CHAPTER 4.1.9 GROUND WATER RESOURCES

KANCHEEPURAM DISTRICT

INDEX

GROUND WATER REPORT OF KANCHEEPURAM 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 extent of Kancheepuram District is 4, 43,210 hectares accounting for 3.5 percent of the geographical area of Tamilnadu State. The district has well laidout roads and railway lines connecting all major towns within and outside the State. For administrative purpose the district has been bifurcated into 8 Taluks,13 Blocks and 67 Firkas. Kancheepuram is the district Headquarter with municipality status.

Kancheepuram District is totally bifurcated into 67 Firkas.

1. Hydrogelogy

(i) Major Geological formations:

Kancheepuram District

Geology

The Kancheepuram district is principally made up of hardrocks and sedimentary formations. These are overlained by laterites and alluvium.

The study area is underlain by formations of Quarternary, Tertiary and Mesozoic ages followed by the basement complex of crystalline rocks of Archaean age.

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Stratigraphic succession of Geological Formations

Age	Formation	Lithography
Recent	Alluvium and beach sands	Sand, gravel, silt and clay
Pleistocene	Laterite, soils, talus	Laterites, sandy clay, silt
Pleistocene to upper Miocene	Conjeevaram gravels	Boulders, cobbles pebbles and gravels chiefly of quartzites
Unconformity		
Lower Cretaceous to Jurassic	Sandstones & Shales	Fine to medium grained sand stone with clay intercalations of greenish soft shale
	Boulder bed	Big boulders of granite gneiss with or without Matrix of clay and the sand
Unconformity		
Archaean	Crystalline formations	Mixed gneisses, charnockites, granites and associated basic and ultra basic intrusives

Archaean: Hard rocks

The hard rocks spread over an area of about 60% of this district. These rocks are Granitic gneisses. Ultra basic intrusives of Archaean age and Charnockites. They are mainly comprisisng of biotite and hornblende and are intrude by amphibolite, dykes of dolorite and occasionally by veins of quartz and pegmites.

Charnockite are more prominent in Tambaram, Sriperumbudur and Madurantakam taluks. Gneissic rocks occur mainly in Thirukkazhukundram and in parts of Kancheepuram taluks. The dolerites, as dykes are observed both in gneisses and in

charnockites. The width ranges from 20m to 40m in the strike direction NE-SW. The dykes are prodominenty observed in Thiruporur and East of Chengalpattu.

Godwana

This formation comprise of clays, shales, sandstones and conglomerates. The shale and clay of gondowana age occur on the bank of Palar river and Sriperumbudur taluk in irregular shape. Oldest of these formations exposed in parts of Sriperumbudur and Kancheepuram taluks as clay and shale beds, are of upper Gondwana age. The fine grained sand is observed at Kancheepuram and uthiramerur taluks. Gravel bed of 2 to 4m thickness is observed in Abdullapuram Manapakkam Road, and the gravel thickness is ranging form 1.5 cm to 5cm in diameter and the same is over lined by sandstone is called Conjeevaram gravels which is equivalent to cuddalore and Rajmundry sand stone of Teritiary age.

Conglomerates and Laterite

Conglomerates are composed of boulders, Pebbles and mostly of quarzites are observed in uplands of Sriperumbadur Taluk. The maximum sizes of these boulders are found as capping over the upper Gondwanas. The laterites are well developed around Chemberambakkam village. These laterites are porous vermicular, clay like rocks of red, yellow, brown, grey and in mottled colours.

Alluvium

Alluvial deposits are the youngest formation consists of sands and clays and is deposited by the cheyyar, Coovam and Palar rivers. The Adayar alluvium consists of silt, fine and coarse grained sands, gravel and pebbles.

The Palar alluvium comprises of coarse sands and gravels. The average thickness of alluvium is about 10 to 30m.

Geological structure

The general trend of the gneiss is NE-SW direction and the regional trend observed is NNE-SSW to NW-SE direction. The deposition of Gondwana raocks, the sedimentary rocks, in faulted troughs and in the rugges topography of crystalline

rocks took place during Jurasic period. The insitu soils laterites and alluvial deposits were deposited along the Palar and Cheyyar rivers during the quarternary period.

Occurrence of Ground Water

Hard Rock Formation

Gneissic Type

Ground water occurs mostly under water table or phreatic conditions in weathered, fractured, jointed and faulted portions of granitic rocks and under artesian conditions in fractured zones located below impervious hard rocks. The pore spaces developed in the weathered mantle acts as shallow granular aquifers and forms the potential water bearing zones. Water table is shallow in ayacut regions whereas it is relatively deeper in other regions.

Charnockite type

Ground water occurs in shallow depth only subject to the intensity of weathering, and its development is much less than gneissic formations.

Sedimentary formation

The most important formation that is carrying substantial amount of ground water is alluvium. Ground water occurs under water table or semi confined conditions. The alluvium essentially composed of boulders, gravel or coarse sand with a little or no silt or clay constitutes the best aquifer. While silt or clay with a little or no boulders gravel or sand is a very poor aquifer. The thickness of these aquifers ranges from 2m to 20m. Another type of aquifer associated with alluvium contains boulders free of any cementing material. The ground water potential of such boulder beds is enormous owing to their very high permeability.

One another mode of occurrence of ground water in alluvium is in the form of perched aquifers. Ground water is met in these perched aquifers at a depth of 1 to 3m from the ground level.

Gondwana Formation

In the Gondwana formation area the ground water yield is very poor and

ground water for drinking water purpose may be taken up from the sand stone of Kancheepuram taluk, Chengalpattu taluk and sriperumbudur taluk.

Coastal Aquifers

In the coastal area, the ground water is available in perched water table conditions. This is very precious one and the same may be used very conservatively. Since overlapping leads to sea water intrusion in the area. The aquifer available only from 2m to 10m BGL.

