CHAPTER 4.1.9 GROUND WATER RESOURCES

TRICHY DISTRICT

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GROUND WATER REPORT OF TRICHY 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 Geographical area of Tiruchirappalli district is 4, 40,383 hectares (4403.83 sq.km) accounting for 3.38 percent of geographical area of Tamil Nadu State. The district has well laid out roads and railway lines connecting all major towns within and outside the state.

For administrative purpose, this district has been bifurcated into 8 Taluks, 14 Blocks and 41 Firkas. The district capital is Tiruchirappalli, which is a major city with corporation status for the past 5 years.

Trichy District is totally bifurcated into 41 Firkas.

1. Hydrogelogy

(i) Major Geological formations:

Geology

Geologically the entire district can be broadly classified into hard rock and sedimentary formations.

Hard Rock Formation

In the total geographical area of 4403.83 sq.km in Tiruchirapalli district, nearly 90 percent is occupied by hard rocks of Archaen age. They are mainly granitic gneiss and Charnockite, Which are intruded by pegmatite veins.

Almost 90 percent of the district i.e. Tiruchi, Samayaouram, Manapparai, Musiri, Thottiyam, Thuraiyur and Mannachanallur and part of Lalgudi taluks are covered by hard rocks of granite, gneisses and charnockite.

Whereas part of Lalgudi ataluk is covered by sedimentary formation such as Gondwana, Cretaceous and Quaternary formations.

In Lalgudi Taluk thin fringes of Gondwana formation which is the ancient sedimentary formation found around Thermanipalayam Village. The cretaceous formations are the lowest beds which are named after the villages of Uttathur which lies on the western charnockites for the major part and on gneiss and granite at northern and southern ends. Near its junction with the cretaceous rocks, the charnockite is heavily weathered with tufaceous lime stone (Kankary matter). However the junction between the Gondwana and the cretaceous rocks does not show any disconformity but a thin ferruginous bed may be seen intervening between the two. The Quaternary formation stretches mainly along the river courses of Cauvery and Coleroon. They are composed mainly made up of fluvial deposits which are medium to coarse grained sediments and finer flood plain deposits. The alluvium overlies the Archaen formation which is mainly occurring in tracts of Musiri, Mannachanallur and Lalgudi taluks of this district.

OOCURENCE OF GROUNDWATER

Hard rock formation

Gneissic type

Groundwater occurs under water table or phreatic conditions in weathered, jointed and fractured formations. The pore space developed in the weathered mantle acts as shallow granular aquifiers and forms the potential water bearing and yielding zones.

Water table is very shallow in river, canal and tank irrigated regions whereas it is somewhat deeper in other regions.

Description of land forms and groundwater occurrence

Geomorphic unit	Characteristics	Hydrology	Groundwater Potential
Alluvial Plain (ALP)	It is gentle plain adjacent to river and sea.	High infiltration, recharge mainly from river, rainfall and other Hyrdrogeolgical features	Very Good
Valley Fill (VF)	It forms low lying valleys and intermontane valleys	Highly permeable zones good infiltration	Good to very good
Burried Pediment (BP)	It is a very low relief area with good drainage network	Infiltration is good	Good
Shallow Pediment (SP)	Intermediate zone between pediment and deep pediment weathered thickness is apprecaible	Moderate Infiltration, Recharge is through hydrogeological feautures	Moderate
Pediment (P)	It forms outcrops with or without soil cover	Run off zone	Poor
Structural Hill (SH)	Composed of composite ridges and valley traversed by structural features	Run off zone. Little infiltration along secondary features	Poor

Charnockite type

Groundwater occurs under water table conditions but the intensity of weathering, jointed and fractured formations and its development is much less when compared to gneissic formations. As a result, these are not termed, as potential water bearing zones excepting in a region where the intensity of weathering coupled with development of joints and fractures is greater. Sometimes the occurrence of Kankar material over charnockite hampers the permeability and well yielding capacity.

Sedimentary formation

The prospects and development of groundwater in large scale in these formations are ruled out as it is situated adjacent to the Archaeans. Only limited quantity of groundwater can be extracted from these formations

The cretaceous formations are deposited under marine condtions. Only a very limited quantity of water can be extracted form these formations through dugwell and borewells.

In the river alluvium, groundwater occurs under water table condition. The alluvial formations are noticed on either side of the Cauvery and Coleroon river. They consist of mainly sand, gravels, clays and sandy clay. The maximum thickness of alluvium is 30.0 m and the average thickness of the aquifer is approximately 15.0 m. These formations are porous and permeable which are good water bearing zones. There is ample scope to develop groundwater on a large scale

Drilling of Boreholes

The occurrence and movement of groundwater in hard rock formations are restricted to open system of fractures like fissured and joints in unweathered formations and also in the porous zones of weathered formations.

Generally in hard rock regions the occurrence of weathered thickness is discontinous both is space and depth. Hence, the recharge oof groundwater is influenced depending upon the intensity of weathering. The sub surface hydrogeological conditions can be ascertained by drilling exploratory boreholes and conducting pump tests.

