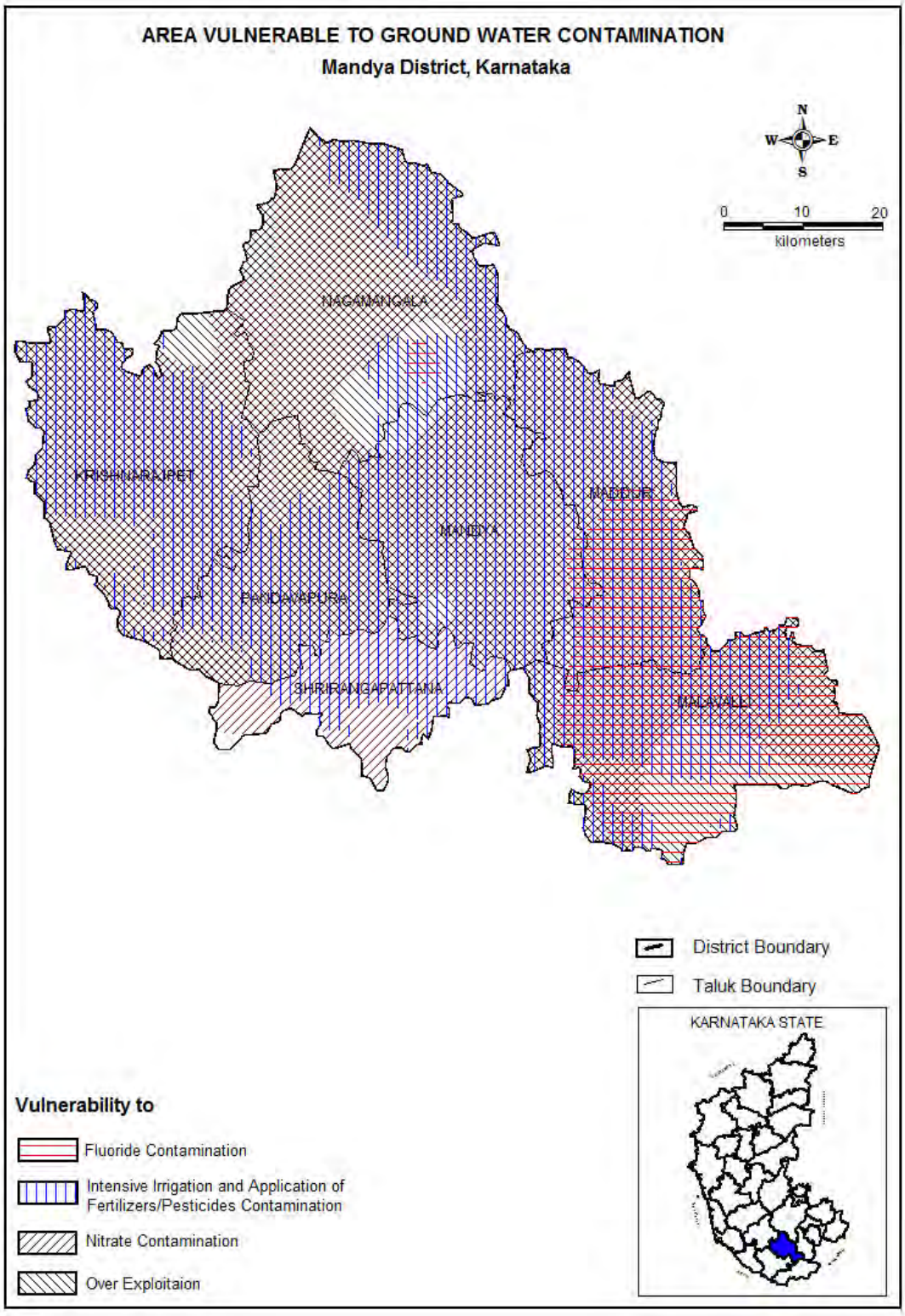

GROUND WATER QUALITY
MANDYA DISTRICT
KARNATAKA
N
HASSAN DISTRICT
TUMKUR DISTRICT
BANGALORE RURAL DISTRICT
MYSORE DISTRICT
CHAMARAJANAGAR DISTRICT
NAGAMANGALA
KRISHNARAJPET
MANDYA
PANDAVAPURA
SRIRANGAPATTANA
MALAVALI
LEGEND
Nitrate concentration
> 45 Mg/L
Chloride concentration
250-1000 Mg/L
Taluk boundary
District headquarters
Taluk headquarters
1000
Electrical conductivity (Micro mhos/cm)
Chemical Data source: Central Ground Water Board and Department of Mines and Geology

