



केंद्रीय भूमि जल बोर्ड
जल संसाधन, नदी विकास और गंगा संरक्षण
विभाग, जल शक्ति मंत्रालय

भारत सरकार
Central Ground Water Board
Department of Water Resources, River
Development and Ganga Rejuvenation,
Ministry of Jal Shakti
Government of India

AQUIFER MAPPING AND MANAGEMENT OF GROUND WATER RESOURCES

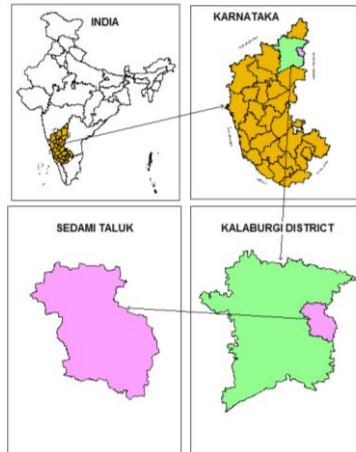
**SEDAM TALUK, KALABURAGI
DISTRICT, KARNATAKA**

दक्षिण पश्चिमी क्षेत्र, बेंगलोर
South Western Region, Bengaluru



**GOVERNMENT OF INDIA
MINISTRY OF JAL SHAKTI
DEPT. OF WATER RESOURCES, RD & GR
CENTRAL GROUND WATER BOARD**

**AQUIFER MANAGEMENT PLAN OF SEDAM TALUK,
KALABURAGI DISTRICT, KARNATAKA STATE**

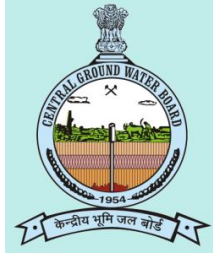


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AQUIFER MANAGEMENT PLAN OF SEDAM TALUK, KALABURAGI DISTRICT, KARNATAKA STATE

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AQUIFER MANAGEMENT PLAN OF SEDAM TALUK, KALABURAGI DISTRICT, KARNATAKA STATE

1.0 SALIENT INFORMATION

Name of the taluk: **Sedam**

District: Kalaburgi

State: Karnataka

Area: 1036.17 sq.km.

Population: 2,18,572

Annual Normal Rainfall: 765 mm

1.1 Aquifer management study area

Aquifer Mapping Studies have been carried out in Sedam taluk, Kalaburagi district of Karnataka, covering an area of 1036.17 sq.kms under National Aquifer Mapping Project. The Sedam taluk is located between North Latitudes $16^{\circ}15'06''$ and $17^{\circ}15'25.2''$ and East Longitudes between $77^{\circ}06'36''$ to $77^{\circ}22'68.8''$ and is falling in Survey of India Toposheets of 56G/4, G/8, 56H/1&H/5. The study area is bounded on the East by Telagana state, on the North by Chincholi taluk, on the South by Yadgir taluk, on the West by Chittapur taluks of Kalaburagi district. Location map of Sedam taluk of Kalaburagi district is presented in **Fig-1**. Sedam is taluk head quarter. There are 117 villages in this taluk.

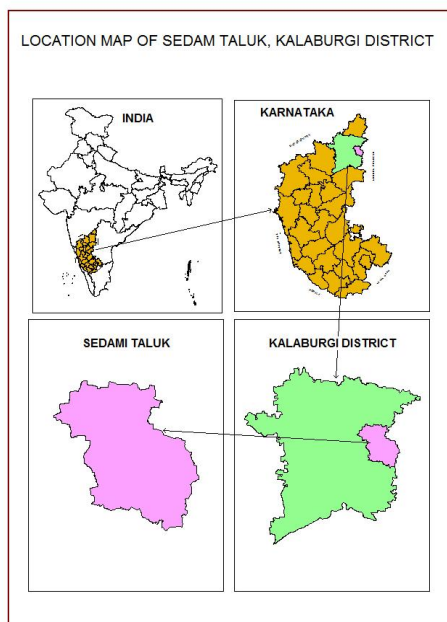


Fig-1: Location map of Sedam taluk of Kalaburagi district

1.2 Population

According to 2011 census, the population in Sedam taluk is 2,18,572. Out of which 1,08,598 are males while 1,09,974 are females. The average sex ratio of Sedam taluk is 10126. The taluk has an overall population density of 214 persons per sq.km. The decadal variation in population from 2001-2011 is 11.5% in Sedam taluk.

