Draft Report

केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण मंत्रालय

भारत सरकार

Central Ground Water Board

Ministry of Water Resources, River Development and Ganga Rejuvenation

Government of India

Report on

AQUIFER MAPPING AND MANAGEMENT PLAN

Chintamani Taluk, Chikballapur District, Karnataka

दक्षिण पश्चिमी क्षेत्र, बैंगलोर

South Western Region,Bengaluru

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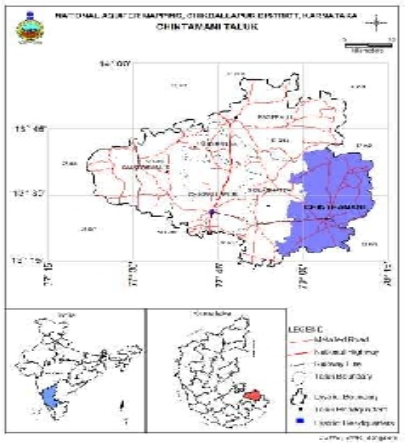
Government of India
Ministry of Water Resources, River Development & Ganga Rejuvenation
Central Ground Water Board

CHINTAMANI TALUK AQUIFER MAPS AND MANAGEMENT PLANS

CHIKBALLAPUR DISTRICT, KARNATAKA STATE



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CHINTAMANI TALUK AQUIFER MAPS AND MANAGEMENT PLANS

CHIKBALLAPUR DISTRICT, KARNATAKA STATE

CONTENTS

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CHIKBALLAPUR DISTRICT, KARNATAKA STATE

1. SALIENT INFORMATION

Name of the taluk	**: CHINTAMANI**
District	: Chikballapur
State	: Karnataka
Area	: 893 sq.km.
Population	: 2,98,070 (2011)
Annual Normal Rainfall	: 726 mm

1.1 Aquifer management study area

Aquifer mapping studies were carried out in Chintamani taluk, Chikballapur district of Karnataka, covering an area of 893 sq.kms under National Aquifer Mapping Project. Chintamani taluk of is located between north latitude $13^0$16'15" and $13^0$40'32.5" & east longitude $77^0$57'26" and $78^0$12'27", and is covered in parts of Survey of India Toposheet Nos. 57G/14, 57G/15, 57K/2 and 57K/3. Chintamani taluk is bounded by Bagepalli taluk on north, Kolar taluk of Kolar district on south, Srinivasapura taluk of Kolar district on east and Sidlaghatta taluk on western side. Location map of Chintamani taluk is presented in Figure-1**.**

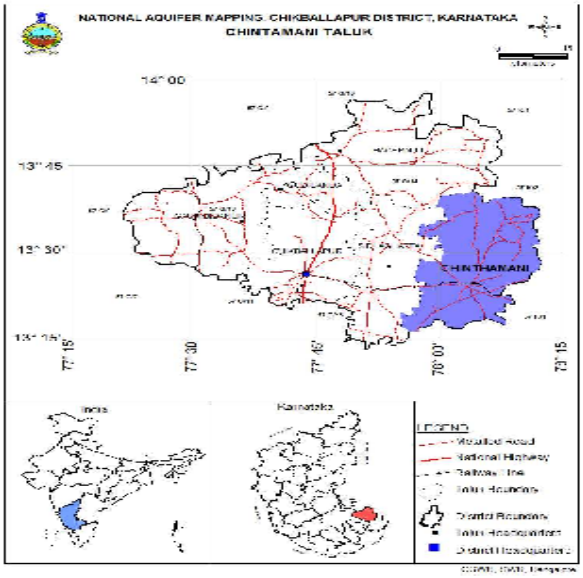

Fig 1: Location Map of Chintamani Taluk, Chikballapur

Taluk administration of Chintamani taluk is divided into 6 Hoblies and Chikballapur is only one town, which is also the taluk head quarter. There are 341 inhabited and 59 uninhabited villages in Chintamani taluk (Table-1).

Table 1: Administrative divisions of Chintamani taluk, Chikballapur district

No. of Villages		VA circles	Hoblies	Gram Panchayat	Municipalities	Cities / Towns / Urban Agglomeration
Inhabited	Uninhabited					
341	59	54	6	34	1	1

Source: District at a glance 2013-14, Govt. of Karnataka

1.2 Population

According to 2011 census, the population in Chintamani taluk is 2,98,070, comprising 1,50,614 males and 1,47,456 females. Out of the total population of 2,98,070, nearly 2,22,002 constitute the rural population and 76,068 is the urban population, which works out to 74.47% (rural) and 25.42 % (urban) of the total population of taluk. The study area has an overall population density of 334 persons per sq.km. The decadal variation in population from 2001-2011 is 9.0 % in Chintamani taluk.

1.3 Rainfall

Chintamani taluk enjoys semiarid to arid climate. Dryness and hot weather prevails in major part of the year. The area falls under Eastern dry agro-climatic zone of Karnataka state and is categorized as drought prone. The normal annual rainfall in Chintamani taluk for the period 1981 to 2010 is 726 mm. Seasonal rainfall pattern indicates that, major amount of (389 mm) rainfall was recorded during South-West Monsoon seasons, which contributes about 54% of the annual normal rainfall, followed by North-East Monsoon season (232 mm) constituting 32% and remaining (105 mm) 14% in Pre-Monsoon season (Table-2).

Computations were carried out for the 30 year blocks of 1981- 2010, the mean monthly rainfall at Chintamani taluk is ranging between 2 mm during January to 151 mm during October. The coefficient of variation percent for premonsoon, monsoon and post monsoon season is 55, 31 & 61 percent respectively. Annual CV at this station works out to be 31 percent (Table-2).