For investigation purpose, the State Ground and Surface Water Resources Date Centre, has drilled more than 187 boreholes spread over the entire district, out of which 182 boreholes are drilled in hard rock formations and the remaing 5 tubewells are constructed in sedimentary formations. The enclosed Map No.6 indicated that in Thuraiyur and Musiri taluks there is considerable thickness of weathering zone ranging from 20.0 to 30.0 meters below ground level beacuase these areas are highly disturbed due to fault effect.

The sedimentary tract of Cauvery alluvium is restricted on either side of the river Cauvery and Coleroon and the thickness of alluvium is estimated to be around 15.0 to 30.0 meters.

Aquifer Paramaters

More or less 90 percent of Tiruchirappalli district is covered by crystalline formation of Archaean. The thickness of aquifer in hard rock formation is highly erratic and varies between 15.0 m and 35.0 m bekow ground level. The inergranular porosity is essentially depend upon the intensity and degree of weathering and fracture development in the bedrock. Deep weathering has developed in gneissic formations and moderate weathering in charnockite formation. The alluvium formation stretches mainly along the river course of Cauvery and Coloeroon.

Range of Aquifer paramters

Formations	Specific Yield %	Transmissivity m^2/d	Permeability m/d	Yield of wells in lps
Alluvium	7.2	49-216	2-5	10-20
Cretaceous	0.3-2.56	33-782	10-66	1.1-3.5
Gondwana	0.3	33-43	10-20	1-2
Weathered Crystalline	0.8-2.5	32-80	5-10	1-2

Drilling of Exploratory Bore holes

Based on the filed studies carried out and interpretations made from aerial photographs and satellite imageries, favourable locations are selected for exploratory drilling. By drilling, subsurface hydrogeological characteristics are determined to evaluate the groundwater potential of the area. From inception, this department has drilled 187 bore wells in this district.

(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 Trichy 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) <u>Notes on existing water level scenario</u>:

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 Trichy District,142 observation wells and 88 piezometers,totally 230 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 Trichy 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) <u>Long term trend of water level</u>:

The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Trichy District. The analysis reveals that the water level has gone down in the north, west and central parts of the Trichy 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 Trichy District.

(iii) Existing network of Monitoring wells:

In Trichy District, the existing network of monitoring wells is 230 wells, 142 wells are observation wells and 88 wells are piezometers. These wells are observed for every month water level.

Thiruchirapplli District: Observation Wells - Location and Co-ordinates

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
71315	Thiruchirappalli	Lalgudi	Pullambadi	Teranippalaiyam	11°05'15"	78°53'00"
73004	Thiruchirappalli	Thuraiyur	Uppliyapuram	Murungapatti	11°21'50"	78°39'15"
73005	Thiruchirappalli	Thuraiyur	Uppliyapuram	Kanjirimalai	11°20'50"	78°32'00"
73014	Thiruchirappalli	Turaiyur	Uppliyapuram	Kallatukombai	11°16'20"	78°26'45"
73015	Thiruchirappalli	Turaiyur	Uppliyapuram	Venkatachalapuram	11°15'15"	78°31'40"
73015A	Thiruchirappalli	Turaiyur	Uppliyapuram	Uppliyapuram	11°15'39"	78°30'54"
73025	Thiruchirappalli	Turaiyur	Uppliyapuram	Angiyam	11°10'55"	78°26'40"
73025A	Thiruchirappalli	Turaiyur	Uppliyapuram	Angiyam	11°10'55"	78°26'40"
73026	Thiruchirappalli	Turaiyur	Uppliyapuram	Sangampatti	11°10'35"	78°33'40"
73027	Thiruchirappalli	Thuraiyur	Thuraiyur	Kirambur	11°10'00"	78°37'30"
73027A	Thiruchirappalli	Turaiyur	Thuraiyur	Kirambur	11°10'00"	78°37'30"
73038	Thiruchirappalli	Musiri	Musiri	Anjalam-melur	11°05'00"	78°22'40"
73039	Thiruchirappalli	Musiri	Tattayyangarpettai	Devanur	11°05'50"	78°26'30"
73039A	Thiruchirappalli	Musiri	Tattayyangarpettai	Devanur(puthur)	11°06'40"	78°25'45"
73040	Thiruchirappalli	Turaiyur	Thuraiyur	Kannanurpalaiyam	11°05'00"	78°32'10"
73041	Thiruchirappalli	Turaiyur	Thuraiyur	Nallavannipatti	11°05'00"	78°35'50"
73041A	Thiruchirappalli	Thuraiyur	Thuraiyur	Pagalavadi	11°05'00"	78°35'50"
73043	Thiruchirappalli	Mannachchanallur	Mannachchanallur	Maniyankurichchi	11°04'30"	78°47'30"