1.3 Rainfall

Sedam taluk enjoys semi-arid climate. The area falls under Northern Eastern Transitional agro-climatic zone of Karnataka state. The normal annual rainfall in Sedam taluk for the period 1981 to 2010 is 765 mm. Seasonal rainfall pattern indicates that, major amount of 573 mm) rainfall was recorded during South-West Monsoon seasons, which contributes about 75% of the annual normal rainfall, followed by North-East Monsoon season (112 mm) constituting 15% and remaining (81 mm) 11% in Pre-Monsoon season (**Table 1**).

On Computations were carried out for the 30 year blocks of 1981-2010, the mean monthly rainfall at Sedam taluk is ranging between 3 mm during February to 185 mm during September. The coefficient of variation percent for pre-monsoon, monsoon and post-monsoon season is 77, 36 & 59 percent respectively. Annual Co-efficient Variation at this station works out to be 26 percent (**Table 1**).

Table 1: Statistical Analysis of Rainfall Data of Sedam taluk, Kalaburagi district (1981 to 2010)

STATION		JAN	FEB	MAR	APR	MAY	PRE	JUN	JUL	AUG	SEP	SW	OCT	NOV	DEC	NE	Annual
SEDAM	NRM	6	3	12	26	33	81	99	144	145	185	573	86	22	4	112	765
	STDEV	12	8	33	38	28	62	64	85	78	107	204	58	32	9	66	202
	CV%	210	265	262	143	85	77	65	59	54	58	36	68	145	248	59	26

1.4 Agriculture & Irrigation

Agriculture is the main occupation in Sedam taluk. Major Kharif crops are Maize, Bajra, Jowar, Tur and Vegetables. Main crops of Rabi season are Maize, Bajra and Jowar (**Table-2**). Water intensive crops like sugarcane is are grown in 0.8% of total crop area. Jowar is grown in 20.6% and oil seeds in 1.5% of total crop area of taluk. Paddy & Maize account 6% of total crop area.

Table-2: Cropping pattern in Sedam taluk 2016-2017 (Ha)

Year	Wheat	Maize	Paddy	Jowar	Pulses	Fruits	Vegetables	Oil seeds	Sugarcane	Cotton
	Area under cultivation (in ha)									
2016-2017	9228	4744	1489	21125	75643	272	610	1550	85	724

It is observed that net sown area accounts 97% and area sown more than once is 19% of total geographical area in Sedam taluk (**Table-3**) and the landuse pattern of the taluk is shown in **Fig. 2**. Area not available for cultivation and Fallow land cover 10% &13% of total geographical area respectively. 92% of net area irrigated is only from Bore well and Dug wells (**Table 4**).

Table-3: Details of land use in Sedam taluk 2016-2017 (Ha)

Taluk	Total Geographical Area	Area under Forest	Area not available for cultivation	Fallow land	Net sown area	Area sown more than once
Sedam	102445	2181	10422	13579	99327	19684

Source: District at a glance 2016-17, Govt. of Karnataka

Table 4: Irrigation details in Sedam taluk (in ha)

Source of Irrigation	Net area irrigated (Ha.)
Canals	-
Tanks	21
Wells	708
Bore wells	772
Lift Irrigation	78
Other Sources	18
Total	1597

