

## DAVANAGERE DISTRICT



FIG.12 DAVANAGERE DISTRICT

Sl.No.	CONTENTS	Page		
1)	Location	180	TABLE: COMPREHENSIVE ANALYSIS OF WATER QUALITY DATA	186
2)	Demography	180		
3)	Climate, Drainage and soil	180		
4)	Geology and Groundwater occurrence	180		
5)	Groundwater quality Characterization	181	<b>LIST OF FIGURES</b>	
5.1	Physical characters	181	FIG.12A FLUORIDE VARIATION (F)	187
5.2	Chemical characters	182	FIG.12B VARIATION OF TOTAL DISSOLVED SALTS (TDS)	188
5.3	Spatial variation	184	FIG.12C VARIATION OF TOTAL HARDNESS (TH)	189
6)	Conclusion	185	FIG.12D NITRATE VARIATION (NO <sub>3</sub> )	190

## 1. Location

Davanagere district is located in the central part of Karnataka State with geographical area of 6018 sq. km. It is bounded by Bellary district on northern side, Haveri and Shimoga districts on western side, Chikmagalur district on southern side and Chitradurga district on southeastern and southern side. It lies between 13° 48' to 14° 56' N Latitude and 75° 24' to 76° 32' E Longitude.

## 2. Demography

As per the 1991 census, Davanagere district has a population of 1,559,222. The total number of census villages / habitations in the district are 1,084. Davanagere district has 6 taluks viz. Channagiri, Davanagere, Harapanahalli, Harihar, Honnali and Jagalur.

## 3. Climate, Drainage and Soil

Davanagere district forms part of the southern maidan region having extensively undulating plateau with elevations ranging between 600 and 1000 m. Occurrence of heavy rainfall on a few days (over 200 mm in a day) is one of the important characteristics of rainfall distribution in the area. Sometimes one-third to two thirds of the annual rainfall has occurred in a single day. Thungabhadra and Chinna Hagari or Janaga Halla rivers drain Davanagere district. The annual average rainfall in the district is 689.2 mm (Ref: Climate of Karnataka State, Published by India Meterological Department, 1984). Davanagere district experiences temperature variation of 19° to 39° C. Part of the district covering Jagalur, Harihar, Harapanahalli and Davanagere taluks are grouped under the central dry zone and Honnali and Chennagiri taluks in the southern transition zone of ten fold Agro-climatic classification of Karnataka. Major portion of the district is covered by Red to Black soils.

## 4. Geology and Groundwater occurrence

In Davanagere district, the basement gneisses and small patches of younger granites are exposed in the eastern half. From the groundwater point of view these rocks are classified as crystalline formations. The fracture / fissure system developed along with joints and faults traversing the rocks facilitate groundwater circulation and hold moderate quantity of water. These gneisses are overlaid by conglomerate, quartz chlorite schist, greywacke, metavolcanics, limestone and iron / manganese formations in the southern part of the district. In the sedimentary rocks, the bedding planes, folds, faults and the fractures act as conduits for water movement as well as repository of groundwater. The open spaces such as subsurface caverns/solution channels in specifically the limestone country are the characteristic features. The structural features control the quantity and the lithological composition of the area governs the quality. The schists and greywackes are relatively impermeable, poor aquifers and yield very less quantity of water of poorer quality. Groundwater generally occurs in the water table conditions in the

weathered and decomposed mantle and also under semi-confined conditions in the deeper fractures.

## **5. Groundwater quality characterization**

To understand and gather information on groundwater quality, 5148 samples collected from 890 villages / habitations in Davanagere 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**

Only 28 samples covering 24 villages show higher turbidity ranging between 10.6 and 81.6 JTU. The samples showing higher turbidity are from Davanagere (19 out of 1016 samples) and Harapanahalli (9 out of 703 samples) taluks. No abnormal turbidity is recorded from the Channagiri, Harihar, Honnali and Jagalur taluks.

#### **Colour**

All the 5148 analysed samples covering 890 villages have colour intensity within the permissible limit of 25 HU. No abnormal Colour intensity is reported in the entire district.

#### **Electrical Conductivity (EC)**

The EC value recorded in the different taluks of Davanagere district are Channagiri 0.99 to 9700 m mhos/cm, Davanagere 34.1 to 98200 m mhos/cm, Harapanahalli 320 to 6017 m mhos/cm, Harihar 235.9 to 8458 m mhos/cm, Honnali 150.8 to 5812 m mhos/cm and Jagalur 406.3 to 6990 m mhos/cm.

#### **Hydrogen Ion Concentration (pH)**

About 513 samples covering 264 villages have shown the abnormal pH value in the range of 8.51 to 9.9 (all are basic in nature except a lone sample, which is having pH value 6.4). The range of pH values recorded in the other taluks are Channagiri 8.6 to 9.9 (62 samples), Davanagere 8.51 to 9.1 (176 samples), Harapanahalli 8.51 to 9 (61 samples), Harihar 6.4-8.9 (85 samples), Honnali 8.51 to 8.91 (56 samples) and Jagalur 8.6 to 9 (73 samples).



## 5.2 Chemical characters

### Total Dissolved Salts (TDS)

Some 268 samples covering 159 villages / habitations have higher content of TDS ranging between 2002 to 7467 ppm. The ranges of abnormal TDS content in different taluks are Channagiri (31 samples with TDS content of 2020 to 5335 ppm), Davanagere (90 samples with TDS content of 2034.9 to 7467 ppm), Harapanahalli (33 samples with TDS content of 2004 to 3550 ppm), Harihar (45 samples with TDS content of 2022 to 4326 ppm), Honnali (8 samples with TDS content of 2131.66 to 3359.34 ppm) and Jagalur (61 samples with TDS content of 2002 to 4893 ppm). The highest value of 7467 ppm is reported from Kodihalli village in Davanagere Taluk.

### Total Hardness (TH)

Totally 1654 samples spread across 569 villages have analysed TH value varying between 604 to 4812 ppm. The range of TH values above the permissible limit in different taluks are Channagiri (392 samples from 128 villages with TH content of 604 to 4812 ppm), Davanagere (274 samples from 106 villages with TH content of 604 to 4740 ppm), Harapanahalli (203 samples from 92 villages with TH content of 604 to 2492 ppm), Harihar (193 samples from 47 villages with TH content of 604 to 4604 ppm), Honnali (308 samples from 93 villages with TH content of 604 to 2560 ppm) and Jagalur (284 samples from 103 villages with TH content of 608 to 3100 ppm). The maximum TH content (4812 ppm) is reported from Haralipura village of Channagiri Taluk.

### Calcium Hardness (CaH)

In the district, about 1157 samples spread across 405 villages are having CaH above the permissible limit in the range of 201.6 to 9260 ppm. The maximum abnormal samples are from Honnali (424 samples with CaH content of 204 to 1280 ppm), Davanagere (328 samples with CaH content of 204 to 2184 ppm), Channagiri (239 samples with CaH content of 201.6 to 1593.6 ppm), Jagalur (62 samples with CaH content of 201.6 to 1046.4 ppm), Harihar (61 samples with CaH content of 201.6 to 828.8 ppm) and Harapanahalli taluks (43 samples with CaH content of 201.6 to 9260 ppm). Highest CaH content of 9260 ppm is recorded from Kanchikere village of Harapanahalli taluk.

### Chloride (Cl)

Only 153 samples from 100 villages/habitations have shown higher Cl content ranging from 1002 to 2922 ppm. The abnormal Cl content noted in other taluks are Channagiri (25 samples from 20 villages with Chloride content of 1004 to 2922 ppm), Davanagere (49 samples from 36 villages with Chloride content of 1006 to 2884 ppm), Harapanahalli (12 samples from 9 villages with Chloride content of 1002 to 1290 ppm), Harihar (26 samples from 12 villages with Chloride content of 1002 to 1596 ppm), Honnali (18 samples from 8 villages with Chloride content of

1002 to 2100 ppm) and Jagalur (23 samples from 15 villages with TH content of 1020 to 2446 ppm). Highest Cl content of 2922 ppm is reported from Haralipura village of Channagiri taluk.

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

In the entire district, only 8 samples from Channagiri (2 samples), Davanagere (5 samples) and Harapanahalli (the lone sample) taluks have higher Sulphate content in the range of 448 to 758.14 ppm. All the analysed samples in the Harihar, Honnali and Jagalur taluks have Sulphate content within the permissible limit.

### **Fluoride (F)**

The analytical data has revealed the higher fluoride content in 1045 samples from 363 villages / habitations in the range of 1.51 to 7.04 ppm. The concentration variation in fluoride reported in different taluks are Channagiri (67 samples with Fluoride content of 1.52 to 3.19 ppm), Davanagere (155 samples with Fluoride content of 1.51 to 4.08 ppm), Harapanahalli (227 samples with Fluoride content of 1.51 to 6.27 ppm), Harihar (325 samples with Fluoride content of 1.51 to 7.04 ppm), Honnali (50 samples with Fluoride content of 1.57 to 3.23 ppm) and Jagalur (221 samples with Fluoride content of 1.52 to 4.98 ppm). Highest concentration of Fluoride (7.04 ppm) is reported from Adhapura village of Harihar taluk.

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

635 samples covering 133 villages / habitations have analysed NO<sub>3</sub> content beyond the permissible in the range of 100.5 to 2490 ppm. These samples are from Channagiri (2 samples), Davanagere (619 samples, almost 97% of the abnormal samples), Harihar (10 samples) and Honnali (4 samples) taluks.

### **Alkalinity (Alk)**

About 296 samples from 162 villages in the district have analysed alkalinity in excess of the standard permissible limit and range between 604 and 3584 ppm. They are from Channagiri (48 samples from 21 villages), Davanagere (32 samples from 23 villages), Harapanahalli (33 samples from 25 villages), Harihar (57 samples from 21 villages), Honnali (25 samples from 17 villages) and Jagalur (101 samples from 55 villages) taluks. Highest Alkalinity of 3584 ppm is recorded from Chikkamudugal village in Channagiri taluk.

### **Iron (Fe)**

Excepting 6 samples in the entire district, Fe content is less than permissible limit. These 6 abnormal samples belong to Davanagere taluk and iron content in them ranges from 1.1 to 43 ppm.

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

Nearly 152 samples covering 142 villages have shown the presence of the Bacteria in the range of 1 - 5 No.s/ 100 ml water. Bacterial count in the different taluks are Channagiri (28 samples with bacterial count of 1 to 4 numbers/100ml), Davanagere (39 samples with bacterial count of 1 to 5 numbers/100ml), Harapanahalli (15 samples with bacterial count of 1 to 4 numbers/100ml), Harihar (29 samples with bacterial count of 1 to 3 numbers/100ml), Honnali (23 samples with bacterial count of 1 to 4 numbers/100ml) and Jagalur (18 samples with bacterial count of 1 to 4 numbers/100ml).

**5.3 Spatial Variation****Bacteria (*E.coli*)**

The map depicting bacterial incidences indicates that, the bacterial incidence is less common in the district. However the few bacteria infected samples are spread unevenly throughout the district.

**Fluoride (F)**

The isoconcentration map of fluoride (Fig.12A) depicts that, the northern half of the district consisting of Jagalur and Harapanahalli taluks has higher fluoride concentration compared to the southern portion of the district where larger patches of abnormal fluoride content are seen.

**Total Dissolved Salts (TDS)**

The isoconcentration map generated for TDS (Fig.12B) shows that, in general, the TDS content in the district is within the permissible limit. However, few isolated patches are randomly spread across the district with comparatively dense spread in the northern half. The southern half has isolated patches of slightly higher TDS concentration.

**Total Hardness (TH)**

The isoconcentration map of Total Hardness (Fig.12C) reveals that, high concentration of TH in Davanagere district is noticed as isolated and elongated patches throughout the district covering all the taluks, but is slightly less in Harihar taluk.

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

The spatial variation map generated for Nitrate (Fig.12D) indicates an interesting situation where only Davanagere taluk found to be affected by high Nitrate concentration when compared to the other parts of the district.



## 6. Conclusion

The water quality data of Davanagere district has reflected the presence of excess Total Hardness, Calcium Hardness, Fluoride, Nitrate and Bacteria. Hardness can be reduced by some conventional methods. 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. Decreasing the application of nitrous fertilizers can reduce nitrate concentrations. The most important component, which is much more harmful, is the presence of Bacteria viz., *E. coli* in drinking water. The consumption of such water may cause the diseases such as Malaria, Diarrhea etc. Probably, these organisms 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.

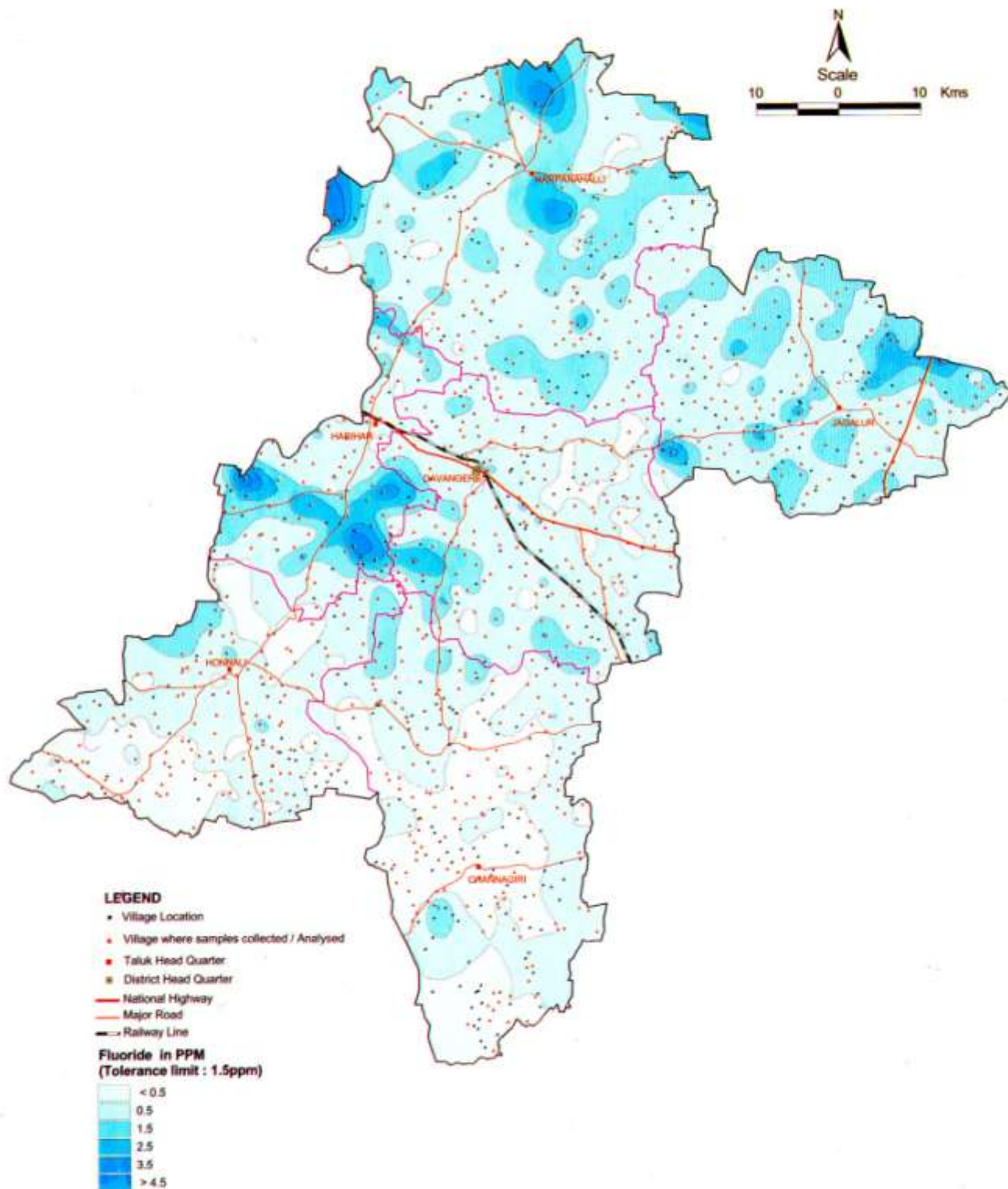
**Table: Comprehensive analysis of water quality data of Davanagere District**

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	Cond - mmtios/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	Channagiri	279	178	996	No. of samples beyond permissible limit	28	-	-	-	62	31	392	239	25	2	67	2	48	-		
					No. of Village affected	27	-	-	40	24	128	91	20	1	23	2	21	-	-	-	-
					Range	1.4	-	-	0.99-9700	2020-5335	604-4812	201.6-1933.6	1004-2922	448-451	1.52-3.19	108.2-128.2	608-3584	-	-	-	-
2	Davanagere	221	165	1016	No. of samples beyond permissible limit	39	19	-	-	176	90	274	328	49	5	155	619	32	6		
					No. of Village affected	37	16	-	-	74	52	106	116	36	3	64	123	23	-	-	-
					Range	1.5	11.9-81.6	-	34.1-96200	2034.9-7467	604-4740	204-2184	1006-2884	451-629	1.51-4.08	100.5-2490	608-1480	1.1-43	-	-	-
3	Harapanahalli	100	182	703	No. of samples beyond permissible limit	15	9	-	-	61	33	203	43	12	1	227	-	33	-		
					No. of Village affected	15	8	-	-	40	22	92	30	9	1	114	-	25	-	-	
					Range	1.4	10.6-26.6	-	320-6017	2004-3550	604-2482	201.6-9260	1002-1290	758-14	1.51-6.27	-	604-860	-	-	-	
4	Harihar	227	78	700	No. of samples beyond permissible limit	29	-	-	-	85	45	193	61	26	-	325	10	57	-		
					No. of Village affected	26	-	-	-	35	19	47	22	12	-	59	4	21	-	-	
					Range	1.3	-	-	235.9-8458	2022-4326	604-4604	201.6-8228	1002-1596	-	1.51-7.04	118.69-513.7	604-1592	-	-	-	
5	Honnali	194	144	1028	No. of samples beyond permissible limit	23	-	-	-	56	8	308	424	18	-	50	4	25	-		
					No. of Village affected	20	-	-	-	39	8	93	112	8	-	22	4	17	-	-	
					Range	1.4	-	-	150.8-5812	2131-663359.34	604-2560	204-1280	1002-2100	-	1.57-3.23	100.14-130.5	608-840	-	-	-	
6	Jagalur	199	143	703	No. of samples beyond permissible limit	18	-	-	-	73	61	284	62	23	-	221	-	101	-		
					No. of Village affected	17	-	-	-	36	34	103	15	-	81	-	55	-	-		
					Range	1.4	-	-	406.3-6990	2002-4893	608-3100	201.6-1046.4	1020-2446	-	1.52-4.96	-	604-1512	-	-	-	
Total	1220	890	5148	15148	No. of samples beyond permissible limit	152	28	-	-	513	268	1654	1157	153	8	1045	635	296	6		
					No. of villages affected	142	24	-	-	264	159	569	100	5	363	133	162	5	162	5	
					Range	1.5	10.6-81.6	-	0.99-96200	2002-7467	604-4812	201.6-9260	1002-2922	448-758.14	1.51-7.04	100.5-2490	604-3584	1.1-43	-	-	



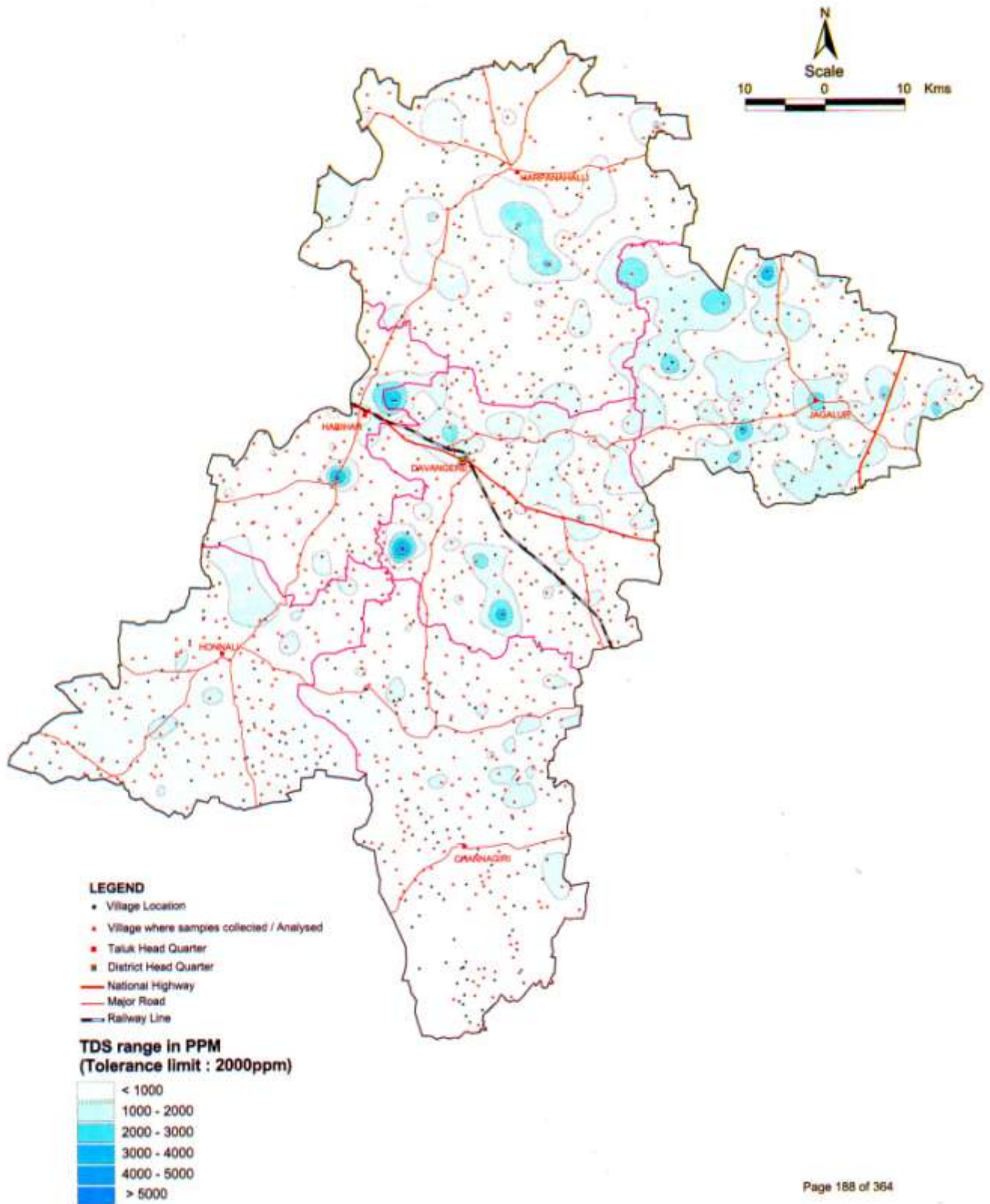
# DAVANAGERE DISTRICT

## FIG.12A : FLUORIDE VARIATION



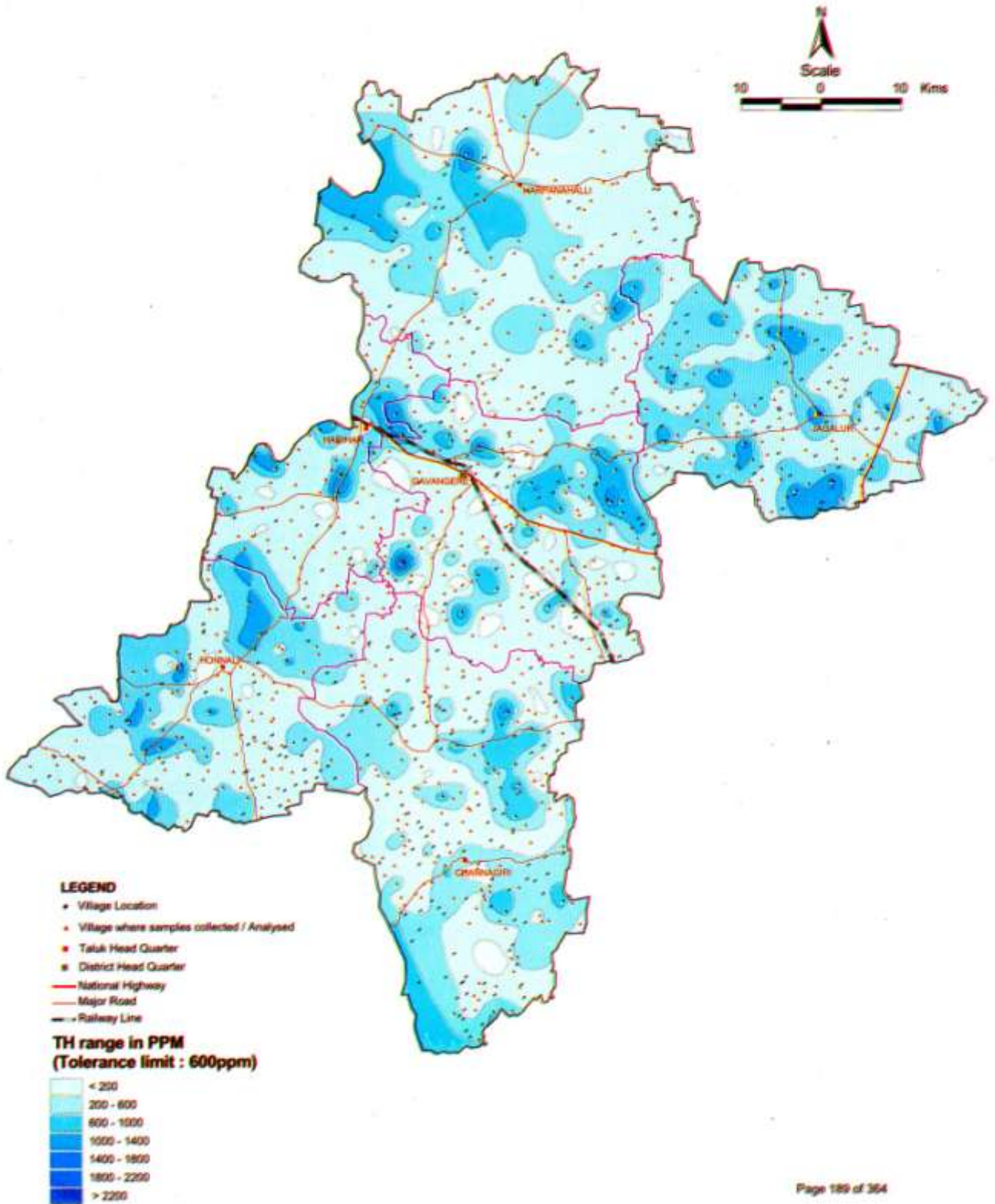
# DAVANAGERE DISTRICT

FIG.12B : VARIATION OF TOTAL DISSOLVED SALTS (TDS)



## DAVANAGERE DISTRICT

FIG.12C : VARIATION OF TOTAL HARDNESS (TH)





**DAVANAGERE DISTRICT**  
**FIG.12D : NITRATE VARIATION**

