

**BIJAPUR DISTRICT****FIG.7 BIJAPUR DISTRICT**

<b>Sl.No.</b>	<b>CONTENTS</b>	<b>Page</b>		
1)	Location	122	TABLE: COMPREHENSIVE ANALYSIS OF WATER QUALITY DATA	128
2)	Demography	122		
3)	Climate, Drainage and soil	122		
4)	Geology and Groundwater occurrence	122		
5)	Groundwater quality Characterization	123	<b>LIST OF FIGURES</b>	
5.1	Physical characters	123	FIG.7A FLUORIDE VARIATION (F)	129
5.2	Chemical characters	123	FIG.7B VARIATION OF TOTAL DISSOLVED SALTS (TDS)	130
5.3	Spatial variation	126	FIG.7C VARIATION OF TOTAL HARDNESS (TH)	131
6)	Conclusion	127	FIG.7D SULPHATE VARIATION (SO <sub>4</sub> )	132

## 1. Location

Bijapur district is located in the northern part of Karnataka State with geographical area of 10475 sq. km. It is bounded by Maharashtra State in the northern side, Belgaum district on the western side, Bagalkot district on the southern and southwestern side, Raichur district on the southern side and Gulbarga district on the southeastern and eastern side. It lies between 16° 09' to 17° 29' N Latitude and 75° 20' to 76° 29' E Longitude.

## 2. Demography

As per the 1991 census, Bijapur district has a population of 1,533,448. The total number of villages / habitations in the district are 928. Bijapur district has 5 taluks namely Basavana Bagewadi, Bijapur, Indi, Muddebihal and Sindgi. Bijapur is the District Headquarters and is the only city in the district.

## 3. Climate, Drainage and Soil

Bijapur district forms part of the northern maidan area having extensively undulating plateau forming the northern part of the State and receives an annual rainfall between 350-650 mm. Occurrence of heavy rainfall on a few days is one of the important characteristics of rainfall distribution in these areas. Sometime one-third to two thirds of the annual rainfall has occurred in a single day. The intensity of rainfall over short periods of 15 minutes to an hour can sometimes be as high as 125 to 200 mm an hour. Bijapur district is drained by 3 rivers namely Krishna, Bhima and Doni. Bhima River forms the boundary between Bijapur and Maharashtra State, Krishna River forms boundary between Bijapur and Bagalkot districts. Alamatti dam located between Bijapur and Bagalkot districts and Narayanapura reservoir located near the southeastern border of the district between Bijapur and Gulbarga districts are the major water storage structures. Bijapur District experiences temperature variation between 16.2° and 38.5° C. This district is grouped under the Northern Dry zone of ten fold Agro-climatic classification of Karnataka. Major portion of the district is covered by shallow to very deep black soil.

## 4. Geology and Groundwater occurrence

The "Deccan Traps" (Basalts) cover more than 80% of Bijapur district. The basalts are hard, compact, jointed and highly weathered. From the groundwater point of view, the size and interconnectivity of vesicles, the joint pattern and the intertrappean beds control occurrence and movement of water in Basalts and normally yield better quality water. Lateritisation of basalts is common. Laterite capping generally act as shallow aquifer and yield good quantity of water for a short duration. Quartzites, limestones and shales representing Bhima group and gneisses are also exposed. In these rocks, the structural features control the quantity and the lithological composition of the area governs the quality. Groundwater occurs in the water table conditions in the weathered, decomposed mantle and also under semi-confined conditions in the deeper fractures.

## 5. Groundwater quality characterization

To understand and gather information on groundwater quality, 4545 samples collected from 708 villages / habitations in Bijapur district have been analysed by RDED.

The water samples have been analysed for only 14 parameters such as Turbidity, Colour, Conductivity, Hydrogen ion concentration (pH), Total Dissolved Salts (TDS), Total Hardness (TH), Calcium Hardness (CaH), Chloride (Cl), Sulphate (SO<sub>4</sub>), Fluoride (F), Nitrate (NO<sub>3</sub>), Alkalinity (Alk), Iron (Fe) and Bacteria. The data is presented in the Table.

### 5.1 Physical characters

#### Turbidity

About 120 samples covering 85 villages have shown higher turbidity ranging between 10.5 to 245 JTU. The samples showing higher turbidity are from: Basavana Bagewadi (46 out of 743 samples), Muddebihal (29 out of 717 samples) and Sindgi (45 out of 801 samples). The highest turbidity of 245 JTU is recorded from Huvin Hipparagi village in Basavana Bagewadi taluk. No abnormal turbidity is recorded from Bijapur and Indi taluks.

#### Colour

No abnormality in colour intensity is reported in the entire district.

#### Electrical Conductivity (EC)

The EC value range in different taluks of the district are: Basavana Bagewadi 145 to 9480 mmhos/cm, Bijapur 110 to 17900 m mhos/cm, Indi 320 to 18610 m mhos/cm, Muddebihal 81 to 20900 mhos/cm and Sindgi 276 to 14700 mmhos/cm.

#### Hydrogen Ion Concentration (pH)

Only 159 samples covering 107 villages have recorded pH value in the range of 6.16 to 10.35. The range of pH values recorded in the other taluks are: Basavana Bagewadi 8.52 to 9.2 (19 samples), Bijapur 6.2 to 10.35 (46 samples), Indi 6.16 to 6.43 (56 samples), Muddebihal 8.51-9.14 (16 samples) and Sindgi 8.51 to 9.07 (22 samples). Highest pH (10.35) is reported from Hebbalhatti village of Bijapur taluk.

### 5.2 Chemical characters

#### Total Dissolved Salts (TDS)

Around 565 samples (12.4%) covering 220 villages / habitations have higher content of TDS in the range of 2002 - 12,810 ppm. The ranges of abnormal TDS

content in different taluks are: Basavana Bagewadi 2002 to 6792 ppm (105 samples), Bijapur 2010 to 11400 ppm (159 samples), Indi 2010 to 12810 ppm (149 samples), Muddebihal 2026 to 12090 ppm (99 samples) and Sindgi 2002 to 4250 ppm (53 samples). The highest value of 12810 ppm is reported from Miragi village in Indi Taluk.

### **Total Hardness (TH)**

As many as 1115 samples spread across 381 villages have recorded TH value ranging from 604 to 6000 ppm. The range of TH values in different taluks are: Basavana Bagewadi 608 to 4836 ppm (247 samples covering 69 villages), Bijapur 612 to 4332 ppm (230 samples covering 70 villages), Indi 604 to 5760 ppm (208 samples covering 62 villages), Muddebihal 616 to 6000 ppm (244 samples covering 99 villages) and Sindgi 608 to 2924 ppm (186 samples covering 81 villages). The highest TH content (6000 ppm) is reported from Baladinni (RC) village of Muddebihal Taluk.

### **Calcium Hardness (CaH)**

There are 382 samples spread across 183 villages having higher CaH ranging from 201 to 1603 ppm. The abnormal samples are from: Basavana Bagewadi (102 samples with CaH 201.5 to 806 ppm), Sindgi (78 samples with CaH 205 to 550 ppm), Indi (70 samples with CaH 201 to 906 ppm), Muddebihal (70 samples with CaH 201.5 to 1203 ppm) and Bijapur (62 samples with CaH 202 to 1603 ppm).

### **Chloride (Cl)**

Totally 122 samples analysed from 71 villages / habitations have shown higher Cl content ranging from 1010 to 38107 ppm. The abnormal Cl content noted in other taluks are: Basavana Bagewadi 1058 to 2864 ppm (25 samples covering 14 villages), Bijapur 1010 to 5894 ppm (27 samples covering 15 villages), Indi 1010 to 38107 ppm (39 samples covering 18 villages), Muddebihal 1020 to 4608 ppm (21 samples covering 18 villages) and Sindgi 1029 to 1600 ppm (10 samples covering 6 villages). Highest Cl content of 38107 ppm is reported from Karabasapura village of Indi taluk.

### **Sulphate (SO<sub>4</sub>)**

Quite a good number of samples (727) covering 261 villages have shown the higher content of sulphate ranging from 402 to 2440 ppm. The sulphate contents in the different taluks are: Basavana Bagewadi 402 to 2440 ppm (168 out of 743 samples), Bijapur 402 to 1900 ppm (202 out of 1104 samples), Indi 404 to 2100 ppm (154 out of 1180 samples), Muddebihal 402 to 2112 ppm (131 out of 717 samples) and Sindgi 404 to 2176 ppm (72 out of 801 samples). The highest sulphate content of 2440 ppm is recorded from the Kadakol village in the Basavana Bagewadi taluk.



**Fluoride (F)**

In all, 528 samples from 193 villages / habitations have shown abnormal Fluoride content in the range of 1.57 to 31.14 ppm. The concentrational variation in fluoride reported in different taluks are: Basavana Bagevadi 1.6 to 9.3 ppm (80 samples covering 30 villages), Bijapur 1.57 to 4.5 ppm (4 samples covering 4 villages), Indi 1.6 to 31.14 ppm (62 samples covering 26 villages), Muddebihal 1.6 to 8.3 ppm (347 samples covering 107 villages) and Sindgi 1.6 to 5.4 ppm (35 samples covering 26 villages). Highest concentration of Fluoride (31.14 ppm) is reported from Chadchan village in Indi taluk.

**Nitrate (NO<sub>3</sub>)**

Only 81 samples covering 46 villages / habitations have analysed NO<sub>3</sub> content ranging from 102 - 6064 ppm. These samples are from Basavana Bagevadi 110 to 720 ppm (29 samples), Bijapur 6004 ppm (the lone sample), Muddebihal 110 to 880 ppm (23 samples) and Sindgi 102 to 282 ppm (28 samples). Highest nitrate content of 6064 ppm is reported from Jalageri village in Bijapur taluk. Indi taluk has Nitrate content well within the permissible limit.

**Alkalinity (Alk)**

Only 22 samples covering 18 villages in the entire district have analysed alkalinity in excess in the range of 604 and 992 ppm. These are from: Basavana Bagevadi 652 ppm (the lone sample), Bijapur 624 to 992 ppm (10 samples), Indi 608 & 618 ppm (2 samples), Muddebihal 604 to 984 ppm (8 samples) and Sindgi 630 ppm (the lone sample). Highest alkalinity content of 992 ppm is reported from Bableshwar village in Bijapur taluk.

**Iron (Fe)**

Totally 389 samples from 229 villages have analysed Fe in excess of 1 ppm ranging between 1.01 to 4.4 ppm. These samples are from: Basavana Bagevadi (63 samples with Fe content of 1.1 to 4 ppm), Bijapur (154 samples with Fe content of 1.1 to 4.4 ppm), Indi (126 samples with Fe content of 1.01 to 4 ppm), Muddebihal (28 samples with Fe content of 1.1 to 2.8 ppm) and Sindgi (18 samples with Fe content of 1.1 to 2 ppm). Highest Iron content of 4.4 ppm is recorded from Hanchinal village in Bijapur taluk.

**Bacteria (*E.coli*)**

Nearly 461 samples covering 231 villages have shown the presence of the Bacteria in the analysed water samples. The bacterial count for the district cannot be given, since the analytical data has not specified the number of incidence in particular samples for Bijapur and Indi taluks. The bacterial count in the different taluks are: Basavana Bagevadi 1 to 12 numbers/100 ml (202 samples covering 73 villages), Bijapur (50 samples covering 37 villages), Indi (10 samples covering 9 villages),

Muddebihal 1 to 20 numbers/100 ml (166 samples covering 86 villages) and Sindgi 1 to 4 numbers/100 ml (33 samples covering 26 villages).

### 5.3 Spatial Variation

#### Bacteria (*E.coli*)

The map depicting number of samples analysed for the individual villages indicate that, bacteria are more commonly seen in the analysed water samples spread unevenly throughout the entire district. No specific zonation is evident.

#### Fluoride (F)

The isoconcentration map of fluoride for Bijapur district (Fig.7A) depicts that, excepting Muddebihal taluk's major portion, southern portion of Basavana Bagevadi taluk and few isolated patches in Indi and Sindgi taluks, entire district is having fluoride content well within the permissible limit.

#### Total Dissolved Salts (TDS)

The isoconcentration map generated for the district for TDS (Fig.7B) shows that, excepting an isolated patch in Bijapur taluk, a linear patch comprising northern part of Basavana Bagevadi taluk, Muddebihal taluk's northern part and Indi taluks southwestern part and few isolated patches in central and southern portion of Muddebihal and Basavana Bagevadi taluks, the southeastern border and western border of Indi taluk and central and northeastern portion of Sindgi taluk have recorded high TDS content. Spatially, central and south-central part of the district has recorded higher TDS in comparison with the rest of the district.

#### Total Hardness (TH)

Total Hardness of the water samples analysed for the district, on the isoconcentration map (Fig.7C) reveals that, there is a sympathetic correlation between TDS and TH. As in TDS, higher concentration of TH is seen predominantly in the central portion of the district with few patches along eastern and southern peripheries.

#### Sulphate (SO<sub>4</sub>)

The spatial variation map generated for sulphate (Fig.7D) shows that, a long linear patch comprising the northeastern border of Basavana Bagevadi taluk and southwestern part of the Sindgi taluk, a small portion in the northern side of Muddebihal taluk and a big patch in Bijapur taluks central and eastern part, long elongated patch in the eastern portion of Indi taluk and few isolated patches in the southern portion of Basavana Bagevadi and Muddebihal taluks, northwestern portion of Indi taluk and central portions of Sindgi taluk have higher sulphate content.

## 6. Conclusion

The water quality data of Bijapur district has reflected the presence of excess Total Hardness, Total Dissolved Salts, Calcium Hardness, Sulphate, Iron and the Bacteria. The hardness can be reduced by some conventional methods. Sulphate radical is usually added to ground water mainly through the dissolution of Sulphide minerals and secondarily due to the addition of wastewater from sewerage through infiltration. Pyrite, a common sulphide mineral is known to occur as accessory minerals in almost all rocks either acidic or basic. Water percolating through these rocks dissolves Sulphur, converts into sulphate and adds to ground water table. When the source of Sulphate is secondary, care has to be taken to check its infiltration. Common Sulphates can be precipitated as salts. Sulphur within permissible limit is good for human beings as most of the treatments for skin complaints contain Sulphur; administering sulpha drugs, chest and lung diseases are treated. Effect of concentration beyond the limit is still unknown. In case of Fluoride, utmost care has to be taken, since many samples have analyzed excess of Fluoride. Though a little amount of Fluoride is essential for the bone development in the infants, excess consumption of Fluoride will induce physical disabilities and Dental Fluorosis. Therefore, it is very essential to treat the water to the desirable standard before it is supplied for the drinking purpose. Proper development of the source and usage of galvanised iron or PVC pipes and proper casing can reduce the iron content. The most important component, which is much more harmful, is the presence of Bacteria viz., *E. coli* in the drinking water. The consumption of such water may cause the diseases such as Malaria, Diarrhea etc. Probably, these organisms might have been introduced into the groundwater regime by anthropogenic activities. This clearly indicates non-hygienic / poor sanitation condition prevailing at village levels. To overcome this both the user and the administrator must be trained properly and awareness has to be created regarding hygienic aspects.

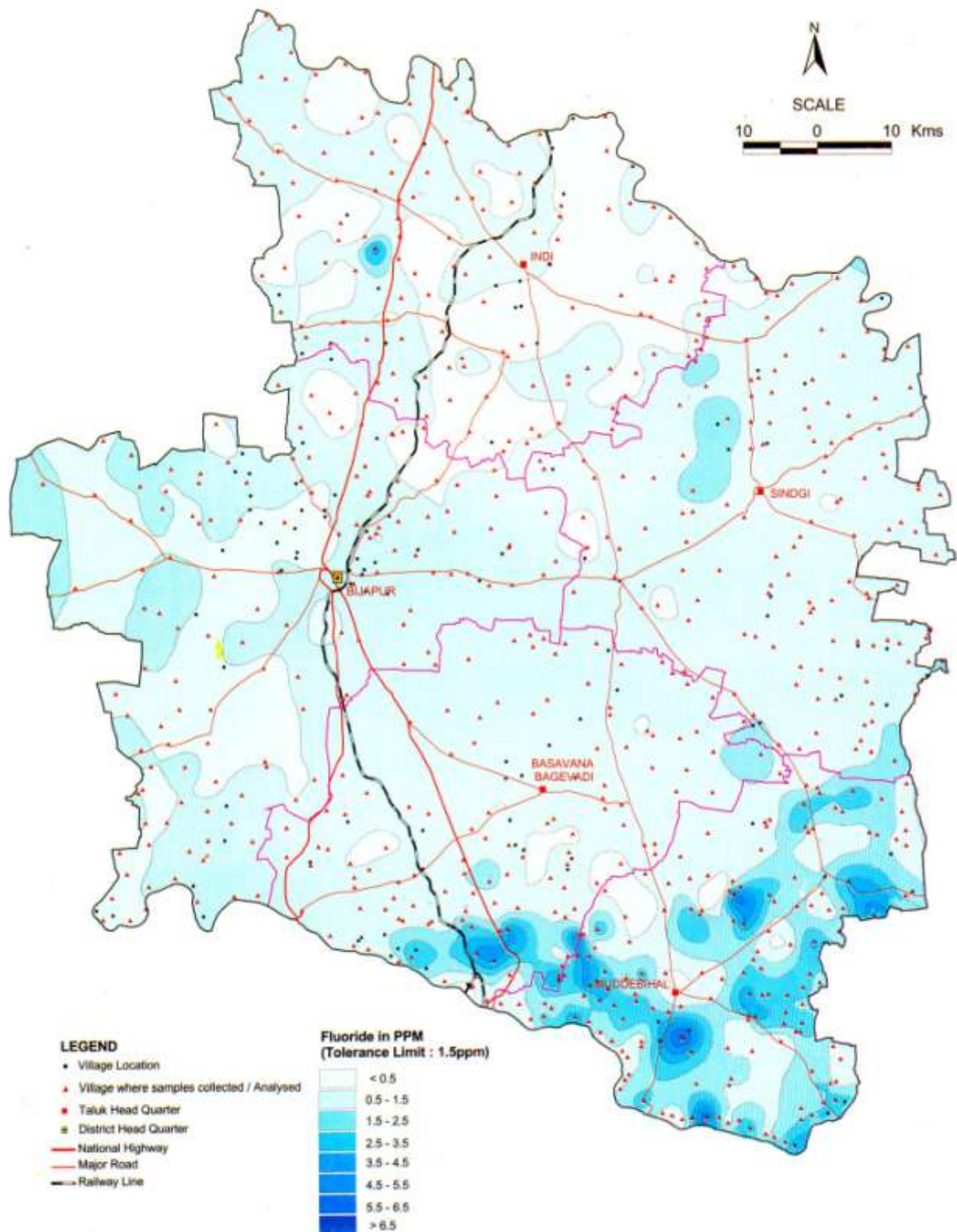
In the case of Bijapur District, flood basalts cover more than 80% of the area. These basalts consist of horizontal flows of varying hydrogeological properties. Generally, horizontal transmissivity will be higher than the vertical transmissivity in these rocks and due to this characteristic there is more possibility of lateral migration of the pathogens. Hence, maximum care has to be taken at the point source itself to avoid pollution of the water source.

**Table: Comprehensive analysis of water quality data of Bijapur District**

SL.NO.	Name of the taluks	Number of villages/habitations	Number of sampled villages	Number of samples analysed	Water quality scenario	Bact (c/100 ml)-0	Tur (10) JTU	Color (25) HU	As (0.05) ppm	Cond - (0.05) mmhos /cm	pH (6.5-8.5)	TDS (2000) ppm	TH (600) ppm	CaH (200) ppm	Cl (1000) ppm	SO <sub>4</sub> (400) ppm	F (1.5) ppm	NO <sub>3</sub> (100) ppm	Alk (600) ppm	Fe (1) ppm	
1	Basavana Bagevadi	149	122	743	No. of samples beyond permissible limit	202	46	-	6	-	19	105	247	102	25	168	80	29	1	63	
					No. of villages affected	73	35	-	6	-	15	38	69	39	14	53	30	12	1	1	41
					Range	1-12	11-245	-	5-10	145-9480	8.52-9.2	2002-6792	608-4636	201.5-806	1058-2864	402-2440	1.6-9.3	110-720	652	1.1-4	
2	Bijapur	178	152	1104	No. of samples beyond permissible limit	50	-	-	-	-	46	159	230	62	27	202	4	1	10	154	
					No. of villages affected	37	-	-	-	-	25	50	70	26	15	62	4	1	8	82	
					Range	PRESENT	-	-	-	110-17900	6.2-10.35	2010-11400	612-4332	202-1603	1010-5894	402-1900	1.57-4.5	6064	624-992	1.1-4.4	
3	Indi	148	140	1180	No. of samples beyond permissible limit	10	-	-	-	-	56	149	208	70	39	154	62	-	2	126	
					No. of villages affected	9	-	-	-	-	36	46	62	31	18	48	26	-	2	67	
					Range	PRESENT	-	-	-	320-18610	6.16-8.43	2010-12810	604-5760	201-906	1010-38107	404-2100	1.6-31.14	-	608-618	1.01-4	
4	Muddebihal	143	153	717	No. of samples beyond permissible limit	166	29	-	4	-	16	99	244	70	21	131	347	23	8	28	
					No. of villages affected	86	25	-	4	-	14	59	99	47	18	60	107	17	6	24	
					Range	1-20	10.5-48	-	5	81-2090	8.51-9.14	2026-12090	616-6000	201.5-1203	1020-4608	402-2112	1.6-6.3	110-880	604-984	1.1-2.8	
5	Sindgi	156	141	801	No. of samples beyond permissible limit	33	45	-	2	-	22	53	186	78	10	72	35	28	1	18	
					No. of villages affected	26	25	-	2	-	17	27	81	40	6	39	26	16	1	15	
					Range	1-4	10.5-55.5	-	5	276-1470	8.51-9.07	2002-4550	608-2924	205-550	1029-1900	404-2176	1.6-5.4	102-282	630	1.1-2	
Total	774	708	4545	No. of samples beyond permissible limit	461	120	0	12	0	159	565	1115	382	122	727	528	81	22	389		
				No. of villages affected	231	85	0	12	0	107	220	381	183	71	261	193	46	18	229		
				Range	PRESENT	10.5-245	0	5-10	81-18610	6.16-10.35	2002-12810	604-6000	201-1603	1010-38107	402-2440	1.57-31.14	102-6064	604-992	1.01-4.4		

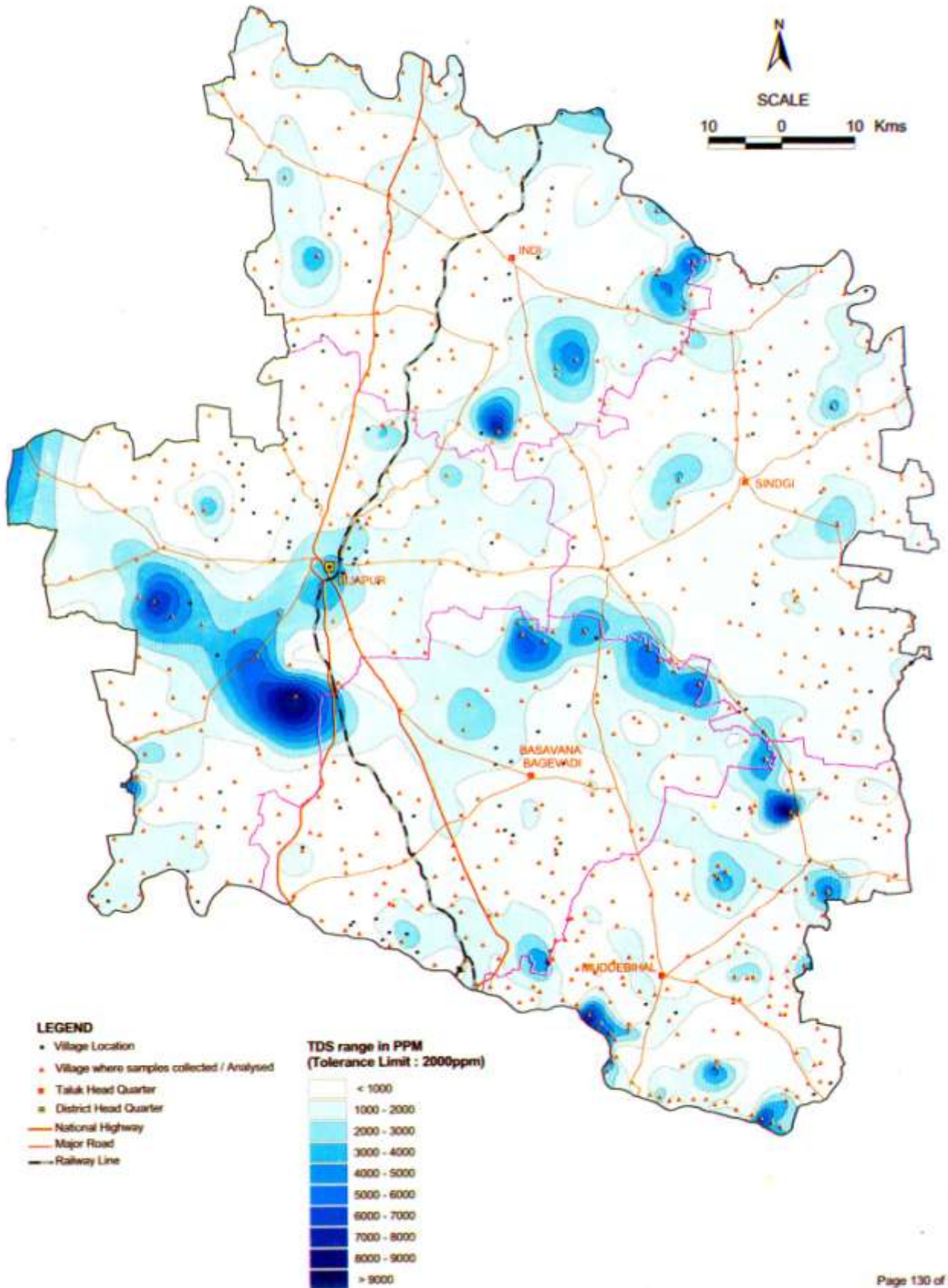


**BIJAPUR DISTRICT**  
**FIG.7A : FLUORIDE VARIATION**



# BIJAPUR DISTRICT

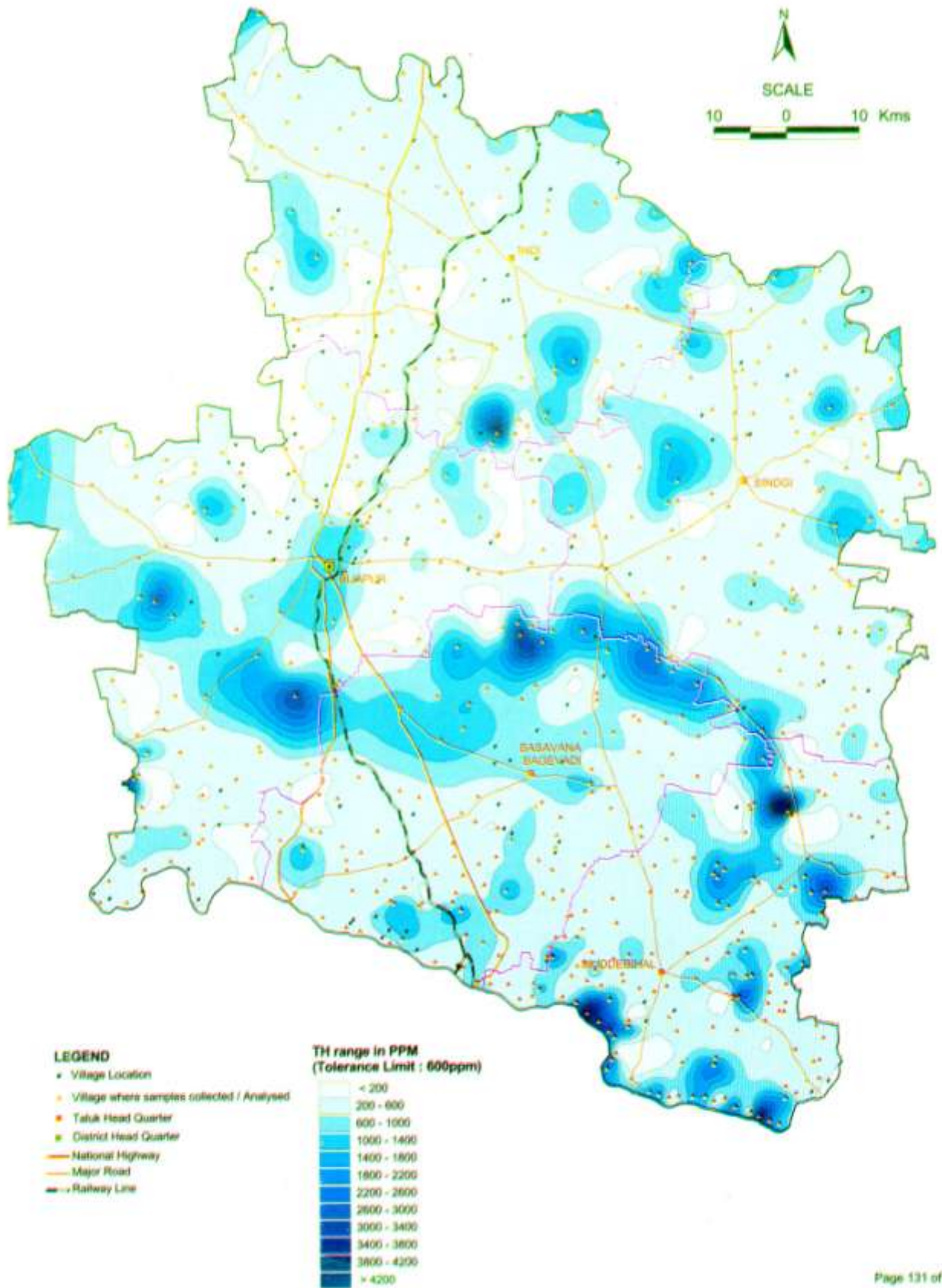
FIG.7B : VARIATION OF TOTAL DISSOLVED SALTS (TDS)





# BIJAPUR DISTRICT

FIG.7C : VARIATION OF TOTAL HARDNESS (TH)



# BIJAPUR DISTRICT

## FIG.7D : SULPHATE VARIATION