73045B	Thiruchirappalli	Lalgudi	Pullambadi	M. Kannanur	11°04'30"	78°58'15"
73055	Thiruchirappalli	Thottiyam	Thottiyam	Unniyur	11°00'00"	78°10'40"
73056	Thiruchirappalli	Thottiyam	Thottiyam	Vendanpatti	10°59'52"	78°16'40"
73057	Thiruchirappalli	Thottiyam	Thottiyam	Arangur (puthur)	11°00'00"	78°21'25"
73058	Thiruchirappalli	Musiri	Thathayangarpettai	Sittilarai	11°00'00"	78°25'35"
73058A	Thiruchirappalli	Musiri	Musiri	Tadampatti	10°59'40"	78°25'30"
73058B	Thiruchirappalli	Musiri	Thathayangarpettai	Tadampatti	10°59'40"	78°25'30"
73059	Thiruchirappalli	Musiri	Musiri	Tandalaiputhur	11°00'00"	78°31'45"
73060	Thiruchirappalli	Turaiyur	Thuraiyur	Kurikkarankulam	10°59'25"	78°37'35"
73061	Thiruchirappalli	Mannachchanallur	Mannachchanallur	Talutalaippatti	10°59'30"	78°43'45"
73062	Thiruchirappalli	Lalgudi	Pullambadi	Reddimangudi	10°59'45"	78°49'30"
73063	Thiruchirappalli	Lalgudi	Pullambadi	Kanakkiliyanallur	10°59'45"	78°53'00"
73064	Thiruchirappalli	Lalgudi	Pullambadi	Kilarasur	11°00'30"	78°59'00"
73075	Thiruchirappalli	Musiri	Musiri	Kottur	10°55'15"	78°32'00"
73075A	Thiruchirappalli	Musiri	Musiri	Kalaravali{kottur}	10°55'10"	78°32'40"
73076	Thiruchirappalli	Mannachchanallur	Mannachchanallur	Neyveli	10°54'15"	78°37'30"
73077	Thiruchirappalli	Mannachchanallur	Mannachchanallur	Kalpalaiyam	10°55'00"	78°42'45"
73078	Thiruchirappalli	Lalgudi	Lalgudi	Kilmarimangalam	10°54'45"	78°48'15"
73079	Thiruchirappalli	Lalgudi	Lalgudi	Sembarai(tinniyam)	10°53'45"	78°53'30"
73079A	Thiruchirappalli	Lalgudi	Lalgudi	Sembarai(tinniyam)	10°53'45"	78°53'30"
73080	Thiruchirappalli	Lalgudi	Pullambadi	Viragalur	10°54'45"	78°59'00"

73090	Thiruchirappalli	Srirangam	Manikandam	Kumaravayalur	10°49'50"	78°37'20"
73091	Thiruchirappalli	Tiruchirappalli	Thiruverumbur	Devadhanam	10°49'55"	78°42'10"
73091A	Thiruchirappalli	Tiruchchirappalli	Tiruverumbur	Devadhanam	10°49'55"	78°42'10"
73092	Thiruchirappalli	Tiruchchirappalli	Tiruverumbur	Melaarasangudi	10°49'20"	78°48'40"
73092A	Thiruchirappalli	Trichy	Tiruverumbur	Melaarasangudi	10°49'20"	78°48'40"
73100	Thiruchirappalli	Tiruchirappalli	Manikandam	Esanapatti	10°44'34"	78°37'40"
73101	Thiruchirappalli	Tiruchchirappalli	Tiruverumbur	Sembattu	10°49'30"	78°42'25"
73101A	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Sembattu	10°49'30"	78°42'25"
73102	Thiruchirappalli	Tiruchchirappalli	Tiruverumbur	Tuvagudi	10°44'50"	78°49'15"
73107	Thiruchirappalli	Manapparai	Vaiyampatti	Ponnakkavundanpatti	10°39'15"	78°17'00"
73107A	Thiruchirappalli	Manapparai	Vaiyampatti	Modaiyagoundanur	10°39'15"	78°17'00"
73108	Thiruchirappalli	Manapparai	Vaiyampatti	Nallampillaipudur	10°39'05"	78°22'00"
73108A	Thiruchirappalli	Manapparai	Manachanallur	Ampalagaranpati	10°39'05"	78°02'00"
73109	Thiruchirappalli	Manapparai	Manapparai	Chokkampatti	10°39'30"	78°27'20"
73109A	Thiruchirappalli	Thiruchirapalli		Muthupudaiyanpatti	10°39'30"	78°27'20"
73116	Thiruchirappalli	Manapparai	Vaiyampatti	Sekkanam	10°33'40"	78°17'35"
73117	Thiruchirappalli	Manapparai	Manapparai	Mullippadi	10°35'06"	78°21'52"
73117A	Thiruchirappalli	Manapparai	Manapparai	Avarampatti	10°35'06"	78°21'52"
73118	Thiruchirappalli	Manapparai	Manapparai	Periamanpatti	10°24'00"	78°27'00"
73118A	Thiruchirappalli	Manapparai	Manapparai	Ponnusangampatti	10°24'00"	78°27'00"
73126	Thiruchirappalli	Manapparai	Vaiyampatti	Ilamanam	10°29'20"	78°16'20"

