State report on Groundwater Quality in Tamilnadu & U. T. of Puducherry

Government of India
Ministry of Jal Shakti
Department of Water Resources, RD & GR
Central Ground Water Board
South Eastern Coastal Region, Chennai

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STATE REPORT ON GROUNDWATER QUALITY IN TAMILNADU & U. T. OF PUDUCHERRY

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EXECUTIVE SUMMARY

The quality of groundwater is a very sensitive issue. Groundwater is never pure and contains varying amounts of dissolved solids, the type and concentration depends on its source, surface and sub-surface environment, rate of groundwater movement, the residence time, the solubility of minerals present and the amount of dissolved carbon dioxide. In addition to the natural changes, anthropogenic activities such as sewage disposal, agricultural practices, industrial pollution etc. also contribute significantly to changes in groundwater quality. Once the contaminants have entered to the sub-surface geological environment, they may remain concealed for many years and may get dispersed over wide areas. Weathering of rock and mineral solubility controls the major ion composition of groundwaters. With increasing anthropogenic activities, a substantial amount of dissolved matter is added to groundwater.

In the chemical lab of SECR, Chennai, a total of 4630 samples were analyzed for basic parameters and heavy metals involving 33134 constituents under National Hydrograph Network station, Aquifer mapping, Exploration, Reappraisal, Pollution studies and others for the period of April 2022 to March 2023 and this report has been prepared based on analytical data of 1199 samples collected from National Hydrograph Network stations/ Groundwater Monitoring wells.

In general, the groundwater quality in the state is fresh in about 16.5 % of the Groundwater Monitoring wells as indicated by the EC value less than 750 µS/cm at 25ºC. In about 59.4 % of the Groundwater Monitoring wells, the EC varies between 751 - 2250 µS /cm at 25^{o} C and 11.7 % of Groundwater Monitoring wells are between 2251 and 3000 µS /cm at 25^{o} C indicating that the groundwater is slightly mineralized and about 12.4 % of Groundwater Monitoring wells the EC is more than 3000 µS /cm at 25ºC indicating that the groundwater is highly mineralized. The highest value 19,850 µS /cm at 25^{o} C was observed in Nenmeni1, Virudhunagar districts.

The chloride content is less than 250 mg/L in about 57 % of the sample analyzed and 39 % of the sample are between 251 – 1000 mg/L and 4% shows more than 1000mg/L which are from Kancheepuram, Thiruvallur, Karur, Namakkal, Perambalur, Salem, Tirupur, Thiruvarur Ramanathapuram, Pudukotai, Tuticorin and Virudhunagar the districts.

The Fluoride content is less than 1.5 mg/L in about 90 % of the sample analyzed and about 10 % of the sample shows more than 1.5 mg/L, which are from Coimbatore, Dharmapuri, Dindigul, Erode, madurai, Namakkal, Perambalur, Pudukottai, Ramanathapuram, Salem, Tirunelveli, Sivaganga, Theni, Tuticorin and Virudhunagar the districts.

The Nitrate content is less than 45mg/L in about 62 % of the sample analyzed and 38 % of sample shows more than 45 mg/L which are from all the districts except Nilgiris district.

A baseline study was carried out in the year 2019 for Uranium with other heavy metals like iron, arsenic etc in shallow groundwater in the state of Tamil Nadu and UT of Puducherry to assess the heay metal contamination. A total of 1208 samples were collected and analysed for Iron and found that iron concentration was morethan the permissible limit of 0.3 mg/L was noticed in 57 wells (4.7%). Arsenic concentration was morethan the permissible limit of 0.01 mg/L was noticed in 16 wells (1.3%) which are mostly from the Coastal district of Chennai, Tiruvallur, Cuddalore, Nagapattinam, and Ramanathapuram. Uranium concentration was morethan the permissible limit of 0.03 mg/L was noticed in 33 wells (2.7%) which are mainly from Chennai, Cuddalore, Erode, Krishnagiri, Perambalur, Pudukottai, Salem Sivaganga, Tiruvallur, Trichy, Tuticorin and Virudhunagar.

The groundwater suitability for irrigation has been evaluated based on salinity, Sodium Adsorption Ratio (SAR), and Residual Sodium Carbonate (RSC). It is observed that it can be seen that in Tamil Nadu and UT of Puducherry 91.8% collected water samples are associated with RSC values less than 1.25 and are safe for use in irrigation practices. Only 3.8% water samples are associated with RSC values more than 2.5 and are unsuitable for irrigation which are from Coimbatore, Dharmapuri, Kancheepuram, Madurai, Pudukottai, Sivagangai, Tiruvannamalai, Tiruvallur, Tuticorin and Virudhunagar districts. The overall probable causes of groundwater quality deterioration in Tamil Nadu are due to natural hydrogeological conditions, over exploitation of groundwater, improper disposal of domestic and industrial waste and lack of public awareness.

The water treatment options may involve physical, chemical, and biological processes. The specific treatment processes for treatment of selective constituents including defluoridation, removal of nitrate, iron and heavy metals can be used as “Groundwater treatment options”. Recommendations based on the groundwater surveys have been presented at the end of the report.

STATE REPORT ON GROUNDWATER QUALITY IN TAMILNADU & U. T. OF PUDUCHERRY

1.0 INTRODUCTION

Evaluation of groundwater quality is as important as its quantity for assessment of groundwater resources. Groundwater is never pure and contains varying amounts of dissolved solids, the type and concentration of which depends on its source, surface and sub-surface environment and rate of groundwater movement. The chemical qualityof groundwater is a function of the quality of the recharge water and the reactions that occur along its flow path, particularly between the moving fluid and the geologic materials. The concentrations of various chemical constituents in groundwater depend on the solubility of minerals present, the residence time and the amount of dissolved carbon dioxide. In addition to the natural changes, anthropogenic activities such as sewage disposal, agricultural practices, industrial pollution etc. also contribute significantly to changes in groundwater quality.

Groundwater has unique features, which render it particularly suitable for public water supply. It has excellent natural quality and is usually free from pathogens, colour and turbidity. Hence, it can be consumed directly without treatment. Due to frequent failure of monsoon, surface water resources cannot be relied as a sustainable source of water supply. This adds a greater demand on groundwater in different sectors. Groundwater is widely distributed and can be frequently developed incrementally at points near the water demand, thus avoiding the need for large scale storage, treatment and distribution system. Groundwater is particularly important as it accounts for about 88%safe drinking water in rural areas, where population is widely dispersed and the infrastructure needed for treatment and transportation of surface water does not exist. Groundwater plays an important role in agriculture and it is estimated that about 45%of irrigation water requirement is met from groundwater sources. Industrial demands for groundwater are also high, as many of its qualities (low salinity, low turbidity, lack of pathogens) makes it suitable for use either as raw water or after treatment. Unfortunately, the availability of groundwater is not unlimited nor is it protected from deterioration. In most of the instances, the extraction of excessive quantities of groundwater has resulted in drying up of wells, damaged ecosystems, land subsidence,

salt-water intrusion, and depletion of the resource. Groundwater quality is being increasingly threatened by agricultural, urban and industrial wastes, which leach or are injected into underlying aquifers.

With the increasing pace of industrialization and urbanization, groundwater contamination has become a growing global concern. People contaminate groundwater and it needs to be protected by the people to ensure that clean and safe groundwater is available to the society now and in future. Once it is contaminated, it is very difficult to remediate. Contamination in groundwater will last for a very long time because of slow movement of groundwater. Furthermore, the time lag between introduction of a contaminant into the hydrologic cycle and its appearance in groundwater may deceive the public regarding its real threat to the groundwater quality. In order to meet the demands of the growing population, there is an urgent need for proper study of changing groundwater quality including groundwater pollution. Pollution of water may be defined as "any undesirable change in physical, chemical, physiological or biological characteristics of natural water, directly or indirectly as the result of the activities of man so that they become less useful or will harmfully affect human life or that of any other desirable species, or industrial processes, living conditions or cultural assets or that may or will waste or deteriorate our water resources" (Handa, 1975- As quoted in CGWB 1996). The pollution can be point pollution or non-point pollution and in former, the pollution is caused at a point whereas in the latter, it is difficult to specify single point of entrance of pollutants.

Generally, shallow aquifers (Phreatic zone) are vulnerable for contamination thandeeper or fractured zones. Municipal and industrial wastes, chemical fertilizers, herbicides and pesticides enter the soil, infiltrate into the aquifer and degrade groundwater quality. Other pollution sources include sewer leakage, faulty septic tank operation and landfill leachates. In some coastal areas, intensive pumping of fresh groundwater has caused salt-water intrusion into fresh water aquifers. Groundwater is less susceptible to bacterial pollution than surface water because the soil and rocks through which groundwater flows, screen out most of the bacteria. Bacteria, however, occasionally find their way into groundwater, sometimes in seriously high concentrations.

Mode and Mechanism of Groundwater Pollution

The movement of pollutants downward towards saturated zone through the zone of aeration follows the same laws that control groundwater movement. The pollutants can enter the aquifer by the process of infiltration and through percolation it migrates into zone of saturation. Its entry and movement, however, is influenced by a large number of geological conditions prevailing in the affected area. The topography of land surface has an important influence. Sedimentary formations which exhibit gradational changes both in horizontal and vertical directions, in the size and character of material deposited determine the permeability which affects the occurrence and movement of water through the media. Hence, under favourable conditions shallow aquifers are mostsusceptible to contamination since these are directly in contact with the surface sourcesof pollution.

The sewage and fluid material enter the ground both intentionally and unintentionally. Septic tanks, cesspools, and systems where sewage water is applied to land for crop irrigation, groundwater recharge, or simply disposal come under pollution sources, created by man. Induced recharge generated in the tube wells while pumping is also responsible for the percolation of contaminated surface water to the aquifers. The unintentional entry of sewage into groundwater environment includes leakage from sewers and seepage from sewage lagoons.

Reactions in the top soil, vadose and saturated zones are certain factors which control groundwater pollution. During the movement, pollutants may undergo changes due to various physical and chemical processes. The physical processes that cause changes are dilution, dispersion and filtration whereas the chemical processes are complexation, acid-base reaction, oxidation-reduction, precipitation-dissolution, adsorption-desorption etc and the biochemical processes are respiration, photosynthesis, humus decay etc.

These processes may cause attenuation of pollutants to some extent depending on extent of reaction that takes place and the local conditions prevailing in the area.

It may take considerable time to reach saturated zone depending upon the above existing factors in the area. On reaching the saturated zone the pollutants may undergo various changes. The factors affecting movement of pollutants in the saturated zone are
1) hydraulic conductivity, 2) moisture content of the soil, 3) relative proportion of

active pore spaces to inactive space 4) degree of heterogeneity of the soil 5) boundary conditions of the unsaturated zone 6) recharge due to rainfall in the area.

During the movement of the solute through unsaturated zone with the percolating water, it spreads out due to dispersion. This takes considerable time to reach the saturated zone. On reaching the saturated zone, the pollutants spread out laterally and moves in the direction of groundwater flow. The pollutants on reaching the top of the aquifer at the water table either move into the aquifer or remain immiscible due to density difference. The important factors which affect the movement of contaminants in saturated zone are as follows.

Convection

Transfer of pollutants by water moving with the same velocity and direction as the contaminants is convection. The convection motion of pollutant depends ongroundwater flow field, which is a function of head distribution, hydraulic conductivity and the sources.

Dispersion

The mixing of pollutant with groundwater in the aquifer is not only due to density effect but also as a result of dispersion. Molecular diffusion takes place to a small extent as a result of mixing of two adjacent miscible liquids even if there is no flow. Mechanical dispersion results in spreading caused by velocity variations and are more predominant than molecular dispersion.

The sources, which are responsible for groundwater pollution, are:

Urban Pollution

- Municipal Dumps and sanitary landfills
- Septic tanks and soak pits
- Municipal liquid wastes

Industrial Pollution

- Industrial solids and liquid waste disposal
- Dumping of solid wastes as landfill
- Petroleum products
- Metal wastes – the seepage of plating wastes containing Cadmium (Cd) and hexavalent Chromium (Cr(VI))
- Disposal of oil filed brines

- Fly ash from thermal power plants

Agricultural Pollution

- Agricultural wastes – plant residues
- Animal wastes – manures
- Fertilizers, Pesticides and Herbicides

Salt-Water Intrusion

- Uncontrolled pumping of groundwater in coastal areas

Pollution due to Radioactive Substances

- Physical pollutants discharged from atomic reactors, mining and milling of radioactive ores, chemical reprocessing etc.

1.1 Purpose and Scope

Tamil Nadu is one of the water scarce States and it is one of States having water quality problem especially the natural occurrence of fluoride in groundwater. In this context, an attempt has been made in this report to compile and processes the data related to groundwater quality of Tamil Nadu, collected during various investigations carried out by officers of Central Groundwater Board, South Eastern Coastal Region, Chennai over the years. Efforts have also been made to arrive at inferences regarding the spatial and temporal variations in the concentration of various contaminants in groundwater. This report is intended to be of use as a reference and guide for administrators, planners and scientists working in the field of sustainable groundwater management in Tamil Nadu.

1.2 Location and Extent

Tamil Nadu State lies between Latitudes 08^0 00‟ and 13^0 30‟ and Longitudes 76^0 15‟ and 80^0 18‟. The State is bounded by Bay of Bengal in the east, the Indian Ocean in the south, Western Ghats in the west and the States of Andhra Pradesh and Karnataka in the north. The total geographical area of State is 1,30,058 Sq. km.

1.3 Physiography

Tamil Nadu State can be divided into four physiographic divisions viz., (i) the Coastal Plains, (ii) the Eastern Ghats, (iii) the Central Plateau and (iv) the Western Ghats**.**

The coastal plains stretch over a distance of 998 km from Pulicat lake in the north to Kanyakumari in the south with an elevation of 2 to 30 m above MSL. The plains consist of Coromandal Coast in the north, alluvial plains of Cauvery delta in the center and southern plains in Pudukkottai - Kanyakumari belt.

The chain of flat-topped hills of Javadis, the Shevroy; the Kalrayan and Pachamalai hills, which join Cardomom hills in the south form the Eastern Ghats. These hills rise steeply above plateau level to 1160 m above MSL in the Javadi hills to 1645 m above MSL in the Shevroy hills.

The Central plateau located between Western Ghats and Eastern Ghats has an undulating topography with an average elevation of 150 m to 160 m above MSL. Westof this region lies the broad Palghat Gap between the Nilgris and Anaimalai hills. Between Cauvery and the Palghat Gap lies an extensive low plateau rising gradually from 120 to 180 m above MSL.

1.4 Drainage

Tamil Nadu is drained by a number of major and minor rivers, mostly originating in the Western Ghats and flow eastwards. The main rivers are the Palar, Ponnaiyar, Vellar, Cauvery, Vaigai, Tambraparni, Gundar, Vaippar and Nambiyar. Cauvery and Tambraparni are perennial rivers and the rest are ephemeral. The Cheyyar, Bhavani, Korattalaiyar, Amaravati, Noyil, Aliyar, Sholiyar and Parambikulam are the othersmall rivers in the State. Pulicat lake and Kaluveli tank are important lagoons.

1.5 Climate and Rainfall

Tamil Nadu, basically, has a tropical climate. The maximum temperature in summer is often higher than 43^0C and the minimum is a little lower than 18^0C.

There are four rainfall seasons in the state viz (i) Winter season (Jan-February), (ii) Hot weather season (March-May), (iii) South-west monsoon (June-September) and (iv) North-east monsoon (October-December).

The annual rainfall of the state is 1020 mm and co-efficient of variation is 20 to 30 per cent increasing from west to east and is about 40 per cent in the extreme south-eastern part. The number of rainy days varies from 53 over the State to less than 40 days in the southwestern part. 75 percent of the area falls in rain shadow region where the annual rainfall ranges from 508 to 1016 mm with an average of 842.2 mm and thus constitutes a semiarid region.

1.6 Industries

There are different types of industrial activities being carried out by 24,130 working factories in Tamil Nadu. Major industrial activities are grouped and given in Table - 1.1. About 30 major activities are being carried out all over Tamil Nadu. However,

certain groups of activities are prominent in certain districts only due to variousfactors, which determine economics of industrial activities such as availability of raw materials, labour, transport, communication and access to shipment/air and other infrastructure facilities. The industries, which are prominent in particular districts are given in Table – 1.2.

Table - 1.1. Group of Major Industrial Activities

S. No.	Description of Industry
1	Agriculture, hunting and related Service Activities
2	Manufacture of Food Products and Beverages
3	Manufacture of Tobacco Products
4	Manufacture of Textiles
5	Manufacture of Wearing Apparel Dressing and Dyeing of Fur
6	Tanning and Dressing of Leather, Manufacture of Luggage, Handbags, Saddlery, Harness and Footwear
7	Manufacture of Wood and of products of wood and Cork except Furniture, Manufacture of Articles of Straw and Plating Materials
8	Manufacture of paper and paper products
9	Publishing, Printing and Reproduction of Recorded Media
10	Manufacture of Coke, Refined Petroleum Products and Nuclear Fuel
11	Manufacture of Chemical and Chemical Products
12	Manufacture of Rubber and Plastics Products
13	Manufacture of other Non-metallic Mineral Products
14	Manufacture of Basic Metals
15	Manufacture of Fabricated Metal Products except Machinery and Equipments
16	Manufacture of Machinery and Equipment NEC
17	Manufacture of Office, Accounting and Computing Machinery
18	Manufacture of Electrical Machinery and Apparatus NEC
19	Manufacture of Radio, Television and Communication Equipment
20	Manufacture of Medical, Precision and Optical Instruments
21	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
22	Manufacture of Other Transport Equipment
23	Manufacture of Furniture, Manufacturing of NEC
24	Electricity, Gas, Steam and Hot Water supply
25	Collection, Purification and Distribution of Water
26	Sale, Maintenance and Repair of Motor Vehicles and Motor
27	Retail Trade except of Motor Vehicles and Motor Cycles, Repairs of Personal and Household Goods
28	Supporting and Auxiliary Transport activities of Travel agencies

(Source: Dept. of Economics and Statistics, Chennai)

Table – 1.2. District–wise Major Industrial Activities in Tamil Nadu

S. No.	District	Major Industrial Activities
1	Tiruvallur	Petro Chemical based Industries (Manali Area)
2	Kancheepuram	Leather Products (Chrompet Area)
3	Cuddalore	Manufacture of Chemical and Chemical Products (Kudikadu)
4	Dharmapuri	Automobile industries (Hosur)
5	Coimbatore	Manufacture of Textiles
6	Vellore	Tanneries
7	Dindigul	Tanneries
8	Erode	Textile Industries (Dyeing & Bleaching)
9	Trichy	Distilleries, Chemical and Tanneries
10	Salem	Sago Industries
11	Namakkal	Sago Industries
12	Karur	Textile Industries (Dyeing & Bleaching)

GROUNDWATER CONDITIONS IN TAMIL NADU AND U. T. OF PUDUCHERRY

2.0 HYDROGEOLOGY

Tamil Nadu State has a diversified geological, climatological and topographic set up, giving rise to divergent groundwater situations in different parts of the state. The prevalent rock formations ranging in age from Archaean to the Recent, which control occurrence and movement of groundwater, are widely varied in composition and structure. Similarly, not too insignificant are the variations of landforms, from the rugged mountainous terrains of the Eastern and part of Western Ghats to the flat alluvial plains of the river valleys and coastal tracts. The rainfall pattern too shows similar region-wise variations. The topography and rainfall control run off and groundwater recharge. Groundwater occurs under water table to confined conditionsin fractured and porous media. The Aquifer Map of Tamil Nadu depicts the salient features of the hydrogeological environment and aquifer potentials (Fig. 2.1). The high relief areas of the western and northwestern regions occupied by the EasternGhats with steep topographic slope and characteristic geological setup offer high run- off and little scope for rainwater infiltrations. The groundwater potential in these terrains is limited to intermontane valleys.

Nearly 73 per cent of the total geographical area of the state is occupied by a variety of hard and fissured crystalline rocks of the Archaean age viz., Charnockites, Gneisses and Granites. Rugged and undulating topography, compact and fissured nature of the rock formations combine to give rise to discontinuous aquifers, with limited to moderate yield potentials. The near surface weathered mantle forms the all important groundwater reservoir and the source for circulation of groundwater through the underling fracture systems. In the hard rock terrain, deep weathered residuum, low lying valleys and abandoned river channels generally contain adequate thickness of porous material to sustain groundwater development under favorable hydrogeological conditions. The aquifer geometry and the fracture pattern as well as fracture conductivity and yield of bore wells are highly variable from place to place. Presence of potential fractures down to 300 m has been identified in the western part of the state comprising Salem, Coimbatore and Dharmapuri districts. However, the deeper fractures are limited to the contact areas of hillocks and are presumably associated with large-scale orogenic activity. Groundwater exploration in the southern part of the

state, comprising Tirunelveli, Tuticorin, Kanyakumari, Madurai, Virudhunagar districts, has revealed the presence of deep fractures down to 200 m along select lineaments and disturbed zones having yields up to 15 liters per second (lps).

The coastal sedimentary tract of the Tamil Nadu forms a part of the Coromandal coast of India. Sedimentary deposits, comprising the semi-consolidated and unconsolidated formations can be broadly grouped into three groups (i.e.) Mesozoic, Tertiary and Quaternary consisting of sandstones, clays, pebbles, gravels, limestones and shales. The fluviatile upper Gondwanas sediments of Jurassic age and the marine beds of Cretaceous age represent the Mesozoic group of rocks in the state. Due to the low transmissivity and compact nature of these formations, they do not contribute much to the groundwater potentialities of the state.

Tertiary formations consisting of porous and permeable Cuddalore sandstones are the most potential sources of groundwater in the state. The aquifers in these formations are highly productive and groundwater generally occurs under confined conditions. Depending upon the topography and thickness of overburden, the piezometric heads vary widely. Auto flowing zones are not uncommon in these formations.

Quaternary sediments in the state are represented by laterite, older alluvium of Pleistocene age and Recent alluvium, „Teris" and coastal sands. The eastern coastal and deltaic tracts of the state are the receptacles of thick alluvial sediments. Major rivers such as Palar, Ponnaiyar, Cauvery and Vaigai have deposited rich alluvium in their deltaic regions. Cauvery alluvium, occupying a major part of the Thanjavur district includes potential alluvial aquifers. Other important alluvial aquifers occur in Kancheepuram, Tiruvallur, Vellore, Pudukkottai and Ramanathapuram districts.

Though highly productive aquifers occur in these tracts, salinity hazards impose quality constraints for groundwater development. In this terrain, the groundwater withdrawal requires to be regulated so as not to exceed annual recharge and not to disturb hydrochemical balance leading to seawater ingress. However, in some cases, excess withdrawal of groundwater to the industrial and urban domestic requirement, seawater ingress has already occurred e.g., North Chennai – Minjur area.

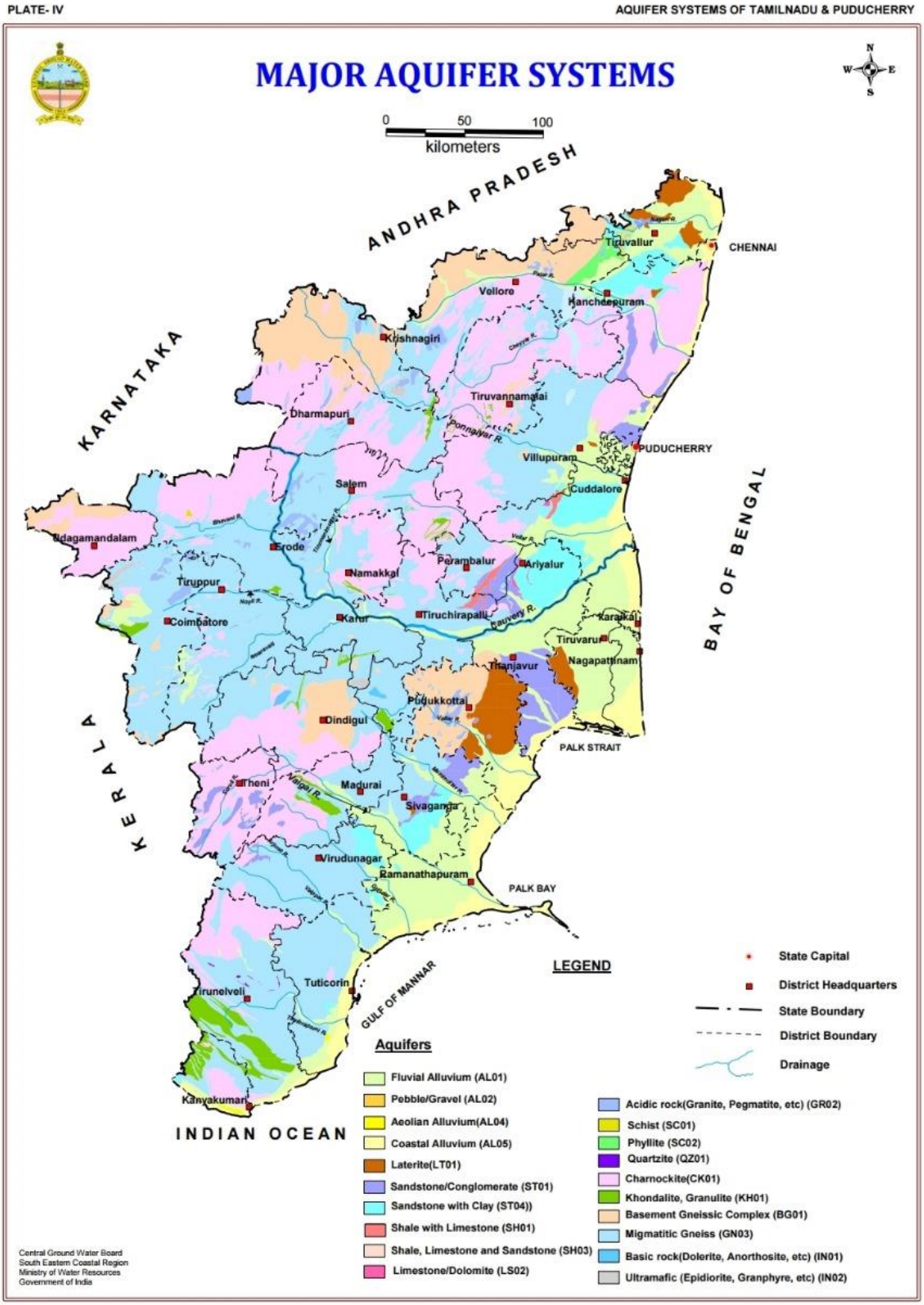

Fig. 2.1. Aquifer Map of Tamil Nadu and U. T. of Puducherry (Puducherry and Karaikal Regions)

The groundwater occurrence in the state may be broadly summarised as:

- Consolidated and fissured formations – Aquifers are heterogeneous and discontinuous with limited yield potentials.
- Sedimentary formations comprising unconsolidated and semi-consolidated sediments - Aquifers homogenous, inter-connected, often extensive, both continuous and discontinuous, moderate to very high yield potentials.

The distribution and potential of the major hydrogeological units are presented in Table – 2.1.

Table – 2.1 Distributions and Potential of Major Hydrogeological Units (CGWB 1996 B)

Geological Age	Rock Formation	Districts / Hydrogeological Characters
Unconsolidated formations Recent	Soils, Beach sands Alluvium (newer)- sands, clays, gravels, silt & calcareous concretions	Occur in the eastern part of the coastal districts of Tamil Nadu. Laterite capping is exposed in the high altitudes of Palani, Nilgris, Shevaroy and Kolli hills. Patches of laterite are seen at the contact of upper Gondwana and Cretaceous formations in Tiruchchirappalli, Tuticorin and Ramanathapuram districts. Recent wind blown sands (Teri sands) are seen in Ramanathapuram and Tuticorin districts. Recent alluvium comprising clay, sand, gravel and pebble are seen in the deltaic regions and coastal plains. Older alluvium is relatively compact.
Pleistocene	Boulder Conglomerates Alluvium (older, sands, clays & laterite.	The alluvia of the major rivers comprising a thick sequence of sand form potential aquifers. The Cauvery alluvium occupying a major part of Thanjavur district has potential alluvial aquifers. Other important alluvial aquifers occur in Kancheepuram, Vellore, Pudukkottai, Ramanathapuram and Madurai districts. The aquifers are of highly variable nature in thickness from place to place. Groundwater occurs under both water table and confined conditions. Important and potential granular zones occur between the depth ranges of 7 to 70m bgl. The yield depends on the potentiality of the aquifer and in general, ranges from 15 to 50m^3/hr. The transmissivity of the aquifer varies from 4,800-10,000 m^2/day. Groundwater

		potential is limited by salinity hazards
Semi consolidated Formations Tertiary	Karaikkal Beds-Sands and clays with fossils Cuddalore sand stones-Mottled & friable sand stones, buff colored clays & gravel. Cretaceous-Arenaceous limestones & sandstones, clays shell limestones Basal limestones & Coral rags.	Sandstones of Upper Cretaceous occur in Vanur area of Cuddalore & Ariyalur area of Perambalur districts and possess promising granular zones worthy of groundwater development. Groundwater occurs both under water table & confined conditions. The yields of the shallow tube wells are moderate (25 m to 40m^3/hr for a draw down of 5 to 8m). The transmissivity & permeability of the aquifers of the Vanur sandstones vary from 1.6 to 829m^2/day & 0.038 to 12.6m/day respectively. Yields of tube wells with depths ranging from 60 to 180m, in parts of Ariyalur, Perambalur districts vary between 45 & 65m^3/hr for draw downs of 2 to 3 m. Tertiary formations are potential source of groundwater in the State. The Cuddalore Sandstones of Miocene age contain highly permeable aquifers. Primary porosity and hydraulic conductivity are moderate to high. Groundwater generally occurs under confined conditions. It is under high pressure and Free flowing conditions occur notably in Cuddalore district, Cauvery delta of Thanjavur district, eastern part of Pudukkottai district and northeastern part of Ramanathapuram district with free flow of up to 4.5m^3/min. (270 m^3/hr). Water levels of wells tapping non-flowing confined aquifers vary widely depending upon the topography, thickness of over burden and piezometric head difference. In general it is up to 44m bgl and at places is as deep as 53m bgl. The discharges vary from 27 to 212m^3/hr. The transmissivity varies between 150 and 4000m^2/day. The Storativity ranges from 5.0 $X10^{-6}$ to 5.5$X10^{-5}$. The groundwater in Cuddalore sandstones in the eastern part of the coastal tract of Thanjavur, Pudukkottai and Ramanathapuram districts are generally saline.

3.0 HYDROCHEMISTRY

Hydrochemistry is an interdisciplinary science that deals with the chemistry of water in the natural environment. Professional fields such as chemical hydrology, aqueous chemistry, hydrochemistry, water chemistry and hydro-geochemistry are all more or less synonyms. The classical use of chemical characteristics in chemical hydrology is to provide information about the regional distribution of water qualities. At the same time, hydrochemistry has a potential use for tracing the origin and history of water. The hydrochemistry can also be of immense help in yielding information about the environment through which water has circulated. Hydrochemistry can be helpful in knowing about residence times, flow paths and aquifer characteristics as the chemical reactions are time and space dependent. It is essential to study the entire system like atmospheric water (rainwater), surface water and ground water simultaneously in evaluating their hydrochemistry and pollution effect.

3.1 Chemistry of Rainwater

The atmosphere is composed of water vapors, dust particles and various gaseous components such as N_2, O_2, CO_2, CH_4, CO, SO_x, NO_x etc. Pollutants in the atmosphere can be transported long distances by the wind. These pollutants are mostly washed down by precipitation and partly as dry fall out. Composition of rainwater is determined by the source of water vapors and by the ion, which are taken up during transport through the atmosphere. In general, chemical composition of rainwater shows that rainwater is only slightly mineralized with specific electrical conductance (EC) generally below 50 µS/cm, chloride below 5 mg/l and HCO_3 below 10 mg/l. Among the cations, concentration of Ca, Mg, Na & K vary considerably but the total cations content is generally below 15 mg/l except in samples contaminated with dust. The concentration of sulphates and nitrates in rainwater may be high in areas near industrial hubs.

3.2 Chemistry of Surface Water

Surface water is found extremely variable in its chemical composition due to variations in relative contributions of ground water and surface water sources. The mineral content in river water usually bears an inverse relationship to discharge. The mineral content of river water tends to increase from source to mouth, although the increase may not be continuous or uniform. Other factors like discharge of city wastewater, industrial waste and mixing of waters can also affect the nature and concentration of minerals in surface water. Among anions, bicarbonates are the most important and constitute over 50% of the total anions in terms of milli equivalent per liter (meq/l). In case of cations, alkaline earths or normally calcium predominates but with increasing salinity the hydrochemical facies tends to change to mixed cations or even to Na-HCO_3 type.

3.3 Chemistry of Ground Water

The downward percolating water is not inactive, and it is enriched in CO_2. It can also act as a strong weathering agent apart from general solution effect. Consequently, the chemical composition of ground water will vary depending upon several factors like frequency of rain, which will leach out the salts, time of stay of rain water in the root-zone and intermediate zone, presence of organic matter etc. It may also be pointed out that the water front does not move in a uniform manner as the soil strata are generally quite heterogeneous. The movement of percolating water through larger pores is much more rapid than through the finer pores. The overall effect of all these factors is that the composition of ground water varies from time to time and from place to place.

Before reaching the saturated zone, percolating water is charged with oxygen and carbon dioxide and is most aggressive in the initial stages. This water gradually loses its aggressiveness,

as free CO_2 associated with the percolating water gets gradually exhausted through interaction of water with minerals.

$$CO_2 + H_2O \longleftrightarrow H_2CO_3 \longleftrightarrow H^+ + HCO_3^-$$

$$H^+ + \text{Feldspar} + H_2O \longrightarrow \text{Clay} + H_4SiO_4 + \text{Cation}$$

The oxygen present in this water is used for the oxidation of organic matter that subsequently generates CO_2 to form H_2CO_3. This process goes on until oxygen is fully consumed.

$$CH_2O + O_2 = CO_2 + H_2O$$
(Organic matter)

Apart from these reactions, there are several other reactions including microbiological mediated reactions, which tend to alter the chemical composition of the percolating water. For example, the bicarbonate present in most waters is derived mostly from CO_2 that has been extracted from the air and liberated in the soil through biochemical activity. Some rocks serve as sources of chloride and sulphate through direct solution. The circulation of sulphur, however, may be greatly influenced by biologically mediated oxidation and reduction reactions. Chloride circulation may be a significant factor influencing the anion content in natural water.

4.0 WATER QUALITY CRITERIA

The available quality of groundwater is the resultant of all the processes and reactions, which taken place since the condensation of water in the atmosphere to the time it is retrieved in the form of groundwater from its source. The water has excellent capability to accumulate substances in soluble form as it moves over and into the land resource, from the biological processes and from human activities. Urbanization, agricultural development and discharges of municipal and industrial residues significantly alter characteristics of groundwater resource. The prevailing climatic conditions, topography, geological formations and use and abuse of this vital resource have significant effect on the characteristics of the water, because of which its quality varies with locations.

The definition of criteria and standards for water quality vary with the type of use. The characteristic of water required for human consumption, livestock, irrigation, industries etc have different water quality requirements. The term water quality criteria may be defined as the “Scientific data evaluated to derive recommendations for characteristics of water for specific use’. The term standard applies to any definite rule, principle or measure established by any statutory Authority. The distinction between criteria andstandards is important, as the two are neither interchangeable nor they become synonyms for the objective or goal. Realistic standards are dependent on criteria, designated uses and implementation as well as identification and monitoringprocedure. The changes in all these factors may provide a basis for alteration instandards. In formulation of water quality criteria, the selection of water quality parameters depends on its use. Sayers, et. al. (1976 as quoted in CGWB & CPCB2000) identified the key water quality parameters according to its various uses **(Table 4.0).**

Table 4.0: Water quality criteria parameters for various uses (Sayers et.al., 1976)

Public Water supply	Industrial Water supply	Agricultural water supply	Aquatic life & wild life water supply	Recreation and Aesthetics
Coliform bacteria Turbidity colour, Taste, Odour TDS, CI, F, SO_4 NO_3, CN, Trace Metals, Trace Organics Radioactive substances	**Processing** pH, Turbidity Colour, Alkalinity, Acidity, TDS, Suspended solids, Trace metals, Trace Organics **Cooling** PH, Temp, Silica, AI, Fe, Mg, Total hardness, Alkalinity / Acidity Suspended solids, Salinity	Farmstead Same as for public supply Live-stock Same as for public supply Irrigation TDS, EC, Na, Ca, Mg, K, B, CI and Trace metals	Temp, DO, pH, Alkalinity, Acidity, TDS Salinity, pH, DCOs, Turbidity Colour, Settleable materials, Toxic substances, Nutrients, Floating materials	Recreations Tem, Turbidity, Colour, Odour, Floating Materials, Settable Materials Nutrients, Coliforms Aesthetics Same as for Recreation and Substances adversely affecting wild life

4.1 WATER QUALITY CRITERIA FOR DRINKING PURPOSE

With the objective of safeguarding water from degradation and to establish a basis for improvement in water quality, standards / guide lines / regulations have been laid down by various national and international organizations such as; Bureau of Indian Standards (BIS), World Health Organization (WHO), European Economic Community (EEC), Environmental Protection Agency (EPA), United States, and Inland Waters Directorate, Canada. The Bureau of Indian Standards (BIS) earlier known as Indian Standards Institutions (ISI) has laid down the standard specification for drinking water during 1983, which have been revised and updated from time to time. In order to enable the users, to exercise their discretion towards water quality criteria, the maximum permissible limit has been prescribed especially where no alternative sources are available. The national water quality standards describe essential and desirable characteristics required to be evaluated to assess suitability of water for drinking purposes. The important water quality characteristics as laid down in BIS standard (IS 10500: 2012) are summarized in **Table - 4.1**

Table 4.1: Drinking Water Characteristics (IS 10500: 2012)

S. No.	Parameters	Desirable Limits (mg/L)	Permissible limits (mg/L)
Essential Characteristics			
1	Colour Hazen Unit	5	15
2	Odour	Unobjectionable	-

3	Taste	Agreeable	-
4	Turbidity (NTU)	1	5
5	pH	6.5-8.5	No relaxation
6	Total Hardness, $CaCO_3$	200	600
7	Iron (Fe)	1.0	No relaxation
8	Chloride (Cl)	250	1000
9	Residual Free Chlorine	0.2	-
10	Fluoride (F)	1.0	1.5
Desirable Characteristics			
11	Dissolved Solids	500	2000
12	Calcium (Ca)	75	200
13	Magnesium (Mg)	30	100
14	Copper (Cu)	0.5	1.5
15	Manganese (Mn)	0.1	0.3
16	Sulphate (SO_4)	200	400
17	Nitrate (NO_3)	45	No relaxation
18	Phenolic Compounds	0.001	0.002
19	Mercury (Hg)	0.001	No relaxation
20	Cadmium (Cd)	0.003	No relaxation
21	Selenium (Se)	0.01	No relaxation
22	Arsenic (As)	0.01	No relaxation
23	Cyanide (CN)	0.05	No relaxation
24	Lead (Pb)	0.01	No relaxation
25		5.0	15
26	Hexavalent Chromium	0.05	No relaxation
27	Alkalinity	200	600
28	Aluminum (Al)	0.03	0.2
29	Boron (B)	1.0	5.0
30	Pesticides	Absent	0.001
31	Uranium	0.03	No relaxation

NTU- Nephelometric Turbidity Unit.

N.B. The fluoride limits vary with average annual temperature of the areas. Similarly, the limits for magnesium are based on sulphate contents of water. When sulphate content is 250 mg/L or above, the magnesium should be between 30 and 50 mg/L but ifsulphate is lower, higher content of magnesium is permissible.

4.2 WATER QUALITY CRITERIA FOR IRRIGATION PURPOSE

Water quality plays a significant role in irrigated agriculture. Many problems originate due to inefficient management of water for agriculture use, especially when it carries high salt loads. The effect of total dissolved salts in irrigation water (measured in terms of electrical conductance) on crop growth is extremely important. Soil water passes in to the plant through the root zone due to osmotic pressure and the plants root able to assimilate water and nutrients. Thus, the dissolved solid contents of the residual water in the root zone also have to be maintained within limits by proper leaching. These effects are visible in plants by their stunted growth, low yield, discoloration and even leaf burns at margin or top. The safe limits of electrical conductivity for crops of different degrees of

salt tolerances under varying soil textures and drainage conditions are presented in **Table - 4.2.**

Table 4.2: Safe Limits for electrical conductivity for irrigation water (IS:11624-1986)

S. No.	Nature of soil	Crop Growth	Upper permissible safe limit of electrical conductivity in water μs/cm at 25°C
1	Deep black soil and alluvial soils having clay content more than 30%; soils that are fairly to moderately well Drained	Semi-tolerant	1500
		Tolerant	2000
2	Textured soils having clay contents of 20-30%; soils that are well drained internally and have good surface drainage system	Semi-tolerant	2000
		Tolerant	4000
3	Medium textured soils having clay 10-20%; internally very well drained and having good surface drainage system	Semi-tolerant	4000
		Tolerant	6000
4	Light textured soils having clay lessthan 10%; soils that have excellent internal and surface drainage system.	Semi-tolerant	6000
		Tolerant	8000

In addition to problems caused by total amount of salts, some of the specific ions like sodium, boron and trace elements, if present in water in excess, also render it unsuitable for agricultural use.

4.2.1 Sodium ADSORPTION RATIO (SAR) & RESIDUAL SODIUM CARBONATE (RSC)

The clay minerals in the soil adsorb divalent cations like calcium and magnesium ions from irrigation water. Whenever the exchange sites in clay are filled by divalent cations, the soil texture is conducive for plant growth. Sodium reacts with soil to reduce its permeability. In case the irrigation water is sodium dominant, the clay lattice is filled with sodium ions due to ion exchange. Such soils become impermeable and sticky and as such the cultivation becomes difficult to support plant growth. However, the cation exchange process is reversible and can be controlled either by adjusting the composition of water or by soil amendment by application of gypsum, which releases cations (Calcium) to occupy the exchange position. The tendency of water to replace adsorbed calcium and magnesium with sodium can be expressed by the Sodium Adsorption Ratio (SAR), where all the ion concentrations are in milli-equivalents per litre (meq/L).

$$\mathbf{SAR} = \frac{\mathbf{Na}}{\sqrt{(\mathbf{Ca} + \mathbf{Mg})/2}}$$

When, water having high bicarbonates and low calcium and magnesium is used for irrigation purpose, precipitation of calcium and magnesium as carbonate takes place, changing the residual water to high sodium water with sodium bicarbonate in solution. It is termed as Residual Sodium Carbonate (RSC) which is expressed as;

$$\mathbf{RSC} = (\mathbf{HCO3} + \mathbf{CO3}) - (\mathbf{Ca} + \mathbf{Mg})$$

(Where all the ions' concentrations are in milli equivalents / litre).

Percentage sodium (%Na):

Percentage sodium (%Na) is an indication of the soluble sodium content of the groundwater and also used to evaluate sodium hazard. In all natural waters, %Na is a common parameter to assess its suitability for irrigation purposes since sodium reacts with the soil to reduce permeability.

$$\%\mathbf{Na} = \frac{(\mathbf{Na} + \mathbf{K})}{(\mathbf{Ca} + \mathbf{Mg} + \mathbf{Na} + \mathbf{K})} * \mathbf{100}$$

The quality of water is commonly expressed by classes of relative suitability for irrigation with reference to salinity levels. The recommended classification with respect to Electrical Conductivity, Sodium content, Sodium Adsorption Ratio, and Residual Sodium Carbonate, under customary irrigation conditions has been depicted in **Table - 4.2.1**

Table 4.2.1: Guidelines for evaluation of quality of irrigation water

Water Class	Alkalinity hazards		
	SAR	RSC (meq/L)	%Na
Low	< 10	< 1.25	< 20
Medium	>10 – 18	>1.25 – 2.5	20 - 60
High	>18 – 26	>2.5	> 60
Very High	> 26		

4.3 EFFECTS OF WATER QUALITY PARAMETERS ON HUMAN HEALTH AND DISTRIBUTION FOR VARIOUS USERS

It is essential to ensure that various constituents are within prescribed limits in drinkingwater supplies to avoid impact on human health **(Table – 4.2.3)**. Man, life forms and domestic animals are affected by alteration in water quality due to natural or anthropogenic reasons. The effect of these substances depends on the quantity of water consumed per day and their concentration in water.

Table 4.2.3: Effects of water quality parameters on human health when used for drinking Purpose

S. No.	Parameters	Prescribed limits IS:10500, 2012		Probable Effects
		Desirable Limit	Permissible Limit	
1	Colour (Hazen unit)	5	15	Makes water aesthetically undesirable
2	Odour	Essentially free from objectionable odour		Makes water aesthetically undesirable
3	Taste	Agreeable		Makes water aesthetically undesirable

S. No.	Parameters	Prescribed limits IS:10500, 2012		Probable Effects
		Desirable Limit	Permissible Limit	
4	Turbidity (NTU)	1	5	High turbidity indicates contamination / Pollution.
5	pH	6.5	8.5	Indicative of acidic or alkalinewaters, affects taste, corrosivity and the water supply system
6	Hardness as$CaCO_3$ (mg/L)	200	600	Affects water supply system (Scaling), Excessive soap consumption, and calcification of arteries. There is no conclusive proof but it may cause urinary concretions, diseases of kidney or bladder and stomach disorder.
7	Iron (mg/L)	1.0	No relaxation	Gives bitter sweet astringent taste, causes staining of laundry and porcelain. In traces it isessential for nutrition.
8	Chloride(mg/L)	250	1000	May be injurious to some people suffering from diseases of heart or kidneys. Taste, indigestion, corrosion and palatability are affected.
9	Residual Chlorine (mg/L) Only when water is Chlorinated	0.20	-	Excessive chlorination of drinking water may cause asthma,colitis and eczema.
10	Total Dissolved Solids-TDS (mg/L)	500	2000	Palatability decreases and may cause gastro intestinal irritation inhuman, may have laxative effect particularly upon transits and corrosion, may damage water system.
11	Calcium (Ca)(mg/L)	75	200	Causes encrustation in water supply system. While in sufficiency causes a severe type of rickets, excess causes concretions in the body such as kidney or bladder stones and irritation in urinary passages.
12	Magnesium (mg) (mg/L)	30	100	Its salts are cathartics and diuretic. High concentration may have laxative effect particularly on new users. Magnesium deficiency is associated with structural and functional changes.It is essential as an activator of many enzyme systems.

S. No.	Parameters	Prescribed limits IS:10500, 2012		Probable Effects
		Desirable Limit	Permissible Limit	
13	Copper (Cu)(mg/L)	0.5	1.50	Astringent taste but essential and beneficial element in humanmetabolism. Deficiency results in nutritional anemia in infants. Large amount may result in liver damage, cause central nervous system irritation and depression. In water supply it enhancecorrosion of aluminum in particular
14	Sulphate (SO_4) (mg/L)	200	400	Causes gastro intestinal irritation along with Mg or Na, can have a cathartic effect on users, concentration more than 750 mg/L may have laxative effect along with Magnesium.
15	Nitrate (NO_3)(mg/L)	45	No relaxation	Cause infant methaemoglobinaemia (blue babies) at very high concentration, causes gastriccancer and affects adversely central nervous system and cardiovascular system.
16	Fluoride (F)(mg/L)	1.0	1.50	Reduce dental carries, very high oncentration may cause crippling skeletal fluorosis.
17	Cadmium (Cd) (mg/L)	0.003	No relaxation	Acute toxicity may be associated with renal, arterial hypertension, itai-itai disease, (a bone disease).Cadmium salt causes cramps, nausea, vomiting and diarhoea.
18	Lead (Pb) (mg/L)	0.01	No relaxation	Toxic in both acute and chronic exposures. Burning in the mouth, severe inflammation of the gastro-intestinal tract with vomiting and diarrhoea, chronic toxicity produces nausea, severe abdominal pain, paralysis, mental confusion, visual disturbances, anaemia etc.
19	Zinc (Zn) (mg/L)	5	15	An essential and beneficial element in human metabolism. Taste threshold for Zn occurs at about 5 mg/L imparts astringent taste to water.

S. No.	Parameters	Prescribed limits IS:10500, 2012		Probable Effects
		Desirable Limit	Permissible Limit	
20	Chromium (Cr^6) (mg/L)	0.05	No relaxation	Hexavalent state of Chromium produces lung tumors can produce cutaneous and nasal mucous membrane ulcers and dermatitis.
21	Boron (B) (mg/L)	0.5	1.00	Affects central nervous system itssalt may cause nausea, cramps, convulsions, coma etc.
22	Alkalinity (mg/L) as $CaCO_3$	200	600	Impart distinctly unpleasant taste may be deleterious to human being in presence of high pH, hardness and total dissolved solids.
23	Pesticides :(m g/l)	Absent	0.001	Imparts toxicity and accumulated in different organs of human body affecting immune and nervous systems may be carcinogenic.
24	Phosphate (PO_4) (mg/L)	No guideline		High concentration may causevomiting and diarrhea, stimulate secondary hyperthyroidism andbone loss
25	Sodium (Na)(mg/L)	No guidelines		Harmful to persons suffering From cardiac, renal andcirculatory diseases.
26	Potassium (K) (mg/L)	No guidelines		An essential nutritional elementbutits excessive amounts is cathartic
27	Silica (SiO_2) (mg/L)	No guidelines		-
28	Nickel (Ni) (mg/L)	0.02		Non-toxic element but may be carcinogenic in animals, can react with DNA resulting in DNAdamage in animals.
29	Pathogens (a)Total coliform (per100ml) (b) Faecal Coliform (per100ml)	nil		Cause water borne diseases like coliform Jaundice, Typhoid, Cholera etc. produce infections involving skin mucous membraneof eyes, ears and throat.
30	Arsenic	0.01	No relaxation	Various skin diseases, Carcinogenic
31	Uranium	0.03	No relaxation	Kidney disease, Carcinogenic

5.0 GROUND WATER QUALITY MONITORING

The International Standard Organization (ISO) has defined monitoring as," The programmed process of samplings, measurements and subsequent recording or signaling or both, of various water characteristics, often with the aim of assessing, conformity to specified objectives". A systematic plan for conducting water quality monitoring is called Monitoring Programme, which includes monitoring network design, preliminary survey, resource estimation, sampling, analysis, data management & reporting.

Monitoring of ground water quality is an effort to obtain information on chemical quality through representative sampling in different hydrogeological units. Ground Water is commonly tapped from phreatic aquifers through dugwells in a major part of the country and through springs and hand pumps in hilly areas. The main objective of ground water quality monitoring programme is to get information on the distribution of water quality on a regional scale as well as lattice is to create a background data bank of different chemical constituents in ground water.

One of the main objectives of the ground water quality monitoring is to assess the suitability of ground water for drinking purpose. The quality of drinking water is a powerful environmental determinant of the health of a community. The problem of the quality of water resources in general, and groundwater resources in particular, is becoming increasingly important in both industrialized and developing nation. In developing countries like India, the essential concerns as regards water resources are their quantity, availability, sustainability and suitability. Groundwater plays a leading role because it has of fundamental importance to all living beings.

Even though water is the most frequently occurring substance on earth, lack of safe drinking water is more prominent in the developing countries. Due to increasing world population, extraction of groundwater is also increasing for irrigations, industries, municipalities and urban and rural households' day by day. During dry season extensive withdrawal of groundwater for irrigation purpose is lowering the water table in the aquifer and also changing the chemical composition of water.

The physical and chemical quality of ground water is important in deciding its suitability for drinking purposes. Bureau of Indian Standards (BIS) formally known as Indian Standard Institute (ISI) vide its document IS: 10500:2012, Edition 3.2 (2012-15) has recommended the quality standards for drinking water. On this basis of classification, the natural ground water of India has been categorized as desirable, permissible and unfit for human consumption.

From the analytical results, it is seen that majority of water samples collected from observation / monitoring wells of CGWB in a major part of the state fall under desirable or permissible category and hence are suitable for drinking purposes. However, a small percentage of well waters are found to have concentrations of some constituents beyond the permissible limits. Such waters are not fit for human consumption and are likely to be harmful to health on continuous use.

5.1 Data Validation / Data Quality Control

Groundwater quality data validation is an essential step in ensuring the reliability and accuracy of the data. Here are some of the main steps for groundwater quality data validation.

a. Checking of Data Consistency: Checking of the data for consistency by comparing the measurements of a particular parameter over time. This will help identify any changes in the groundwater quality due to measurement methodology or equipment
b. Checking the correlation between EC and TDS:
    a. The relationship between the two parameters is often described by a constant (commonly between 0.55 and 0.95 for freshwaters).

b. Thus: TDS (mg/l) ~ (0.55 to 0.95) x EC (mS/cm).
c. The value of the constant varies according to the chemical composition of the water. For freshwaters, the normal range of TDS can be calculated from the following relationship:
d. 0.55 conductivity (mS/cm) < TDS (mg/l) < 0.95 conductivity (mS/cm).
e. Typically the constant is high for chloride rich waters and low for sulphate rich waters.

c. Checking the cation-anion balance

When a water quality sample has been analysed for the major ionic species, one of the most important validation tests can be conducted: the cation-anion balance.

Sum of cations = sum of anions

where:
cations = positively charged species in solution (meq/l)
anions = negatively charged species in solution (meq/l)

The Electronic charge balance is expressed as follows:

$$\text{Electronic Charge Balance (ECB \%)} = \frac{[\sum \text{cations} - \sum \text{anions}]}{[\sum \text{cations} + \sum \text{anions}]} \times 100$$

All concentrations should be in epm. Error charge balance has been computed for the chemical results of 2022-23 and analysis showing more than 10% ECB has not been accepted as it indicates that there has been an error made in at least one of the major cation/anion analyses.

6.0 GROUND WATER QUALITY SCENARIO IN TAMILNADU AND UT OF PUDUCHERRY

The quality of shallow ground water in the state of Tamil Nadu and UT of Puducherry has been evaluated by sampling and analysis of water sample collected from Ground Water Monitoring wells. About 1199 Ground Water Monitoring wells were monitored for water quality during May 2022 representing pre-monsoon water quality (1180 wells from Tamil Nadu and 19 wells from UT of Puducherry). The district wise chemical analysis data are given in the Annexure-I. The summarized results of ground water quality ranges are given in Table 6.1.

Table 6.1 Ground water quality of SECR, during May-2022

S. No	Parameters		Range	No. of sample	Percentage
1	Electrical Coductivity µs/cm at 25°c	Fresh	< 750	198	16.5
		Moderate	751- 2250	712	59.4
		Slightly mineralized	2251- 3000	140	11.7
		Highly mineralized	> 3000	149	12.4
2	Chloride mg/l	Desirable limit	< 250	759	63.3
		Permissible limit	251-1000	399	33.2
		Beyond permissible limit	> 1000	41	3.5
3	Fluoride mg/l	Desirable limit	< 1.0	832	69.5
		Permissible limit	1.1- 1.5	246	20.5
		Beyond permissible limit	>1.5	121	10.0
4	Nitrate mg/l	Permissible limit	<45	749	62.5
		Beyond permissible limit	> 45	450	37.5

pH is the measure of hydrogen or hydroxyl ion concentration in water. The pH scale isused to predict whether the water is acidic or basic in nature. The pH scale rangesfrom 0 to 14, the midpoint 7 is taken as neutral and waters having pH < 7 is called acidic, and having pH > 7 is called basic. pH is an important parameter in water chemistry, because geochemical reactions such as oxidation-reduction, dissolution- precipitation are pH dependent. For example, mineral solubility is enhanced under acidic pH, whereas high pH leads to precipitation of minerals such as calcite. Consequently, water having acidic pH would be more corrosive and alkaline pH would lead to the deposition of minerals (encrustation). Due to the solubility of atmospheric carbon dioxide, the rainwater pH would be around 5.6. In industrial areas, where there are more oxides of sulphur and nitrogen emission, the rainwater pH would be even less because the dissolution of these gases forms strong acids such as nitric (HNO_3) and sulphuric acids (H_2SO_4), resulting acid rain. As rainwater percolates, the pH may further be lowered, due to the dissolution ofsoil carbon dioxide liberated by plants and other microbial reactions. In groundwater, pH increases the solubility of minerals and other anthropogenic pollutants. Therefore, pH plays a major role in the mineralization of groundwater and it is expected to increase along groundwater flow path. The pH of groundwater is normally controlled by the equilibrium between the dissolved carbon dioxide – bicarbonate – carbonate species.

In the shallow groundwater of the state, the pH ranged between 3.78 and 8.50. Based on the NHS 2022 data, in about 96% of the area the groundwater pH is between 7 and 8.5. 4% samples showed pH <7.00. Analysis of thedata shows that occurrence of pH <7 is sporadic and is insignificant. No pattern of spatial variation is observed with respect to the distribution of pH. In recharge areas, where fresh rainwater gets recharged, groundwater without much dissolution is characterizedby low EC values. It increases along groundwater flow path, because of the utilization of H^+ ions for mineral dissolution leading to the formation of bicarbonate ions with increase of alkalinity. In conformity with the above hypothesis, the samples with the EC values <500 µS/cm are all have pH <7. Several samples are from wells located in hilly terrains where the contact time of groundwater and the aquifer minerals are less, as seen in the lower pH samples from Nilgiris, Dindigul, Tiruvannamalai and Pudukottai districts. Few samples from sedimentary areas such as Cuddalore, and Tuticorin also showed lower pH values and all these samples are very fresh.

In general, the ground water quality in the state is fresh in about 16.5 % of the Ground Water Monitoring wells as indicated by the EC value less than 750 μs/cm at 25ºC. In about 59.4 % of the Ground Water Monitoring wells, the EC varies between 751 -2250μs/cm at 25º C and 11.7 % of Ground Water Monitoring wells are between 2251-3000 μs/cm at 25º C indicating that the ground water is slightly mineralized and about 12.4 % of Ground Water Monitoring wells the EC is more than 3000 μs/cm at 25ºC indicating that the ground water is highly mineralized. The highest value 19850 μs/cm at 25º C was observed in Nenmeni, Virudhunagar district.

7.0 GROUND WATER QUALITY HOT SPOTS IN UNCONFINED AQUIFERS OF TAMILNADU AND UT OF PUDUCHERRY

Unconfined aquifers are extensively tapped for water supply across the country therefore; its quality is of paramount importance. The chemical parameters like TDS, Chloride, Fluoride, Iron, Arsenic and Nitrate etc are main constituents defining the quality of ground water in unconfined aquifers. Therefore, presence of these parameters in ground water beyond the permissible limit in the absence of alternate source has been considered as groundwater quality hotspots.

Groundwater quality hot spot maps of the country have been prepared depicting six main parameters based on their distribution shown on the separate maps. These maps depict the spatial distribution of the following constituents in ground water tapping the unconfined aquifers.

I. Electrical Conductivity
II. