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

Purandhar and Baramati Talukas, Pune District, Maharashtra (Part-I)

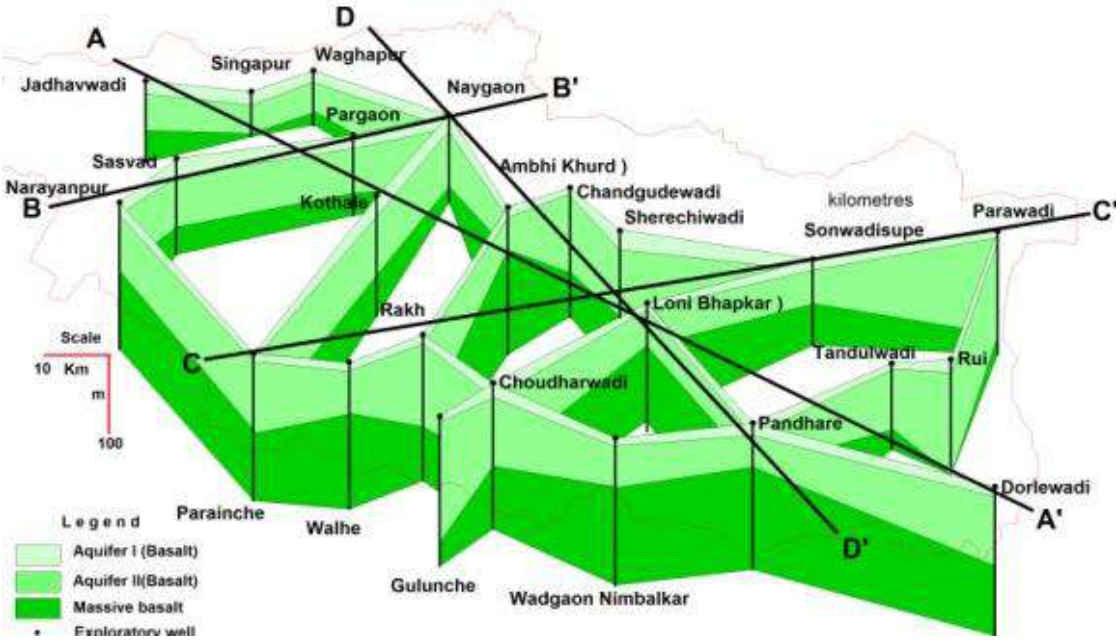
मध्य क्षेत्र, नागपुर

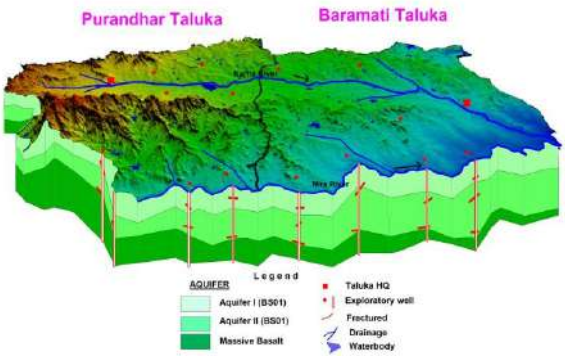
Central Region, Nagpur

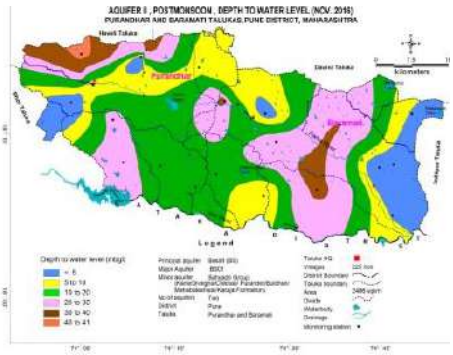
भारत सरकार
Government of India
जल संसाधन, नदी विकास एवं गंगा संरक्षण मंत्रालय
Ministry of Water Resources, River Development & Ganga Rejuvenation
केन्द्रीय भूमिजल बोर्ड
CENTRAL GROUND WATER BOARD

जल बचत जल संचय

AQUIFER MAP AND MANAGEMENT PLANS FOR PURANDHAR AND BARAMATI TALUKAS, PUNE DISTRICT, MAHARASHTRA







मध्य क्षेत्र, नागपुर
CENTRAL REGION, NAGPUR
March 2017

AQUIFER MAP AND MANAGEMENT PLANS FOR, PURANDHAR AND BARAMATI TALUKAS, PUNE DISTRICT, MAHARASHTRA

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PART-I

AQUIFER MAP AND MANAGEMENT PLANS FOR, PURANDHAR AND BARAMATI TALUKAS, PUNE DISTRICT, MAHARASHTRA

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AQUIFER MAP AND MANAGEMENT PLANS FOR, PURANDHAR AND BARAMATI TALUKAS, PUNE DISTRICT, MAHARASHTRA

1 INTRODUCTION

In XII five year plan, National Aquifer Mapping (NAQUIM) had been taken up by CGWB to carry out detailed hydrogeological investigation on toposheet scale of 1:50,000. The NAQUIM has been prioritised to study Over-exploited, Critical and Semi-Critical talukas as well as the other stress areas recommended by the State Govt. Aquifer mapping is a process wherein a combination of geologic, geophysical, hydrologic and chemical analyses is applied to characterize the quantity, quality and sustainability of ground water in aquifers.

The vagaries of rainfall, inherent heterogeneity & unsustainable nature of hard rock aquifers, over exploitation of once copious alluvial aquifers, lack of regulation mechanism has a detrimental effect on ground water scenario of the Country in last decade or so. Thus, prompting the paradigm shift from "**traditional groundwater development concept**" to "**modern groundwater management concept**".

Varied and diverse hydrogeological settings demand precise and comprehensive mapping of aquifers down to the optimum possible depth at appropriate scale to arrive at the robust and implementable ground water management plans. The proposed management plans will provide the **"Road Map"** for ensuring sustainable management and equitable distribution of ground water resources, thereby primarily improving drinking water security and irrigation coverage. Thus the crux of NAQUIM is not merely mapping, but reaching the goal-that of ground water management through community participation. The aquifer maps and management plans will be shared with the State Govt. for its effective implementation.

1.1 Objective and Scope

Aquifer mapping itself is an improved form of groundwater management – recharge, conservation, harvesting and protocols of managing groundwater. These protocols will be the real derivatives of the aquifer mapping exercise and will find a place in the output i.e, the aquifer map and management plan. The activities under NAQUIM are aimed at:

- identifying the aquifer geometry,
- aquifer characteristics and their yield potential
- quality of water occurring at various depths,
- aquifer wise assessment of ground water resources
- preparation of aquifer maps and
- Formulate ground water management plan.

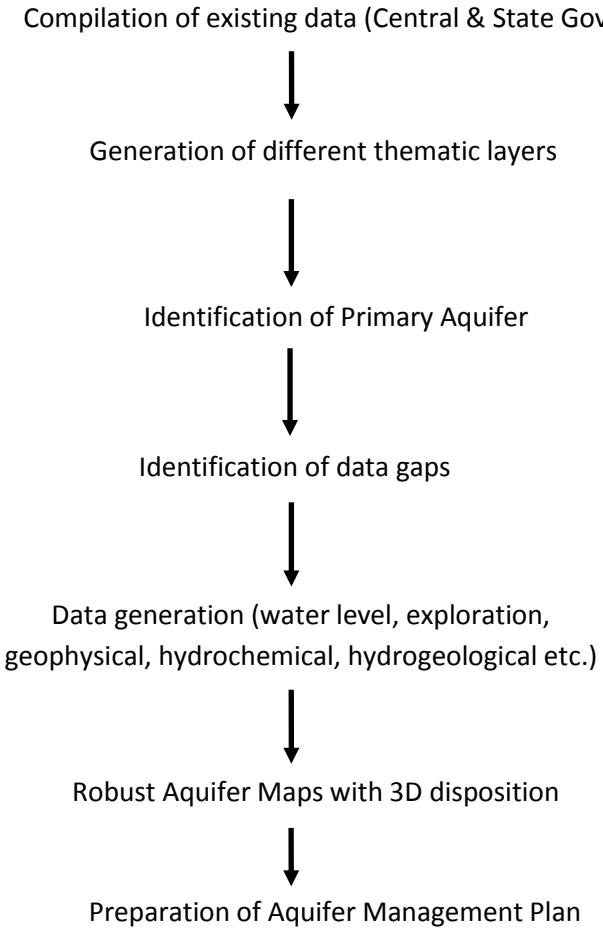
This clear demarcation of aquifers and their potential will help the agencies involved in water supply in ascertaining, how much volume of water is under their control. The robust and implementable ground water management plan will provide a **"Road Map"** to systematically manage the ground water resources for equitable distribution across the spectrum.

Thus, Purandhar and Baramati talukas, Pune district, Maharashtra covering an area of 2466 sq.km. have been entirely covered during the Annual Action Plan of 2016-17.

1.2 Approach and Methodology

The ongoing activities of NAQUIM include toposheet wise micro-level hydrogeological data acquisition supported by geophysical and hydro-chemical investigations supplemented with ground water exploration down to the depths of 200 meters.

Considering the objectives of the NAQUIM, the data on various components was segregated, collected and brought on GIS platform by geo-referencing the available information for its utilisation for preparation of various thematic maps. The approach and methodology followed for Aquifer mapping is as given below:



1.3 Study area

Keeping in view the current demand and supply and futuristic requirement of water, Central Ground Water Board has initiated the National Aquifer Mapping Programme (NAQUIM) in India during XII five year plan, with a priority to study Over-exploited, Critical and Semi-Critical talukas. Hence, Semi-Critical talukas - Purandhar and Baramati talukas of Pune district have been taken up to carry out detailed hydrogeological investigation by covering an area of 2466 sq. km. in the year 2016-17. The index map and the administrative map of the study area is presented in **Fig.1.1.** These talukas are categorized as Semi-Critical, as per Ground Water Resources Estimation carried out by CGWB and GSDA as on March 2013.

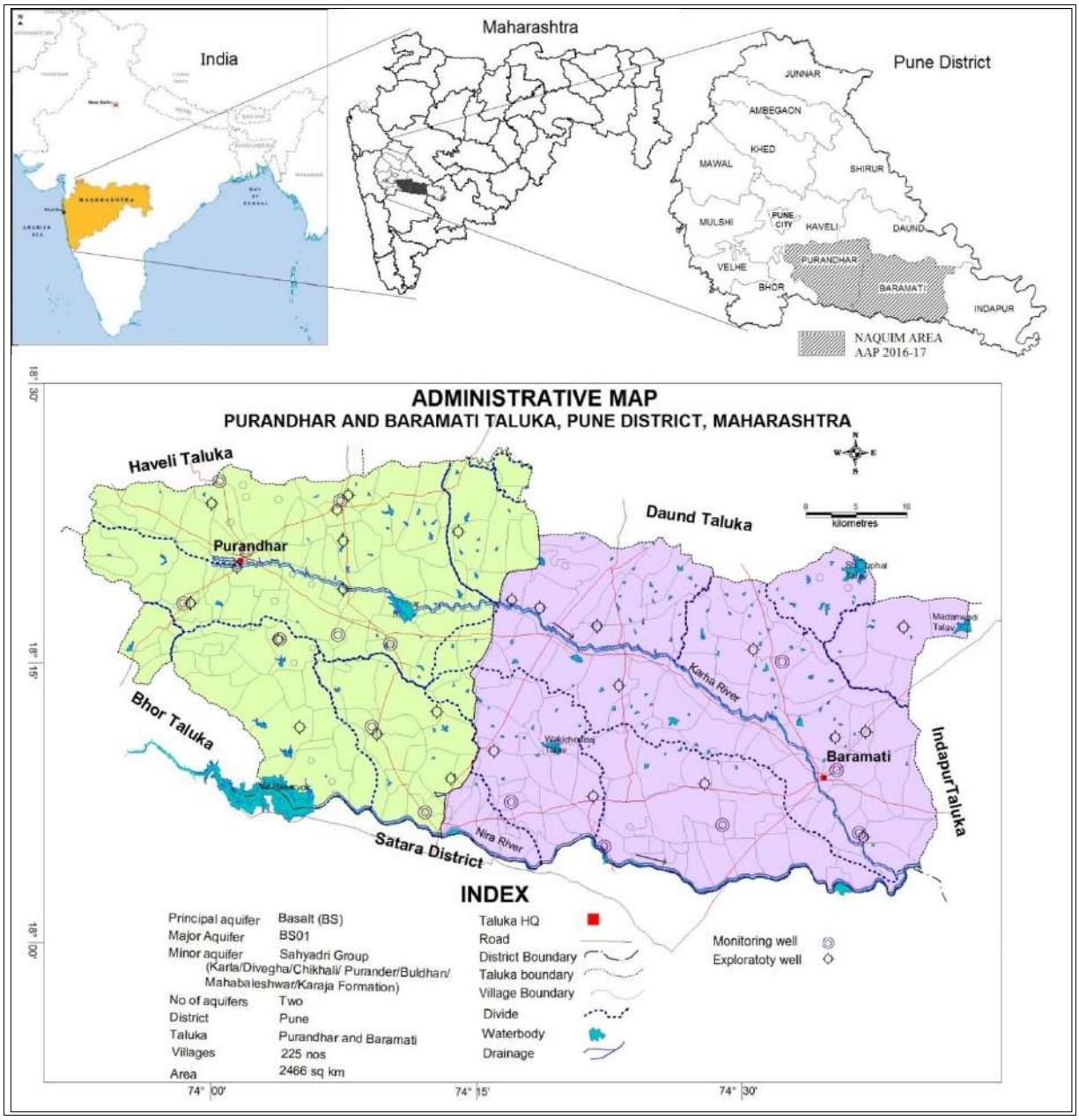


Fig. 1.1: Index & Administrative map, Purandhar and Baramati Taluka, Pune District

1.4 Data Adequacy and Data Gap Analysis:

The available data of the Exploratory wells drilled by Central Ground Water Board, Central Region, Nagpur, Ground water monitoring stations and ground water quality stations monitored by Central Ground Water Board were compiled and analysed for adequacy of the same for the aquifer mapping studies. In addition to these, the data on ground water monitoring stations and ground water quality stations of the State Govt. (GSDA) was also utilised for data adequacy and data gap analysis. The data adequacy and data gap analysis was carried out for each of the quadrant of falling in the study area mainly in respect of following primary and essential data requirements:

- Exploratory Wells
- Geophysical Surveys
- Ground Water Monitoring and
- Ground Water Quality

The locations of existing exploratory wells and ground water monitoring wells, which are also used as ground water quality sampling locations, are shown in **Fig. 1.2.**

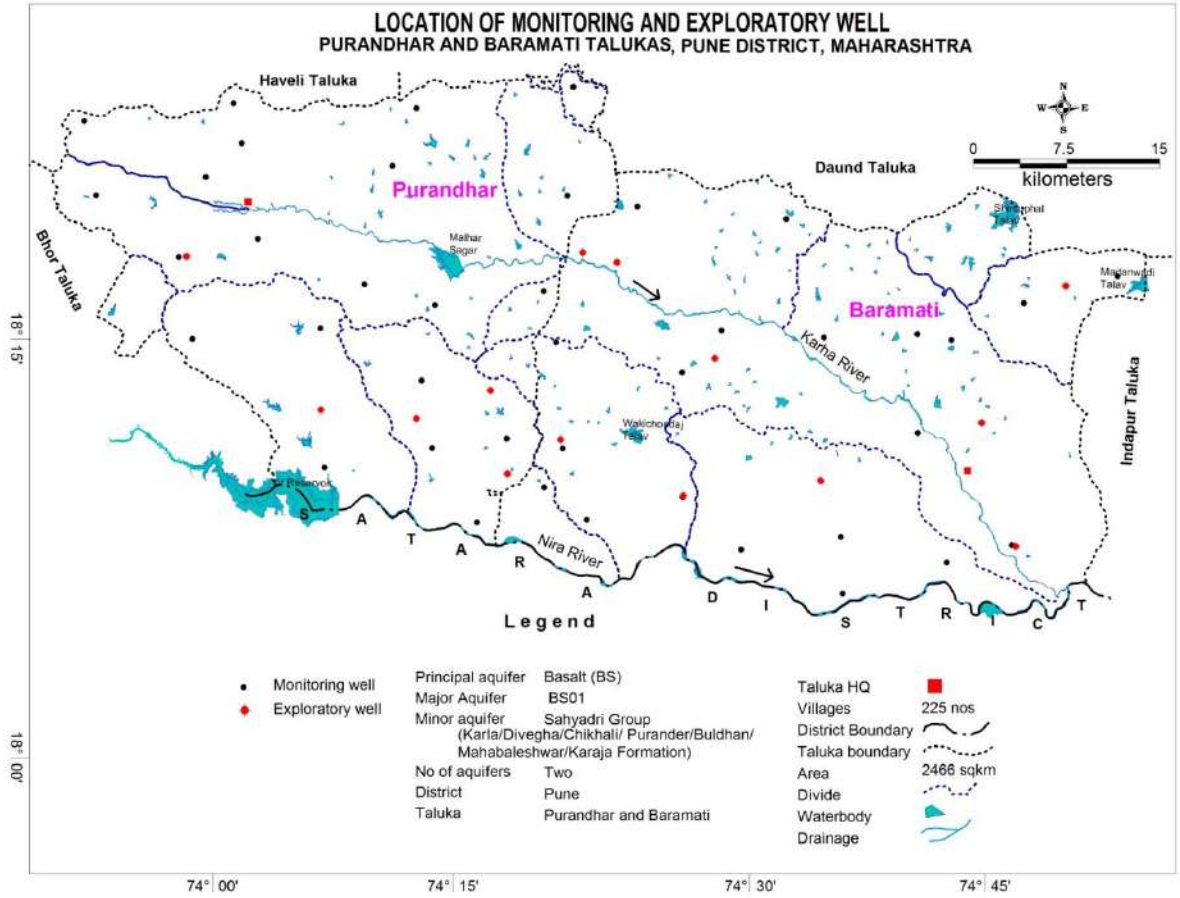


Fig 1.2: Locations of Existing Exploratory Wells and Ground Water Monitoring Wells.

After taking into consideration, the available data of Ground Water Exploration, Geophysical survey, Ground Water Monitoring and Ground Water Quality, the data adequacy is compiled and the summarised details of required, existing and data gap of Exploratory wells, Ground Water monitoring and Ground water quality stations is given below **(Table 1.1)** and discussed in detail.

Table 1.1: Data Adequacy and Data Gap Analysis

Taluka	EXPLORATORY DATA			GEOPHYSICAL DATA			GW MONITORING DATA (AQI)			GW MONITORING DATA (AQII)			GW QUALITY DATA (AQI)			GW QUALITY DATA (AQII)		
	Req.	Exist.	Gap	Req.	Exist	Gap	Req.	Exist.	Gap	Req.	Exist.	Gap	Req.	Exist.	Gap	Req.	Exist.	Gap
Baramati	10	5	9	28	0	28	20	4	18	10	5	9	20	4	18	10	5	9
Purandhar	8	9	5	30	0	30	18	7	13	8	9	5	18	7	13	8	9	5
	18	14	14	58	0	58	38	11	31	18	14	14	38	11	31	18	14	14

1.5 Data Gap Identification

The data adequacy as discussed in the above table 1.1, data gap exist in exploration, water level and quality have been achieved during data generation and only data gap exists in Geophysical Survey (VES). Exploratory Wells, Ground Water Level Monitoring and Ground Water Quality, there is no data gap. Location of existing exploratory wells GW level monitoring stations are presented in **Fig. 1.2**.

1.6 Rainfall and Climate

The area experiences the sub-tropical to tropical temperate monsoon climate with a hot summer and general dryness throughout the year except during the south-west monsoon season. The climate of the area is characterised by three distinct seasons: summer, monsoon and winter. Typical summer months are from February to May, with maximum temperatures ranging from 30 to 40 °C **(Table 1.2**). The warmest month is May. The monsoon lasts from June to end of September, with moderate rainfall. Winter months are October to January.

Table 1.2: Tempratures in Purandhar and Baramati taluka, Pune district

Talukas	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
Baramati	**Average high °C**	30.5	33.1	36.3	38.2	38.2	33	29.1	28.9	30	31.5	30.6	29.9	33
	Average low °C	13.4	14.6	18.3	22	23.3	22.8	21.9	21.2	20.8	19.7	15.7	13.2	20
Purandhar	**Average high °C**	30	34	37	39	40	35	30	27	30	28	27	26	33
	Average low °C	22	23	24	26	26	23	22	21	21	20	20	20.5	21

Table 1.3: Normal Rain, Actual Rain during 2015 and 2016 in Purandhar and Baramati Talukas, Pune district

Taluka	Month ->	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Baramati	**Normal Rain**	4.2	0.8	2.2	7.7	27.7	78.5	56.7	67.4	150.1	72.2	32.1	5.3	504.9
	Rain 2015	0	-	21.1	0.2	45.2	85.2	1.7	8.2	160.2	71	6.6	-	399.4
	Rain 2016						97.5	57.4	56.8	170.7	56.8			
Purandhar	**Normal Rain**	1.4	0.6	3	16.2	30.4	88.7	110.7	64	112	87.2	33.1	9.1	556.4
	Rain 2015	0	-	44.5	7.5	7.9	102.5	26.3	1	122.1	44.6	32.4	-	388.8
	Rain 2016						33.9	84.6	79.1	36.7	35.9			

Rainfall data of rain gauge stations located at taluka headquarters of Purandhar and Baramati have been collected from available sources and are subjected to various types of statistical analysis to understand the characteristic of the rainfall. Baramati taluka receives average annual rainfall of 504.9 mm while Purandhar taluka receives average annual rainfall of 556.4 mm**(Fig 1.3).** The rainfall data available for more than 100 years pertaining to these stations were analyzed. In Baramati taluka, the highest average annual rainfall was recorded 1263 mm in 1998, while the lowest average annual rainfall was recorded 113.2 mm in 2003. In Purandhar taluka, the highest average annual rainfall was recorded 1476 mm in 2006, while the lowest average annual rainfall was recorded 215 mm in 2003. The salient features of rainfall analysis are presented in **Table 1.4.**

Table 1.4: Long-term rainfall analyses, Purandhar and Baramati taluka, Pune district

Sl No	Station	No of Years	Normal Rainfall (mm)	Coeff icient of Variation (%)	Droughts (No. of years / % of Total years)			Rainfall (No. of years / % of Total years)		Rainfall Trend (1901-2007) mm/ year	Rainfall Trend (1901-2015) mm/ year	Decadal Trend (1998-2007) mm/year	Decadal Trend (2006-2015) mm/ year
					Moderate	Severe	Acute	Normal	Excess				
1	Baramati	108	504.9	35	20/18.52	4/3.70	1/0.93	58/53.70	25/23.15	1.396	0.986	-33.89	-29.61
2	Purandhar	100	556.4	35	18/18	4/4	0/0	58/58	20/20	1.737	1.002	50.15	-71.09

Rainfall departure: Excess: > 25%; Normal: 25% To -25%; Moderate Drought: -25% To -50%; Severe Drought: 50% To -75%; Acute Drought: < -74%

Perusal of **Table 1.4** shows that

1. The coefficient of variation in rainfall is 35% for both Baramati taluka and Purandhar taluka.
2. Normal rainfall has been received during total numer of 58 years during the period 1901 to 2015 (53.7% to 58 % of the years).
3. Despite of excess rainfall in 20 to 25 years during the period 1901 to 2015, the talukas have suffered drought conditions in 22% to 25% of years.
4. The long-term analysis of rainfall for the period 1901-2007 indicates that both the rainfall stations have insignificant rising trend of 0.986 mm/yr to 1.002 mm/yr in Baramati and Purandhar taluka respectively.
5. From the decadal rainfall trend analysis from 2006 to 2015 it's observed that, both the stations have significant falling rainfall trend of -29.61 mm/year in Baramati taluka and -71.09 mm/year in Purandhar taluka.

The Annual rainfall for the last ten years ranges from 235 mm to 804.6 mm in Baramati taluka while 550 mm to 1124.6 mm in Purandhar taluka. Thus, it has been observed that there is about 50 % variation in the minimum to maximum rainfall in both the talukas. The annual rainfall data of last ten years is given in **Table 1.5.**

Table 1.5: Annual Rainfall Data of 10 Years in mm

S.N.	Taluka	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Avg
1	Baramati	567	622	454	738.8	804.6	291	235	469.5	417.6	399.4	462.6	499.89
2	Purandhar	1476	519	497	806	602	609.4	371	574.3	371.3	388.8	270.2	621.48

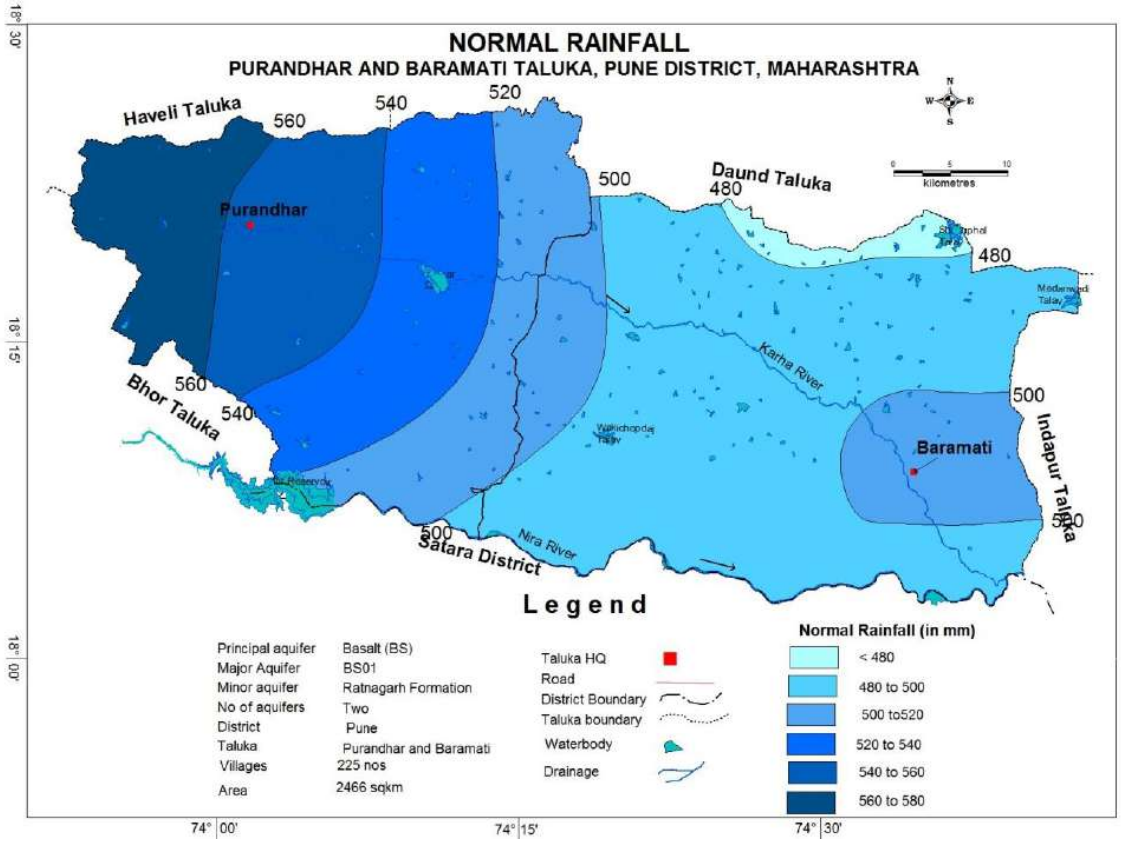


Fig 1.3: Normal Rainfall, Purandhar and Baramati Taluka, Pune District

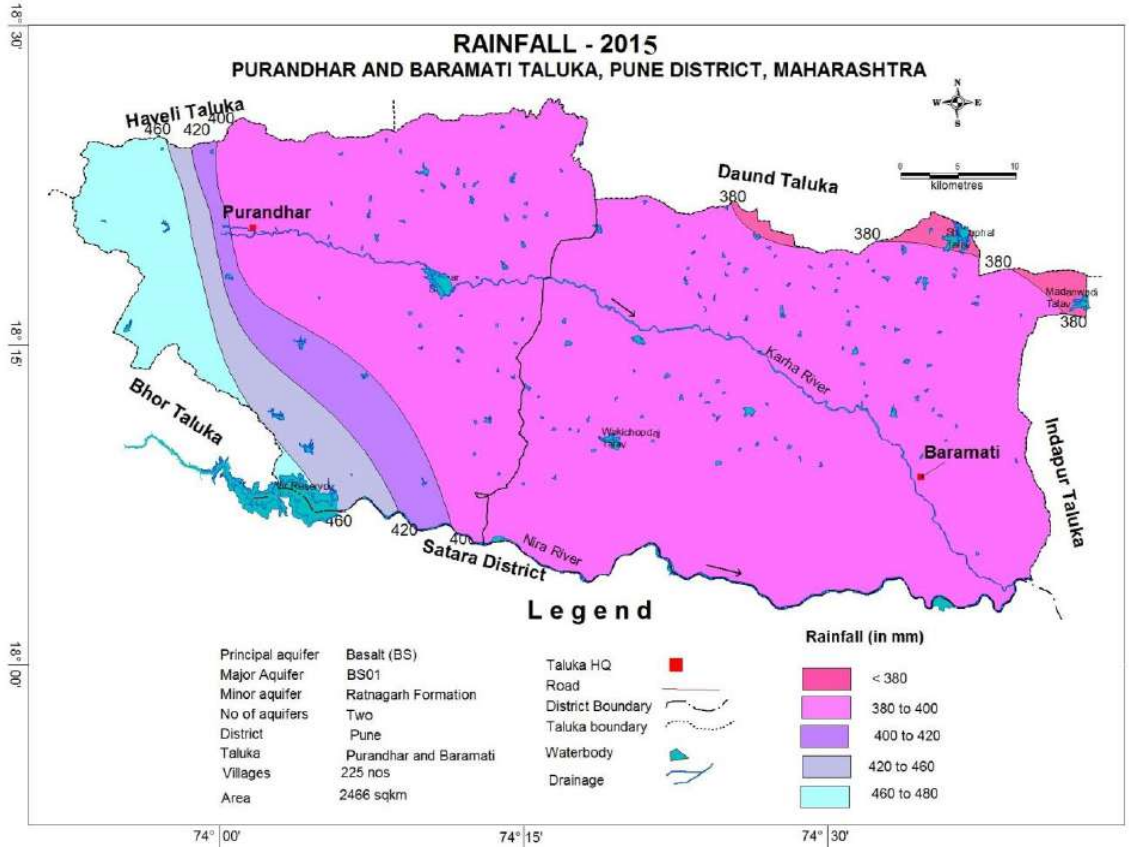


Fig 1.4: Rainfall during the year 2015, Purandhar and Baramati Taluka, Pune District

1.7 Physiography

The area can be broadly divided into three physiographic units i.e., Older Flood Plain (513-560 mamsl), Region of Denudational origin (550-600 mamsl), Middle Level Plateau (600-900 mamsl), High Level Plateau (>900 mamsl). The western part of the area is occupied by hills, the central part by hillocks and the eastern part by nearly plain terrain with few isolated mounds, dissected by valleys of Karha River and other tributaries of Nira River. The height of the hillocks vary between 100 to 150 m above the ground level. The minimum elevation in the area is 516 m above mean sea level and the maximum being 1340 m above m.s.l. (Gherapurandar). The physiography of the area is shown in **Fig. 1.5**

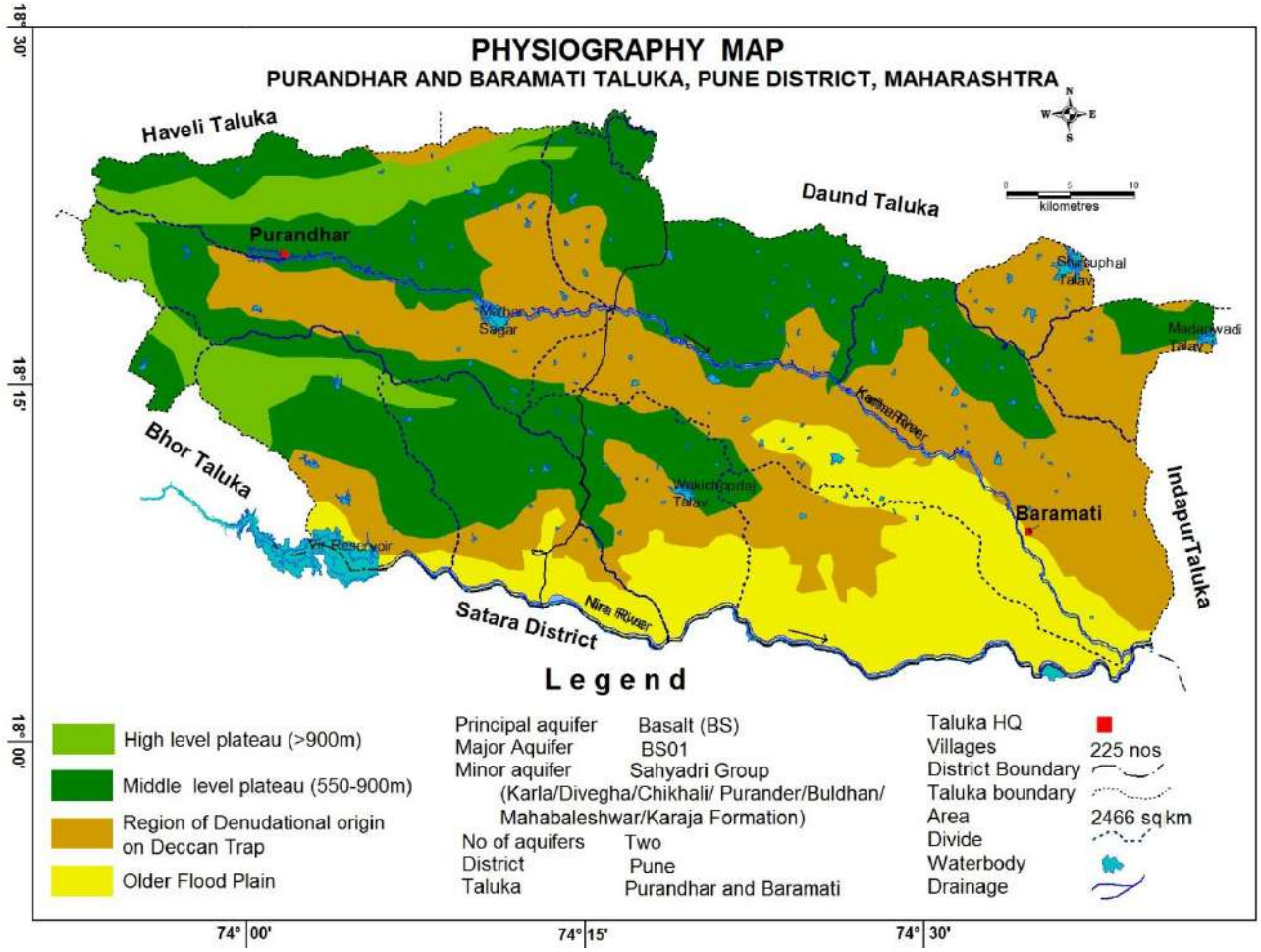


Fig. 1.5: Physiography, Purandhar and Baramati taluka, Pune district

1.8 Geomorphology

The analysis of geomorphological data and thematic map collected from MRSAC, Nagpur reveals that almost entire area forms the Upper Plateau-Highly Dissected (HDP), which can be broadly divided in to twelve units depending on extent of weathering and thickness of soil cover viz. Plateau Undissected (PLU) with less than 1m weathering, Plateau Slightly Dissected (PLS) with less than 1m weathering, Plateau Moderately Dissected (PLM), Plateau Highly Dissected (PLH), Plateau Weathered (PLWS) with 1-2m weathering, Plateau Weathered (PLWS) with 1-2m weathering, Plateau Weathered (PLW) with 2-5m weathering along rivers and streams, Plateau Weathered in Nira Canal Command area (PLC), Outer Fringes of Plateau (OFP) and Escarpment Slope (ES), Butte (B)and Mesa (M). The geomorphology of the area is shown in **Fig. 1.6.**

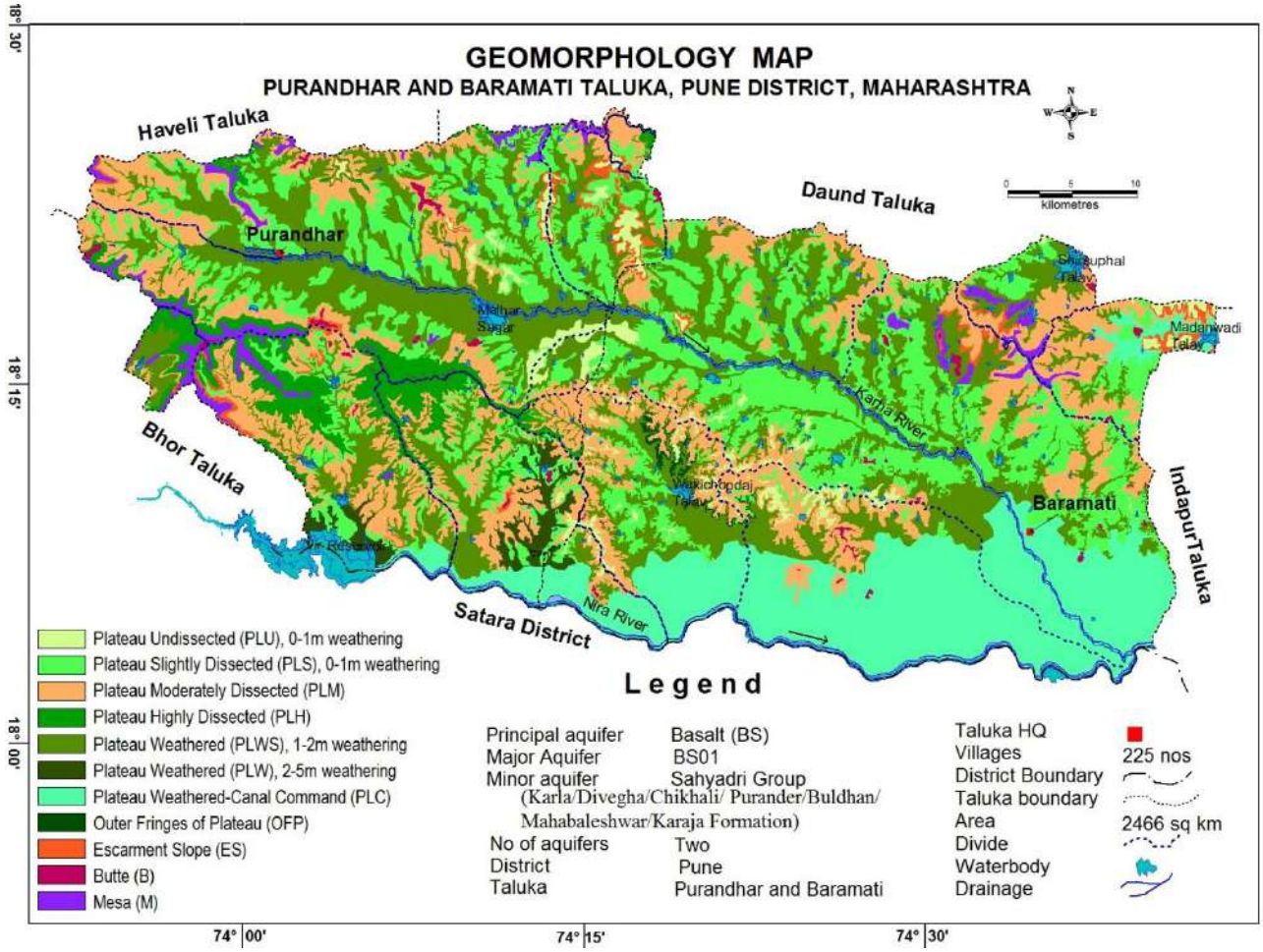


Fig. 1.6: Geomorphology, Purandhar and Baramati taluka, Pune district

1.9 Land Use

The landuse details and the thematic map available with the MRSAC, Nagpur has been collected and analysed with reference to the present agricultural practices, various land use etc. It has been observed that the major parts of the area are covered by agricultural land. Forest covers very little area in the western part on the slopes of hills, while most of the hilly tract is barren wasteland. The built up area is reflected wherever settlements have come up. The thematic map on land use is shown in **Fig. 1.7** and Land Use / Land Cover, Purandhar and Baramati taluka, Pune district is given in **Table 1.6**, Area under Principal Crops, Purandhar and Baramati taluka, Pune district **Table 1.7**

