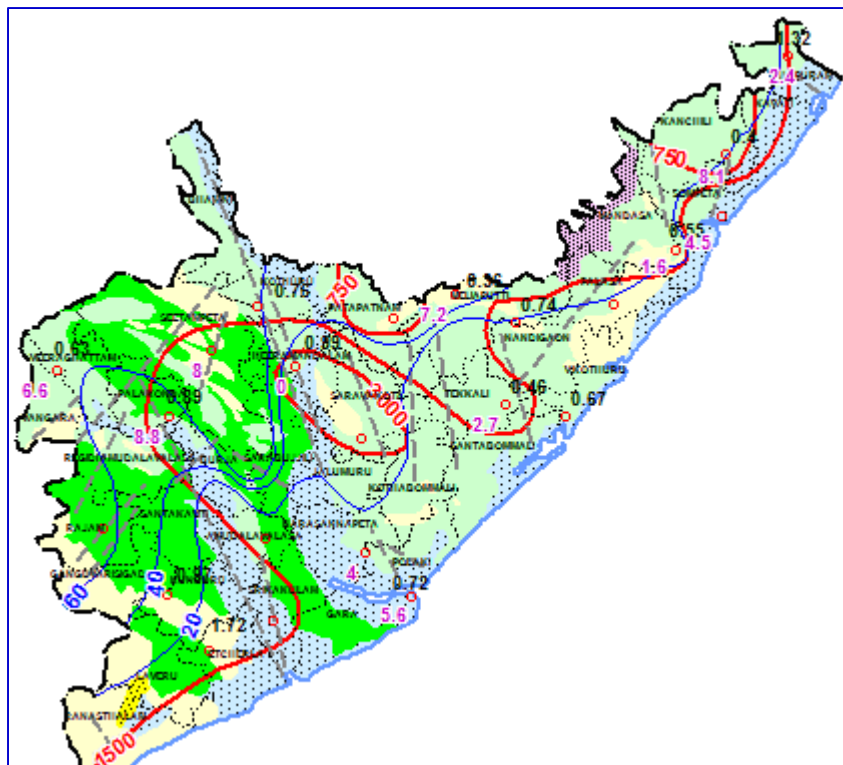




**CENTRAL GROUND WATER BOARD**  
**MINISTRY OF WATER RESOURCES**  
**GOVERNMENT OF INDIA**

**GROUND WATER BROCHURE**  
**SRIKAKULAM DISTRICT, ANDHRA PRADESH**



**SOUTHERN REGION**  
**HYDERABAD**  
**September 2013**



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**GROUND WATER BROCHURE  
SRIKAKULAM DISTRICT, ANDHRA PRADESH  
(AAP-2012-13)**

**BY**

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# GROUND WATER BROCHURE

## SRIKAKULAM DISTRICT, ANDHRA PRADESH

### CONTENTS

<b>S.No</b>	<b>CHAPTER</b>
	District at a Glance
1	Introduction
2	Rainfall & Climate
3	Geomorphology & Soil Types
4	Ground Water Scenario
5	Ground Water Management Strategy
6	Ground Water Related Issues and Problems
7	Awareness & Training Activity
8	Areas Notified by CGWA / SGWA
9	Recommendations

## **SRIKAKULAM DISTRICT AT A GLANCE**

### **1. GENERAL INFORMATION**

Geographical Areas	:	5837 sq. km
Administrative Divisions		
District HQ	:	Srikakulam
Mandals	:	38
Towns	:	6
Villages	:	1763
Population	:	25,37,593
Average Annual Rainfall	:	1067 mm
Annual Rainfall (2012)	:	1289 mm

### **2. GEOMORPHOLOGY**

Major Physiographic Units	:	Structural hills, pediplains, alluvial plains and coastal plains
Major Drainage	:	Vamsadhara and Nagavali

### **3. LAND USE (ha)**

Forest Area	:	68,641
Net Area Sown	:	3,18,793

### **4. SOIL TYPE**

Red soils, Red loams, Sandy loams, Sandy soils, Black soils and Alluvial soils.

### **5. IRRIGATION BY DIFFERENT SOURCES (ha)**

Dug Wells	:	5,647
Tube wells/ Bore wells	:	4,538
Tanks/ Ponds	:	65,769
Canals	:	1,12,894
Other Sources	:	2,814
Net Irrigated Area	:	1,91,662

### **6. GROUND WATER MONITORING WELLS**

Dug Wells	:	24
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### **7. GEOLOGICAL FORMATIONS**

Recent	:	Alluvium
Sub-recent	:	Laterite
Gondwana	:	Sandstones
Archaean	:	Migmatites Charnockites Khondalites

## 8. Hydrogeology

Water Bearing Formations	:	
Hard Rock	:	Granitic gneisses, Charnockites & Khondalites
Soft Rock	:	Sandstones, Alluvium
Pre-monsoon	:	1.86 to 12.74 m bgl
Depth to Water Level (May, 2012)	:	
Post-monsoon	:	0.24 to 2.24 m bgl
Depth to Water Level (Nov., 2012)	:	

## 10. GROUND WATER EXPLORATION

Wells Drilled	:	21
Depth Range	:	47 to 200 m
Discharge	:	0.44 to 4.34 lps
Transmissivity	:	1.21 to 114.45 m <sup>2</sup> /day

## 11. GROUND WATER QUALITY

Good and suitable for drinking and irrigation purposes.

## 12. DYNAMIC GROUND WATER RESOURCES (2008-09)

Annual Replenishable GW Resources	:	927.16 MCM
Total Draft	:	272.17 MCM
Projected Demand (2025) for Domestic & Industrial Uses	:	92.10 MCM
Stage of GW development	:	29%

## 13. AWARENESS AND TRAINING ACTIVITY

Water Management Training Programme:	one
Date	: 22.11.2007
Place	: Srikakulam
No. of Participants	: 32
Mass Awareness Programme	: one
Date	: 3.12.2012
Place	: Seethampet
No. of Participants	: 200

## 14. ARTIFICIAL RECHARGE & RAIN WATER HARVESTING

Projects Completed	:	Nil
Projects under Technical Guidance	:	Nil

## 15. GROUND WATER CONTROL & REGULATION

Over Exploited Mandals	:	One
Critical Mandals	:	Nil
Semi Critical	:	One
Notified Villages	:	11

## 16. MAJOR GROUND WATER PROBLEMS AND ISSUES

Except over exploitation in Ranasthalam mandal no major problem related to ground water is reported in the district.

# **GROUND WATER BROCHURE**

## **SRIKAKULAM DISTRICT, ANDHRA PRADESH**

### **1.0 Introduction**

Srikakulam district is the north eastern district of Andhra Pradesh and classified as a backward district. The district has a coastline of 192 km, and is sandwiched between the Eastern Ghats and Bay of Bengal. It is one of the less populated and literacy districts of the state. The district is endowed by good rainfall, forest wealth, mineral resources and surface water.

The district lies between north latitude of 18° 20' and 19° 10' and east longitudes of 83° 05' and 84° 50' with an aerial extent of 5837 km<sup>2</sup>. The district is bounded by the Bay of Bengal on the east, northeast and southwest with a coastline of 192 km, Vizianagaram district of Andhra Pradesh on west and south, and Orissa state on north and northwest. Howrah – Chennai broad gauge railway line and NH-5 are passing across the district almost parallel to the coastline.