Fig-10


AREA VULNERABLE TO GROUND WATER CONTAMINATION
Mandya District, Karnataka
N
W
E
S
0
10
20
kilometers
NAGAMANGALA
KRISHNARAJPET
PANDAVAPURA
SHRIRANGAPATTANA
MANDYA
MADDUR
MALAVALLI
District Boundary
Taluk Boundary
KARNATAKA STATE
Vulnerability to
Fluoride Contamination
Intensive Irrigation and Application of Fertilizers/Pesticides Contamination
Nitrate Contamination
Over Exploitaion

- Industrial cluster as identified by Central Pollution Control Board, prone for pollution from industries.

In the district, the groundwater is vulnerable to fluoride and nitrate contamination and to fertilizer and pesticide because of intensive agriculture its application of (Fig 10). Hence precaution is to be practiced in command areas.

4.4 Status of Ground Water Development

The ground water is a major source for drinking purpose. The farmers with small acreage of land depend mainly on the rainwater and water available in the shallow wells within their premises. The abstraction structures, dug-wells and bore wells constructed/existing are mainly tapping the aquifers within depth range 8.00 to 12.00mbgl and 150 to 200mbgl respectively. As per the record of 31.3. 2006, the domestic water requirement is supplied through 1132 numbers of Mini-water supply schemes, 932 numbers of piped water supply schemes through bore wells along with 9902 number of bore wells installed with hand pumps.

The 4th Minor Irrigation census was carried out in 2006-07 which included both ground and surface water. The Ground Water Schemes consists of Dug wells, Shallow Tube wells and Deep Tube wells. As per the census, there are 3119 dug wells (88 are not is use) and 35709 bore wells (546 are not in use). The taluk wise status of dug well and bore well is given in Table 7.

Table- 7: Distribution of wells according to status as per MI Census 2006-07

Sl No	Taluk	Wells in Use		Wells not in use	
		Dug Wells	Shallow BW	Dug Wells	Bore Well
1	K.R.Pet	14	9411	0	233
2	Maddur	192	4990	2	153
3	Malavalli	344	7069	19	54
4	Mandya	1511	4131	47	49
5	Nagamangala	144	5568	3	39
6	Pandavapura	399	2667	1	7
7	S.R.patna	515	1327	16	11
Total		3119	35163	88	546

The total number of Minor Irrigation Schemes in the district was found to be 39337 out of which 3119 pertains to Dug well Scheme, 35709 are Shallow Tube well Schemes, 319 Surface Flow Schemes & 190 Lift Irrigation Schemes

4.4.1 Water Lifting devices

Water lifting devices used in the district are Electric motor, Diesel Pump, Wind Mill and manual. Distribution of water lifting devices is given in table -8(a) and (b) as per 4th MI Census of 2006-07

Table- 8(a): Distribution of dug wells according to water lifting device

Lifting device	Dug well
Submersible Pump	857
Centrifugal pump	2159
Turbine	21
Manual	8
Others	74
Total	3119

Table- 8(b): Distribution of bore wells according to water lifting device

Lifting device	Bore well
Electric Pump	35366
Diesel pump	165
Wind mill	54
Solar pump	12
Manual/animal	12
Others	100
Total	35709

4.4.2 Distribution of wells according to Horse Power

Capacity of pumps used in the area to draw ground water ranges from less than 2HP to >10HP. Majority of the wells are fitted with 4 to 6 HP motor. The Distribution of wells according to Horse Power is given in table- 9.

