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

AQUIFER MAPPING REPORT

Kavthe Mahankal and Miraj Talukas, Sangli District, Maharashtra (Part-II)

मध्य क्षेत्र, नागपुर

Central Region, Nagpur

भारत सरकार

Government of India

जल संसाधन, नदी विकास एवं गंगा संरक्षण मंत्रालय

Ministry of Water Resources, River Development & Ganga Rejuvenation

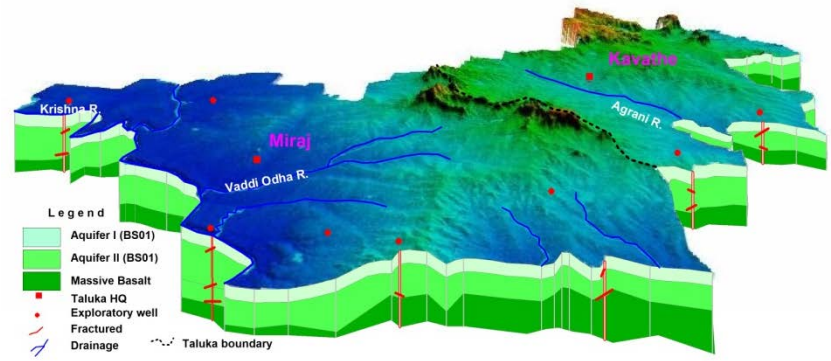
केन्द्रीय भूमि जल बोर्ड

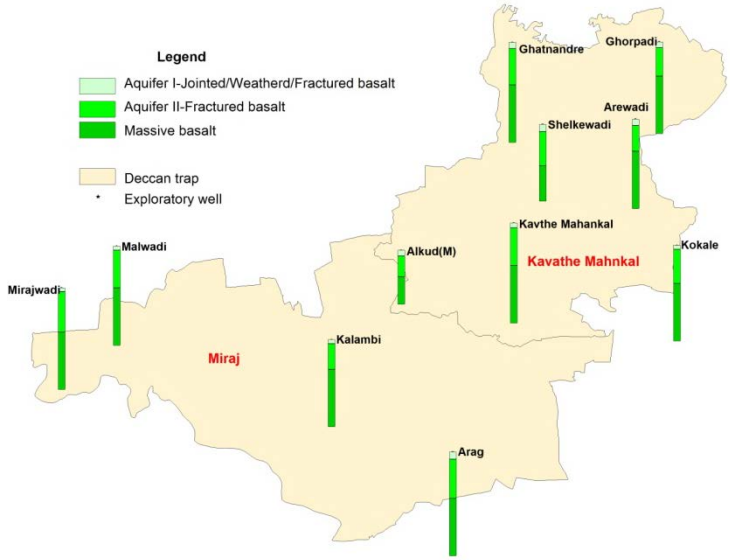
CENTRAL GROUND WATER BOARD

जल बचत जल संचय

जलभृत नक्शे तथा भूजल प्रबंधन योजना पर संक्षिप्त रिपोर्ट

Brief Report on Aquifer Maps and Ground Water Management Plan





KAVTHE MAHANKAL AND MIRAJ TALUKA SANGLI DISTRICT MAHARASHTRA

कवठे महांकाळ एवं मिरज तालुका सांगली जिल्हा महाराष्ट्र

PART-II

BRIEF REPORT ON AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS, FOR KAVATHE MAHANKAL AND MIRAJ TALUKAS, SANGLI DISTRICT, MAHARASHTRA

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PART-II

BRIEF REPORT ON AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS, FOR KAVATHE MAHANKAL AND MIRAJ TALUKAS, SANGLI DISTRICT, MAHARASHTRA

CONTENTS

BRIEF REPORT ON AQUIFER MAPS AND GROUND WATER MANAGEMENT PLANS, FOR KAVATHE MAHANKAL AND MIRAJ TALUKAS, SANGLI DISTRICT, MAHARASHTRA

1 BRIEF INTRODUCTION

In XII five-year plan (2012-17), National Aquifer Mapping (NAQUIM) has been introduced to carry out detailed hydrogeological investigation on toposheet scale (1:50,000). Keeping in view the current demand vis-à-vis supply and futuristic requirement of water, Central Ground Water Board has taken up NAQUIM in Over-exploited, Critical and Semi-Critical talukas and prioritised stress areas. Hence, water stress area i.e., Miraj & Kavathe Mahankal Talukas of Sanghli district has been taken up to carry out detailed hydrogeological investigation covering an area of 1703.59 sq.km in the year 2016-17. The index map of the study area is presented below- **Fig 1.1**.

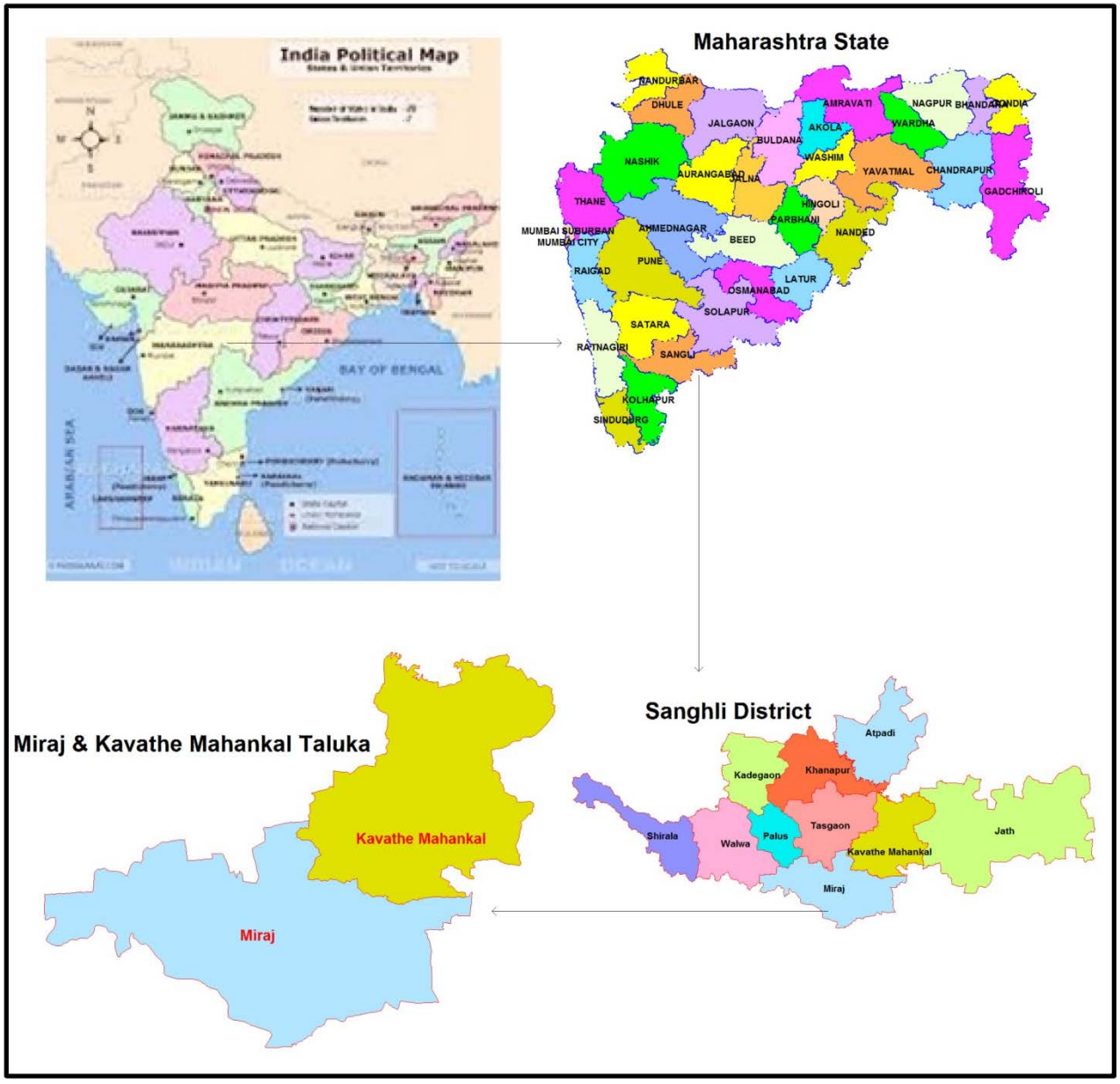
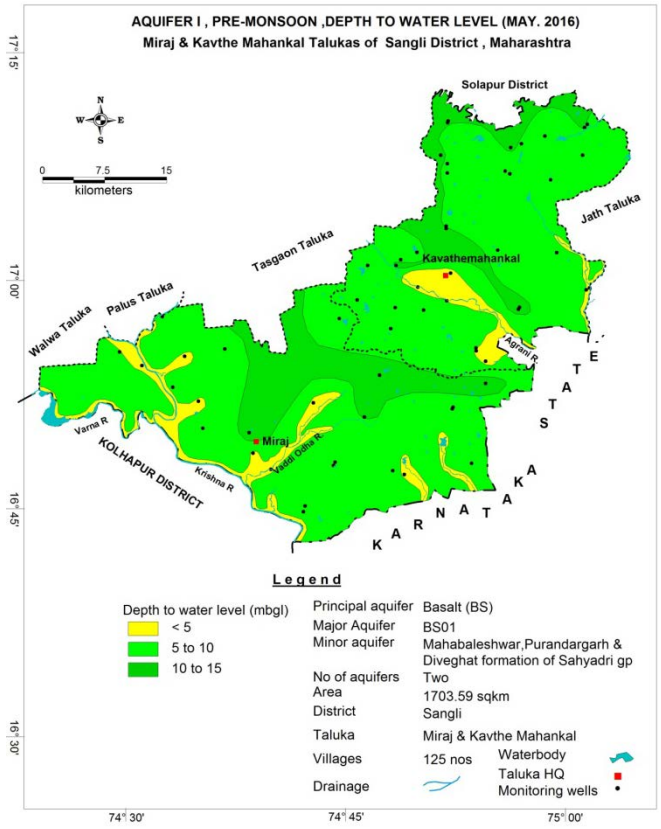
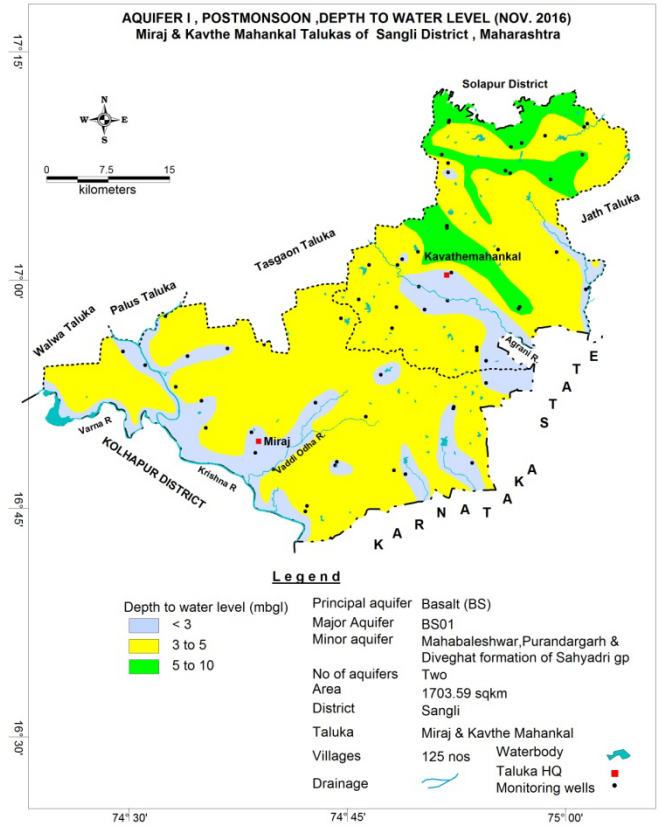