Table 2: Statistical Analysis of Rainfall Data of Chintamani Station, (1981 to 2010)

	JAN	FEB	MAR	APR	MAY	PRE	JUN	JUL	AUG	SEP	SW	OCT	NOV	DEC	NE	Annual
NRF (mm)	2	4	12	22	64	105	65	79	97	148	389	151	65	16	232	726
CV(%)	271	260	162	121	70	55	81	86	70	45	31	90	81	108	61	31
% of ARF	0.3	0.6	1.7	3.0	8.8	14.5	8.9	10.9	100	20.4	53.6	20.8	8.9	2.2	32.0	100

1.4 Agriculture & Irrigation

Agriculture is the main occupation in Chintamani taluk. The amount of rainfall and its distribution throughout the season contributes to the cropping pattern in the area.There are two agricultural seasons namely Kharif (June - October) and Rabi season (Mid October - Mid February). Major Kharif crops are paddy, maize, ragi, tur dal and vegetables (Table-3). Main crops of Rabi season are Ragi, Maize, horse gram, groundnut, and sunflower. Mango plantations are the major perennial crop grown in the area.

Table 3: Cropping pattern in Chintamani taluk 2013-2014

Year	Paddy	Maize	Ragi	Total Cereals and minor millets	Oil seeds	Pulses	Fruits	Vegetables	Cotton	Sugarcane
	Area under cultivation (Ha)									
2013-14	1140	5161	16134	22451	5460	3557	9505	2696	120	2

It is observed that net sown area accounts 52% and area sown more than once is 7% of total geographical area in Chintamani taluk (Table-4). 21% area falls under area not available for cultivation. Groundwater from bore wells forms the only source of irrigation.

Table 4: Details of land use in Chintamani taluk, 2013-2014 (Ha)

Taluk	Total Geographical Area	Area under Forest	Area not available for cultivation	Fallow land	Net sown area	Area sown more than once
Chintamani	86697	3243	18263	4030	45366	6264

Source: District at a glance 2013-14, Govt. of Karnataka

1.5 Geomorphology, Physiography & Drainage

Geomorphologically, the taluk area is covered with uplands on Gneisses and Granites, which are ideal for agriculture. Physiography of the entire area is in southern maidan region, characterized by undulating landscape with broad valleys, where the elevation ranges from 700 to 1338 m amsl with good degree of slope. The eastern part of the taluk is covered by prominent hill ranges which are continuation of Nandidurga hill ranges running almost N-S direction and is the provenance for the sediment and drainage of Pennar. The remaining portion is having rolling topography undulating and gently sloping lands and valleys. The prominent hill ranges in the area is Devarbetta hill range with 1014 m amsl (Fig-2).

There are no perennial rivers in Chintamani taluk. The taluk is drained by three river basins namely Palar, Ponnaiyar, and Pennar. All these rivers and their tributaries are small and carry water only during rainy season. Palar originates at Ambajidurga hillocks in Chintamani taluk and flows NW-SE direction. The drainage is highly dendritic in nature (Fig-3). The Pennar river originates in Doddaballapura taluk of Bangalore Rural district and flows towards north

covering parts of Chintamani taluk. North Pinakani originates from Nandi hills in Chintamani taluk and flows towards north. R iver Papagni enters in Sidlaghatta taluk and flows towards NE covering parts of Chintamani, Bagepally and Sidlaghatta taluks (Fig.-3).

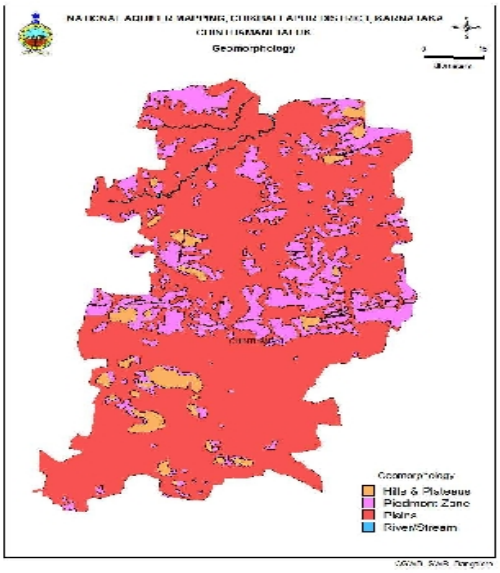

Fig 2: Geomorphology Map

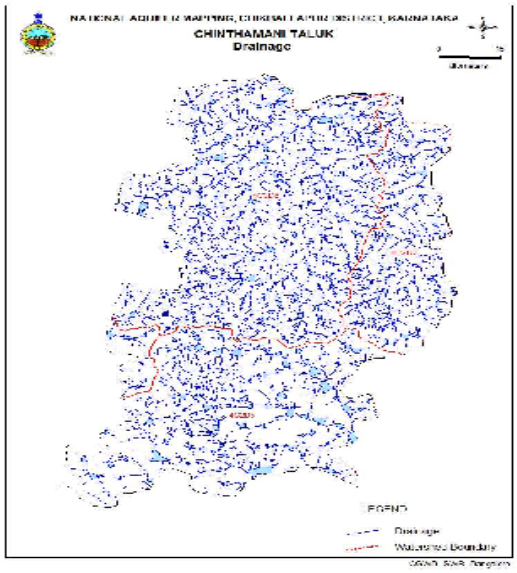

Fig 3: Drainage Map

1.6 Soil

Chintamani taluk is covered by four classes of soils that are clayey, clayey mixed, loamy skeletal and rocky land.