The district headquarters is located at Srikakulam town. The district is divided into three revenue divisions viz., Srikakulam, Palakonda and Tekkali. Further these revenue divisions are divided into 38 revenue mandals (**Fig. 1**). There are 6 towns 1763 villages in the district. As per the 2011 census the population of the district is 25,37,593. The urban population of the district is 4,36,347 whereas rural population constitutes 22,63,124. The density of population of the district is 462 persons per sq. km.

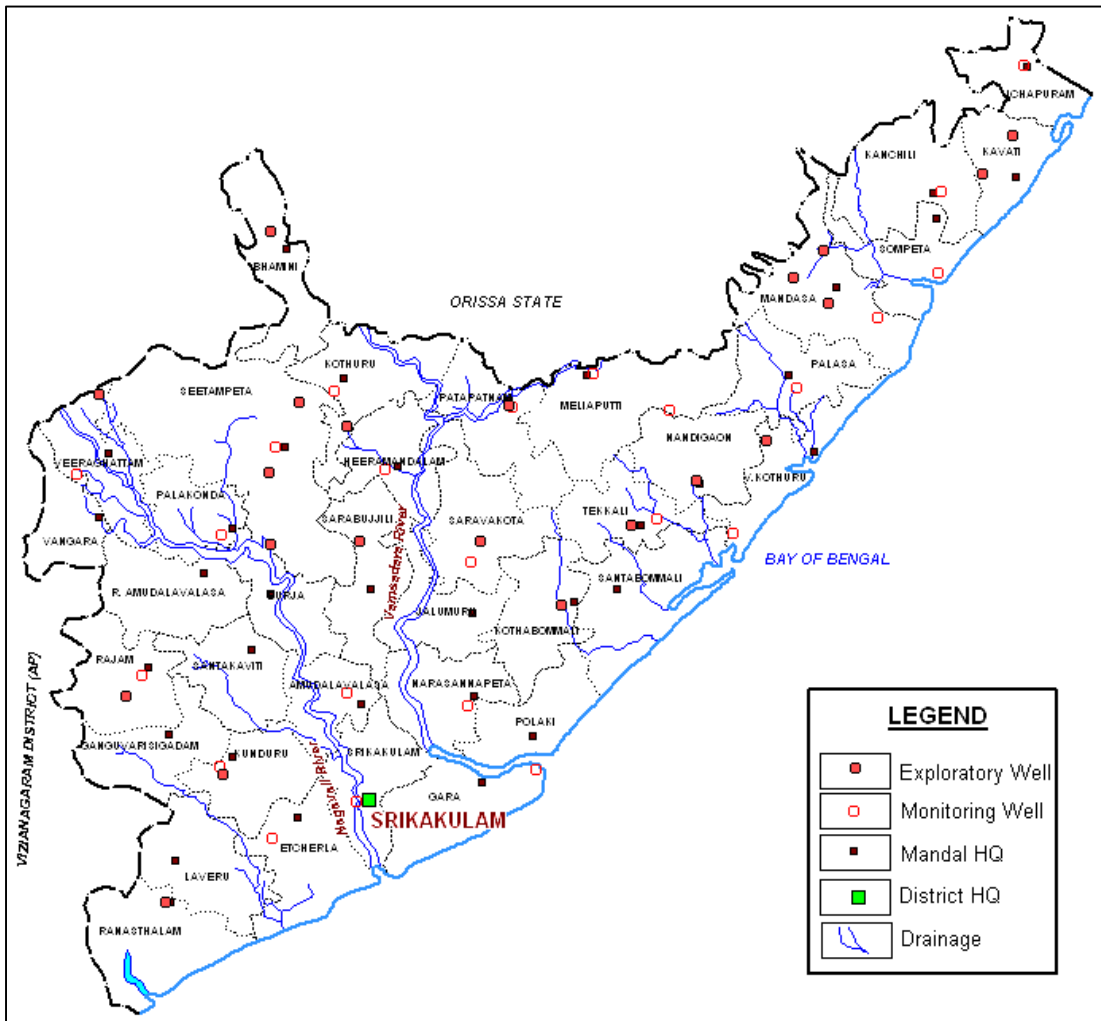
### **1.1 Drainage**

The main rivers drain the district are Vamsadhara and Nagavali. The other important rivers flowing in the district are Suvarnamukhi, Vegavati, Mahendra Tanya and Bahuda. Among the rivers Vamsadhara, Nagavali and Suvarnamukhi are perennial. The general drainage pattern is dendritic to sub-dendritic and occasionally parallel at places. The drainage in western part of the district resembles dendritic type, whereas in the central part it is parallel to sub-dendritic. The overall drainage is of medium to coarse textured towards west and north of the district, whereas in central and southern parts it is very coarse. The drainage density varies from less than 0.2 to 1 km/km<sup>2</sup>. In Palakonda area the density is of 0.6 to 1 km/km<sup>2</sup>. While areas with a density of more than 0.2 km/sq.km are observed in Ichapuram, Sompeta, Narasannapeta and Srikakulam. The density is less than 0.2 km/sq.km in plain area of Tekkali and in parts of Pathapatnam.

### **1.2 Irrigation**

The Srikakulam district is served with both surface and ground water irrigation sources. Major and medium irrigation projects exist in the district. The total net area irrigated is 191662 ha by means of all sources of irrigation available in the district.

**Fig.1 Location Map**



### 1.3 CGWB activities

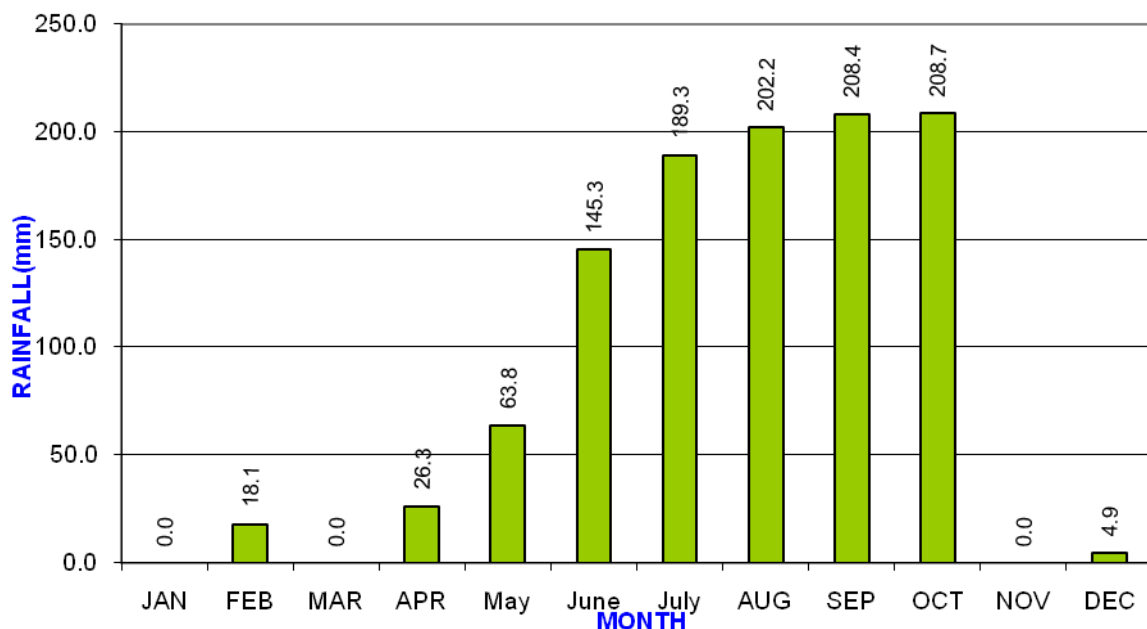
The Central Ground Water Board took up long term hydrogeological studies since 1969 with the establishment of Network Hydrograph Stations in various Hydrogeological environments as a part of the all India programme and presently there are 24 such monitoring stations in the district. Ground water investigations for agricultural purposes were carried out in Sompeta area during 1966-68 and for drinking purpose during 1971-72. The systematic hydrogeological surveys were carried out during 1970-1998. As a part of ground water exploration programme Geophysical surveys were carried out during 1999-2000. Ground water exploratory drilling programme was taken up during 1999-2001 in the district in both hard rock and soft rock areas and 21 wells were drilled to evaluate the aquifer properties of deeper aquifers. Hydrogeological investigations were also carried out during the year 2010-11 particularly in the coastal mandals of the district to study seawater ingress.

## 2.0 Rainfall & Climate

The climate of the district is moderate and characterized by high humidity all through the year along with oppressive summer and good seasonal rainfall. The period from December to middle of February is generally the season of fine weather.

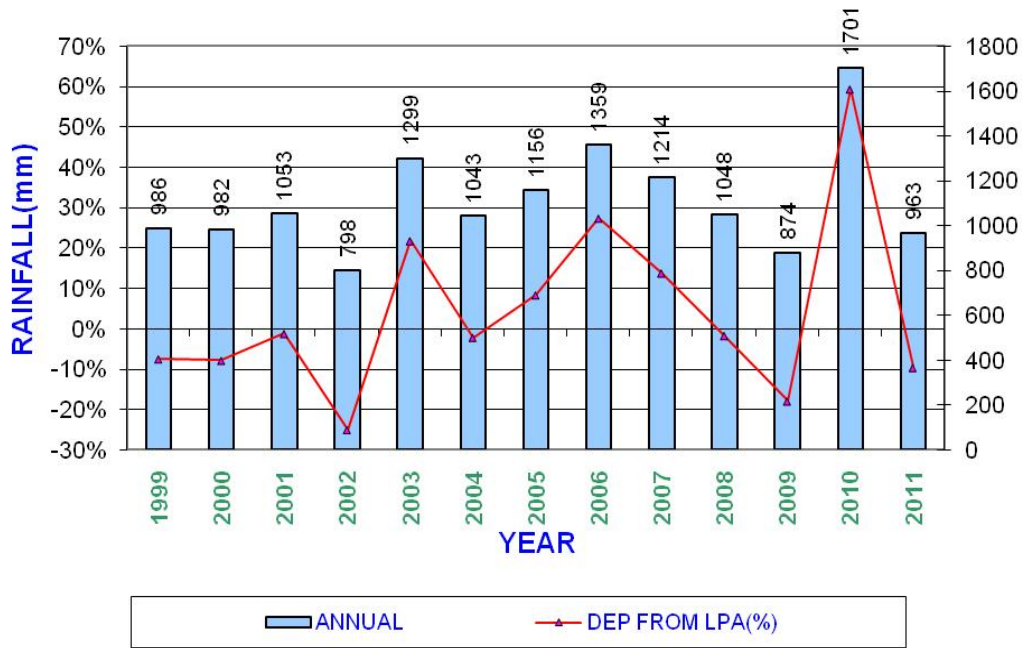
The average annual rainfall of the district is 1067 mm, which ranges from nil rainfall in January and November to 208 mm in September and October. September and October are the wettest months of the year. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June-September), 214 mm in northeast monsoon (Oct-Dec), 18 mm rainfall in Winter (Jan-Feb) and 90 mm in summer (March-May). The percentage distribution of rainfall, season-wise, is 70% in southwest monsoon, 20 % in northeast monsoon, 2% in winter and 8 % in summer. The mean monthly rainfall distribution is given in **Fig.2**. The annual rainfall ranges from 799 mm in 2002 to 1700 mm in 2010. The annual rainfall departure ranges from -25 % in 2002 to 59 % in 2010. The southwest monsoon rainfall contributes about 70% of annual rainfall. It ranges from 557 mm in 2002 to 1100 mm in 2006. The year 2002 experienced drought conditions in the district as the annual rainfall recorded is 25 % less than the long period average (LPA) respectively. The cumulative departure of annual rainfall from LPA is presented in **Figure 3**. It indicates that, the rainfall departure as on 2011 is positive i.e. 57%, showing rainfall excess. The annual rainfall during 2012 is 1289 mm.

**Fig.2 : Monthly Rainfall Distribution of long Period Average**





**Fig.3 : Annual Rainfall and Rainfall Departure from LPA**



The mean daily maximum temperature in the district is about 34°C in May and the mean daily minimum temperature is about 17.5°C in December/ January. Temperature in the district begins to rise from the middle of February till May. With the onset of southwest monsoon in June, the temperature decreases by about 2°C and is more or less uniform during the monsoon period. From October onwards the temperature steeply declines till December/ January. The mean daily maximum temperature increases from coast to west of the district where as mean daily minimum temperature decreases from coast to western part of the district.

The relative humidity in the district is of the order of 80 percent in the mornings throughout the year, where as in the evenings the relative humidity varies from about 70 to more than 80 percent Winds in the district are generally light to moderate in speed with some strengthening during summer and the early part of the southwest monsoon season with directions mostly between south and west.

### 3.0 Geomorphology & Soil Types

Geomorphologically the district can be broadly divided into 4 distinct units, viz., structural hills, pediplains, alluvial plains and coastal plains. Major part of the district in the northern and western parts is represented by structural hills i.e. high topographic relief and is characterized by hills forming the extensions of Eastern ghats and exhibits generally a NW-SE trend. Prominent hills like Mulegakonda, Gangadakonda, Nagalakonda, Suddalakonda and Antikonda have crescent shape and show NW-SE trend. Pandara hills, west of Kotturu attains a maximum height of 974 m amsl in the district. The hilly terrain is mostly confined to Palakonda, Hiramandalam, Pathapatnam, Tekkali and Amudalavalasa mandals. The pediplains, which occupy a larger part of the district and constitute shallow buried pediplains, deeply buried pediplains, pediments, residual hills and inselbergs. The thickness of

weathered zone in these varies from 5 to 15 m. The occurrence of ground water in this unit is generally poor except along fractures where moderate yields can be expected.

The alluvial plains are developed along major river courses, along valleys and at the foothill zones of structural hills. The intermontane valleys are narrow and steep in nature are observed between various hill ranges in the western part and coast. The general elevation of the plains varies from 60 to 120 m amsl. The plain country is very wide upto 15 km at north of Amudalavalasa and east of Srikakulam, it narrows down at south of Ichchapuram. The alluvial plains along the major course of rivers form the flood plain deposits. The alluvial plains form shallow to deep fresh water aquifers with good to very good yields. The coastal plains occur parallel and nearer to the sea and are of marine origin.