Table 1.6: Land Use / Land Cover, Purandhar and Baramati taluka, Pune district (in Ha)

Taluka/ Total Geographical Area	Area Under Forest	Land not available for Cultivation		Uncult-ivable other than Barren Land	Cultivable Area	Fallow Land	Net Area Sown	Area Sown More Than Once	Gross Cropped Area	Irrigation	
		Non Agricu-ltural land	Barren Uncult-ivable Land							Ground water	Surface Water
Purandhar/ 110313	2221	2641	5567	9499	89068	4620	85765	3335	89100	7152	5853
Baramati 138248	4929	4856	8809	5765	135915	9783	104106	39269	143375	18154	23379
Total/ 248561	**7150**	**7497**	**14376**	**15264**	**224983**	**14403**	**189871**	**42604**	**232475**	**25306**	**29232**

Source :'Superintendent of Land Record,Commissioner of Agriculture Pune'. Reporting Year : 2011-12

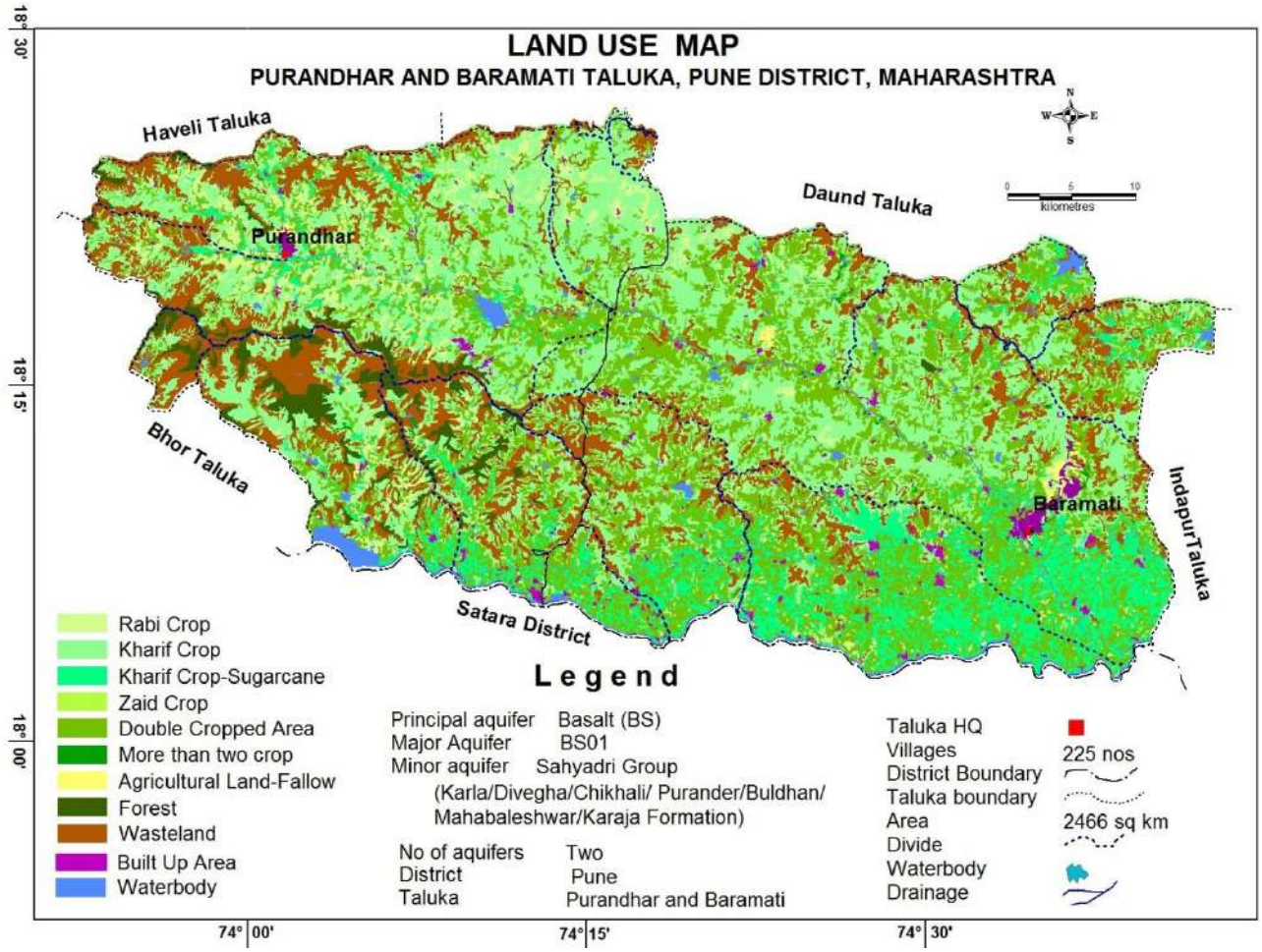


Fig. 1.7: Landuse, Purandhar and Baramati taluka, Pune district

Table 1.7: Area under Principal Crops, Purandhar and Baramati taluka, Pune district (ha)

Taluka	Jawari	Bajra	Wheat	Sugarcane	Onion	Gram	Groundnut	Sunflower
Baramati	617.91	40.79	88.8	155.3	35.08	77.91	39.08	1.9
Purandhar	321.88	170.98	78.83	5.62	8.31	14.25	20.23	0.44

Source :'Superintendent of Land Record,Commissioner of Agriculture Pune.

The agricultural distribution of crops does not follow traditional pattern as cash crops like sugarcane and fruits like grapes, custard apple, pomegranate etc. are becoming popular. Jawari and Bajra are grown in areas where irrigation water availability is less. The ground water based irrigation caters to the major area i.e., 71.52 sq.km. (8.35% of net sown area) in Purandhar Taluka and 181.54 sq.km. (8.35% of net sown area) in Baramati Taluka, while surface water irrigated area is about 71.52 sq.km. (17.5% of net sown area) in Purandhar Taluka and 233.79 sq.km. (22.5% of net sown area) in Baramati Taluka.

1.10 Soil

The soil data and the thematic map of the area available with the MRSAC, Nagpur has been collected and analysed. It has been observed that the major part of the area is occupied by clayey soil and clayey loam, especially around the drainage lines, followed by sandy loam. Gravelly sandy clay type of soils occupy mainly the high hill slopes and barren

wastelans of the area. The thematic map on the soil distribution in the study area is shown in **Fig. 1.8.**

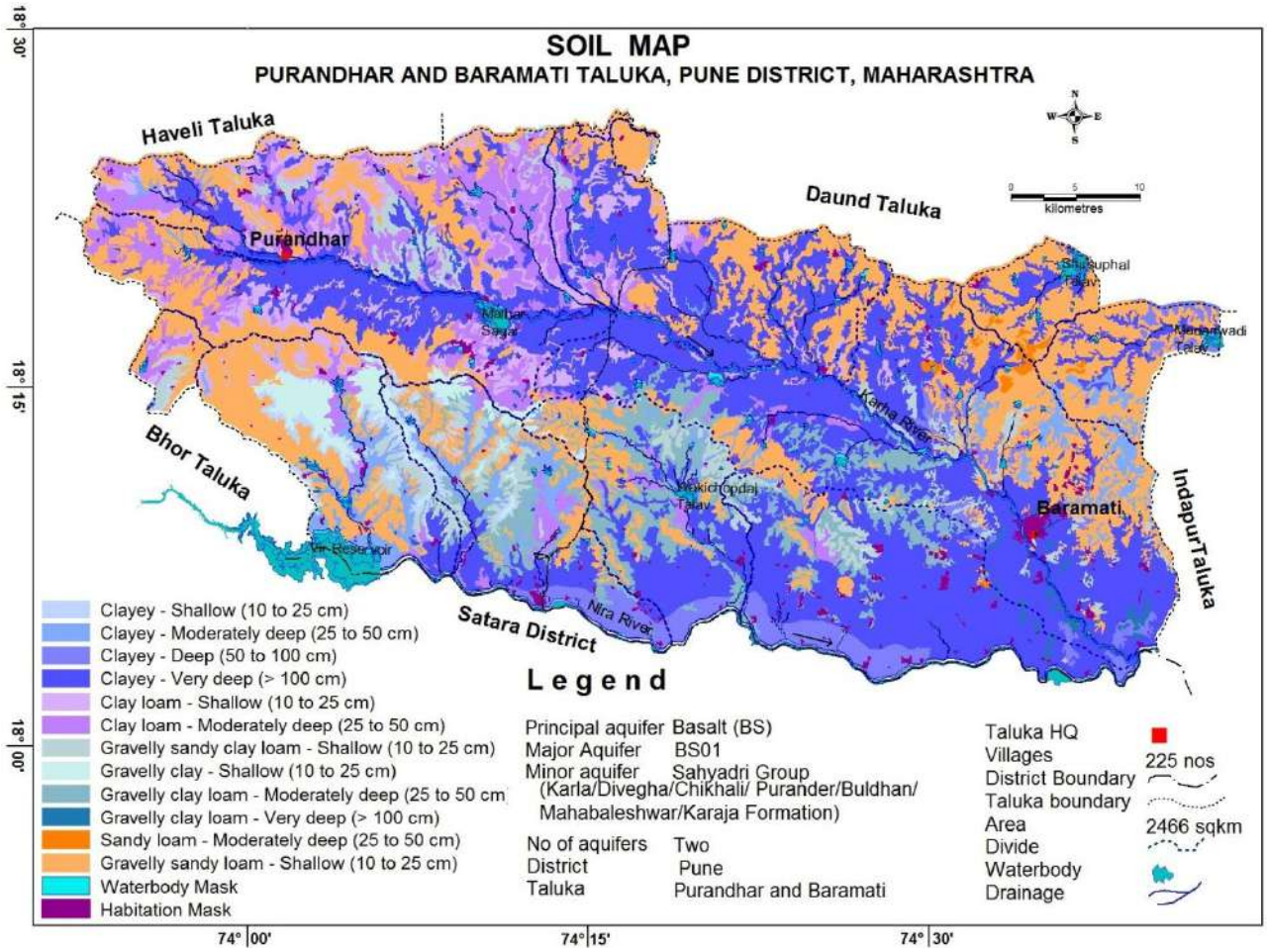


Fig. 1.8: Soil, Purandhar and Baramati taluka, Pune district

1.11 Hydrology

Part of the area falls under the command area of major Irrigation Projects, Nazre Project, Khadakwasla Project and Nira Dam (the dams and reservoirs of these major Projects fall outside the area). No major Project is constrcted within Purandhar and Baramati Talukas. However, the State Govt. constructed a number of medium and minor irrigation structures. As per the Water Resources Department, Govt. of Maharashtra, 7984 ha and 4654 ha land was irrigated in Purandhar and Baramati talukas due to these irrigation structures respectively. While, it is expected to that 8020 ha and 1333 ha of land in Purandhar and Baramati Taluka respectively would be under irrigation due to ongoing irrigation projects. The Abstract of irrigation projects are presented as **Table 1.8a** and **1.8b** while details of area presented as **Annexure-I**

Table 1.8a: Abstract of Major, Medium and Minor irrigation projects, Purandhar and Baramati Talukas, Pune district

Taluka	Major Irrigation Projects			Medium Irrigation Projects			Minor Irrigation Projects		
	No.	Irrigation Capacity (Ha)	Irrigation Potential Utilised (Ha)	No.	Irrigation Capacity (Ha)	Irrigation Potential Utilised(Ha)	No.	Irrigation Capacity (Ha)	Irrigation Potential Utilised (Ha)
Baramati	Outside Taluka	14760	28628	0	1800	1847	5	1351	1034
Purandhar	Outside Taluka	14324	12221	1	1395	1343	10	2492	1632
Total		29084	40849	1	3195	3190	15	3843	2666

(Source: Irrigation Department, Govt. of Maharashtra, June 2014)

1.12 Prevailing Water Conservation and Recharge Practices

The State Water Conservation Department, Agricultural Department, Social Forestry along with Zilla Parishad has constructed various water conservation structures, like percolation tanks, check dams, KT wiers, mati nala bandh, nala bunding, gully plugs, gabion structures, farm ponds, vanrai bandhara etc. These structures are constructed by the various Govt and NGO as suitable sites. However, as per the data available, check dams are the most preferred water conservation structures in study area. At present, under *Jal yukt shivar* scheme of Agriculture Department which is a flagship programme of Chief Minister, check dams and farm ponds are being constructed in the Purandhar and Baramati taluka.

Table 1.8b: Abstract of Minor irrigation projects, district.

Taluka	KT Weir			Lift Irrigation		Percolation Tank			Div. Weir	Storage Bandhara	
	No/Storage Capacity (MCM)	Irrigation Capacity (Ha)	Irrigation Potential Utilised (Ha)	Irrigation Capacity (Ha)	Irrigation Potential Utilised (Ha)	No/Storage Capacity (MCM)	Irrigation Capacity (Ha)	Irrigation Potential Utilised (Ha)	No/Irrigation Capacity (Ha)	No/Gross Storage	Irrigation Capacity (Ha)
Baramati	30/ 75.65	11540	5205	17770	0	9/3.89	522		5/191	7/ 11.25	120
Purandhar	13/ 16.73	1548	3847	16794	4878	21/ 14.18	2551	1568	9/311	3/ 15.85	126
Total	43/ 92.38	13088	9052	34564	4878	30/ 18.07	3073	1568	14/ 502	10/ 27.1	246

(Source: Irrigation Department, Govt. of Maharashtra, June 2014)

1.13 Drainage

The area forms a part of Krishna River Basin, Bhima sub-basin and is drained by Karha River and other tributaries of Nira River. Nira river forms the southern boundary of the area, flowing in easterly direction, while Karha river bisects the area flowing in south easterly direction. Nira River emanates from the catchment of Devghar Dam in Bhor Taluka, Pune District. The river then flows and enters the area at Vir Dam (Vir Reservoir) and then

finally joins the Bhima River, which is a tributary of Krishna River. Karha river is the main tributary of the Nira river, originates in the north-western part of the area, near Garade Village in Purandhar Taluka, flows through the cities of Baramati, Saswad and Jejuri, which lie on the banks of this river and confluences with Nira river at the south-eastern point of the area, near the village Songaon in Baramati Taluka. The nalas/ streams of the hilly terrain are seasonal, and form the main nullahs and rivers. The drainage pattern is mainly sub dendritic to sub parallel.Drainage map of the area is given in **fig 1.9**

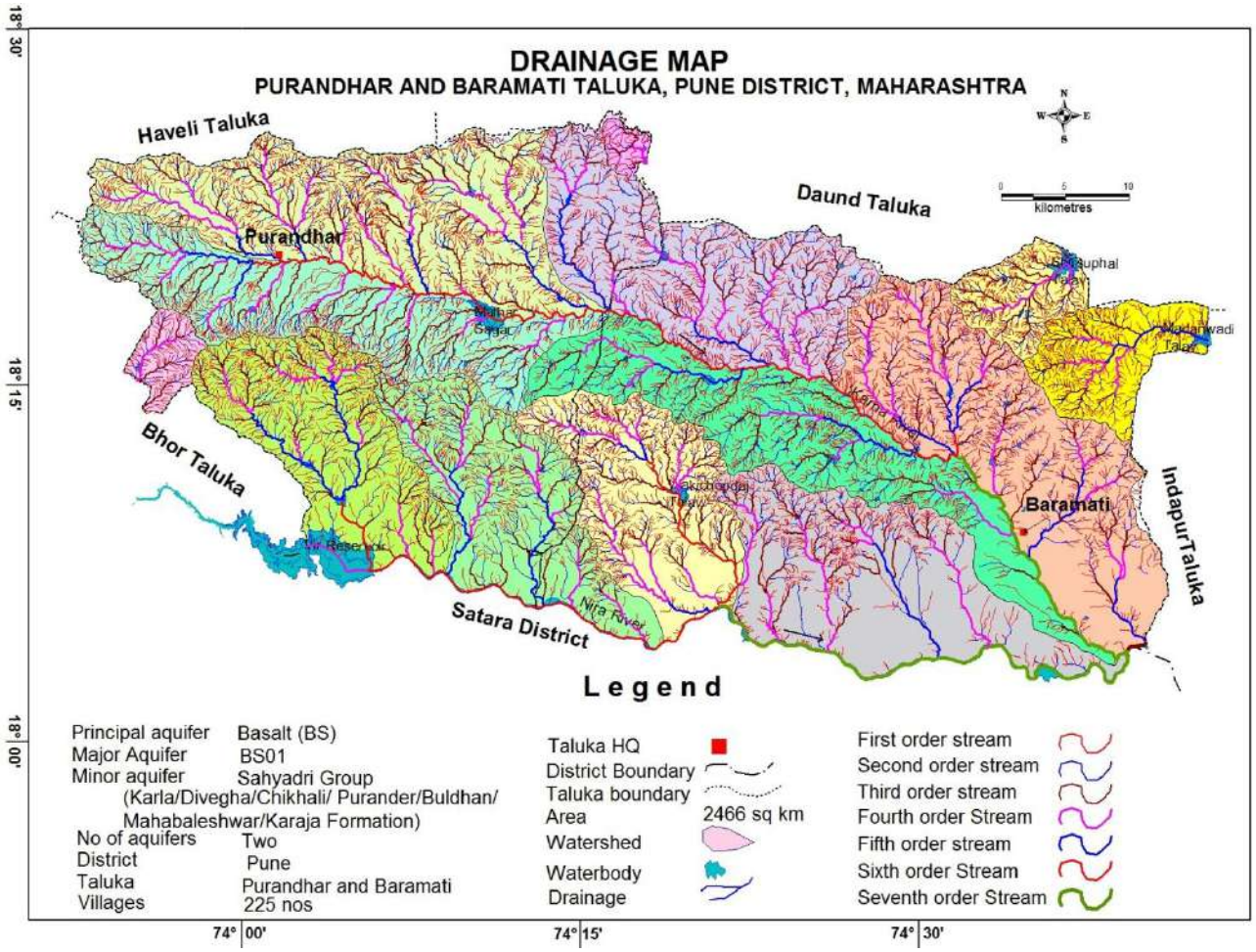


Fig. 1.9: Drainage, Purandhar and Baramati taluka, Pune district

2 DATA COLLECTION AND GENERATION

The primary data such as water levels, quality and lithological inputs were available with CGWB as well as GSDA, Govt. of Maharashtra has been collected and utilised as baseline data. However, the ancillary data such as numbers of ground water abstraction structures, irrigation facilities, rainfall etc., have been collected from the various State govt. departments and compiled and validated so as to remove the discrepancies and make it utilisable on GIS platform.

2.1 Data Collection and Compilation

The data collection and compilation for various components was carried out as given below.

i. Hydrogeological Data – Current and historical water levels along with water level trend data of 21 and 21 monitoring wells in Purandhar and Baramati talukas respectively representing Aquifer-I. The water levels of 14 and 12 exploratory wells in Purandhar and Baramati talukas respectively representing Aquifer-II were also collected and compiled.
ii. Hydrochemical Data - Ground water quality data of 19 monitoring wells each in Purandhar and Baramati talukas representing Aquifer-I of CGWB and data of 7 and 12 exploratory wells in Purandhar and Baramati talukas respectively representing Aquifer-II were also collected and compiled.
iii. Exploratory Drilling – Ground water exploration data of CGWB of 14 exploratory wells and 1 observation wells in Purandhar taluka and 12 exploratory wells and 7 observation wells in Baramati Taluka.
iv. Geophysical Data – No Geophysical Surveys were carried out inPurandhar and Baramati talukas.
v. Hydrology Data – Data on various irrigation projects, their utilisation status, number of ground water abstraction structures and area irrigated from Irrigation Department were compiled.
vi. Hydrometeorological Data - Long term rainfall data for each of the Talukas from IMD and Dept. of Agriculture were complied.
vii. Water Conservation Structures – Numbers, type and storage potential of water conservation structures prevailing in the area from Dept. of Agriculture, ZP, Social forestry etc. were complied.
viii. Cropping Pattern Data – Data on prevailing cropping pattern from Agriculture Dept. were complied.

2.2 Data Generation

After taking into consideration, the data available with CGWB on Ground Water Exploration, Ground Water Monitoring Wells (GWMW) and Ground Water Quality, the data adequacy was compiled. The requirement, availability and gap of major data inputs i.e., exploratory wells, geophysical data, GWMW and ground water quality data are detailed in the **Table 1.1**. Based on Data Gap Analysis, all the necessary data was generated as discussed below.

2.2.1 Ground Water Exploration

As seen from **Table-1.1**, exploratory drilling was required at 14 locations. The drilling at these sites was done down to targeted depth by deploying DTH-LMP-87/73 to assess the

lithological disposition of shallow aquifer (Aquifer-I) and deeper aquifer [Aquifer-II). Ground water exploration down to the depth of 200 m bgl in Purandhar and Baramati has been taken up where the data gap exists and accordingly 14 exploratory wells and 5 observation wells have been constructed. The details of aquifers encountered are discussed in successive chapter. The locations of exploratory wells are shown in **Fig. 2.1**. The details of existing and newly constructed exploratory and observation wells is given in **Annexure-II**.

2.2.2 Ground Water Monitoring Wells

As observed from Table-1.1, GWMW's were required at 31 locations for Aquifer-I and 14 for Aquifer-II correspondingly 31 key observation wells (KOW) were established and 14 EW were monitored in addition to the existing GWMW to assess the ground water scenario of shallow & deeper aquifer (Aquifer-I& II) of the area. The locations of KOW's are shown in **Fig. 2.1**. The details of existing and newly established GWMW/KOW's are given in **Annexure-III**. Water level data of Aquifer II is given in **Annexure V**

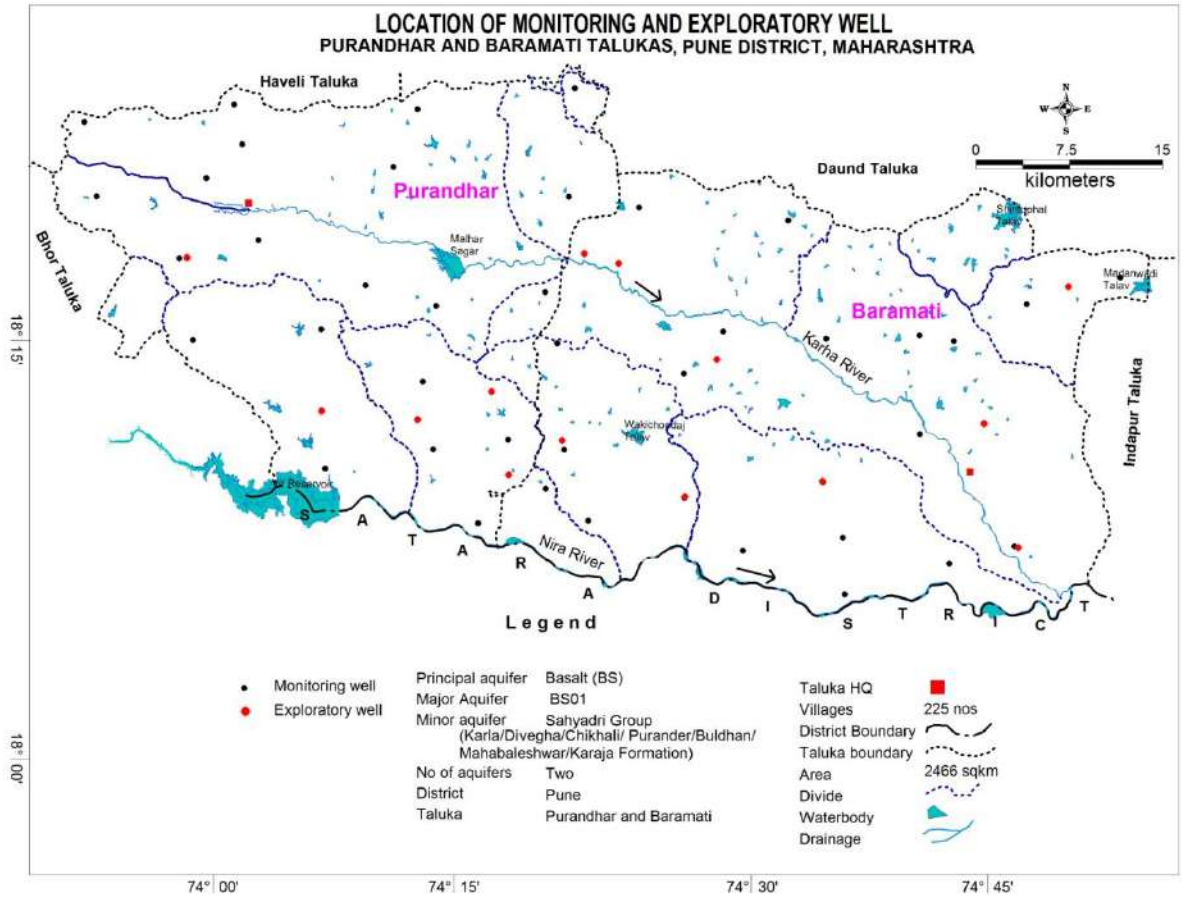


Fig.2.1: Locations of Exploratory Wells Ground Water Monitoring Wells

2.2.3 Ground Water Quality

As observed from Table-1.1, GWMWs were required at 31 locations for Aquifer-I and 14 for Aquifer-II correspondingly 31 key observation wells (KOW) were established and 14 EW were monitored in addition to the existing GWMW to assess the ground water quality of

shallow and deeper aquifer (Aquifer-I, II & III) of the area. The details of chemical analysis for Aquifer-I and Aquifer-II are given in **Annexure-VI and VII.**

2.2.4 Micro Level Hydrogeological Data Acquisition

In addition to the KOWs, micro level hydrogeological data was also required as per data gap analysis for deciphering the sub-surface lithological disposition, water level scenario and other hydrogeological inputs such as weathered thickness etc., of shallow aquifer (Aquifer-I). Thus 62 wells, 31 in Baramati and 31 in Purandhar talukas respectively, were inventoried for micro level data acquisition. The details of dugwells inventoried for micro-level data acquisition are given in **Annexure-VIII**. The locations of micro level hydrogeological data acquisition wells are shown in **Fig. 2.2**.

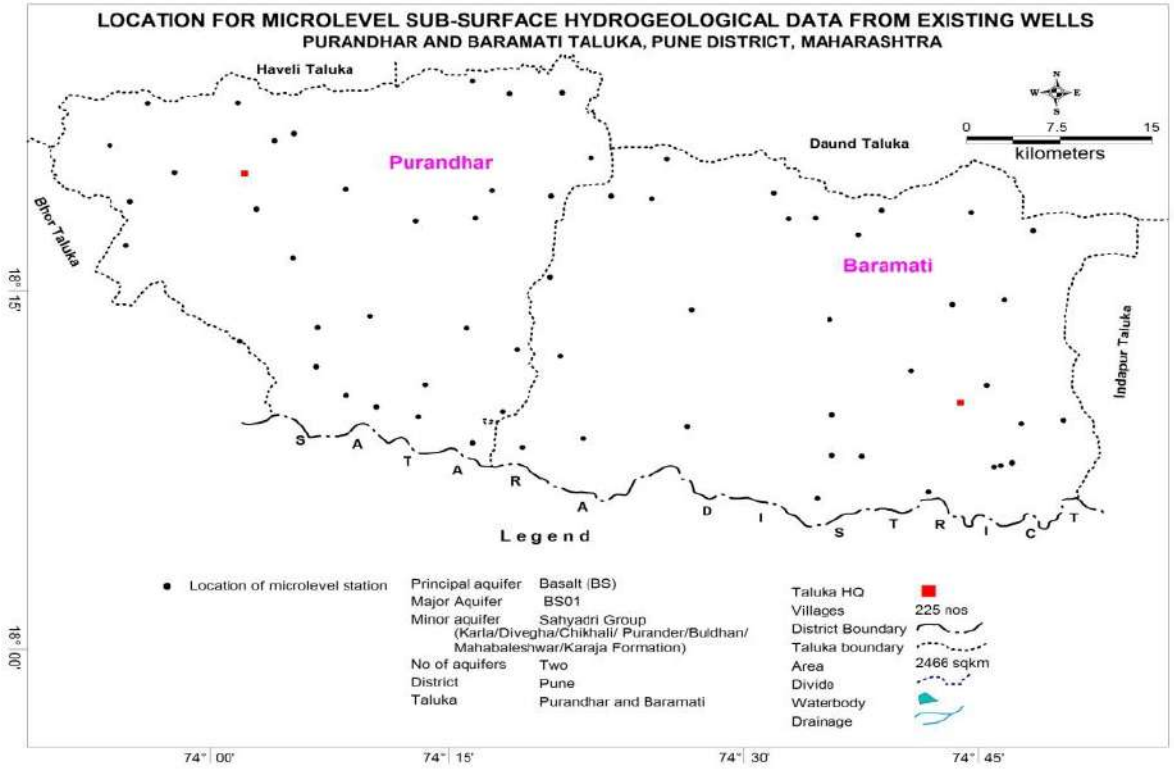


Fig.2.2: Locations of Micro Level Hydrogeological Data Acquisition Wells

2.2.5 Thematic Layers

The following five thematic layers were also generated on GIS platform, which supported the primary database and provided precise information to assess the present ground water scenario and also to propose the future management plan.

- Drainage
- Geomorphology
- Soil
- Land Use – Land Cover
- Geology and Structure

The thematic layers such as drainage, geomorphology, soil, land use-land cover have been described in Chapter – I. The geology of the area is presented in **Fig. 2.3** and the disposition of the basaltic flows is presented in **Fig.2.4**.

The area exposes a thick succession of basaltic lava flows of cretaceous to Eocene age. The Lava pile exposed within the altitude of 500 to 1000 mamsl, consists of 32 basalt flows of 'aa'/pahoehoe type occupying major part of the area. Each flow comprise of 3 units namely top vesicular basalt followed by fractured/massive basalt followed by massive basalt. Alluvium is occupied along the Nira River. These flows occur in layered sequence ranging in thickness from 20 to 40 m. Flows are represented by massive portion at bottom and vesicular portion at top and are separated from each other by marker bed known as bole bed. The thickness of weathering varies widely in the district form 5 to 25 m bgl.

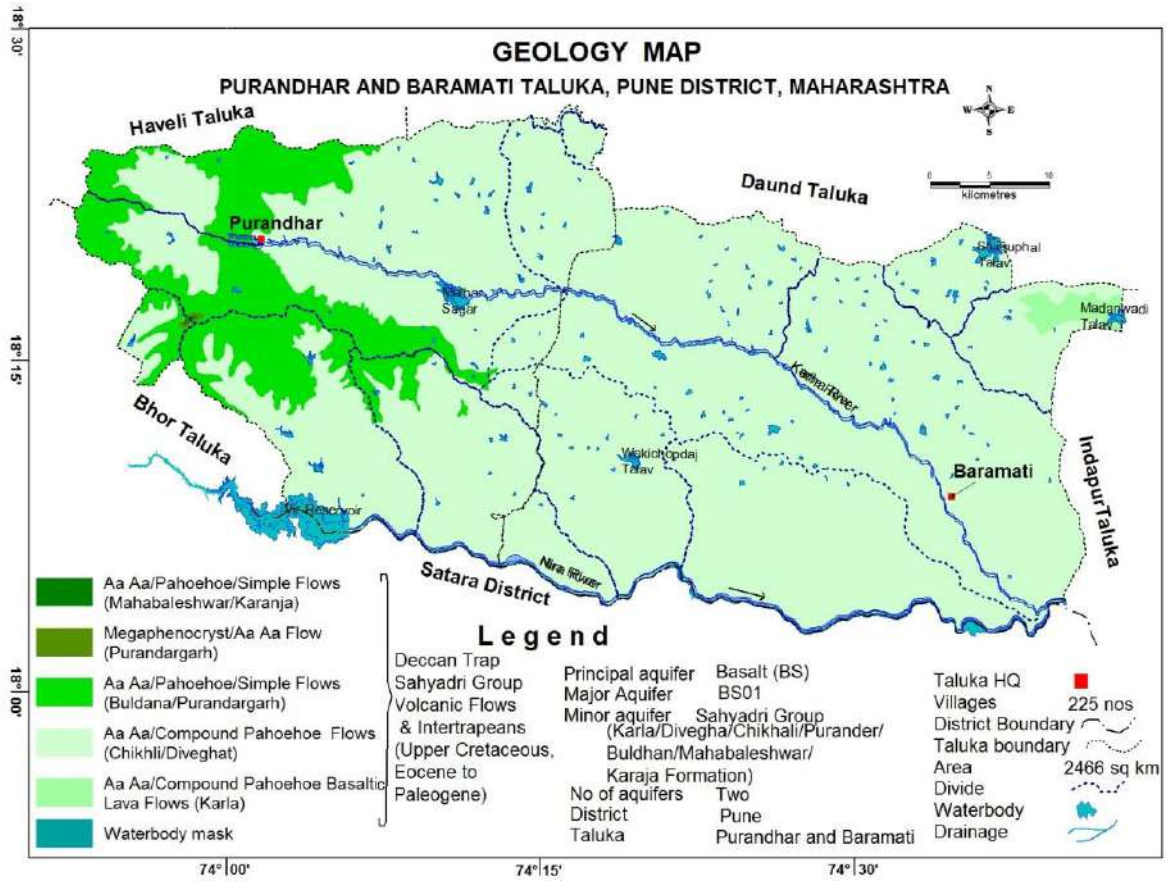


Fig. 2.3: Geology, Purandhar and Baramati taluka, Pune district

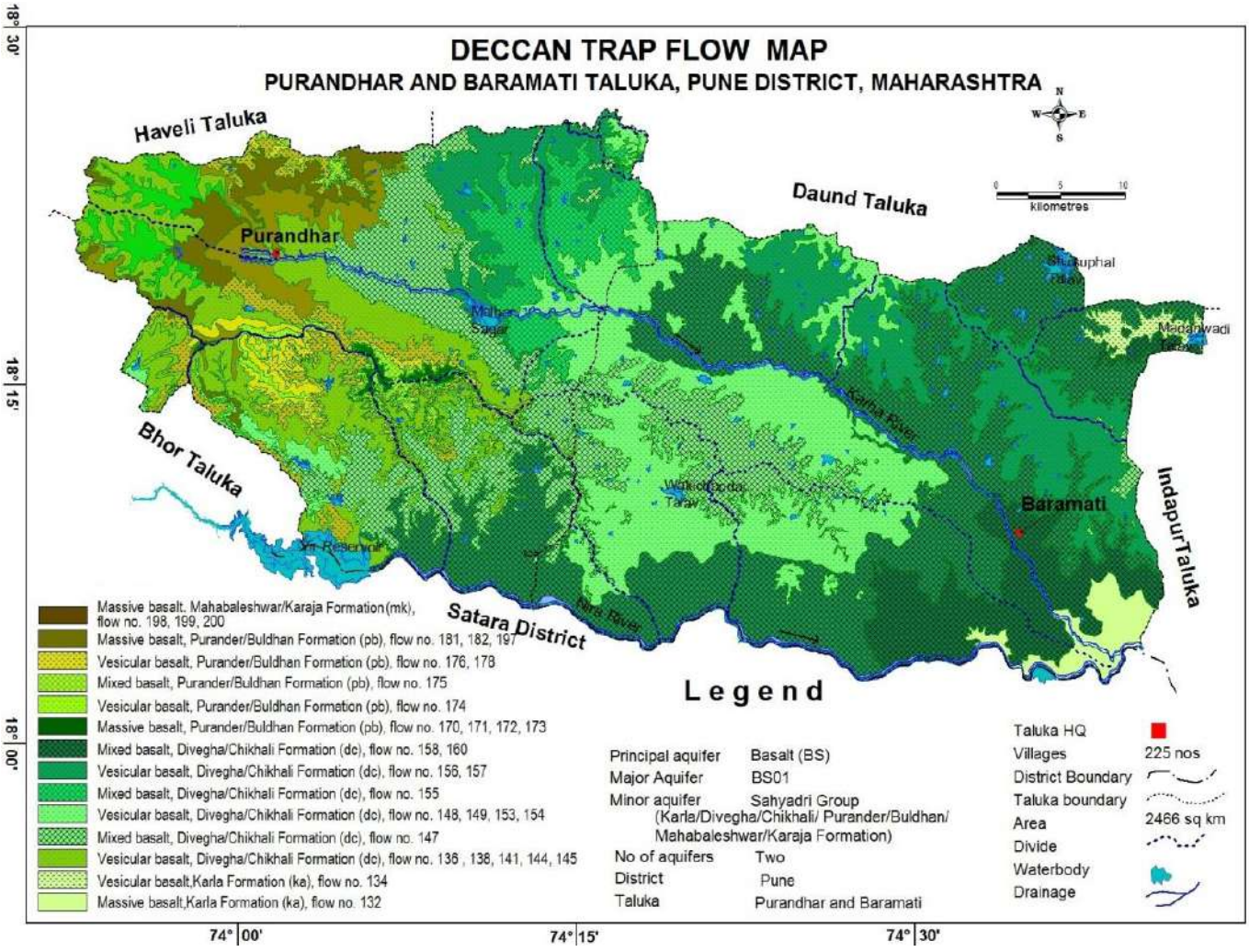


Fig. 2.4: Basalt Flow Map, Purandhar and Baramati taluka

3 Data Interpretation, Integration and Aquifer Mapping

The data collected and generated on various parameters viz., water levels, water quality, exploration, aquifer parameters, geophysical, hydrology, hydrometeorology, irrigation, thematic layers was interpreted and integrated. Based on this the various aquifer characteristic maps on hydrogeology, aquifer wise water level scenario both current and long term scenarios, aquifer wise ground water quality, 2-D and 3-D sub surface disposition of aquifers by drawing fence and lithological sections, aquifer wise yield potential, aquifer wise resources, aquifer maps were generated and as discussed in details.

3.1 Hydrogeology

Hydrogeologically, the area occupied is mainly comprised of Deccan Traps with inter-trappean beds of Upper Cretaceous- Lower Eocene age (**Fig. 3.1**). The Lava pile exposed within the altitude of 500 to 1000 mamsl, consists of 32 basalt flows of 'aa'/pahoehoe type occupying major part of the area. Each flow comprise of 3 units namely top vesicular basalt followed by fractured/massive basalt followed by massive basalt. Alluvium is occupied along the Nira River.

The yield of wells is function of the permeability and transmissivity of aquifer encountered and varies with location, diameter and depth etc. The basaltic lava flows are massive and fine grained with negligible primary porosity and transmissivity, however their yields are enhanced mainly due to the presence of secondary porosity developed due to the fractures and jointing. Also weathered zones of about 5-12 m thickness have developed in plains and depressions. Thus the weathered, jointed and fractured zones of vesicular and massive units of a flow constitute the main water bearing horizons. However, these zones are not continuous and uniformly developed laterally as well as vertically and this factor plays an important role in the success and failure of wells in the area. There are three types of ground water structures in the area i.e. dugwells, borewells and dug cum borewells (DCB) and dugwells with near horizontal bores within fractured basalt. Their yield characteristics are described below.

Ground water occurs in unconfined state in shallow aquifer encountered between 8 and 28 m depth and tapped by dugwells, water levels are ranging from 2.0 – 17.5 m bgl and the yield of dugwells in basalt varies from 20 to 90 m^3/day. However, dugwells located in favourable area in basalt can yield 100 to 250 m^3/day. Ground water is predominantly used for irrigation, as it is the major ground water utilising sector in these intense sugarcane, grape, pomegranate and other cashcrop growing talukas.

State government has drilled large number of borewells fitted with hand pumps and electric motors for rural drinking water purposes in the area. Yields of borewells range from 500 to 3000 lph. The ground water development in these talukas is mostly through dugwells.

Ground water occurs under phreatic/ unconfined to semi-confined conditions in basalts. Ground water occurs in unconfined state in shallow Aquifer-I tapped by dugwells of 5.6 to 28 m depth, water levels are ranging from 2.0 to 17.5 to 18.11 m bgl during pre-

monsoon and 0.2 to 12.0 during post-monsoon. Yield varies from 5 to 100 m^3/day. The deeper Aquifer-II is also present which is being tapped by borewells and it ranges from 20 to 174 m bgl, whereas the water level ranges from 2.3 to 60.0 m bgl during pre-monsoon and 2 to 41.0 during post-monsoon. For deeper Aquifer-II, 34 exploratory wells (19 in Baramati and 15 in Purandhar taluka) have been drilled and studied

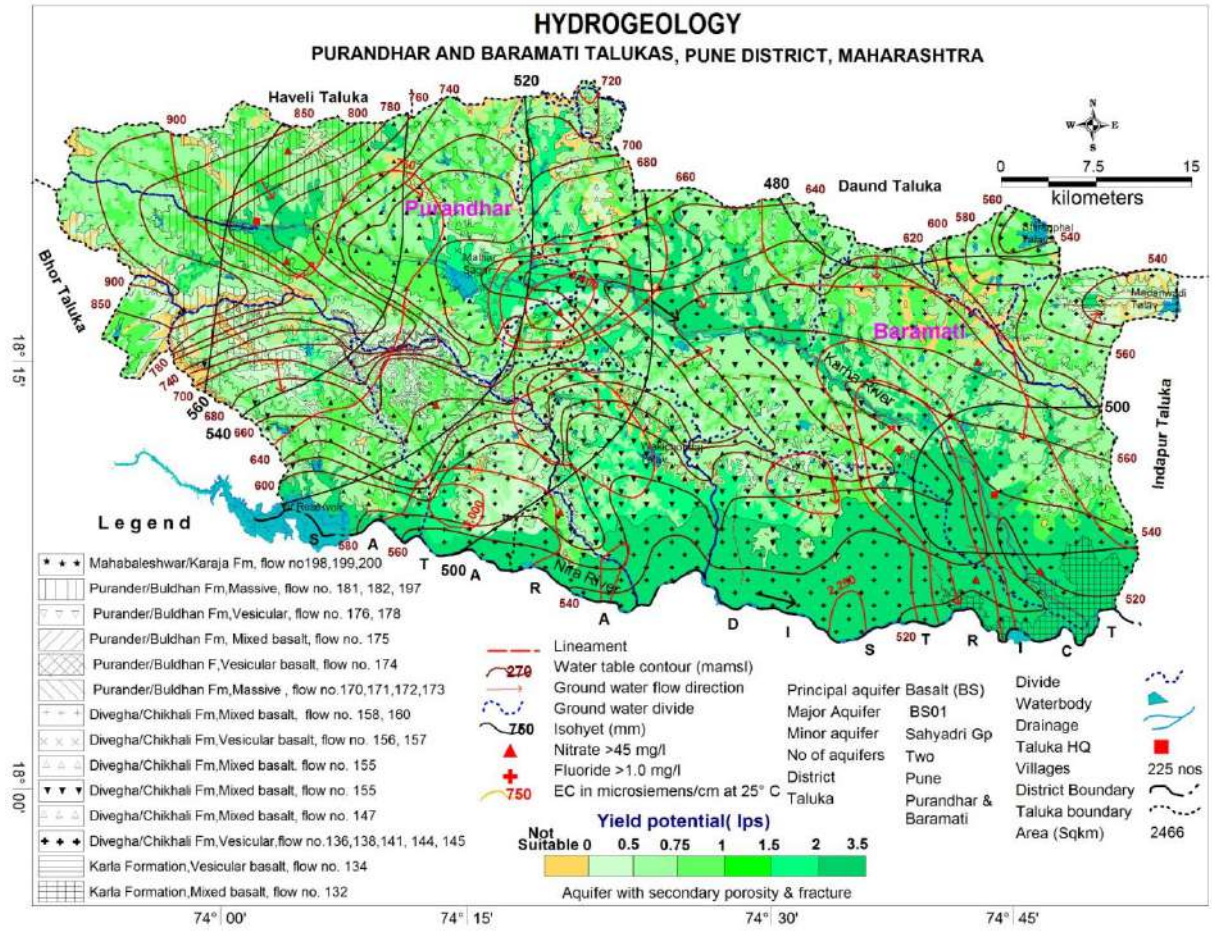


Fig. 3.1: Hydrogeology, Purandhar and Baramati taluka, Pune district

3.1.1 Water Level Scenario (Aquifer-I):

To decipher the ground water dynamics of shallow Aquifer-I, 42 KOW and 62 micro-water level wells were established. The water level data from May 2016 and Nov. 2016 were collected and analysed. Thus, the ground water level scenarios for Shallow Aquifer-I are analysed.

3.1.1.1 Depth to Water Level (pre-monsoon May 2016)

The depth to water levels in Baramati-Purandhar Talukas during May 2016 ranges between 2.0 m bgl (Narayanpur) and 15.1 m bgl (Veer) m bgl and 17.5 m bgl (Mawadi Kadepathar). During premonsoon water levels within 10 m bgl are observed major part of the area (57% area), whereas, water levels between 10-15 mbgl is observed in hilly tracts and ground water devide (40% area) in these talukas and water level more than 15 m bgl is

seen in small isolated patches (2.5% area). The premonsoon depth to water level map is given in **Fig.3.2a**. and the water level data is presented as **Annexure-III.**

3.1.1.2 Depth to Water Level (Post-monsoon 2016)

The depth to water levels in Baramati-Purandhar Talukas during Nov 2016 ranges between 0.20 m bgl (Narayanpur) and 12.00 m bgl (Zendewadi). Depth to water levels during postmonsoon is within 10 m bgl in entire area, except small isolated patches. Depth to water levels during premonsoon within 0 to 5 m bgl are observed 49% area, whereas, water levels between 5-10 mbgl is observed in 45% area. The postmonsoon depth to water level map is given in **Fig. 3.2b**.

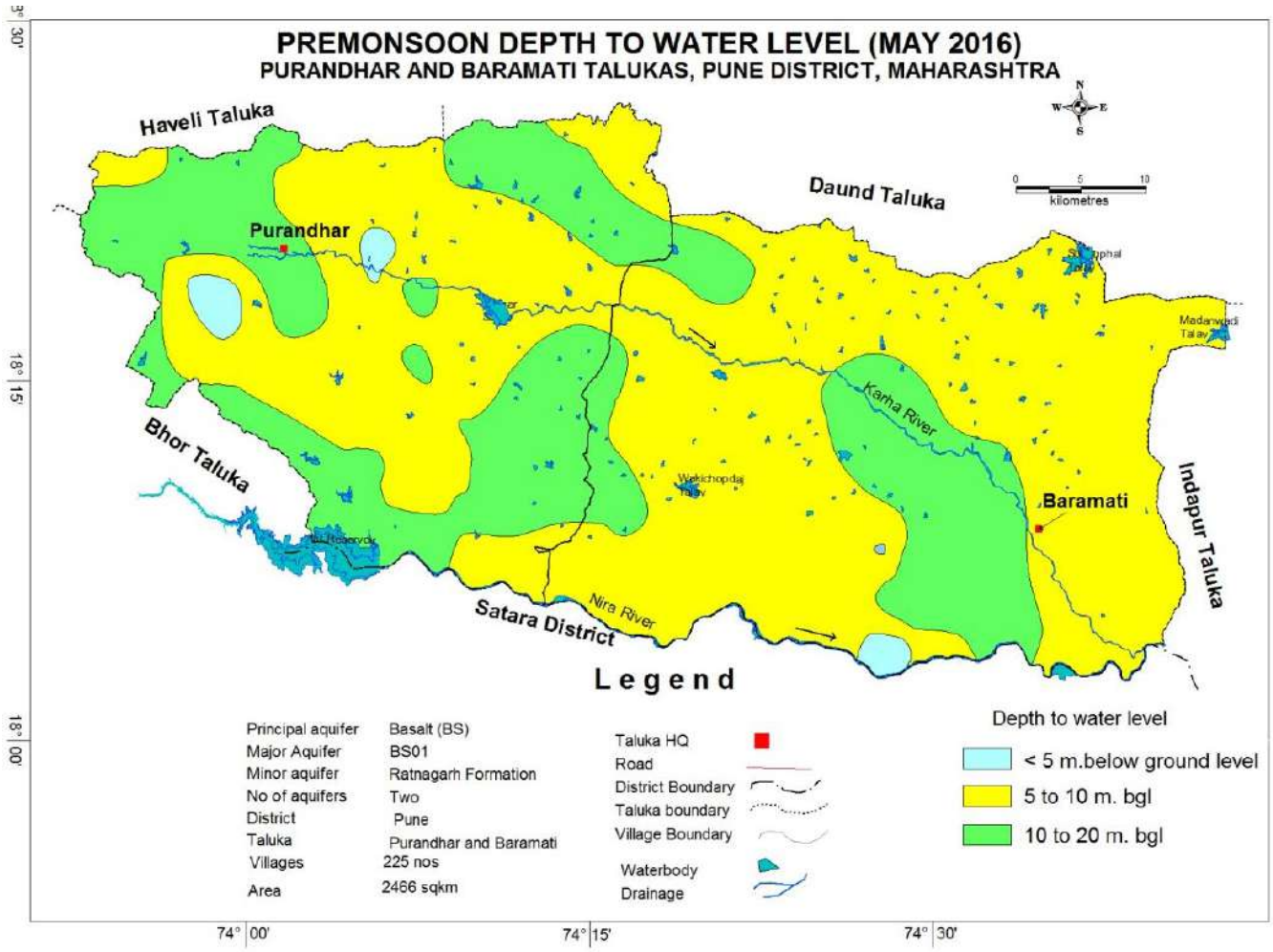


Fig. 3.2a: Pre-monsoon Depth to Water Level (Aquifer –I)

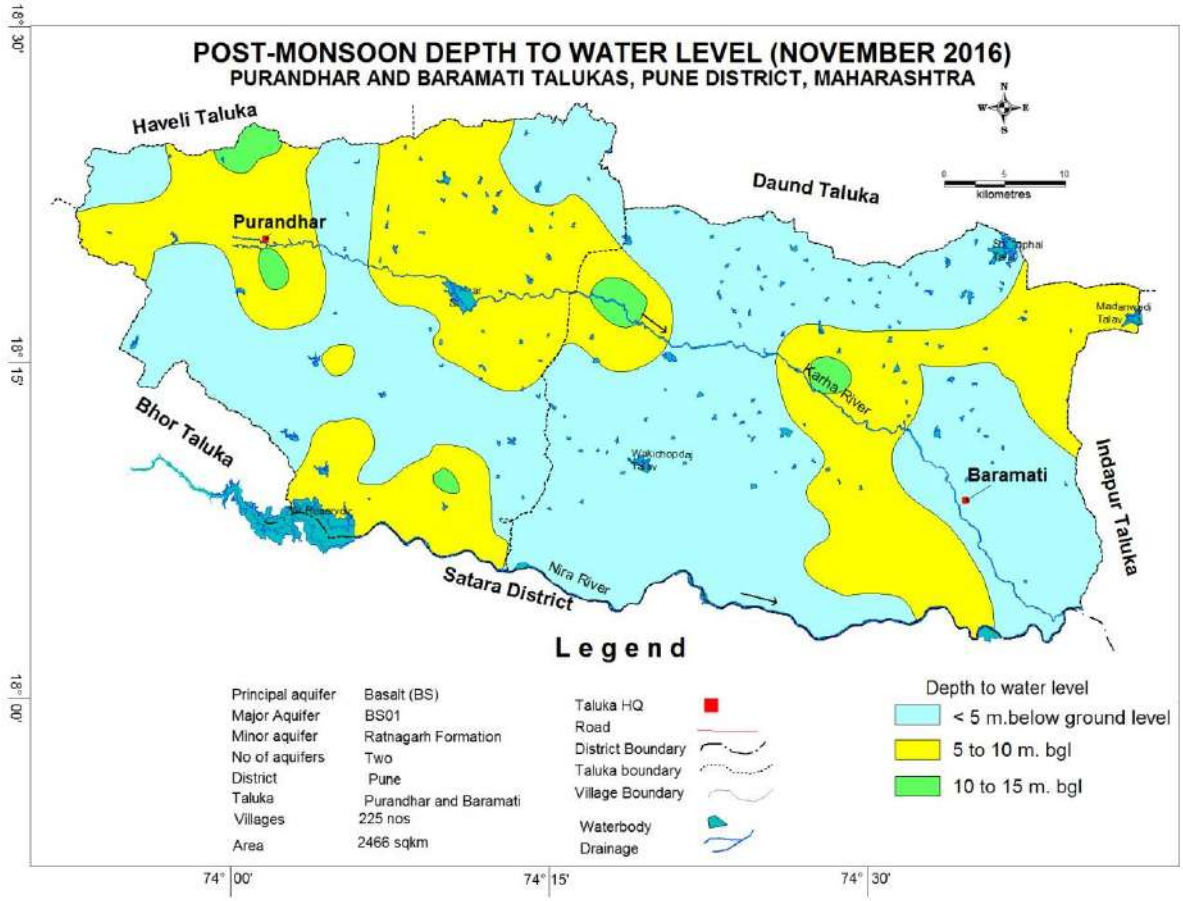


Fig. 3.2b: Post-monsoon Depth to Water Level Level (Aquifer–I)

3.1.1.3 Water Level Fluctuation, Shallow Aquifer-I

The water level measured during pre and post monsoon period was used to calculate the fluctuation. The seasonal fluctuation (May 16-Nov 16) in water level was obtained from difference in water level during pre and post monsoon water level. In the area, number of wells and their percentage falling in each fluctuation range is presented in **Table 3.1**.

Table 3.1: Seasonal fluctuation (May-16 vs Nov-15) in water level with percentage

Taluka	No. of key wells	Seasonal fluctuation in water level m with %				
		<0	0 to 2	2 to 4	4 to 6	>6
Baramati	33	2 (6.1%)	6 (18.2%)	4 (12.1 %)	13 (39.4%)	7 (21.2%)
Purandhar	34	2 (5.9%)	9 (26.5%)	8 (23.5 %)	6 (17.6%)	9 (26.5%)
Total	67	4 (6%)	15 (22.4%)	12 (17.9 %)	19 (28.4%)	16 (23.9%)

It is observed that fall in water level was measured at Moregaon and Panwadi, Baramati Taluka and at Zendewadi and Pangare, Purandhar Taluka, while high water level fluctuation was measured at Chaudharwadi (10.5 m) in Baramati Taluka and at Veer (9.11 m) in Purandhar Taluka. The water level fluctuations are grouped under three categories and are discussed under.

<0 m (fall) - Poor rainfall

0-2 m and 2-4 m - Less water level fluctuation
4-6 m - Moderate water level fluctuation
>6 m - High water level fluctuation

Area with less water level fluctuation, about 46.3% wells (31 wells) were showing water level fluctuation less than 4m. The area with less water level fluctuation is observed in almost entire Purandhar and Baramati taluka. High water level fluctuation is seen in 23.9% wells (16 wells).

3.1.2 Depth to Water Level Trend (2007-16)

Based on the CGWB's GWMW and Observation wells of GSDA, Pune, the long-term trend of water levels for pre-monsoon and post-monsoon periods for the last ten years (2007-16) have been computed. The long term water level data of 38 wells has been utilised. The maps depicting the special variation in long-term water level trend is presented as (**Fig 3.3a and 3.3b**). The data is presented in **Annexure IV**

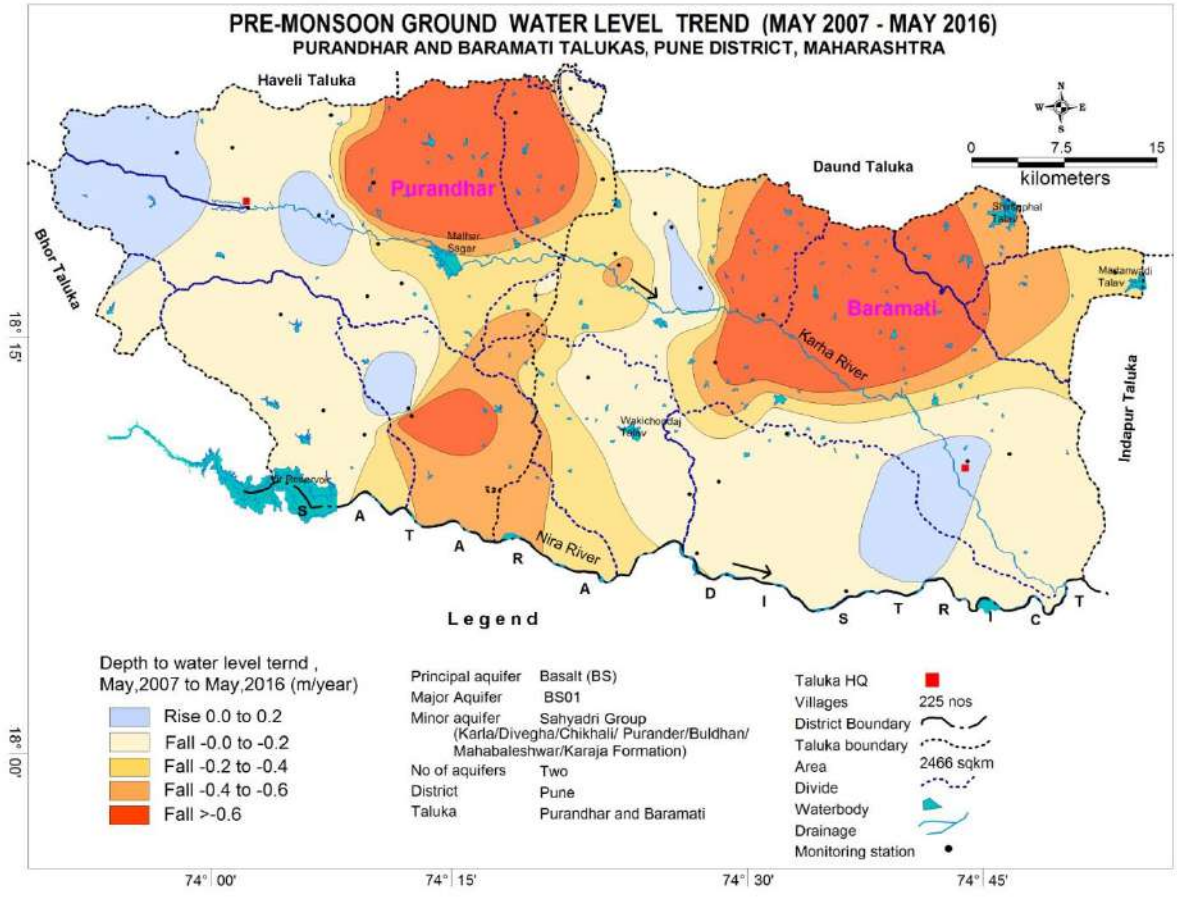


Fig 3.3a: Pre -monsoon decadal water level trend (2007-16)

In the study area, pre monsoon rise in water levels trend has been recorded at 7 stations and it ranges between 0.04 m/year (Barmati- rural) to 0.17 m/year (Baburdi) while falling trend was observed in 31 stations varing from -0.01 (Sangvi) to -2.07 m/year (Malshiras). In pre monsoon the falling water level trend has been observed in almost entire area of Purandhar and Baramati while small patches of rising trend has been observed isolated patches.

In the study area, post monsoon rise in water levels trend has been recorded at 04 stations and it ranges between 0.002 m/year (Baramati Rural) to 0.14 m/year (Wadgaon Nimbalkar) while falling trend was observed in 34 stations varing from -0.014 m/year (Kutwalwadi) to -1.58 (Pargaon).

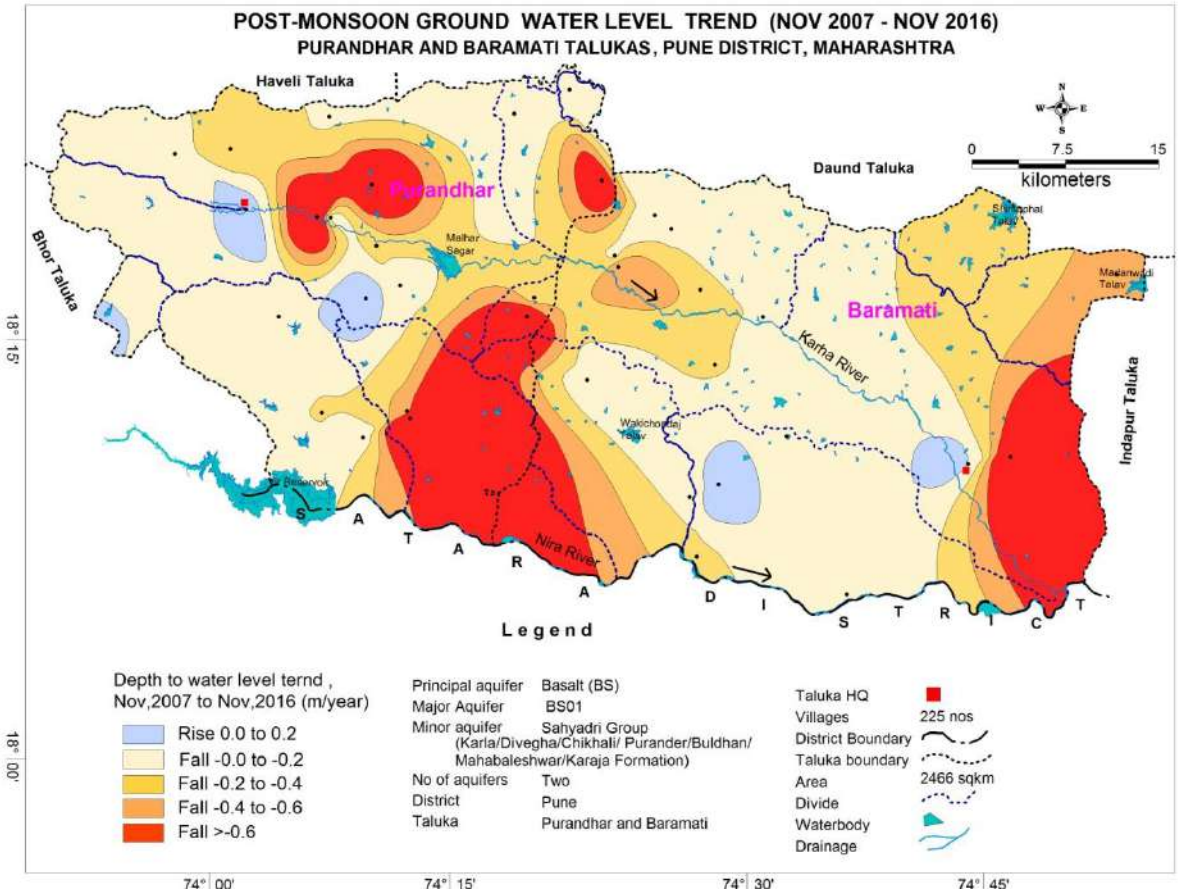


Fig 3.3b: Post -monsoon decadal water level trend (2007-16)

3.1.3 Ground Water Flow

In a groundwater regime, equipotential lines, the line joining points of equal head on the potentiometric surface, were drawn based on the area of variation of the head of an aquifer. Based on the Water table elevation, ground water flow directions are demarcated (**Fig. 3.4**). It has been observed that

1 The area under study, Nira river is the only perennial river, while its tributaries are seasonal emanating from the hilly terrain and constitute the drainage system in the area. The drainage pattern is mainly dendritic, sub dendritic to sub parallel. The ordering of the stream is upto 7th order. Overall direction of surface water drainage is from northwest to southeast.

2 The water table varies from 500 m amsl near the confluence of Nira and Karha rivers in southeastern part of the area in Baramati Taluka to about 1000 m amsl north-western part of the area in Purandhar Taluka.

3 The ground water movement is mainly controlled by the elevation and topography of the area. The overall ground water movement in the area is from northwest, towards

Nira river and Karha river. The ground water divide almost follows the surface water divide. This indicates the topographic control for the ground water movement. However, close to reservoirs and tanks/ponds (talavs) of the study area, the ground water movement is controlled by artificial recharge to ground water.

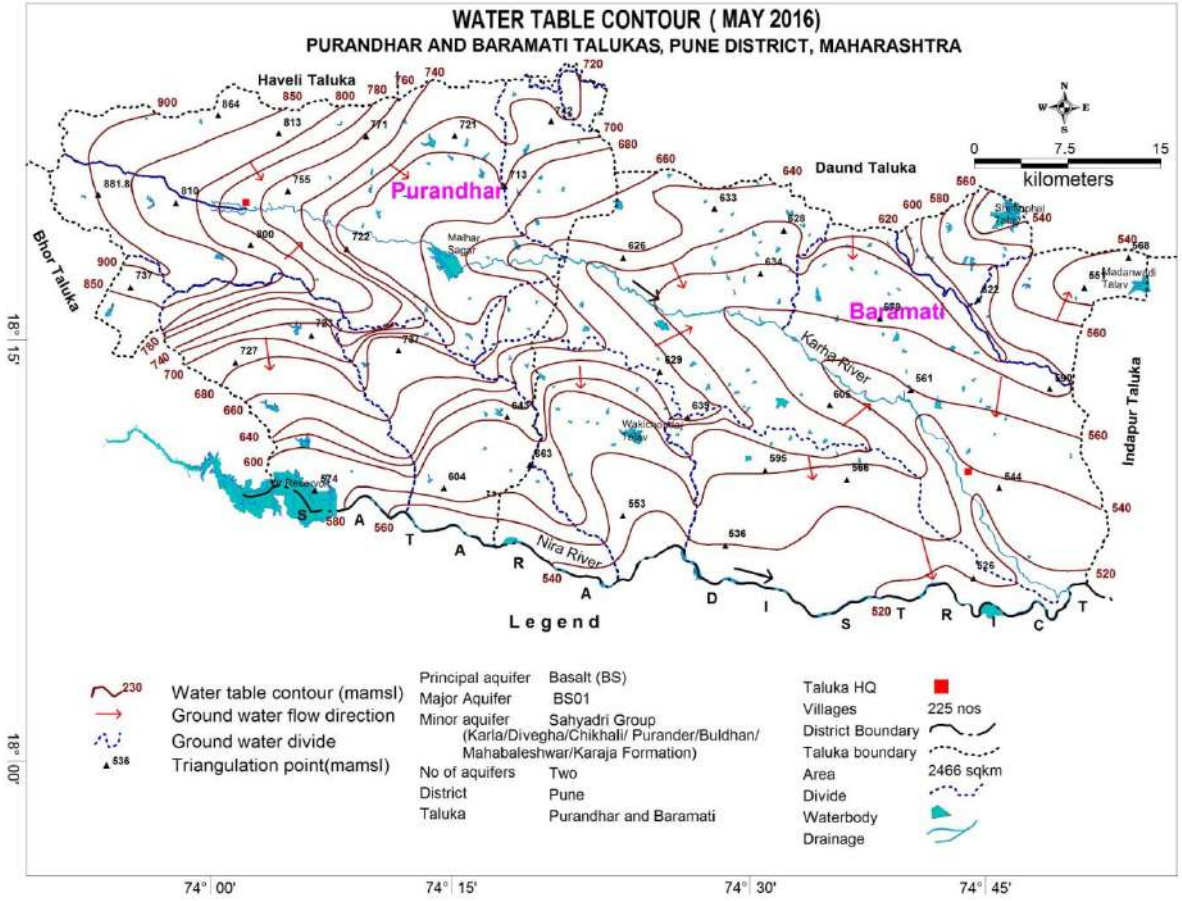


Fig. 3.4: Ground water table contour, Purandhar and Baramati taluka, Pune district

3.1.4 Depth to water level (Deeper Aquifer-II)

The depth to water level scenario of deeper aquifer was generated by utilizing water level data of 26 exploratory/observation wells/Piezometers representing deeper aquifer. The **pre-monsoon** depth to water levels (2016) ranged between 2.3 m bgl (Tandulwadi) and 60 m bgl (Ambhi Khurd). The deeper DTWL (>50 m bgl) has been observed in nort-western part of the Purandhar taluka. The Shallow DTWL (upto 10 m bgl) has been observed in central and southern part of the area. In rest of the area water level ranges between 10 to 30 m bgl. The premonsoon depth to water level for Aquifer –II is given in **Fig. 3.5a** and the details are presented in **Annexure V**.

The post-monsoon DTWL ranges from 1.5 m bgl (Singapur) and 41 m bgl (Jadhawadi) in Aquifer-II and presented in **Fig. 3.5b**. The deeper DTWL (>30 m bgl) has been observed in north-western part of the Purandhar taluka. The Shallow DTWL (less than 5 m bgl) has been observed in southwestern and eastern part of the area. In rest of the area water level ranges between 5 to 30 m bgl.

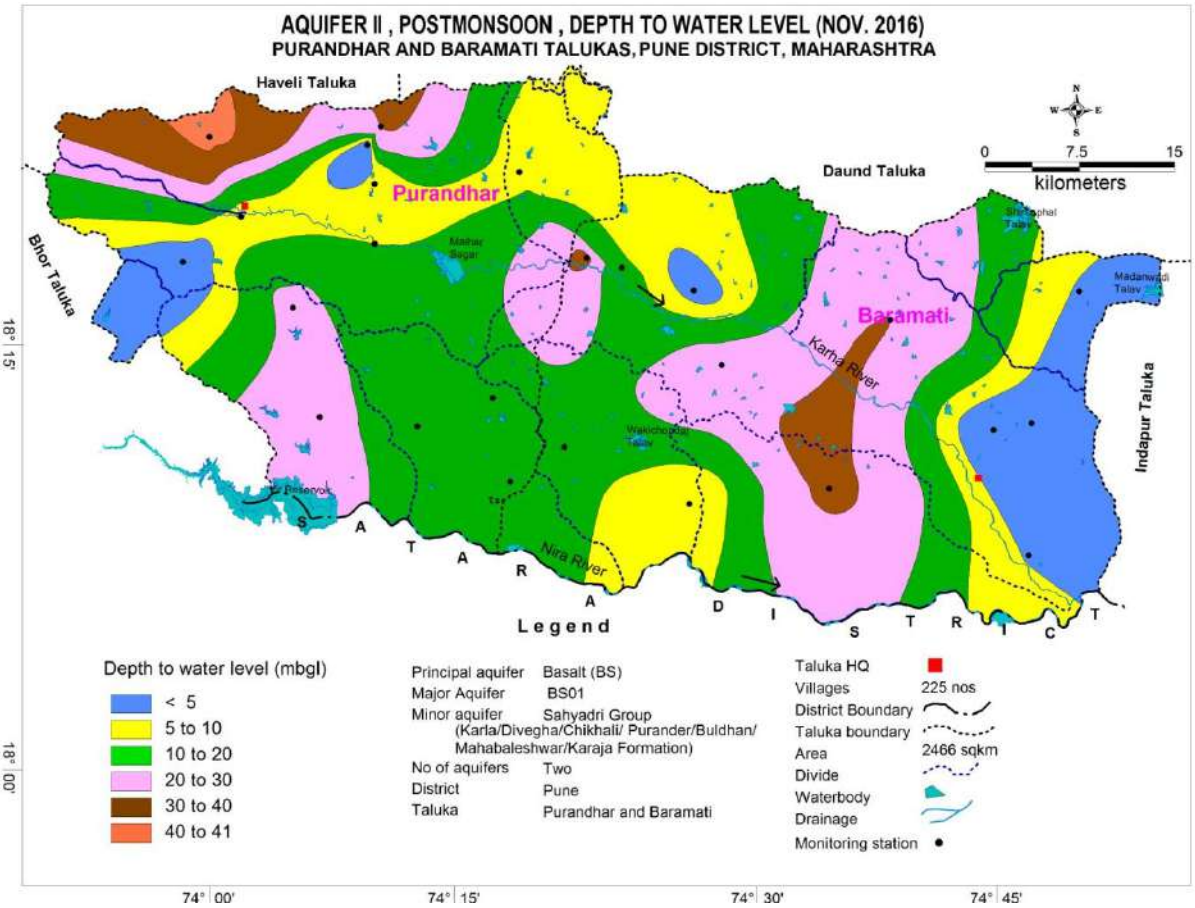


Fig. 3.5a: Pre-monsoon Depth to Water Level (Aquifer–II)

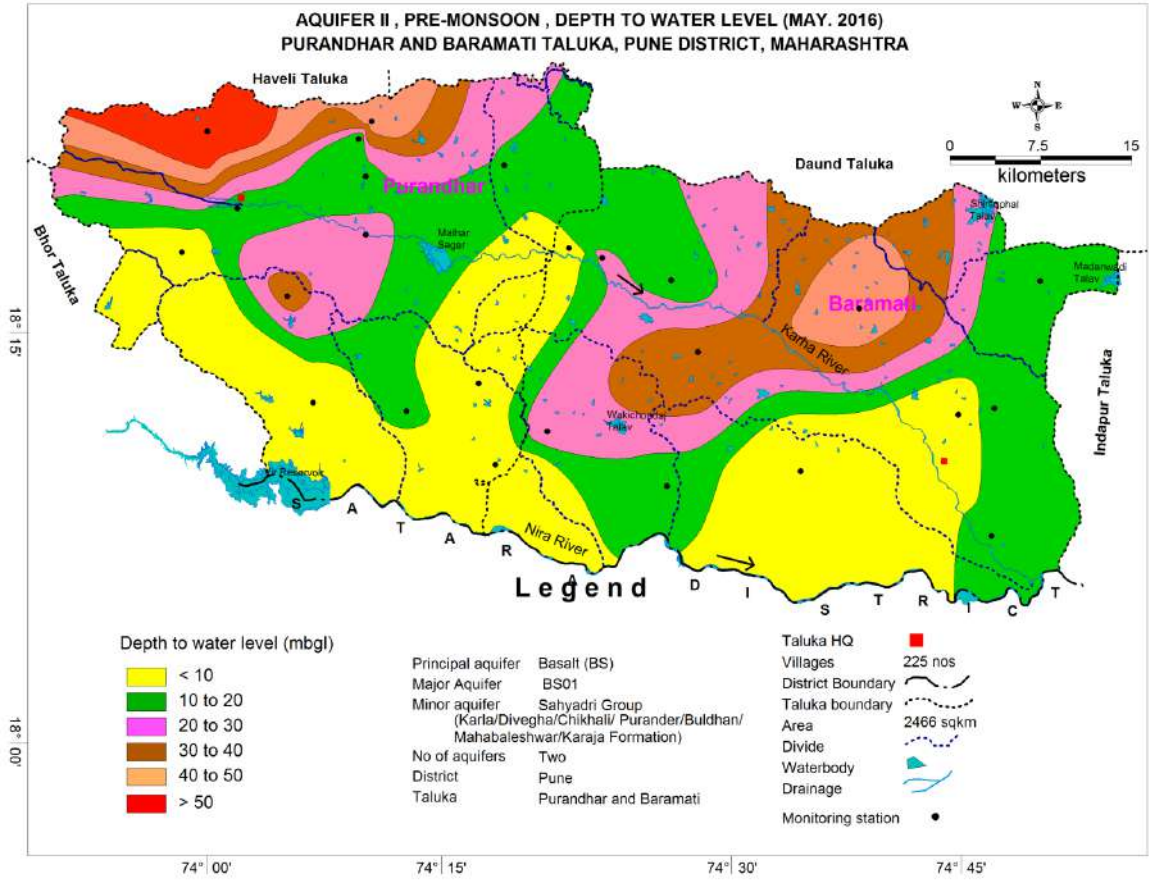


Fig. 3.5b: Post-monsoon Depth to Water Level Level (Aquifer–II)

3.2 Ground Water Quality

The suitability of ground water for drinking/irrigation/industrial purposes is determined keeping in view the effects of various chemical constituents present in water on the growth of human being, animals, various plants and also on industrial requirement. Though many ions are very essential for the growth of plants and human body but when present in excess, have an adverse effect on health and growth. For estimation of the quality of ground water, ground water samples from 38 shallow dug wells, representing Aquifer - I have been collected during pre-monsoon. Similarly, for Aquifer – II, the ground water samples were collected during the drilling and pumping test activities of 19 exploratory / observation wells constructed in Purandhar and Baramati. The ground water samples were analysed for major chemical constituents. The aquifer wise ranges of different chemical constituents present in ground water are given in **Table 3.2.** The details of water quality analysis of **Aquifer I and II** is given in **Annexure VI and Annexure VII**.

Table 3.2: Aquifer wise ranges of chemical constituents in Purandhar and Baramati Talukas

Constituents	Shallow aquifer-I		Deeper aquifer-II	
	Min	Max	Min	Max
pH	7.5	8.4	7.5	8.3
EC	13.8	6818	307	2859
TDS	88.32	4364	162	1538
TH	50	1195	30	1250
Calcium	40	374	8	248
Magnesium	2	281	2	157
Potassium	.07	65.7	.55	14
Sodium	10	1024	41	276
Carbonate	0	29	0	0
Bi-carbonate	39	498	49	360
Chloride	3	1439	43	681
Sulphate	23	1287	4	314
Nitrate	7	52	7	353
Fluoride	.05	2.89	.09	1.08

It is observed from the Table 3.2, that the quality of ground water in deeper aquifer is better to the shallow aquifer.

- The EC values are found more than 2250 µS/cm at Bhondwewadi, Jalgaon supe, Nirvagaj, Medad and Jwalarajun in aquifer I and at Chandgudewadi and Rui in Aquifer-II.
- Aquifer-I at Medad and Aquifer-II at Chandgudewadi is contaminated with fluoride (2.89 mg/l and 1.08 respectively).
- However, the nitrate contamination have been observed in both shallow as well as in deeper aquifers. In Aquifer-I is observed at Nirvagaj, Pimpale, Daundaj, Gojubavi, Dive,

Karanje and Jawalarjun, while in Aquifer-II, it is observed in Saswad, Singapur, and Sreechiwadi.

- Rest of the constituents are found within the permissible limit as per BIS norms.