1.7 Ground water resource availability and extraction

Aquifer wise total ground water resources up to 200 m depth are given in Table-5 below.

Table 5: Total GW Resources (2011) (Ham)

Taluk	Annual replenishable GW resources	Fresh In-storage GW resources		Total availability of fresh GW resources
		Phreatic	Fractured (Down to 200m)	Dynamic + phreatic in-storage + fractured
Chintamani	5917	0	2902	8818

1.8 Existing and future water demands (as per GEC-2011)

- Net ground water availability for future irrigation development : Nil
- Domestic (Industrial sector) demand for next 25 years : 2.55 MCM

1.9 Water level behavior

(a) Depth to water level

Aquifer – I : Phreatic aquifer is almost dry / desaturated due to over exploitation.

Aquifer – II : Pre-monsoon & Post-monsoon water level are given in Table below and shown in Figures-4 & 5 respectively.

Taluk	Pre-monsoon WL (mbgl)			Post-monsoon WL (mbgl)		
	Minimum	Maximum	Average	Minimum	Maximum	Average
Chintamani	3.86	142.20	39.63	5.50	143.20	73.94

(b) Water level fluctuation

Aquifer-II (Fig.-6)

A. Seasonal Fluctuation: Rise ranges between 0.40 to 10.57 m;
Fall ranges between 0.18 to 7.15 m.

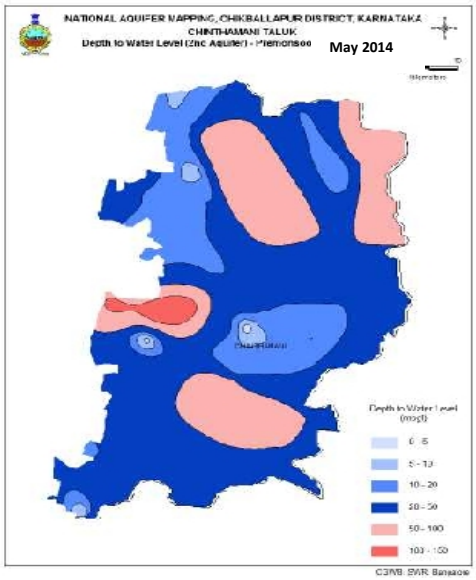

Fig 4: Pre-monsoon Depth to WL (Aq-II)

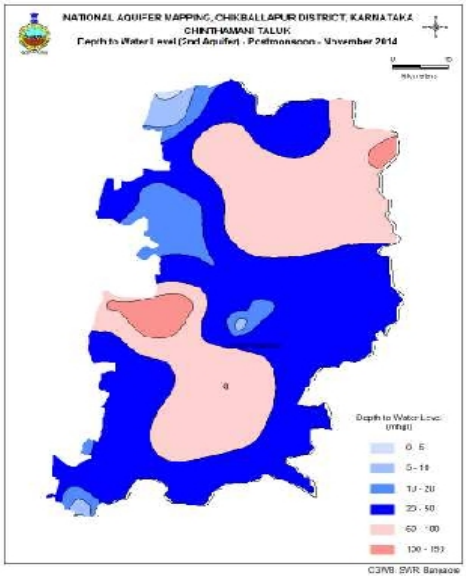

Fig 5: Post-monsoon Depth to WL (Aq-II)

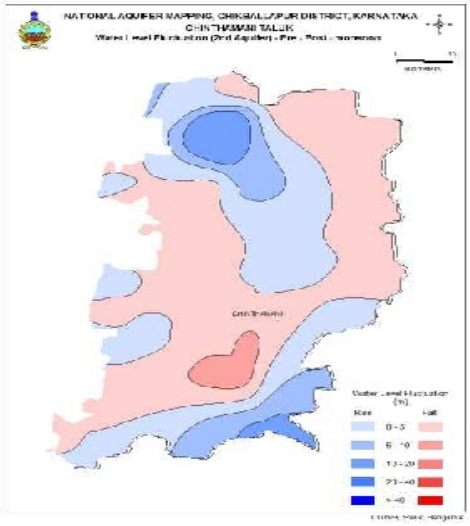

Fig 6: Water Level Fluctuation (Aq-II)

2. AQUIFER DISPOSITION

2.1 Number of aquifers: In Chintamani taluk, there are mainly two types of aquifer systems;

i. **Aquifer-I (Phreatic aquifer)** comprising Weathered Banded Gneissic Complex / Granite

ii. **Aquifer-II (Fractured aquifer)** comprising Fractured Banded Gneissic Complex / Granite

In Chintamani taluk, fractured Banded Gneissic Complex / gneisses and granite are the main water bearing formations (Figure-7). Ground water occurs within the weathered and fractured gneisses and granite under water table condition and semi-confined condition. In Chintamani taluk bore wells were drilled from a minimum depth of 50 mbgl to a maximum of 501 mbgl (Table-6). Thickness of weathered zone (Aquifer-I) ranges from 11.0 mbgl to 58.0 mbgl (Figure-8). Ground water exploration reveals that aquifer-II fractured formation was encountered between the depth of 30 to 336 mbgl. Yeild ranges from 0.3 to 14.0 lps. The most productive granular zones with good discharge encountered are in between 100 to 200 m. Transmissivity ranges from 5.0 to 55.0 m^2/day. The basic characteristics of each aquifer are summarized in Table-7.

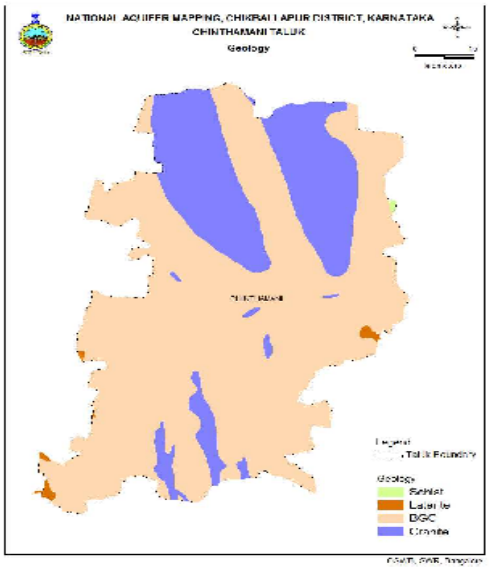

Fig 7: Geology Map

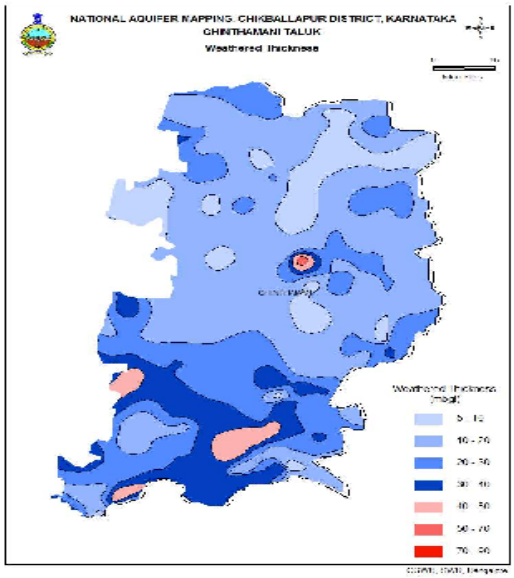

Fig 8: Weathered thickness map (Aq-I disposition)

Table 6: Details of Ground Water Exploration

S. No.	Location	Lat.	Long.	Depth Drilled (mbgl)	Casing Depth (m)	Fracture Zones (mbgl)	SWL (mbgl)	Q (lps)	DD (m)	T (m2/ day)
1	Nagadenahalli EW	13°21'15"	78°0'55"	180	23.5	19-34, 34-35, 39-41, 43-45	13.97	7.46	3.9	44
2	Nagadenahalli OW	13°21'15"	78°0'55"	50	19.8	34-35, 37-39	14.73	0.3		-
3	Nadumpalli	13°21'15"	78°11'0"	172	16.4	18.77-30.01, 75-77,136-138, 165-167, 169-171	11.42	2.32	21.05	5
4	Nadumpalli	13°21'15"	78°11'0"	171.37	16.4	18.77-28.01, 34-35, 100-102, 115-121, 140-142, 159-161, 167-169	11.42	7.3	9.575	55
5	Bhairasandra	13°21'15"	78°4'55"	501.2	11		13.1	0.31		
6	Akkimangala EW	13°21'15"	77°11'45"	501.2	43		75.09	4.25		
7	Akkimangala OW	13°21'15"	77°11'45"	400.5	43	Nil		2.08		
8	B.M.Halli EW	13°21'15"	78°4'45"	347.6	58	326-328, 334-336	198.26	6.73		
9	B.M Halli OW	13°21'15"	78°4'45"	328.5	58	102-104, 297-299,303-306, 326-327		12.76		
10	Nadumpalli EW	13°21'15"	78°4'40"	225.6	12.2	29-31, 41-43, 194-196, 218-220,222-224		14	7.15	
11	Nadumpalli OW	13°21'15"	78°4'40"	232.8	12.2	45-47,120-123, 230-232	32.1	1	9.77	
12	Doddaganjur	13°21'15"	78°6'25"	477	23.9	88.4-90.4,112.8-114.8, 247-249	45.5			
13	Maillandahallir	13°21'15"	78°5'17"	446.4	37.6	434-435		1.5		
14	Junjunahalli	13°21'15"	78°7'53"	300	23.9	251.10-253.10,257.20-259.20,279.6-281.60				
15	Munganahalli	13°21'15"	78°4'46"	279.5	23.7	47.7-49.8,53.8-55.9,56.9-57.9,64-68,86.4-88.4,137.2-139.2,194-196,197-198				
16	Mittahalli EW	13°21'15"	78°3'27"	290	26.55	27.4-28.4,31.5-33.5,110.8-112.8, 147.4-149.4,171.8-173.8, 271.4-273.4, 279.5-281.6,: 287.7-290	191	4.36		
17	Mittahalli OW	13°21'15"	78°3'26"	284.6	25.65	165.6-167.6,281.6-282.6	190	4.36		
18	N.Kottur	13°21'15"	78°3'25"	336.5	16.2	277.5-279.5	96.6			
19	Katriguppa EW	13°21'15"	78°59'6"	251.1	26.9	90.4-91.5,92.5-94.5,240.9-242.9,247-249	158.7	3.35		
20	Katriguppa OW	13°21'15"	78°59'7"	257.2	25.65	31.5-33.5,66-68,78.2-80.3,177.9-179.9,220.6-222.6,253.1-255.1	161	4.36		
21	Kaiwar	13°21'15"	77°58'56"	324.3	13.6	120.9-123,125-127,261.2-263.2	116	0.97		

Table 7: Basic characteristics of each aquifer

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered gneisses and laterite	Fractured / Jointed gneisses and laterite
Thickness range (mbgl)	30	Fractures extends upto 300 mbgl
Depth range of occurrence of fractures (mbgl)	-	30 – 300 65% between 30 - 200
Range of yield potential (lps)	Mostly Dry	< 1 - 5
Specific Yield	2%	0.2%
T (m^2/day)	-	5 - 55
Quality Suitability for Irrigation	Yes	Yes
Suitability for Domestic purposes	Yes	Yes
Remarks	Over exploited	Ground water in hard rocks exists within the fractures & 1 to 3 sets of fractures are likely to be encountered up to the depth of 500 m bgl.

2.2 3 D aquifer disposition and Cross-Sections

A. Aquifer disposition – Rockworks output (Fig.-9 & Fig.-10)

Based on the aquifer input data, various aquifer models viz., 3D aquifer models, 3D aquifer fence diagram and aquifer cross sections have been prepared and presented in Figures-9 & 10.

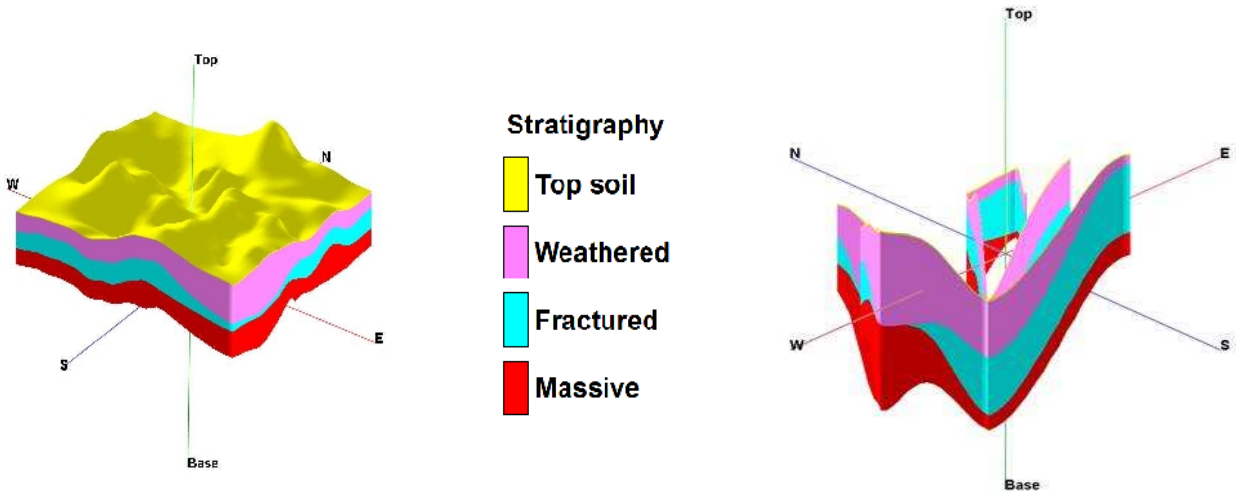

Fig 9: 3D aquifer Disposition and Fence Diagram

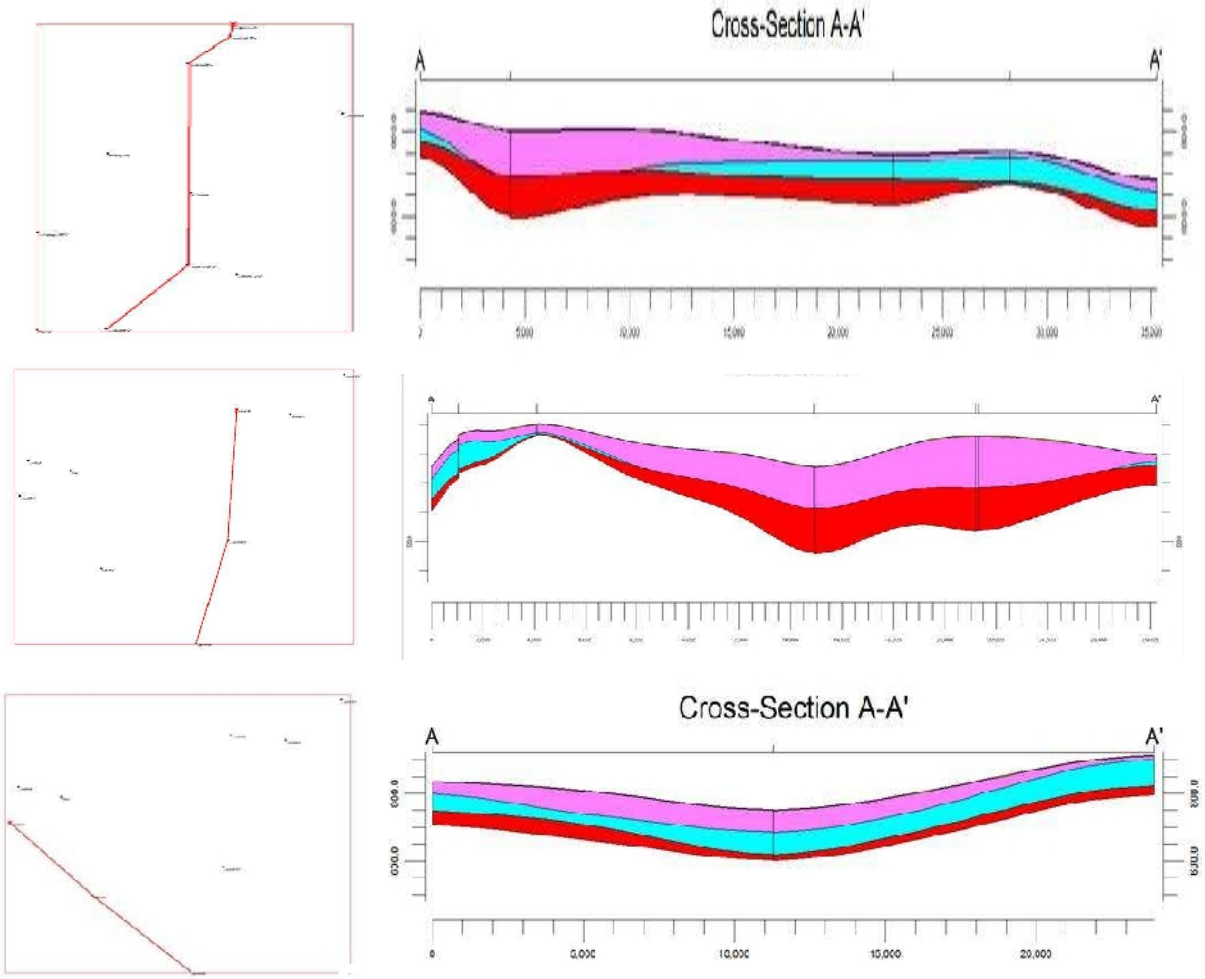

Fig 10: Cross sections of aquifers in different

3. GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

a. Aquifer wise resource availability and extraction

(a) Present Dynamic Ground Water Resource (2011)

Taluk	NET ANNUAL GROUND WATER AVAILABILITY	EXISTING GROSS GROUND WATER DRAFT FOR IRRIGATION	EXISTING GROSS GROUND WATER DRAFT FOR DOMESTIC AND INDUSTRIAL WATER SUPPLY	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	EXISTING STAGE OF GROUND WATER DEVELOPMENT	Category
Chintamani	5917	9701	255	9956	255	26	168	OVER-EXPLOITED

(b) Present total Ground Water Resource (Ham)

Taluk	Annual replenishable GW resources (in ham)	Fresh In-storage GW resources (in ham)		Total availability of GW resource (in ham)
		Phreatic	Fractured	Dynamic + phreatic in-storage + fractured in-storage
Chintamani	5917	0	2902	8818

(c) Comparison of ground water availability and draft scenario in Chintamani taluk

Taluk	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development
	2009			**2011**			**2013**		
Chintamani	5286	7908	150	5917	9956	168	5892	10039	170

b. Chemical quality of ground water and contamination

Range of chemical constituents from analytical results of 28 samples in Chintamani taluk is presented in Table-8.

Table 8: Range of chemical constituents in ground water, Chintamani taluk

Chemical constituents in PPM	P^h	EC in m/mhos/cm at 25 ^{0} c	Total hardness asCaCo$_3$	Ca	Mg	Na	K	HCO$_3$	CO_3	Cl	SO_4	NO_3	F	B
Aquifer I (Dug wells)														
Range	7.6 to 8.2	260 to 2860	100 to 620	16 to 168	12 to 77	100 to 357	1.8 to 107	73 To 525	0	43 to 795	28 to 164	22 to 120	0.64 to 1.61	0.001 to 0.012
Aquifer II (Bore wells)														
Range	7.0 to 8.4	190 to 2410	50 to 740	8 to 168	7 to 77	19 to 212	0.8 to 50	30 To 488	0 to 15	21 to 483	8 to 154	6 to 100	0.32 to 1.8	0.001 to 0.065