Drilling Bore Holes

The occurrence and movement of ground water in hard rock formations are restricted to weathered and jointed portions. The intensity of weathering is nor uniform and vary from place to place. Generally weathering and fractures are common at shallow depth. The sub surface conditions can be studies by open well inventories and by geophysical investigation. Exploratory boreholes can be attempted in complicated areas to ascertain the sub surface conditions. Aquifer test or yield test can also be tried where ever large quantity of ground water is needed.

The SG & SWRDC has drilled 190 bore holes for investigation purposes of which the lithology for the 54 representative bore holes have been enclosed for reference. The boreholes are located through out the entire district so as to get a comprehensive idea of the subsurface conditions. The complexity of the geological formations in this district is very well determined by drilling series of borewells all along the Palar river course. The thickness of alluvium is about 10 meters near the confluence of Cheyyar and Palar rivers. The maximum thickness of Alluvium (30-40m in flood plain area) is noted near Panakattucheri village of Thirukalukundram block.

The north western part of the district ie, Kancheepuram and Sriperumbudur taluks are covered mostly by clay and alluvial formations. The aquifer depth is limited to an extent of 10 to 12 m from ground level and hence dug wells are common in these areas.

The central part of the district and the coastal zone are favourable for sinking bore wells. The remaining parts of the area are composed of hard rocks, where the weathered thickness ranges from 15 to 20m.

Drilling of Exploratory Boreholes

Based on the field study carried out and interpretations made from aerial photographs and satellite imageries, favorable locations are selected for exploratory boreholes. Sub surface hydrogeological characteristics are determined to evaluate the groundwater potential of the area. Since the inception of this department, 190 exploratory boreholes have been drilled in this district and more than 46 boreholes have been handed over to user agencies like Municipality, TWAD Board and Panchayat Unions etc., for drinking water purposes.

(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 Villupuram 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 Kancheepuram District,185 observation wells and 47 piezometers,totally 232 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 Kancheepuram 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 Kancheepuram District. The analysis reveals that the water level has gone down in the north, west and central parts of the Kancheepuram 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 Kancheepuram District.

(iii) Existing network of Monitoring wells:

In Kancheepuram District, the existing network of monitoring wells is 232 wells, 185 wells are observation wells and 47 wells are piezometers. These wells are observed for every month water level.

Kancheepuram District: Observation Wells - Location and Co-ordinates

Well No	District	Tahsil / Taluk	Block / Mandal	Village	Latitude	Longitude
OW1214437 95838	Kancheepuram	Cheyyur	Chittamur	Kolathur	12°24'40"	79°55'10"
OW1215307 95400	Kancheepuram	Cheyyur	Chittamur	Chunambedu	12°15'21"	79°54'00"
OW1217037 95700	Kancheepuram	Cheyyur	Chittamur	Kadukkalur	12°17'03"	79°57'00"
OW1217487 95741	Kancheepuram	Cheyyur	Chittamur	Vedal	12°17'48"	79°57'41"
OW1218197 95409	Kancheepuram	Cheyyur	Chittamur	Puthirankottai	12°18'40"	79°53'40"
OW1218238 00016	Kancheepuram	Cheyyur	Chittamur	Vilambur	12°18'20"	80°00'40"
OW1218487 95929	Kancheepuram	Cheyyur	Chittamur	Kadapakkam	12°16'53"	79°59'29"
OW1219427 95345	Kancheepuram	Cheyyur	Chittamur	Periyakilakkadi	12°19'42"	79°53'45"
OW1220057 94447	Kancheepuram	Madhuranthagam	Acharapakkam	Karasangal	12°20'05"	79°44'47"
OW1221117 95143	Kancheepuram	Cheyyur	Chittamur	Chinnakayapakkam	12°21'11"	79°51'43"
OW1221258 00348	Kancheepuram	Cheyyur	Lattur	Paramankeni	12°21'30"	80°03'40"
OW1221397 94230	Kancheepuram	Madhuranthagam	Acharapakkam	Kongaraimambattu	12°21'39"	79°42'30"
OW1221588 00040	Kancheepuram	Cheyyur	Chittamur	Ammanur	12°22'05"	80°00'10"
OW1222117 94305	Kancheepuram	Madhuranthagam	Acharapakkam	Kalathur	12°22'11"	79°43'05"
OW1222538 00521	Kancheepuram	Cheyyur	Lattur	Perun Thuravur	12°22'00"	80°05'15"
OW1223027 94842	Kancheepuram	Cheyyur	Chittamur	Thenpakkam	12°23'02"	79°48'42"
OW1223047 95139	Kancheepuram	Cheyyur	Chittamur	Pekkaranai	12°23'05"	79°51'39"
OW1223138 00036	Kancheepuram	Cheyyur	Lattur	Marudheri	12°23'13"	80°00'36"
OW1223487 95615	Kancheepuram	Madhuranthagam	**Madhuranthagam**	Kattu Devadur	12°23'48"	79°56'15"

OW122349795327	Kancheepuram	Cheyyur	Chittamur	Kannimangalam	12°23'49"	79°53'27"
OW122400800550	Kancheepuram	Cheyyur	Lattur	Kuvathur	12°26'40"	80°05'50"
OW122404800545	Kancheepuram	Cheyyur	Lattur	Mugaiyur	12°24'00"	80°05'50"
OW122412794854	Kancheepuram	Madhuranthagam	Acharapakkam	Acharapakkam Sangukulam	12°24'12"	79°48'54"
OW122413794417	Kancheepuram	Madhuranthagam	Acharapakkam	Kallikunam	12°24'13"	79°44'17"
OW122413794859	Kancheepuram	Madhuranthagam	Acharapakkam	Acharapakkam Mosque	12°24'13"	79°48'59"
OW122416795624	Kancheepuram	Madhuranthagam	Madhuranthagam	Kollambakkam	12°24'16"	79°56'24"
OW122425795332	Kancheepuram	Cheyyur	Chittamur	Chittamur BDO	12°24'25"	79°53'32"
OW122442794859	Kancheepuram	Madhuranthagam	Acharapakkam	Acharapakkam	12°24'42"	79°48'59"
OW122528794413	Kancheepuram	Madhuranthagam	Acharapakkam	Elapakkam	12°25'28"	79°44'13"
OW122605800517	Kancheepuram	Cheyyur	Lattur	Nedumaram	12°26'05"	80°05'17"
OW122630794925	Kancheepuram	Cheyyur	Chittamur	Sothupakkam	12°26'30"	79°49'25"
OW122632800123	Kancheepuram	Cheyyur	Lattur	Kadugupattu	12°25'38"	80°01'10"
OW122645800016	Kancheepuram	Cheyyur	Lattur	Pavunjur Bdo	12°26'45"	80°00'16"
OW122646794426	Kancheepuram	Madhuranthagam	Acharapakkam	Mohalvadi	12°26'46"	79°44'26"
OW122657800211	Kancheepuram	Cheyyur	Lattur	Palur	12°26'57"	80°02'11"
OW122747795428	Kancheepuram	Madhuranthagam	Madhuranthagam	Chitravadi-3	12°27'47"	79°54'28"
OW122752795424	Kancheepuram	Madhuranthagam	Madhuranthagam	Chitravadi-2	12°27'52"	79°54'24"
OW122758794542	Kancheepuram	Madhuranthagam	Acharapakkam	Ramapuram	12°27'58"	79°45'42"

OW1228027 95438	Kancheepuram	Madhuranthagam	Madhuranthagam	Chitravadi-1	12°28'02"	79°54'38"
OW1228147 95127	Kancheepuram	Madhuranthagam	Madhuranthagam	Pakkam	12°28'14"	79°51'27"
OW1228377 94556	Kancheepuram	Madhuranthagam	Acharapakkam	Velamur	12°28'37"	79°45'56"
OW1229188 00755	Kancheepuram	Thirukalukundram	Thirukalukundram	Voyalur	12°29'18"	80°07'55"
OW1229508 00632	Kancheepuram	Thirukalukundram	Tthirukalukundram	Ayapakkam	12°29'50"	80°06'32"
OW1229557 95230	Kancheepuram	Madhuranthagam	Madhuranthagam	Madhuranthagam R.D.O	12°29'55"	76°52'30"
OW1230278 00553	Kancheepuram	Chenglepet	Tk.kundram	Nallathur	12°30'27"	80°05'53"
OW1230357 95308	Kancheepuram	Madhuranthagam	Madhuranthagam	Madhuranthagam Taluk Offi	12°30'33"	79°53'12"
OW1230357 95339	Kancheepuram	Madhuranthagam	Madhuranthagam	Madhuranthagam	12°30'35"	79°53'39"
OW1231047 94637	Kancheepuram	Madhuranthagam	Acharapakkam	L.Endathur	12°31'04"	79°46'12"
OW1231127 94637	Kancheepuram	Madhuranthagam	Acharapakkam	Laddakaranai	12°31'12"	79°46'37"
OW1231318 00420	Kancheepuram	Thirukazhukkuntram	Thirukazhukkundram	Nerumbur	12°31'31"	80°04'20"
OW1231347 95338	Kancheepuram	Madhuranthagam	Madhuranthagam	Karunguzhi	12°31'34"	79°53'38"
OW1231357 95612	Kancheepuram	Madhuranthagam	Madhuranthagam	Kinar	12°31'35"	79°56'12"
OW1231398 00601	Kancheepuram	Chenglepet	Kattankulathur	Lattur	12°31'39"	80°06'01"
OW1231438 00940	Kancheepuram	Thirukalukundram	Thirukalukundram	Sadras	12°31'43"	80°09'40"

OW123221800047	Kancheepuram	Thirukazhukkuntram	Thirukazhukundram	Vilagam	12°32'21"	80°00'47"
OW123235795415	Kancheepuram	Madhuranthagam	Madhuranthagam	Karunguzhi - Ib	12°32'35"	79°54'15"
OW123255794611	Kancheepuram	Madhuranthagam	Acharapakkam	Kadambur	12°32'55"	79°46'11"
OW123307800430	Kancheepuram	Chenglepet	Tk.kundram	Naduvakkarai	12°33'07"	80°04'30"
OW123308794713	Kancheepuram	Madhuranthagam	Acharapakkam	Tittalam	12°33'08"	79°47'13"
OW123326795754	Kancheepuram	Madhuranthagam	Madhuranthagam	Pallipattu	12°33'26"	79°57'54"
OW123351795046	Kancheepuram	Madhuranthagam	Acharapakkam	Vinayaganallur	12°33'51"	79°50'46"
OW123353795839	Kancheepuram	Tthirukalukundram	Thirukalukundram	Elumichampet	12°33'53"	79°58'39"
OW123417800631	Kancheepuram	Chenglepet	Tk.kundram	Nathankariyachery	12°34'17"	80°06'31"
OW123501794429	Kancheepuram	Uthiramerur	Uthiramerur	Menallur	12°35'01"	79°44'29"
OW123523800134	Kancheepuram	T.k.kundram	T.k.kundram	Agatheeswarmangalam	12°35'23"	80°01'34"
OW123532795656	Kancheepuram	Madhuranthagam	Madhuranthagam	Padalam	12°35'32"	79°56'56"
OW123538795337	Kancheepuram	Madhuranthagam	Madhuranthagam	Malaivaiyavur	12°35'38"	79°53'37"
OW123545800859	Kancheepuram	Tthirukalukundram	Thirukalukundram	Kadambadi	12°35'45"	80°08'59"
OW123616794535	Kancheepuram	Uthiramerur	Uthiramerur	Pattancheri	12°36'16"	79°45'35"
OW123622800321	Kancheepuram	Thirukazhukkuntram		South Sannathi Street	12°36'22"	80°03'21"
OW123630800345	Kancheepuram	Tthirukalukundram	Thirukalukundram	PWD IB	12°36'30"	80°03'45"

OW123641800322	Kancheepuram	Thirukazhukkuntram	Thirukalukundram	Panchayat Board	12°36'41"	80°03'22"
OW123654794525	Kancheepuram	Uthiramerur	Uthiramerur	Uthiramerur Bazaar St	12°36'54"	79°45'25"
OW123658794515	Kancheepuram	Uthiramerur	Uthiramerur	Uthiramerur Nasarathpet	12°36'58"	79°45'15"
OW123702794513	Kancheepuram	Uthiramerur	Uthiramerur	Uthirameru Sathakam St	12°37'02"	79°45'13"
OW123752795825	Kancheepuram	Chenglepet	Tk.kundram	Pudupakkam	12°37'52"	79°58'25"
OW123855793927	Kancheepuram	Uthiramerur	Uthiramerur	Perunagar-1	12°38'55"	79°39'27"
OW123903793859	Kancheepuram	Uthiramerur	Uthiramerur	Perunagar-2	12°39'03"	79°38'59"
OW123903794547	Kancheepuram	Uthiramerur	Uthiramerur	Thirupulivanam-2	12°39'03"	79°45'47"
OW123912795332	Kancheepuram	Uthiramerur	Uthiramerur	Kilakadi	12°39'12"	79°53'32"
OW123940800827	Kancheepuram	Chenglepet	Tk.kundram	Amur	12°39'40"	80°08'27"
OW123949794538	Kancheepuram	Uthiramerur	Uthiramerur	Thirupulivanam-1	12°39'49"	79°45'38"
OW123954794647	Kancheepuram	Uthiramerur	Uthiramerur	Marudam	12°39'54"	79°46'47"
OW123957795312	Kancheepuram	Uthiramerur	Uthiramerur	Kurumbarai	12°39'54"	79°53'12"
OW123957800103	Kancheepuram	Chenglepet	Tk kundram	Nenmeli	12°39'57"	80°01'03"
OW124009794911	Kancheepuram	Uthiramerur	Uthiramerur	Kunnavakkam	12°40'09"	79°49'11"
OW124025794920	Kancheepuram	Uthiramerur	Uthiramerur	Vinayagapuram	12°40'25"	79°49'20"
OW124049794514	Kancheepuram	Uthiramerur	Uthiramerur	Karuveppampoondi	12°40'49"	79°45'14"
OW124131795213	Kancheepuram	Uthiramerur	Uthiramerur	Edamachi	12°41'31"	79°52'13"

OW124148795834	Kancheepuram	Chenglepet	Kattankulathur	Chengalpet-police Qtrs.	12°41'48"	79°58'34"
OW124150800318	Kancheepuram	Chenglepet	Thiruporur	Reddikuppam	12°41'50"	80°03'18"
OW124157800248	Kancheepuram	Chenglepet	Thiruporur	Senneri	12°41'57"	80°02'48"
OW124214800520	Kancheepuram	Chenglepet	Thiruporur	Karumbakkam	12°42'14"	80°05'20"
OW124224794832	Kancheepuram	Uthiramerur	Uthiramerur	Malayankulam	12°42'24"	79°48'32"
OW124251800102	Kancheepuram	Chenglepet	Tk kundram	Ichankaranai	12°42'51"	80°01'02"
OW124305794514	Kancheepuram	Kancheepuram	Kancheepuram	Magaral	12°43'05"	79°45'14"
OW124307794518	Kancheepuram	Kancheepuram	Kancheepuram	Magaral	12°43'00"	79°45'18"
OW124310801100	Kancheepuram	Chenglepet	Thiruporur	Thiruporur	12°43'10"	80°11'00"
OW124310801107	Kancheepuram	Chenglepet	Thiruporur	Thiruporur	12°43'10"	80°11'07"
OW124319794518	Kancheepuram	Kancheepuram	Kancheepuram	Arpakkam	12°43'19"	79°45'18"
OW124319795336	Kancheepuram	Uthiramerur	Uthiramerur	Kavanipakkam	12°43'19"	79°53'36"
OW124400801000	Kancheepuram	Chenglepet	Thiruporur	Ellalur	12°44'00"	80°10'00"
OW124413795204	Kancheepuram	Uthiramerur	Uthiramerur	Arunkundram	12°44'13"	79°52'04"
OW124439795419	Kancheepuram	Uthiramerur	Uthiramerur	Sithanjeri	12°44'39"	79°54'19"
OW124500800010	Kancheepuram	Chenglepet	Kattankulathur	Pareri	12°45'00"	80°00'10"
OW124526795533	Kancheepuram	Chenglepet	Kattankulathur	(Palur Village) Devanur	12°45'26"	79°55'33"
OW124608795726	Kancheepuram	Chenglepet	Kattankulathur	Venbakkam	12°46'08"	79°57'26"
OW124636795351	Kancheepuram	Chenglepet	Kattankulathur	Melacheri	12°46'36"	79°53'51"
OW124652794906	Kancheepuram	Kancheepuram	Walajapet	Kannadiar Kudisai	12°46'52"	79°49'06"

