CHAPTER 4.1.9 GROUND WATER RESOURCES

SALEM DISTRICT

INDEX

GROUND WATER REPORT OF SALEM DISTRICT

INRODUCTION :

In Tamil Nadu, the surface water resources are fully utilized by various stake holders. The demand of water is increasing day by day. So, groundwater resources play a vital role for additional demand by farmers and Industries and domestic usage leads to rapid development of groundwater. About 63% of available groundwater resources are now being used. However, the development is not uniform all over the State, and in certain districts of Tamil Nadu, intensive groundwater development had led to declining water levels, increasing trend of Over Exploited and Critical Firkas, saline water intrusion, etc.

ADMINISTRATIVE SET UP

The Salem District Comprises 4 Revenue Divisions,9 Taluks, 42 Firkas,20 Panchayat Unions, 35 Town Panchayats, 376 village Panchayats and 631 Revenue village,Salem is a major city with corporation status.

The total Geographical extent of Salem district is 5207sq.km. Which includes 4995.3 sq.km. In rural and 211.7sq.km under urban, accounting for 4% of the total geographical area of the TamilNadu State.

Salem District is totally bifurcated into 42 Firkas.

1. Hydrogelogy

(i) Major Geological formations:

Geology

The Salem district is underlain by Archaean crystalline, metamorphic complex. The geology of the district is very complicated owing to recurring tectonic and magmatic activities in the pre-cambrian period.

The minerals like magnesite, bauxite, iron-ore, limestone and chromite are the major contribution made to the state by the district.

a) Gneisses

The gneisses are perhaps the oldest rocks (fundamental gneisses) in about seven taluks. The general direction of foliation varies from E-W to ENE-WSW or S-E. The gneiss are highly weathered upto 30m at places, several ultramafic and basic rocks parallel to the foliation of the gneisses.\

b) Charnockites

The Charnockites, coarse grained and bluish dark to grey in colour, have the second largest coverages in the district. They are exposed in the Shevaroy hills, PachamalaiKalrayan hills and in the western parts of Metturtaluk. Some of them are garnetiferous and are massive and less weathered than the gneisses. They show two to three distinct set of joints most of which are vertical with steep dip.

These rocks occur in the kanjamalai, Godumalai, Chitteri and Olaipatti areas of the district. Kanjamalai are major iron ore deposits and are associated with Quartz-feldspathic gneisses, garnetiferous- quartz. These rocks are highly folded and jointed and less weathered.

c) CalcQuartzites and crystalline – lime stones

These rocks are exposed in patches in Sankaridurg. The thickness of the bands varies from a few metres to few hundred metres and the length is few kilometres. Their trend is in the NW & SE to NWW-SEE direction.

d) Laterites

The physical weathering and bleaching in the flat topped, hillocks of Shevaroys have given rise to laterites rich in alumina. There are also a few pockets of Bauxite in these hills. The weathering is 10 to 15m deep.

e) Alluvium and talus

There is a poor deposit of alluvium along the course of the Cauvery as it runs mostly on highland and rock floor. So is the case with the Thirumanimutharriver which also flows on rocky floor. However, little alluvium is found along the stream in Atturtaluk.

Talus consisting of pebbles and boulders is found at the foot hills of Shevaroys and Kalrayan hills, alluvium 10 to 25m thick important for groundwater development is found at some places like Kanyeni and Kurumbapatti villages in the foot hills of Shevaroys and Thumbal areas of the Kalrayan hills.

f) Structure

Three distinct phases of high tectonic activity resulted in the development of a complex structure evidenced by the presence of a number of folds, faults and joints in the district.

g) Dunites and Peridotites

These rocks appear in the foot hills of Shevaroys near Salem, which is known as the ‘Chalk hills’. These are ultramafics, cutting across the foliation planes of the gneisses and are highly weathered and talc occurs at many places as economic deposits. The talc schists, feldspathicschistsand hornblende schists formed by deformation of basic Igneous rocks are also seen in a few places in Salem taluk.

h) Anorthosites and Pyroxenites

Charnockite, Garnet, Pyroxene rock, Anthophyllite rock, dropsodite, pyroxinites occur in west and south of the shevaroys, and also massively and partly joint in the Nagarmalai and in the WSW slopes of Shevaroys.

i) Dolerite Dykes and other intrusives

There are number of basic intrusive dykes in Atturtaluk. They are massive running in NE-SW to NNE-SSW direction in general, parallel to the foliation direction of the gneisses. They are few metres in thickness and a few kilometres in length. Their contact with the country rock is sheared at many places.

j) Granites and Syenites

These are found in Thiruchengode, Sankari and Metturtaluks. They are massive and jointed poorly. Two permatite intrusions called “White elephant rocks” appear massively in the Shevaroy on top hills.

The hill ranges are characterised by fold-axis-trends, varying from NE-SW to EW with over turned beds at places Kanjamalai Syncline, NagamalaiAnticlinorium, Shevaroys anticline, etc., are a few that could be named here which include among others isoclines synoforms and antiforms.

The joints are well developed in the Plutonic crystalline and moderately developed in other intrusive rocks. These are two distinct sets of joints with trends of NS/NNW-SSE approximately to E-W with steep to nearly vertical southernly or easternly dips, several faults and shears occurring mostly with NE-SW trend are expected to influence the course of groundwater movement, its storage and developmental potentials in the district.

Drilling of bore holes:

The occurrence and movement of groundwater in hard rock formations are restricted to the porous zones of weathered formations and the open systems of fractures, fissures and joints.

The State Ground and Surface Water Resources Data Centre, during the course of investigation, have drilled boreholes spread over the entire district to find out the nature and behaviour of the sub surface material. There is considerable diversity in the nature of formation even within short distance. The weathered zone varies from 5 to 35m below ground level.

Aquifer parameters

a) Hard rock

The thickness of aquifer in this district varies between 15 to 60m below ground level. The intergranular porosity is essentially dependent upon the intensity degree of weathering and fracture development in the hard rock. The deep weathering has developed in gneissic formation and moderate weathering in Charnockite formation.

The range of aquifer parameters in hard rock areas is given as follows:

Parameters	Range
Well yield in LPM	45-545lpm
Transmissivity (T) m^2/day	10.2-524.8 m^2/day
Permeability (K) m/day	0.1-50 m/day

(iii) Drilling:

The drilling types are different according to the formation of the terrain. In general, DTH rigs are used in Hard rock formations for drilling a borewell at a depth ranges from 30m to 200m, according to the extension of joints, fractures, lineaments, etc in an area. In Sedimentary formations, rotary rigs with different rotors used according to the Tube well's diameter. The Bento novate clay is used in rotary rigs to avoid the collapse of the Tube well. The sedimentary tube wells are drilled up to a depth of 30m to 300m depending on the area, yield,etc. In alluvial formations, the hand rotary used for drilling tube wells ranges from 10m to 15m.In river beds, infiltration tube wells used for extraction of groundwater.

In Hard rock, the well designing is simple. The upper top soil and highly weathered zone is cased with PVC pipe and the remaining weathered, Fissured, Jointed portion is left as it is. In Selam District, the weathered zone ranges from 1.0m to 12.0m. In Granitic gneiss area, the highly weathered portion will be more up to 15m but in charnockite area, the weathered zone will extend up to 8.0m to 10.m only. In Sedimentary area, the well construction depends on the occurrence of sand thickness in the referred area. The logger is also used in the construction to identify the area of good quality of water.

2. GROUNDWATER REGIME MONITORING:

(i) Notes on existing water level scenario:

The water level is being monitored by State Ground & Surface Water Resources Data Centre from 1971 onwards from a network of 1746 observation wells (shallow open wells) located all over the State. The water level readings are observed in the first week of every month by the field officers. In Salem District, 224 observation wells and 81 piezometers,totally 305 wells are monitoring on Monthly basis. The Central Ground Water Board also monitors the water level from 900 numbers of wells spread all over the State. They observe water level four times in a year. (i.e January, May, August and November). The collected water level data are uploaded in GWDES software and database is maintained regularly for analysing the water level trend with rainfall. From the Monitoring network of wells, the selected representative wells are taken for Resource Estimation computations.

In Salem District, during the pre monsoon, the water level generally in declining trend ranges from G.L. to 15m. The depth of well below GroundLevel 12.0m are become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. The water level trend maps for pre and post monsoons are included as Annexure- I & II.

(ii) Long term trend of water level:

The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Salem District. The analysis reveals that the water level has gone down in the north, west and central parts of the Selam District. The inference taken from the annual fluctuation is due to lack of rainfall which in turn affects the groundwater levels in phreatic aquifer. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sectored needs and due to failure of monsoons, the water level has gone down. The hydrograph of observation wells water level trend from 2005 to 2017 enclosed as Annexure – III and water level trend from 2000 to 2017 of Piezometers enclosed as Annexure – IV for Salem District.

(iii) Existing network of Monitoring wells:

In Salem District, the existing network of monitoring wells is 305

wells, 224 wells are observation wells and 81 wells are piezometers. These wells are observed for every month water level.

Salem District: Observation Wells - Location and Co-ordinates

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
53501	Salem	Salem	Veerapandi	Elampillai	11°36'15"	78°00'40"
53501 A	Salem	Salem	Veerapandi	Elampillai	11°36'08"	78°00'29"
53501AY	Salem	Salem	Veerapandi	Elampillai	11°36'15"	78°00'40"
53502	Salem	Salem	Veerapandi	Attayampatty	11°31'50"	78°03'55"
53502AY	Salem	Salem	Veerapandi	Attayampatty	11°31'50"	78°03'55"
53503 AA	Salem	Salem	Veerapandi	Murungapatty	11°38'49"	78°02'32"
53503A	Salem	Salem	Veerapandi	Pethampatty	11°38'20"	78°02'34"
53503AY	Salem	Salem	Veerapandi	Pethampatty	11°38'20"	78°02'34"
53504	Salem	Salem	Veerapandi	Vedukathampatty	11°39'10"	78°04'55"
53504AY	Salem	Salem	Veerapandi	Vedukathampatty	11°39'10"	78°04'55"
53505	Salem	Salem	Veerapandi	Ariyanur	11°35'35"	78°04'40"
53505AY	Salem	Salem	Veerapandi	Ariyanur	11°35'35"	78°04'40"
53506A	Salem	Salem	Panamarathupatti	Nalikkalpatty	11°36'05"	78°07'40"
53507	Salem	Salem	Panamarathupatti	Panamarathupatti	11°33'35"	78°10'00"
53507AY	Salem	Salem	Panamarathupatti	Panamarathupatti	11°33'35"	78°10'00"
53508	Salem	Salem	Panamarathupatti	Kamalapatty	11°35'20"	78°17'30"
53509	Salem	Salem	Valappadi	Vepilaipatty	11°34'50"	78°21'10"
53509AY	Salem	Salem	Valappadi	Vepilaipatty	11°34'50"	78°21'10"

53510	Salem	Salem	Ayothiapattinam	Vellalakundam	11°37'30"	78°19'58"
53510AY	Salem	Salem	Ayothiapattinam	Vellalakundam	11°37'30"	78°19'58"
53511	Salem	Salem	Valappadi	Pudupalayam	11°38'50"	78°24'15"
53512	Salem	Salem	Valappadi	Attanurpatty	11°41'20"	78°24'40"
53513	Salem	Salem	Valappadi	Kurichy	11°43'40"	78°24'40"
53513 A	Salem	Valapadi	Valapadi	Kurichy		
53514	Salem	Salem	Valappadi	Neermulikuttai	11°42'35"	78°21'25"
53514(A)	Salem	Valapadi	Valapady	Chandrapillaivalasu	11°42'29"	78°23'15"
53514AY	Salem	Salem	Valappadi	Neermulikuttai	11°42'35"	78°21'25"
53515	Salem	Salem	Ayothiapattinam	Karipatti	11°39'55"	78°17'15"
53515 A	Salem	Valapadi	Ayothiyapattinam	Mettupatty	11°39'00"	78°10'32"
53516	Salem	Salem	Ayothiapattinam	Kattur	11°42'00"	78°16'00"
53517	Salem	Salem	Salem	Kannankurichy	11°41'55"	78°11'10"
53518A	Salem	Salem	Salem	Suramangalam	11°40'30"	78°07'25"
53519	Salem	Salem	Salem	Mettupatty Thadhanur	10°21'02"	77°58'07"
53520	Salem	Salem	Salem	Achankuttapatti	11°45'27"	78°77'44"
53520 A	Salem	Salem	Salem	Achankuttapatti	11°45'11"	78°18'26"
53521	Salem	Valapadi	Valapadi	Ayothiyapattinam	11°40'23"	78°14'02"
53522	Salem	Valapadi	Valapady	S. Natamangalam	11°41'54"	78°18'29"
53523	Salem	Valapadi	Valapady	Komalivattam	11°44'15"	78°16'27"
53523 A	Salem	Valapadi	Valapadi	Komalivattam	-	-
53524	Salem	Valapadi	Valapady	Koothapatty	12°09'12"	78°30'57"

53525	Salem	Valapadi	Valapady	Kattuveppilaipatty	11°38'58"	78°20'58"
53526	Salem	Valapadi	Valapady	Muthampatty	11°39'21"	78°23'04"
53551	Salem	Attur	Thalaivasal	Unathur	11°40'20"	78°47'10"
53551AY	Salem	Attur	Thalaivasal	Unathur	11°40'20"	78°47'10"
53552	Salem	Attur	Thalaivasal	Puttur	11°37'35"	78°47'00"
53552AY	Salem	Attur	Thalaivasal	Puttur	11°37'35"	78°47'00"
53553 A	Salem	Salem	Thalaivasal	Thalaivasal	78°45'30"	11°35'00"
53553A	Salem	Attur	Thalaivasal	Thalaivasal	11°35'00"	78°45'30"
53553AYA	Salem	Attur	Thalaivasal	Thalaivasal	11°35'00"	78°45'30"
53554	Salem	Attur	Thalaivasal	Govindapalayam	11°31'50"	78°49'00"
53554(A)	Salem	Athur	Thalaivasal	Pallipalayam	11°31'27"	78°50'08"
53554AY	Salem	Attur	Thalaivasal	Govindapalayam	11°31'50"	78°49'00"
53555	Salem	Attur	Thalaivasal	Aragalur	11°33'39"	78°47'29"
53555 A	Salem	Athur	Athur	Aragalur	11°34'12"	78°47'38"
53555A	Salem	Attur		Arogolur	11°34'11"	78°47'38"
53555AY	Salem	Attur	Thalaivasal	Aragalur	11°33'35"	78°47'30"
53556	Salem	Attur	Thalaivasal	Veeraganur	11°28'25"	78°44'25"
53556AY	Salem	Attur	Thalaivasal	Veeraganur	11°28'25"	78°44'25"
53557	Salem	Attur	Thalaivasal	Sarvoy	11°35'05"	78°42'35"
53558	Salem	Attur	Thalaivasal	Kattukottai	11°36'10"	78°40'10"
53558 A	Salem	Athur	Athur	Kattukottai	11°36'13"	78°40'10"
53558AY	Salem	Attur	Thalaivasal	Kattukottai	11°36'10"	78°40'10"
53559	Salem	Attur	Attur	Manjani	11°33'29"	78°37'58"
53559 A	Salem	Attur	Attur	Manjani	78°37'58"	11°33'29"
53559A	Salem	Attur	Attur	Manjani	11°33'29"	78°37'58"

53560	Salem	Attur	Gangavalli	Gangavalli	11°29'50"	78°38'45"
53560AY	Salem	Attur	Gangavalli	Gangavalli	11°29'50"	78°38'45"
53561	Salem	Attur	Attur	Attur	11°35'55"	78°36'00"
53562	Salem	Attur	Peddanaikanpalayam	Peddanaikanpalayam	11°38'55"	78°30'40"
53562AY	Salem	Attur	Peddanaikanpalayam	Peddanaikanpalayam	11°38'55"	78°30'40"
53563	Salem	Attur	Attur	Malliakari	11°34'20"	78°30'00"
53563A	Salem	Attur	Attur	Malliakari	11°34'20"	78°30'00"
53564	Salem	Attur	Attur	Kirippatti	11°32'30"	78°29'30"
53564A	Salem	Attur	Attur	Kirippatti	11°32'30"	78°29'30"
53564AYA	Salem	Attur	Attur	Kirippatti	11°32'30"	78°29'30"
53565	Salem	Attur	Gangavalli	Swedanadhi	11°26'15"	78°29'15"
53565(A)	Salem	Gangavelli	Gangavelli	Thammpatti	11°26'40"	78°29'50"
53565AY	Salem	Attur	Gangavalli	Swedanadhi	11°26'15"	78°29'15"
53566	Salem	Attur	Gangavalli	Sendarappatti	11°27'15"	78°31'30"
53566 A	Salem	Attur	Gangavalli	Sendarappatti	78°31'20"	11°27'10"
53566A	Salem	Attur	Gangavalli	Sendarappatti	11°27'10"	78°31'20"
53566AYA	Salem	Attur	Gangavalli	Sendarappatti	11°27'15"	78°31'30"
53567	Salem	Attur	Peddanaikanpalayam	Ettapur	11°39'55"	78°28'30"
53567(A)	Salem	Athur	Attur	Ethapur	11°39'30"	78°28'35"
53567AY	Salem	Attur	Peddanaikanpalayam	Ettapur	11°39'55"	78°28'30"
53568	Salem	Attur	Peddanaikanpalayam	Panaimadal	11°43'30"	78°28'55"

53568AY	Salem	Attur	Peddanaikanpalayam	Panaimadal	11°43'30"	78°28'55"
53569	Salem	Attur	Peddanaikanpalayam	Thumbal	11°46'05"	78°31'05"
53569AY	Salem	Attur	Peddanaikanpalayam	Thumbal	11°46'05"	78°31'05"
53570	Salem	Attur	Peddanaikanpalayam	Chinnakrishnapuram	11°35'35"	78°30'30"
53570AY	Salem	Attur	Peddanaikanpalayam	Chinnakrishnapuram	11°35'35"	78°30'30"
53571	Salem	Athur	Attur	Kandhasamy Pudur	11°32'57"	78°29'09"
53572	Salem	Gangavelli	Gangavelli	74.krishnapuram	11°28'58"	78°38'06"
53573	Salem	Gangavelli	Gangavelli	Krishnapuram - 74-ii	11°28'54"	78°37'50"
53574	Salem	Gangavelli	Gangavelli	74-krishnapuram-iii	11°27'27"	78°36'51"
53575	Salem	Gangavelli	Gangavelli	Goodamalai	11°27'36"	78°35'32"
53575 A	Salem	Gangavelli	Gangavelli	Koodamalai	11°27'39"	78°35'25"
53576	Salem	Gangavelli	Gangavelli	Kondayampalli	11°27'30"	78°31'22"
53577	Salem	Gangavelli	Gangavelli	Lathuvadi	11°23'57"	78°47'06"
53578	Salem	Gangavelli	Gangavelli	Thammampatty	11°26'56"	78°29'10"
53651	Salem	Mettur	Mecheri	Olaipatti	11°46'00"	77°59'30"
53652A	Salem	Mettur	Mecheri	Mecheri	11°49'55"	77°56'40"
53653	Salem	Mettur	Mecheri	Vellar	11°53'25"	77°58'00"
53654	Salem	Mettur	Mecheri	Koonandiur	11°53'45"	78°53'00"
53654A	Salem	Mettur	Mecheri	Koonandiyur	11°53'45"	78°53'00"
53654AY	Salem	Mettur	Mecheri	Koonandiyur	11°53'45"	78°53'00"
53655	Salem	Mettur	Mecheri	Pottaneri	11°49'15"	77°54'25"

53656 A	Salem	Mettur	Nangavalli	Nangavalli	77°53'40"	11°45'30"
53656A	Salem	Mettur	Nangavalli	Nangavalli	11°45'30"	77°53'40"
53657	Salem	Mettur	Nangavalli	Jalagandapuram	11°41'47"	77°52'45"
53658 A	Salem	Mettur	Nangavalli	Kunjandiyur	77°51'30"	11°48'35"
53658A	Salem	Mettur	Nangavalli	Kunjandiyur	11°48'35"	77°51'30"
53659	Salem	Mettur	Kolathur	Navapatti	11°44'00"	77°47'00"
53660	Salem	Mettur	Kolathur	Chitrapattipudur	11°45'20"	77°44'55"
53660AY	Salem	Mettur	Kolathur	Chitrapattipudur	11°45'20"	77°44'55"
53661	Salem	Mettur	Kolathur	Thanda	11°52'20"	77°40'10"
53662	Salem	Mettur	Kolathur	Govindapadi	11°52'50"	77°47'40"
53663	Salem	Mettur	Mettur	Puttarettiyur	-	-
53664	Salem	Mettur	Mettur	Kamaneri	8°28'43"	77°34'28"
53664 A	Salem	Mettur	Mecheri	Kamaneri	11°47'19"	77°59'30"
53665	Salem	Mettur	Mettur	Puralkottai	10°22'49"	78°49'14"
53666	Salem	Mettur	Mettur	Konur	11°26'39"	79°14'58"
53667	Salem	Mettur	Mettur	Pannavadi	11°52'58"	77°43'33"
53668	Salem	Mettur	Mettur	Mettupalayur	11°52'58"	77°43'33"
53669	Salem	Mettur	Mettur	Kuzhayur	-	-
53670	Salem	Mettur	Mettur	Kaveripuram Nehru Nagar	11°53'59"	77°42'54"
53671	Salem	Mettur	Mettur	Kaveripuram Sathya Nagar	11°53'59"	77°42'54"
53672	Salem	Mettur	Mettur	Singiripatty	11°54'05"	77°42'55"
53673	Salem	Mettur	Mettur	Kuttapatty	11°47'36"	77°55'18"
53674	Salem	Mettur	Mettur	Thithigiripatty	-	-

53701A	Salem	Omalur	Omalur	Tekkampatti	11°44'50"	78°06'50"
53701A (A)	Salem	Omalur	Omalur	Tekkampatti	11°43'14"	78°07'09"
53702	Salem	Omalur	Kadayampatti	Danishpet	11°52'15"	78°08'05"
53703	Salem	Omalur	Kadayampatti	Lokur	11°56'05"	78°11'40"
53704	Salem	Omalur	Kadayampatti	Theevattipatti	11°52'35"	78°05'10"
53705	Salem	Omalur	Kadayampatti	Thinnappatti	11°49'50"	78°05'20"
53705 A	Salem	Omalur	Kadayampatti	Thinnapatty	11°49'39"	78°06'00"
53706	Salem	Omalur	Omalur	Karuppur	11°43'20"	78°05'20"
53707	Salem	Omalur	Omalur	Muthunaickanpatti	11°42'45"	78°02'10"
53707A	Salem	Omalur	Omalur	Muthanaickanpatti	11°43'30"	78°01'52"
53708 A	Salem	Omalur	Omalur	Omalur	78°02'50"	11°44'55"
53708A	Salem	Omalur	Omalur	Omalur	11°44'55"	78°02'50"
53709A	Salem	Omalur	Kadayampatti	Gundakkal	11°53'15"	78°02'45"
53710	Salem	Omalur	Kadayampatti	Marakkottai	11°48'20"	78°00'05"
53711	Salem	Omalur	Omalur	Tholasampati	11°44'40"	77°57'20"
53712 A	Salem	Mettur	Tharamangalam	Tharamangalam	77°58'30"	11°41'35"
53712A	Salem	Omalur	Tharamangalam	Tharamangalam	11°41'35"	77°58'30"
53713	Salem	Omalur	Omalur	Kamalapuram	11°46'19"	78°03'39"
53714	Salem	Omalur	Omalur	Palpakki	-	-
53715	Salem	Omalur	Omalur	Thindamangalam	11°44'46"	78°00'39"
53715 A	Salem	Omalur	Omalur	Thindamangalam	11°40'20"	78°09'26"
53716	Salem	Omalur	Omalur	Pappampadi	11°38'49"	77°56'58"
53717	Salem	Omalur	Omalur	Salavadi	12°14'54"	79°40'00"
53718	Salem	Omalur	Omalur	Amarakudhi	11°44'04"	79°58'00"
53719	Salem	Omalur	Omalur	Kammampatty	11°54'24"	77°59'40"

53720	Salem	Omalur	Omalur	K.N.pudur	11°57'03"	78°14'03"
53720 A	Salem	Omalur	Omalur	K.n.pudur	11°57'09"	78°14'35"
53721	Salem	Omalur	Omalur	Ganapathypalayam	11°01'56"	77°19'46"
53722	Salem	Omalur	Omalur	Kullanallur	10°30'17"	76°15'07"
53723	Salem	Omalur	Omalur	Kanjanaickanpatty	11°58'06"	78°53'13"
53724	Salem	Omalur	Omalur	Gonagapadi	11°41'24"	77°59'57"
53751	Salem	Yercaud	Yercaud	Yercaud	11°45'50"	77°14'35"
53752 A	Salem	Yercaud	Yercaud	Nagalur	77°14'30"	11°50'55"
53752A	Salem	Yercaud	Yercaud	Nagalur	11°50'55"	77°14'30"
53753	Salem	Yercaud	Yercaud	Pattimedu	11°40'46"	78°38'23"
53754	Salem	Yercaud	Yercaud	Semanatham	-	-
53755	Salem	Yercaud	Yercaud	Vellakadai	11°09'47"	76°59'30"
53801	Salem	Sankari	Sankari	Morur	11°25'40"	77°52'35"
53801AY	Salem	Sankari	Sankari	Morur	11°25'40"	77°52'35"
53802	Salem	Sankari	Edappadi	Kalvadangam	11°33'40"	77°44'55"
53802AY	Salem	Sankari	Edappadi	Kalvadangam	11°33'40"	77°44'55"
53803	Salem	Sankari	Sankari	Chinnagoundanur	11°28'35"	77°50'40"
53803AY	Salem	Sankari	Sankari	Chinnagoundanur	11°28'35"	77°50'40"
53804	Salem	Sankari	Edappadi	Iruppali	11°39'30"	77°51'00"
53804AY	Salem	Sankari	Edappadi	Iruppali	11°39'30"	77°51'00"
53805	Salem	Sankari	Mac Donald Choultry	Vaikuntham	11°32'45"	77°57'20"
53805AY	Salem	Sankari	Mac Donald Choultry	Vaikuntham	11°32'45"	77°57'20"
53806	Salem	Sankari	Sankari	Mavelipalayam	11°29'30"	77°54'20"
53806AY	Salem	Sankari	Sankari	Mavelipalayam	11°29'30"	77°54'20"

53807	Salem	Sankari	Mac Donald Choultry	Kunnipalayam	11°32'35"	77°59'05"
53808	Salem	Sankari	Konganapuram	Konganapuram	11°33'55"	77°54'55"
53808AY	Salem	Sankari	Konganapuram	Konganapuram	11°33'55"	77°54'55"
53809	Salem	Sankari	Edappadi	Idappadi	11°35'10"	77°50'10"
53809 A	Salem	Edapadi	Edapadi	Edapadi	11°33'0 "	77°50'56"
53809AY	Salem	Sankari	Edappadi	Idappadi	11°35'10"	77°50'10"
53810	Salem	Sankari	Edappadi	Vellarivelli	11°36'55"	77°47'20"
53810AY	Salem	Sankari	Edappadi	Vellarivelli	11°36'55"	77°47'20"
53811	Salem	Sankari	Edappadi	Pillukurichi	11°38'10"	77°47'35"
53811AY	Salem	Sankari	Edappadi	Pillukurichi	11°38'10"	77°47'35"
53812	Salem	Sankari	Konganapuram	Andipalayam	11°36'00"	77°55'20"
53813	Salem	Sankari	Edappadi	Pakkanadu	11°42'00"	77°48'55"
53814	Salem	Edapadi	Edapadi	Kurumapatty	11°34'51"	77°52'36"
53815	Salem	Edapadi	Edapadi	Thangayur	11°32'20"	77°46'25"
53816	Salem	Edapadi	Edapadi	Poolampatty	11°39'17"	77°46'25"
53817	Salem	Edapadi	Edapadi	Chittur	13°14'48"	79°05'47"
53817 A	Salem	Edapadi	Edapadi	Chittur	11°38'11"	77°49'20"
53818	Salem	Edapadi	Edapadi	Thathapuram	11°37'25"	77°53'07"
53819	Salem	Edapadi	Edapadi	Samuthiram	12°12'30"	79°02'56"
53820	Salem	Sankari	Sankari	A.thalaiyur	11°32'08"	77°57'29"
53821	Salem	Sankari	Sankari	Vadugapatty	11°27'55"	77°55'33"
53822	Salem	Sankari	Sankari	Kasthuripatty	11°08'30"	78°19'56"
53823	Salem	Sankari	Sankari	Thevannagoundar	-	-
53823 A	Salem	Sankari	Sankari	Thevannagoundanur	11°29'57"	77°50'59"

53824	Salem	Sankari	Sankari	Mavurettipatty	-	-
53825	Salem	Sankari	Sankari	Thevur	11°31'27"	77°45'08"
53826	Salem	Sankari	Sankari	Arasiramani	11°34'46"	77°48'34"
53827	Salem	Sankari	Sankari	K.agraharam	11°32'55"	77°44'27"
53828	Salem	Sankari	Sankari	Edanganasalai	11°36'28"	78°00'15"
53829	Salem	Sankari	Sankari	Theppakuttai	-	-
53830	Salem	Sankari	Sankari	A.pudur	11°34'37"	77°57'30"
53831	Salem	Sankari	Sankari	Kakkapalaym	11°33'27"	78°00'34"
53832	Salem	Sankari	Sankari	Naduvaneri	11°34'40"	77°59'58"
53833	Salem	Sankari	Sankari	Kandarkulamanickam	11°32'29"	78°01'46"
HP1S05 (A)	Salem	Attur	Pedanaickanpalayam	Thumbal	11°46'40"	78°31'00"
HP1S06(A)	Salem	Attur	Pedanaickanpalayam	Ethapur	11°39'32"	78°26'45"
HP1S07(A)	Salem	Attur	Attur	Mallikarai	11°34'04"	78°29'38"
HP1S08(A)	Salem	Valapadi	Ayothiyapattinam	Kattur	11°45'02"	78°15'43"
HP2S03(A)	Salem	Attur	Thalaivasal	Sathapady	11°32'16"	78°41'37"
MWS -06 A	Salem	Gangavalli	Gangavalli	Sokkanur Agraharam	11°28'16"	78°43'20"
MWS-04 A	Salem	Attur	Thalaivasal	Thalaivasal	11°35'18"	18°45'07"
MWS-10(A)	Salem	Attur	Attur	Paithur	11°32'19"	78°34'42"
MWS-16 A	Salem	Salem	Veerapandi	Kuralnatham	11°35'18"	78°13'26"
MWS-21A	Salem	Omalur	Kadayampatti	K.morur	11°57'00"	78°12'15"
MWS-36 A	Salem	Mettur	Kollathur	Kurumbanur	11°49'50"	77°43'26"
MWS-38 A	Salem	Mettur	Kolathur	Kottaiyur	11°54'48"	77°43'46"

Selam District - Piezometers - Location and Co-ordinates

Well no	District	Tashil/Taluk	Block/Mandal	Village	Latitude	Longitude
53509(A)	Salem	Valapadi	Valapadi	Veppilaipatty	11.580833	78.350833
HP1S01	Salem	Valapadi	Ayothiyapattinam	karipatti	11.663889	78.300000
HP1S01(A)	Salem	Valapadi	Ayothiyapattinam	Minnampalli	10.633056	77.431667
HP1S02	salem	Valapadi	Valapadi	Nirmullikuttai	11.216667	78.361111
HP1S03	Salem	Attur	Pedanaickanpalayam	Panaimadal	11.716667	78.477778
HP1S04	Salem	Attur	Pedanaickanpalayam	Chinnakrishnapuram	11.593056	78.422222
HP1S05	Salem	Attur	Pedanaickanpalayam	Thumbal	11.777778	78.516667
HP1S06	Salem	Attur	Pedanaickanpalayam	Ethapur	11.661111	78.475000
HP1S07	Salem	Attur	Athur	Malliakarai	11.566667	78.500000
HP1S08	Salem	Valapadi	Ayothiyapattinam	Kattur	11.700000	78.400000
HP1S09	salem	Valapadi	Valapadi	A.valapadi	11.644444	78.400000
000HP1S09(A)	Salem	Valapadi	Valapadi	Singipuram	11.633333	78.415833
HP1S10	Salem	Salem	Veerapandi	Attaiyampatti	11.527222	78.044444
HP1S11	salem	Salem	Veerapandi	Vedukattampatti	11.655556	78.094444
HP1S12	Salem	Salem	Veerapandi	Pethampatti	11.639444	78.043056
HP1S12(A)	Salem	Salem	Salem	Murungapatty	11.641389	78.038889
HP1S22	Salem	Mettur	Nangavalli	Jalakandapuram	11.694444	77.888889
HP2S01	Salem	Salem	Salem	Kannankurichi	11.700000	77.183333
HP2S02	Salem	Attur	Thalaivasal	Siruvachur	11.637500	78.755833
HP2S03	Salem	Attur	Thalaivasal	Sathapadi	11.536111	78.697222
HP2S14	Salem	Edapadi	Konganapuram	Koranampatti	11.616667	77.913889
HP2S15	Salem	Sankari	Sankari	Vadugapatti	11.502778	77.866667
HP2S16	Salem	Edapadi	Edapadi	Pakkanadu	11.700000	78.675000
HP2S17	Salem	Omalur	Kadayampatti	Marakottai	11.850000	78000000
HP2S18	Salem	Omalur	Omalur	Thekkampatti	11.744444	78.100000
HP2S19	Salem	Omalur	Kadayampatti	Gundakkal	11.891667	78.041667
HP2S20	Salem	Omalur	Tharamangalam	Manathal	11.773611	77.955556
HP2S21	Salem	Mettur	Kolathur	Moolakkadu	11.813889	77.786111
HP2S21(A)	Salem	Mettur	Kolathur	Moolakkadu	11.813889	77.786111
HP2S22	Salem	Mettur	Mecheri	Amaram	11.838889	77.966667
HP2S23	Salem	Edapadi	Konganapuram	Erumaipatti	11.562500	77.916667
HP2S24	Salem	Edapadi	Konganapuram	Avaniperur Keelmugam	11.604167	77.851389
HP2S25	Salem	Edapadi	Konganapuram	Samuthiram	11.651389	77.9125
HP2S26	Salem	Edapadi	Konganapuram	Muthiyampatti	11.646667	77.891667
HP2S27	Salem	Omalur	Tharamangalam	Chinnapillaiyur	11.641667	77.958889
HP2S28	Salem	Omalur	Kadayampatti	Periyakadampatty	11.708333	78.001389
HP2S29	Salem	Omalur	Kadayampatti	Nallagoundampatti	11.695833	78.072222
HP2S30	Salem	Omalur	Omalur	Nadupatty	11.882778	78.091667

HP2S31	Salem	Omalur	Kadayampatti	Chinnavadugampatti	11.891111	78.152222
HP3S01	Salem	Salem	Salem	Ammapet	11.658333	78.188889
HP3S02	Salem	Salem	Salem	Hasthampatti	11.672222	78.155556
IBH 51750	Salem	Edapadi	Konganapuram	Katchupalli	11.522500	77.932222
IBH 51751	Salem	Sankari	Magudanchavadi	Vaikundham	11.596111	77.918333
MWS-01	Salem	Gangavalli	Gangavalli	Eastrajapalayam	11.430000	78.813333
MWS-02	Salem	Gangavalli	Gangavalli	Illupanatham	11.510833	78.758056
MWS-03	Salem	Attur	Thalaivasal	Sitteri	11.544444	78.798611
MWS-04	Salem	Attur	Thalaivasal	Thalaivasal	11.587500	78.753611
MWS-05	Salem	Attur	Attur	Attur	11.596667	78.590556
MWS-06	Salem	Gangavalli	Gangavalli	Sokkanur Agraharam	11.471667	78.722222
MWS-07	Salem	Gangavalli	Gangavalli	Kadambur	11.503333	78.599444
MWS-08	Salem	Attur	Pedanaickanpalayam	Pappanaickanpatti	11.777222	78.568889
MWS-09	Salem	Attur	Attur	Ramanaickanpalayam	11.628056	78.559722
MWS-10	Salem	Attur	Attur	Paithur	11.538611	78.578333
MWS-11	Salem	Gangavalli	Gangavalli	Sendarapatti	11.436944	78.511389
MWS-12	Salem	Valapadi	Valapadi	Pulluthikuttai	11.770833	78.427778
MWS-13	Salem	Salem	Ayothiyapattinam	Sukkampatti	11.717778	78.266944
MWS-14	Salem	Valapadi	Valapadi	Mannarpalayam	11.607500	78.398889
MWS-15	Salem	Valapadi	Ayothiyapattinam	Ayodhiyapattinam	11.673056	78.246667
MWS-16	Salem	Salem	Panamarathupatti	Kuralnatham	11.581667	78.238889
MWS-17	Salem	Salem	Panamarathupatti	Sandhiyur	11.566944	78.141389
MWS-18	Salem	Salem	Magudanchavadi	Egapuram	11.609722	77.961389
MWS-19	Salem	Sankari	Sankari	Sankari	11.471944	77.870278
MWS-20	Salem	Salem	Salem	Hasthampatti	11.686667	78.164444
MWS-21	Salem	Omalur	Kadayampatti	K.morur	11.950000	78.204167
MWS-22	Salem	Omalur	Kadayampatti	Deevatipatti	11.866667	78.086667
MWS-23	Salem	Mettur	Mecheri	Bukkampatti	11.837778	77.977222
MWS-31	Salem	Sankari	Sankari	Ramagudal	11.489167	77.717500
MWS-32	Salem	Sankari	Sankari	Kullampatti	11.568889	77.793611
MWS-33	Salem	Edapadi	Edapadi	Chettimankurichi	11.641389	77.851389
MWS-34	Salem	Edapadi	Edapadi	Pillukurichi	11.639722	77.781944
MWS-35	Salem	Mettur	Kolathur	Navapatti	11.746389	77.785278
MWS-36	Salem	Mettur	Kolathur	Kurumbanur	11.831944	77.724167
MWS-37	Salem	Mettur	Kolathur	Pannavadi	11.872778	77.766389
MWS-24	Salem	Omalur	Tharamangalam	Thuttampatti	11.673611	77.968333
MWS-25	Salem	Mettur	Nangavalli	Gonur	11.836944	77.876389
MWS-26	Salem	Mettur	Nangavalli	Veerakal	11.778889	77.874722
MWS-27	Salem	Mettur	Nangavalli	Sanarpatti	11.731944	77.866944
MWS-28	Salem	Omalur	Tharamangalam	Ariyampatti	11.717222	77.911667
MWS-29	Salem	Sankari	Magudanchavadi	A.thalaiyur	11.552500	77.928333
MWS-30	Salem	Sankari	Sankari	Manjakalpatti	11.503056	77.865556
MWS-38	Salem	Mettur	Kolathur	Kottaiyur	11.700278	77.729444

(iv) Data Constraints:

The following are constraints in collecting the water level data in the field and validating the data are:

1) The water level data are collected on the monthly basis in the referred observation wells and piezometers. The collected data is not sufficient quantity for analyzing purpose due to drying of wells, Wells abounded by various reasons, lack of selecting the alternate wells, lack of open wells available for monitoring purpose due to increased usage of bore wells in the villages, Panchayats, etc. In many villages, the water supply schemes implemented by overhead tank supply or mini energised pumps and the existing open wells are not used generally by the villagers and moreover, they filled with garbage.
2) The number of bore wells should be increased for monitoring purpose.
3) The site selection of new bore wells should be based on the Geological methods.
4) Strengthening the network of monitoring wells by closing the gaps in the network.
5) Maintenance cost should be allotted to maintain the bore wells on the periodical basis to maintain the quality as well as yield.
6) Installation of Automatic water level recorders in the sensitive and more water level fluctuation in the bore wells will helpful to monitor the extensive depletion of groundwater areas.
7) Upgrading the measuring instruments will helpful to take accurate reading of water levels in the field.
8) Upgrading the soft ware will helpful to minimize the errors and increasing the accuracy of data.
9) Erecting the Telemetric water level recorders in the over exploited Firkas will helpful to monitor the over extraction of groundwater.

10) Lack of manpower and transporting vehicles are also major problems for data collection in the field in proper time.

3. DYNAMIC GROUND WATER RESOURCES:

The State Ground and Surface Water Resources Data Centre has estimated the ground water resources of Tamil Nadu periodically in co-ordination with the Central Ground Water Board, Government of India , Ministry of Water Resources, Chennai, based on the Methodology evolved by the Ground Water Resources Estimation Committee, 1997 (GEC 97).

Groundwater potential assessment is a dynamic one and not static. While assessing an area, the following factors can be considered such as Geology, Total Irrigated Area, Total Number of Wells used for Irrigation, Water Level Data for the past five years, Average Rainfall, Total Recharge, Irrigation methods adopted in the area, Cropping pattern details, Seepage factor, Specific yield, Geological conditions prevailing in that area, Recharge through Artificial recharge structures, etc.

Groundwater potential assessment proposal should be presented for approval in the Central and State Level Working Group Committees and then, presented for final approval in the Central Level Committee as well as State Level Committees.

The Ground Water Potential Assessments as on January 1992 and January 1997 were done in the State, taking the Panchayat Union Block as an Assessment Unit and the entire State **was categorized as Dark, Grey and White areas**. The Blocks with more than 85% to 100% ground water development (extraction) were categorized as “Dark Blocks” and the blocks with ground water development between 65% to 85% were categorized as “Grey Blocks” and blocks with less than 65% ground water development were categorized as “White Blocks”.

Subsequently, the **Ground Water Potential Assessment was done as on March 2003 and as on March 2009.** In these assessments, the Panchayat Union Blocks in Tamil Nadu were **categorized as Over-Exploited, Critical, Semi-Critical, Safe and Saline instead of Dark, Grey and White blocks.** The Blocks with more than 100% extraction were categorized as “Over Exploited Blocks”, the blocks

with 90% to 100% extraction as “Critical Blocks”, the blocks with 65% to 90% extraction as “Semi Critical Blocks”, the blocks with less than 65% extraction as “Safe Blocks” and

the bad quality blocks were categorized as “Saline Blocks”. No schemes should be formulated in over exploited and critical blocks - “Notified Blocks – A category – (Stage of Groundwater extraction is 90% and above)”.

The re-estimation of groundwater resources in the State as on March 2011 and as on March 2013 can be assessed in Micro Level basis. In these assessments, the assessing unit is Firka (Unit of Taluk) and **categorized as Over-Exploited, Critical, Semi-Critical, Safe, and Saline Firkas.** As on March 2013 assessment, in the Villupuram District

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 1139 Firkas in the State, 358 Firkas are categorized as “Over Exploited Firkas”, 105 Firkas are categorized as “Critical Firkas”, 212 Firkas are categorized as “Semi Critical Firkas”, 429 Firkas are categorized as “Safe Firkas” and 35 Firkas are categorized as “Saline Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 374 to 358 Firkas, the “Critical Firkas” increased from 48 to 105 Firkas, the “Semi Critical Firkas” comes down marginally from 235 to 212 Firkas, the “Safe Firkas” comes down marginally from 437 to 429 Firkas and the “Saline Firkas” remains same as 35 Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the “Over Exploited Firkas” by various departments.

Methodology adopted for Estimation of Ground Water Potential :

The present methodology used for resources assessment is known as Ground Water Resource Estimation Methodology - 1997 (GEC'97) .In GEC'97, two approaches are recommended - **water level fluctuation method and norms of rainfall infiltration method**. The water level fluctuation method is based on the concept of storage change due to differences between various input and output components. Input refers to recharge from rainfall and other sources and subsurface inflow into the unit of assessment. Output refers to ground water draft, ground water evapotranspiration, base flow to streams and subsurface outflow from the unit. Since

the data on subsurface inflow / outflow are not readily available, it is advantageous to adopt the unit for ground water assessment as basin / sub basin / watershed, as the inflow / outflow across these boundaries may be taken as negligible.

In each assessment unit, hilly areas having slope more than 20% are deleted from the total area to get the area suitable for recharge. Further, areas where the quality of ground water is beyond the usable limits should be identified and handled separately. The remaining area after deleting the hilly area and separating the area with poor ground water quality is to be delineated into command and non-command areas. Ground water assessment in command and non-command areas are done separately for monsoon and non-monsoon seasons.

The rainfall recharge during monsoon season computed by Water Level Fluctuation (WLF) method is compared with recharge figures from Rainfall Infiltration Factor (RIF) method. In case the difference between the two sets of data are more than 20% then RIF figure is considered, otherwise monsoon recharge from WLF is adopted. While adopting the rainfall recharge figures, weight age is to be given to WLF method over adhoc norms method of RIF. Hence, wherever the difference between RIF & WLF is more than 20%, data have to be scrutinized and corrected accordingly.

During 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. In case of areas receiving less than 10% of the annual rainfall during non-monsoon season, the rainfall recharge is ignored.

The total annual ground water recharge of the area is the sum-total of monsoon and non-monsoon recharge. An allowance is kept for natural discharge in the non-monsoon season by deducting 5 to 10 % of total annual ground water recharge.

The balance ground water available accounts for existing ground water withdrawal for various uses and potential for future development. This quantity is termed as Net Ground Water Availability.

Net Ground Water Availability = Annual Ground Water Recharge - Natural discharge during non-monsoon season.

GEC'97 methodology has recommended norms for various parameters being used in ground water recharge estimation. These norms vary depending upon water bearing formations and agroclimatic conditions. While norms for specific yield and recharge from rainfall values are to be adopted within the guidelines of GEC'97, in

case of other parameters like seepage from canals, return flow from irrigation, recharge from tanks & ponds, water conservation structures, results of specific case studies may replace the adhoc norms.

The Gross yearly ground water draft is to be calculated for Irrigation, Domestic and Industrial uses. The gross ground water draft would include the ground water extraction from all existing ground water structures during monsoon as well as during non-monsoon period. While the number of ground water structures should preferably be based on latest well census, the average unit draft from different types of structures should be based on specific studies or adhoc norms given in GEC'97 report.

The stage of Ground water Development is defined by

Stage of Ground water = <u>Existing Gross Ground water Draft for all uses</u> X 100
Development (%) Net annual Ground Water Availability

The units of assessment are categorized for ground water development based on two criteria – a) stage of ground water development and b) long-term trend of pre and post monsoon water levels. Four categories are - Safe areas which have ground water potential for development; Semi-critical areas where cautious ground water development
is recommended; Critical areas; Over -exploited areas where there should be intensive monitoring and evaluation and future ground water development be linked with water conservation measures.

The criteria for categorization of assessment units are as follows:

S. No.	Stage of Groundwater Development	Significant Long term Decline		Categorization
		Pre-monsoon	Post -monsoon	
1.	<=70%	No	No	SAFE
		Yes / No	No / Yes	To be re-assessed
		Yes	Yes	To be re-assessed
2.	>70% and <=90%	No	No	To be re-assessed
		Yes / No	No / Yes	SEMI – CRITICAL
		Yes	Yes	SEMI – CRITICAL
3.	>90 and <=100%	No	No	To be re-assessed
		Yes / No	No / Yes	CRITICAL
		Yes	Yes	CRITICAL
4.	>100%	No	No	To be re-assessed
		Yes / No	No / Yes	OVER- EXPLOITED
		Yes	Yes	OVER- EXPLOITED

Note:' *To be re-assessed' means that data is to be checked and reviewed. If the ground water resources assessment and the trend of long term water levels contradict each other. This anomalous situations requires a review of the ground water resource computations, as well as the reliability of water level data.*

The long term ground water level data should preferably be for a period of 10 years. The significant water level decline may be taken in consideration between 10 to 20 cm/ year depending upon the local hydro geological conditions.

Dynamic Ground Water Resources Estimation of TamilNadu As on March 2013

District Summary

(in ha.m)

SELAM DISTRICT							
Sl.No (District))	**District**	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**No of Over Exploited Firkas**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	SALEM	54,609.38	58,715.04	4,984.54	63,699.58	117	27

Firka Wise Summary

(in ha.m)

SELAM DISTRICT							
Sl.No	**Assessment Unit (Firka)**	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**Category of the Firka**
1	ARUNOOTHUMALAI	176.55	83.85	5.20	89.05	50	SAFE
2	ATTUR	2,001.44	2,903.50	60.92	2,964.42	148	OVER EXPLOITED
3	BELUR	1,148.15	950.00	52.85	1,002.85	87	SEMI CRITICAL
4	EDAPPADI	810.32	1,306.13	165.85	1,471.98	182	OVER EXPLOITED

5	ERNAPURAM	1,372.89	1,886.30	78.15	1,964.45	143	OVER EXPLOITED
6	GANGAVALLI	3,920.69	6,384.90	65.45	6,450.35	165	OVER EXPLOITED
7	KADAYAMPATTI	2,267.98	2,019.40	311.16	2,330.56	103	OVER EXPLOITED
SELAM DISTRICT							
Sl.No	**Assessment Unit (Firka)**	**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 (4+5)**	**Stage of Ground Water Development {(6/3)*100} %**	**Category of the Firka**
8	KALRAYANMALAI	1,835.38	586.35	40.53	626.88	34	SAFE
9	KARIPPATTI	1,533.92	1,705.20	84.77	1,789.97	117	OVER EXPLOITED
10	KARUPUR	1,815.13	1,456.63	106.17	1,562.79	86	SEMI CRITICAL
11	KATTUKKOTTAI	1,894.33	2,153.33	68.08	2,221.40	117	OVER EXPLOITED
12	KOLATHUR	3,036.09	2,332.80	91.84	2,424.64	80	SEMI CRITICAL
13	KONGANAPURAM	1,297.88	1,530.60	217.52	1,748.12	135	OVER EXPLOITED
14	MALLIYAKARAI	1,866.58	2,495.68	76.37	2,572.05	138	OVER EXPLOITED
15	MECHERI	939.59	726.99	335.33	1,062.32	113	OVER EXPLOITED
16	Mettur	1,511.94	1,170.80	70.01	1,240.81	82	SEMI CRITICAL
17	NANGAVALLI	944.81	1,208.40	219.30	1,427.70	151	OVER EXPLOITED
18	OMALUR	1,291.74	1,056.25	436.99	1,493.24	116	OVER EXPLOITED
19	PALAMALAI	232.95	325.20	10.65	335.85	144	OVER EXPLOITED
20	PANAMARATHUPPATTI	1,377.55	1,641.90	247.37	1,889.27	137	OVER EXPLOITED
21	PATCHAMALAI	306.21	200.60	9.26	209.86	69	SAFE
22	PETHANAICKANPALAYAM	1,218.39	1,777.50	104.86	1,882.36	154	OVER EXPLOITED
23	POOLAMPATTI	2,134.15	1,811.20	240.47	2,051.67	96	CRITICAL
24	POTTANERI	799.49	647.60	61.82	709.42	89	SEMI CRITICAL
25	PUTHUR	528.80	-	17.55	17.55	3	SAFE

26	SALEM_TOWN	801.65	701.95	198.43	900.38	112	OVER EXPLOITED
27	SANKARI EAST	940.40	1,192.50	131.05	1,323.55	141	OVER EXPLOITED
28	SANKARI WEST	678.36	831.00	146.67	977.67	144	OVER EXPLOITED
29	SEMMANDAPPATTI	1,238.24	1,411.13	83.23	1,494.35	121	OVER EXPLOITED
30	SURAMANGALAM	813.11	765.00	22.82	787.82	97	CRITICAL
31	THALAIVASAL	1,798.03	3,150.98	61.71	3,212.69	179	OVER EXPLOITED
32	THARAMANGALAM	1,332.27	1,213.70	304.44	1,518.14	114	OVER EXPLOITED
33	THEVUR	2,031.49	1,429.10	34.08	1,463.18	72	SEMI CRITICAL
34	THIRUMALAIGIRI	596.26	632.85	23.40	656.25	110	OVER EXPLOITED
35	VALASAIYUR	1,146.03	1,696.35	76.35	1,772.70	155	OVER EXPLOITED
36	VAZHAPPADI	1,435.87	2,381.10	381.36	2,762.46	192	OVER EXPLOITED
37	VEERAGANOOR	1,556.79	1,172.85	28.47	1,201.32	77	SEMI CRITICAL
38	VEERAPANDI	754.45	1,140.55	163.30	1,303.85	173	OVER EXPLOITED
39	VELLAKKADAI	531.97	-	13.84	13.84	3	SAFE
40	VEMBADITHALAM	675.42	824.00	69.73	893.73	132	OVER EXPLOITED
41	YERCAUD	454.97	-	28.96	28.96	6	SAFE
42	YETHAPUR	1,561.12	1,810.90	38.24	1,849.14	118	OVER EXPLOITED
TOTAL		**54,609.38**	**58,715.04**	**4,984.54**	**63,699.58**	**117**	

4. Groundwater quality issues:

The rainfall is the main source for the availability of water both in surface and sub surface. The quantum of rainfall varies every year depending upon the monsoon. However, the extraction of surface and sub surface water is increasing year by year. It leads to environmental impact on the water sources like depletion of water level, deterioration of water quality. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes.