Electrical Conductivity: Aquifer I- Out of 6 samples collected from dug wells representing Aq-I only, 1 sample indicates EC greater than the permissible limit of 2000 m/mhos/cm. EC values of Aq-I ranges between 190 to 2310 m/mhos/cm at 25°C.

Aquifer- II - Out of 28 samples collected from bore wells representing Aq- II only, 2 samples indicates EC greater than the permissible limit of 2000 m/mhos/cm. Fig-11 illustrates electrical conductivity of water samples representing Aq-II, which indicates ground water in larger extent has EC value within the permissible limit. EC values of Aq-II ranges between 530 to 2860 m/mhos/cm at 25°C.

Fluoride: Fluoride concentration in ground water is of geogenic origin in areas underlain by younger granites/ gneisses containing minerals like Flurospar & fluroapatite

Aquifer I- Out of 6 samples collected from dug wells representing Aq-I only, none of the sample indicates EC greater than the permissible limit of 1.5 mg/l. EC values of Aq-I ranges between 0.64 to 1.3 mg/l.

Aquifer – II - Out of 28 samples collected from bore wells representing Aq–II, 5 samples indicate fluoride greater than the permissible limit of 1.5 mg/l, which constitutes 18% of the samples collected. Fig-12 illustrates fluoride concentration and its spatial occurrence in water samples representing Aq-II. Ground water in southwest and northeast of taluk has fluoride greater than the permissible limit. Fluoride ranges between 0.3 to 1.7 mg/l (Gedre).

Nitrate: Aquifer I: Out of 6 samples collected from dug wells representing Aq–I, 2 sample indicate nitrate greater than the permissible limit of 45 mg/l, which constitutes 33% of the samples collected. Ground water in half of the taluk has nitrate greater than the permissible limit. Nitrate ranges between 22 to 89 mg/l. Nitrate contamination is due to extensive use of fertilizers, hence is anthropogenic in origin.

Nitrate: Aquifer II: Out of 28 samples collected from bore wells representing Aq–II, 12 sample indicate nitrate greater than the permissible limit of 45 mg/l, which constitutes 42% of the samples collected. Fig-13 illustrates nitrate concentration and its spatial occurrence in water samples representing Aq-II. Ground water in half of the taluk has nitrate greater than the permissible limit. Nitrate ranges between 20 to 120 mg/l. Nitrate contamination is due to extensive use of fertilizers, hence is anthropogenic in origin.