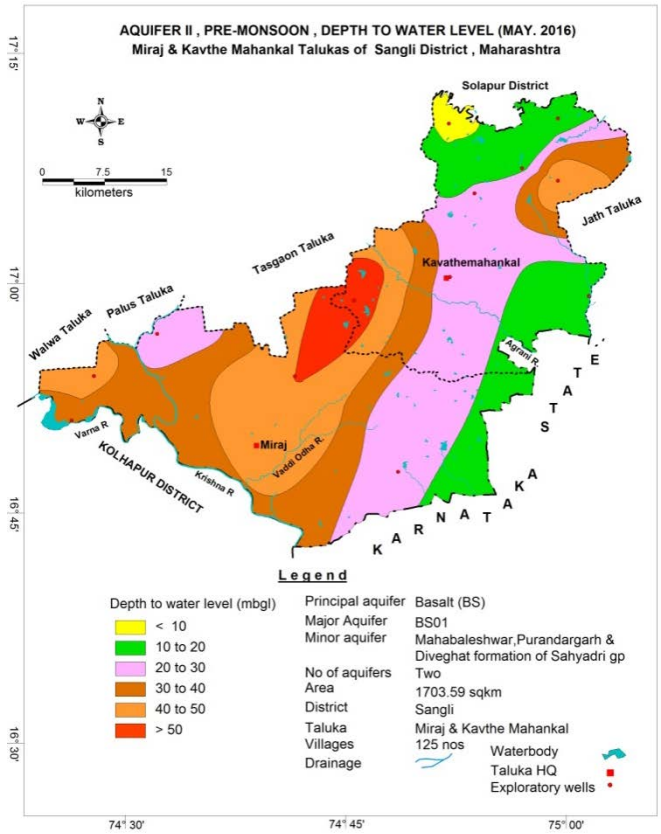
Fig 1.1 Index map of the Study area

2 SALIENT FEATURES

PARTICULARS	Kavathe Mahankal	Miraj
District	Sanghli	Sanghli
State	Maharashtra	Maharashtra
Area (sq.km.)	745.53	954.06
Population (2011)		
Rural/Urban	152327/0	325954/528627
Total	152327	854581
Rainfall (mm)		
I. Normal Annual Rainfall	520.35 mm	584.8 mm
II. Current Rainfall (2015)	445.2 (-14 % deficient)	508.8(-13 % deficient)
III. Rainfall Trend (mm/yr)	-0.9.43 (1998 to 2015)	10.59 (1998 to 2015)
Agriculture (sq.km.)		
i. Principal Crops		
Jawari	227.6	298.78
Bajra	91.0	82.6
Wheat	26.73	38.1
Sugarcane	15.0	138.0
GramHarbhata	21.65	53.08
Cotton	2.59	2.31
Tur	10.0	11.92
Graps	2.15	9.1
ii. Cultivable Area	581.02	806.35
iii. Net Sown Area	514.22	727.37
iv. Forest	9.24	10.79
Irrigation Sources (sq.km.)		
i. Ground water	64.27	180.26
ii. Surface Water	23.96	71.2
Data Utilised		
i. Key Observation Wells	37	26
ii. GW exploration	10EW+ 3 OW	7 EW
iii. VES	0	0
iv. GWQ sampling locations- AQI	33	33
AQII	8	10
Existing / Future Water Demands (MCM)		
Domestic & Industrial	4.59/ 6.24 (2025)	2.61/ 4.16 (2025)
Irrigation	85.18 / 6.94	113.32 / 14.36
Water Level Behaviour		
Aquifer I		
Pre-monsoon WL (m bgl)	3 to 11.9	1 to 14.3
Post-monsoon WL (m bgl)	1.45 to 10.45	0.4 to 7.4
Pre-monsoon WL Trend –Rise (m/yr)	0.01to 0.18	0.06 to 0.15
Pre-monsoon WL Trend-Fall(m/yr)	-0.003 to -0.59	-0.05 to-0.45
Post-monsoon WL Trend –Rise(m/yr)	0.04to 0.1	0.04 to 0.1
Post-monsoon WL Trend –Fall(m/yr)	-0.07 to -0.3	-0.07to -0.52
Aquifer II		
Pre-monsoon WL (Aq-II) m bgl	9.2 to 53.2	21 to 50
Post-monsoon WL (Aq-II) m bgl	5.3 to 25	12 to 31







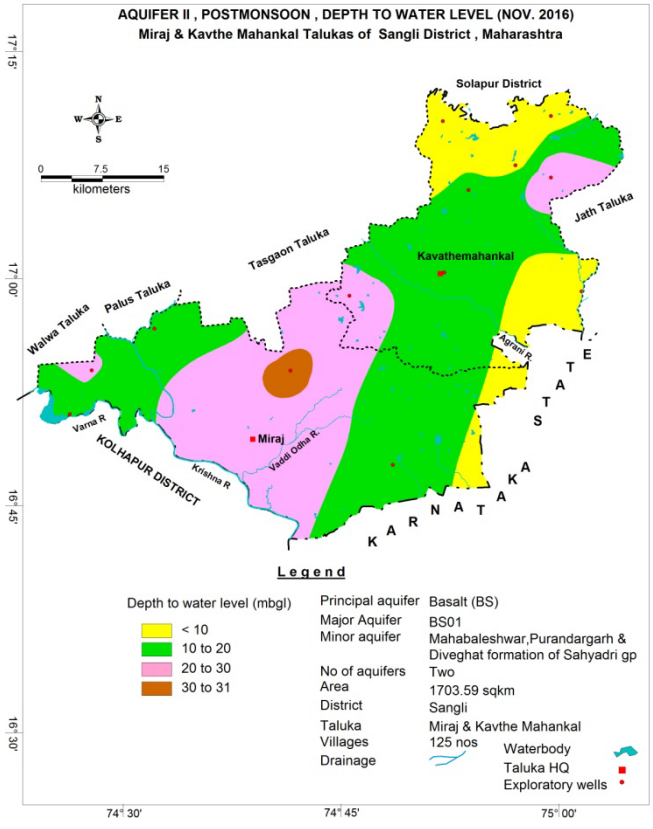
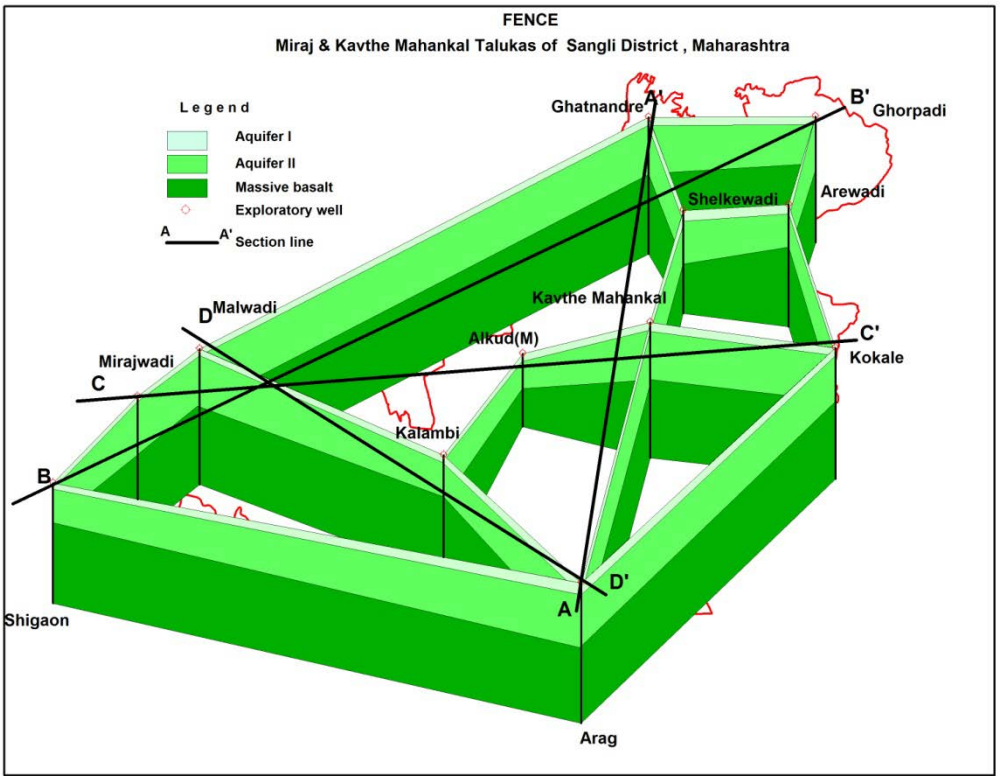


Fig 2.1 Water level of Aquifer I and Aquifer II

3 AQUIFER DISPOSITION

2-D and 3-D Aquifer Disposition	**Aquifer**: **Basalt**; **Aquifer I** - Weathered/Fractured Basalt: Depth range- 8 to 32 m and thickness of 6 to 16 m. **Aquifer II** - Jointed/Fractured Basalt: Depth range - 20 to 152 m, Thickness – 0.5 to 12 m