OW124657795118	Kancheepuram	Kancheepuram	Walajabad	Palayerseva ram(Sankarapur	12°46'57"	79°51'18"
OW124700795041	Kancheepuram	Kancheepuram	Walajabad	Puliyambakkam	12°47'00"	79°50'41"
OW124731800511	Kancheepuram	Thirukalukundram	Tthirukalukundram	Pandur	12°47'31"	80°05'11"
OW124731800512	Kancheepuram	Chenglepet	Kattankulathur	Pondur	12°47'31"	80°05'11"
OW124755794627	Kancheepuram	Kancheepuram	Walajabad	Thangi	12°47'55"	79°46'27"
OW124800794214	Kancheepuram	Kancheepuram	Kancheepuram	Orikkai Water Works[damal	12°48'00"	79°42'14"
OW124806800514	Kancheepuram	Chengalpattu	Kattankulathur	Kannivakkam	12°48'06"	80°05'14"
OW124816794656	Kancheepuram	Kancheepuram	Walajapet	Babashahib Pettai	12°48'16"	79°46'56"
OW124831794441	Kancheepuram	Kancheepuram	Walajabath	Thenampakkam	12°48'31"	79°44'41"
OW124833794947	Kancheepuram	Kancheepuram	Walajabath	Uthukadu	12°48'33"	79°49'47"
OW124835794513	Kancheepuram	Kancheepuram	Walajabad	Muthialpet	12°48'35"	79°45'13"
OW124836794948	Kancheepuram	Kancheepuram	Walajabad	Uthukadu-1	12°48'36"	79°49'48"
OW124838795616	Kancheepuram	Chenglepet	Kattankulathur	Vadakkupattu	12°48'38"	79°56'16"
OW124845794421	Kancheepuram	Kancheepuram	Kancheepuram	Naz-arethpet	12°48'45"	79°44'21"
OW124845801436	Kancheepuram	Chengalpattu	Thiruporur	Muttukkadu	12°48'45"	80°14'36"
OW124929794242	Kancheepuram	Kancheepuram	Kancheepuram	Kancheepuramwarehouse	12°49'29"	79°42'42"
OW124935794140	Kancheepuram	Kancheepuram	Kancheepuram	Kancheepu Collector Off	12°49'35"	79°41'40"
OW124950801435	Kancheepuram	Chenglepet	Tiruporur	Muthukadu	12°49'50"	80°14'35"

OW124953801434	Kancheepuram	Chengalpattu	Thiruporur	Muttukkadu	12°49'53"	80°14'34"
OW125001795107	Kancheepuram	Kancheepuram	Walajabad	Kattavakkam	12°50'01"	79°51'07"
OW125015801000	Kancheepuram	Chenglepet	Tiruporur	Mambakkam	12°50'15"	80°10'00"
OW125031794122	Kancheepuram	Kancheepuram	Kancheepuram	Kilkadirpur	12°50'31"	79°41'22"
OW125033794122	Kancheepuram	Kancheepuram	Kancheepuram	Kancheepuram	12°50'33"	79°41'22"
OW125034794439	Kancheepuram	Kancheepuram	Walajabath	Vaiyavoor	12°50'34"	79°44'39"
OW125104801436	Kancheepuram	Chenglepet	Tiruporur	Reddikuppam	12°51'04"	80°14'36"
OW125137801129	Kancheepuram	Tambaram	St.thomas mount	Ottiyambakkam	12°51'37"	80°11'29"
OW125145795232	Kancheepuram	Kancheepuram	Walajabad	Navettukulam	12°51'45"	79°52'32"
OW125153800654	Kancheepuram	Chenglepet	Kattankulathur	Unanmanchery	12°51'53"	80°06'54"
OW125157800759	Kancheepuram	Chenglepet	Kattankulathur	Rathinamangalam	12°51'57"	80°07'59"
OW125200794311	Kancheepuram	Kancheepuram	Walajabad	Ayyamicheri	12°52'00"	79°43'11"
OW125200794312	Kancheepuram	Kancheepuram	Kancheepuram	Damal(madanthangal)	12°52'00"	79°43'12"
OW125202793428	Kancheepuram	Kancheepuram	Kancheepuram	Kilar	12°52'02"	79°34'28"
OW125203801337	Kancheepuram	Chenglepet	Thiruporur	Semmanjeri	12°52'03"	80°13'37"
OW125207801011	Kancheepuram	Tambaram	Thiruporur	Maduraipakkam	12°52'07"	80°10'11"
OW125209801123	Kancheepuram	Tambaram	St. thomas mount	Sittalapakkam	12°52'09"	80°11'23"
OW125213800629	Kancheepuram	Chenglepet	Kattankulathur	Unamanchery	12°52'13"	80°06'29"
OW125213801446	Kancheepuram	Tambaram	St.Th.Mount	Uthandi	12°52'13"	80°14'46"
OW125215794311	Kancheepuram	Kancheepuram	Kancheepuram	Chetiyarpet	12°52'15"	79°43'11"
OW125308800046	Kancheepuram	Sriperumbudur	Kundrathur	Salamangalam	12°53'08"	80°00'46"

OW125355801505	Kancheepuram	Tambaram	St.Th.Mount	Akkarai	12°53'55"	80°15'05"
OW125357801459	Kancheepuram	Tambaram	St.Th.Mount	Akkarai	12°53'57"	80°14'59"
OW125405801332	Kancheepuram	Tambaram	St.thomas mount	Sholinganallur	12°54'05"	80°13'32"
OW125430794319	Kancheepuram	Kancheepuram	Walajabad	Chettiyarpettai	12°54'30"	79°43'19"
OW125437795035	Kancheepuram	Sriperumbudur	Sriperumbudur	Senthamangalam	12°54'37"	79°50'35"
OW125437801459	Kancheepuram	Tambaram	St.thomas mount	Injambakkam	12°54'37"	80°14'59"
OW125438800129	Kancheepuram	Sriperumbudur	Kundrathur	Padappai	12°54'38"	80°01'29"
OW125438801512	Kancheepuram	Tambaram	St.Th.Mount	Injambakkam	12°54'38"	80°15'12"
OW125452801504	Kancheepuram	Tambaram	St.Th.Mount	Injambakkam	12°54'52"	80°15'04"
OW125457800908	Kancheepuram	Tambaram	St.thomas mount	Rajakelpakkam	12°54'57"	80°09'08"
OW125500800631	Kancheepuram	Tambaram	St. thomas mount	Irumbuliyur	12°55'00"	80°06'31"
OW125502801014	Kancheepuram	Tambaram	St.Th.Mount	Vengivasal	12°55'02"	80°10'14"
OW125511801509	Kancheepuram	Chenglepet	St. thomas mount	Injambakkam	12°55'11"	80°15'09"
OW125513801506	Kancheepuram	Tambaram	St. thomas mount	Injambakkam	12°55'13"	80°15'06"
OW125523800704	Kancheepuram	Tambaram	St.thomas mount	Tambaram	12°55'23"	80°07'04"
OW125542801513	Kancheepuram	Tambaram	St.Th.Mount	Injambakkam	12°55'42"	80°15'13"
OW125552800700	Kancheepuram	Tambaram	St.Th.Mount	Tambaram	12°55'52"	80°07'00"
OW125604801213	Kancheepuram	Tambaram	St.Th.Mount	Pallikaranai	12°56'04"	80°12'13"
OW125630801001	Kancheepuram	Tambaram	St. thomas mount	Nanmangalam	12°56'30"	80°10'01"

OW125700801521	Kancheepuram	Tambaram	St.Thomas Mount	Kabaleeswarar Nagar	12°57'00"	80°15'21"
OW125707794903	Kancheepuram	Sriperumbudur	Sriperumbudur	Madurmangalam	12°57'07"	79°49'03"
OW125719794031	Kancheepuram	Kancheepuram	Walajabad	Govindavadiagaram	12°57'19"	79°40'31"
OW125719795607	Kancheepuram	Sriperumbudur	Sriperumbudur	Vadamangalam	12°57'19"	79°56'07"
OW125733800711	Kancheepuram	Tambaram	St. thomas mount	Tiruneermalai	12°57'33"	80°07'11"
OW125739801540	Kancheepuram	Chenglepet	Tiruporur	Palavakkam	12°57'39"	80°15'40"
OW125746800647	Kancheepuram	Tambaram	St.Th.Mount	Thiruneermalai	12°57'46"	80°06'47"
OW125804800901	Kancheepuram	Tambaram	St.Th.Mount	Pallavaram	12°58'04"	80°09'01"
OW125806800713	Kancheepuram	Tambaram	St.thomas mount	Anakaputhur	12°58'06"	80°07'13"
OW125812800900	Kancheepuram	Tambaram	St.Th.Mount	Pallavaram	12°58'12"	80°09'00"
OW125821795627	Kancheepuram	Sriperumbudur		Pwd Lake	12°58'21"	79°56'27"
OW125926794501	Kancheepuram	Kancheepuram	Walajabad	Purisai	12°59'26"	79°45'01"
OW125952800537	Kancheepuram	Sriperumbudur	Sriperumbadur	Thirunageswaram	12°59'52"	80°05'37"
OW125955793905	Kancheepuram	Sriperumbudur		Thirumangai	12°58'18"	79°57'05"
OW130014801143	Kancheepuram	Tambaram	Tambaram	St.thomas Mount	13°00'14"	80°11'43"
OW130016801208	Kancheepuram	Tambaram	St thomas mount	Alandur	13°00'16"	80°12'08"
OW130029800458	Kancheepuram	Sriperumbudur	Kundrathur	Chembarambkkam	13°00'29"	80°04'58"
OW1300598000026	**Kancheepuram**	**Sriperumbudur**	**Sriperumbudur**	**Chettipedu**	**13°00'59"**	**80°00'26"**
OW23523800134	**Kancheepuram**	**Thirukalukundram**	**Thirukalukundram**	**Agatheeswarmangalam**	**12°35'23"**	**80°01'34"**

OW24318800638	Kancheepuram	Chenglepet	Thiruporur	Kottamedu	12°43'18"	80°06'38"

Kancheepuram District - Piezometers - Location and Co-ordinates

Well no	District	Tashil/Taluk	Block/Mandal	Village	Latitude	Longitude
HP 31572	Cuddalore	Cuddalore	Cuddalore	Periakattuppalayam	11.853889	79.790000
HP31515	Cuddalore	Thittakudi	Mangalore	Vallimarudham	11.508889	78.944722
HP31516A	Cuddalore	Thittakudi	Mangalore	Kaludur	11.506111	79.093056
HP31538	Cuddalore	Vriddhachalam	Vriddhachalam	T.mavadandal	11.628056	79.218611
HP31539	Cuddalore	Vriddhachalam	Vriddhachalam	M.Parur	11.580833	79.254722
HP31540	Cuddalore	Vriddhachalam	Nallur	Vilambavur	11.543889	79.075278
HP31542	Cuddalore	Thittakudi	Mangalore	Eluthur	11.438333	79.012500
HP31543A	Cuddalore	Vriddhachalam	Nallur	Veppur	11.528333	79.123056
HP31544	Cuddalore	Vriddhachalam	Vriddhachalam	Keelpalaiyur	11.466111	79.422500
HP31545	Cuddalore	Vriddhachalam	Kammapuram	Kammapuram	11.478333	79.421667
HP31546	Cuddalore	Chidambaram	Parangippettai	Puduchathiram	11.542222	79.722778
HP31547	Cuddalore	Kattumannarkoil	Kumaratchi	Kumaratchi	11.310556	79.629167
HP31548	Cuddalore	Kattumannarkoil	Kattumannarkoil	Lalpet	11.298611	79.549167
HP31549	Cuddalore	Cuddalore	Cuddalore	Thiruvandipuram	11.750556	79.711944
HP31551	Cuddalore	Panruti	Annagramam	Anna Grammam	11.788056	79.601944
HP31552	Cuddalore	Cuddalore	Cuddalore	Cuddalore - OT	11.722222	79.774722
HP31553A	Cuddalore	Vriddhachalam	Kammapuram	V.Kumaramangalam	11.491667	79.385556
HP31554	Cuddalore	Panruti	Annagramam	Palur	11.758333	79.628889
HP31558	Cuddalore	Kattumannarkoil	Kattumannarkoil	Eyyalur	11.188056	79.515833
HP31559	Cuddalore	Chidambaram	Keerapalayam	Palayamkottai . I.	11.358611	79.473889
HP31560A	Cuddalore	Kattumannarkoil	Kattumannarkoil	Kondasamuthram	11.337222	79.474722
HP31575	Cuddalore	Chidambaram	Kumaratchi	Chidambaram	11.393056	79.692500
HP31577	Cuddalore	Cuddalore	Cuddalore	Thukkanampakkam	11.841667	79.706944
HP31578	Cuddalore	Kurinjipadi	Kurinjipadi	Ramanathankuppam	11.623889	79.693056
HP31580	Cuddalore	Kurinjipadi	Kurinjipadi	Vadalur	11.554444	79.546389
HP31581	Cuddalore	Vriddhachalam	Vriddhachalam	Ko-poovanur	11.610833	79.306389
INV 11228	Cuddalore	Thittakudi	Mangalore	Lekkur	11.465833	79.018611
INV 31436	Cuddalore	Cuddalore	Cuddalore	Cuddalore N.T	11.756667	79.761111
INV 31445	Cuddalore	Vriddhachalam	Vriddhachalam	Vriddhachalam	11.506944	79.327500
INV 31446	Cuddalore	Thittakudi	Nallur	Pennadam	11.404167	79.250556
INV 31461	Cuddalore	Vriddhachalam	Kammapuram	Melakuppam	11.570833	79.439722
INV31434	Cuddalore	Panruti	Panruti	Poongunam	11.788889	79.797222
INV31435	Cuddalore	Cuddalore	Cuddalore	Vandarasankuppam	11.722222	79.634722
INV31446	Cuddalore	Chidambaram	Kumaratchi	Keerapalayam	11.431944	79.653333
INV31447	Cuddalore	Chidambaram	Melbhuvanagiri	Krishnapuram	11.484722	79.616667
INV31448	Cuddalore	Chidambaram	Keerapalayam	Mazhavarayanallur	11.417500	79.520556
INV31449	Cuddalore	Kattumannarkoil	Kattumannarkoil	Parivilagam	11.342500	79.603611