Magnesium: Aquifer-I: Magnesium concentration in 4 water samples was found to be greater than the permissible limit of 30 mg/l, which constitutes 66% of samples. Magnesium ranges between 7 and 65.

Aquifer-II: Magnesium concentration in 17 water samples was found to be greater than the permissible limit of 30 mg/l, which constitutes 60% of samples. Magnesium ranges between 12 and 77.

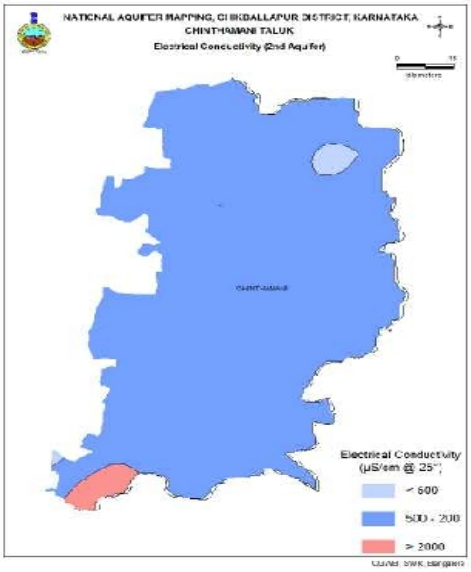

Fig 11: Electrical Conductivity Map

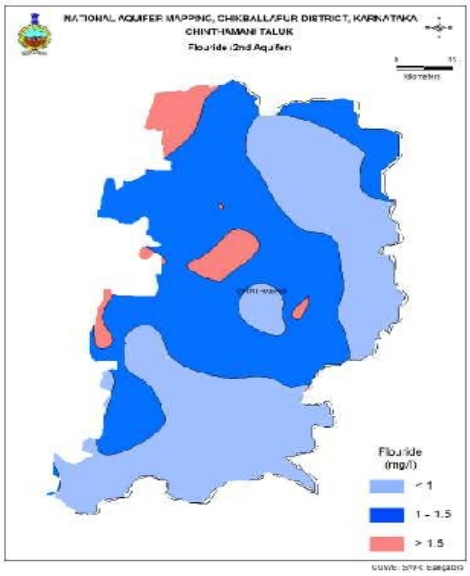

Fig 12: Fluoride Map

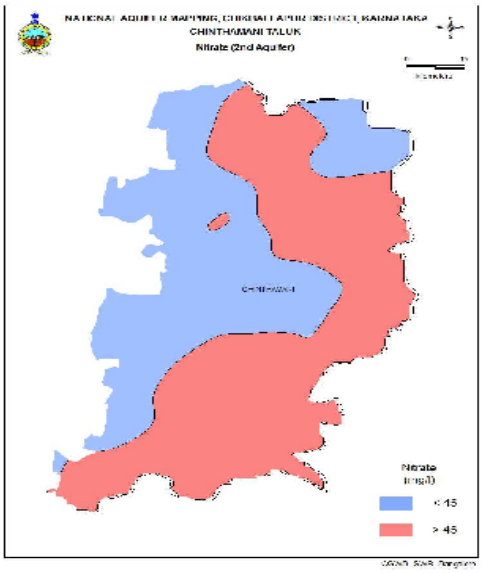

Fig 13: Nitrate Map

In general, ground water quality in Chintamani taluk is good for drinking purpose except in some areas as depicted in above illustrated maps, where nitrate & fluoride is found to be greater than the permissible limit as per “Indian Standard Drinking Water Specification 2009”. Ground water samples have also been tested and found suitable for agriculture & irrigation purposes.

4. GROUND WATER RESOURCE ENHANCEMENT

a. Aquifer wise space available for recharge and proposed interventions

Recharge dry phreatic aquifer (Aq-I) in the taluk through construction of artificial recharge structures, viz; check dams, percolation tanks & point recharge structures (Table-9). The choice of recharge structures should be site specific and such structures need to be constructed in areas already identified as feasible for artificial recharge (Figure-14). Tentative location of proposed artificial recharge structures is shown in Figure-15.

Table 9: Quantity of non-committed surface runoff & expected recharge through AR structures

Artificial Recharge Structures Proposed	Chintamani taluk
Non committed monsoon runoff available (MCM)	10.50
Number of Check Dams	65
Number of Percolation Tanks	4
Number of Point Recharge structures	7
Tentative total cost of the project (Rs. in lakhs)	253.00
Excepted recharge (MCM)	5.95
Expected rise in water level (m)	0.3
Cost Benefit Ratio (Rupees/ cu.m. of water harvested)	4.25

b. Proposed Yettinahole Project

Yettinahole project is a drinking water supply scheme which neither proposes irrigation use nor development of any command areas.

The project envisages Drinking Water Supply Scheme to Chikballapur district along with other six districts ie. Kolar, Bangalore Rural, Ramnagaram, Tumkur, Hassan and Chickmagalur by Karnataka Neeravri Nigam Ltd, Government of Karnataka.

The project proposal comprises two components namely, drinking water and tank filling. In Chintamani taluk, implementation of the project helps to recharge 210 Ham to groundwater by which there will be increase in the groundwater availability and the stage of GW development will come down (Table-10).