The iso-conductivity map of Aquifer I and II has been prepared and presented as **Fig 3.6a** and **Fig 3.6b** respectively. On perusal of the **Fig 3.6a** it is observed that the electrical conductivity for shallow aquifer-I in Purandhar and Baramati taluka is within Permissible Limit (2250 µMhos/cm @ 25°C) except at Bhondwewadi, Jalgaon supe, Nirvagaj, Medad and Jwalarajun (High EC), Aquifer-II at Chandgudewadi and Rui ((High EC).

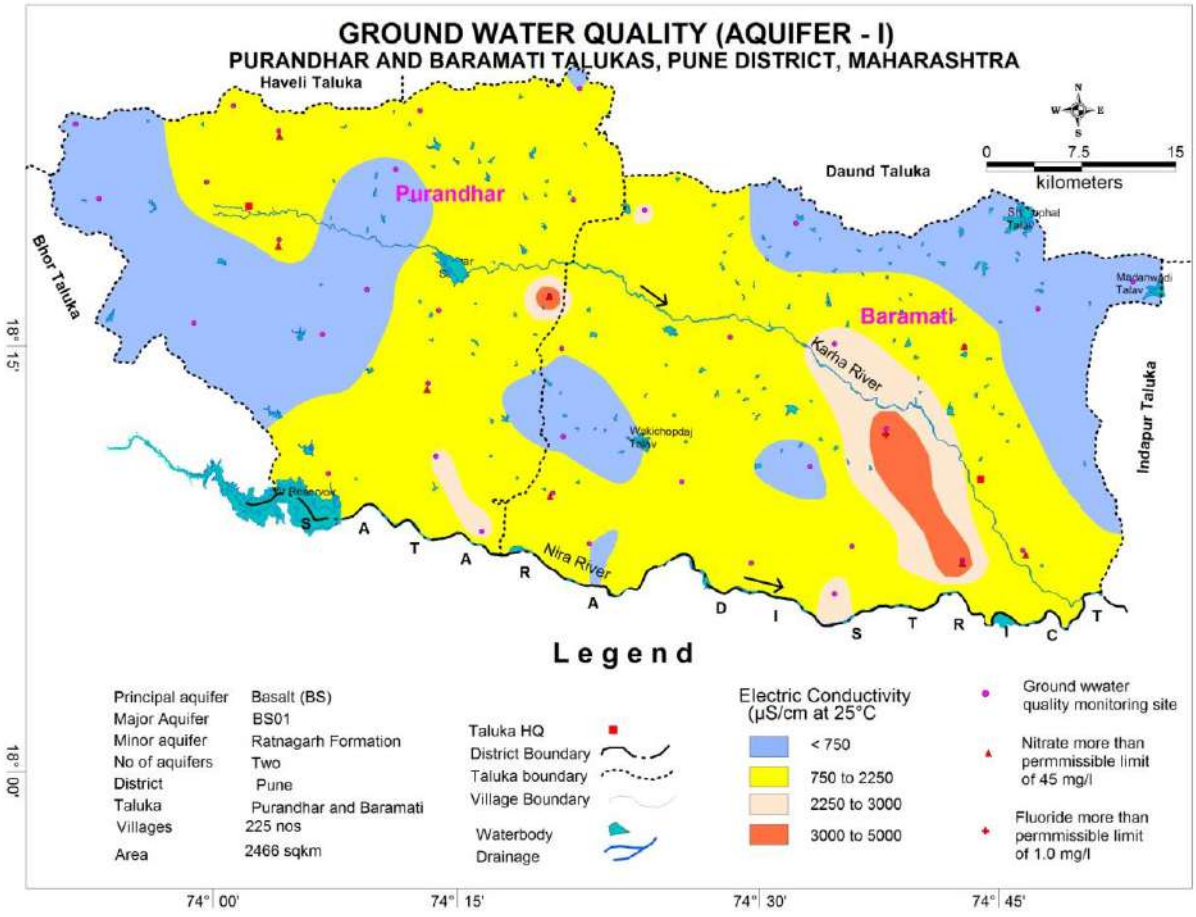


Fig. 3.6a: Aquifer-I, Iso conductivity, Purandhar and Baramati taluka, Pune district

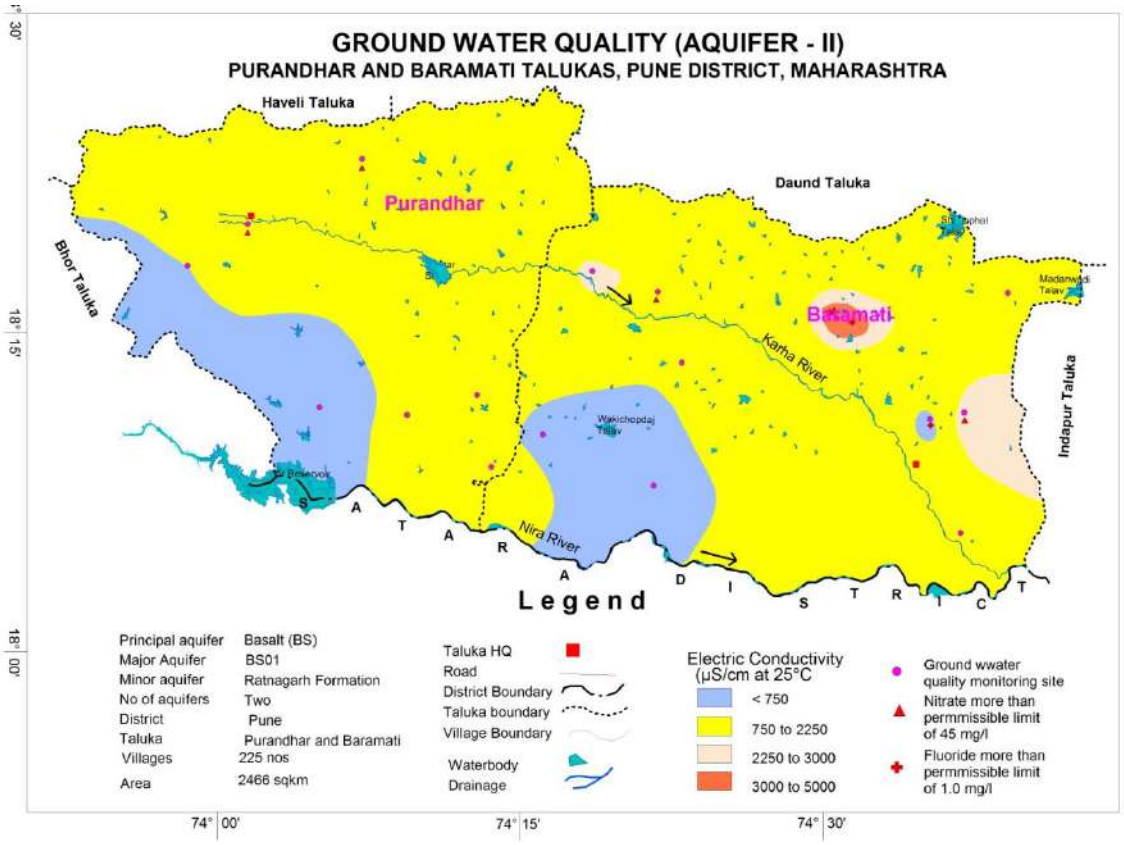


Fig. 3.6b: Aquifer-II, Iso conductivity, Purandhar and Baramati taluka, Pune district

3.3 3-D and 2-D Aquifer Disposition

The data generated from ground water monitoring wells, micro level hydrogeological inventories, exploratory and observation wells, various thematic layers was utilized to decipher the aquifer disposition of the area. This particularly includes the information on geometry of aquifers and hydrogeological information of these aquifers. In the area, Deccan Trap Basalt is the only formation and within it two aquifer systems has been deciphered as listed below:

Deccan Trap Basalt –

a. **Aquifer – I (Shallow Aquifer): 8 to 28 m**
b. **Aquifer – II (Deeper Aquifer): 20 to 174 m**

The fence diagram indicating the disposition of various aquifers is presented in **Fig.3.7** and 3-D representation is presented in **Fig. 3.8 and Fig 3.9**. The disposition of Aquifer-I and Aquifer-II followed by massive basalt can be observed in the Fence. In the north-eastern parts of Baramati and southern parts of Purandar taluka, the cumulative depth of Aquifer-I and II is more, elongated parts, indicating potential areas of ground water. Whereas in central east west parts of Purandar and Baramati talukas , the depth of Aquifer-I and II and the thickness of aquifer is restricted.

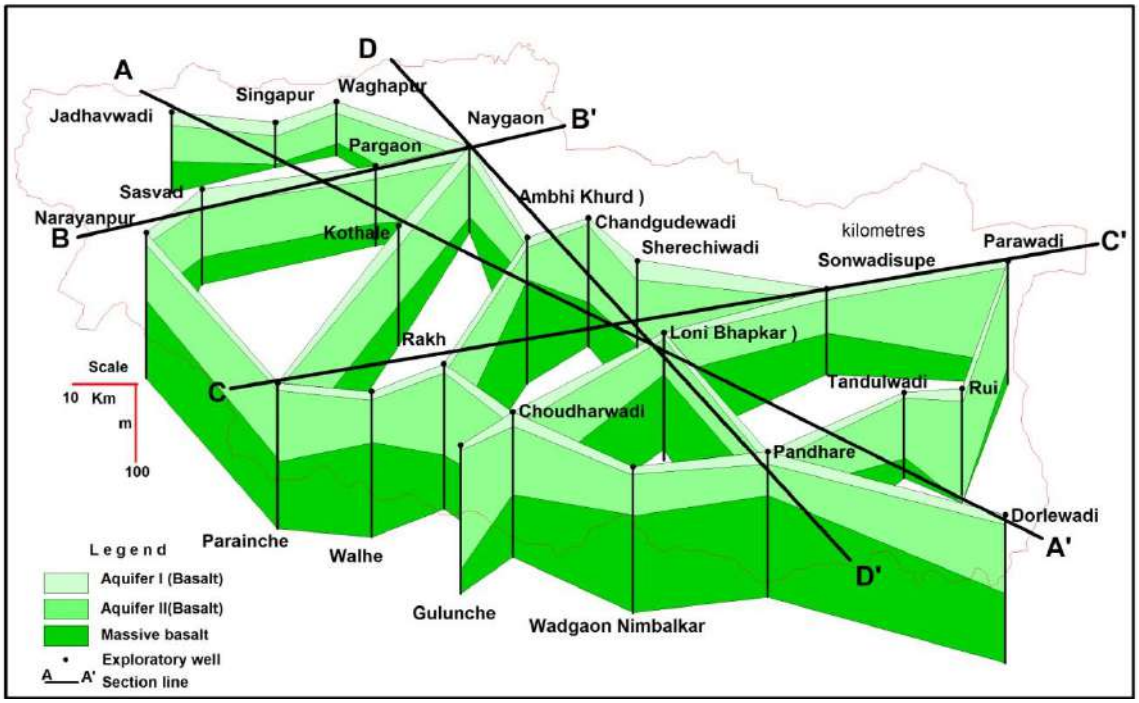


Fig. 3.7: 3-D Fence diagram, Purandhar and Baramati taluka, Pune district

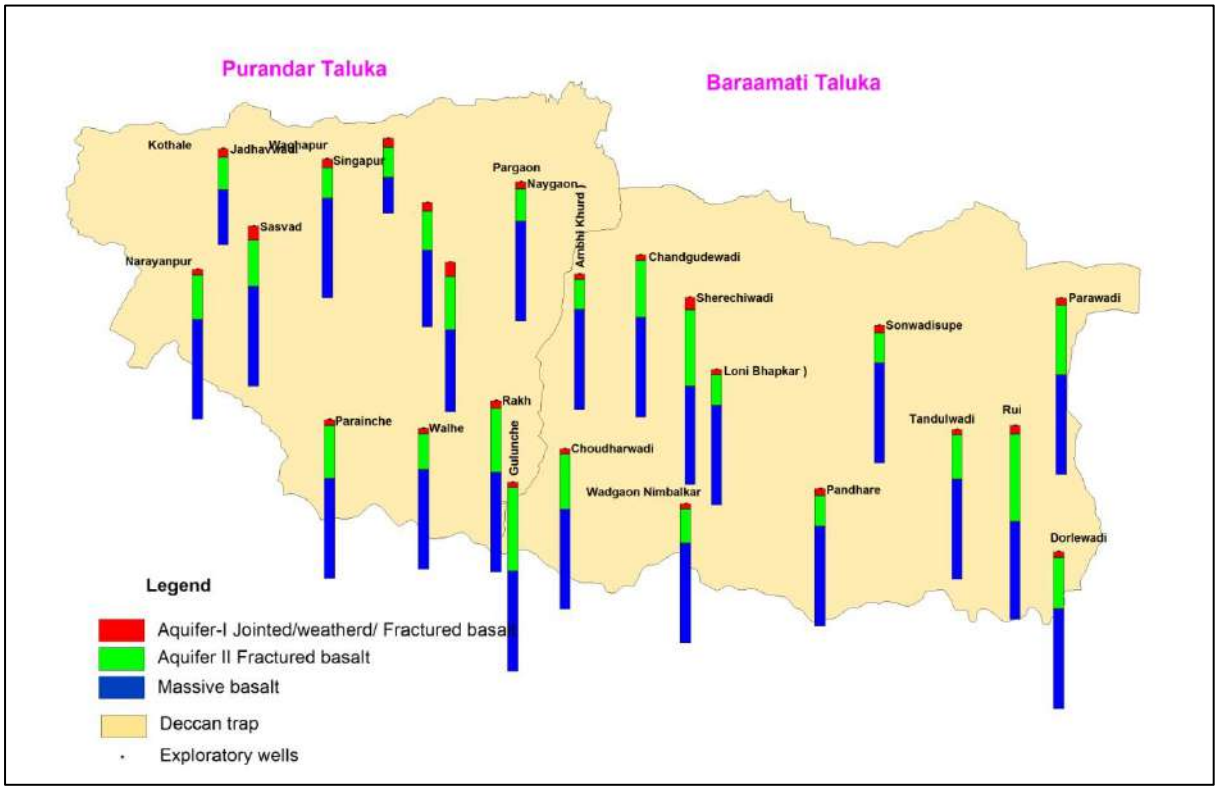


Fig. 3.8: Sub surface Aquifer disposition based on litholog, Purandhar and Baramati taluka, Pune district

To visualize the Aquifer-I and Aquifer-II, a schematic 3-D aquifer disposition has been prepared and shown in **Fig. 3.9.**

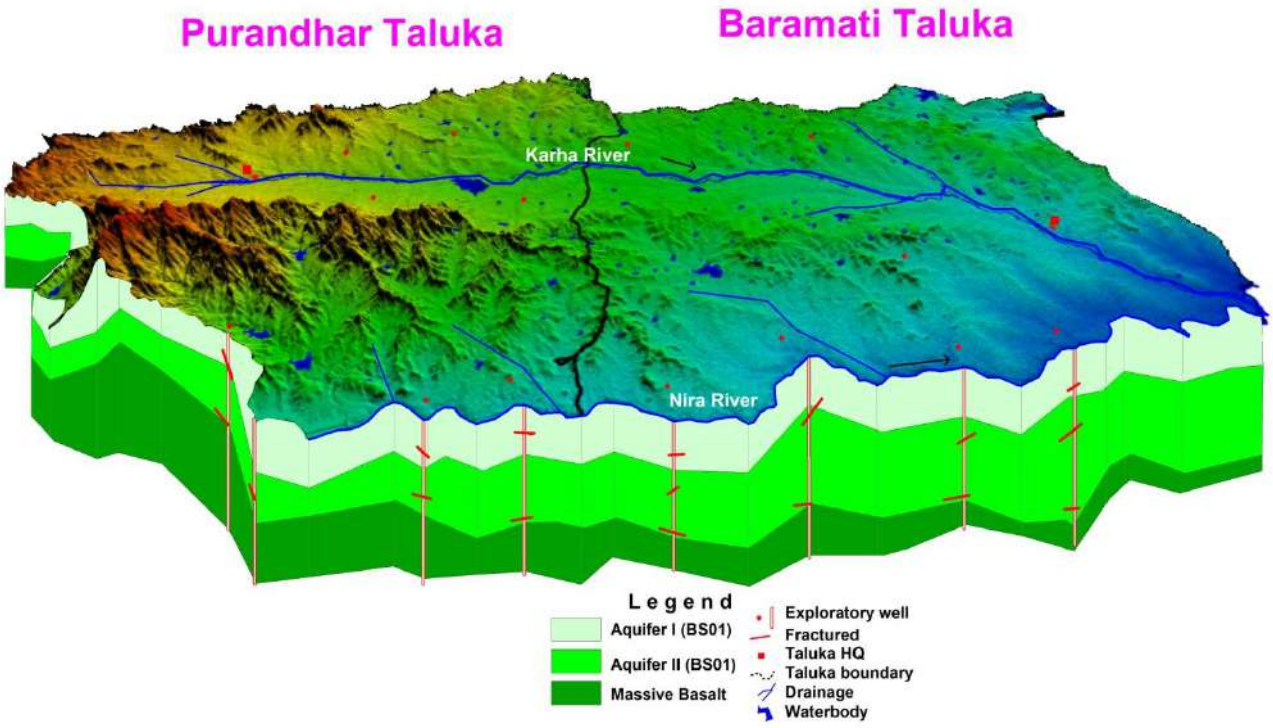


Fig. 3.9: Schematic 3-D Aquifer Disposition, Purandhar and Baramati taluka, Pune district

The 2-D map showing spatial disposition and vertical extent of **Aquifer-I** indicating its depth of occurrence and fractured rock thickness has been generated and shown in **Fig 3.10**, whereas that of **Aquifer-II** is presented in Fig.**3.11.,** cumulative thickness of aquifers are presented in **fig 3.12.** The perusal of **Aquifer-I map** indicates in major part the shallow aquifer is observed upto 20 m and thickness of the aquifer is upto 10 m. In northern and southern parts of Purandhar taluka and in northern parts of Baramati taluka maximum depth (28 m) and thickness (upto 18 m) of Aquifer-I is observed which implies that this parts are having good ground water potential. In southwestern part of Purandhar taluka hilly, the aquifer depth is restricted to 10-15 m and the thickness of aquifer is restricted to 8 m.

The perusal of **Aquifer-II map** indicates in major part the deeper aquifer is observed upto 120 m depth and thickness of upto 6 m. In southern eastern part parts of Purandhar taluka and north eastern parts of Baramati taluka, maximum depth of Aquifer -II is upto 140 to 162 m, is observed, however even in this 140-160 m depth, the thickness of fractured rock is limited to 6 to 12 m. Thus the water bearing zones in Aquifer-II are limited in the area and the borewell construction is not feasible in the areas except when located in the potential areas.

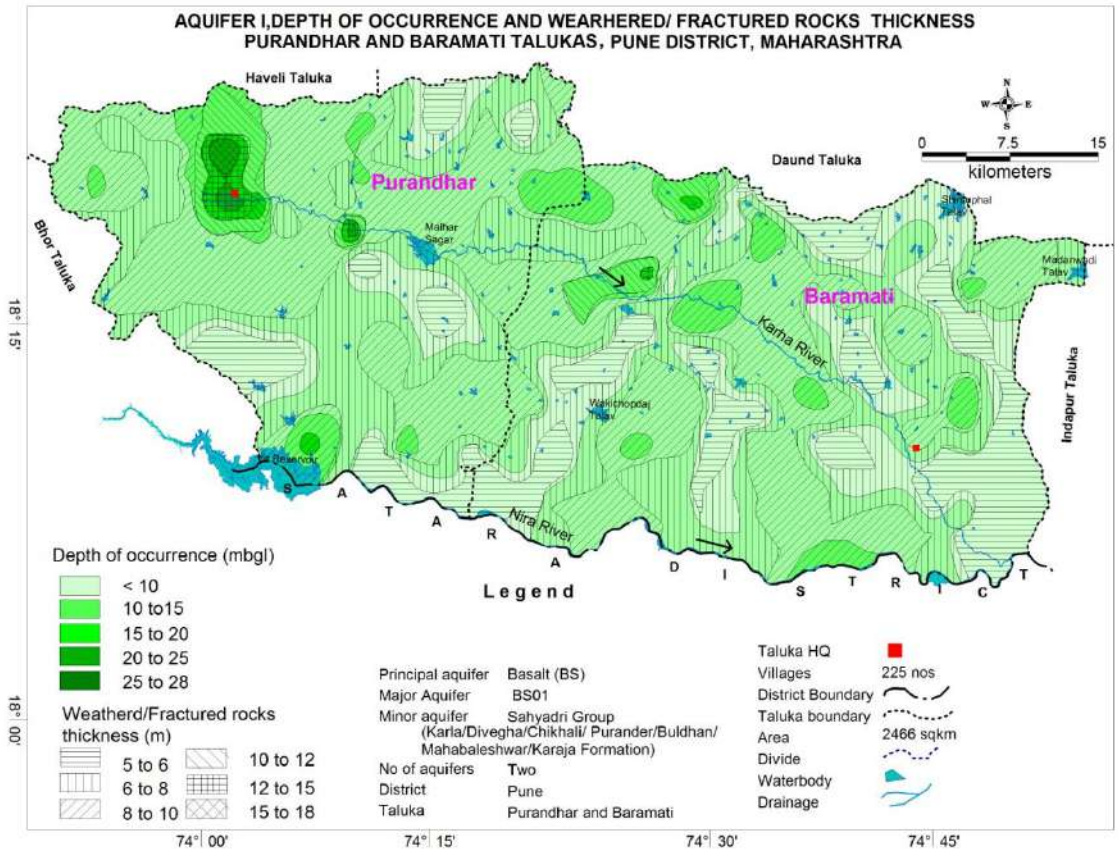
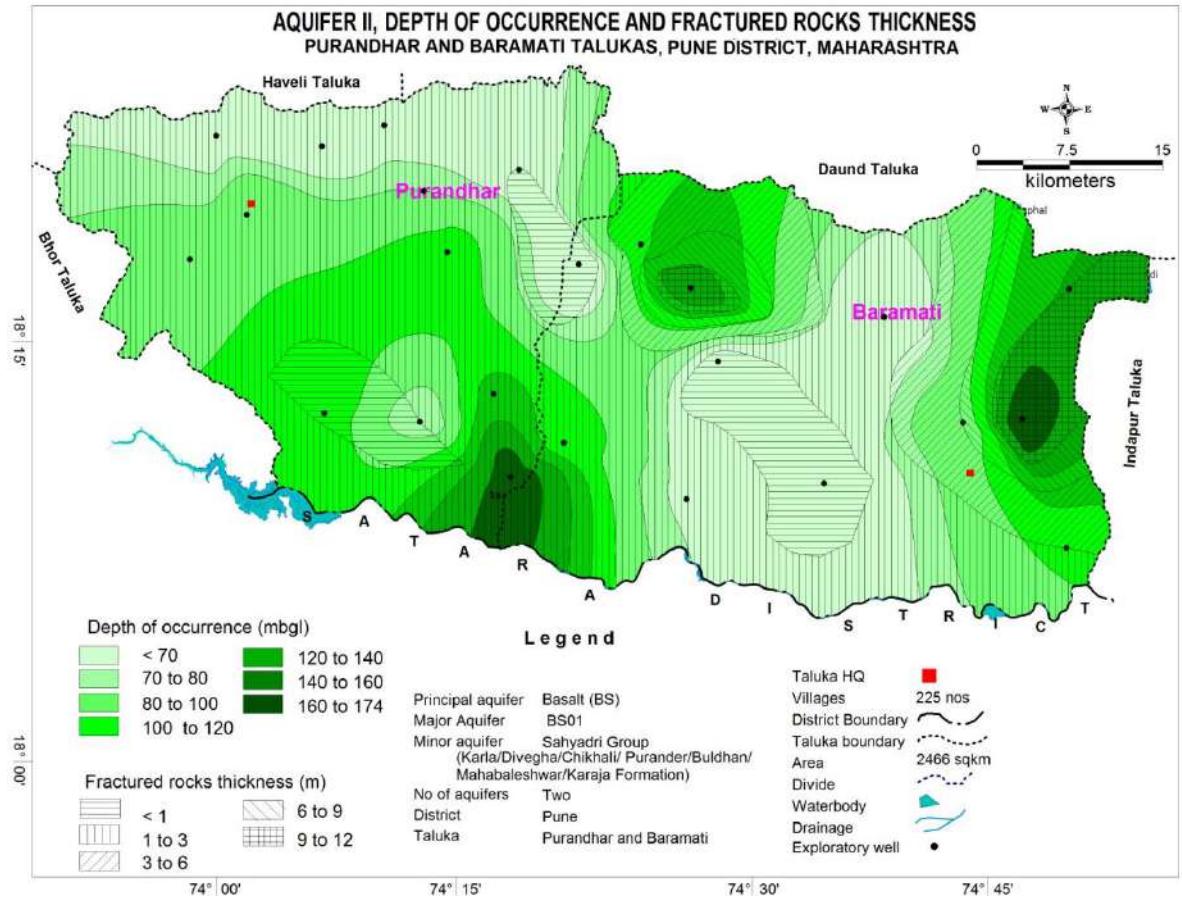


Fig. 3.10: Aquifer-I: Depth of occurrence and Weatherd/ Fractured rocks thickness



g. 3.11: Aquifer-II: Depth of occurrence and Fractured rocks thickness

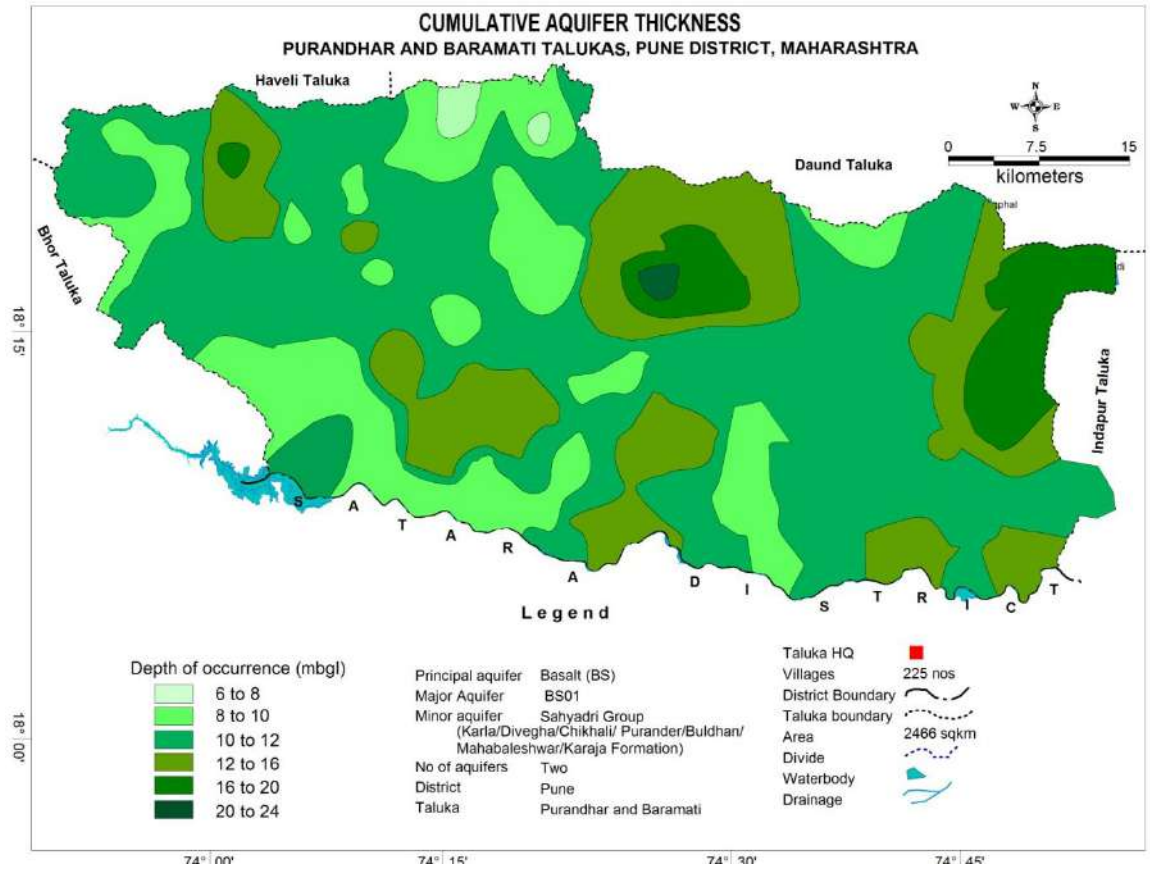


Fig. 3.12: Thickness of Fractured/weatherd Basalt

3.3.1 Hydrogeological Cross Sections

Based on ground water exploration a sub-surface lithological section has been prepared to know the lithological continuity and its extent. The aquifer disposition in detail, various hydrogeological cross section indicating aquifer geometry has been prepared viz. A-A' representing northwest – southeast direction (across both Purandhar and Baramati Talukas), B-B' representing south-southwest- north-northeast direction (across Purandhar Taluka), C-C' representing south-southwest- north-northeast direction (across Purandhar and Baramati Talukas) and D-D' representing north-northwest – south-southeast direction (across both Purandhar and Baramati Talukas), as marked in **Fig. 3.7.** The sections are shown in **Fig 3.13** to **3.16.**

3.3.1.1 Hydrogeological Cross Section A-A'

Section A-A'**(Fig 3.13)** represents the entire basaltic terrain sub-surface hydrogeology & aquifer disposition along Jadhawadi to Dorlewadi area (NW – SE section), ranging in depth from 112 to 200 m bgl. The data of 5 exploratory wells i.e., Jadhawadi, Pargaon, Kothale, Loni Bhapkar and Dorlewadi has been utilised. The Basalt has been encountered down to depth of 200 m bgl. The thickness of aquifer is observed less in Loni Bhapkar with a low discharge of 0.4 lps. Three fracture zones are encountered in aquifer-II at Dorlewadi, with a cumulative discharge of 3 lps. The water levels have also been depicted in the section and a close observation of water level indicates that the water levels of both shallow and deeper aquifer-I and II are entirely different and at Jadhawadi, the waterlevel is deeper for aqifer II.

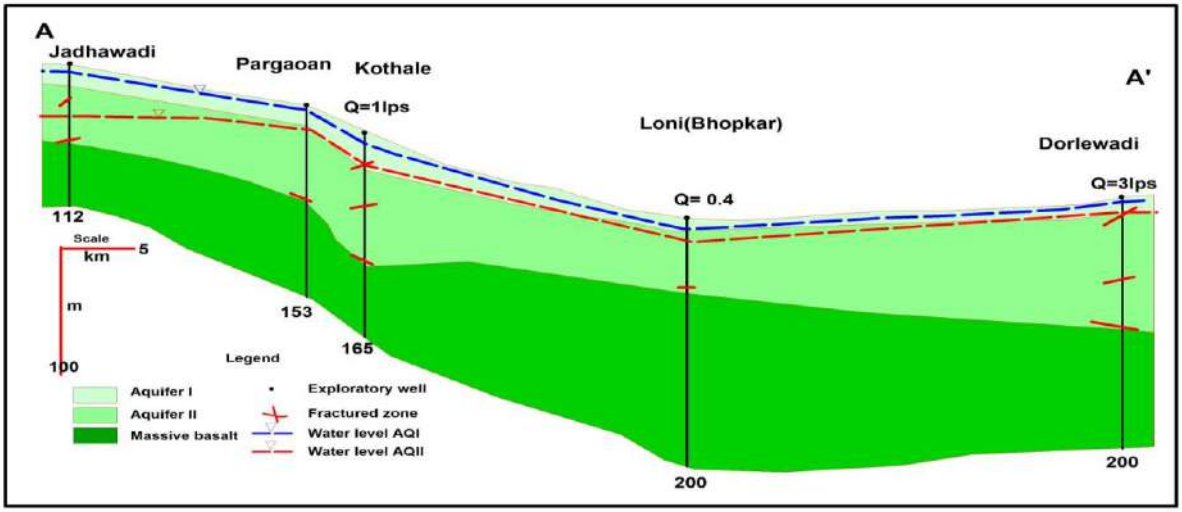


Fig. 3.13: Lithological section A-A', Purandhar and Baramati Talukas, Pune district

3.3.1.2 Hydrogeological Cross Section B-B'

Section B-B'**(Fig 3.14)** represents the major part consisting of basaltic terrain sub-surface hydrogeology & aquifer disposition along Narayanpur to Naygaon (WSW – ENE section), down to 200m bgl. The data of 4 exploratory wells i.e., Narayanpur, Saswad, Pargaon and Naygaon has been utilised. The water levels have also been depicted in the section and it indicates that the water levels of both aquifer-I and II are entirely distinct, shallow in aquifer-I and deep in aquifer-II except at Narayanpur, where water level is shallow (almost coinciding) for both shallow aquifer-I and deeper aquifer-II. The combined dishage of both aquifers is high (7.76 lps) at Narayanpur. The Aquifer-I (Shallow) has water levels residing within the aquifer zone.

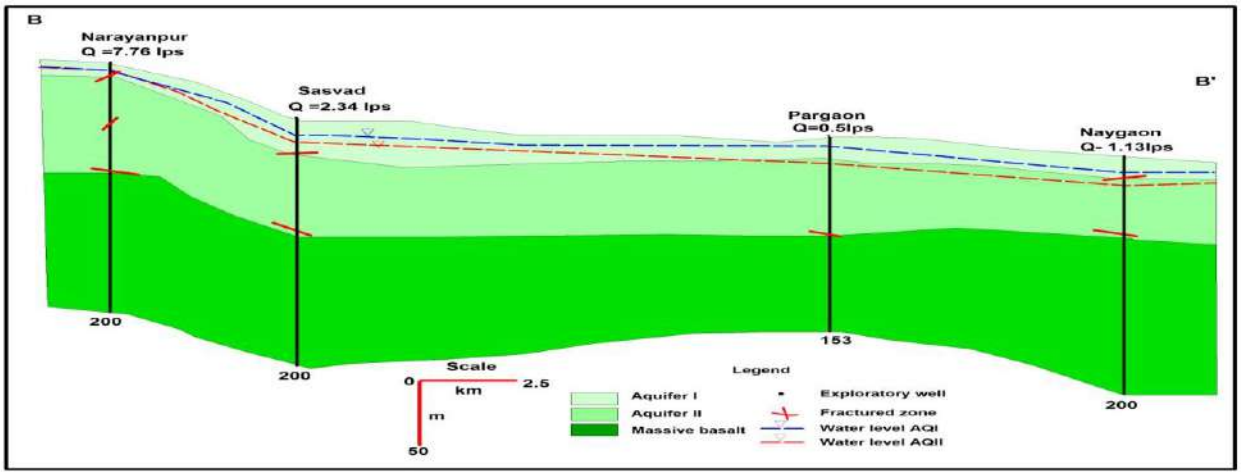


Fig. 3.14: Lithological section B-B', Purandhar Taluka, Pune district

3.3.1.3 Hydrogeological Cross Section C-C'

Section C-C'(Fig 3.15) represents the major part consisting basaltic terrain sub-surface hydrogeology & aquifer disposition along Parinche to Parwadi (WSW – ENE section) with depth down to 200 m bgl. The data of 6 exploratory wells i.e., Parinche, Walhe, Rakh, Loni Bhapkar, Sonwadisupe and Parwadi have been utilised. The thickness of Aquifer-II (Deeper aquifer) is found relatively more in & around Parinche, Rakh and Parwadi. The water levels have also been depicted in the section and it indicates that the water levels of both shallow and deeper aquifer-I and II are quite distinct. At Parwadi, one fracture zone in aquifer-I and two fracture zones in aquifer-II are encountered with acummulative discharge of 7.78 lps.

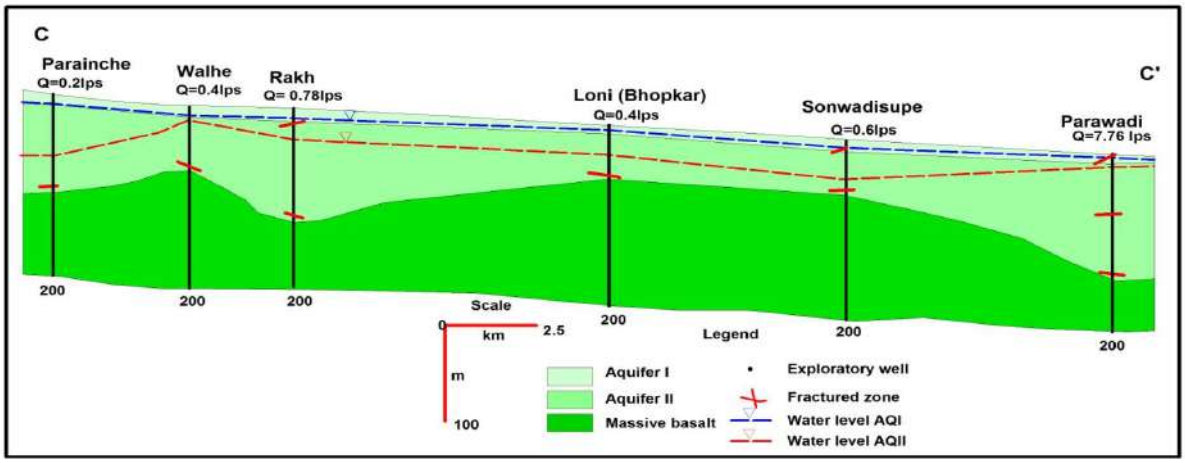


Fig. 3.15: Lithological section C-C', Purandhar and Baramati Talukas, Pune district

3.3.1.4 Hydrogeological Cross Section D-D'

Section D-D' represents the basaltic terrain sub-surface hydrogeology & aquifer disposition along Naygaon to Pandhare, with depth down to 200m bgl. The data of 4 exploratory wells i.e., Naygaon, Ambi khurd, Loni Bhapkar and Pandhare (NNW – SSE section) has been utilised. The thickness of Aquifer-I (Shallow) and Aquifer-II (Deeper aquifer) is uniform along the section. The water levels have also been depicted in the section and it indicates that the water levels of both shallow and deeper aquifer-I and II are entirely distinct, shallow in aquifer-I and deep in aquifer-II except at Naygaon, where water level is shallow (almost coinciding) for both shallow aquifer-I and deeper aquifer-II.

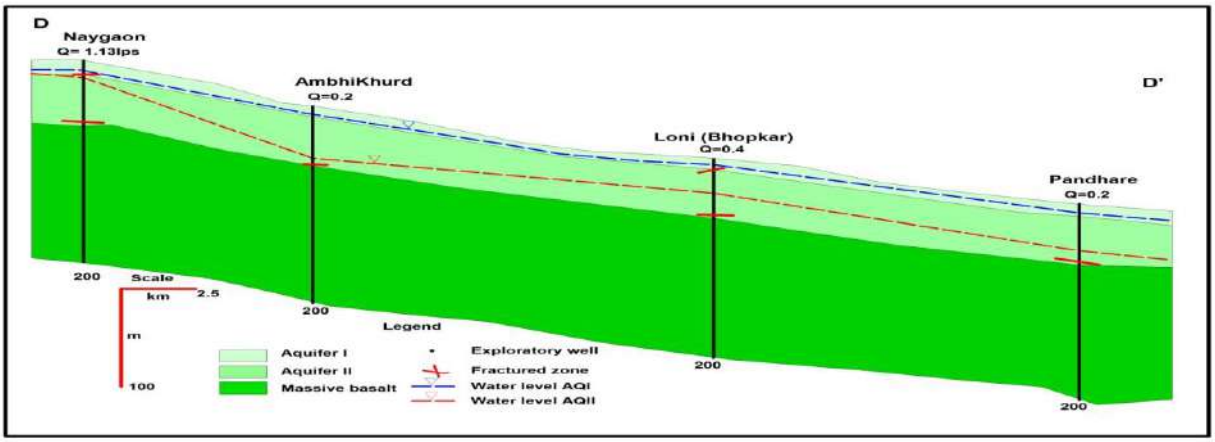


Fig. 3.16 : Lithological section D-D', Purandhar and Baramati Talukas, Pune district

3.4 Aquifer Characteristics

Basalt forms the main aquifer of the area and comprises two distinct units viz, upper vesicular unit and lower massive unit. The massive basalt is hard, compact and does not have primary porosity and hence impermeable. Weathering, jointing and fracturing induces secondary porosity in massive unit of basalt. In vesicular basalt, when vesicles are interconnected constitutes good primary porosity and when the vesicles are filled/ partly filled the porosity is limited. Ground water occurs under phreatic/ unconfined to semi-confined conditions in basalts.

Based on extensive analysis of historical data, micro level hydrogeological survey data generated and ground water exploration carried out in the Purandhar and Baramati talukas, the following two types of aquifers can be demarcated and the details are given below in Table-3.3.

Table 3.3 Aquifer Characteristic of Purandhar and Baramati Taluka, Pune district

Aquifer	Formation	Depth range (mbgl)	SWL (mbgl)	Thickness (m)	Fractures Zones encountered (m bgl)	Yield	Sustaina-bility	Aquifer parameter (Transmissivity)	Sy/S	Suitability for drinking/ irrigation
Aquifer-I	Weathered/ Fractured /Jointed Basalt	8-28	2 to 17.5	5 to 18	8 to 28	5 to 100 m^3/day	1 to 2 Hours – recurring	Sp capacity 1.7-18.9 lpm/m K 12 -65 m/day	0.02	Yes for both (except Nitrate affected villages for drinking)
Aquif	Jointed/Fractured Basalt	20-174	1.5 to 60	0.5 to 12	20 to 174	25 - 200 LPM	1 to 2 hours	T-18-89 m^2/day	0.00034 to 6.37 $x10^{-4}$	Yes for both

Aquifer-I in the area predominantly consists of weathered fractured and jointed basalt and exposed almost covering entire area. It is 'Unconfined Shallow Aquifer', occurs in Deccan trap basalt. Ground water is present in pore spaces in the vesicular unit of each flow and in the weathered fractured and jointed portions of massive unit. However, secondary porosity and permeability that has been developed due to weathering and fracturing play a very important role in the storage and movement of ground water. Weathering not only produces granular materials but also widens the fractures, joint and shear zones and constitute ground water potential aquifers in the area.

The Aquifer-I is observed in the depth range of 8 to 28 m bgl with water levels of 2.0 to 17.5 m bgl and thickness of 5.00 to 18 m. The fractures are encountered upto 28 m bgl. The yield of the dugwells tapping this aquifer generally ranges from 5 to 100 m^3/day which susitains from 1 to 2 hs. Sp capacity ranges from 1.7 to 18.9 lpm/m and permeability ranges from 12 -65 m/day. The transmissivity ranges from 3.5 to 45 m^2/day. The overall groundwater quality is suitable for both drinking/domestic and irrigation purposes except at few villages where nitrate contamination is observed. Based on Ground Water Exploration, map of Aquifer –I depicting depth of occurrence and fractured rock thickness is generated and shown in **Fig 3.17.**

Dugwells tapping Basalt in south-eastern part along Nira river of Baramati Taluka and Nira canal command area is high and ranges between 50 to 100 m^3/day. Around 50% area is having moderate yield in the range of 25 to 50 m^3/day. Rest of the taluka is having low yield in the range of 15 to 25 m^3/day. About 20% areas is having low yield in the range of 15 to 25 m^3/day. Central and north-central part of area is dry due to poor rainfall and negligible recharge during the current year, 2016-17. The yield potential map of Aquifer-I for Purandhar and Baramati taluka is shown in **Fig. 3.18**.

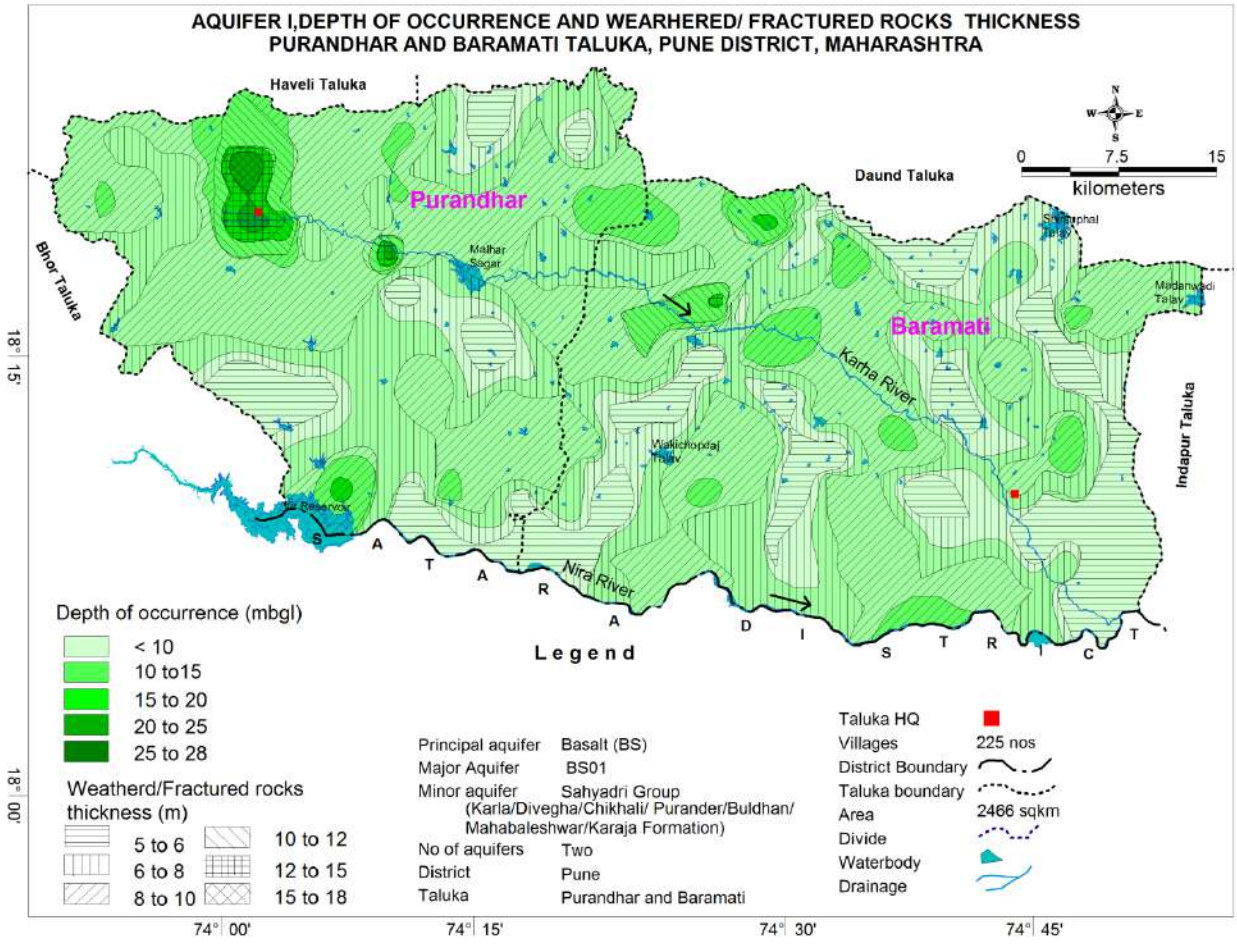


Fig. 3.17: Aquifer-I, Depth of occurrence and weatherd/fractured rocks thickness.

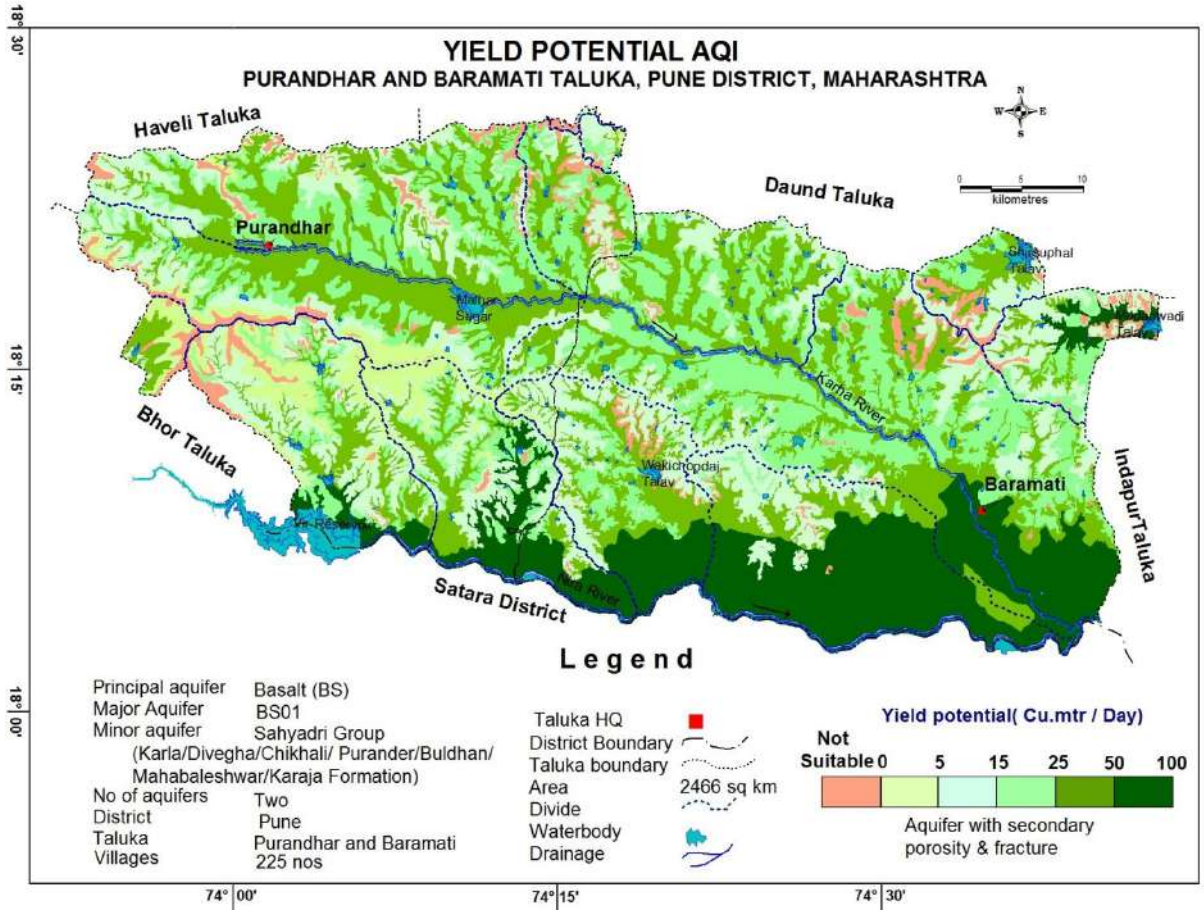


Fig. 3.18: Aquifer-I , Yield potential, Purandhar and Baramati taluka, Pune district

Aquifer II – Semi-confined to Confined Deeper Aquifer. Generally occurs in Deccan trap basalt. The Aquifer-II is observed in the depth range of 20 to 174 m bgl with water levels of 1.5 to 60 m bgl and thickness of 0.50 to 12 m. The fractures are encountered upto 174 m bgl. The yield of the borewells tapping this aquifer generally ranges from 25 to 200 lpm which susitains from 1 to 2 hs. The transmissivity ranges from 18-89 m^2/day m^2/day. The overall groundwater quality is suitable for both drinking/domestic and irrigation purposes except at Maragsur where fluoride contamination is observed. Based on Ground Water Exploration, map of Aquifer-II depicting depth of occurrence and fractured rock thickness is generated and shown in **Fig 3.19**.

The data of exploratory wells reveals that, in Baramati Taluka high yielding area is restrict to northeastern and ranges between 1 to 2 lps in terms of sustainability. Rest of the area is having moderate to low yield in upto 1 lps. Whereas, In Purandhar taluka, major part is having low to moderate yield of bore wells in the range of 0.5 to 1 lps. The yield potential map of Aquifer-II for Purandhar and Baramati taluka is shown in **Fig. 3.20.**

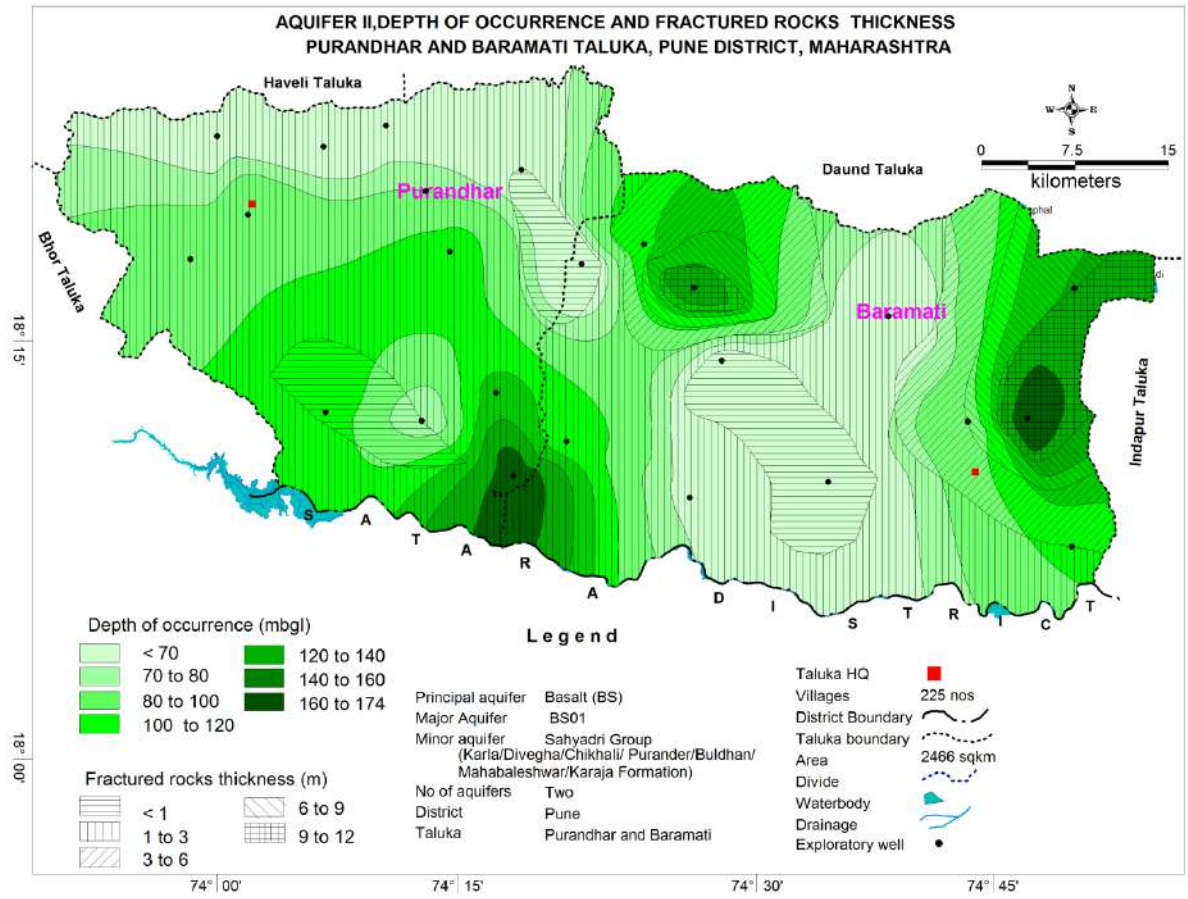


Fig. 3.19: Aquifer-II, Depth of occurrence and fractured rocks thickness

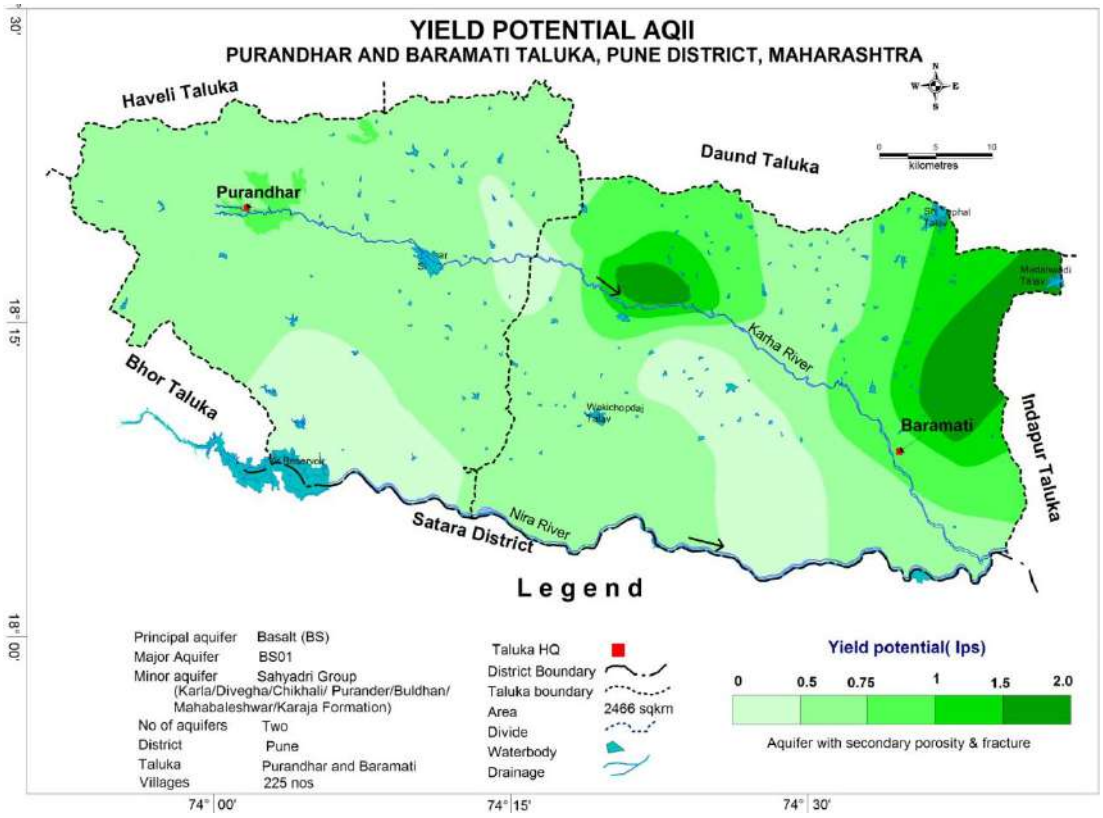


Fig. 3.20: AquiferII- yield potential, Purandhar and Baramati taluka, Pune district

4 GROUND WATER RESOURCES

The ground water resources have been assessed for two types of aquifer existing in the area i.e., Aquifer-I and Aquifer-II. The details of the assessment are discussed below.

4.1 Ground Water Resources – Aquifer-I

The ground water resource assessment has been carried out for command and non-command areas separately after excluding the hilly areas and the salient features of the resources are given in **Table 4.1, 4.2** and **4.3**. As per Table-4.1, out of the total 246609 ha area, recharge worthy areas are 37865.61 ha in command areas and 191661.7 ha in non-command areas, whereas 11305.83 ha area is not worthy for recharge on account of its hilly nature.

Table-4.1: Ground Water Recharge Worthy Areas for Resource Estimation

Name of Administrative Unit	Type of rock formation	Areal extent (in hectares)				
		Total Grographical Area	Hilly Area	Ground Water Recharge Worthy Area		
				Command area	Noncommand area	Poor ground water quality area
Baramati	Basalt	138363.37	578.70	35947.73	96741.92	5095.02
Purandhar	Basalt	108246.37	10727.12	1917.88	94919.76	681.61

4.1.1 Recharge Component

During monsoon season, the rainfall recharge is the main recharge parameter, which is estimated as the sum total of the change in storage and gross draft. The change in storage is computed by multiplying groundwater level fluctuation between pre and post monsoon periods with the area of assessment and specific yield. Monsoon recharge can be expressed as:-

$$R = h \times Sy \times A + DG$$

where,

h = rise in water level in the monsoon season, S_y = specific yield

A = area for computation of recharge, D_G = gross ground water draft

The specific yield value as estimated from dry season balance method or field studies was taken, wherever available. In absence of field values of specific yield values through above methods recommended values as per GEC-1997 norms has been taken. The specific yield value for Deccan Traps - 0.002 to 0.03. Here, the value for Specific yield is taken as 0.02.

The monsoon ground water recharge has two components- rainfall recharge and recharge from other sources. The other sources of groundwater recharge during monsoon season include recharge from rainfall, seepage from canals, surface water irrigation, tanks and ponds, ground water irrigation, and water conservation structures.

During the non-monsoon season, rainfall recharge is computed by using Rainfall Infiltration Factor (RIF) method. Recharge from other sources is then added to get total non-monsoon recharge. As the area is occupied by Deccan traps, the factor is taken as 0.07 to

0.14 depending on the formation, which is weathered basalt and vesicular jointed basalt. The details of Recharge parameters are given in **Table 4.2.**

Table-4.2: Recharge Components evaluated for Resource Estimation

Administrative Unit	Command / Non-Command / Total	Recharge from rainfall during monsoon season	Recharge from other sources during monsoon season	Recharge from rainfall during non-monsoon season	Recharge from other sources during non-monsoon season	Total Annual Ground Water Recharge	Provision for Natural Discharges	Net Annual Ground Water Availability
Baramati	Command	2023.58	1167.88	111.34	7034.20	10337.0	820.99	9516.01
Baramati	Non Command	6007.65	681.38	651.45	2353.11	9693.58	484.68	9208.90
Baramati	Total	8031.23	1849.25	762.79	9387.31	20030.6	1305.67	18724.91
Purandhar	Command	97.00	294.07	6.26	1983.55	2380.9	119.04	2261.83
Purandhar	Non Command	6808.03	693.23	841.45	2996.28	11338.	566.96	10772.04
Purandhar	Total	6905.03	987.30	847.70	4979.83	13719.9	685.99	13033.87

It is estimated that the *recharge from rainfall during monsoon season* is 14936.26 while it is 1610.49 during non-monsoon. Considering the *natural discharges* of 1991.66 ham, *net ground water availability* estimated as 13ham for Baramati Taluka and 31758.78 ham for Purandhar and Baramati Talukas.

4.1.2 Discharge Component

The discharge parameters include natural discharge in the form of springs and base flow and discharge for ground water irrigation, domestic and industrial draft. The annual gross draft for all uses is estimated at 17942.68 ham for Baramati Taluka and 12364.53 ham for Purandhar Taluka with irrigation sector being the major consumer. The annual draft for domestic and industrial uses was 464.85 ham for Baramati Taluka and 334.25 ham for Purandhar Taluka. The allocation for domestic & industrial requirement supply up to next 25 years is about 780.16 ham for Baramati Taluka and 579.21 ham for Purandhar Taluka (Table 4.3). The Stage of ground water development of Purandhar and Baramati taluka is 94.86% and 95.82% respectively and categorised as Semi Critical (Fig.4.1). The details of ground water resources are given in **Table 4.3.**

TABLE 4.3 Ground water resources, Purandhar and Baramati taluka (2013)

Taluka	Command/ Non-command	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross GW Draft for domestic & industrial water supply	Existing Gross GW Draft for All uses	Provision for domestic and industrial requirement supply to 2025	Net GW Availability for future irrigation development	Stage of Ground Water Development (%) /Category
Baramati	Command	9516.01	9352.66	225.17	9577.83	-	-	-
	Non Command	9208.90	8098.19	240.80	8338.99	-	-	-
	Taluka total	18724.91	17477.83	464.85	17942.68	780.16	1062.70	95.82 (SC)
Purandhar	Command	2261.83	1009.07	26.97	1036.04	-	-	-
	Non Command	10772.04	11027.11	307.06	11334.17	-	-	-
	Taluka total	13033.87	12030.28	334.25	12364.53	579.21	992.23	94.86 (Semi Critical)

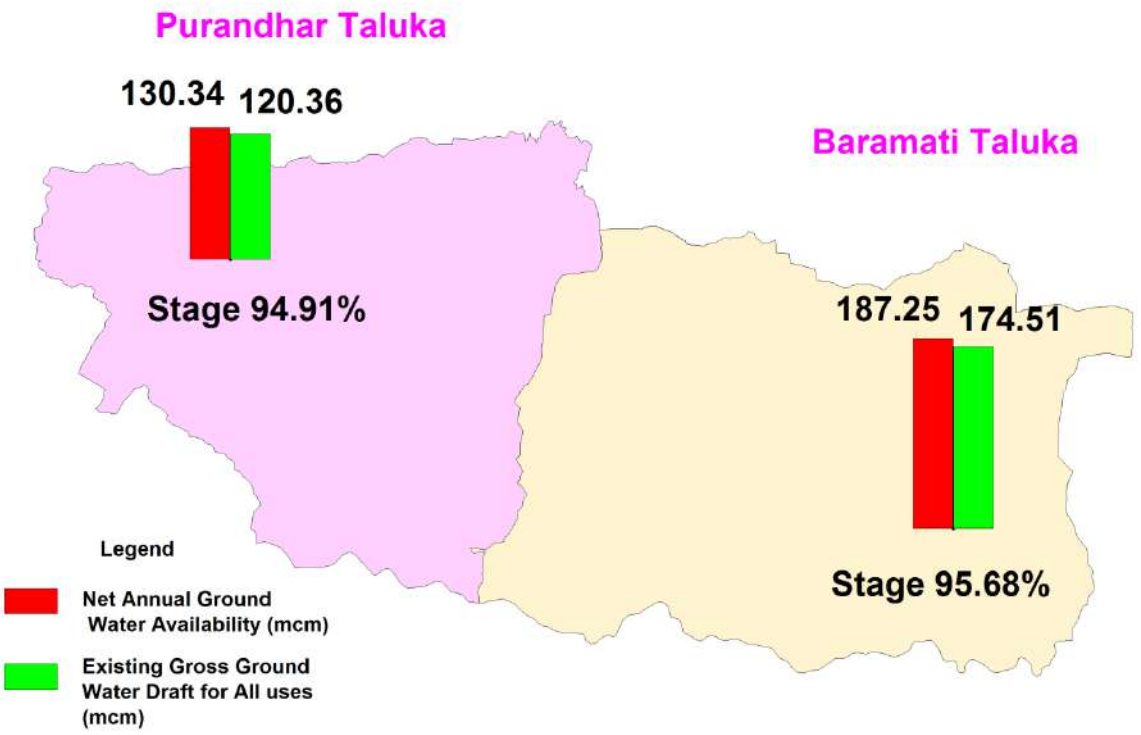


Fig. 4.1: AquiferI- Dyanamic ground water resources, Purandhar and Baramati taluka, Pune district

4.2 In-storage groundwater resources

The fresh In-storage groundwater resources in aquifer-I, of the Purandharand Baramati talukas, below the pre-monsoon water level are estimated 0.16 mcm , whereas saline in-storage resources are 0.0333 mcm . Including the components of Dynamic (317.58 mcm) and In-storage ground water resources (0.16 mcm), the total fresh resources of the study area has been estimated as 317.74 mcm. **Table 5.2**

Table 5.2: In-storage groundwater resources

Name of Administrative Unit	Type of rock formation	Total Geographical Area (ha)	Total Area (ha)	Fresh Water (ham)	Brackish/ Saline Water (ham)	Thickness of the Granular Zone/ Productive Zone below Pre monsoon WL	Average Specific Yield (fraction)	Fresh Water (ham)	Brackish/ Saline Water (ham)
Baramati	Basalt	138363.37	15580.8	12900.82	2680.01	1.25	0.0010	16.00	3.33
Purandhar	Basalt	108246.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4.3 Ground Water Resources – Aquifer-II

The ground water resource of the aquifer – II (Basalt) was also estimated to have the corret quantification of resources so that proper management strategy can be framed.

To assess these resources of Auqifer-II (Basalt), the area was divided into 14 polygons (11 in Baramati & 3 in Purandhar) based on fractured rock thickness occurring below water level and the thickness of aquifer –II in that particular polygon (if present). Then the storativity value for the nearest exploratory well was taken into consideration. By applying the formula of deeper ground water resource estimation as given by CGWB, CHQ during the static ground water resources was utilised i.e.,

GWR = Area x Thickness of aquifer x Storativity

By applying above formula the ground water resources of aquifer-II was estimated and are presented below in **Table- 4.4.** Thus the total resources of aquifer-II and have been estimated as 41.87 MCM .

Table- 4.4: Ground Water Resources of Aquifer-II

Taluka	Lower (m)	Upper (m)	Mean (m)	Area SQkm	Piezo metric head (m)	Sorativity	Sy	Resource above confining layer (mcm)	Resource of fractured rocks (mcm)	Total (mcm)
Baramati	0.5	1	0.75	184.883	25	0.0000637	0.005	0.2944	0.6933	0.9877
Baramati	0.5	1	0.75	20.6211	15	0.0000637	0.005	0.0197	0.0773	0.0970
Baramati	3	6	4.5	0.010373	15	0.0000637	0.005	0.0000	0.0002	0.0002
Baramati	6	9	7.5	92.3469	25	0.00034	0.005	0.7849	3.4630	4.2480
Baramati	6	9	7.5	43.0877	25	0.00034	0.005	0.3662	1.6158	1.9820
Baramati	1	3	2	629.194	15	0.00034	0.005	3.2089	6.2919	9.5008
Baramati	3	6	4.5	170.221	15	0.00034	0.005	0.8681	3.8300	4.6981
Baramati	3	6	4.5	0.031884	10	0.00034	0.005	0.0001	0.0007	0.0008
Baramati	3	6	4.5	134.038	10	0.00034	0.005	0.4557	3.0159	3.4716
Baramati	9	12	10.5	19.4896	15	0.00034	0.005	0.0994	1.0232	1.1226
Baramati	9	12	10.5	89.5831	15	0.00034	0.005	0.4569	4.7031	5.1600
Total				**1383.507**				**6.5543**	**24.7144**	**31.2688**
Purandhar	0.5	1	0.75	173.125	20	0.0000637	0.005	0.2206	0.6492	0.8698
Purandhar	0.5	1	0.75	38.5625	20	0.0000637	0.005	0.0491	0.1446	0.1937
Purandhar	1	3	2	870.823	15	0.0000637	0.005	0.8321	8.7082	9.5403
Total				**1082.511**				**1.1018**	**9.502**	**10.6038**
G. Total				**2466.017**				**7.6562**	**34.2165**	**41.8728**

5 GROUND WATER RELATED ISSUES

The Purandhar and Baramati talukas are part of famous 'Sugarcane belt' of Maharashtra. On one hand, ground water development has been drastically raised, while, on the ther side, the area receives very low rainfall (less than 500 mm for the last 3 years), construction of water conservation structures by various government agencies & NGOs, micro irrigation practices adopted by the farmers etc. Hence, although the stage of ground water development is high i.e., upto 95 %, the talukas are categorized as semi-critical, because of rise in water levels in certain areas. Though the farmers of the area have adapted large scale micro irrigation techniques, however limited ground water availability has stunted the increase in irrigation potential. The major issues afflicting the areas are discussed below

5.1 Low Rainfall and Droughts

The short term rainfall analysis for the period 2006-2015 infdicates that average rainfall of Baramati and Purandhar taluka is 499.89 and 621.48 mm respectively, whereas the long term rainfall data for 100 years (1916-2015) for both these talukas was also analysed and it indicates that normal rainfall of Baramati and Purandhar talukas are 504.9 mm and 556.4 mm respectively **(Fig 5.1).** The current rainfall (2015) **(fig 5.2)** for these 2 talukas was 399.4

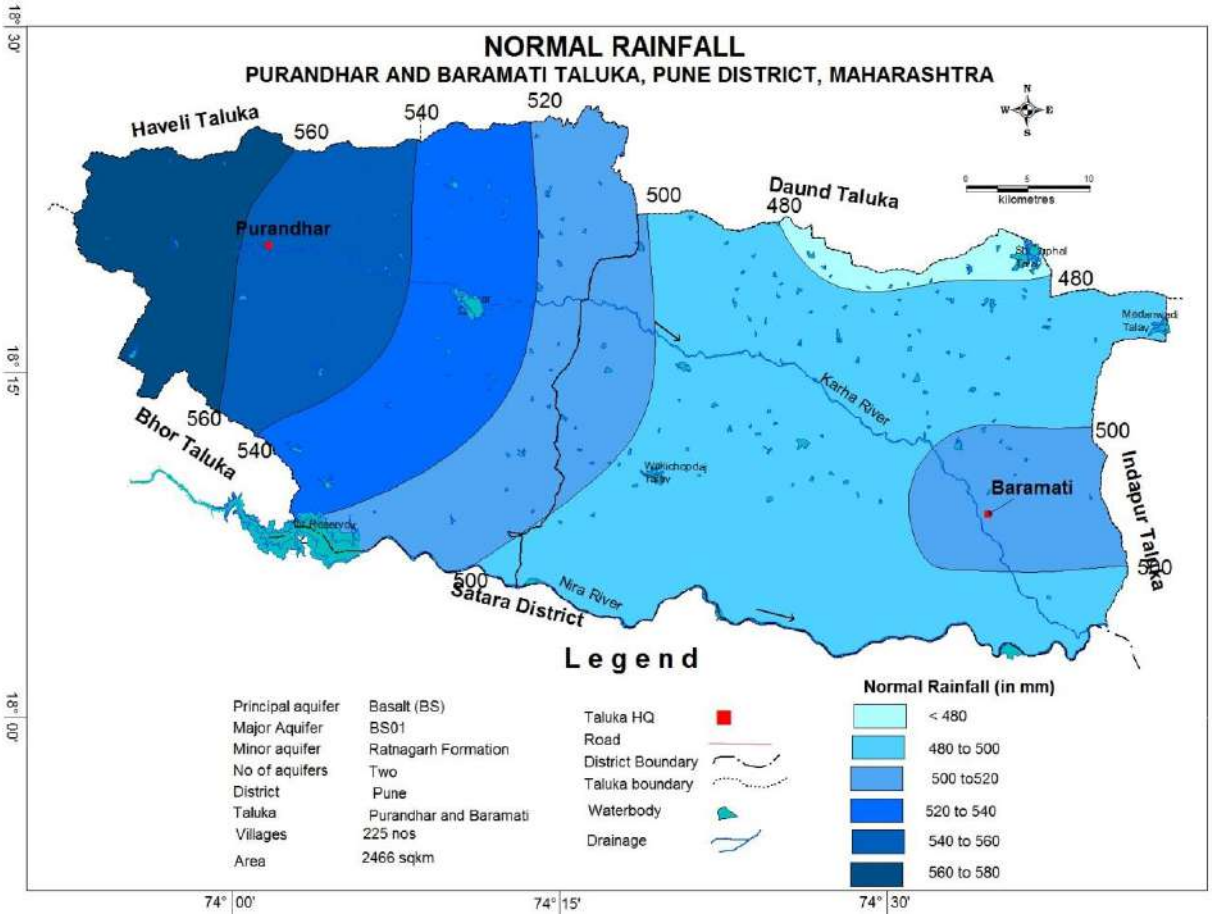


Fig 5.1: Normal Rainfall, Purandhar and Baramati Taluka, Pune District

mm (21% deficient) and 388.8 mm (31% deficient). From the decadal rainfall trend analysis from 2006 to 2015 it's observed that, both the stations have significant falling rainfall trend of -29.61 mm/year in Baramati taluka and -71.09 mm/year in Purandhar taluka. Thus indicating that both these talukas are experiencing low and declining rainfall with frequent droughts.

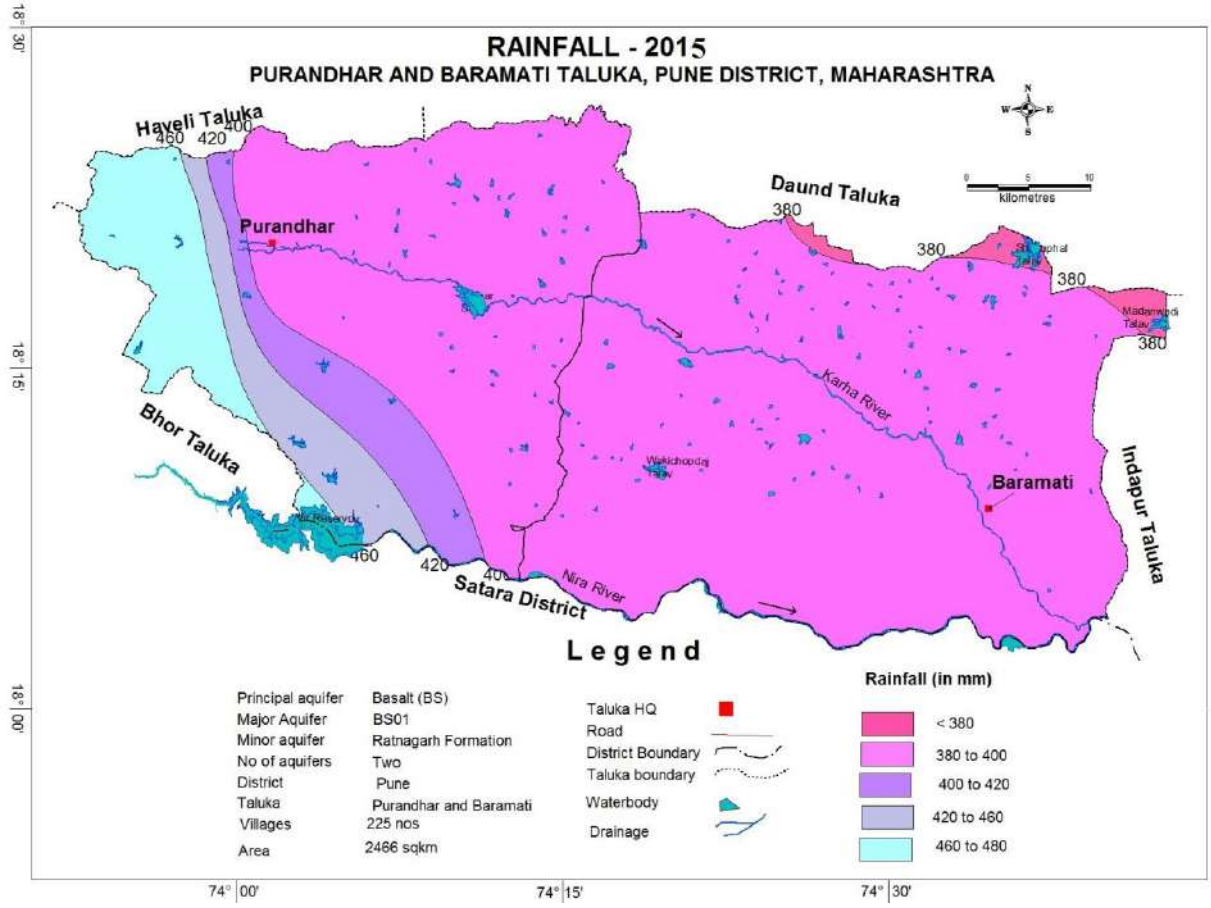


Fig 5.2: Rainfall during the year 2015, Purandhar and Baramati Taluka, Pune District

5.2 Cash Crop Cultivation

The cultivation of cash crop i.e., sugarcane which is a water intensive crop with crop water requirement of about 2.45 m is wide spread and covers an area of about 160.92 sq.km.'s mostly in Baramati taluka. Although the surface water accounts as major source water (155.3sq.km. in Baramati), ground water also supports entire irrigation of sugarcane in Purandhar (5.62 sq.km.) and parlty in Baramati. Thus huge quantum of ground water is required to sustain the sugarcane crop.

5.3 Over Exploitation

The stage of ground water development has increased over the period of time from 2004 to 2011 in 2 talukas from 84.07 % to 94.91 % in Purandhar taluka.The main reason for ground water overdraft is for irrigation purpose. The draft for these 2 talukas has increased from 297.09 MCM in 2004 to 302.87 MCM in 2013.

5.4 Declining Water Levels

The ground water exploitation has resulted in declining of water levels over the period of time. At present, the pre monsoon declining water level trend of more than 0.2m/year has been observed in about 1188 Sq.km. (48.2% of area) and the post monsoon declining water level trend of more than 0.2m/year has been observed in about 1978 Sq.km. (80% of area) (**Fig 5.3 & Fig 5.4**).

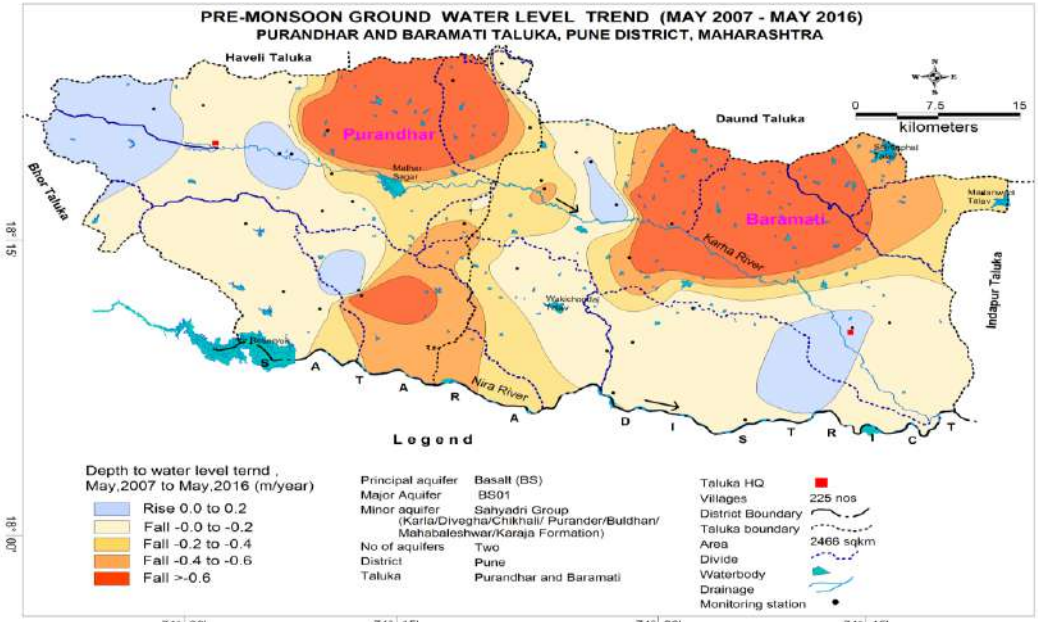


Fig 5.3 :Premonsoon Fall @ > 0.2/year area 1188 sqkm

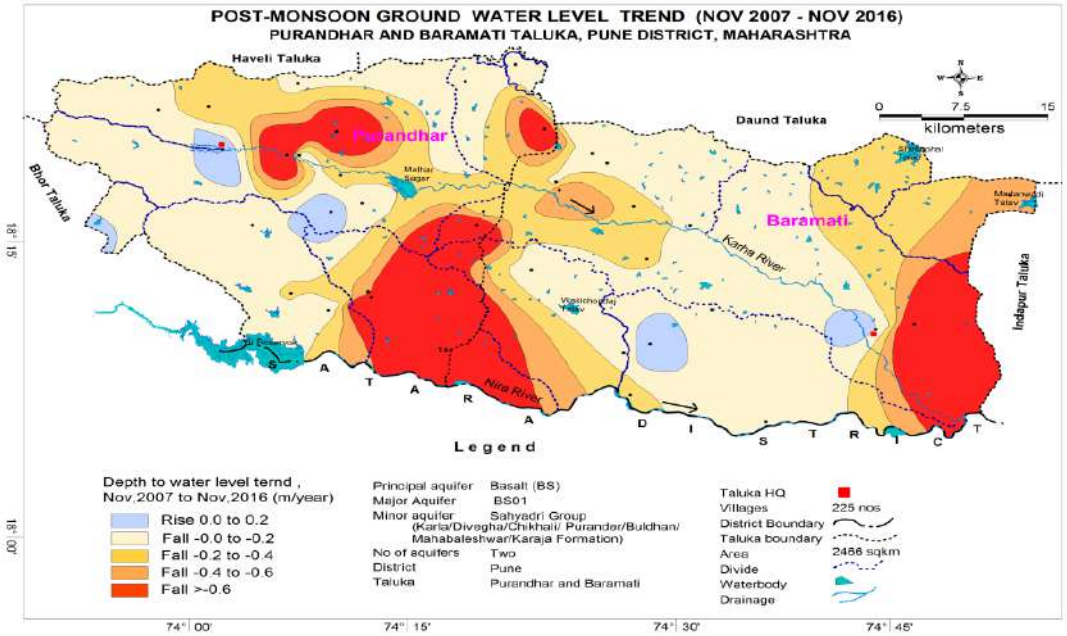


Fig 5.4 : Postmonsoon Fall @ > 0.2/year area 1978 sqkm

6 MANAGEMENT STRATEGIES

A through study was carried out based on data gap analysis, data generated in-house, data acquired from State Govt. departments and maps procured from MRSAC, an integrated approach was adopted while preparing aquifer management plan of Purandhar and Baramati talukas of Pune district, categorised as Semi Critical blocks. Based on geomorphology, soil, land use, field data and lithological layers generated, following management plan is prepared. The detailed aquifer management plan for Purandhar and Baramati talukas of Pune district is presented in **Table 6.1**.

6.1 Aquifer Management Plan for Baramati Taluka

The geographical area of Baramati Taluka is 1383.63 sq. km., as per ground water resources estimation 2013, the stage of ground water development is **95.68 %** and categorised as semi-critical. The annual ground water resource available is 187.25 MCM and the gross ground water draft for all uses is 179.17 MCM including 174.51 MCM for irrigation and 4.66 MCM for domestic sector. The major issues identified in Baramati Taluka are high stage of ground water development, low rainfall,decline of water level,exploitation of ground water and limited aquifer potential.

The agricultural demand from ground water and surface water is 174.51mcm and 210.41 MCM respectively. Whereas, the domestic demand for ground water and surface water is 4.66 and 1.17 MCM. The agricultural supply from ground water and surface water is 174.51mcm and 210.41 MCM respectively. Whereas, the domestic supply for ground water and surface water is 4.66 and 1.17 MCM. Hence, there is no Demand-Supply gap. To bring the stage of ground water development upto 70 % it is estimated that about 68.71 MCM of water is required.

Supply side interventions proposed to tackle above said major issues through rainwater harvesting and artificial recharge. The volume of unsaturated zone available in Baramati taluka is worked out as 1119.34 MCM. The volume of water required for recharge the area is 22.39 MCM. The surface surplus non-committed runoff availability is 13.71 MCM. Therefore, the surface runoff of 13.71 MCM is considered for planning. For this, a total of 54 percolation tank and 96 Check dams are required as recharge measures. The volume of water expected to be conserved/recharged @75% efficiency is 8.1 MCM through Percolation tank and 2.16 MCM through Check dams. The cost estimate for 54 percolation tank and 96 check dams are Rs. 81 and Rs. 28.8 crore respectively. The location of artificial recharge structures proposed are given in **Annexure IX** and shown in **Fig 6.1.**

The rainwater harvesting in urban areas can be adopted in 25% of the household with 50 Sq. m roof area. A total of 0.26 MCM potential can be generated by taking 80% runoff coefficient. The estimated cost for rainwater harvesting through rooftop is calculated as Rs.13.95 crore. Hence, this technique is not economically viable and therefore it is not recommended.

Overall total volume of water expected to be recharged or conserved by artificial recharge is 10.26 MCM with a cost estimate of Rs. 109.8 crore, excluding roof top rain water harvesting which is not economically viable.

Demand side interventions such as change in cropping pattern has not been proposed. About 70% of sugarcane crop area (i.e. 155.3 Sq km) is proposed to be covered under Drip i.e., about 108.7 sq km. Due to which about 61.959 MCM water is expected to be saved (water req for Surface Flooding 2.45 m., Drip 1.87 = saving 0.58 m). The expenditure of Rs. 161.15 Crore is expected considering Rs. 60,000/- per acre, towards the implementation of micro-irrigation in Baramati Taluka.

Thus, following benefits are expected after implementation of above said Aquifer Management Plan in Baramati Taluka.

1. Additional ground water resources available after implementing above measures is 72.22 MCM which would bring the stage of ground water development from 95.68 % to 70 % i.e. about 25.68 % reduction in the stage of ground water development with estimated expenditure of Rs. 270.95 crore.
2. About 540 ha (5.4 sq km) additional area will be covered under assured irrigation
3. Apart from this, it is proposed to impose ground water regulatory measures like banning the bore well drilling down to 60 m bgl for irrigation purpose.

6.2 Aquifer Management Plan for Purandhar Taluka

The geographical area of Purandhar Taluka is 1082.46 sq. km., as per ground water resources estimation 2013, the stage of ground water development is **94.91 %** and categorised as semi-critical. The annual ground water resource available is 130.34 MCM and the gross ground water draft for all uses is 123.7 MCM including 120.36 MCM for irrigation and 3.34 MCM for domestic sector. The major issues identified in Purandhar Taluka are high stage of ground water development, exploitation of ground water, limited aquifer potential, decline of water level and water scarcity during lean period.

The agricultural demand from ground water and surface water is 120.36 and 52.94 MCM respectively. Whereas, the domestic demand for ground water and surface water is 3.34 and 0.84 MCM. The agricultural supply from ground water and surface water is 120.36 and 52.94 MCM respectively. Whereas, the domestic supply for ground water and surface water is 3.34 and 0.84 MCM. Hence, there is no Demand-Supply gap. To bring the stage of ground water development upto 70 % it is estimated that about 46.37 MCM of water is required .

Supply side interventions proposed to tackle above said major issues through rainwater harvesting and artificial recharge. The volume of unsaturated granular zone available in Purandhar taluka is worked out as 499.87 MCM. The volume of water required for recharge the area is 13.3 MCM. The surface surplus non-committed runoff availability is 6.12 MCM. Therefore, the surface runoff of 6.12 MCM is considered for planning. For this, a total of 21 percolation tank and 62 Check dams are required as recharge measures. The volume of water expected to be conserved/recharged @75% efficiency is 3.15 MCM

through Percolation tank and 1.4 MCM through Check dams. The cost estimate for 21 percolation tank and 62 check dams are Rs. 31.5 and Rs. 18.6 crore respectively. The location of artificial recharge structures proposed are given in **Annexure IX** and shown in **Fig 6.1.**

The rainwater harvesting in urban areas can be adopted in 25% of the household with 50 Sq. m roof area. A total of 0.13 MCM potential can be generated by taking 80% runoff coefficient. The estimated cost for rainwater harvesting through rooftop is calculated as Rs. 50.1 crore. Hence, this technique is not economically viable and therefore it is not recommended.

Overall total volume of water expected to be recharged or conserved by artificial recharge is 4.55 MCM with a cost estimate of Rs. 50.1 crore, excluding roof top rain water harvesting which is not economically viable.

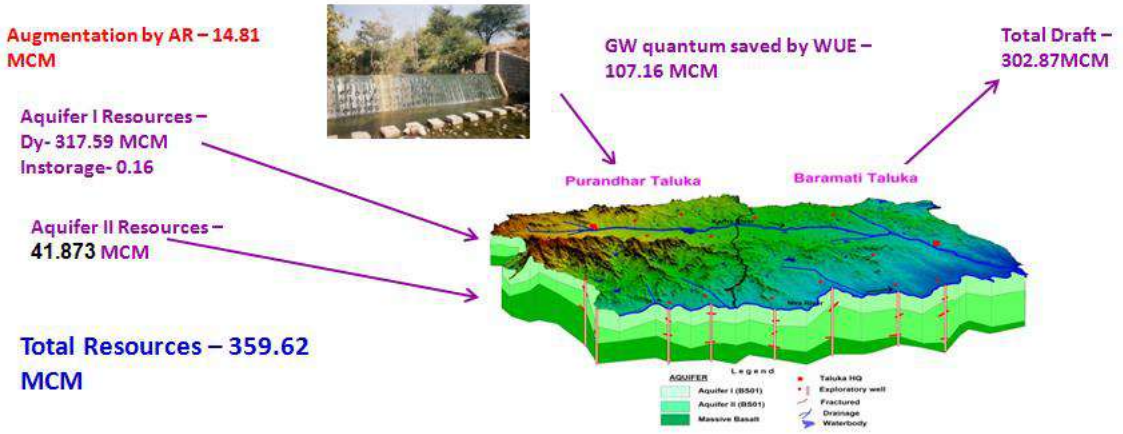
Demand side interventions such as change in cropping pattern has not been proposed. About 70% of sugarcane crop area (i.e. 5.62 Sq km) is proposed to be covered under Drip i.e., about 3.934 sq km. Due to which about 2.242 MCM water is expected to be saved (water req for Surface Flooding 2.45 m., Drip 1.87 = saving 0.58 m). The expenditure of Rs. 5.83 Crore is expected considering Rs. 60,000/- per acre, towards the implementation of micro-irrigation , about 50% of double crop area (i.e. 191.7 Sq km) is proposed to be covered under Drip i.e., about 95.85 sq km. Due to which about 38.24 MCM water is expected to be saved (water req for Surface Flooding 0.9 m., Drip 0.4 = saving 0.5 m). The expenditure of Rs. 59.21 Crore is expected considering Rs. 25,000/- per acre, towards the implementation of micro-irrigation ,about 50% of Onion crop area (i.e. 35.5 Sq km) is proposed to be covered under Drip i.e., about 17.75 sq km. Due to which about 4.615 MCM water is expected to be saved (water req for Surface Flooding 0.78 m., Drip 0.52 = saving 0.26 m). The expenditure of Rs. 10.965 Crore is expected considering Rs. 25,000/- per acre, towards the implementation of micro-irrigation in Baramati Taluka

Thus, following benefits are expected after implementation of above said Aquifer management plan in Baramati Taluka.

1. Additional ground water resources available after implementing above measures is 18.67 MCM which would bring the stage of ground water development from 94.91 % to 70.00% i.e. about 24.91 % reduction in the stage of ground water development with estimated expenditure of Rs. 126.108 crore.
2. About 518 ha (5.18 sq km) additional area will be covered under assured irrigation after implementation.
3. Apart from this, it is proposed to impose ground water regulatory measures like banning the bore well drilling down to 60 m bgl for irrigation purpose.

PROPOSED MANAGEMENT PLAN

115.08 mcm of GW quantum is required to be augmented/managed to bring stage of GWD @70%



ADDITIONAL RESOURCES CREATED/SAVED
14.81 MCM - by AR
107.16 MCM – by WUE
121.97 mcm – TOTAL

PROBABLE BENEFITS AFTER IMPLEMENTING AR & WUE MEASURES

STAGE OF GW DEVELOPMENT IN Purandhar and Baramati Taluka can be brought 70 % from Present stage of GW development of Purandhar and Baramati Taluka is 94.91% & 95.68 % respectively and about 10.58 Sqkm Additional Area proposed to be brought under assured GW irrigation after implementation of artificial recharge to ground water & micro irrigational techniques

Table 6.1 Management plan for Purandhar and Baramati talukas of Pune district

Block	Baramati		Purandhar		Total
Area	**1383.63**		**1082.46**		
Major Issues Identified	Over - Exploitation Declining WL,Limited Aquifer Potential Water Scarcity - lean period				
Stage of GW Development	95.68%		94.91%		
GW Annual Available Resource (mcm)	187.25		130.34		317.59
GW Gross Annual Draft (mcm)	179.17		123.70		302.87
Domestic Rquirement (mcm)	4.66		3.34		8.00
DEMAND (MCM)					
Agricultural demand -GW	174.51		120.36		294.87
Agricultural demand -SW	210.41		52.94		263.35
Domestic demand - GW	4.66		3.34		8.00
Domestic demand - SW	1.17		0.84		2.00
Total Demand (mcm)	**390.75**		**177.48**		**568.22**
SUPPLY (MCM)					
Agricultural Supply -GW	174.51		120.36		294.87

Block	Baramati		Purandhar		Total
Agricultural Supply -SW	210.41		52.94		263.35
Domestic Supply - GW	4.66		3.34		8.00
Domestic Supply - SW	1.17		0.84		2.00
Total supply(mcm)	**390.75**		**177.48**		**568.22**
PRESENT DEMAND - SUPPLY GAP (MCM)	**0.00**		**0.00**		0.00
GAP TO BRING STAGE OF GWD UPTO 70%	**68.71**		**46.37**		115.08
TOTAL GAP TO BRING STAGE OF GWD UPTO 70%	**68.71**		**46.37**		115.08
Interventions proposed to deal with overexploitation					
SUPPLY SIDE INTERVENTIONS					
Rainwater Harvesting and Artificial Recharge					
Volume of unsaturated granular zone (MCM)	1119.34		499.87		1619.21
Recharge Potential (MCM)	22.39		10.00		32.39
Surface water requirement @ 75% efficiency (MCM)	29.78		13.30		43.08
Availability of Surplus surface runoff (MCM)	13.71		6.12		19.83
Surplus runoff considered for planning (MCM) @ 70%	13.71	10.28	6.12	4.59	14.87
Proposed Structures:Percolation Tank (@ Rs.150 lakh, Av. Gross Capacity-100 TCM*2 fillings = 200 TCM,Check Dam (@ Rs.30 lakh, Av. Gross Capacity-10 TCM * 3 fillings = 30 TCM	Percolation Tank	Check Dam	Percolation Tank	Check Dam	
Number of Strcutures	54	96	21	62	**233**
Volume of Water expected to be conserved / recharged @ 75% effeciency (MCM)	8.10	2.16	3.15	1.40	**14.81**
Estimated Expenditure (Rs. in Cr.)	81.00	28.80	31.50	18.60	**159.90**

Block	Baramati		Purandhar		Total
RTRWH - Urban Areas					
Households to be covered (10% with 50 m2 area)	9300		5126		14426.00
Total RWH potential (MCM)	0.26		0.13		0.39
Rainwater harvested / recharged @ 80% runoff co-efficient	0.21		0.11		0.32
Estimated Expenditure (Rs. in Cr.) @ Rs. 15000/- per HH	13.95	**Economically not viable & Not Recommend ed**	7.69	**Economically not viable & Not Recommended**	21.64
Total volume of water expected to be recharged/conserved by AR	10.26		4.55		14.81
Total Estimated Expn. For AR	109.80		50.10		159.90
DEMAND SIDE INTERVENTIONS					
Proposed Cropping Pattern change	None		None		
Micro irrigation techniques					
Sugarcane area proposed to be covered 70% of 155.3 Sqkm in Baramati and 70% of 5.62 Sqkm in Prarandhar Taluka	108.7		3.934		112.634
Volume of Water expected to be conserved (MCM). Sugarcane requirement - 2.45 m, Drip – 1.87 m, WUE - 1.75 m	61.959		2.24238		64.20138
Estimated Expenditure	161.1586 2		5.8325484		166.9912
Area proposed to be covered (191.7sq.km.) 50% DC area drip/sprinkler			95.85		95.85
Volume of Water expected to be conserved (MCM). DC			38.34		38.34

Block	Baramati		Purandhar		Total
requirement - 0.90 m, Drip - 0.40 m,					
Estimated Expenditure			59.2113375		59.21134
Area proposed to be covered (35.5sq.km.) 50% Onion area			17.75		17.75
Volume of Water expected to be conserved (mcm). Onion requirement - 0.78 m, Drip - 0.52 m,			4.615		4.615
Estimated Expenditure			10.9650625		10.96506
Alternate Sources	Nil		Nil		
Additional GW resources available after implementing above measures (mcm)	72.22		49.74		121.96
Volume of Water Required to bring stage of GWDupto 70%	68.71		46.37		115.08
Balance GWR available for GW Development after STAGE OF GWD is brought to 70%	3.51		3.37		6.88
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	**5.40**		**5.18**		10.58
Regulatory Measures	**Regulation of wells below 60 m**				

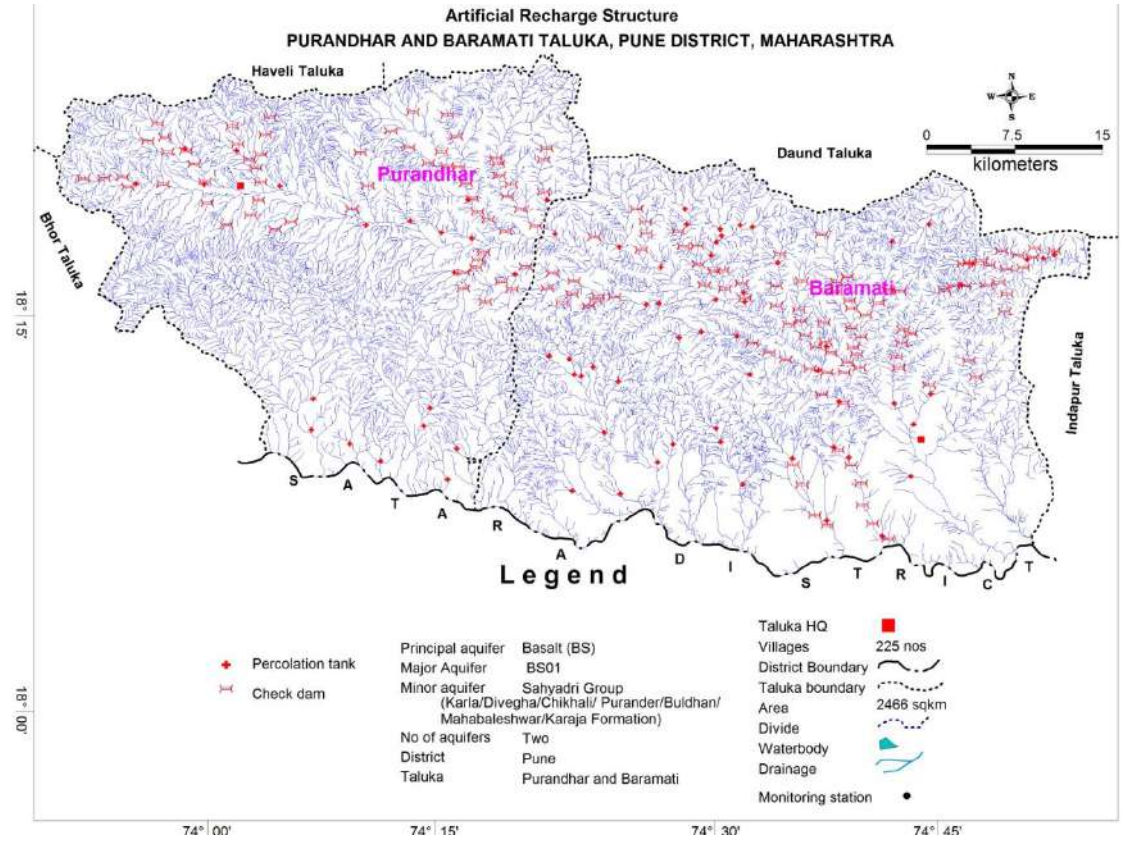


Fig 6.1 Location of Artificial recharge structure

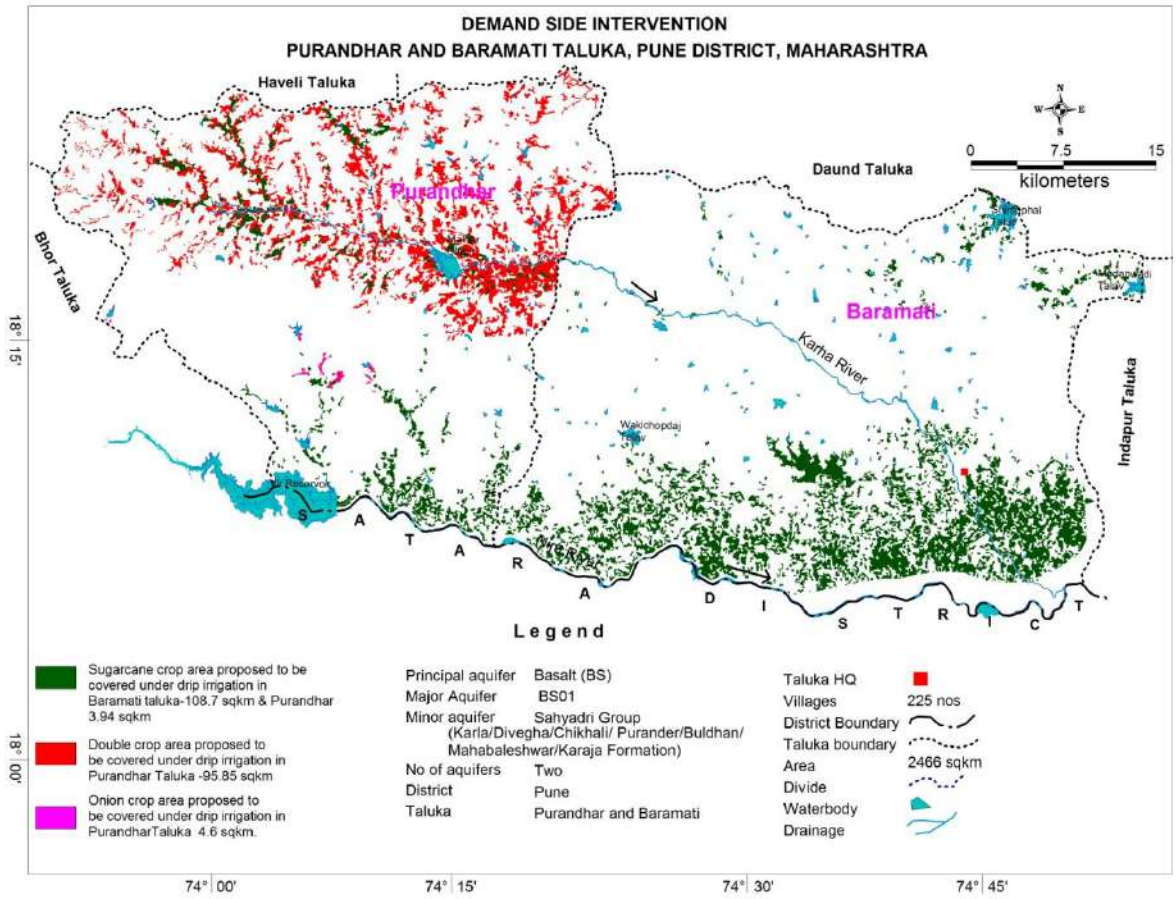


Fig 6.2 Location of Proposed drip irrigation

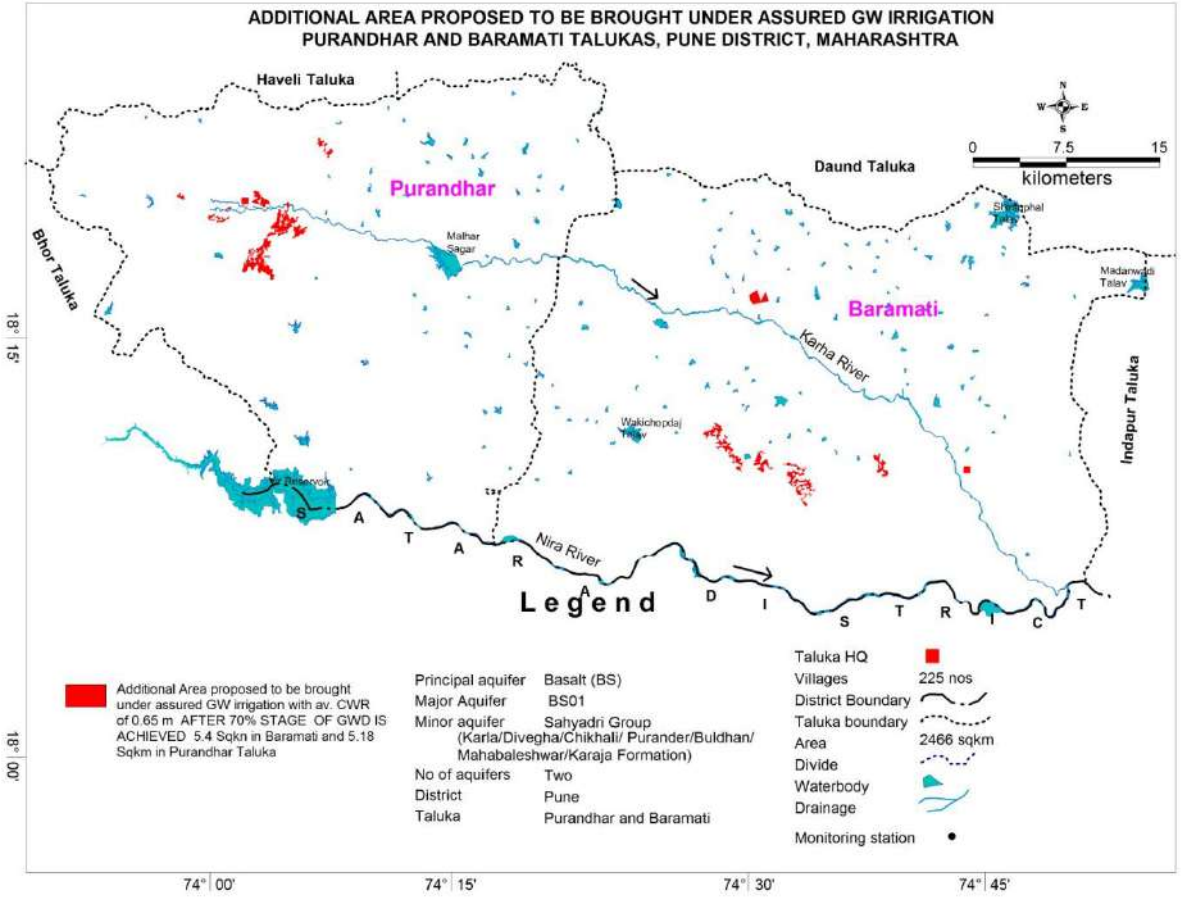


Fig 6.3 Location of Proposed area for ground water irrigation

7 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 Baramati and Purandhar Talukas of Pune district.

The study area is spanning over 2466.09 sq.km. Geologically the area is occupied by Basalt and the stage of ground water development is 95.68 % in Baramati and 94.91% in Purandhar taluka. The area has witnessed ground water depletion and over exploitation over a period of time. In Aquifer-I, the deeper water levels of >15 m bgl has been observed in central and southern parts of Purandhar taluka and 10 to 15 mbgl along surface divide in Baramati and Purandhar taluka, while in Aquifer –II, deeper water levels of > 40 mbgl has been observed in north western parts of Purandhar taluka . The declining water level trend > 0.20 m/yr. has been observed in major part about 1188 sq km during pre-monsoon and 1978 sq km during post-monsoon trend (2007 to 2016). This has been due to cultivation of water intensive cash crop like Sugarcane (160.9 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 75 Percolation Tanks and 158 Check Dam is proposed in Baramati and Purandhar Talukas ,which will augment ground water resources to the tune of 14.81 MCM (11.25 MCM by Percolation Tanks and 3.56 MCM by Check Dam). The total cost of implementing these interventions will be Rs. 159.9 crore.

As a part of demand side interventions, change in irrigation techniques from surface flooding to drip irrigation is also proposed. A total of 112.63 sqkm of Sugarcane crop area in Baramati and Purandhar talukas is proposed to be covered under drip irrigation techniques instead of flood irrigation that will save 64.2 MCM of water resources. The total cost of implementing these interventions will be Rs 166.99 crore. Double crop of 95.85 sqkm and 17.75 Sqkm of Onion crop areas in Purandhar taluka are also proposed to be covered under drip irrigation techniques instead of flood irrigation that will save 42.955 MCM of water resources. The total cost of implementing these interventions will be Rs 70.176 crore.

In Baramati and Purandhar Talukas, a total of 14.81 MCM resources will be augmented after adopting artificial recharge, whereas and 107.156 MCM will be saved after implementing water user efficiency measures (drip irrigation). This will bring the stage of ground water development to 70 % in Baramati and Purandhar talukas from the present stage of 95.68 % in Baramati and 94 91 % in Purandhar taluka and 10.58 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.

Annexure I

Details of Minor irrigation projects (<100 ha), Purandhar and Baramati taluka, Pune district

Taluka	Name	Type of Project	Storage	Cap	Ut
Baramati	Nira Left Bank Canal	Major Irr. Projects (Outside the area)		13780	28628
Baramati	Kharakvasla	Major Irr. Projects (Outside the area)		980	0
Purandha	Nira Left Bank Canal	Major Irr. Projects (Outside the area)		420	12221
Purandhar	Gunjwani(under progress)	Major Irr. Projects (Outside the area)		13904	0
Baramati	Nazare	Medium Irr. Project		1800	1847
Purandhar	Nazare	Medium Irr. Project		1395	1343
Baramati	Nimbut	KT Weir	1.858	275	308
Baramati	Murum	KT Weir	3.171	677	2056
Baramati	Hol	KT Weir	2.8	402	50
Baramati	Korhale	KT Weir	3.39	737	201
Baramati	Late	KT Weir	2.124	436	214
Baramati	Kambleshwar	KT Weir	2	450	351
Baramati	Shirawali	KT Weir	2.39	493	403
Baramati	Nirvagaj	KT Weir	2.98	679	546
Baramati	Ghadagewadi	KT Weir	2.95	606	157
Baramati	Songaon Gitevasti	KT Weir	1.68	510	256
Baramati	Songaon Sangam	KT Weir	1.716	451	229
Baramati	Malwadi	KT Weir	1.318	290	122
Baramati	Karhati	KT Weir	1.318	405	137
Baramati	Karhati High School	KT Weir	0.49	269	88
Baramati	Phondwada Gaonthan	KT Weir	0.933	323	0
Baramati	Phondwada	KT Weir	0.776	262	0
Baramati	Karhavagaj	KT Weir	0.776	274	0
Baramati	Jalgaon Kade Pathar	KT Weir	0.872	302	0
Baramati	Anjangaon	KT Weir	0.91	368	0
Baramati	Nepat Valan	KT Weir	0.817	284	0
Baramati	Gunwadi	KT Weir	1.196	429	87
Baramati	Morgaon	KT Weir	1.112	410	0
Baramati	Baburdi	KT Weir	0.76	267	0
Baramati	Baburdi	KT Weir	0.399	162	0
Baramati	Jalgaon Supe	KT Weir	0.311	225	0
Baramati	Barhanpur	KT Weir	0.888	231	0
Baramati	Medad	KT Weir	0.45	173	0
Baramati	Tardoli	KT Weir	0.53	207	206
Baramati	Morgaon (Nevasevasti)	KT Weir	3.80	28	0
Baramati	Morgaon (khatkalicha Mala)	KT Weir	4.99	28	0
Baramati	Karanje	KT Weir	0.06	23	0
Baramati	Parwadi	KT Weir	0.03	73	0

Taluka	Name	Type of Project	Storage	Cap	Ut
Baramati	Chandgude Wadi	KT Weir (< 100 ha)	4.97	32	0
Purandhar	Nira	KT Weir	2.169	517	535
Purandhar	Jeur	KT Weir	4.570	680	1581
Purandhar	Mandaki	KT Weir	1.427	710	913
Purandhar	Pimpra	KT Weir	3.860	482	818
Purandhar	Ambodi	KT Weir		280	280
Purandhar	Walunj	KT Weir	0.66	244	0
Purandhar	Kothale	KT Weir	0.56	160	0
Purandhar	Kumbharvalan	KT Weir	0.55	160	0
Purandhar	Karnalwadi	KT Weir	0.84	130	0
Purandhar	Ekhatpur	KT Weir	0.48	123	0
Purandhar	Belsar	KT Weir	0.54	127	0
Purandhar	Pandeshwar	KT Weir	0.60	147	0
Purandhar	Siddheshwar	KT Weir	0.48	94	0
Purandhar	Hargude No 1	KT Weir (< 100 ha)	1.99	15	0
Purandhar	Belsar (Padhremala)	KT Weir (< 100 ha)	4.46	32	0
Purandhar	Veer Sonarbagh	KT Weir (< 100 ha)	4.81	26	0
Purandhar	Varude Gayran	KT Weir (< 100 ha)	3.67	40	0
Purandhar	Shikrapur	KT Weir (< 100 ha)	3.67	55	0
Purandhar	Dhalewadi	KT Weir (< 100 ha)	2.78	23	0
Baramati	Janai Shirsai	LIS		11308	280
Baramati	Purandhar	LIS		6462	1060
Purandhar	Janai Shirsai	LIS		11308	280
Purandhar	Purandhar	LIS		6462	1060
Baramati	Jalgaon Supe	Percolation Tank	0.55	60	0
Baramati	Borkarwadi	Percolation Tank	1.21	158	0
Baramati	Tardoli	Percolation Tank	1.69	143	0
Baramati	Borkarwadi	Percolation Tank	1.21	158	0
Baramati	Shirsuphal	Percolation Tank	0.08	15	0
Baramati	Deulgaon Rasal	Percolation Tank	0.06	20	0
Baramati	Patharevasti supe	Percolation Tank	0.03	6	0
Baramati	Shirsuphal	Percolation Tank	0.07	70	0
Baramati	Morgaon Gavhalvasti	Percolation Tank	0.08	25	0
Baramati	Wanewadi Garade	Percolation Tank	0.12	25	0
Baramati	Palshi Kadevasti	Percolation Tank	1.88	28	0
Purandhar	Garade	Percolation Tank	1.850	372	297
Purandhar	Pilanwadi	Percolation Tank	1.910	399	432
Purandhar	Ghodwadi	Percolation Tank	1.900	279	49
Purandhar	Mahur	Percolation Tank	2.378	432	350
Purandhar	Veer Nala	Percolation Tank	2.555	382	440
Purandhar	Bopgaon (under Const)	Percolation Tank	1.353	265	0
Purandhar	Pisarve	Percolation Tank	1.740	243	0
Purandhar	Pingori	Percolation Tank	0.57	40	24