Source: District at a glance 2016-17, Govt. of Karnataka

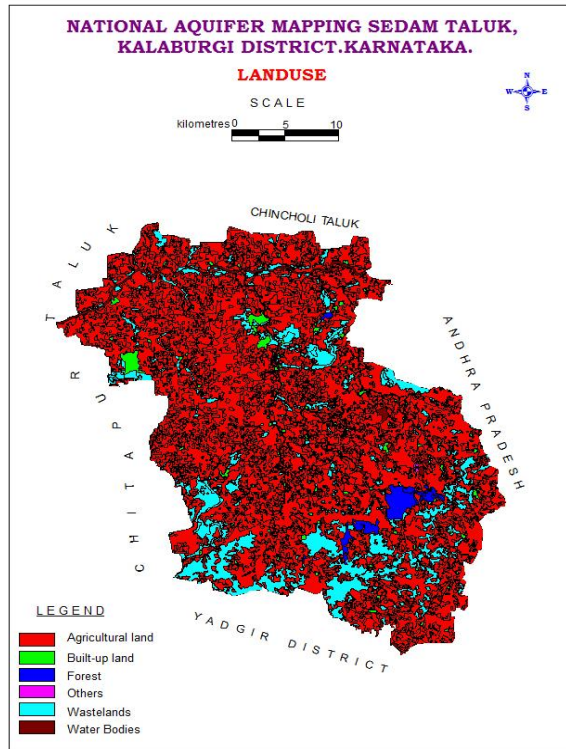


Fig-2: Land use Map

1.5 Geomorphology, Physiography & Drainage

Sedam taluk is exhibit moderate to gently “undulating terrain” having sparsely distributed knolls and tors. The elevation in the plains varies from 594 m in the North western part to 415m amsl in the Southern part of the taluk. This has its bearing on the regional slope which is towards south. The differential altitude is significant because, it is likely to cause irregular ground water flow patterns on the micro scale (**Fig.3**). Topography is dominantly controlled by geological structures.

The entire Sedam taluk falls in Kaginei river which is tributary of Krishna river basin. The Drainage pattern is dendritic to subdendritic (**Fig.4**).

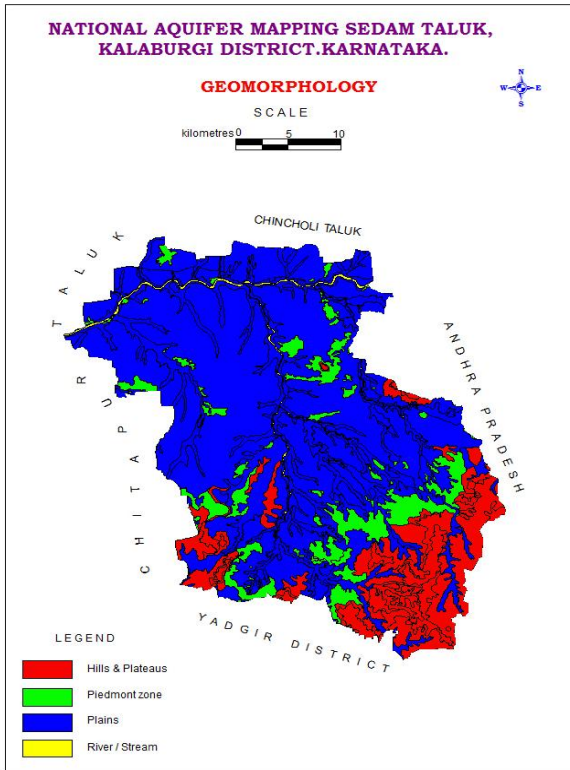


Fig-3: Geomorphology Map

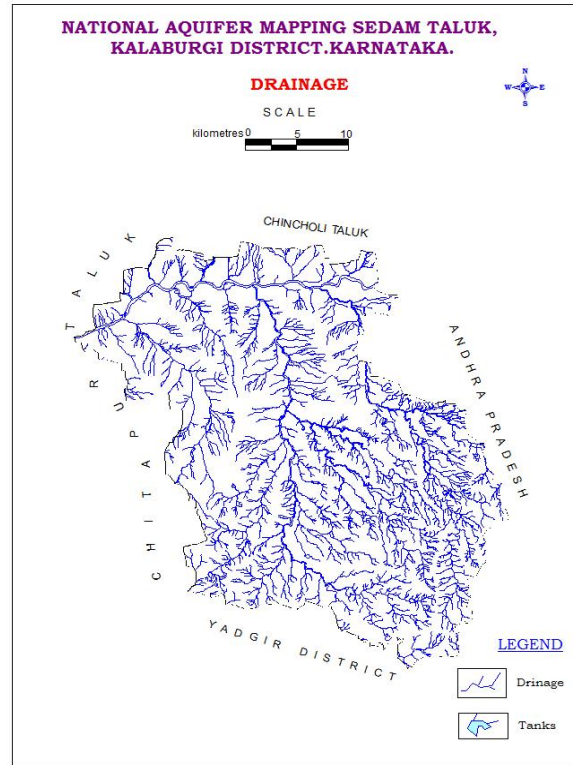


Fig-4: Drainage Map

1.6 Soil

The soil of Sedam taluk can broadly be classified into Black cotton soil, Red soil and Lateritic soil. These soil vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. Black cotton soils are mature soils with high humus and are mildly alkaline in nature. Along the Kagina river these soils are overlapped by alluvial clayey materials. Black cotton soils are the product of highly weathered and decomposed basaltic rocks (Fig-5).