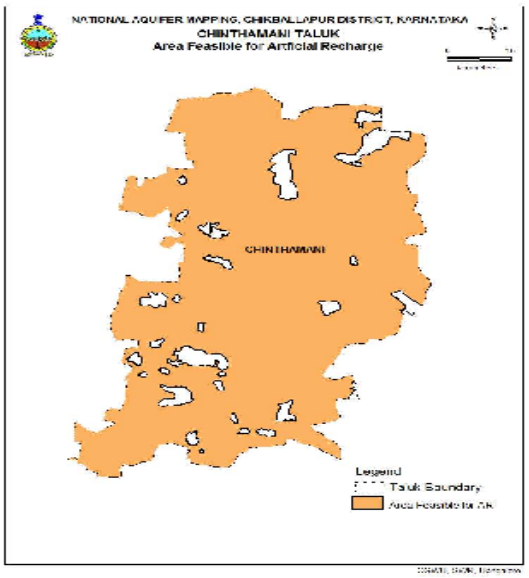

Fig 14: Area feasible for AR structures

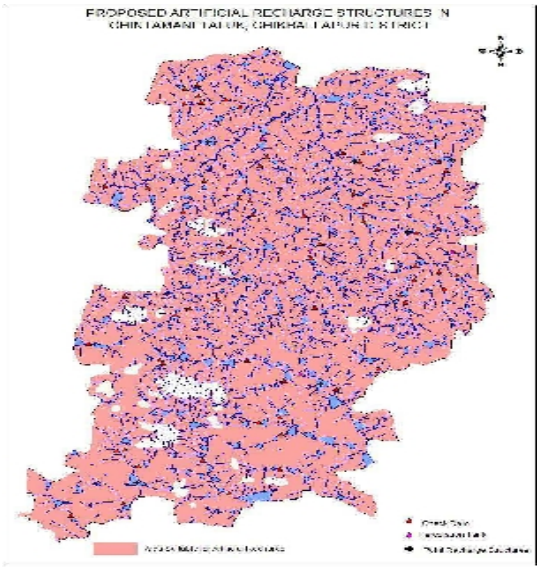

Fig 15: Tentative location of AR

The increase in groundwater availability on recharging the available water from different sources and consequent change in groundwater scenario is presented in the Table-10.

Table 10: Ground Water Availability and Draft Scenario and Expected Improvement in Stage of Ground Water Development

Taluk	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for all uses	Existing stage of Ground Water Development	Expected Recharge from Artificial Recharge Projects	Additional Potential from proposed Yettinahole Project	Proposed Tertiary Treated Waste Water of Bangalore City	Cumulative Annual Ground Water Availability	Expected Improvement in stage of Ground Water Development after the Implementation of the Project	Expected Improvement in overall stage of Ground Water Development
	Ham	**Ham**	**%**	**Ham**	**Ham**	**Ham**	**Ham**	**%**	**%**
Chintamani	5917	9956	168	595	210	0	6721	20	148

5. DEMAND SIDE INTERVENTIONS

a. Water use efficiency

Agriculture is the main occupation and source of livelihood of the rural population in Chintamani taluk. As there are no other sources, groundwater is the only source for agriculture. Therefore, agriculture sector is major consumer of groundwater. Because of over-exploitation, dug wells are practically dry and yield of bore wells also is on declining trend. Hence, farmers are facing inadequacy of groundwater for agriculture and in the district about 70% of the farmers have

adopted to change in cropping pattern and water economy irrigation practices like drip irrigation and sprinkler irrigation.

Heavy water consuming crops like paddy is grown in less than 2% of the net sown area and sugarcane is not grown. If, the remaining 30% farmers also adopt the water use efficient irrigation practices, there will be additional saving in water. Therefore, encouragement from government is essential for achieving full target of water use efficiency in the district.

b. Regulation and Control

- Chintamani taluk has been categorized as Overexploited, since the Stage of ground water development has reached 168% (GEC-March 2011). Hence, stringent action has to be taken up through Karnataka Ground Water Authority to control further ground water exploitation in the taluk.
- Ground water recharge component needs to be made mandatory in the taluk.

c. Quality issue management options

The main quality issues in the Chintamani taluk are fluoride and nitrate in both the aquifers. But, they are sporadic in nature. Fluoride is geogenic. Nitrate contamination is local in nature and is anthropogenic.

For remediation, the following management measures are suggested.

- Alternate source
- Removal technique
- Artificial recharge
- In-situ rainwater harvesting
- Centralized drinking water supply from Yettinahole Project
- Prevention of contamination

6. SUMMARY

The summary of Management plan of Chintamani taluk is given in Table-11.

Table 11: Summary of Management plan of Chintamani taluk

Chintamani taluk is over-exploited & present stage of GW Development (2011)	168%
Net Annual Ground Water Availability (MCM)	59.17
Existing Gross Ground Water Draft for all uses	99.56
Groundwater development feasibility	NIL
Total GW Resources (Dynamic & Static upto the depth of 200 mbgl) (MCM)	88.18
Expected additional recharge from monsoon surplus runoff (MCM)	5.95
Change in Stage of GW development, %	168 to 153
Expected additional recharge from Proposed Yettinahole project (50% live capacity of MI tank) (MCM)	5.65
Change in Stage of GW development, %	153 to 148
Expected additional recharge from Proposed project of filling MI tanks with	0

Urban Tertiary treated water (MCM)	
Water Use efficiency measures	• 70 % farmers have adopted water use efficiency irrigations practices like dip & sprinkler irrigation • Water intensive crops (Paddy & Sugarcane) are being cultivated in <2% of net sown area and • Government to take initiative to encourage remaining 30% farmers to adopt water use efficiency irrigations practices
Groundwater quality aspects - Fluoride & Nitrate	• Alternate source • Removal technique • Artificial recharge • In-situ rainwater harvesting • Centralized drinking water supply from Yettinahole Project • Prevention of contamination