73126A	Thiruchirappalli	Manachanallur	Vaiyampatti	Chithapatti	10°29'20"	78°16'20"
73127	Thiruchirappalli	Manapparai	Manapparai	Alagakkavundanpatti	10°28'28"	78°20'42"
73127A	Thiruchirappalli	Manapparai	Manachanallur	Sevakattur	10°28'28"	78°20'42"
73128	Thiruchirappalli	Manapparai	Marungapuri	Vellayakkonpatti	10°29'10"	78°27'08"
73128A	Thiruchirappalli	Manapparai	Marungapuri	Vellayakkonpatti	10°29'10"	78°27'08"
73129	Thiruchirappalli	Manapparai	Marungapuri	Vannarapatti	10°28'40"	78°32'32"
73137	Thiruchirappalli	Manapparai	Marungapuri	Manjampatti	10°23'20"	78°21'40"
73138 A	Thiruchirappalli	Manapparai	Marungapuri	Kottaikkariyampatti	10°24'45"	78°26'10"
73138A	Thiruchirappalli	Manapparai	Marungapuri	Kottaikkariyampatti	10°24'45"	78°26'10"
73147	Thiruchirappalli	Manapparai	Marungapuri	Tettur	10°19'10"	78°21'50"
73212	Thiruchirappalli	Lalgudi	Lalgudi	Marudur	10°54'35"	78°46'05"
73212A	Thiruchirappalli	Lalgudi	Lalgudi	Marudur	10°54'35"	78°46'05"
73214	Thiruchirappalli	Thuraiyur	Thuraiyur	Topsengattupatti	11°18'35"	78°35'15"
73261	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapalli Municipal	10°47'10"	78°40'20"
73263	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapalli Municipal	10°47'20"	78°41'20"
73264	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapalli	10°50'10"	78°41'20"
73265	Thiruchirappalli	Thiruchirapalli	Thiruverumber	Thiruchirapalli Municipa	10°48'00"	78°42'20"
73266	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapalli Municipal	10°48'50"	78°41'45"

73267	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapalli Municipal	10°47'22"	78°42'56"
73268	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Thiruchirapallimunicipali	10°46'40"	78°41'45"
73268A	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Kajamalai	10°46'40"	78°41'45"
73269	Thiruchirappalli	Manaparai	Manaparai	Manaparai Municipality	10°35'20"	78°26'00"
73270	Thiruchirappalli	Manaparai	Manapparai	Manapparai Municipality	10°35'20"	78°26'00"
73271	Thiruchirappalli	Karur	Karur	Karur Municipality	11°05'00"	78°08'00"
73272	Thiruchirappalli	Karur	Karur	Thanthoni Panchatyat	11°05'00"	78°08'00"
73274	Thiruchirappalli	Thuraiyur	Thuraiyur	Thuraiyur Municipality	11°07'00"	78°38'00"
73277 A	Thiruchirappalli	Srirangam	Anthanallur	Srirangam	10°47'15"	78°40'20"
73277A	Thiruchirappalli	Trichy	Trichy	Colroom(srirangam)	10°47'30"	78°40'25"
73278	Thiruchirappalli	Srirangam	Manikandam	Srirangam	10°47'15"	78°40'20"
73280	Thiruchirappalli	Thuraiyur	Thuraiyur	Thuraiyur	11°08'50"	78°37'00"
73282	Thiruchirappalli	Thuraiyur	Thuraiyur	Muthayampalayam	11°04'03"	78°41'12"
73283	Thiruchirappalli	Manachanallur	Manachanallur	Vazhaiyur	11°04'11"	78°46'41"
73284	Thiruchirappalli	Manachanallur	Manachanallur	Thiruvallarai	10°57'24"	78°40'03"
73285	Thiruchirappalli	Manachanallur	Manachanallur	Manachanallur	10°54'32"	78°41'50"

73286	Thiruchirappalli	Thottiyam	Thottiyam	Murungai	11°02'54"	78°13'12"
73287	Thiruchirappalli	Thuraiyur	Thuraiyur	Sorathur	11°08'38"	78°36'39"
73288	Thiruchirappalli	Musiri	Musiri	Thiruthalaiyur	11°02'15"	78°32'43"
73289	Thiruchirappalli	Thuraiyur	Thuraiyur	Nagalapuram	11°08'51"	78°40'15"
73290	Thiruchirappalli	Musiri	Musiri	Puthanampatti	11°04'03"	78°41'12"
73291	Thiruchirappalli	Thuraiyur	Thuraiyur	Okkarai	11°12'56"	78°32'23"
73292	Thiruchirappalli	Musiri	Musiri	Perur	11°00'46"	78°31'19"
73293	Thiruchirappalli	Musiri	Musiri	Kallikudi	11°06'19"	78°30'52"
73294	Thiruchirappalli	Thuraiyur	Thuraiyur	Sengattupatti	11°12'30"	78°39'03"
73295	Thiruchirappalli	Musiri	Musiri	Soorampatti	11°02'49"	78°24'55"
73296	Thiruchirappalli	Musiri	Musiri	Paithamparai	11°04'16"	78°27'40"
73297	Thiruchirappalli	Thuraiyur	Thuraiyur	Pachaperumalpatti	11°12'46"	78°27'25"
73298	Thiruchirappalli	Manachanallur	Manachanallur	Valaiyur	11°01'12"	78°43'00"
73299	Thiruchirappalli	Musiri	Musiri	Poolancheri	11°04'26"	78°23'40"
73300	Thiruchirappalli	Musiri	Musiri	Nallendirapuram	11°03'10"	78°42'49"
73301	Thiruchirappalli	Musiri	Musiri	Vengaimandalam	10°59'10"	78°35'53"
73302	Thiruchirappalli	Musiri	Musiri	Vadakkuchithambur	10°56'23"	78°34'33"
73303	Thiruchirappalli	Thottiyam	Thottiyam	Elurpatti	11°01'41"	78°17'02"
73304	Thiruchirappalli	Thuraiyur	Thuraiyur	Sellipalayam	11°12'28"	78°36'45"
73305	Thiruchirappalli	Thuraiyur	Thuraiyur	Sikkathambur	11°11'40"	78°33'39"
73306	Thiruchirappalli	Srirangam	Andanallur	Marudhandankuruchi	10°50'17"	78°38'59"
73307	Thiruchirappalli	Srirangam	Andanallur	Koppu	10°50'36"	78°34'58"

73308	Thiruchirappalli	Srirangam	Manikandam	Uyyakondanthirumalai	10°48'54"	78°39'38"
73325	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Vengur	10°49'01"	78°45'55"
73326	Thiruchirappalli	Lalgudi	Pullambadi	Pullambadi	10°56'44"	78°54'43"
73327	Thiruchirappalli	Thottiyam	Thottiyam	Mangalam	11°03'00"	78°28'49"
73328	Thiruchirappalli	Manaparai	Vaiyampati	Vaiyampatti	10°33'04"	78°18'07"
73329	Thiruchirappalli	Manaparai	Vaiyampati	Palampatti	10°32'21"	78°15'35"
73330	Thiruchirappalli	Thuraiyur	Thuraiyur	Meyampatti	11°09'09"	78°32'04"
73331	Thiruchirappalli	Manaparai	Manapparai	Kottaipattiputhur	10°39'54"	78°24'47"
73332	Thiruchirappalli	Thottiyam	Thottiyam	Kattuputhur	10°59'20"	78°13'15"
73333	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Bathalapettai	10°48'18"	78°51'01"
73334	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Valavanthankottai	10°45'40"	78°50'26"
73359	Thiruchirappalli	Thuraiyur	Thuraiyur	Veeramachampatti	11°07'16"	78°32'26"
MMWSTRY1	Thiruchirappalli	Manapparai	Manapparai	Chinnagoundanpatti	10°25'25"	78°27'35"
MMWSTRY10	Thiruchirappalli	Manachanallur	Manachanallur	Kariyamanigam	10°53'56"	78°35'26"
MMWSTRY11	Thiruchirappalli	Thiruchirapalli	Thathayangarpettai	Mudigandam	10°42'15"	78°39'45"
MMWSTRY12	Thiruchirappalli	Musiri	Musiri	Thumpalam	11°01'22"	78°25'48"
MMWSTRY13	Thiruchirappalli	Musiri	Musiri	Velampatti	11°09'40"	78°22'30"
MMWSTRY2	Thiruchirappalli	Manapparai	Manapparai	Edaiyapatti	10°25'25"	78°27'35"
MMWSTRY3	Thiruchirappalli	Manapparai	Manapparai	Annachatiram	10°25'25"	78°27'35"
MMWSTRY4	Thiruchirappalli	Manapparai	Manapparai	Sevanthampatti	10°15'50"	78°23'52"
MMWSTRY5	Thiruchirappalli	Manapparai	Manappari	Rediyapatti	10°32'20"	78°28'50"

MMWS TRY6	Thiruchirappalli	Lalgudi	Lalgudi	Neigulam	11°03'12"	78°51'22"
MMWS TRY7	Thiruchirappalli	Lalgudi	Lalgudi	Viragalur	10°54'46"	78°57'52"
MMWS TRY8	Thiruchirappalli	Lalgudi	Lalgudi	Vellanur	10°54'55"	78°52'20"
MMWS TRY9	Thiruchirappalli	Lalgudi	Lalgudi	Aangarai	10°52'40"	78°42'20"
U43008	Thiruchirappalli	Tiruchirappalli	Thiruverumbur	Tiruverumbur	10°47'05"	78°46'35"
U43008A	Thiruchirappalli	Tiruchchirappalli	Tiruverumbur	Tiruverumbur	10°47'05"	78°46'35"