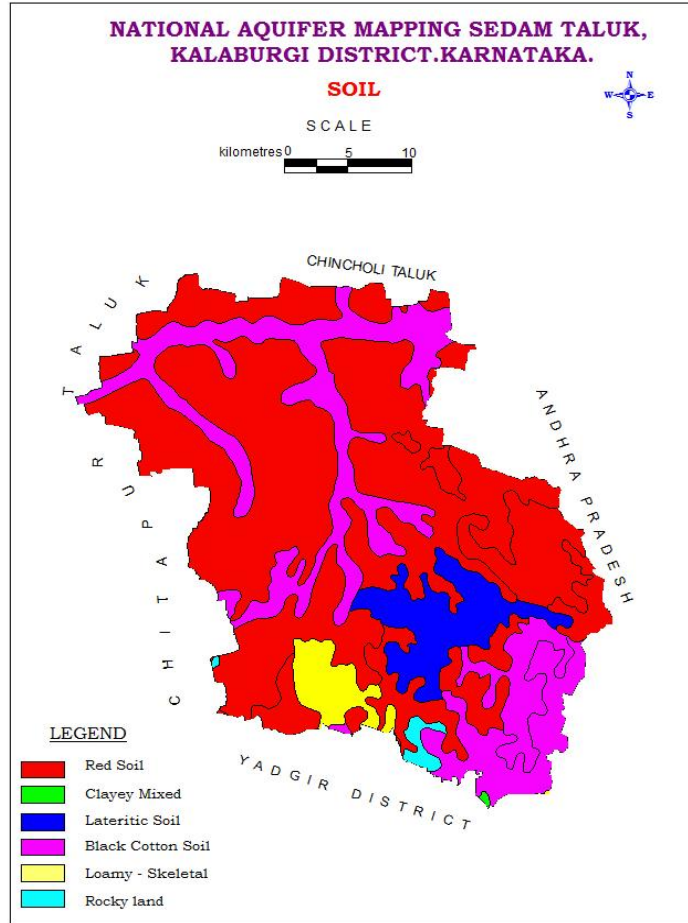


Fig. 5: Soil Map

1.7 Ground water resource availability and extraction

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

Table-5: Total Ground Water Resources (2017) (Ham)

Taluk	Annual replenishable GW resources	Fresh In-storage GW resources(Down to 200m)	Total availability of fresh GW resources
Sedam	3849	(Phreatic Fractured)	Dynamic + phreatic in-storage + fractured
		1775	5624

1.8 Existing and future water demands (as per GEC-2017)

- Net ground water availability for future irrigation development : 23.96 MCM
- Domestic (Industrial sector) demand for next 25 years : 5.05 MCM

1.9 Water level behavior
(a) Depth to water level

Aquifer-I

- Pre-monsoon: 7.31 – 9.53 mbgl (**Fig.-6**)
- Post-monsoon: 2.11 – 9.52 mbgl (**Fig.-7**)

Aquifer-II

- Pre-monsoon: 8.30 – 11.10 mbgl
- Post-monsoon: 4.85 – 7.00 mbgl

(b) Water level fluctuation

Aquifer-I

- Seasonal Fluctuation: Rise ranges 0.01 – 5.2 m (**Fig.-8**)

Aquifer-II

- Seasonal Fluctuation: Rise ranges 3.45 – 4.15 m.

Table 6: Depth to water level for Pre-monsoon and Post-monsoon (Aquifer I)

Sr. No	Village	Pre-monsoon Depth to water May-2019 (mbgl)	Post-monsoon Depth to water Nov-2019 (mbgl)	Water level Fluctuation
Aquifer-I				
1	Huda	8.99	6.10	2.89
2	Mothakpalli	7.31	2.11	5.2
3	Nilhalli	9.53	9.52	0.01
4	Sedam	10.1	5.75	4.35
5	Batgera.K	5.90	2	3.9
6	Kurkunta	4.9	1.75	3.15
7	Nadepalli	6.6	2.85	3.75
Aquifer-II				
8	Malkhed	11.10	7.00	4.1
9	Adki	9.40	5.25	4.15
10	Mudhol	8.30	4.85	3.45