Taluka	Name	Type of Project	Storage	Cap	Ut
Purandhar	Adwadi	Percolation Tank	0.06	40	0
Purandhar	Walhe	Percolation Tank	0.07	40	40
Purandhar	Pangare	Percolation Tank	-	-	-
Purandhar	Kopare	Percolation Tank	-	-	-
Purandhar	Ale	Percolation Tank	-	-	-
Purandhar	Daundaj	Percolation Tank	0.05	10	0
Purandhar	Garade Ravadevasti	Percolation Tank	0.11	32	0
Purandhar	Dive	Percolation Tank	0.07	20	0
Purandhar	Singapur Futkada	Percolation Tank	0.12	25	0
Purandhar	Kolvihir Pawarwadi	Percolation Tank	0.08	18	0
Purandhar	Nawali Girmevasti	Percolation Tank	0.13	28	0
Purandhar	Nawali Thorvevasti	Percolation Tank	0.15	14	0
Purandhar	Daundaj	Percolation Tank	0.06	36	0
Purandhar	Nawali Kurad	Percolation Tank	0.13	32	0
Purandhar	Shivari Pangare	Percolation Tank	0.1	30	0
Purandhar	Mandhar Kalubai	Percolation Tank	0.15	15	0
Purandhar	Garade Darewadi	Percolation Tank	10.60	64	
Purandhar	Dhalewadi	Percolation Tank	10.60	64	0
Purandhar	Rakh Talemala	Percolation Tank	4.95	35	0
Baramati	Waki	MI Tank	2.3	329	0
Baramati	Sirsuphal	MI Tank	9.52	661	1034
Baramati	Mudhale Lohkhandwadi	Div. Weir		19	0
Baramati	Parwadi	Div. Weir		66	0
Baramati	Kalkhairewadi No. 2	Div. Weir		30	0
Baramati	Karhavagaj Nalemala	Div. Weir		42	0
Baramati	Pandare Gat No. 193	Div. Weir		34	0
Baramati	Palshi	Div. Weir		5	0
Purandhar	Pandeshwar	Div. Weir		15	0
Purandhar	Walunj	Div. Weir		12	0
Purandhar	Nilunj	Div. Weir		32	0
Purandhar	Yadhavwadi Panvatha	Div. Weir		45	0
Purandhar	Pargaon	Div. Weir		25	0
Purandhar	Mahur	Div. Weir		35	0
Purandhar	Parinche Dudhalwadi	Div. Weir		52	0
Purandhar	Dive Jadhavwadi	Div. Weir		20	0
Purandhar	Kodit	Div. Weir		75	0
Baramati	Mudhale Veerbaba	Storage Bandhara	1.00	7	0
Baramati	Jalgaon Supe	Storage Bandhara	0.72	5	0
Baramati	Nimbodi No. 2	Storage Bandhara	1.75	18	0
Baramati	Murti Chirekhan Vasti	Storage Bandhara	2.22	32	0
Baramati	Masalwadi (Khuri)	Storage Bandhara	2.01	25	0
Baramati	Jalgaon Supe (Piplacha Ma	Storage Bandhara	0.72	5	0
Baramati	Palshi Kadevasti	Storage Bandhara	2.83	28	0
Baramati	Pansarewadi Lavhevasti	Storage Bandhara	1.03	5	0

Taluka	Name	Type of Project	Storage	Cap	Ut
Baramati	Tardoli	Storage Bandhara	1.00	10	0
Baramati	Vadgaon Nimbalkar (Koral Road	Storage Bandhara	1.51	12	0
Baramati	Parwadi No 1 (Bhairavnath Temple)	Storage Bandhara	1.70	25	0
Baramati	Jalgaon KP Bhilarwadi	Storage Bandhara	0.95	8	0
Baramati	Jalgaon Supe Patilvasti (Bhanjaicha)	Storage Bandhara	3.33	28	0
Baramati	Palshi Kadevasti No. 1	Storage Bandhara	1.88	28	0
Baramati	Palshi Kadevasti No. 3	Storage Bandhara	2.83	28	0
Purandhar	Naygaon Kadevasti	Storage Bandhara	1.60	35	0
Purandhar	Pimpre (Thopatewadi)	Storage Bandhara	1.00	25	0
Purandhar	Hivare (P P Vihirijaval)	Storage Bandhara	2.66	22	0
Purandhar	Karnalwadi Ambyacha Mala	Storage Bandhara	1.83	14	0
Purandhar	Pangare Shindewadi	Storage Bandhara	3.68	18	0
Purandhar	Pangare Bhatmalwadi	Storage Bandhara	3.27	18	0
Purandhar	Romanwadi (Kavdar Odha)	Storage Bandhara	1.40	10	0
Purandhar	Kolvihire (Ghatewadi	Storage Bandhara	1.21	10	0
Purandhar	Nazare Supe (Sapikacha Mala)	Storage Bandhara	2.99	18	0
Purandhar	Jejuri (Lavathleshvar)	Storage Bandhara	1.81	28	0
Purandhar	Nazare Supe	Storage Bandhara	2.99	27	0
Purandhar	Pandeshwar Shedgevasti	Storage Bandhara	2.26	35	0
Purandhar	Naygaon Kadevasti	Storage Bandhara	1.60	35	0
Purandhar	Nawali	Storage Bandhara	0.12	25	0
Purandhar	Kodit Nagzari	Storage Bandhara	0.06	10	0

Salient Features of Ground water exploration in Baramati and Purandhar Talukas, Pune district. ***Annexure-II***

Sl no	Village	Type of well	Taluka	Latitude	Longitude	Depth (mbgl)	Casing depth (mbgl)	Zones encountered /tapped (mbgl)	Aquifer	SW L(mbgl)	Q (lps)	DD (m)	Aqifer I (mbgl)	Aqifer II (mbgl)
1	Ambhi Khurd	EW	Baramati	18°18'20"	74°17'02"	200	6	seepage	Fr. Ves	>50	Traces	>51	seepage	
2	Chandgudewadi	EW	Baramati	18°17'54"	74°18'36"	123.5	6	19.00 116.00	Wth. Ves. Fr. Mas.	11.8	4.43	32.5	19	116
3	Chandgudewadi	OW	Baramati	18°17'54"	74°18'36"	200	6	43	Fr. Ves	12.3	3	27.61		43
4	Choudharwadi	EW	Baramati	18°10'13"	74°16'01"	200	6.1	109	Fr. Mas	17.8	1.37	>50		109
5	Dorlewadi	EW	Baramati	18°05'35"	74°36'52"	200	6	105	Fr. Mas.	4.87	3	37		105
6	Dorlewadi	OW	Baramati	18°05'35"	74°36'52"	200	6	35	Fr. Ves.	24.1	Traces	>50	35	
7	Gulunche	EW	Purandhar	18°08'44"	74°13'35"	200	6	84.60 168.00	Wth. Ves. Fr. Mas.	>30	0.014	>50		84.60 168.00
8	Jadhavwadi	EW	Purandhar	18°23'30"	74°00'05"	112	5.6	65	VB	50	0.2			65
9	Kothale	EW	Purandhar	18°18'55"	74°07'30"	165	6.5	28 - ,100 -	VB	10	0.42		28 - ,100 -	28 - ,100 -
10	Kothale	EW	Purandhar			165	6.5		VB	21				
11	Loni Bhapkar	EW	Baramati	18°13'44"	74°23'05"	200	6	seepage	NA	25.5	0.38	>50	seepage	
12	Narayanpur	EW	Purandhar	18°18'09"	73°58'53"	160	8.3	32	Wth. Ves.	5.1	7.76	NIL	32	
13	Narayanpur	OW	Purandhar	18°18'09"	73°58'53"	200	6.1	34.8	Fr. Mas.	5.8	Traces	>50		34.8
14	Naygaon	EW	Purandhar	18°22'00"	74°14'00"	200	2.5	42 -51 ,58 -64	VB	4.5	1.13			42 -51 ,58 -64
15	Naygaon (Khorawade)	EW	Purandhar			200	5.5	9 - ,21 -	F VB	21			9 - ,21	
16	Pandhare	EW	Baramati	18°08'27"	74°27'55"	200	12	seepage	NA	>50	Traces	>50	seepage	
17	Pangare Sailor Vasti	EW	Purandhar	18°16'12"	74°03'50"	184.7	5.6	23	F Basalt	22.2	0.62		23	
18	Parainche	EW	Purandhar	18°11'30"	74°05'02"	200	6.1	41.00 108.00	Wth. Ves. Fr. Mas.	>50	Traces	>50		41.00 108.00
19	Parawadi	EW	Baramati	18°16'53"	74°39'09"	142	12	65.00 77.00 141.00	fr. Mas. Fr. Mas Fr. Mas	4.85	7.76	13		65.00 77.00 141.00
20	Parawadi	OW	Baramati	18°16'53"	74°39'09"	200	6	59	Fr. Mas.	7.85	2.16	27.56		59

Sl no	Village	Type of well	Taluka	Latitude	Longitude	Depth (mbgl)	Casing depth (mbgl)	Zones encountered /tapped (mbgl)	Aquifer	SW L(mbgl)	Q (lps)	DD (m)	Aqifer I (mbgl)	Aqifer II (mbgl)
21	Pargaon	EW	Purandhar	18°21'30"	74°07'30"	153.2	5.6	18 - ,70 -	VB	5.6	0.3		18	70 -
22	Rakh	EW	Purandhar	18°12'20"	74°12'48"	200	6.1	28.70 127.00	Fr. Ves. Fr. Mas.	>30	0.78	>50	28.7	127
23	Rui	EW	Baramati	18°11'15"	74°37'00"	198.2	5.5	12 -18 ,49 -62 ,97 -152 ,70 -76 ,167 -174	VB	4.87	8.24		12 - 18	49 -62 ,97 - 152 ,70 -76 ,167 -174
24	Rui	OW	Baramati	18°11'15"	74°37'00"	58	3.7	15 -21 ,52 -58	VB	2.19	4.76		15 -21	52 - 58
25	Sasvad	EW	Purandhar	18°20'05"	74°01'30"	200	6.2	27 -37 ,61 -94	VB	8	2.34		27 -37	61 -94
26	Sherechiwadi	EW	Baramati	18°16'55"	74°21'50"	195.2	6	9.2 -15.3 ,33.6 - 39.7 ,112.9 -119 ,91.6 -97.7 ,128.2 -143.4 ,146.5 -152.6	VB	3.5	4.76			9.2 -15.3 ,33.6 -39.7 ,112.9 -119 ,91.6 -97.7 ,128.2 -143.4 ,146.5 -152.6
27	Sherechiwadi	OW	Baramati	18°16'55"	74°21'50"	152.6	23.5	9.2 -15.3	VB	4.38	0.6			9.2 -15.3
28	Sherechiwadi	OW	Baramati	18°16'55"	74°21'50"	24.5	7.2	9.2 -18.3	VB	4.2	3.4			9.2 -18.3
29	Singapur	EW	Purandhar	18°23'10"	74°07'10"	200	4.6		VB	1.5	0.2			
30	Sonwadisupe	EW	Baramati	18°15'40"	74°30'40"	200	3		VB	30	0.6			
31	Tandulwadi	EW	Baramati	18°10'57"	74°35'18"	93	6	30 .00 91.00	Weth. Ves Fr. Mas	2.3	12.18	-	30	91
32	Tandulwadi	OW	Baramati	18°10'57"	74°35'18"	200	6	49	Wet . Ves	11.1	2.16	35		49
33	Wadgaon Nimbalkar	EW	Baramati	18°07'47"	74°21'38"	200	9	24	Wth. Ves.	5.1	2.16	35	24	
34	Waghapur	EW	Purandhar	18°23'57"	74°07'47"	73.2	5.5	35 - ,45 -	F VB	30	2.34			35 - ,45 -
35	Walhe	EW	Purandhar	18°11'07"	74°09'25"	200	6	19	Wth. Ves.	12.3	0.38	>50	19	

Annexure-IIIa

Details of Key Observation Wells in* Baramati *and* Purandhar *taluka, Pune district.

SN	Village	Aquifer	Toposheet	X	Y	Owner	Approach to Well	MP (magl)	Depth (mbgl)	Dia (m)	Elev (m. amsl)	DTW (mbgl) May 16	DTW (mbgl) Nov. 16	Fluctuation (M)	RL Pre WL (mamsl)
BARAMATI TALUKA															
1	Bajrangwadi	BS01	47J8	74.404	18.091	Panchayat	When coming from Nira, turning southwards from about 24 Km on Nira Baramati Road, turning to right and well is located, right side of village road, 35 yrs old well	1	10.2	10.5	544	7.55	3.42	4.13	536.45
2	Bhondvewadi	BS01	47J7	74.325	18.340	Private	North of Village, opp. East of Supe Road	0.6	14.6	5.5	628	11.78	2.27	9.51	616.22
3	Chaudhar Wadi	BS01	47J8	74.268	18.164	Chikne's Well	Turning eastwards from Nira Moregaon highway, on Rakh Someshwar Road.	0.45	15	7	554	12.45	1.95	10.5	541.55
4	Dhumalwadi			74.481	18.101	NHS					539	10.4	8.33	2.07	528.6
5	Dorlewadi			74.611	18.094	NHS					527	5	4.26	0.74	522
6	Gojubavi	BS01	47J12	74.565	18.243	Private	Dattatreya Tulsiram Atoya ,behind 3 temples, kucha track opposite Hare Kirana store, in front of cow shed	0.7	9	5.2	576	7.9	3.05	4.85	568.1
7	Jalgaon Supe	BS01	47J8	74.468	18.245	Panchayat	East of Sonwadi village road, in front of cowshed and owner's house.	0.2 m	13	8	576	12.2	10.7	1.5	563.8
8	Jogwadi	BS01	47J8	74.263	18.241	Panchayat	in front of Panchayat Nigam office	1.15	11	4.6	641	11	1.81	9.19	630
9	Kamatwadi-Walha			74.169	18.165	NHS					632	8.7	10.6	-1.9	623.3
10	Karanje			74.254	18.136	NHS					566	6.1	1.92	4.18	559.9
11	Karanjepul	BS01	47J8	74.286	18.113	Panchayat	On Nira Baramati Highway,outskirts of village on Baramati side	1	10	10.5	559	5.55	0.7	4.85	553.45
12	Kololi	BS01	47J7	74.439	18.330	Panchayat	Behind Panchayat Office	g.l.	7.5	4.5	626	5.6	0.53	5.07	620.4
13	Loni Bhapkar	BS01	47J8	74.360	18.219	Panchayat	at the entrance gate (Kaman) of the village, near the hospital and under the bridge.	g.l.	7	4.2	598	6.15	1.1	5.05	591.85
14	Loni Bhapkar	BS01	47J8	74.389	18.250	Public	Adjacent to Vividh Seva Sahkari Soc. Vividh Seva Sahkari Soc. and Mangalmurti Niwas	0.5	8.9	7.2	595	9.7	1.16	8.54	585.3
15	Medad	BS01	47J12	74.539	18.176	Private	In field of shri Mahadev Pangev, about 200 m behind Toyota Showroom, aproach is not good, (behind Gavdewadi over field boundary)	g.l.	13	5	554	11.6	4.65	6.95	542.4

16	Nimbodi	BS01	47J11	74.692	18.289	Panchayat	North from village east of turning for Parwadi village	0.2	8.6	3.8	539	9.9	6.84	3.06	529.1
17	Nirvagaj	BS01	47J12	74.561	18.082	Prabhakar Bapu Rao Devkote)	East of Baramati-Nirawagaj Road, in field, about 1 Km nort of Village (towards Baramati)	0.2	16.25	10.5	527	11.15	6.5	4.65	515.85
18	Parwadi	BS01	47J11	74.620	18.270	Private	Owner-Suresh Dadaram & Bond Gawde Near the old fort next to stop dam	0.4	7	10.5	537	5.1	5.2	-0.1	531.9
19	Sangavi	BS01	47J8	74.482	18.060	Panchayat	In Village Quadrangle, School on one side, Veterinary hospital on another and Overhead Tank and Pumphouse near by	1.15	4.45	3	528	3.11	1.7	1.41	524.89
20	Sonkaswadi	BS01	47J8	74.466	18.141	Panchayat	4 Km. north of main village on Pandhare-Bhilawadi-Karhawagaj Road	0.6	12	10.5	551	9.5	9.2	0.3	541.5
21	Undavri Kade Pathar			74.539	18.247	NHS					580	8.77	6.75	2.02	571.23
22	Vadgaon Nimbalkar	BS01	47J8	74.360	18.129	Panchayat	located behind the school, Vetal Nagar	0.7	11	10.5	552	7.65	3.4	4.25	544.35
PURANDHAR TALUKA																
23	Ambale	BS01	47J3	74.157	18.411	Garekar Peshwa	Old Bawri Step well, in front of Mahadev Temple and new fort like building	0.35	13	6.8 m X 5 m	728	11.15	9.5	1.65	716.85
24	Askarwadi	BS01	47F15	73.903	18.401	Baban Maruti Wadkar	Well is approacable from Katraj-Kondwa- Saswad Road after turning right or westwards, located on Path opp College, leading behind Mehboob Imam Syed's house	0.4)	15.6	7.2	927	9.3	1.6	7.7	917.7
25	Bhosalewadi	BS01	47J3	74.138	18.369	Panchayat	Well near Pond bund	0.35	11	6.8	705	5.65	2.22	3.43	699.35
26	Daundaj	BS01	47J4	74.160	18.214	Panchayat	Well behind Mukti dham, roar across the temple crossing the culvert	0.9	14.5	7	656	10.1	6.6	3.5	645.9
27	Dive	BS01	47J3	74.023	18.385	Panchayat	Turning eastwards from Pune Saswad highway, from side of Prathmik Arogya Kendra, Dive. Well is located in front of 100 yrs old MahadevTemple.	0.4	13.5	6.75	800	8.83	4.9	3.93	791.17
28	Hivare	BS01	47F15	73.996	18.360	Panchayat	Drinking water supply well on left side of road while coming from Pune	1	16.8	8.5	799	13.85	7.05	6.8	785.15
29	Jawalarjun	BS01	47J7	74.254	18.278	Private, old well	North of Village, opp. Temple. Near Maruti RaoAavsaheb Rane Pravesh Dwar, near mobile tower under cluster of trees	1.2	11	3.5	643	8.6	7.9	0.7	634.4
30	Jejuri			74.171	18.268	NHS					722	6.9	5.8	1.1	715.1

31	Kaldari	BS01	47F15	73.986	18.244	Panchayat	Panchayat	0.5	12	8	795	10.1	1.22	8.88	784.9
32	Narayanpur			73.975	18.303	NHS					885	8.7	0.2	8.5	876.3
33	Pangre Sailar Basti			74.083	18.251	NHS					739	6.9	6	0.9	732.1
34	Pimpale	BS01	47J3	74.035	18.316	Private	Sh. Prakash Khemat and Sh Maruti Khemat ,next to ownwrs house, outskirts of village, isolated house of Khemats.	1	14	7.5	789	12.6	10.65	1.95	776.4
35	Pimpri (Kh) Malvasti			74.203	18.111	NHS					561	5.7	5.35	0.35	555.3
36	Pondhe	BS01	47J7	74.276	18.426	Sakarbai (Vihir)	Behind Mahadeo (Hanuman) Temple	0.3	4.1	7.5	720	7.2	1.72	5.48	712.8
37	Rajuri	BS01	47J7	74.272	18.347	Private (farmer)	Southof Village, about 300 m south of Supe-Saswad Road, in field	0.3	12	6	682	10.75	5.28	5.47	671.25
38	Sakurde			74.117	18.283	NHS					764	6.3	1.75	4.55	757.7
39	Thapewadi	BS01	47F15	73.912	18.347	Private	Inscribed Nanuram Gurjar on Parapet wall -0n rt side of road, across gate of Sohan Farms	0.45	18	7	883	13.15	6.85	6.3	869.85
40	Veer	BS01	47J4	74.086	18.151	Panchayat	Drinking water supply well in front of pump house in the heart of village	0.4	20	6.75	594	15.1	5.99	9.11	578.9
41	Zendewadi			74.017	18.414	NHS					836	10.3	12	-1.7	825.7
42	Gulunche	BS01	47J4	74.225	18.172										0

Annexure-IIIb

Aquifer-I, Depth to water level data Purandhar and Baramati taluka, Pune district

Sl. No.	Taluka	Village	Longitude	Lattitude	Elevation (m. msl)	Pre Monsoon Depth to Water	Post Monsoon Depth to Water	Pre to Post Monsoon Water Level Fluctuation (m)	Pre Monsoon Water Table Elevation (mamsl)	Post Monsoon Water Table Elevation (mamsl)
1	Baramti	Bajrangwadi	74.404	18.091	544	7.55	3.42	4.13	536.45	540.58
2	Baramti	Bhondvewadi	74.342	18.321	628	11.78	2.27	9.51	616.22	625.73
3	Baramti	Chaudhar Wadi	74.268	18.164	554	12.45	1.95	10.5	541.55	654.05
4	Baramti	Dhumalwadi	74.481	18.101	539	12.82	8.33	4.49	526.18	530.67

Sl. No.	Taluka	Village	Longitude	Lattitude	Elevation (m. msl)	Pre Monsoon Depth to Water	Post Monsoon Depth to Water	Pre to Post Monsoon Water Level Fluctuation (m)	Pre Monsoon Water Table Elevation (mamsl)	Post Monsoon Water Table Elevation (mamsl)
5	Baramti	Dorlewadi	74.611	18.094	527	6.92	4.26	2.66	520.08	522.74
6	Baramti	Gojubavi	74.571	18.232	576	7.9	3.05	4.85	568.1	567.95
7	Baramti	Jalgaon Supe	74.466	18.244	576	12.2	10.7	1.5	563.8	565.3
8	Baramti	Jogwadi	74.262	18.244	641	11	1.81	9.19	630	639.19
9	Baramti	Kamatwadi-Walha	74.169	18.165	632	11.7	10.6	1.1	620.3	621.4
10	Baramti	Karanje	74.254	18.136	566	6.82	1.92	4.9	559.18	564.08
11	Baramti	Karanjepul	74.286	18.113	559	5.55	0.7	4.85	553.45	558.3
12	Baramti	Kololi	74.446	18.317	626	5.6	0.53	5.07	620.4	625.47
13	Baramti	Loni Bhapkar	74.382	18.228	598	6.15	1.1	5.05	591.85	596.9
14	Baramti	Loni Bhapkar	74.402	18.231	595	9.5	1.16	8.34	585.5	593.84
15	Baramti	Medad	74.539	18.176	554	11.6	4.65	6.95	542.4	549.35
16	Baramti	Nimbodi	74.691	18.290	539	8.6	6.84	1.76	530.4	532.16
17	Baramti	Nirvagaj	74.561	18.082	527	11.15	6.5	4.65	515.85	520.5
18	Baramti	Parwadi	74.651	18.280	537	5.1	5.2	-0.1	531.9	531.8
19	Baramti	Sangavi	74.482	18.060	528	3.11	1.7	1.41	524.89	526.3
20	Baramti	Sonkaswadi	74.466	18.141	551	9.5	9.2	0.3	541.5	541.8
21	Baramti	Undavri Kade	74.538	18.250	580	12	6.75	5.25		573.25
22	Baramti	Vadgaon Nimbalkar	74.360	18.129	552	7.65	3.4	4.25	544.35	548.6
23	Purandhar	Ambale	74.167	18.404	728	11.15	9.5	1.65	716.85	718.5
24	Purandhar	Askarwadi	73.903	18.401	927	9.3	1.6	7.7	917.7	925.4
25	Purandhar	Bhosalewadi	74.149	18.331	705	5.65	2.22	3.43	699.35	551.78
26	Purandhar	Daundaj	74.160	18.214	656	10.1	6.6	3.5	645.9	793.4
27	Purandhar	Dive	74.023	18.385	800	8.83	4.9	3.93	791.17	571.1
28	Purandhar	Hivare	73.996	18.360	799	13.85	7.05	6.8	785.15	791.95

Sl. No.	Taluka	Village	Longitude	Lattitude	Elevation (m. msl)	Pre Monsoon Depth to Water	Post Monsoon Depth to Water	Pre to Post Monsoon Water Level Fluctuation (m)	Pre Monsoon Water Table Elevation (mamsl)	Post Monsoon Water Table Elevation (mamsl)
29	Purandhar	Jawalarjun	74.240	18.301	643	8.6	7.9	0.7	634.4	635.1
30	Purandhar	Jejuri	74.171	18.268	722	6.7	5.8	0.9	715.3	716.2
31	Purandhar	Kaldari	73.986	18.244	795	10.1	1.22	8.88	784.9	793.78
32	Purandhar	Narayanpur	73.975	18.303	885	2	0.2	1.8	883	884.8
33	Purandhar	Pangre Sailar Basti	74.083	18.251	739	5.75	6	-0.25	733.25	733
34	Purandhar	Pimpale	74.035	18.316	789	12.6	10.65	1.95	776.4	778.35
35	Purandhar	Pimpri (Kh) Malvasti	74.203	18.111	561	6.25	5.35	0.9	554.75	555.65
36	Purandhar	Pondhe	74.274	18.426	720	7.2	1.72	5.48	712.8	718.28
37	Purandhar	Rajuri	74.273	18.367	682	10.75	5.28	5.47	671.25	676.72
38	Purandhar	Sakurde	74.117	18.283	764	5.83	1.75	4.08	758.17	762.25
39	Purandhar	Thapewadi	73.912	18.347	883	13.15	6.85	6.3	869.85	876.15
40	Purandhar	Veer	74.086	18.151	594	15.1	5.99	9.11	578.9	588.01
41	Purandhar	Walha	74.150	18.192	714	2.15	0.52	1.63	711.85	713.48
42	Purandhar	Zendewadi-1	74.018	18.415	836	11.43	9	2.43	824.57	824
43	Baramati	Baburdi	74.375	18.279	607	7.5	1.3	6.2	599.5	605.7
44	Baramati	Dhakale	74.441	18.173	583.4	9.8	2.8	7	573.6	580.6
45	Baramati	Jogwadi	74.296	18.208	597	6.2	1.7	4.5	590.8	595.3
46	Baramati	Loni Bhapkar	74.386	18.228	597.3	8.2	4.3	3.9	589.1	593
47	Baramati	Morgaon	74.314	18.299	629.7	8.4	11	-2.6	621.3	618.7
48	Baramati	Murti	74.289	18.214	604.3	5	2.5	2.5	599.3	601.8
49	Baramati	Pandare	74.465	18.136	554.2	4.7	2.85	1.85	549.5	551.35
50	Baramati	Sangavi	74.486	18.059	527.7	7	1.5	5.5	520.7	526.2
51	Baramati	Supe	74.388	18.336	632	8.9	4	4.9	623.1	628
52	Baramati	Undwadi Kp.	74.542	18.249	576	6.3	4	2.3	569.7	572
53	Baramati	Vadgaon Nimbalkar	74.389	18.138	560	7.3	2.2	5.1	552.7	557.8

Sl. No.	Taluka	Village	Longitude	Lattitude	Elevation (m. msl)	Pre Monsoon Depth to Water	Post Monsoon Depth to Water	Pre to Post Monsoon Water Level Fluctuation (m)	Pre Monsoon Water Table Elevation (mamsl)	Post Monsoon Water Table Elevation (mamsl)
54	Purandhar	Belsar	74.128	18.311	708.7	14.3	8.2	6.1	694.4	700.5
55	Purandhar	Dive	74.017	18.381	797.6	11.4	8	3.4	786.2	789.6
56	Purandhar	Gurholi	74.093	18.405	799	6	3.5	2.5	793	795.5
57	Purandhar	Harani	74.118	18.172	606.4	5.9	3.4	2.5	600.5	603
58	Purandhar	Hargude	74.077	18.218	672	8.1	2.5	5.6	663.9	669.5
59	Purandhar	Jejuri	74.146	18.283	731.3	5.1	3.2	1.9	726.2	728.1
60	Purandhar	Khanwadi	74.094	18.331	726.2	4.7	3.5	1.2	721.5	722.7
61	Purandhar	Malshiras	74.234	18.406	712.3	11.3	3	8.3	701	709.3
62	Purandhar	Mawadi Kp.	74.243	18.260	659	17.5	9.5	8	641.5	649.5
63	Purandhar	Parinche	74.087	18.190	639	11.85	9.1	2.75	627.15	629.9
64	Purandhar	Pingori	74.054	18.260	744	8.5	3.5	5	735.5	740.5
65	Purandhar	Pondhe	74.276	18.424	723	5.4	2	3.4	717.6	721
66	Purandhar	Sakurde	74.120	18.273	770.1	10.7	2	8.7	759.4	768.1
67	Purandhar	Walha	74.152	18.192	631	8.45	4.4	4.05	622.55	626.6

Aquifer-I, Water level trend (2007-16), *Baramati* and *Purandhar T*talukas, Pune district **Annexure IV**

SN	Village	Latitude	Longitude	Depth of well	Premonsoon WL (mbgl)	Pre trend (m/year)	Postmonsoon WL(mbgl)	Post Trend (m/year)
Baramati Taluka								
1	Baburdi	18.279	74.375	10.8	8.2	-0.17485	3.8	0.364634
2	Baramati Rural	18.153	74.579	11.6	11.6	-0.04048	3	-0.00286
3	Chandgude Wadi	18.304	74.310	90	11.1	0.338909	9.9	0.174865
4	Chandgude Wadi	18.296	74.313	31.6	11.4	0.437242	7	0.5
5	Dhakale	18.173	74.441	10	5.5	0.064303	6.4	0.161429
6	Jalochi	18.158	74.611	30	9.3	0.051939	7.4	0.932703
7	Karhati	18.260	74.423	60	9.8	1.382788	6.15	0.17027

SN	Village	Latitude	Longitude	Depth of well	Premonsoon WL (mbgl)	Pre trend (m/year)	Postmonsoon WL(mbgl)	Post Trend (m/year)
8	Korhale Kh	18.086	74.372	58	7.25	0.148193	3.1	0.211667
9	Korhale Kh	18.086	74.372	90	9.15	0.215758	4.15	0.334865
10	Kutwalwadi	18.333	74.340	92.1	5.15	0.084125	4	0.006494
11	Loni Bhapkar	18.225	74.386	95	5.6	0.59327	2.2	0.206688
12	Murti	18.214	74.289	16.3	6.7	0.119818	5	0.12
13	Nimbodi	18.291	74.692	30	8.95	0.354364	5.2	0.45359
14	Sangavi	18.059	74.486	7.9	4.6	0.004061	1.3	0.124342
15	Supe	18.324	74.353	30	6.25	-0.01163	3.25	0.147391
16	Vadgaon Nimbalkar	18.138	74.389	8.2	7	0.021818	2.9	-0.14095
17	Vadgaon Nimbalkar	18.129	74.367	68	6	0.039091	5.1	0.14
Purandhar Taluka								
18	Belsar	18.311	74.128	16.5	14.6	0.227297	9.1	0.265
19	Chambhali	18.378	73.975	50	11.5	-0.07673	9	0.115625
20	Dive	18.381	74.017	36.1	18	0.184848	7.3	0.376311
21	Gurholi	18.405	74.093	8.7	7.6	0.116824	1.9	0.172746
22	Harni	18.172	74.118	7.05	6.4	0.096364	2.1	0.101429
23	Jejuri	18.283	74.146	7	5.5	0.191818	1.4	0.120082
24	Khalad	18.332	74.083	30	6	-0.16393	13.75	1.014649
25	Khanvadi	18.331	74.094	9.15	4.7	-0.14315	3.6	0.129098
26	Malshiras	18.407	74.233	100	29.2	2.077576	4	0.014754
27	Mawadikade Pathar	18.274	74.249	34	11.6	0.202303	5.5	0.325313
28	Mawadikade Pathar	18.260	74.243	14.85	7.2	0.445697	5.6	0.962432
29	Pargaon	18.356	74.125	97	26.8	1.247444	6	0.227
30	Pargaon	18.356	74.125	35	30.35	1.319576	25.2	1.588516
31	Parinche	18.190	74.087	11.85	9.7	0.034632	7.7	0.205714
32	Pingori	18.260	74.054	9.4	7.5	0.136303	3.2	0.043238
33	Pondhe	18.424	74.276	90	4.9	0.040811	3.5	0.05
34	Rise	18.358	74.300	60	9.15	0.383758	7.85	0.741598
35	Sakurde	18.273	74.120	10.7	6.9	0.053333	1.4	-0.09
36	Saswad Rural	18.338	74.029	30	5.1	0.117857	3.5	-0.10825
37	Walhe	18.192	74.152	9	7.3	-0.07558	3	0.456548
38	Walhe	18.186	74.154	30	12.5	0.750364	6.4	1.275

-ve value indicates rising while +ve value indicates falling trend.

Annexure-V

Aquifer-II, Depth to water level data Purandhar and Baramati taluka, Pune district

S.N.	Name of Site	Type of well	Taluka	Y	X	altitude m	Depth Drilled (Mbgl)	Casing (Mbmp)	Zones Encountered (mbgl)	Aquifer (Basalt)	Pre DTW	Post DTW	Discharge (lps)	AQI thickness	AQII thickness	AQI	AQII	Massive
1	Rakh	EW	Purandar	18.20556	74.21333		200	6.1	28.70 , 127.00	Fr. Ves. Fr. Mas.	>30	15	0.78	14	2	14	127	200
2	Gulunche	EW	Purandar	18.14556	74.22639		200	6	84.60,168.00	Wth. Ves. Fr. Mas.	>30	15	0.014	10	1	10	168	200
3	Walhe	EW	Purandar	18.18528	74.15694		200	6	19	Wth. Ves.	12.3	11	0.38	11	1	11	70	200
4	Narayanpur	EW	Purandar	18.3025	73.98139		200	8.3	32	Wth. Ves.	5.1	3	7.76	12	3	12	90	200
5	Parainche	EW	Purandar	18.19167	74.08389		200	6.1	41.00 ,108.00	Wth. Ves. Fr. Mas.	>50	25	Traces	10	0.5	10	108	200
6	Wadgaon Nimbalkar	EW	Baramati	18.12972	74.36056		200	9	24	Wth. Ves.	15	5.1	2.16	10	2	10	67	200
7	Choudharwadi	EW	Baramati	18.17028	74.26694		200	6.1	109	Fr. Mas	25	17.8	1.37	10	2	10	109	200
8	Chandgudewadi	EW	Baramati	18.29833	74.31		200	6	19.00 116.00	Wth. Ves. Fr. Mas.	21	11.8	4.43	10	4	10	116	200
9	Loni Bhapkar)	EW	Baramati	18.22889	74.38472		200	6	nil seepage	NA	35	25.5	0.38	10	0.5	10	60	200
10	Parawadi	EW	Baramati	18.28139	74.6525		200	12	65.00 , 77.00 ,141.00	fr. Mas.	12	4.85	7.76	13	9	13	141	200
11	Dorlewadi	EW	Baramati	18.09306	74.61444		200	6	105	Fr. Mas.	11	4.87	3	12	3	12	105	200
12	Tandulwadi	EW	Baramati	18.1825	74.58833		200	6	30 .00, 91.00	Weth. Ves Fr. Mas	2.3	2	12.18	10	6	10	91	200
13	Pandhare	EW	Baramati	18.14083	74.46528		200	12	nil seepage	NA	>50	31	Traces	15	0.5	15	60	200
14	Ambhi Khurd)	EW	Baramati	18.30556	74.28389		200	6	nil seepage	NA	>50	31	Traces	10	0.5	10	60	200
15	Sonwadisupe	EW	Baramati	18.2611	74.5111	579.5	200	3		VB	45	30	0.6	14	2	14	60	200
16	Rui	EW	Baramati	18.1875	74.6167	561.9	198.2	5.5	12 -18 ,49 -62 ,97 -152 ,70 -76 ,167 -174	VB	15	4.87	8.24	18	12	18	174	198.2

17	Sherechiwadi	EW	Baramati	18.2819	74.3639	603.5	195.2	6	9.2 -15.3 ,33.6 -39.7 ,112.9 -119 ,91.6 -97.7 ,128.2 -143.4 ,146.5 -152.6	VB	16	3.5	4.76	25	12	25	153	195.2
18	Naygaon (Khorawade)	EW	Purandhar	18.3667	74.2333	680.2	200	5.5	9 - ,21 -	F VB	21	11.4		25	1	25	100	200
19	Jadhavwadi	EW	Purandhar	18.3917	74.0014	859.6	112	5.6	-65	VB	60	41		18	1	18	65	112
20	Kothale	EW	Purandhar	18.3153	74.125	704.4	165	6.5	28 - ,100 -	VB	21	10		28	2	28	106	165
21	Naygaon	EW	Purandhar	18.3667	74.2333	680.2	200	2.5	42 -51 ,58 - 64	VB	18	4.5	1.13	15	1	15	64	200
22	Pangare Sailar Vasti	EW	Purandhar	18.27	74.0639	753.3	184.7	5.6	-23	F Basalt	32	22.2	0.62	23	2	23	60	184.7
23	Pargaon	EW	Purandhar	18.3583	74.125	730.1	153.2	5.6	18 - ,70 -	VB	18	5.6	-	18	2	18	80	153.2
24	Sasvad	EW	Purandhar	18.3347	74.025	773.4	200	6.2	27 -37 ,61 - 94	VB	17	8	2.34	27	3	27	94	200
25	Singapur	EW	Purandhar	18.3861	74.1194	764.4	200	4.6		VB	12	1.5	-	18	1	18	60	200
26	Waghapur	EW	Purandhar	18.3992	74.1297	751.4	73.2	5.5	35 - ,45 -	F VB	43	30	2.34	18	3	18	60	73.2

Annexure-VI

Aquifer-I, Ground water quality of Baramati and Purandhar Talukas, Pune district

Sl. No	Tahsil	Site Name	Latitude	Longitude	Ph	EC µs/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F
							←---------- mg/l ----------→											
1	BARAMATI	Chaudhar Wadi	18.1786	74.2642	8.3	556	355.8	189	44	0.49	95	23	14	127	41	53	40	0.418
2	BARAMATI	Sonkaswadi	18.1574	74.4491	8.1	602	385.3	199	78	0.71	80	29	0	293	3	45	9	0.33
3	BARAMATI	Karanjepul	18.1024	74.2838	7.9	752	481.3	244	61	0.71	139	25	0	210	90	56	17	0.117
4	BARAMATI	Vadgaon Nimbalkar	18.1466	74.3531	8.0	834	533.8	115	141	1.10	95	5	0	327	46	56	34	0.462
5	BARAMATI	Bajrangwadi	18.0886	74.4048	7.7	1674	1071	588	111	1.54	344	59	0	249	193	307	34	0.076
6	BARAMATI	Sangavi	18.0671	74.4677	7.6	138	88.32	50	10	0.86	40	2	0	39	8	25	7	0.48
7	BARAMATI	Nirvagaj	18.0885	74.5636	7.8	3425	2192	757	440	2.40	294	113	0	83	260	1195	46	0.153
8	BARAMATI	Nimbodi	18.2889	74.6916	7.5	268	171.5	75	28	0.44	40	8	0	39	18	66	7	0.173
9	BARAMATI	Parwadi	18.2695	74.6202	7.9	440	281.6	100	57	0.15	75	6	0	146	26	56	8	0.559
10	BARAMATI	Gojubavi	18.2428	74.5649	7.6	1021	653.4	413	42	0.26	264	36	0	205	113	139	49	0.291
11	BARAMATI	Jalgaon Supe	18.2446	74.4676	8.0	2539	1625	687	271	0.21	329	87	0	264	573	208	32	0.381
12	BARAMATI	Loni Bhapkar	18.2496	74.3893	8.2	1601	1025	259	242	1.68	75	45	0	273	254	207	7	0.05
13	BARAMATI	Jogwadi	18.2414	74.263	8.1	759	485.8	244	61	0.07	125	29	0	176	75	100	42	0.291
14	BARAMATI	Kololi	18.3303	74.4387	8.0	424	271.4	144	31	0.07	80	16	0	112	44	55	7	0.16
15	BARAMATI	Bhondvewadi	18.3396	74.3253	7.7	2266	1450	578	254	0.11	374	50	0	151	409	387	44	0.779
16	BARAMATI	Medad	18.1799	74.5063	8.4	4451	2849	144	955	0.19	95	12	29	498	293	1287	25	2.89
17	BARAMATI	Karanje	18.1361	74.2542		2220	1172	630	195	7.07	146	64.4	18	390	453.8	144	51	0.64
18	BARAMATI	Dhumalwadi	18.1006	74.4806		618	327	235	53	0.77	52.1	25.5	12	140	99.26	81	26	0.4
19	BARAMATI	Dorlewadi	18.0944	74.6111		826	439	365	45.3	0.75	70.1	46.2	0	159	117	157	45	0.42
20	PURANDHAR	Askarwadi	18.401	73.8981	7.9	488	312.3	174	30	1.73	105	17	0	195	23	40	7	0.15
21	PURANDHAR	Pimpale	18.3143	74.0504	8.0	766	490.2	289	39	2.29	184	25	0	224	51	75	46	0.22
22	PURANDHAR	Veer	18.1524	74.0875	8.0	957	612.5	279	94	1.20	194	21	0	303	69	100	42	0.324
23	PURANDHAR	Thapewadi	18.3478	73.9156	7.9	389	249	154	16	0.69	125	7	0	161	21	31	7	0.164