INV31452	Cuddalore	Kurinjipadi	Kurinjipadi	Pethanaickenkuppam	11.584167	79.615833
INV31453	Cuddalore	Kurinjipadi	Kurinjipadi	Kattiyankuppam	11.637222	79.633056
INV31454	Cuddalore	Chidambaram	Keerapalayam	Pudaiyur	11.361667	79.515556
INV31455	Cuddalore	Chidambaram	Keerapalayam	Koodalaiyathur	11.415278	79.470278
INV31456	Cuddalore	Chidambaram	Kumaratchi	Thuniseramedu	11.376389	79.655278
INV31457	Cuddalore	Chidambaram	Melbhuvanagiri	Kiliyanur	11.424722	79.590278
INV31462	Cuddalore	Thittakudi	Mangalore	Alambadi	11.459444	79.061389
INV31463	Cuddalore	Thittakudi	Mangalore	Vinayaganandal	11.518056	79.040000
MWS 31582	Cuddalore	Panruti	Panruti	Marungur	11.655000	79.535278
MWS 31585	Cuddalore	Panruti	Panruti	Thiruvamur	11.768056	79.478333

(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 Kancheepuram 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 Development (%) = Existing Gross Ground water Draft for all uses / Net annual Ground Water Availability X 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 Estimation of TamilNadu As on March 2013

District Summary

(in ha.m)

KANCHEEPURAM 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	KANCHEEPURAM	105,447.62	63,406.00	5,062.76	68,468.76	65	14

Firka Wise Summary

(in ha.m)

KANCHEEPURAM 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	ACCHIRUPAKKAM	1,933.19	1,646.25	61.41	1,707.66	88	SEMI CRITICAL
2	ALANTHUR	110.72	-	30.33	30.33	27	SAFE
3	APPUR	433.61	402.80	8.82	411.62	95	CRITICAL
4	ARUMPULIYUR	2,590.52	2,415.45	41.88	2,457.33	95	CRITICAL
5	CHENGALPATTU	988.88	829.25	31.68	860.93	87	SEMI CRITICAL
6	CHEYYUR	2,026.69	1,578.25	74.51	1,652.76	82	SEMI CRITICAL
7	CHITHAMUR	2,155.11	1,495.50	49.24	1,544.74	72	SEMI CRITICAL

KANCHEEPURAM 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	CHITLAPAKKAM	236.93	45.00	11.58	56.58	24	SAFE
9	CHITTIAMBAKKAM	1,887.28	563.00	48.44	611.44	32	SAFE
10	GOVINDHAVADI	1,724.10	1,721.40	26.20	1,747.60	101	OVER EXPLOITED
11	GUDUVANCHERI	900.56	743.20	22.66	765.86	85	SEMI CRITICAL
12	JAMEENENDATHUR	1,415.49	1,229.20	24.06	1,253.26	89	SEMI CRITICAL
13	KADAPAKKAM	2,772.02	443.00	31.16	474.16	17	SAFE
14	KALIYAMPOONDI	2,322.00	1,601.20	48.86	1,650.06	71	SEMI CRITICAL
15	KANCHEEPURAM	1,399.75	492.78	207.94	700.71	50	SAFE
16	KARUGKUZHI	2,555.73	1,280.10	53.78	1,333.88	52	SAFE
17	KARUMBAKKAM	924.50	584.40	16.05	600.45	65	SAFE
18	KATTANKULATHUR	918.16	684.68	12.40	697.07	76	SEMI CRITICAL
19	KAYAPAKKAM	1,687.08	972.70	39.08	1,011.78	60	SAFE
20	KELAMBAKKAM	724.09	131.65	53.42	185.07	26	SAFE
21	KODUR	2,219.08	1,313.00	73.46	1,386.46	62	SAFE
22	KUNNAVAKKAM	1,429.26	1,105.80	36.57	1,142.37	80	SEMI CRITICAL
23	KUNRATHUR	2,104.67	226.40	149.50	375.90	18	SAFE
24	L.ENDATHUR	2,007.35	2,146.50	32.74	2,179.24	109	OVER EXPLOITED
25	LATHUR	3,149.19	1,350.00	44.05	1,394.05	44	SAFE
26	MADAMBAKKAM	429.17	152.45	18.06	170.51	40	SAFE
27	MADHURANTHAKAM	1,569.86	893.48	41.86	935.33	60	SAFE
28	MADURAMANGALAM	1,863.14	955.50	42.65	998.15	54	SAFE
29	MAHARAL	2,762.25	1,353.38	63.98	1,417.36	51	SAFE
30	MAMALLAPURAM	1,755.06	1,350.00	64.72	1,414.72	81	SEMI CRITICAL
31	MAMBAKKAM	1,047.67	568.00	20.74	588.74	56	SAFE
32	MANAMBATHY	745.84	402.15	13.62	415.77	56	SAFE