Trichy District - Piezometers - Location and Co-ordinates

Well no	District	Tashil/Taluk	Block/Mandal	Village	Latitude	Longitude
11001	Thiruchirappalli	Thiruverumbur	Thiruverumbur	Sembattu	10.827778	78.716667
11001 A	Thiruchirappalli	Thiruverumbur	Thiruverumbur	Sembattu	10.827778	78.716667
11002	Thiruchirappalli	Manachanallur	Manachanallur	Neyveli	10.900000	78.625000
11003 D	Thiruchirappalli	Musiri	Musiri	Thandalaiputur	10.997222	78.533333
11004 D	Thiruchirappalli	Thuraiyur	Thuraiyur	Nallavannipatti	11.084722	78.616667
11005 D	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Uppiliyapuram	11.261111	78.511111
11006	Thiruchirappalli	Thuraiyur	Thuraiyur	Sangampatti	11.177778	78.370833
11007 D	Thiruchirappalli	Manapparai	Vaiyampatti	Aniyapur	10.670833	78.343056
11008 D	Thiruchirappalli	Manapparai	Vaiyampatti	Nadupatti	10.530556	78.238889
11009 D	Thiruchirappalli	Manapparai	Marungapuri	Palayapalayam	10.355556	78.348611
11010 D	Thiruchirappalli	Manapparai	Marungapuri	Pudupatti	10.466667	78.547222
11011 D	Thiruchirappalli	Manapparai	Manapparai	Karuppur	10.490278	78.325000
11012 D	Thiruchirappalli	Manapparai	Manapparai	Sithanatham	10.683333	78.505556
11013 D	Thiruchirappalli	Srirangam	Manikandam	K.kallikudi	10.751389	78.630556
11014 D	Thiruchirappalli	Srirangam	Manikandam	Mudikandam	10.702778	78.666667
11015	Thiruchirappalli	Srirangam	Andanallur	Kulumani	10.843056	78.594444
11015 A	Thiruchirappalli	Srirangam	Andanallur	Kulumani	10.843056	78.594444
11016	Thiruchirappalli	Thiruchirappalli	Thiruverumbur	Suriyur	10.669444	78.754167
11016 A	Thiruchirappalli	Thiruchirapalli	Thiruverumbur	Suriyur	10.669444	78.754167
11017 D	Thiruchirappalli	Musiri	Musiri	Pulivalam	11.013889	78.637500
11018 A	Thiruchirappalli	Musiri	Musiri	Kottathur	11.109167	78.670556
11018 D	Thiruchirappalli	Musiri	Musiri	Kottathur	11.102778	78.673611
11019 D	Thiruchirappalli	Thottiyam	Thottiyam	Alagarai	10.981944	78.390278
11020	Thiruchirappalli	Thottiyam	Thottiyam	Kidaram	11.038889	78.186111
11021	Thiruchirappalli	Thottiyam	Thottiyam	Kattupputtur	10.988889	78.220833
11021 A	Thiruchirappalli	Thottiyam	Thottiyam	Kattuputhur	10.993611	78.215278
11022 D	Thiruchirappalli	Musiri	Thathayangarpettai	Sittalarai	11.002778	78.427778
11023 D	Thiruchirappalli	Musiri	Thathayangarpettai	Mahadevi	11.163889	78.397222

11024 D	Thiruchirappalli	Thuraiyur	Thuraiyur	Sengattuppatti	11.204167	78.647222
11025	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Pachchaiperumalpatti	11.208333	78.461111
11026 D	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Mangupatty	11.388889	78.504167
11027 D	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Nagayanallur	11.329167	78.481944
11028	Thiruchirappalli	Manachanallur	Manachanallur	Valaiyur	11.018056	78.719444
11029 D	Thiruchirappalli	Manachanallur	Manachanallur	Pirahambi	11.097222	78.755556
11030	Thiruchirappalli	Manachanallur	Manachanallur	Konalai	10.983333	78.766667
11031D	Thiruchirappalli	Lalgudi	Lalgudi	Tachchankurichchi	10.952778	78.822222
11032	Thiruchirappalli	Manapparai	Manapparai	Poygaippatti	10.579167	78.430556
11033 D	Thiruchirappalli	Thuraiyur	Thuraiyur	Perumalpalaiyam	11.212500	78.586111
11034 D	Thiruchirappalli	Manapparai	Marungapuri	Kiranippatti	10.405556	78.508333
11035 D	Thiruchirappalli	Musiri	Thathayangarpettai	Tulaiyanatham	11.045833	78.495833
11036	Thiruchirappalli	Manapparai	Vaiyampatti	Amayapuram	10.459722	78.350000
11037	Thiruchirappalli	Manapparai	Manapparai	Kalpalayathanpatti	10.572222	78.402778
11038	Thiruchirappalli	Manapparai	Manapparai	Ponnasangampatti	10.477778	78.355556
11039	Thiruchirappalli	Musiri	Thathayangarpettai	Surampatti	11.045833	78.412500
11041	Thiruchirappalli	Thuraiyur	Thuraiyur	Thuraiyur	11.145833	78.601389
11041A	Thiruchirappalli	Thuraiyur	Thuraiyur	Thuraiyur	11.145833	78.601389
11042	Thiruchirappalli	Thuraiyur	Thuraiyur	Senappanallur	11.136111	78.543056
11042A	Thiruchirappalli	Thuraiyur	Thuraiyur	Senappanallur	11.136111	78.543056
11043	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Eragudi	11.184722	78.508889
11043A	Thiruchirappalli	Thuraiyur	Uppiliyapuram	Eragudi	11.184722	78.508889
11044	Thiruchirappalli	Thuraiyur	Thuraiyur	Chinnasalempatti	11.090278	78.568056
11044A	Thiruchirappalli	Thuraiyur	Thuraiyur	Chinnasalempatti	11.090278	78.568056
11045	Thiruchirappalli	Musiri	Musiri	Thinnanur	11.048333	78.638056
11045A	Thiruchirappalli	Musiri	Musiri	Thinnanur	11.048333	78.638056
11046	Thiruchirappalli	Musiri	Thathayangarpettai	Sergudi	11.051389	78.416944
11046A	Thiruchirappalli	Musiri	Thathayangarpettai	Sergudi	11.051389	78.416944
11047	Thiruchirappalli	Manapparai	Vaiyampatti	Poolampatti	10.633611	78.310556
11048	Thiruchirappalli	Manapparai	Vaiyampatti	Pannapatti	11.690278	78.317778
11049	Thiruchirappalli	Manapparai	Manapparai	Muthupudaiyanpatti	10.636944	78.4538890
11050	Thiruchirappalli	Manapparai	Manapparai	Vedugapatti	10.581389	78.405000
11051	Thiruchirappalli	Manapparai	Marungapuri	Thirunellipatti	10.495000	78.404167
11059	Thiruchirappalli	Manachanallur	Manachanallur	Rajampalayam	10.935556	78.706944
11060	Thiruchirappalli	Thottiyam	Thottiyam	Kullakudi	11.021111	78.387778
11061	Thiruchirappalli	Thottiyam	Thottiyam	Natham	10.982778	78.259444
11062	Thiruchirappalli	Musiri	Thathayangarpettai	Anjalamelur	10.085278	78.380000
11063	Thiruchirappalli	Musiri	Musiri	Idayapatti	11.022500	78.513889
11064	Thiruchirappalli	Lalgudi	Pullambadi	Neikkulam	11.055833	78.339444
11065	Thiruchirappalli	Lalgudi	Pullambadi	Peruvallapur	11.012222	78.873611
11073	Thiruchirappalli	Manachanallur	Manachanallur	Melur Valmalpalyam	11.010833	78.792222
71313	Thiruchirappalli	Lalgudi	Pullambadi	Puthurpalayam	10.972222	78.958333
71351	Thiruchirappalli	Thiruchirapalli	Manapparai	Suriyur	10.783889	78.699444
71352	Thiruchirappalli	Musiri	Thathayangarpettai	Morupatti	11.161111	78.449722
71353	Thiruchirappalli	Musiri	Musiri	Velampatti	11.163056	78.384444