Sl. No	Tahsil	Site Name	Latitude	Longitude	Ph	EC µs/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F
							←---------- mg/l ----------→											
24	PURANDHAR	Hivare	18.3595	73.9966	7.8	826	528.6	299	53	0.97	164	33	0	215	105	50	44	0.247
25	PURANDHAR	Dive	18.3924	74.0514	7.8	1061	679	289	71	65.70	189	24	0	200	113	161	49	0.234
26	PURANDHAR	Kaldari	18.2593	73.9868	8.1	338	216.3	144	13	0.49	125	5	0	146	15	23	7	0.313
27	PURANDHAR	Daundaj	18.2122	74.1619	7.9	858	549.1	209	101	0.41	129	19	0	264	69	75	46	0.309
28	PURANDHAR	Jawalarjun	18.2783	74.2537	7.8	6818	4364	1195	1024	5.54	40	281	0	220	1439	1100	52	0.646
29	PURANDHAR	Rajuri	18.3471	74.2718	8.0	1106	707.8	344	95	5.20	204	34	0	200	105	200	44	0.643
30	PURANDHAR	Pondhe	18.4259	74.2764	8.0	750	480	274	45	0.70	110	40	0	259	82	34	19	0.469
31	PURANDHAR	Ambale	18.4105	74.1566	8.2	1834	1174	677	117	5.01	374	74	0	493	154	287	28	0.346
32	PURANDHAR	Bhosalewadi	18.3688	74.1383	8.2	633	405.1	194	52	0.39	70	30	0	156	87	59	7	0.289
33	PURANDHAR	Zendewadi	18.4139	74.0167		965	510	425	45.3	1.36	90.2	48.6	0	226	113.4	162	42	0.46
34	PURANDHAR	Pangre	18.2514	74.0833		620	328	270	45.1	2.45	66.1	25.5	15	275	56.72	32	7	0.5
35	PURANDHAR	Sakurde	18.2833	74.1167		691	366	295	37.7	14	70.1	29.2	0	250	81.54	68	32	0.42
36	PURANDHAR	Kamatwadi-Walha	18.1647	74.1686		1172	623	405	105	0.92	56.1	64.4	21	238	195	130	44	0.4
37	PURANDHAR	Jejuri	18.2681	74.1708		865	458	280	85.9	0.38	66.1	27.9	0	220	134.7	120	7	0.36
38	PURANDHAR	Pimpri (Kh)	18.1111	74.2028		1251	663	325	132	3.34	46.1	51	0	195	74.45	364	29	0.65

Annexure-VII

Aquifer-II, Ground water quality of Baramati and Purandhar Talukas, Pune district

S. No	Taluka	Location		Latitute	Longtitude	pH	EC µS/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F
								←---------- mg/l ----------→											
1	Baramati	Chandgude Wadi	EW	18°17'53"	74°18'35"	7.7	2859	1516	1210	238	149	101	0.72	0	55	681	314	32	0.47
2	Baramati	Chandgude Wadi	OW	18°17'53"	74°18'35"	8	993	526	275	52	35	90	2.47	0	189	177	4	18	0.1
3	Baramati	Chandgude Wadi	OW	18°17'53"	74°18'35"	7.6	1190	630	255	56	28	100	1.14	0	73	252	88	16	0.41
4	Baramati	Chandgude Wadi	OW	18°17'53"	74°18'35"	7.7	2838	1505	1250	242	157	96	0.55	0	55	674	294	32	0.12

S. No	Taluka	Location		Latitute	Longtitude	pH	EC µS/cm at 25°C	TDS	TH	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F
								←---------- mg/l ----------→											
5	Baramati	Choudharwadi	EW	18°10'13"	74°16'08"	8	438	232	160	42	13	41	0.63	0	214	43	5	32	0.12
6	Baramati	Dorlewadi	EW	18°05'35"	74°36'50"	7.9	1791	950	410	80	51	186	1.29	0	49	429	226	29	0.75
7	Baramati	Dorlewadi	EW	18°05'35"	74°36'50"	7.7	1580	838	235	78	10	168	1.16	0	61	369	92	26	0.8
8	Baramati	Dorlewadi	OW	18°05'35"	74°36'50"	7.5	1736	920	395	64	57	180	4.79	0	73	408	207	29	0.94
9	Baramati	Loni Bhapkar	EW	18°13'36"	74°23'01"	7.8	889	471	120	22	16	104	0.97	0	55	206	5	7	0.1
10	Baramati	Parwadi	EW	18°16'52"	74°39'10"	7.7	1268	673	150	34	16	166	1.5	0	122	255	5	33	0.1
11	Baramati	Parwadi	OW	18°16'52"	74°39'10"	7.9	593	314	215	40	28	47	1.09	0	104	113	61	24	0.1
12	Baramati	Rui	EW	18°11'15"	74°37'00"	7.9	2500	1538	900	248	68	164	2.2	0	165	440	200	353	0.93
13	Baramati	Sherechiwadi	EW	18°16'55"	74°21'50"	7.7	1610	1025	485	76	72	156	2	0	177	223	205	201	0.74
14	Baramati	Sherechiwadi	EW	18°16'55"	74°21'50"	7.7	1610	1025	485	76	72	156	2	0	177	223	205	201	0.74
15	Baramati	Sherechiwadi	OW	18°16'55"	74°21'50"	7.5	2100	1310	740	110	113	154	1	0	183	362	150	330	0.91
16	Baramati	Sherechiwadi	OW	18°16'55"	74°21'50"	7.5	2100	1310	740	110	113	154	1	0	183	362	150	330	0.91
17	Baramati	Tandulwadi	EW	18°10'57"	74°35'18"	7.6	653	345	150	28	19	90	0.87	0	55	170	23	7	1.08
18	Baramati	Tandulwadi	OW	18°10'57"	74°35'18"	7.9	1283	680	465	84	62	79	1.02	0	67	238	212	32	0.15
19	Baramati	Wadgaon Nimbalkar	EW	18°07'49"	74°21'37"	8	707	374	130	38	9	88	14	0	323	64	6	27	0.33
20	Baramati	Wadgaon Nimbalkar	OW	18°07'49"	74°21'37"	7.8	707	377	145	38	12	87	5.08	0	299	71	5	24	0.13
21	Purandhar	Gulunche	EW	18°08'42"	74°13'34"	7.8	1620	860	510	148	34	83	3.75	0	146	362	121	34	0.09
22	Purandhar	Narayanpur	EW	18°18'09"	73°58'31"	7.7	749	397	250	48	32	60	2.08	0	140	103	58	30	0.11
23	Purandhar	Narayanpur	OW	18°18'09"	73°58'31"	7.7	782	414	290	56	36	57	1.6	0	134	121	95	27	0.09
24	Purandhar	Narayanpur	OW	18°18'09"	73°58'31"	7.9	1112	590	375	76	45	71	1.07	0	262	174	78	34	0.09
25	Purandhar	Parinche	EW	18°11'30"	74°05'03"	7.8	307	162	30	8	2	55	0.58	0	61	50	16	7	0.15
26	Purandhar	Rakh	EW	18°12'05"	74°12'52"	7.6	2199	1166	770	228	49	96	1.36	0	159	574	129	35	0.12
27	Purandhar	Sasvad	EW	18°20'05"	74°01'30"	7.8	1530	893	170	48	13	276	1	0	360	234	91	50	0.4
28	Purandhar	Singapur	EW	18°23'10"	74°07'10"	8.3	1120	650	295	28	55	127	5	0	342	92	61	110	0.6
29	Purandhar	Walha	EW	18°11'08"	74°09'24"	7.7	971	514	340	82	33	70	1.61	0	244	149	72	34	0.12

Annexure-VIII

Details of Micro-level Surveys in **Baramati** ***and*** **Purandhar** ***taluka, Pune district.***

Sl.No.	Village	Long_ deci	Lat_deci	Eleva-tion (amsl)	Geology	Well depth (mbgl)	D.T.W. (mbgl)	EC (µs/ cm)	Thick-ness weath-ered portion(m)	Thick-ness of fracture zone (m)	Annual pumpin g hours.	HP of Pum p	Rate of disc-harge (m^3/hr)	Kharif draft(m3)	Rabi Draft(m3)	Summ er Draft (m3)	Annua l Draft m3/ye ar
Baramati Taluka																	
1	Ambi Kh	74.309	18.323	645	BS01	12.7	8.5	832	6	3	625	3	9	3375	2250	0	5625
2	Bhondvewadi	74.341	18.321	633	BS01	13	12.5		3	4	890	3	10.8	972	8640	0	9612
3	Dandwadi	74.434	18.326	634	BS01	11.8	11.6	1266	1.5	2	555	5	14.4	5400	2592	0	7992
4	Dandwadi	74.479	18.104	543	BS01	13.3	7	1473	2	4	715	3	10.8	432	6480	810	7722
5	Deulgaon Rasal	74.466	18.305	619	BS01	11.2	11	697	7	3	900	5	16.2	2916	11664	0	14580
6	Dorlewadi	74.608	18.095	528	BS01	7	5.8		4	0	850	3	9	360	6480	810	7650
7	Gojubavi	74.571	18.232	577	BS01	8.6	8	1703	5	1	560	3	9	1800	3240	0	5040
8	Jalgaon KP	74.477	18.219	567	BS01	12.5	10.9	8929	6	0	205	3	7.2	1152	324	0	1476
9	Jalochi	74.597	18.163		BS01	9	6.8		7	0	6172	3	10.8	1728	64930.	0	66658.
10	Jogwadi	74.262	18.255		BS01	18	16		18	0	225	5	12.6	1134	1701	0	2835
11	Karanjepul	74.287	18.118	555	BS01	10	4.7	803	10		1760	5	14.4	0	13824	11520	25344
12	Karkhel	74.498	18.290	595	BS01	7.3	7	697	3	0	420	3	9	2160	1620	0	3780
13	Katewadi (Kanheri)	74.655	18.133	540	BS01	6	4.4		6		915	5	19.8	891	14256	2970	18117
14	Katphal	74.610	18.235	586	BS01	9.3	7.8	1200	2	2	960	3	9	2160	6480	0	8640
15	Kharade Wadi	74.516	18.311	607	BS01	8	4.3	1012	4	1	330	3	9	810	2160	0	2970
16	Kololi	74.445	18.304	634	BS01	6.5	5.4	625	3.5	0	1020	5	16.2	7776	8748	0	16524
17	Loni Bhapkar	74.370	18.227		BS01	15	14		6		350	5	16.2	3240	2430	0	5670
18	Malegaon Bk	74.501	18.103	541	BS01	8.9	dry		3.6	2.2	840	3	18	0	8640	6480	15120
19	Medad	74.539	18.176	554	BS01	13	11.2	4368	3	3	420	5	18	1080	2880	3600	7560
20	Mekhali	74.602	18.094	527	BS01	7	4.4	2365	6	1	1470	5	9	3600	7200	2430	13230
21	Modhave (Umbarwada/	74.270	18.188	605	BS01	10	7.2	1461	7	2	350	5	23.4	3510	4680	0	8190

Sl.No.	Village	Long_ deci	Lat_deci	Eleva-tion (amsl)	Geology	Well depth (mbgl)	D.T.W. (mbgl)	EC (µs/ cm)	Thick-ness weath-ered portion(m)	Thick-ness of fracture zone (m)	Annual pumpin g hours.	HP of Pum p	Rate of disc-harge (m^3/hr)	Kharif draft(m3)	Rabi Draft(m3)	Summ er Draft (m3)	Annua l Draft m3/ye ar
	Murti))																
22	Nimbut	74.241	18.111	551	BS01	8	6.4	1412	8	0	920	3	10.8	1296	6480	2160	9936
23	Nirvagaj	74.552	18.073	516	AL01	6	0.5	5556			1840	3	12.6	3024	10080	10080	23184
24	Pardhare	74.479	18.138	549	BS01	10.5	6.2	887	7	1.5	1200	3	10.8	1728	8640	2592	12960
25	Parwadi	74.633	18.294	557	BS01	9	4.5	1251	6	1	1040	3	12.6	3402	9072	630	13104
26	Pimpali	74.624	18.131	541	BS01	16	2.5	861	6		100	17	64.8	0	38880	51840	6480
27	Sangvi	74.467	18.067	540	BS01	6.1	5.9	2228	5	0	170	3	9	180	1080	270	1530
28	Shirsuphal	74.585	18.309	570	BS01	9	6.8	704	8	0	540	3	7.2	1728	2160	0	3888
29	Vadgaon Nimbalkar	74.367	18.128	552	BS01	15	3.6	1191	4	6	1616	5	16.2	4147	15552	6480	26179. 2
30	Vadhane	74.352	18.355	655	BS01	13.5	dry		2	4	550	3	9	2250	2700	0	4950
31	Zaragadwadi	74.617	18.098	533	BS01	17	14.8		6	1.5	475	5	14.4	648	5760	432	6840
Purandha Taluka																	
32	Bopgaon	73.953	18.402	862	BS01	12.8	11.8	677	3	3	320	3	12.6	2520	1512	0	4032
33	Devadi	73.937	18.281	725	BS01	15	14.6	863	6	5	560	7.5	36	7200	12960	0	20160
34	Dhalewadi	74.159	18.302	689	BS01	10			6	1	248	5	12.6	1613	1512	0	3124.8
35	Dive	74.023	18.402	820	BS01	17	16.7	950	6	2	810	3	12.6	1134	9072	0	10206
36	Garade	73.924	18.366	885	BS01	15.8	15.7	390	5	2	232	5	14.4	1037	2304	0	3340.8
37	Gulunche	74.226	18.141	567	BS01	11	9.1	1.24	4	1	360	3	9	540	2700	0	3240
38	Karnalwadi	74.167	18.164	600	BS01	23	15.1	1428	8	2	600	5	18	7200	3600	0	10800
39	Khanvadi	74.105	18.329	721	BS01	18	17.5	1177	3	2	100	3	9	90	810	0	900
40	Kodit Bk.	73.974	18.343	803	BS01	12.5	11	684	11	1	490	5	12.6	504	5670	0	6174
41	Kumbharvalan	74.066	18.376	769	BS01	14	5.9	900	7	1	500	5	12.6	252	6048	0	6300
42	Malshiras	74.231	18.410	720	BS01	8	4	1067	2	2.5	700	3	12.6	2520	6300	0	8820
43	Mandaki	74.129	18.145	577	BS01	10	3.9	920	5	2	1296	5	25.2	2419	20160	10080	32659.
44	Mandhar	74.024	18.200	692	BS01	10.5	8.5	472	6	2	400	3	12.6	504	4536	0	5040

Sl.No.	Village	Long_ deci	Lat_deci	Eleva-tion (amsl)	Geology	Well depth (mbgl)	D.T.W. (mbgl)	EC (µs/ cm)	Thick-ness weath-ered portion(m)	Thick-ness of fracture zone (m)	Annual pumpin g hours.	HP of Pum p	Rate of disc-harge (m^3/hr)	Kharif draft(m3)	Rabi Draft(m3)	Summ er Draft (m3)	Annua l Draft m3/ye ar
45	Nawalewadi	74.083	18.179	627	BS01	15.5	5.2	1081	3	3	165	5	21.6	972	2592	0	3564
46	Nazare Supe	74.205	18.304	663	BS01	6	5.5		5.5	0.5	207	3	9	1215	540	108	1863
47	Pandeshwar	74.263	18.323	648	BS01	9	3.8	1855	1	1	628	5	16.2	2074	8100	0	10173. 6
48	Pangare	74.065	18.271	739	BS01	9	8.5	803	4	3	400	3	12.6	504	4536	0	5040
49	Parinche	74.084	18.212	657	BS01	11.5	7.9	620	8	2	100	3	7.2	115.2	1080	1440	720
50	Pimpale	74.037	18.312	791	BS01	13	11.5		3	2.5	150	3	7.2	216	864	0	1080
51	Pimpre Kh.	74.203	18.114	586	BS01	8.5	4.5	1491	3	0	325	3	10.8	1350	2160	0	3510
52	Pimpri	74.218	18.328	662	BS01	16	15.5		5	1	120	0.5	0.9	27	54	27	108
53	Pingori	74.124	18.222	680	BS01	11	9.1	726	6	0	770	7.5	18	2160	10800	900	13860
54	Pisurti	74.161	18.136	571	BS01	10.5	8.5	3530	5	0	380	5	14.4	4608	864	0	5472
55	Pondhe	74.271	18.411	718	BS01	5	3.6	750	3	2	360	3.5	18	720	2880	2880	6480
56	Rakh	74.237	18.193	612	BS01	15.9	14.5	520	8.8	2	140	5	14.4	576	1440	0	2016
57	Rise	74.294	18.356	665	BS01	18	14.6	1057	5	5	65	6.5	27	1080	675	0	1755
58	Somurdi	73.940	18.319	878	BS01	5.5	4.4	620	1.5	1.3	110	5	21.6	1080	1296	0	2376
59	Tekavadi	74.203	18.420	729	BS01	10	dry		3	0.5	325	3	12.6	0	4095	0	4095
60	Udachiwadi	74.051	18.370	779	BS01	20	8.7	804	16	0	640	3	9	360	5400	0	5760
61	Veer	74.105	18.155	593	BS01	16	4.6	766	4	3	890	5	23.4	1170	14040	5616	20826
62	Wagdarwadi	74.198	18.211	652	BS01	20	Dry		10	2	0	3	0	0	0	0	0

Annexure IX

Location of proposed Check Dams and Percolation Tanks in Baramati and Purandhar Talukas, Pune district

SN	Village	Taluka	District	Structure	Longitude	Latitude
1	Ambi Bk	BARAMATI	Pune	Check dam	74.2758	18.2636
2	Anjangaon	BARAMATI	Pune	Check dam	74.5047	18.2142
3	Anjangaon	BARAMATI	Pune	Check dam	74.5001	18.2227
4	Anjangaon	BARAMATI	Pune	Check dam	74.4926	18.2188
5	Anjangaon	BARAMATI	Pune	Check dam	74.4842	18.2276
6	Anjangaon	BARAMATI	Pune	Check dam	74.4806	18.2387
7	Anjangaon	BARAMATI	Pune	Check dam	74.5013	18.1995
8	Anjangaon	BARAMATI	Pune	Check dam	74.4876	18.2021
9	Anjangaon	BARAMATI	Pune	Check dam	74.4683	18.2089
10	Barhanpur	BARAMATI	Pune	Check dam	74.5278	18.2031
11	Barhanpur	BARAMATI	Pune	Check dam	74.5256	18.2132
12	Barhanpur	BARAMATI	Pune	Check dam	74.5226	18.2188
13	Barhanpur	BARAMATI	Pune	Check dam	74.5181	18.2067
14	Barhanpur	BARAMATI	Pune	Check dam	74.5156	18.1995
15	Chandgude Wadi	BARAMATI	Pune	Check dam	74.3138	18.3027
16	Deulgaon Rasal	BARAMATI	Pune	Check dam	74.4603	18.2657
17	Deulgaon Rasal	BARAMATI	Pune	Check dam	74.4633	18.2768
18	Gadikhelwadi (nv)	BARAMATI	Pune	Check dam	74.6128	18.2655
19	Gadikhelwadi (nv)	BARAMATI	Pune	Check dam	74.6164	18.2831
20	Gadikhelwadi (nv)	BARAMATI	Pune	Check dam	74.5963	18.2621
21	Gadikhelwadi (nv)	BARAMATI	Pune	Check dam	74.6032	18.2653
22	Gadikhelwadi (nv)	BARAMATI	Pune	Check dam	74.6117	18.2821
23	Gojubavi	BARAMATI	Pune	Check dam	74.5634	18.2318
24	Gojubavi	BARAMATI	Pune	Check dam	74.5693	18.2286
25	Gojubavi	BARAMATI	Pune	Check dam	74.5618	18.2214
26	Jainakwadi	BARAMATI	Pune	Check dam	74.6451	18.2459
27	Jalgaon Kade Pathar	BARAMATI	Pune	Check dam	74.455	18.2145
28	Jalgaon Kade Pathar	BARAMATI	Pune	Check dam	74.4413	18.2216
29	Jalgaon Supe	BARAMATI	Pune	Check dam	74.4708	18.2361
30	Jalgaon Supe	BARAMATI	Pune	Check dam	74.4603	18.2504
31	Jalgaon Supe	BARAMATI	Pune	Check dam	74.4354	18.2559
32	Jaradwadi	BARAMATI	Pune	Check dam	74.5197	18.254
33	Karhati	BARAMATI	Pune	Check dam	74.418	18.2595
34	Karhati	BARAMATI	Pune	Check dam	74.4105	18.2768
35	Karhati	BARAMATI	Pune	Check dam	74.4173	18.2771
36	Karhati	BARAMATI	Pune	Check dam	74.4325	18.2673
37	Karhati	BARAMATI	Pune	Check dam	74.4028	18.266
38	Karhati	BARAMATI	Pune	Check dam	74.3976	18.2816
39	Khandaj	BARAMATI	Pune	Check dam	74.5301	18.0976
40	Khandaj	BARAMATI	Pune	Check dam	74.5383	18.0836

SN	Village	Taluka	District	Structure	Longitude	Latitude
41	Kharade Wadi	BARAMATI	Pune	Check dam	74.497	18.3046
42	Malegaon Bk	BARAMATI	Pune	Check dam	74.521	18.1283
43	Malegaon Kh.	BARAMATI	Pune	Check dam	74.5102	18.14
44	Medad	BARAMATI	Pune	Check dam	74.515	18.1756
45	Morgaon	BARAMATI	Pune	Check dam	74.3143	18.2542
46	Morgaon	BARAMATI	Pune	Check dam	74.317	18.2574
47	Morgaon	BARAMATI	Pune	Check dam	74.2958	18.259
48	Morgaon	BARAMATI	Pune	Check dam	74.3006	18.2633
49	Morgaon	BARAMATI	Pune	Check dam	74.2854	18.269
50	Morgaon	BARAMATI	Pune	Check dam	74.2875	18.2524
51	Morgaon	BARAMATI	Pune	Check dam	74.3094	18.2498
52	Nepat Valan	BARAMATI	Pune	Check dam	74.4974	18.1822
53	Nimbodi	BARAMATI	Pune	Check dam	74.6849	18.2919
54	Nirvagaj	BARAMATI	Pune	Check dam	74.551	18.0719
55	Pandare	BARAMATI	Pune	Check dam	74.474	18.1286
56	Pansarewadi	BARAMATI	Pune	Check dam	74.3858	18.2956
57	Pansarewadi	BARAMATI	Pune	Check dam	74.3858	18.3093
58	Pansarewadi	BARAMATI	Pune	Check dam	74.3907	18.3224
59	Parwadi	BARAMATI	Pune	Check dam	74.6402	18.2681
60	Parwadi	BARAMATI	Pune	Check dam	74.6464	18.2782
61	Parwadi	BARAMATI	Pune	Check dam	74.6598	18.2795
62	Parwadi	BARAMATI	Pune	Check dam	74.6669	18.2873
63	Parwadi	BARAMATI	Pune	Check dam	74.6558	18.289
64	Parwadi	BARAMATI	Pune	Check dam	74.6428	18.2922
65	Parwadi	BARAMATI	Pune	Check dam	74.6467	18.2593
66	Parwadi	BARAMATI	Pune	Check dam	74.6692	18.2945
67	Parwadi	BARAMATI	Pune	Check dam	74.6591	18.2723
68	Parwadi	BARAMATI	Pune	Check dam	74.6324	18.2815
69	Parwadi	BARAMATI	Pune	Check dam	74.6262	18.2847
70	Pawnewadi	BARAMATI	Pune	Check dam	74.5292	18.1143
71	Rui	BARAMATI	Pune	Check dam	74.6216	18.1955
72	Sawantwadi	BARAMATI	Pune	Check dam	74.5575	18.2113
73	Shirawali	BARAMATI	Pune	Check dam	74.5018	18.082
74	Shirawali	BARAMATI	Pune	Check dam	74.4917	18.0901
75	Sonvadisupe	BARAMATI	Pune	Check dam	74.4988	18.2374
76	Sonvadisupe	BARAMATI	Pune	Check dam	74.4789	18.2471
77	Sonvadisupe	BARAMATI	Pune	Check dam	74.4773	18.2563
78	Sonvadisupe	BARAMATI	Pune	Check dam	74.4812	18.269
79	Supe	BARAMATI	Pune	Check dam	74.3516	18.293
80	Supe	BARAMATI	Pune	Check dam	74.3545	18.3054
81	Supe	BARAMATI	Pune	Check dam	74.3552	18.3146
82	Supe	BARAMATI	Pune	Check dam	74.348	18.3243
83	Tandulwadi	BARAMATI	Pune	Check dam	74.553	18.1969

SN	Village	Taluka	District	Structure	Longitude	Latitude
84	Tandulwadi	BARAMATI	Pune	Check dam	74.5598	18.2025
85	Tardoli	BARAMATI	Pune	Check dam	74.3297	18.2569
86	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5288	18.2266
87	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5327	18.2429
88	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5432	18.252
89	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5513	18.2621
90	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5213	18.2334
91	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5217	18.2481
92	Undavadi Kade Pathar	BARAMATI	Pune	Check dam	74.5606	18.2612
93	Undavadisupe	BARAMATI	Pune	Check dam	74.5093	18.2687
94	Undavadisupe	BARAMATI	Pune	Check dam	74.5181	18.2726
95	Vanjarwadi	BARAMATI	Pune	Check dam	74.6164	18.2084
96	Yelewasti	BARAMATI	Pune	Check dam	74.4812	18.1133
97	Ambale	PURANDHAR	Pune	Check dam	74.1731	18.383
98	Bhivadi	PURANDHAR	Pune	Check dam	74.0169	18.3122
99	Bopgaon	PURANDHAR	Pune	Check dam	73.9693	18.368
100	Bopgaon	PURANDHAR	Pune	Check dam	73.9533	18.3761
101	Bopgaon	PURANDHAR	Pune	Check dam	73.9611	18.3898
102	Bopgaon	PURANDHAR	Pune	Check dam	73.9673	18.379
103	Chambali	PURANDHAR	Pune	Check dam	73.9908	18.3585
104	Chambali	PURANDHAR	Pune	Check dam	73.9843	18.3689
105	Dive	PURANDHAR	Pune	Check dam	74.0446	18.366
106	Dive	PURANDHAR	Pune	Check dam	74.0482	18.381
107	Dive	PURANDHAR	Pune	Check dam	74.0518	18.3944
108	Garade	PURANDHAR	Pune	Check dam	73.9455	18.3428
109	Garade	PURANDHAR	Pune	Check dam	73.9327	18.3487
110	Garade	PURANDHAR	Pune	Check dam	73.9562	18.3396
111	Jadhavwadi (n.v.)	PURANDHAR	Pune	Check dam	74.0214	18.3875
112	Jadhavwadi (n.v.)	PURANDHAR	Pune	Check dam	74.026	18.3738
113	Jawalarjun	PURANDHAR	Pune	Check dam	74.2582	18.2802
114	Khanvadi	PURANDHAR	Pune	Check dam	74.1183	18.3243
115	Kodit Bk.	PURANDHAR	Pune	Check dam	73.9996	18.3455
116	Kodit Bk.	PURANDHAR	Pune	Check dam	74.0015	18.3288
117	Kolvihire	PURANDHAR	Pune	Check dam	74.208	18.2636
118	Kolvihire	PURANDHAR	Pune	Check dam	74.2278	18.2633
119	Mawadi Supe	PURANDHAR	Pune	Check dam	74.2047	18.3565
120	Mawadi Supe	PURANDHAR	Pune	Check dam	74.2102	18.3438

SN	Village	Taluka	District	Structure	Longitude	Latitude
121	Mawadikade Pathar	PURANDHAR	Pune	Check dam	74.2386	18.2688
122	Mawadikade Pathar	PURANDHAR	Pune	Check dam	74.2494	18.2701
123	Naygaon	PURANDHAR	Pune	Check dam	74.2464	18.3428
124	Naygaon	PURANDHAR	Pune	Check dam	74.2543	18.3601
125	Naygaon	PURANDHAR	Pune	Check dam	74.237	18.3497
126	Naygaon	PURANDHAR	Pune	Check dam	74.2357	18.3644
127	Nazare Supe	PURANDHAR	Pune	Check dam	74.2246	18.2907
128	Nazare Supe	PURANDHAR	Pune	Check dam	74.2197	18.2855
129	Nazare Supe	PURANDHAR	Pune	Check dam	74.2181	18.2796
130	Nazare Supe	PURANDHAR	Pune	Check dam	74.2083	18.2757
131	Pandeshwar	PURANDHAR	Pune	Check dam	74.2663	18.3112
132	Pandeshwar	PURANDHAR	Pune	Check dam	74.2543	18.3239
133	Pandeshwar	PURANDHAR	Pune	Check dam	74.2438	18.3337
134	Pandeshwar	PURANDHAR	Pune	Check dam	74.2422	18.307
135	Pargaon	PURANDHAR	Pune	Check dam	74.1245	18.3471
136	Pargaon	PURANDHAR	Pune	Check dam	74.1248	18.3673
137	Pimpale	PURANDHAR	Pune	Check dam	74.0563	18.3086
138	Pimpale	PURANDHAR	Pune	Check dam	74.0687	18.3148
139	Pimpri	PURANDHAR	Pune	Check dam	74.2278	18.3161
140	Pimpri	PURANDHAR	Pune	Check dam	74.2197	18.322
141	Pimpri	PURANDHAR	Pune	Check dam	74.2155	18.3324
142	Pisarve	PURANDHAR	Pune	Check dam	74.2067	18.3657
143	Pisarve	PURANDHAR	Pune	Check dam	74.1949	18.3575
144	Pisarve	PURANDHAR	Pune	Check dam	74.1917	18.3689
145	Pisarve	PURANDHAR	Pune	Check dam	74.1799	18.3595
146	Rajewadi	PURANDHAR	Pune	Check dam	74.1603	18.3869
147	Rajewadi	PURANDHAR	Pune	Check dam	74.1639	18.3712
148	Rajuri	PURANDHAR	Pune	Check dam	74.267	18.3497
149	Rajuri	PURANDHAR	Pune	Check dam	74.2728	18.3373
150	Rajuri	PURANDHAR	Pune	Check dam	74.2735	18.3614
151	SASVAD	PURANDHAR	Pune	Check dam	74.0426	18.3311
152	Saswad Rural	PURANDHAR	Pune	Check dam	74.0351	18.3621
153	Saswad Rural	PURANDHAR	Pune	Check dam	74.0443	18.3448
154	Saswad Rural	PURANDHAR	Pune	Check dam	74.0407	18.3559
155	Supe Kh.	PURANDHAR	Pune	Check dam	74.0364	18.3194
156	Tekavadi	PURANDHAR	Pune	Check dam	74.1952	18.3963
157	Thapewadi	PURANDHAR	Pune	Check dam	73.9181	18.3477
158	Thapewadi	PURANDHAR	Pune	Check dam	73.9014	18.3474
1	Ambi Kh	BARAMATI	Pune	Percolation Tank	74.2818	18.3055
2	Anjangaon	BARAMATI	Pune	Percolation Tank	74.4944	18.2008
3	Anjangaon	BARAMATI	Pune	Percolation Tank	74.5009	18.2194
4	Baburdi	BARAMATI	Pune	Percolation Tank	74.3672	18.2801
5	BARAMATI	BARAMATI	Pune	Percolation Tank	74.5712	18.1598

SN	Village	Taluka	District	Structure	Longitude	Latitude
6	Chopadaj	BARAMATI	Pune	Percolation Tank	74.3214	18.1533
7	Deulgaon Rasal	BARAMATI	Pune	Percolation Tank	74.4618	18.2833
8	Dhakale	BARAMATI	Pune	Percolation Tank	74.4158	18.1464
9	Dhakale	BARAMATI	Pune	Percolation Tank	74.4118	18.1566
10	Gadikhelwadi (nv)	BARAMATI	Pune	Percolation Tank	74.61	18.2663
11	Gadikhelwadi (nv)	BARAMATI	Pune	Percolation Tank	74.5539	18.2996
12	Gadikhelwadi (nv)	BARAMATI	Pune	Percolation Tank	74.5839	18.3126
13	Gunwadi	BARAMATI	Pune	Percolation Tank	74.5691	18.12
14	Hol	BARAMATI	Pune	Percolation Tank	74.3346	18.1063
15	Jalgaon Kade Pathar	BARAMATI	Pune	Percolation Tank	74.4287	18.2273
16	Jalgaon Kade Pathar	BARAMATI	Pune	Percolation Tank	74.4392	18.1977
17	Jalgaon Supe	BARAMATI	Pune	Percolation Tank	74.4351	18.2533
18	Kalkhairewadi	BARAMATI	Pune	Percolation Tank	74.3868	18.3244
19	Karanjepul	BARAMATI	Pune	Percolation Tank	74.2958	18.1089
20	Karhati	BARAMATI	Pune	Percolation Tank	74.4116	18.255
21	Karhati	BARAMATI	Pune	Percolation Tank	74.4333	18.2709
22	Karhati	BARAMATI	Pune	Percolation Tank	74.408	18.2892
23	Khandaj	BARAMATI	Pune	Percolation Tank	74.5461	18.0741
24	Kololi	BARAMATI	Pune	Percolation Tank	74.4312	18.312
25	Kololi	BARAMATI	Pune	Percolation Tank	74.4413	18.3107
26	Kololi	BARAMATI	Pune	Percolation Tank	74.4184	18.3023
27	Korhale Bk	BARAMATI	Pune	Percolation Tank	74.377	18.1444
28	Loni Bhapkar	BARAMATI	Pune	Percolation Tank	74.3656	18.252
29	Loni Bhapkar	BARAMATI	Pune	Percolation Tank	74.3818	18.226
30	Loni Bhapkar	BARAMATI	Pune	Percolation Tank	74.3801	18.2293
31	Malegaon Bk	BARAMATI	Pune	Percolation Tank	74.5192	18.1343
32	Malegaon Kh.	BARAMATI	Pune	Percolation Tank	74.5068	18.1421
33	Medad	BARAMATI	Pune	Percolation Tank	74.5114	18.177
34	Moralwadi	BARAMATI	Pune	Percolation Tank	74.3032	18.1967
35	Murti	BARAMATI	Pune	Percolation Tank	74.2973	18.1977
36	Murti	BARAMATI	Pune	Percolation Tank	74.2934	18.2097
37	Murti	BARAMATI	Pune	Percolation Tank	74.2771	18.2117
38	Naroli	BARAMATI	Pune	Percolation Tank	74.4162	18.3039
39	Naroli	BARAMATI	Pune	Percolation Tank	74.4163	18.3101
40	Nimbodi	BARAMATI	Pune	Percolation Tank	74.685	18.2896
41	Palshiwadi	BARAMATI	Pune	Percolation Tank	74.3201	18.1804
42	Palshiwadi	BARAMATI	Pune	Percolation Tank	74.3263	18.1859
43	Pandare	BARAMATI	Pune	Percolation Tank	74.4736	18.1337
44	Pandare	BARAMATI	Pune	Percolation Tank	74.4334	18.1138
45	Pansarewadi	BARAMATI	Pune	Percolation Tank	74.3883	18.3125
46	Parwadi	BARAMATI	Pune	Percolation Tank	74.6544	18.2754
47	Parwadi	BARAMATI	Pune	Percolation Tank	74.663	18.2859
48	Parwadi	BARAMATI	Pune	Percolation Tank	74.6185	18.2823

SN	Village	Taluka	District	Structure	Longitude	Latitude
49	Shirawali	BARAMATI	Pune	Percolation Tank	74.5014	18.0861
50	Supe	BARAMATI	Pune	Percolation Tank	74.3337	18.2954
51	Tandulwadi	BARAMATI	Pune	Percolation Tank	74.5559	18.1755
52	Tandulwadi	BARAMATI	Pune	Percolation Tank	74.5852	18.183
53	Tardoli	BARAMATI	Pune	Percolation Tank	74.3413	18.2531
54	Vadgaon Nimbalkar	BARAMATI	Pune	Percolation Tank	74.3646	18.1307
55	Ambodi	PURANDHAR	Pune	Percolation Tank	74.0597	18.342
56	Chambali	PURANDHAR	Pune	Percolation Tank	73.9831	18.3707
57	Dhalewadi	PURANDHAR	Pune	Percolation Tank	74.1771	18.2951
58	Garade	PURANDHAR	Pune	Percolation Tank	73.9574	18.3407
59	Gulunche	PURANDHAR	Pune	Percolation Tank	74.2026	18.1412
60	Jadhavwadi (n.v.)	PURANDHAR	Pune	Percolation Tank	74.0249	18.3691
61	Jawalarjun	PURANDHAR	Pune	Percolation Tank	74.2495	18.2745
62	Kodit Bk.	PURANDHAR	Pune	Percolation Tank	73.9988	18.3433
63	Kothale	PURANDHAR	Pune	Percolation Tank	74.1651	18.3153
64	Mahur	PURANDHAR	Pune	Percolation Tank	74.0868	18.1793
65	Mandaki	PURANDHAR	Pune	Percolation Tank	74.1409	18.1314
66	Nazarekade Pathar	PURANDHAR	Pune	Percolation Tank	74.2146	18.3019
67	Nilanj	PURANDHAR	Pune	Percolation Tank	74.1292	18.312
68	Pandeshwar	PURANDHAR	Pune	Percolation Tank	74.2753	18.3313
69	Pimpre Kh.	PURANDHAR	Pune	Percolation Tank	74.1951	18.1174
70	Pimpri	PURANDHAR	Pune	Percolation Tank	74.212	18.3316
71	Ranamala (n.v.)	PURANDHAR	Pune	Percolation Tank	74.1902	18.3062
72	Samagirwasti (n.v.)	PURANDHAR	Pune	Percolation Tank	74.1162	18.1447
73	Veer	PURANDHAR	Pune	Percolation Tank	74.0852	18.1555
74	Walhe	PURANDHAR	Pune	Percolation Tank	74.1758	18.1584
75	Walhe	PURANDHAR	Pune	Percolation Tank	74.1811	18.1721