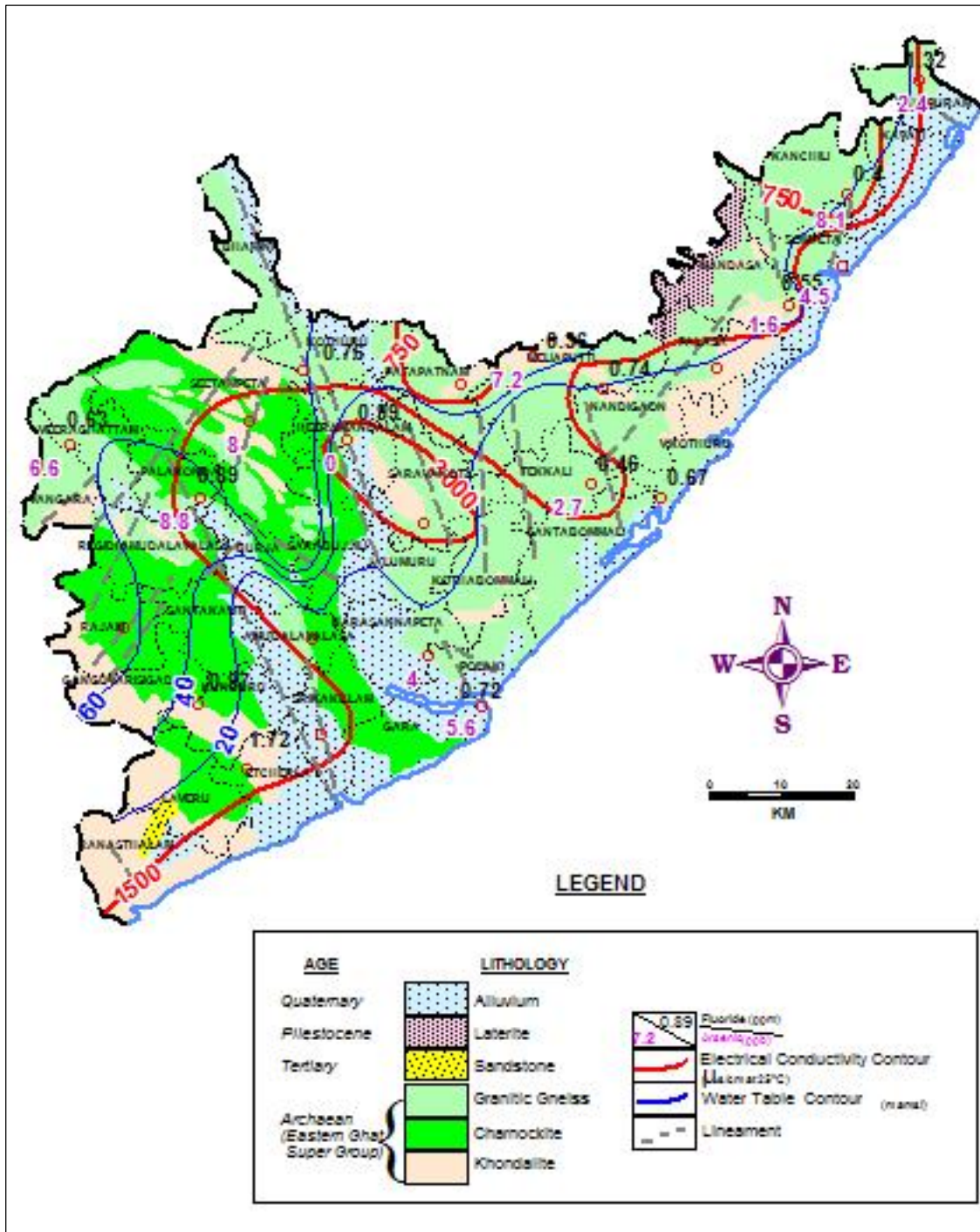
The predominant soils in Srikakulam district are red soils, red loams, sandy loams, sandy soils, black soils and alluvial soils. Red soils which are derived from the weathering of khondalites and gneissic rocks occur mostly along hill slopes. The narrow valleys and low lying areas between the hills are also covered with red loamy soils. Sandy soils are seen occurring in the southern and eastern parts of the district. The deltaic alluvial soil is seen distributed along the banks of the rivers Vamsadhara, Nagavalli and their tributaries. The coastal alluvial soils are seen in the coastal tracts of the district in parts of Ichchapuram, Sompeta and Tekkali area. The red sand and lateritic soils are mostly distributed throughout the district.

## **4.0 Ground Water Scenario**

### **4.1 Hydrogeology**

The district is underlain by variety of geological formations from the oldest Archaeans to Recent Alluvium. The Archaean Group of rocks includes Khondalites and Charnockites of Eastern Ghat Super Group and Granitic gneisses of Migmatite Group. The Gondwana rocks which are represented by sandstones are of very limited aerial extent. These sandstones occur as outlier in Ranastalam mandal on western part of the district. The thickness of this formation is more than 220 m. The recent sediments constitute coarse to fine sands, gravels, silts and clays. Structurally the are is highly disturbed as evidenced by the structurally controlled rivers viz: Vamsadhara and Nagavali which are observed to flow in the faulted zone trending NW-SE direction. Prominent lineaments are trending in NE-SW, NW-SE and NNW-SSE (**Fig.4**).

Fig.4 : Hydrogeology - Srikakulam District



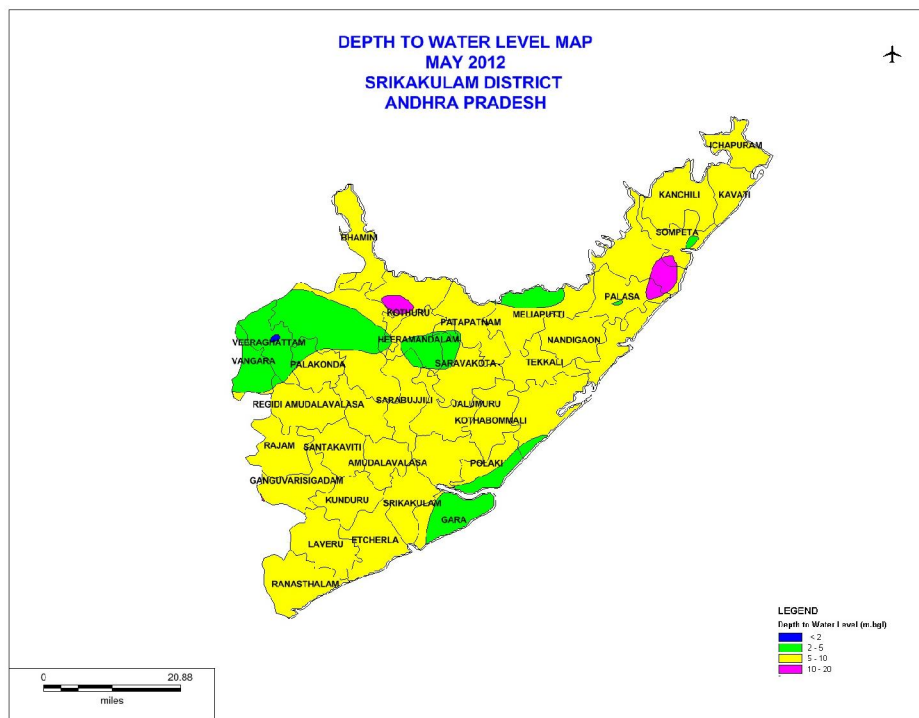
Ground water occurs in almost all geological formations. From the ground water point of view, the aquifers found in the district can be broadly classified into hard rocks (khondalites, quartzites, charnockites, granitic gneisses etc.) and soft rocks (sand stones, river alluvium, coastal alluvium etc.). Ground water occurs under unconfined to semi-confined conditions in the hard rock formations, while it occurs under unconfined to confined conditions in soft rock formations. The yields in the weathered zones of khondalites and charnockites are very limited and are in the order of 10 to 20 m<sup>3</sup>/d. In the weathered granitic gneisses the yields are in the

ranges from 10 to 40 m<sup>3</sup>/d. The bore wells constructed in the hard rocks generally tap the fractured and fissured zones. The yields of the bore wells range between <1 lps to 3 lps. The higher yields are limited to the available thickness of fractured, fissured and jointed zones. The occurrence of fractures is limited down to 30 to 40 m bgl and occasionally extends down to 70- 100m bgl. The river alluvium being unconsolidated sediment and having high porosity and permeability forms potential aquifer system. The yields generally range in this aquifer between 3 and 5 lps. Occasionally 7 to 9 lps yields are also observed in the sediments consisting of thick sand and gravel beds. Coastal alluvium has good yield potential in the range of 2 to 4 lps depending upon the availability of sand beds. The yields in sandstone formation range between 6 and 19 lps. Granularity of the sandstone bed is the deciding factor of yield potential as the higher yields are recorded in the wells tapping coarse sand stone beds.

### Water Level Scenario

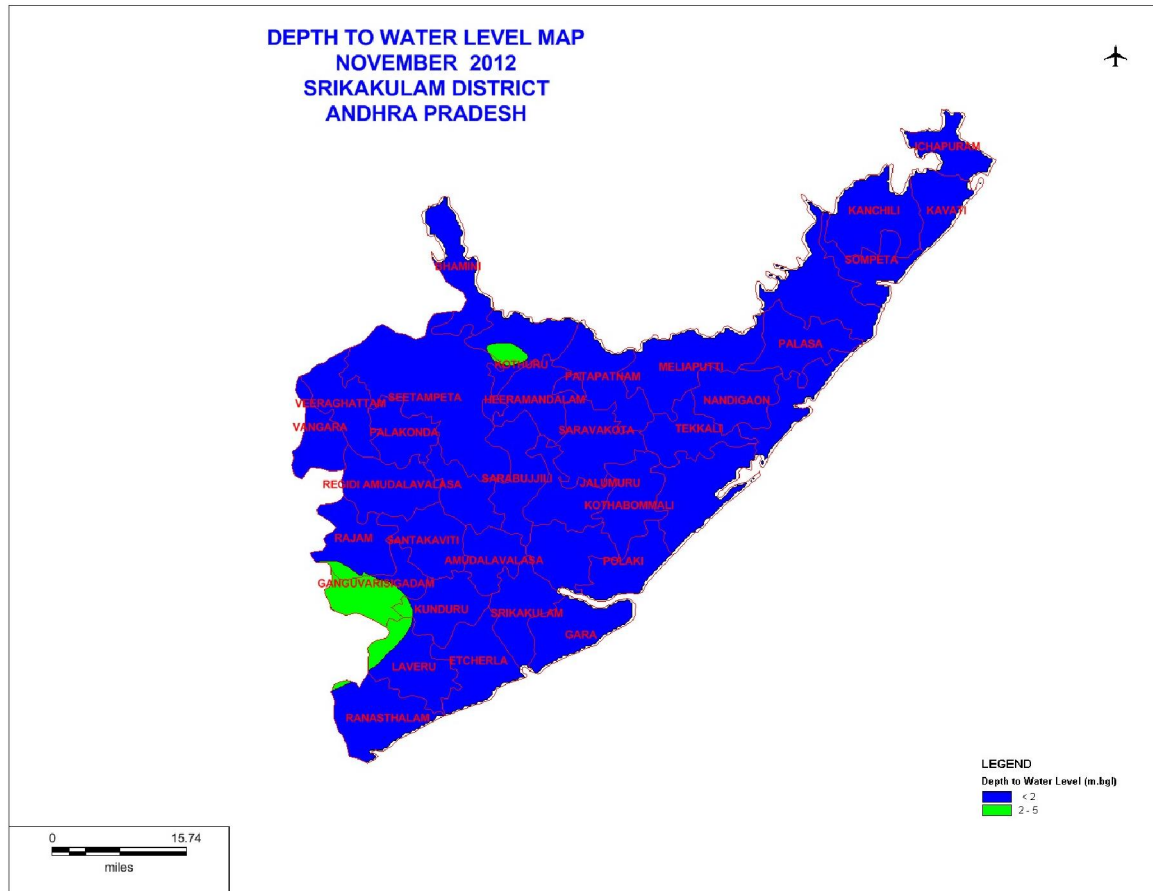
The depth to water level during pre monsoon season (May, 2012) in the district generally ranges between 5 and 10 mbgl (**Fig. 5**). Shallow water levels less than 5 m bgl occur in parts of Seetampeta, Veeraghattam, Vangara, Saravakota, Gara, Meliaputti, Patapatnam, and Ichapuram mandals. whereas water levels more than 10 m bgl are recorded at Palasa and Kotturu.

**Fig. 5 : Depth to Water Level - Pre Monsoon (May, 2012)  
Srikakulam District**



The depth to water level during post monsoon season (Nov, 2012) in the district generally less than 2 mbgl (**Fig. 6**). Deeper water levels more than 2 mbgl occur in Laveru, G.Sigadam, Ponduru, Rajam and Ranastalam mandals.

**Fig. 6 : Depth to Water Level - Post Monsoon (Nov, 2012)  
Srikakulam District**



Ground water levels fluctuate considerably in response to the recharge and draft conditions of ground water reservoir. Rise in water levels from pre-monsoon to post-monsoon is in the range of 1.31 m to 9.05 m exist in the district. Majority of the district is below 4 m fluctuation. The minimum average fluctuation is in alluvium, whereas maximum average fluctuation is in khondalites. Long-term trend of water level (2001 to 2011) indicates during pre monsoon an overall raise in the district in the range of 0.002 to 0.532 m/yr where as fall in the range of 0.007 to 0.228 m/yr exist at Kanchili, Ponduru, Heeramandalam and Srikakulam. During post-monsoon period overall raise exists in the district, it varies from 0.003 to 0.487 m/yr except at Srikakulam and Kanchili, where fall recorded of 0.013 and 0.018 m/yr respectively.

The water table elevation ranges between <1 m amsl (Kalingapatnam) and 139 m.amsl (Sitampeta). The water table contours are almost parallel to the topographic contours with gentle slopes along higher order streams of Vamsadhara and Nagavali and steep slopes in the hilly and intermontane upland areas. The general ground water flow direction is towards south directing towards the sea. Pumping test data of exploratory wells drilled by CGWB reveal that the transmissivity values in hard rocks vary between 2 and 44 m<sup>2</sup>/day while the storativity ranges from 2.5x10<sup>-4</sup> to 5.8x10<sup>-4</sup>. The aquifer parameters will be very high in soft rock formations i.e. alluvium and sandstone due to high yield potential.

## **4.2 Ground Water Resources**

Ground water resources for each mandal are presented in Table-1. Net annual ground water availability is 411.30 MCM in the command area and 515.86 MCM in non-command area with a total of 927.16 MCM in the entire district. The gross ground water draft for all uses in the command area is in the order of 80.75 MCM whereas it is 191.42 MCM in non-command area and the total gross ground water draft for all uses in the district is 272.17 MCM. Out of this Resource 23.41 MCM in Command area and 68.29 MCM in non-command area with the total of 92.103 MCM in the entire district allocated to cater the domestic and industrial needs of the population in the district as on 2025. Net ground water availability for future irrigation use is 318.49 MCM in the command, 287.26 MCM in non-command area and 605.75 MCM in the entire district. All the mandals in the district are categorised as safe except Ranasthalam (Over exploited) and Laveru (Semi Critical) mandals.

## **4.3 Ground Water Quality**

The quality of ground water is as important as quantity. The electrical conductivity varies from 468 to 4073  $\mu\text{s}/\text{cm}$  at 25°C. In major portion of the district EC ranges from 750 to 1500  $\mu\text{s}/\text{cm}$  at 25°C. EC values more than permissible limit occur at Heeramandalam (3570  $\mu\text{s}/\text{cm}$  at 25°C) and at Aludu (4073  $\mu\text{s}/\text{cm}$  at 25°C) in central portion of the district. Major chemical constituents are within permissible limits except at Kothuru, Patapatnam, Baruva, Heeramandalam, Srikakulam, Veerghattam, Narasannapeta, Tekkalipatnam and Ponduru where NO<sub>3</sub> recorded more than permissible limit. The Arsenic and Fluoride contents are also within the permissible limits. The quality of ground water in the district is in general potable and suitable for domestic, industrial and irrigation purposes, except at a few localities in isolated places, which is due to localised pollution.

## **4.4 Status of Ground Water Development**

The assessment of ground water resources in the district has brought to light the wide scope for utilising the ground water resources to boost the irrigation. Ground water is one of the most important and essential commodities for agricultural development and thus the judicious and scientific management of the resource is essential. It is therefore, imperative that wells have to be designed and spaced properly for meeting the irrigation water requirements of the district. In the hard rocks at present dug wells of 4 to 6m diameter with depths of 10 to 12m exist and in sandstones with 2 to 3m diameter are prevalent in the district. In sandstone and alluvium, wells are either stone or brick lined (masonry lined) and RCC rings are lowered in alluvium formation upto sufficient depths. Ground water in the district is also developed through bore wells of 250 to 380mm diameter and with casing lowered upto 10 to 15 m deep and are drilled down to 40 to 60m depth at places. Similarly tube wells in sandstone area of the district with 380mm diameter down to depths of about 100m, tapping 30 to 40m saturated aquifer material are recommended and also filter point wells of 254mm diameter are put down in the coastal alluvium in the plains and river alluvium areas wherever the thickness of saturated zone exceeds 5m with depth ranging between 10 to 15 m.

**Table : 1 Groundwater Resources of Srikakulam District**

Sl. No	Administrative unit/District	C/ Non-C	Total annual ground water recharge	Provision for natural discharge	Net annual ground water availability	Existing gross ground water draft for all uses	Provision for domestic and industrial requirement supply to 2025	Net ground water availability for future irrigation development	Stage of ground water development [%]	Category
1	2	3	4	5	6	7	8	9	10	11
1	AMADALAVALASA	C	984	73	911	73	41	824	8	Safe
		Non-C	1023	47	976	224	278	533	23	Safe
		Total	2007	120	1887	297	319	1357	16	Safe
2	BHAMINI	C	0	0	0	0	0	0	0	
		Non-C	2114	107	2007	339	142	1598	17	Safe
		Total	2114	107	2007	339	142	1598	17	Safe
3	BOORJA	C	1208	128	1080	77	30	992	7	Safe
		Non-C	1010	69	941	521	140	366	55	Safe
		Total	2218	197	2021	598	170	1358	30	Safe
4	ETCHERLA	C	2240	218	2022	390	144	1537	19	Safe
		Non-C	1237	75	1162	572	133	583	49	Safe
		Total	3477	293	3184	962	277	2120	30	Safe
5	G.SIGADAM	C	638	73	565	96	30	454	17	Safe
		Non-C	1872	264	1608	1116	191	388	69	Safe
		Total	2510	337	2173	1212	221	842	56	Safe
6	GARA	C	4261	182	4079	1503	173	2481	37	Safe
		Non-C	527	46	481	312	58	161	65	Safe
		Total	4788	228	4560	1815	231	2642	40	Safe
7	HIRAMANDALAM	C	154	8	146	41	8	101	28	Safe
		Non-C	1374	59	1315	306	137	947	23	Safe
		Total	1528	67	1461	347	145	1048	24	Safe
8	ICHAPURAM	C	0	0		0	0	0		
		Non-C	1678	91	1587	360	432	880	23	Safe
		Total	1678	91	1587	360	432	880	23	Safe
9	JALUMURU	C	2547	164	2383	456	123	1880	19	Safe
		Non-C	705	69	636	87	54	527	14	Safe
		Total	3252	233	3019	543	177	2407	18	Safe
10	KANCHILI	C	0	0		0	0	0		
		Non-C	2211	117	2094	386	222	1611	18	Safe
		Total	2211	117	2094	386	222	1611	18	Safe

Sl. No	Administrative unit/District	C/ Non-C	Total annual ground water recharge	Provision for natural discharge	Net annual ground water availability	Existing gross ground water draft for all uses	Provision for domestic and industrial requirement supply to 2025	Net ground water availability for future irrigation development	Stage of ground water development [%]	Category
11	KAVITY	C	0	0		0	0	0		
		Non-C	2029	110	1919	669	271	1110	35	Safe
		Total	2029	110	1919	669	271	1110	35	Safe
12	KOTABOMMALI	C	876	45	831	433	46	377	52	Safe
		Non-C	2075	32	2043	1429	202	503	70	Safe
		Total	2951	77	2874	1862	248	880	65	Safe
13	KOTTURU	C	0	0	0	0	0	0		
		Non-C	2439	191	2248	282	168	1921	13	Safe
		Total	2439	191	2248	282	168	1921	13	Safe
14	L.N.PETA	C	682	68	614	208	42	375	34	Safe
		Non-C	487	46	441	41	40	392	9	Safe
		Total	1169	114	1055	249	82	767	24	Safe
15	LAVERU	C	0	0		0	0	0		
		Non-C	2139	214	1925	1655	277	44	86	Semi-Critical
		Total	2139	214	1925	1655	277	44	86	Semi-Critical
16	MANDASA	C	0	0		0	0	0		
		Non-C	3607	182	3425	320	293	2925	9	Safe
		Total	3607	182	3425	320	293	2925	9	Safe
17	MELIAPUTTI	C	0	0		0	0	0		
		Non-C	2438	273	2165	456	153	1651	21	Safe
		Total	2438	273	2165	456	153	1651	21	Safe
18	NANDIGAM	C	904	95	809	284	53	507	35	Safe
		Non-C	2055	189	1866	584	147	1282	31	Safe
		Total	2959	284	2675	868	200	1789	32	Safe
19	NARASANNAPETA	C	3156	130	3026	635	153	2379	21	Safe
		Non-C	98	6	92	8	64	20	9	Safe
		Total	3254	136	3118	643	217	2399	21	Safe
20	PALAKONDA	C	1499	57	1442	30	84	1328	2	Safe
		Non-C	679	53	626	503	164	61	80	Safe
		Total	2178	110	2068	533	248	1389	26	Safe
21	PALASA	C	786	25	761	147	116	527	19	Safe
		Non-C	1848	197	1651	334	216	1171	20	Safe
		Total	2634	222	2412	481	332	1698	20	Safe
22	PATAPATNAM	C	0	0		0	0	0		
		Non-C	1880	122	1758	539	193	1149	31	Safe
		Total	1880	122	1758	539	193	1149	31	Safe
23	POLAKI	C	3983	170	3813	895	187	2887	23	Safe
		Non-C	0	0		0	0	0		
		Total	3983	170	3813	895	187	2887	23	Safe



Sl. No	Administrative unit/District	C/ Non-C	Total annual ground water recharge	Provision for natural discharge	Net annual ground water availability	Existing gross ground water draft for all uses	Provision for domestic and industrial requirement supply to 2025	Net ground water availability for future irrigation development	Stage of ground water development [%]	Category
24	PONDURU	C	1311	127	1184	325	122	772	27	Safe
		Non-C	1096	110	986	1028	89	0	104	O.E
		Total	2407	237	2170	1353	211	772	62	Safe
25	R.AMDALAVALASA	C	2184	232	1952	363	115	1527	19	Safe
		Non-C	1215	127	1088	393	154	591	36	Safe
		Total	3399	359	3040	756	269	2118	25	Safe
26	RAJAM	C	0	0		0	0	0		
		Non-C	1814	75	1739	801	271	770	46	Safe
		Total	1814	75	1739	801	271	770	46	Safe
27	RANASTHALAM	C	0	0		0	0	0		
		Non-C	2609	182	2427	2532	241	0	104	Over Exploited
		Total	2609	182	2427	2532	241	0	104	Over Exploited
28	SANTABOMMALI	C	3349	266	3083	303	113	2741	10	Safe
		Non-C	809	9	800	235	119	495	29	Safe
		Total	4158	275	3883	538	232	3236	14	Safe
29	SANTHAKAVITI	C	2329	198	2131	335	121	1741	16	Safe
		Non-C	959	78	881	360	87	480	41	Safe
		Total	3288	276	3012	695	208	2221	23	Safe
30	SARAVAKOTA	C	361	40	321	17	25	279	5	Safe
		Non-C	2146	21	2125	652	140	1352	31	Safe
		Total	2507	61	2446	669	165	1631	27	Safe
31	SARUBUJJILI	C	868	81	787	168	72	590	21	Safe
		Non-C	460	37	423	193	29	228	46	Safe
		Total	1328	118	1210	361	101	818	30	Safe
32	SEETHAMPETA	C	0	0		0	0	0		
		Non-C	1409	176	1233	179	188	991	15	Safe
		Total	1409	176	1233	179	188	991	15	Safe
33	SOMPETA	C	0	0		0	0	0		
		Non-C	2142	107	2035	323	489	1298	16	Safe
		Total	2142	107	2035	323	489	1298	16	Safe
34	SRIKAKULAM	C	3554	293	3261	318	150	2853	10	Safe
		Non-C	856	48	808	137	599	124	17	Safe
		Total	4410	341	4069	455	749	2977	11	Safe
35	TEKKALI	C	1293	112	1181	116	94	996	10	Safe
		Non-C	1508	151	1357	323	149	957	24	Safe
		Total	2801	263	2538	439	243	1953	17	Safe
36	V.KOTTURU	C	784	65	719	55	37	651	8	Safe
		Non-C	1796	50	1746	142	204	1474	8	Safe
		Total	2580	115	2465	197	241	2125	8	Safe
37	VANGARA	C	2745	297	2448	606	165	1748	25	Safe
		Non-C	216	22	194	40	21	143	21	Safe
		Total	2961	319	2642	646	186	1891	24	Safe
38	VEERAGHATTAM	C	1684	103	1581	201	97	1302	13	Safe
		Non-C	826	48	778	761	114	0	98	Semi-Critical
		Total	2510	151	2359	962	211	1302	41	Safe
	District Total	C	44380	3250	41130	8075	2341	31849	20	
		Non-C	55386	3800	51586	19142	6869	28726	37	
		Total	99766	7050	92716	27217	9210	60575	29	

Ground water irrigation in the district is not extensive and accounts only for 14% of the gross irrigation of the district. A total area of 268 sq.kms is irrigated through ground water, of which 155 sq.kms with dug well sources and 113 sq.kms by bore/tube wells. A total number of 32750 dug wells and 8132 bore/tube wells are functioning in the district to irrigate a gross area of 197 sq.kms during rabi and 71 sq.kms during kharif season.

Urban water supply is mostly from surface water source of Nagavali, Bahuda, Vamsadhara and Mahendratana rivers for Srikakulam, Icchapuram, Amudalavalasa and Palasa-Kasibugga towns respectively. 25 to 30% of total requirement of urban water supply is being met by ground water. The rural water supply to the 1763 habitations of the district is through both surface and ground water. A total number of 5366 open wells, 12741 bore wells, 513 protected water schemes meeting the drinking water requirements of the rural population.

## **5.0 Ground Water Management Strategy**

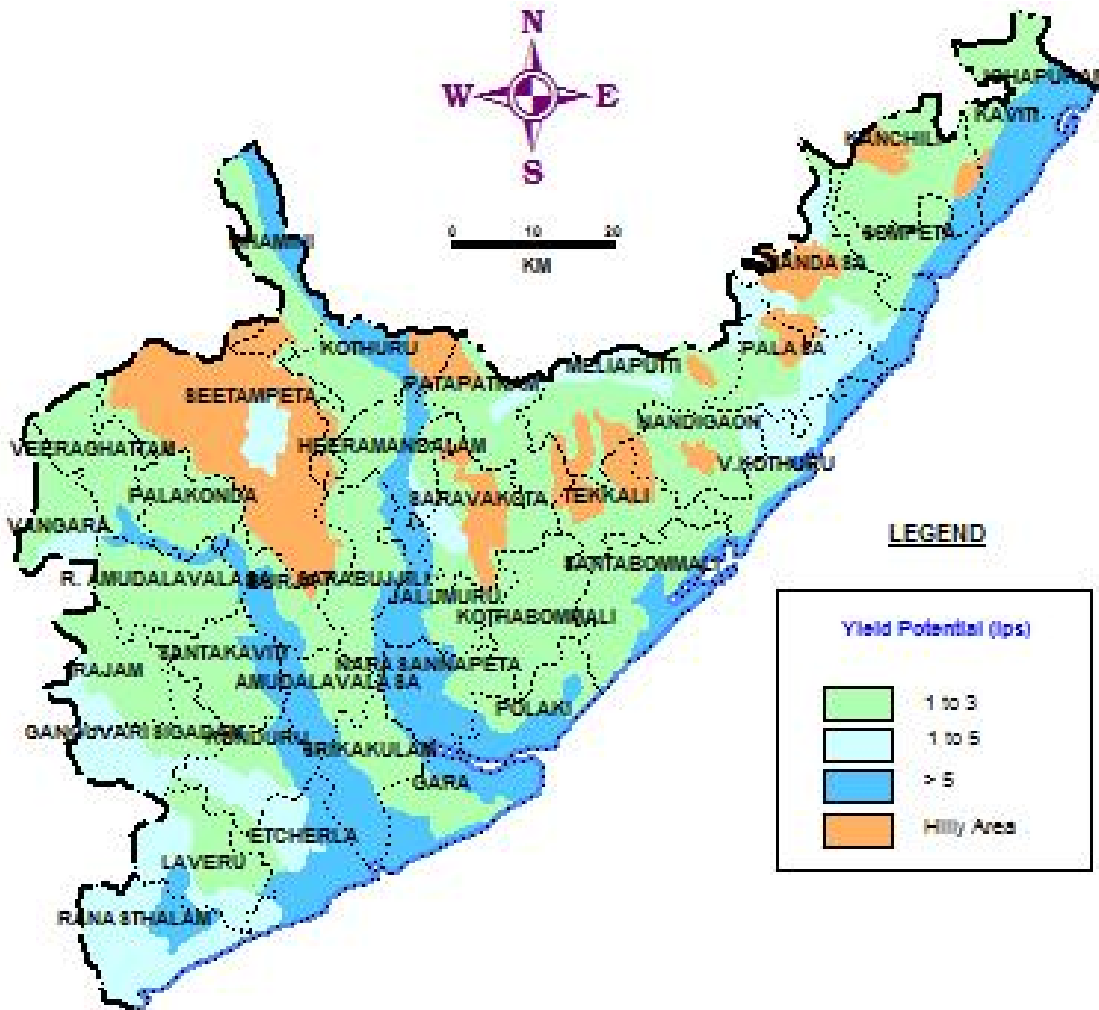
### **5.1 Ground Water Development**

The level of ground water development in the district is in the order of 29% of the annual replenishable resource. There is a huge scope for further development of ground water in order to bring more unirrigated area. Present irrigation is confined to 56% of the net sown area. Hence a balance of 44% area is devoid of irrigation facilities. Though surface water is abundant, during summer season its availability is very less due to swift nature of streams and rivers of the district. The district is underlain by hard rock formations and to a limited extent by unconsolidated formations, therefore DTH and DR rigs respectively suggested for deployment. Based on the yield potential of the aquifers the district is classified as low (1 to 3 lps), Low to Moderate (1 to 5 lps) and Moderate (3 to 5 lps) yield potential areas (**Fig. 7**).

### **5.2 Water Conservation and Artificial Recharge**

Stage of ground water development and long term water level trends indicate, there is no urgent need for artificial recharge measures to be taken up in the district except in Ranastharam and Laveru areas, where ground water development is high. However, in order to avoid any possible ecological imbalance due to excess drawl of ground water in future, the following areas are identified as feasible for constructing artificial recharge structures to increase the storage potential of aquifer in addition to Ranastharam and Laveru areas.

**Fig. 7 Ground Water Potential Map of Srikakulam District**



Nedimella valley and also valley between Narsipuram-Viraghattam-Kaviti and Sighupuram, between Kurusinghi-Bhasuru and Tummarada in the Sitampeta and Palakonda mandals, Nativada-Gottamangalapuram, east of the Rajam between Santhakaviti-Mamidipalle-Naguluvalsa and Palakondyam area, between Tallavalasa-Gummadam and Tamada, Burja south between Nilmmapeta-Narasapuram-Uppinavalasa-Guttuvala Nelli parts and Chimalavalasa, Somagundhi-Padali and Farlapadu valley, Srimukhalingam-Bhadri and Komanapalle, Patapatnam mandal, between Komanapalle-Rompivalasa and Lakshmipuram, Saravakota mandal, valley between Lingalava-Kottapalli-Kishtipuram-Jarjangi and Harishchandrapurram, Meliaputti mandal, valley between Meliaputti-Tiddini and Bhimapuram, Tekkali mandal, valley between Narsingapalli and Talagam, Between Maradikota-Nandigam - Temburu and Naugam, Valley between Narsingapalli and Dimilida, Valley between Goppili-Rentikota-Lakshmipuram and Kasibugga, Valley between Bhogabonda and Mandasa, Valley between Sabakota-Budarasiggi and Pottangi, Kanchili south, between Badupuram-Nuvagada-Jalatara and Buragam and North of Kanchili, valley between Dalagavindapuram-Kanaka Mundala.

## **6.0 Ground Water Related Issues and Problems**

Overall there is no significant change in water levels in the district. However, at few places decline in water table exists, which suggests that suitable preventive steps to be taken. However the magnitude of the decline is less. Water logging does not exist in the canal command and irrigated areas of the district. The reason for not having the water logging may be due to the nature of the soil in the district i.e. sandy soil, topography and the possibility of good subsurface drainage which are maintaining the ground water levels with in permissible levels.

Ground water pollution is not significant in the district. However localized effects of ground water pollution due to leaching effect of chemical fertilizers and pesticides applied in the normal agricultural practice has caused to increase in the nitrate (at Ichapuram, Heeramandalam, Narsannapeta, Kalingapatnam, Patatekkali, Ponduru and Tekkalipatnam). Though district has a coast line of 192 km, no sea water intrusion/ ingress reported.

## **7.0 Awareness and Training Activity**

One Training Programme on Water Management was organized at Srikakulam on 22.11.2007 a total of 32 persons from different organizations (government and non government) attended this programme. During this training programme posters related to ground water were displayed and explained to the participants and visitors in detail.

One mass awareness Programme on Ground Water Management was organized at Seetampeta village of Srikakulam on 3.2.2012 by involving, local school children and general public. During this awareness programme elocution, drawing and painting competitions were organized. A rally was also organized on this occasion by displaying placards depicting water conservation techniques.

## **8.0 Areas Notified by CGWA/ SGWA**

As per the ground water resources of the district except Ranasthalam (Over Exploited) and Laveru (Semi Critical) mandals, all the mandals fall under *Safe* category. 11 villages of Ranasthalam Mandal are notified by SGWA.

## **9.0 Recommendations**

1. The additional storage potential of the phreatic aquifers may be harnessed appropriately considering the drinking water scarcity and irrigation needs of the district. It will generate benefits to the local population.
2. Presently the ground water development in the district is rather unplanned. Construction of abstraction structures has taken place on a large scale without adhering to space norms like in Ranasthalam mandal, where industrial development is taking place. Such unscientific development of ground water may cause permanent damage to aquifer. Further development in such areas needs to be viewed with caution and preventive steps are to be evolved especially for such areas. Such unscientific development of ground water has

to be regulated. Artificial recharge measures should be adopted in the urban and over exploited areas like Ranasthalem for improving the ground water situation.

3. In the coastal area ground water development has to be taken up very judiciously to avoid any possibility of sea water ingress/intrusion.
4. Even though there is no immediate threat to the soil or crop due to water logging condition it is recommended to follow the anti water logging measures like conjunctive use of surface and ground water in the feasible areas as the number of surface water irrigation projects are coming up in the district.
5. A multi-sectoral approach is needed to study the ground water development, augmentation and management perspective. Therefore, all the aspects related to conjunctive use, ground water legislation, involvement of NGOs and mass awareness campaign will play an important role in conserving and developing the precious water resources.