11052	Thiruchirappalli	Manapparai	Manapparai	Ammachatram	10.423611	78.350278
11053	Thiruchirappalli	Manapparai	Marungapuri	Sevanthanpatti	10.323056	78.385833
11054	Thiruchirappalli	Manapparai	Manapparai	Thuvarankurichi	10.373611	78.391667
11055	Thiruchirappalli	Manapparai	Marungapuri	Piranpatti	10.480000	78.471389
11056	Thiruchirappalli	Srirangam	Manikandam	Nagamangalam	10.704167	78.620000
11057	Thiruchirappalli	Thiruchirappalli	Thiruverumbur	Kumbakudi	10.701389	78.759167
11058	Thiruchirappalli	Manapparai	Manapparai	Sampatti	10.548889	78.429722
11066	Thiruchirappalli	Lalgudi	Pullambadi	Kumulur	10.954444	78.844444
11067	Thiruchirappalli	Srirangam	Andanallur	Uthamachili	10.836389	78.778056
11068	Thiruchirappalli	Lalgudi	Pullambadi	Malvoi	11.049444	78.965278
11069	Thiruchirappalli	Lalgudi	Pullambadi	Vandalakudalur	10.972222	78.889444
11070	Thiruchirappalli	Lalgudi	Manachanallur	Vanthalaikoodalur	10.966111	78.715278
11071	Thiruchirappalli	Lalgudi	Pullambadi	Kallkudi	10.989722	78.959722
11072	Thiruchirappalli	Manachanallur	Manachanallur	Ayyampalayam	10.931389	78.625000

(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

$$\text{Stage of Ground water Development (\%)} = \frac{\text{Existing Gross Ground water Draft for all uses}}{\text{Net annual Ground Water Availability}} \times 100$$

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)

TRICHY 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	TRICHY	70,069.09	49,515.74	7,175.30	56,691.04	81	13

Firka Wise Summary

(in ha.m)

TRICHY 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	AAMUR	1,407.83	842.53	53.38	895.91	64	SAFE
2	ANBIL	3,531.89	878.40	164.87	1,043.27	30	SAFE
3	ANDANALLUR	1,644.40	634.00	347.38	981.38	60	SAFE
4	EALURPATTI	1,391.39	1,013.70	74.00	1,087.70	78	SEMI CRITICAL
5	ERAGUDI	2,005.39	1,803.60	35.27	1,838.87	92	CRITICAL
6	KALLAKKUDI	2,311.93	1,204.50	37.58	1,242.08	54	SAFE
7	KANNANUR	1,739.74	1,974.90	54.91	2,029.81	117	OVER EXPLOITED