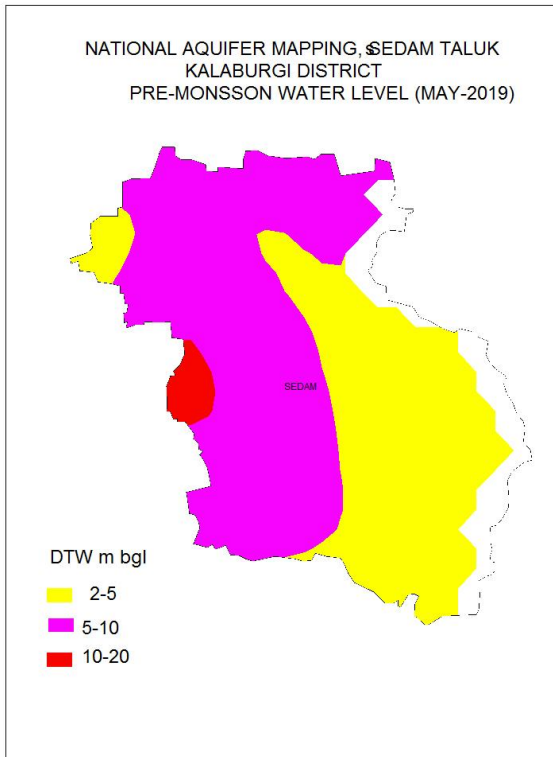


Fig-6: Pre-monsoon Depth to Water Level

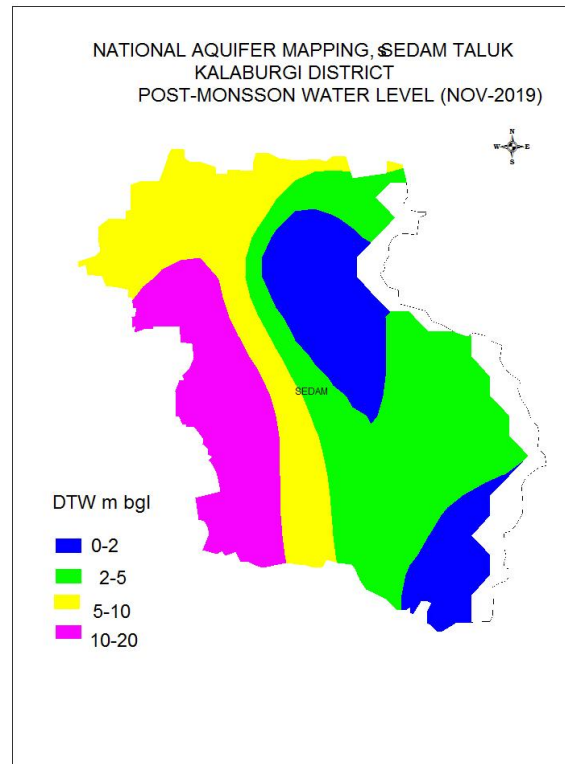


Fig-7: Post-monsoon Depth to Water Level

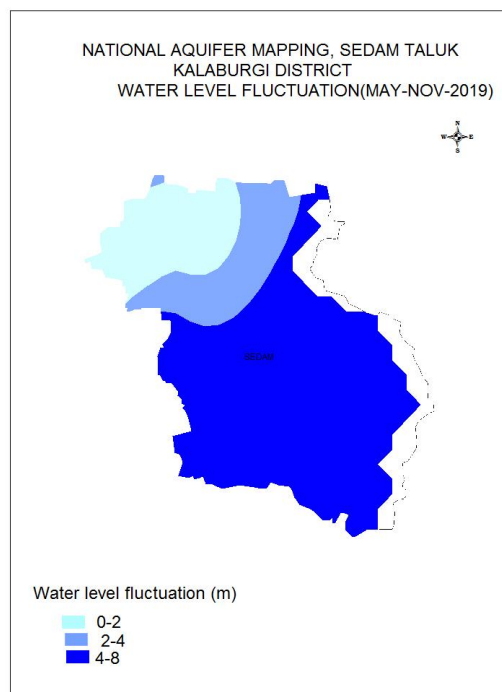


Fig-8: Water Level Fluctuation Map

2.0 AQUIFER DISPOSITION

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

- i. **Aquifer-I (Phreatic aquifer)** Weathered Basalt, Granitic gneiss and lime stone
- ii. **Aquifer-II (Fractured aquifer)** Fractured Basalt, Granitic gneiss and lime stone