Table- 9: Distribution of wells according to Horse Power

	Horse Power						
Type of well	0-2	2--4	4--6	6--8	8--10	>10	No lifting device
Dug Well	43	440	2336	168	14	110	8
Bore Well	8	5038	26942	3319	190	152	60
Total	51	5478	29278	3487	204	262	68

4.4.3 Drinking water Wells

The ground water is a major source for drinking purpose. As per the record of 31.3, 2006 the domestic water requirement supplied through 1132 numbers of Mini-water supply schemes, 932 numbers of piped water supply schemes through bore wells along with 9902 number of bore wells installed with hand pumps.

As per Mandya Municipal Council, the total water supplied is 23.5 MLD @ 125 LPCD.

5. Ground Water Management Strategy.

5.1 Ground water development

Sustainability of ground water resource and its judicious use should be given prime importance while making development strategy. In critical and over exploited areas, artificial recharge and rainwater harvesting measures are recommended to augment to ground water system. About **91343** ham of ground water resource is available in the district for further development. The development is recommended only in area categorized as safe and semi critical while avoiding the parts of over exploited blocks of Nagamangala, Pandavpura, KR pet and Malavalli. In such areas, potential aquifers can be located by hydrogeological surveys aided by geophysical methods. Dug wells and filter points are recommended only in river and valley banks where sufficient thickness of valley fill is available which gets saturated during rainy seasons. The ground water development in other feasible areas should be done by bore wells. Spacing norm of 200 m may be strictly adhered to avoid interference. Aquifer should be pumped as per crop water requirement.

In areas, which are categorized as critical and over exploited, growing crops like paddy, sugarcane etc, having high water requirement may be avoided. Farmers should be encouraged to go for less water requirement crops. Advance irrigation methods like drip and sprinkler irrigation may be practiced.

In the command areas, conjunctive use of surface and ground water may be practiced to avoid long-term hazards like water logging and ground water as well as soil salinity problems.

5.2 Water conservation and Artificial Recharge

The ground water development in KR pet taluk is 63% (21% taluk area is over exploited) and Nagamangala is 59%, (50% taluk area is over exploited). Water level in these is taluks showing downward trend. In such a situation there is a need to augment ground water recharge by artificial recharge structures and rainwater harvesting structures to harvest noncommittal surface runoff.

In the western part of the district where the topography is hilly and rugged artificial recharge structures like nalla and gully plugs contour bunds and contour trenches and nallabunds may be constructed and in comparatively plain areas percolation tanks and point recharge structures like recharge shafts recharge pits and recharging through existing dug/bore wells may be practiced. In semi-urban areas in the district, lot of roof area is available for rooftop rainwater harvesting. So in these semi-urban areas rooftop rainwater harvesting practices may be encouraged. This will help in reducing the load on urban water supply systems. In the district headquarter i.e. Mandya town, rain water harvesting is to be encouraged in all the government departments and educational institutions.

Moreover from the year 2001-02, Central Ground Water Board was also involved technically with NABARD and concerned state government departments in dug well recharge scheme, where 4677 nos. of structures and 91 small and marginal structures were surveyed. Out of the total 4768 nos. of structures, 1660 structures were approved by SLSC, district agencies and NABARD. Till date as on 31.3.2012, only 12 nos. of structure are in progress and an amount of 50 lakh has been released so far. As a part of the scheme, trainings, workshops, capacity buildings are also organized in Mandya district.

Fig- 11 shows the area feasible for artificial recharge structures in the district based on Master Plan of Artificial Recharge of Karnataka prepared by CGWB. According to the master plan, 1836 nos. of check dam, 310 nos of percolation tanks, 83 nos. of point recharge structures and 9 nos. of sub-surface dykes construction are feasible in the Mandya district.

6.0 Ground water related Issues & Problems

There is over exploitation of ground water resource in parts of K.R.Pet taluk, Malavalli taluk, Nagamangala and Pandavpura taluk. This has resulted in the decline of water level. Therefore, immediate artificial recharge measures are

required to be taken up in these taluks to achieve sustainability of ground water resources.