TRICHY 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	KARIYAMANICKAM	1,555.76	2,218.70	94.13	2,312.83	149	OVER EXPLOITED
9	KATTUPUTHUR	1,358.10	1,355.90	44.39	1,400.29	103	OVER EXPLOITED
10	KOPPAMPATTI	1,619.56	1,727.70	56.94	1,784.64	110	OVER EXPLOITED
11	KULUMANI	1,308.33	483.00	53.59	536.59	41	SAFE
12	LALGUDI	2,779.55	1,137.60	50.17	1,187.77	43	SAFE
13	MANAPPARAI	1,801.95	1,597.15	74.24	1,671.39	93	CRITICAL
14	MANIKANDAM	2,006.35	491.40	2,553.39	3,044.79	152	OVER EXPLOITED
15	MANNACHANALLUR	1,408.11	1,189.50	56.17	1,245.67	88	SEMI CRITICAL
16	MARUNGAPURI	1,489.63	1,591.60	164.13	1,755.73	118	OVER EXPLOITED
17	MUSIRI	1,167.51	834.30	30.71	865.01	74	SEMI CRITICAL
18	NAVALPATTU	1,904.53	31.50	425.30	456.80	24	SAFE
19	PANNAPPATTI	1,878.86	1,712.55	80.76	1,793.31	95	CRITICAL
20	PERUVALPUR	1,415.60	1,312.43	41.05	1,353.47	96	CRITICAL
21	PULIVALAM	1,495.45	3,631.44	109.10	3,740.54	250	OVER EXPLOITED
22	PULLAMBADI	2,855.82	630.40	160.06	790.46	28	SAFE
23	SENGATTUPPATTI	1,228.23	1,160.40	38.10	1,198.50	98	CRITICAL
24	SIRUGAMBUR	1,687.22	1,191.20	82.84	1,274.04	76	SEMI CRITICAL
25	SOMARASANPETTAI	2,014.16	533.15	419.31	952.46	47	SAFE
26	SRIRANGAM	1,114.29	480.00	25.06	505.06	45	SAFE
27	THATHAIYANGARPETTAI	1,448.38	1,987.50	45.18	2,032.68	140	OVER EXPLOITED

28	THOTTIYAM	1,876.37	1,716.75	64.10	1,780.85	95	CRITICAL
29	THUMBALAM	1,329.49	1,778.90	44.78	1,823.68	137	OVER EXPLOITED
30	THURAIYUR	1,411.43	1,706.20	72.77	1,778.97	126	OVER EXPLOITED
31	THUVARANGURICHI	1,869.43	1,868.80	44.59	1,913.39	102	OVER EXPLOITED
32	TIRUVERUMBUR	2,013.30	53.30	639.81	693.11	34	SAFE
33	TRICHY NORTH	523.21	33.00	119.52	152.52	29	SAFE
34	TRICHY SOUTH	515.79	7.00	132.92	139.92	27	SAFE
35	UPPILIYAPURAM	1,680.33	1,192.50	29.18	1,221.68	73	SEMI CRITICAL
36	V.PERIYAPATTI	2,196.08	1,938.90	69.43	2,008.33	91	CRITICAL
37	VAIYAMPATTI	1,199.68	1,230.60	243.41	1,474.01	123	OVER EXPLOITED
38	VALADI	3,091.17	1,805.50	72.62	1,878.12	61	SAFE
39	VALAIEDUPPU	963.11	1,272.50	39.88	1,312.38	136	OVER EXPLOITED
40	VALANADU	1,958.51	1,213.70	50.39	1,264.09	65	SAFE
41	VENGUR	1,871.22	49.05	179.92	228.97	12	SAFE
TOTAL		**70,069.09**	**49,515.74**	**7,175.30**	**56,691.04**	**81**	

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 Trichy 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 14 blocks in Trichy District, 9 blocks are categorized as Over Exploited and remaining 5 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 Trichy District, totally 40 Firkas, 16 Firkas are categorized as Over Exploited and remaining 24 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 64.28%, but, the total percentage of over exploited and critical Firkas as on March 2011 Assessment is 40%, in the Trichy 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 40 Firkas, the total percentage of over exploited and critical Firkas is 40%, but, In 2013 assessment, out of 41 Firkas, it has been come down marginally to 48.78%, in the Trichy 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 41 Firkas in the District, 13 Firkas are categorized as “Over Exploited Firkas”, 7 Firkas are categorized as “Critical Firkas”, 5 Firkas are categorized as “Semi Critical Firkas”, 16 Firkas are categorized as “Safe Firkas”.

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2011, Out of 40 Firkas in the District, 15 Firkas are categorized as “Over Exploited Firkas”, 1 Firkas are categorized as “Critical Firkas”, 7 Firkas are categorized as “Semi Critical Firkas”, 17 Firkas are categorized as “Safe Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 15 to 13 Firkas, the “Critical Firkas” increased from 1 to 7 Firkas, the “Semi Critical Firkas” decreased from 7 to 5 Firkas, the “Safe Firkas” decreased from 17 to 16 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	15	13
2	Critical	1	7
3	Semi Critical	7	5
4	Safe	17	16
5	Saline	Nil	Nil
TOTAL		40	41

(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.