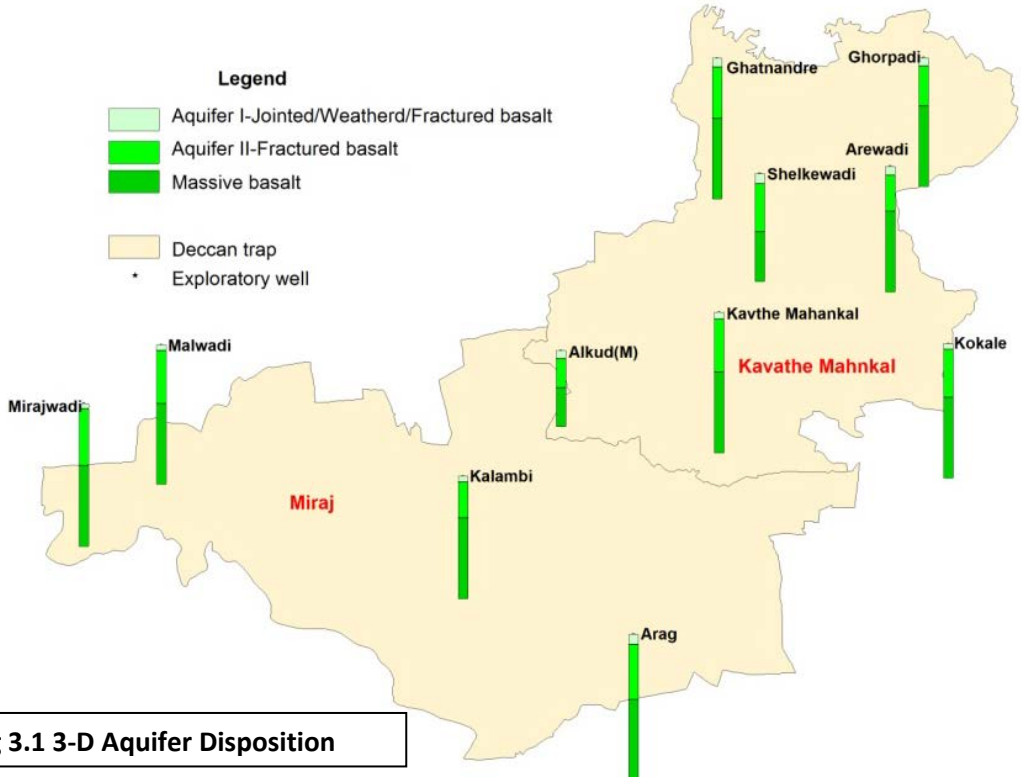
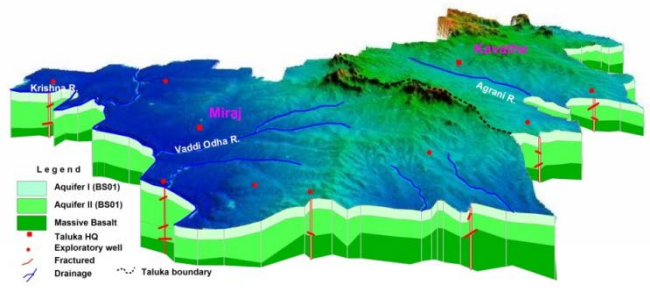
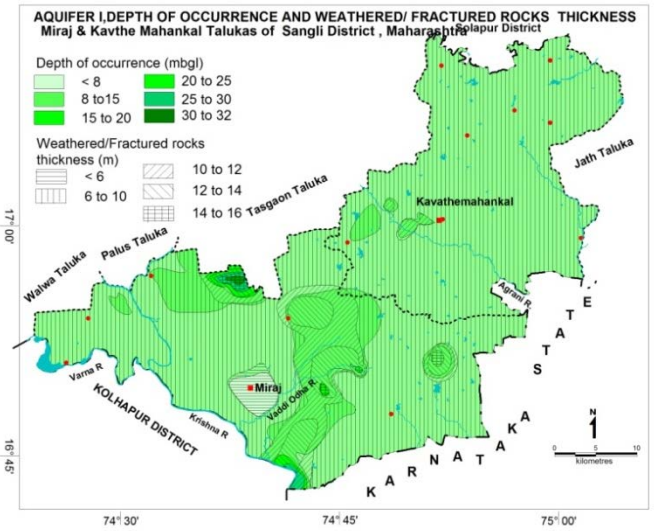