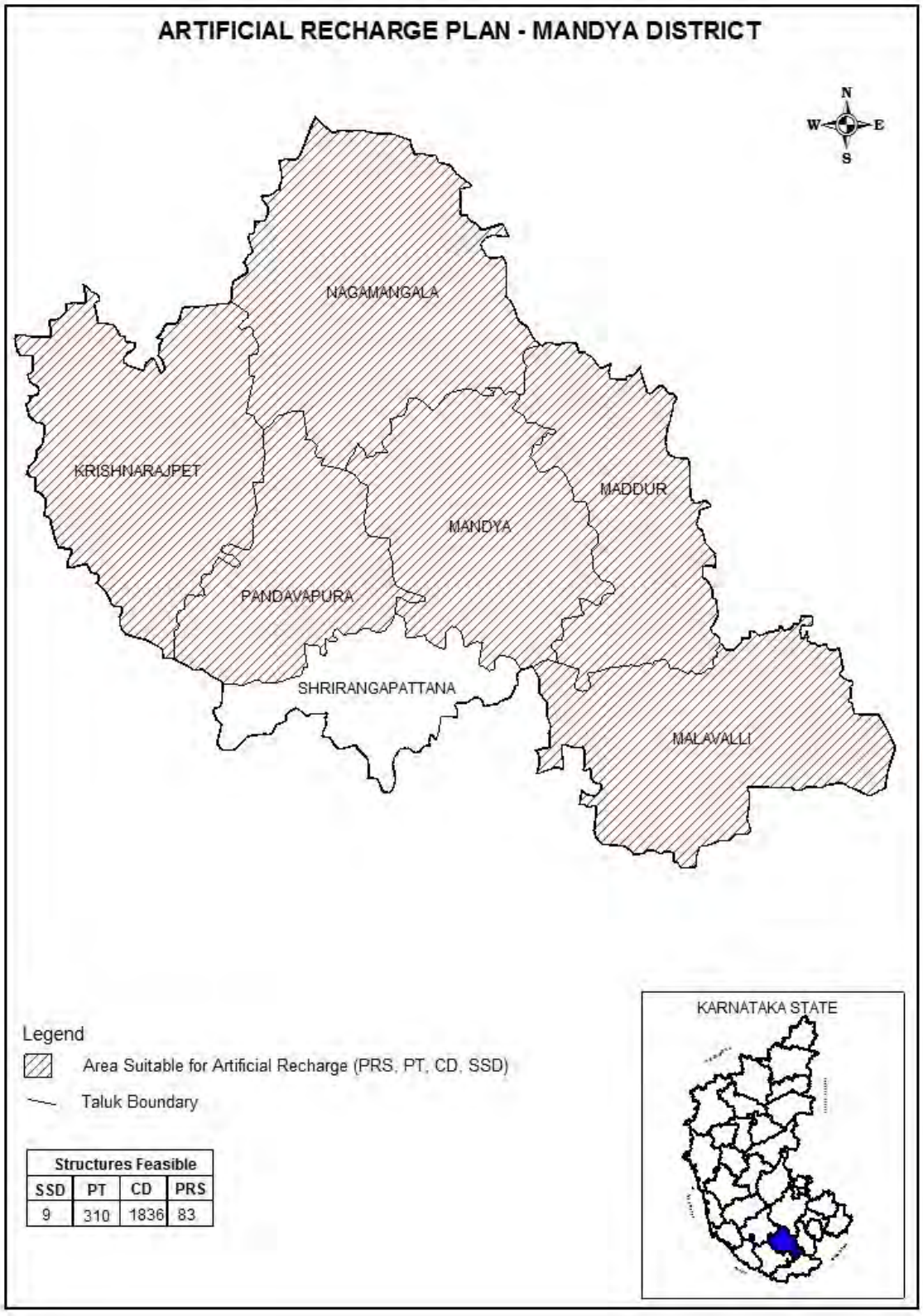
Fluoride concentration of more than permissible limit exists as small pockets in parts of Maddur and Nagamangala taluks of the district. Ground water in younger granites has more fluoride content than the gneisses. The fluoride content increases with depth in same aquifer. The shallow aquifers are having comparatively low concentration of fluoride. In order to reduce or control the problem, it is recommended to recharge ground water by way of artificial recharge structures like percolation tank, desilting of silted tanks, check dams, nalla bunds, farm ponds and subsurface dykes. Nitrate concentration of more than permissible limit exists all over the district. This may be due to indiscriminate use of fertilizer and biological contamination from decaying vegetation. Judicious use of fertilizer and proper care in disposing the biological waste can reduce the problem. Regulated use of fertilizer and pesticide is required in the command and vulnerable areas.