For the present assessment, the value of Total Dissolved Solids (TDS) have been considered for demarcation of good / bad quality areas. For this purpose, the TDS

value of less than or equal to 2000 mg/l have been considered as good quality and the value more than 2000 mg/l have been considered as bad quality areas.

The presence of fluoride in natural Ground Water is having its merits and demerits depending upon the concentration. Presence of fluoride <1.0 mg/l in drinking water reduces dental diseases whereas higher level > 1.50 mg/l will affect the health and causes dental fluoridise. Nitrate is noted significantly in Ground Water due to use of chemical fertilizer for agriculture and other local pollution rocks and soils are also contributing nitrate to Ground Water. Arsenic is another poisonous heavy metal in Ground Water. The allowable limits for drinking purposes are 0.05 mg/l.

In Salem District, the quality of Ground Water generally ranges from moderate to good quality both in the shallow dug well and bore wells except in & around the Kazhuveli tank, where the water quality is poor due to seawater intrusion in the lagoons during high tide seasons, the production of salt and Aquaculture farming.

5. Groundwater issues and challenges:

The groundwater quantity and quality are to be highlighted and may be analyzed in terms of :

(i)Problems posed by nature:

In terms of Quantitative aspects, nowadays, rainfall may more within the short period of duration. Due to this aspect, recharge is less and runoff will be more. The availability of groundwater is less due to over extraction than recharge. The Percentage of OE/Critical Firkas increased due to this reason. Increasing the artificial recharge structures in the proper areas may avoid the depletion of groundwater especially in OE/Critical Firkas.

(ii) Problems caused by anthropogenic activities:

The problems caused due to intensive groundwater extraction, intensive surface water irrigation, intensive mining activities, growing urban complexes and industrial establishments will lead to drastic depletion in groundwater resources only. Proper alternative recharge structures must be established.

(iii) Problems caused by socio-economic condition:

The land holdings of farmers may be different from another. One farmer having more than 5 Acres has less expense than a farmer having one acre. The free electric supply to all farmers have chance to extract more groundwater. To avoid this, proper guidance will be given to the farmers for the usage of groundwater.

(iv) Administrative issues:

To control, regulate and manage the Ground Water Resources in the State, there is no groundwater act, now in force. But, the **Chennai Metropolitan Area Ground Water (Regulation) Act, 1987** is in force and it extends to Chennai City and notified 302 revenue villages in Kanchipuram and Thiruvallur Districts, only.

The rest of Tamilnadu, **G.O.(Ms).No.142, Public Works (R2) Department, dated: 23.07.2014** and **G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** are regulate and manage the groundwater resources. The Government of Tamil Nadu had enacted the **Tamil Nadu Ground Water (Development and Management) Act, 2003**. However, this **Act was repealed on 14.09.2013**, in order to enact a comprehensive law to develop and manage the groundwater in the changed scenario in the State.

The pricing policy for groundwater users is also an important strategy in controlling the illegal extraction of groundwater by taking from lorries,etc. The unused dug wells and bore wells can be used as artificial recharge structures will be good concept in recharging the ground water.

6. Groundwater Management and Regulations:

(i) <u>Statute/Law/Policy/Regulations if any</u>:

The Central Ground Water Authority has been constituted to regulate, control, development and management of ground water resources for whole country based on overall situation prevailing in India. But, the ground water conditions are varying from State to State. **Ground Water is a State subject and the State Government has every right to protect and regulate their own precious ground water resources according to the prevailing conditions in the State.**

The Tamil Nadu Government had enacted **"The Tamil Nadu Ground Water (Development and Management) Act, 2003"** which was subsequently **repealed in 2013**, so as to bring out an effective management Act considering the present scenario. **As an interim measure, for regulating the exploitation of ground water, the Government have issued G.O. (Ms) No.142,PWD dated 23.07.2014 for regulations for management of ground water for safe guarding the scarce groundwater resources in Tamil Nadu State.** In the absence of an Act, the

Government executes this Government order to control, regulate and manage the Ground Water Resources while taking into consideration of the future of the State and its people.

The State Ground and Surface Water Resources Data Centre has estimated the Ground Water resources of Tamil Nadu State periodically in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Methodology evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

Accordingly, **the Ground Water Potential Assessment done as on January 1992 and as on January 1997 on the basis of Panchayat Union Blocks as assessment units** in Tamil Nadu and **categorized as Dark, Grey and White areas.** The Blocks with more than 85% to 100% ground water development were categorized as “Dark Blocks” and the blocks with ground water development between 65% to 85% were categorized as “Grey Blocks” and less than 65% ground water development were categorized as “White Blocks” and the Government approved the categorisation and released as Government order and G.O.No:326, PW (R2) Dept, dated: 23.11.1993. It was in effect up to the next assessment done as on March 2003.

Subsequently, **the Ground Water Potential Assessment done as on March 2003**, **categorized the blocks as Over Exploited, Critical, Semi Critical, Safe, Saline instead of Dark, Grey and White blocks**. The Blocks with more than 100% were categorized as “Over Exploited Blocks”, the blocks in between 90% to 100% as “Critical Blocks”, the blocks in between 65% to 90% as “Semi Critical Blocks” and less than 65% as “Safe Blocks” and the bad quality blocks were categorized as “Saline Blocks” and the same was approved by the Government and released as G.O.No:51, PW (R2) Dept, dated: 11.02.2004. It was in effect up to the next assessment done as on March 2009.

The Next **Ground Water Potential Assessment done as on March 2009**, and the same was approved by the Government and **released as G.O.No:52,PW(R2) Dept, dated: 02.03.2012.**

As per G.O.No.52,PW(R2) Dept, dated: 02.03.2012 and G.O. (Ms) No.142,PW(R2)Dept dated 23.07.2014, the State Government have authorized

and empowered the Chief Engineer, State Ground and Surface Water Resources Data Centre, Chennai for issuing permission or license or No Objection Certificate/renewal for drawal and transportation of Ground Water based on the hydro geological conditions to the New Industries, Packaged Drinking Water Companies, Infrastructures and Mining projects, etc except the areas to which the Chennai Metropolitan Area Ground Water (Regulation) Act,1987 extends.

Subsequently, the next **Ground Water Resources Assessment of the State was completed as on March 2011** and taking **Firka as an assessment unit** in the State of Tamil Nadu. Based on the above assessment, **the Government had approved and issued G.O.(Ms).No.113, Public Works (R2) Dept , Dt:09.06.2016** for categorisation of the Firkas in the State as Over Exploited, Critical, Semi-Critical and Safe Firkas. All the Over Exploited and Critical Firkas are notified as **"A" Category** (where the stage of ground water extraction is 90% and Above) and all the Semi Critical and Safe Firkas are notified as **"B" Category** (where the stage of ground water extraction is below 89%). In this Government Order, the Government had directed that **no Schemes should be formulated in the "A" Category Firkas and in "B" Category Firkas, all the Schemes should be formulated through State Ground and Surface Water Resources Data Centre by issuing No Objection Certificate for Ground Water Clearance.**

The term "Schemes" excludes Energisation of Agricultural pump sets by the Tamil Nadu Electricity Board. The present order may also exclude the Ground Water drawal for a). Domestic purpose by individual household, b). Domestic Infrastructure project (Housing), c).Government's Drinking Water Supply Schemes and d). non water based industries, (i.e.- the industries which do not require and use water, either as raw material or for other processing). However, the domestic use of water by this non water based industries will be permitted by the Chief Engineer / State Ground and Surface Water Resources Data Centre based on hydro geological conditions. (i.e. NOC from Chief Engineer, State Ground and Surface Water Resources Data Centre, Water Resources Department, Chennai). The list of non water based industries will be issued by the Industries Department of Government of Tamil Nadu separately.

Appropriate rain water harvesting and Artificial recharge schemes should be carried out in the categories viz , Over exploited , Critical , Semi Critical and

Safe blocks of Tamil Nadu. While carrying out the above schemes, priority should be given to marginal quality and bad quality areas so as to avoid further deterioration.

All the schemes and proposals based on Ground Water will have to adhere to the Government orders and conditions. The Chief Engineer, State Ground and Surface Water Resources Data Centre had received the Government approval on Groundwater Assessment as on March 2011.

Regarding granting permission/ License for transportation of ground water for water suppliers/ private water tankers for selling the water on commercial basis, the State Ground and Surface Water Resources Data Centre, Public Works Department is not issuing any No Objection Certificate.