33	MANGADU	585.74	359.30	178.52	537.82	92	CRITICAL
34	MEDAVAKKAM	674.02	27.00	429.38	456.38	68	SAFE
35	NELLIKUPPAM	1,109.95	635.80	18.52	654.32	59	SAFE
36	NERUMBUR	1,790.20	1,622.25	42.88	1,665.13	93	CRITICAL
37	ONAMPAKKAM	2,083.09	1,455.80	42.50	1,498.30	72	SEMI CRITICAL
38	ORATHI	2,351.58	2,257.60	68.03	2,325.63	99	CRITICAL
39	PADAPPAI	1,264.76	275.15	54.27	329.42	26	SAFE
40	PAIYANUR	1,037.07	631.00	23.24	654.24	63	SAFE
41	PALLAVARAM	189.88	-	43.32	43.32	23	SAFE
42	PALLIKARANAI	681.90	337.20	116.54	453.74	67	SAFE
43	PALLUR	1,083.64	620.20	34.35	654.55	60	SAFE
44	PAMMAL	251.77	38.40	38.87	77.27	31	SAFE
45	PARANDUR	2,398.11	1,079.43	57.33	1,136.76	47	SAFE
46	PERUMPAKKAM	2,450.89	1,694.90	40.62	1,735.52	71	SEMI CRITICAL
47	PONVILAYANTHAKALATHUR	3,035.18	2,571.50	54.59	2,626.09	87	SEMI CRITICAL
48	SALAVAKKAM	2,002.32	807.00	38.39	845.39	42	SAFE
49	SERAPPANACHERI	1,555.35	708.80	60.21	769.01	49	SAFE
50	SHOLINGANALLUR	339.10	20.25	77.02	97.27	29	SAFE
51	SINGAPERUMALKOIL	600.11	635.30	14.04	649.34	108	OVER EXPLOITED
52	SIRUKAVERIPAKKAM	2,227.52	2,632.13	124.79	2,756.92	124	OVER EXPLOITED
53	SRIPERUMPUDUR	2,037.58	164.15	29.58	193.73	10	SAFE
54	SUNAMPEDU	2,052.66	936.70	33.66	970.36	47	SAFE
55	SUNKUVARCHATRAM	1,733.73	684.90	65.23	750.13	43	SAFE
56	TAMBARAM	315.28	24.00	91.35	115.35	37	SAFE
57	THANDALAM	988.72	161.60	26.54	188.14	19	SAFE
58	THENNERI	1,859.21	300.65	40.16	340.81	18	SAFE
59	THIRUKAZHUKUNDRAM	3,791.26	3,548.15	59.92	3,608.07	95	CRITICAL
60	THIRUPORUR	1,725.64	926.80	53.73	980.53	57	SAFE
61	THIRUPPU KUZHI	2,626.03	2,420.00	40.54	2,460.54	94	CRITICAL
62	THIRUPULIVANAM	1,569.62	1,480.40	39.76	1,520.16	97	CRITICAL
63	UTHIRAMERUR	2,103.94	1,589.60	40.47	1,630.07	77	SEMI CRITICAL
64	VAIYAVUR	2,062.77	638.60	54.46	693.06	34	SAFE
65	VALLAM	1,309.85	88.60	78.09	166.69	13	SAFE

66	VANDALUR	721.47	599.80	42.54	642.34	89	SEMI CRITICAL
67	WALAJABAD	2,048.74	756.60	1,313.87	2,070.47	101	OVER EXPLOITED
TOTAL		**105,447.62**	**63,406.00**	**5,062.76**	**68,468.76**	**65**	

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 Kancheepuram 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 Kancheepuram 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 13 blocks in Kancheepuram District, 4 blocks are categorized as Over Exploited and Critical blocks and remaining 9 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 Kancheepuram District, totally 61 Firkas, 11 Firkas are categorized as Over

Exploited and remaining 50 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 30.76%, but, the total percentage of over exploited and critical Firkas as on March 2011 Assessment is 18.03%, in the Kancheepuram 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 61 Firkas, the total percentage of over exploited and critical Firkas is 18.03%, but, In 2013 assessment, out of 67 Firkas, it has been come down marginally to 19.40%, in the Kancheepuram 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 67 Firkas in the District, 5 Firkas are categorized as “Over Exploited Firkas”, 8 Firkas are categorized as “Critical Firkas”, 15 Firkas are categorized as “Semi Critical Firkas”, 39 Firkas are categorized as “Safe Firkas”.

Based on the Estimation of Ground Water Resources of Tamil Nadu State as on March 2011, Out of 61 Firkas in the District, 6 Firkas are categorized as “Over Exploited Firkas”, 5 Firkas are categorized as “Critical Firkas”, 15 Firkas are categorized as “Semi Critical Firkas”, 35 Firkas are categorized as “Safe Firkas”.

When compared to last assessment as on March 2011, the “Over Exploited Firkas” comes down from 6 to 5 Firkas, the “Critical Firkas”

increased from 5 to 8 Firkas, the “Semi Critical Firkas” maintains the same as 15 Firkas, the “Safe Firkas” increased from 35 to 39 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	6	5
2	Critical	5	8
3	Semi Critical	15	15
4	Safe	35	39
5	Saline	Nil	Nil
TOTAL		61	67

(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.