7. Awareness and Training Activity

7.1 Water Management Programmes (WMTP)

Training program on Ground water management was organized for TOT at Cauvery Auditorium, ZP Office, Mandya during 26.7.2003 to 28.7.2003. Sri.S.S.Chauhan Chairman, CGWB presided over the function. Sri B.P.Kaniram, IAS, DC, Mandya District inaugurated on 26.7.03. Sri K.H.Ashwathnarayana Gowda, IAS, CEO, ZP, Mandya participated as Guest of Honour. Sri C.S.Ramasesha R.D, CGWB, SWR, welcomed the gathering and Sri.K.Keerthiseelan, Suptdng Hydrogeologist gave vote of thanks. 32 trainees from various State Government Departments, NGOs, and Educational Institutions from Mandya district participated in the training programme. Officers of CGWB presented seven lecture topics on the theme. One-day field visit was arranged to Bangalore University and trainees were apprised of the artificial recharge scheme implemented in the university campus. Valedictory function was held on 28.7.03 and certificates with course material were distributed to the trainees.

Fig-11


ARTIFICIAL RECHARGE PLAN - MANDYA DISTRICT
N
W
E
S
NAGAMANGALA
KRISHNARAJPET
MADDUR
MANDYA
PANDAVAPURA
SHRIRANGAPATTANA
MALAVALLI
KARNATAKA STATE
Legend
Area Suitable for Artificial Recharge (PRS, PT, CD, SSD)
Taluk Boundary
Structures Feasible
SSD
PT
CD
PRS
9
310
1836
83

7.2 Participation in Exhibition, Mela, fair etc

No exhibition was conducted in the district

8.0 Areas Notified by CGWA/SGWA

No area in the district is notified so far.

9. Recommendations

Considering the prevailing scenario of the groundwater resources and development the following recommendations are made for the optimum drawl with sustainable development of resources in the area.

1) The dug wells, which penetrate partially the weathered, fractured zones of the aquifers, may be deepened further for the better productivity.
2) Construction of several types of structures like sub surface dykes, percolation tanks, check dam etc has been proposed in the different taluks.
3) A comprehensive programme should be formulated to harvest the rain water through roof top, check dams, surface tanks, bunds and subsurface dykes to use the resources directly from the structures, which in turn to arrest the sub surface flows and augment the groundwater resources.
4) The ground water worthy areas such as topographic lows, valley portions low water level fluctuations zones should be developed with an adequate soil conservation measures to prevent the soil erosions.
5) Constant monitoring of ground water quality should be carried out in the Cauvery and Hemavathi canal command areas to prevent the pollution and related problems. The determination of trace elements and organic compound is done to help in categorizing the quality of water.
6) The ground water in canal command area is found under-developed therefore, it is strongly recommended to prepare an action plan to bring more area under conjunctive use of ground water and surface water irrigation.
7) An additional number of 13667 dug wells and 26092 borewells/dug-cum-borewells, constructed would help in tapping the unutilized ground water, an annual average draft of 0.9 ham and 1.1ham can be exploited respectively through dug wells and borewells and keep the area under safer category.
8) Conjunctive use of both Surface and Ground water practiced in the canal command area would improve the quality of ground water, prevent the water logging conditions and availability of canal water to the tail end areas.

9) The ground water development should be allowed only areas, which are catagorised as safe and semi critical with caution.
10) Mass awareness programmes should be conducted for public awareness about the limited availability of ground water resource.
11) Farmers should be educated to grow less water intensive crops and adopt micro irrigation system. Government should provide subsidy such irrigation systems.
12) Artificial recharge structures should be constructed in feasible areas for augmenting ground water resource and to improve ground water quality especially in areas of K.R.Pet, Nagamangala and Malavalli taluks where fluoride problem exists to a limited extent.
13) Sites for bore wells and dug wells should selected with the technical advice from technical qualified persons.
14) Precaution is to be exercised while using pesticides and fertilizer in the command areas of the district as it is vulnerable to ground water contamination.

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