In Sedam taluk, Granitic gneiss and lime stone are the main water bearing formations (**Fig-9**). Ground water occurs within the weathered and fractured Basalt, Granitic gneiss and lime stone under water table condition and semi-confined condition. In Sedam taluk bore wells were drilled from a minimum depth of 36 mbgl to a maximum of 302 mbgl. Depth of weathered zone ranges from 2.1 to 8.85 mbgl. Ground water exploration reveals that aquifer-II fractured formation was encountered between the depth of 38 to 127 mbgl. Yield ranges from 0.10 to 9.90 lps (**Table 7**). The basic characteristics of each aquifer are summarized in **Table 8**.

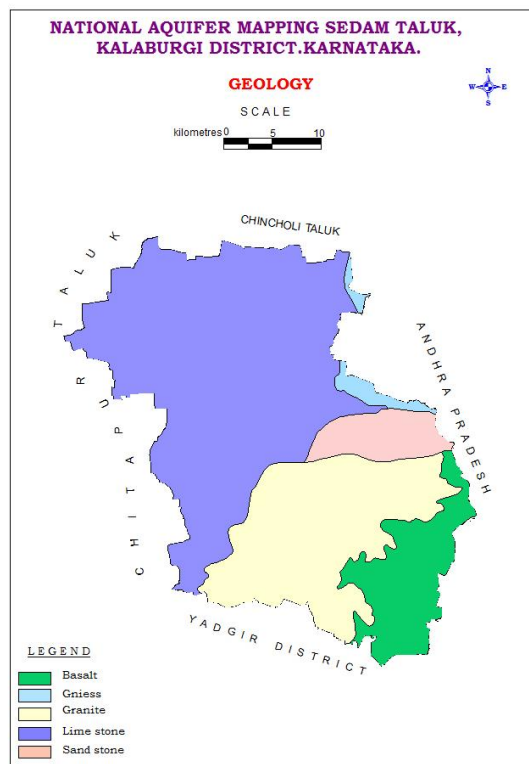


Fig. 9 Geology Map

Table-7: Details of Ground Water Exploration

S.No	Location	Lat &Long	Depth m bgl	Casing (m)	Lithology	SWL (mbgl)	Q (lps)	DD (m)	T (m ² / day)
1	Itkal	16° 54' 45" 77° 23' 20"	90	8.2	Granite gneiss	690	0.10	-	-
2	Kadcharla	17° 02' 45" 77° 22' 30"	90	2.1	Granite gneiss	4.14	1.25	2.39	40
3	Konapur	16° 59' 45" 77° 20' 35"	90	8.85	Granite gneiss	2.37	6.26	6.66	160
4	Neelahalli	17° 11' 00" 77° 13' 30"	90	-	Shale/Limestone	-	-	-	-
5	Sedam	17° 10' 40" 77° 17' 40"	51.4	-	Shale/Limestone	2.91	2.4	2.29	-
6	Udasi	17° 09' 00" 77° 13' 00"	36	-	Shale/Limestone	3.75	9.0	-	-
7	Chandapur	17° 26' 45" 77° 25' 15"	225	6.1	Granite	7.05	6.72	2.59	155. 7
8	Bhatgira	17° 07' 51" 77° 18' 05"	302	5.6	Shale/Limestone Granite gneiss	4.14	0.22	-	-
9	Udgi	17° 08' 41" 77° 13' 24"	241.3	5.5	Granite	1.95	14	1.41	-

Table-8: Basic characteristics of each aquifer

Aquifers	Weathered Zone (Aq.-I)	Fractured Zone (Aq.-II)
Prominent Lithology	Weathered Granite gneiss and Limestone	Fractured / Jointed granite gneiss, shale and Limestone
Thickness range (mbgl)	20	Fractures upto 200 mbgl
Depth range of occurrence of fractures (mbgl)	7-15	38-127
Range of yield potential (lps)	Poor yield	< 1 – 9.90
Specific Yield	2%	0.2%
T (m ² /day)	-	1 – 155.7
Quality Suitability for Domestic & Irrigation	Suitable	Suitable

3.0 GROUND WATER RESOURCE, EXTRACTION, CONTAMINATION AND OTHER ISSUES

3.1 Aquifer wise resource availability and extraction

(a) Present Dynamic Ground Water Resource (2017)