Fig 3.1 3-D Aquifer Disposition

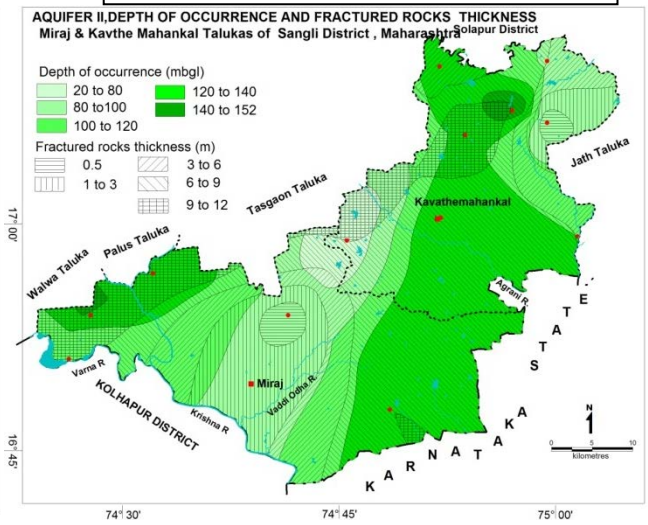
3-D Aquifer Disposition



Aquifer- I, Depth of occurrence & weathered/fractured rocks thickness



Aquifer-II, Depth of occurrence & fractured rocks thickness

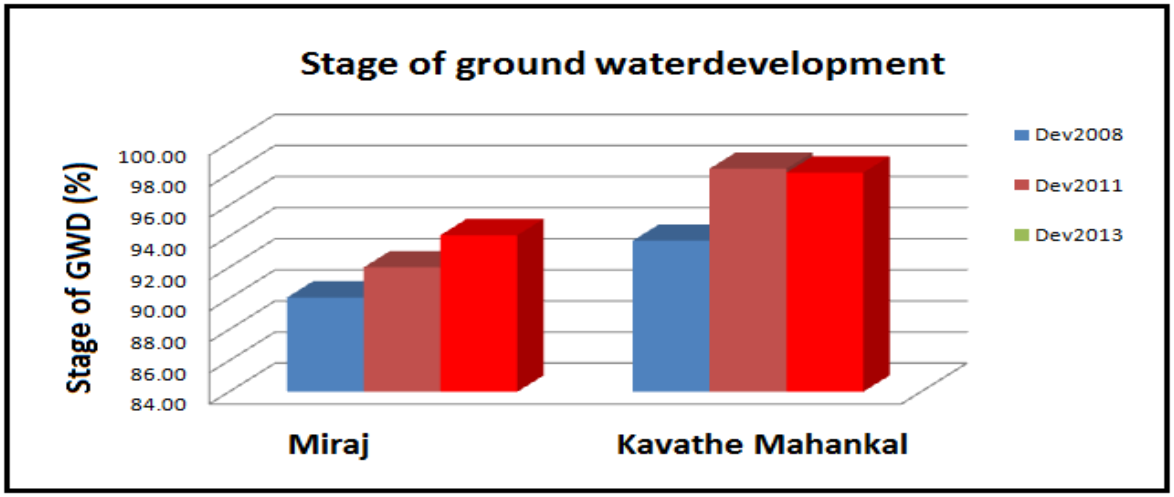


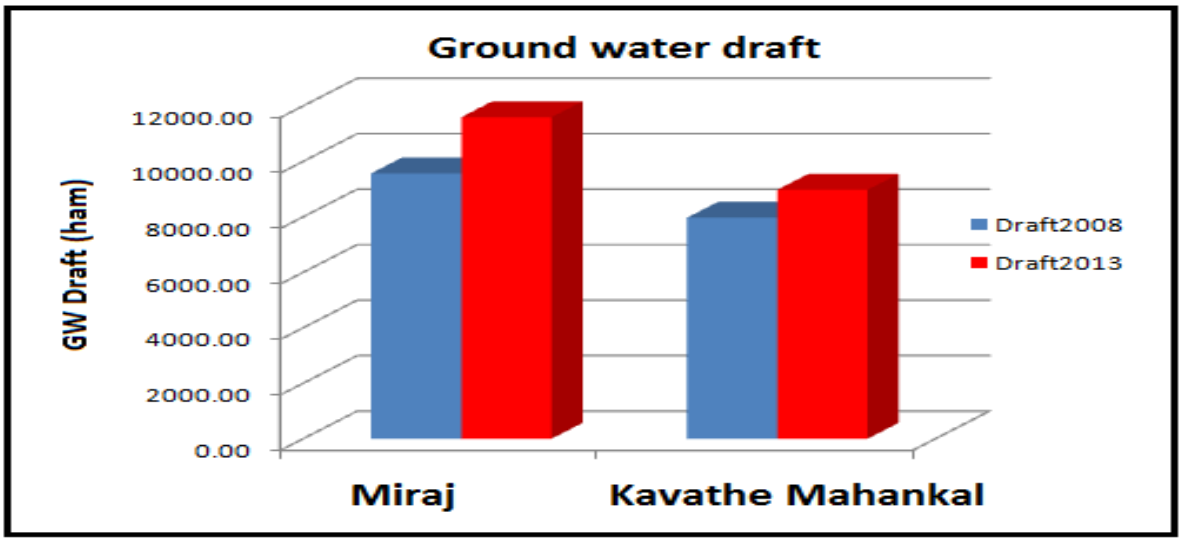
Type of Aquifer	Formation	Depth range (mbgl)	SWL (mbgl)	Fracture/ weathered Zones encountered (m bgl)	Fractured/ weathered rocks Thickness (m)	Yield (m3/day)	Sustai-nability	Aquifer parameter (Transmissivity – m2/day)	Sy/S	Suitability for drinking/ irrigation
Aquifer-I	Deccan Trap-Weathered/ Fractured Basalt	8 - 32	0.5-14.5	Upto 32	6 to 16	10 to 100 m3/day	1 to 2 Hours	10.03-62.81	0.019-0.028	Yes , suitable for both
Aquifer-II	Jointed/ Fractured Basalt	20-152	9.2-53.2	20 to 152	0.5 to 12	Upto 3 lps	0.5 to 3 hours	5.85-177	1.30 x 10-4. 5.31 x 10-4	Yes, suitable for both, except High EC

4 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

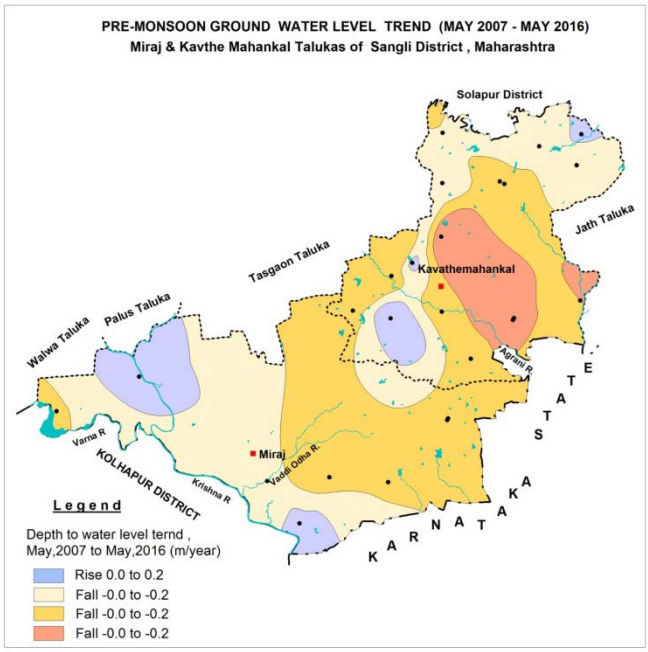
	Kavathe Mahankal	Miraj
Aquifer wise Ground Water Resource availability and Extraction		
Ground Water Resource (MCM)		
Aquifer –I: upto 28 m		
Availability	91.15	123.25
Withdrawal	89.76	115.94
Ground Water Resource (MCM) **Aquifer –II:** 20 to 152 m		
Availability	10.42	25.28
Withdrawal	0	0
Stage of GW Development	98.1%	94.07%
Present Category	Critical	Semi-Critical
Ground Water Related Issues		
Over Exploitation	The stage of ground water development has increased over the period of time from 2008 to 2013 from 90.05% to 94.07% in Miraj taluka and from 93.72% to 98.1% in Kavathe mahankal taluka The main reason for ground water excessive draft is for irrigation purpose. in Miraj taluka the draft has increased from 9564.01 MCM in 2008 to 11594.05 MCM in 2013 while in Kavathe mahankal the draft has increased from 7969.99 MCM in 2008 to 8976.44 MCM in 2013 .	
Declining rainfall	In last five years ,four year rain fall are showing decline trend in the range of 10% to 40 % from normal rainfall. Thus indicating that both these talukas are experiencing low and declining rainfall with frequent droughts	
Declining Water Levels	The pre monsoon declining water level trend (2007-2016) of more than 0.2m/year has been observed in about 879 Sq.km. (56.6% of area) and the post monsoon declining water level trend of more than 0.2m/year has been observed in about 666 Sq.km. (42.85% of area)	
Low ground water potential	Low ground water potential areas have been identified in 1100 sq.km. covering northern part of Miraj Taluka and almost entire Kavathe Mahankal taluka mostly due to restricted depth of weathering in Aquifer-I and limited aquifer thickness of Aquifer-II	

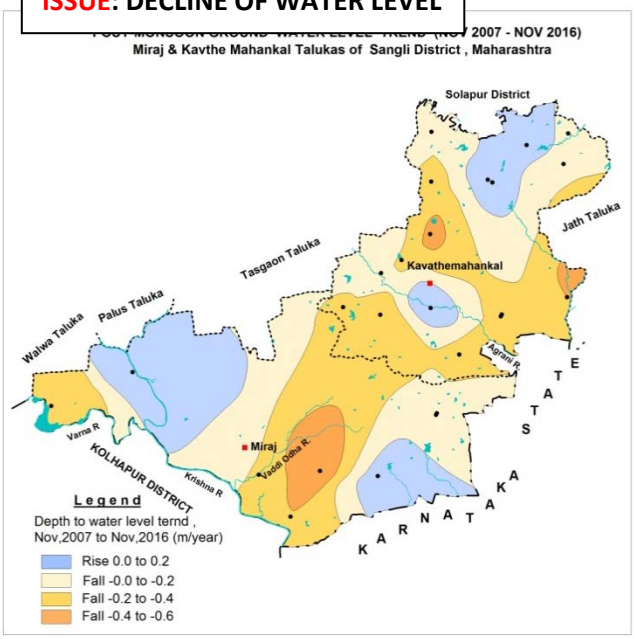
ISSUE: OVER-EXPLOITATION





ISSUE: DECLINE OF WATER LEVEL





Declining of water level 879 Sqkm in premonsoon and 666 ssqkm during postmonsoon period

5 GROUND WATER RESOURCE ENHANCEMENT AND PROPOSED MANAGEMENT INTERVENTIONS

	Kavathe Mahankal	Miraj	Total
5.1 Resource Enhancement by Supply Side Interventions			
Recharge Potential	19.73	3.05	22.78
Surface water requirement @ 75% efficiency	26.31	4.07	30.37
Availability of Surplus surface runoff	12.08	1.87	13.95
Surplus runoff considered for planning	12.08	1.87	13.95
Proposed Artificial Recharge Structures			
PT	48	7	55
CD	83	16	99
Volume of Water expected to be recharged @ 75% efficiency (MCM)	9.07	1.41	10.48
Proposed RTRWH			
Households to be covered	12982	10614	23595
Total RWH potential	0.37	0.27	0.64
Rainwater harvested / recharged @ 80% runoff co-efficient	0.29	0.22	0.51
Estimated Expenditure (Rs. in Cr.)	19.47	15.92	35.39
RTRWH Economically not viable & Not Recommended. Total estimated Cost of RTRWH would be-21.64 Cr. For Harvesting 032 MCM of Rain Water.			
Total volume of water expected to be recharged by AR	9.07	1.41	10.48
Total Estimated Expenditure for AR	96.9	15.3	112.2

Resource Enhancement by Supply Side Interventions			
DEMAND SIDE INTERVENTIONS	**Kavathe Mahankal**	**Miraj**	**Total**
Proposed Cropping Pattern change	None	None	
Micro irrigation techniques			
Area proposed to be covered (sq.km.) 70% in Kavathe Mahankal & 60% in Miraj of sugarcane area	10.5	82.8	93.3
Volume of Water expected to be conserved (MCM). Sugarcane requirement - 2.45 m, Pomegranate with Drip - 0.7 m, WUE - 1.75 m,Saving-0.57m	5.99	47.2	53.18
Estimated Expenditure	15.57	122.76	138.327
Area proposed to be covered (70.0sq.km.) 75% DC area drip/sprinkler	52.5		52.5
Volume of Water expected to be conserved (MCM). DC requirement - 0.90 m, Drip - 0.40 m,	21.0		21.0
Estimated Expenditure	32.43		32.43
Area proposed to be covered (5.5 sq.km.) 90% Cotton area	4.95		4.95
Volume of Water expected to be conserved (MCM). Onion requirement - 0.78 m, Drip - 0.52 m,	1.49		1.49
Estimated Expenditure	3.06		3.06

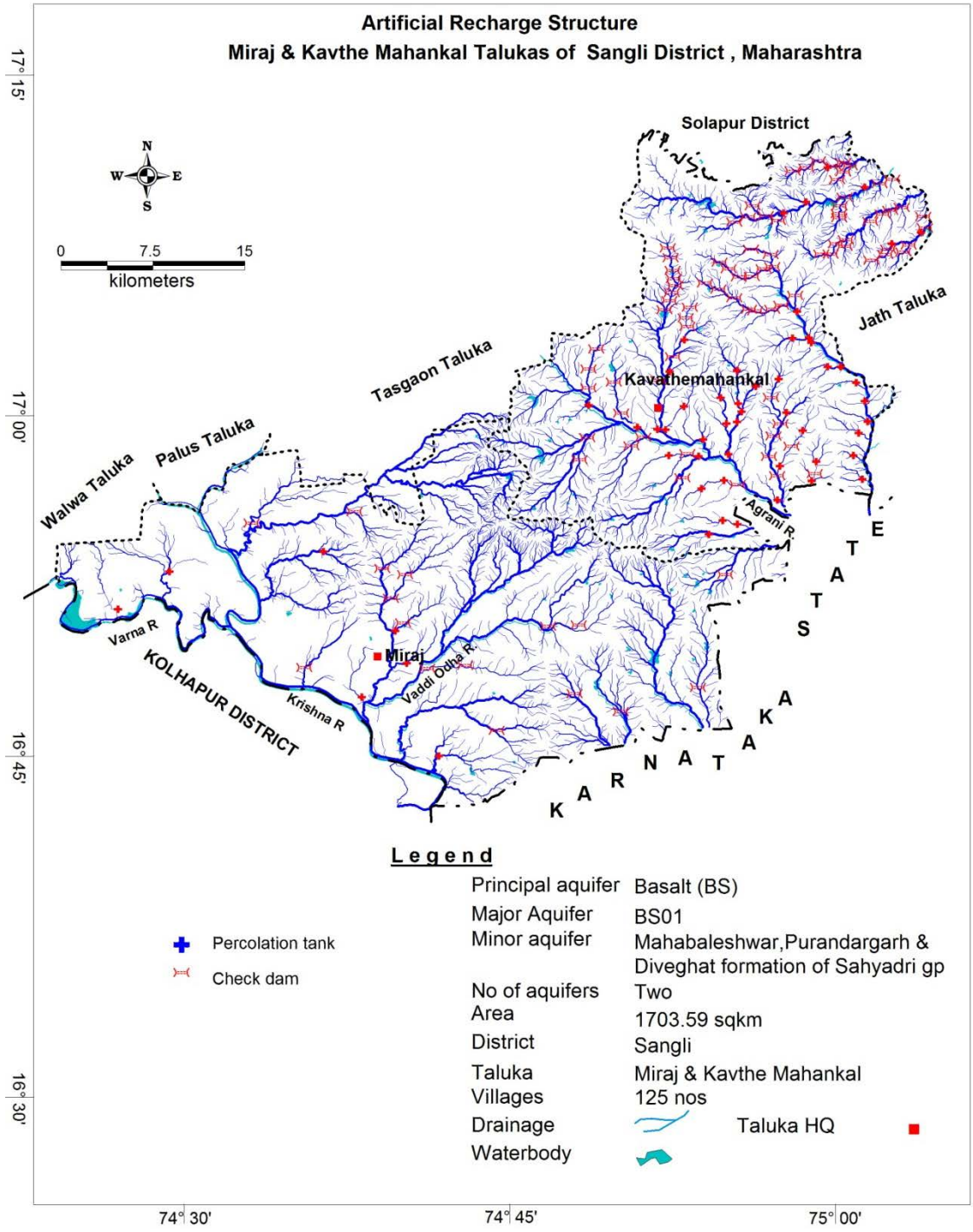


Fig 5.1 Location of artificial recharge structure

5.1 Probable Benefits

Item	Kavathe Mahankal	Miraj	Total
Additional GW resources available after implementing above measures (MCM)	37.54	48.61	86.14
Volume of Water Required TO BRING STAGE OF GWD UPTO 70%	36.72	42.38	79.1
Balance GWR available for GW Development after STAGE OF GWD is brought to 70%	0.82	6.23	7.05

Additional Area (sq.km.) proposed to be brought under assured GW irrigation with av. CWR of 0.65 m AFTER 70% STAGE OF GWD IS ACHIEVED OR	1.26	9.581	10.84

5.2 Regulatory Measures

	Baramati	Purandhar
Regulatory Measures	Regulation of wells below 60 m	Regulation of wells below 60 m

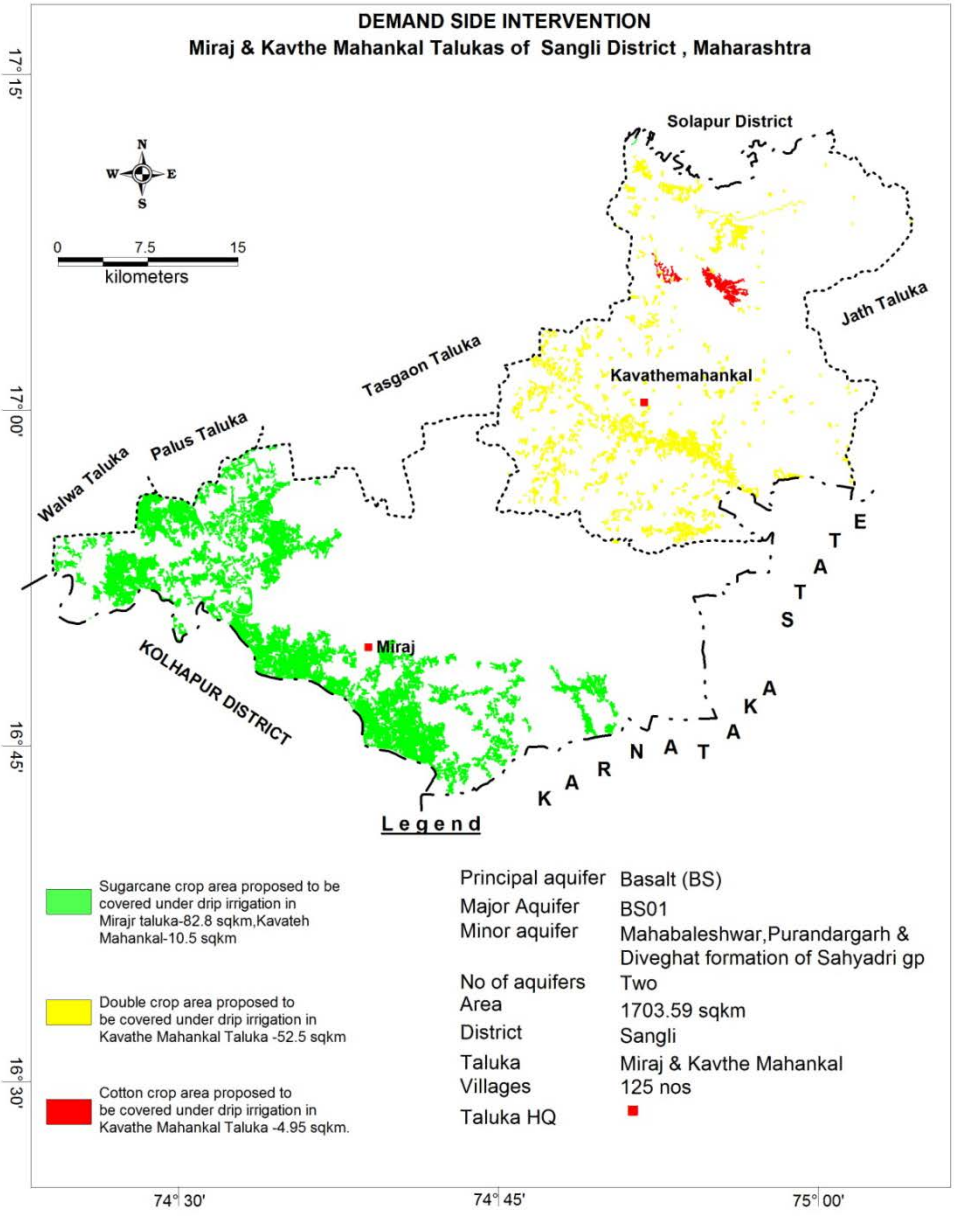


Fig 5.2 Location of proposed drip irrigation

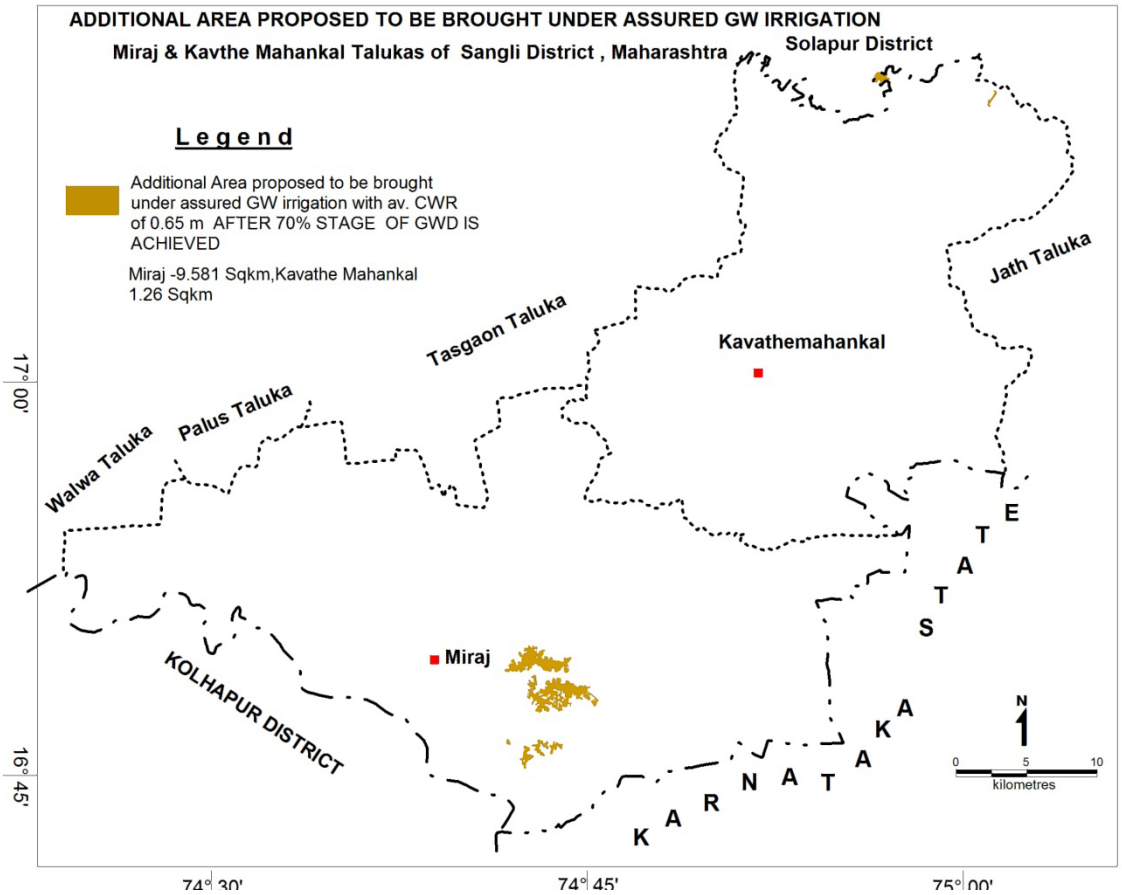


Fig 5.3 Location of proposed to crop be brought under GW irrigation

PROPOSED MANAGEMENT PLAN

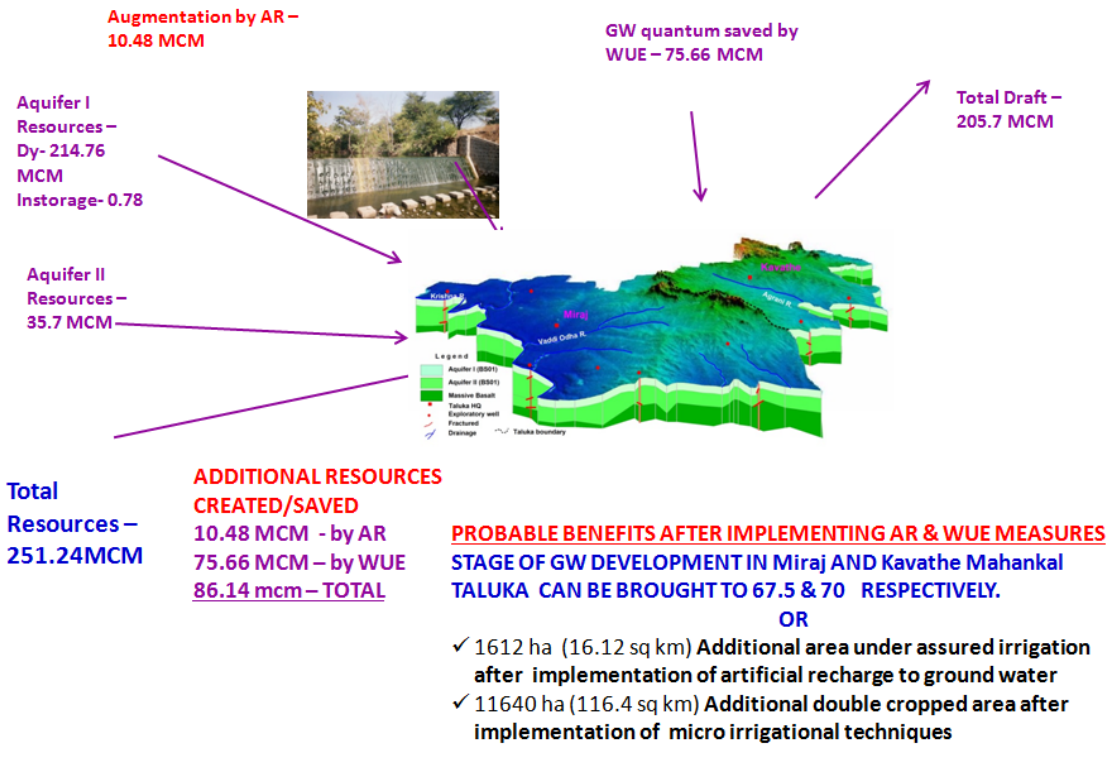


Fig 5.4 Proposed Management Plan

6 SUM UP

A thorough study was carried out based on data gap analysis, data generated in-house; data acquired from State Govt. departments and GIS maps prepared for various themes. All the available data was brought on GIS platform and an integrated approach was adopted for preparation of aquifer maps and aquifer management plans of Miraj and Kavathe Mahankal Talukas of Sanghli district

The study area is spanning over 1703.59 sq.km. Geologically the area is occupied by Basalt and the stage of ground water development is 98.1 % in Kavthe Mahankal and 94.07% in Miraj taluka. The area has witnessed ground water depletion and over exploitation over a period of time. In Aquifer-I, The deeper water levels of more than 10 m bgl are observed in limited areas in the central part of the study area covering west to east elongated patch adjacent to the water divide boundary of Agrani River and Krishna River, while in Aquifer –II, deeper water levels of > 40 mbgl has been observed in in western parts of Miraj taluka . The declining water level trend > 0.20 m/yr (2007 to 2016). has been observed in about 879 Sq.km. (56.6% of area) during pre-monsoon and in 666 Sq.km. (42.85% of area) in the post monsoon. This has been due to cultivation of water intensive cash crop like Sugarcane (153 sq.km), which are completely dependent on ground water irrigation.

Ground water management plan has been prepared with the objective of bringing the current stage of ground water development down to 70% and decline of water level may be arrested, so that the taluka comes under Safe category by adopting both, supply side and demand side interventions.

As a part of supply side interventions, a total of 55 Percolation Tanks and 99 Check Dam is proposed in Miraj and Kavathe Mahankal Talukas ,which will augment ground water resources to the tune of 10.48 MCM (8.25 MCM by Percolation Tanks and 2.23 MCM by Check Dam). The total cost of implementing these interventions will be Rs. 112.2 crore. As a part of demand side interventions, change in irrigation techniques from surface flooding to drip irrigation is also proposed. A total of 153 sqkm of Sugarcane crop area is proposed to be covered under drip irrigation techniques instead of flood irrigation that will save 53.18 MCM of water resources. The total cost of implementing these interventions will be Rs 138.33 crore. Double crop of 52.5 sqkm and 4.95 Sqkm of Cotton crop areas in Kavathe Mahankal taluka are also proposed to be covered under drip irrigation techniques instead of flood irrigation that will save 22.49 MCM of water resources. The total cost of implementing these interventions will be Rs 25.49 crore.

In Miraj and Kavathe Mahankal Talukas, a total of 10.48 MCM resources will be augmented after adopting artificial recharge, whereas and 75.66 MCM will be saved after implementing water user efficiency measures (drip irrigation). This will bring the stage of ground water development to 70 % in Kavathe Mahankal and 67.5 % in Miraj talukas from the present stage of 98.1 % in Kavathe Mahankal and 94 07 % in Miraj taluka and 10.84 sq.km area proposed to be brought under assured GW irrigation with av.CWR of 0.65 m.

This will probably result in arresting the decline of water levels. These interventions also need to be supported by regulation of deeper aquifer and hence it is recommended to regulate/ban deeper tubewells/borewells of more than 60 m depth in these talukas, so that the deeper ground water resources are protected for future generation and also serve as ground water sanctuary in times of distress/drought. Similarly IEC activities and capacity building activities needs to be aggressively propagated to establish the institutional framework for participatory groundwater management.