The Chief Engineer, SG&SWRDC have empowered to issue the NOC for drawal of Ground Water is up to 1 Million Gallons per day. Beyond this, the firms should get an approval in Water Utilisation Committee for drawal of both Surface and Ground Water resources in Tamil Nadu.

(ii) <u>Suggestions for improvement of groundwater governance</u>.

Groundwater is recognized as a common pool resource. The use of groundwater by anybody should in no way cause adverse impacts on realization of other person's fundamental right to safe water for life. Access to groundwater without any discrimination, equitable distribution, and sustainable use considering the needs of future generations are considered. Right to water for life is the first priority and then to agriculture, and eco system needs. The precautionary principle and the polluter pay principle only to conserve and recharge groundwater.

The responsibility of the State for ensuring every person's right to safe water even when water service is delegated to a private agency. Groundwater is not amenable to ownership by the State, communities or persons and the State is the public trustee of groundwater. It also deals elaborately on groundwater protection and groundwater security plans.

The Groundwater Act should incorporate legal pronouncement on groundwater such as the public, trust doctrine and recognition of the right to groundwater. It addresses the deficiencies in the present legal frame

work in dealing with over exploitation and includes the improvements to the control mechanism to ensure the qualitative and quantitative sustainability of groundwater resources. It proposes to strengthen the regulating powers of Panchayat and Municipal bodies related to Ground water in line with articles 243G and 243W of the constitution.

The Pricing of Ground Water for irrigation, Industrial and domestic purposes and collecting fees by water users association should be left to the State decision.

(iii) <u>Institutions governing/managing/monitoring the resources and Institutional structure, gaps if any</u> :

While framing the Groundwater Act, the recommendation for the constitution of (1) Gram Panchayat Groundwater Sub-Committee, (2) Block Panchayat Groundwater Management, (3) Ward Groundwater Committee, (4) Municipal Water Management Committee, (5) District Ground Water Council and (6) State Ground Water Advisory Council to control and manage Ground water should be considered.

- The constitution of aforesaid committees is completely based on administrative boundaries such as village, block, ward, municipality, district etc. But, with respect to water resources control and management issues and conflicts, the boundary should be based on river basins to have efficient monitoring and management of water resources. The Government of India, in all issues related to water resources considered only the basin boundary concept. Hence, the institutional frame work has to be revised so as to have the jurisdiction of the committees with respect to basin / watershed concept. Further, Government of India, MoWR, RD &GR advocates time and again integrated water resources management. The above institutional frame work separately for groundwater is not in line with that.
- Further, it has also provided for many committees, viz., Gram Panchayat Groundwater Sub-Committee, Village Water and Sanitation Committee, Ward Committee, Municipal Committee, Block level Committee, District level Committee and State level Committee. For managing surface water resource water users association already exists. Too many committees at village / ward level would

jeopardize the very purpose of managing the Groundwater resources efficiently and may invite lot of conflicts.

(iv) <u>Areas of people/private participation if any</u>:

The participation of people or private parties in the groundwater management is not suggestible, acceptable one and more chances of making litigations in the society and has unnecessary law and order problems may arise.

7. Tools and Methods

(i) Water Level and quality measurements through wells, piezometers, DWLR with telemetry, ground water elevation.

In general, water levels in the observation wells and piezometers can be taken manually by measuring tape. This is the simple, cost effective, good accuracy and less maintenance method. Water Levels are observed above the Measuring point.

Monitoring water level in DWLR with telemetry is costly, high maintenance, good accuracy, get the data immediately on desktop, easy to analysis purpose.

The water quality generally is analysed in the Chemical Lab only by collecting water samples in Pre Monsoon and post Monsoon period in the field. Sometimes, instant kits are used for analyzing the TDS and Ph level in the water.

(ii) Metering water supply to confirm contribution from groundwater.

Metering the water supply is essential one to monitor the overall usage of groundwater by different sectors. Flow meter must be fixed in every extraction structure and it has to be monitored periodically by Government officials.

8. Performance Indicators:

(i) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/ standards currently.

The Ground Water resources of State periodically estimated in co-ordination with the Central Ground Water Board, Government of India, SECR, Chennai, based on the Norms evolved by Ground Water Resources Estimation Committee, 1997 (GEC 97).

The ground water potential assessment can be assessed based on the bench marks such as Average Rainfall, Total recharged Area, Monthly Water Level Data, Total no of wells in the area, Irrigation methods adopted, Cropping pattern details,

Geological conditions prevailing in that area, Specific yield, Seepage factor, Constructed Artificial recharge structures, etc and various calculations methods, etc, have to be considered.

Status of various Performance Indicators

(ii) Percentage of over exploited ,critical, Semi critical , Safe and Saline/Poor quality Firkas/area units

- Trend of over exploited and critical Firkas to total Firkas as per pervious assessment. (2009 Assessment Vs 2011 Assessment)

  The Ground Water Potential Assessment as on March 2009, Out of 20 blocks in Selam District, 13 blocks are categorized as Over Exploited and Critical blocks and remaining 7 blocks are categorized as Semi Critical and Safe blocks.

  The next Ground Water Resources Assessment of the State was done as on March 2011 and taking Firka as an assessment unit. In Salem District, totally 42 Firkas, 29 Firkas are categorized as Over Exploited and remaining 13 Firkas are categorized as Semi Critical and Safe blocks.

  Instead of taking Block as an assessment, Firka can be taken as assessment unit is to concentrate the assessment in micro level. For Eg, a block contains more than three to four Firkas. In this block, two Firkas may have good groundwater potential than other two Firkas but it may to categorize as Over Exploited. To avoid this, assessment done on the basis of Firkas for the benefit of farmers to the implementation of schemes related to Irrigation.

  The percentage of over exploited and critical Firkas has been increased by changing the concept from Block to Firka assessment. The total percentage of over exploited and critical Blocks for 2009 Assessment is 65%, but, the total percentage of over exploited and critical Firkas as on March 2011 Assessment is 69.04%, in the Salem District.

- Trend of over exploited and critical Firkas to total Firkas as per latest assessment

  The percentage of over exploited and critical Firkas has been decreased in 2013 latest assessment when compared to 2011 assessment. In 2011 assessment, out of 42 Firkas, the total percentage of over exploited and

critical Firkas is 69.04%, but, In 2013 assessment, out of 42 Firkas, it has been come down marginally to 69.04%, in the Salem District.

- Existing state of groundwater resources as compared to previous assessment (2013 Vs 2011 assessment).

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2013, Out of 42 Firkas in the State, 27 Firkas are categorized as “Over Exploited Firkas”, 2 Firkas are categorized as “Critical Firkas”, 7 Firkas are categorized as “Semi Critical Firkas”, 6 Firkas are categorized as “Safe Firkas”.

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2011, Out of 42 Firkas in the State, 29 Firkas are categorized as “Over Exploited Firkas”, 6 Firkas are categorized as “Semi Critical Firkas”, 7 Firkas are categorized as “Safe Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 29 to 27 Firkas, the “Critical Firkas” increased from Nil to 2 Firkas, the “Semi Critical Firkas” increased marginally from 6 to 7 Firkas, the “Safe Firkas” decreased from 7 to 6 Firkas and the “Saline Firkas” remains Nil Firkas. The alteration of Firkas are due to the construction of Artificial Recharge structures such as Check Dams, Recharge Wells, Recharge shafts, percolation ponds; etc was constructed in the “Over Exploited Firkas” by various departments.

S.No	Categorisation	No of Firkas	
		2011	2013
1	Over Exploited	29	27
2	Critical	Nil	2
3	Semi Critical	6	7
4	Safe	7	6
5	Saline	Nil	Nil
TOTAL		42	42

(iii) Water Level(Well hydrographs and water level trends – pre and post monsoon such as declining trend/rising trend,etc).

(iv) Comparison of area irrigated from groundwater resources (Current assessment 2013 to previous assessment 2011).

S.No	Description	2011 Assessment	2013 Assessment
1	Area Irrigated from ground water resources(In hm)	6538.07	6505.06

(v) No. of groundwater abstraction structures (existing no. over the year and trends).

S.No	Description	2011 Assessment	2013 Assessment
1	No of groundwater abstraction structures for Irrigation	1,71,071 Wells	1,70,983 Wells

(vi) Trend in water quality (no of habitations affected with groundwater contamination like As, F, Salinity etc. Change in contamination level over the years.

(vii) Source augmentation (Groundwater)

- Area covered with infrastructure for recharging groundwater:

  The proper artificial recharge structures has to be constructed based on local geological conditions in the areas of existing infrastructure for recharging groundwater according to their extraction needs.

- GW recharge plan to combat adversaries:

  Groundwater recharge plans has to be strictly followed by with of implementing the groundwater laws to combat adversaries.

9. Reforms undertaken/being undertaken/proposed if any.

10. Road Map of activities/tasks proposed for better governance with timelines and agencies responsible for each task/activity.