Taluk	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross ground water draft for domestic and industrial water supply	Existing gross ground water draft for all uses	Allocation for domestic and industrial use for next 25 years	Net ground water availability for future irrigation development	Existing stage of ground water development	Category
Sedam	3849	900	505	1405	553	2396	36	Safe

(b) Present total Ground Water Resource (in ham)

Taluk	Annual replenishable GW resources (in ham)	Fresh In-storage GW resources (in ham)	Total availability of GW resource (in ham)
		(Phreatic Fractured)	Dynamic + phreatic in-storage + fractured in-storage
Sedam	3849	1775	5624

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

Taluk	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development	GW availability (in ham)	GW draft (in ham)	Stage of GW development
	2011			2013			2017		
	Sedam	4211	2223	53	4220	1848	44	3849	1405

3.2 Chemical quality of ground water and contamination

Interpretation from Chemical Analysis results in Sedam taluk (Table 9) is mentioned as under:

Electrical conductivity: In general, EC values range from 580 to 5010 μ /mhos/cm in the aquifer-I at 25°C (Fig-10 a).

Fluoride: Fluoride concentration in ground water ranges between 0.07 and 0.79 mg/l in the aquifer-I (Fig-10 b).

Nitrate: Nitrate concentration in ground water ranges from 13 and 91 mg/l in the Aquifer –I (Fig-10 c).

Chloride: Chloride concentration in ground water ranges between 85 and 959 mg/l in the aquifer-I(Fig-10 d) . .

Table-9: Quality of ground water in Sedam taluk of Kalaburagi district

Sl_No	Location	pH	EC	Cl	NO ₃	F
1	Huda	7.838	580	85	13	0.79
2	Mothakpalli	8.146	1320	135	58	0.29
3	Nilhalli	8.491	5010	959	91	0.07

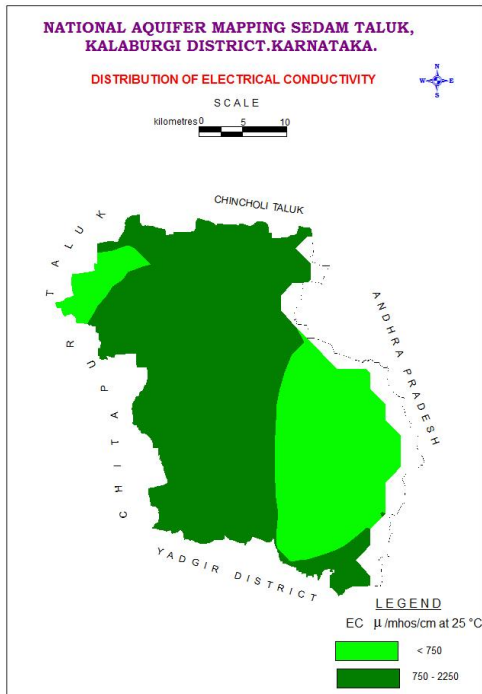


Fig-13a Distribution of Electrical Conductivity

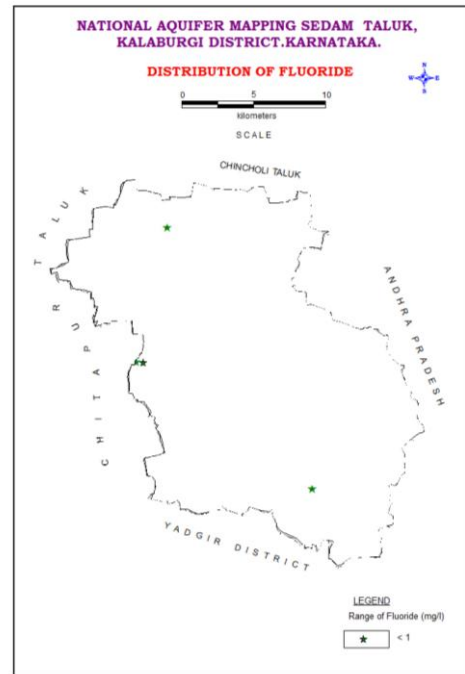


Fig-13 b Distribution of Fluoride

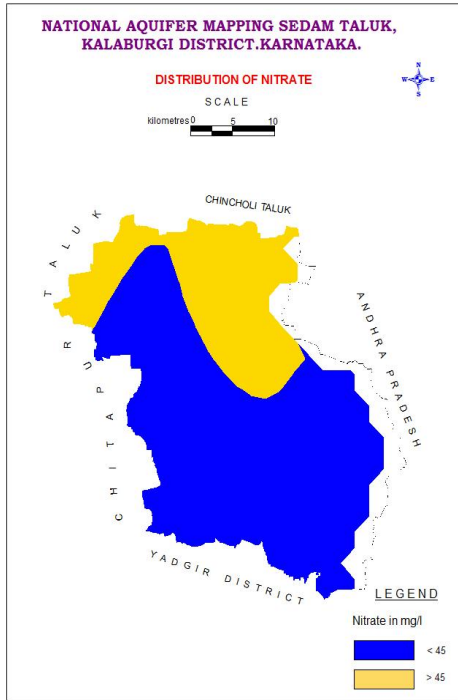


Fig-13 c Distribution of Nitrate

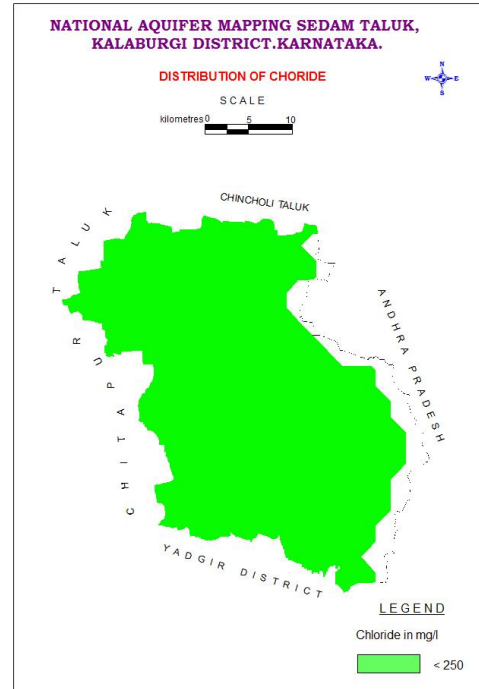


Fig-13 d Distribution of Fluoride

4.0 GROUND WATER RESOURCE ENHANCEMENT

4.1 Aquifer wise space available for recharge and proposed interventions

Recharge dry phreatic aquifer (Aq-I) in the taluk, through construction of artificial recharge structures, viz; check dams, percolation tanks & Sub surface dyke (**Table-10**). The choice of recharge structures should be site specific and such structures need to be constructed in areas already identified as feasible for artificial recharge.

Table-10: Quantity of non-committed surface runoff & expected recharge through AR structures

Artificial Recharge Structures Proposed	Sedam taluk
Non committed monsoon runoff available (MCM)	31.691
Total no. of existing Artificial Recharge Structures	136
Number of Check Dams	63
Number of Percolation Tanks	19
Number of Sub surface dyke	1
Tentative total cost of the project (Rs. in lakhs)	1017.548 Lakhs
Excepted recharge (MCM)	23.768

Table-11 Improvement in GW availability due to Recharge, Sedam taluk

Taluk	Net annual ground water availability	Existing gross ground water draft for all uses	Existing stage of ground water development	Expected recharge from proposed artificial recharge structures	Expected improvement in stage of ground water development after the implementation of the project	Expected improvement in overall stage of ground water development
	HAM	HAM	%	HAM	%	%
Sedam	3849	1405	36	2376	22	14

4.2 Other interventions proposed

- Periodical maintenance of artificial recharge structures should also be incorporated in the Recharge Plan.
- Excess nitrate & fluoride concentration is found in ground water samples require remedial measures viz.
 - Dilution of nitrate rich ground water through artificial recharge & water conservation.
 - Roof top rain water harvesting.

5.0 SUMMARY

The summary of Management plan of Sedam taluk is given in **Table-12**.

Table-12: Summary of Management plan of Sedam taluk

SEDAM taluk is safe & present stage of GW Development (2017)	36%
Net Annual Ground Water Availability (MCM)	38.49
Existing Gross Ground Water Draft for all uses	14.05
Total GW Resources (Dynamic & Static upto the depth of 200 mbgl) (MCM)	56.24
Expected additional recharge from monsoon surplus runoff (MCM)	23.76
Change in Stage of GW development, %	36 to 22
Excess nitrate & fluoride concentration	<ul style="list-style-type: none"> • Dilution of nitrate rich ground water through artificial recharge & water conservation. • Roof top rain water harvesting.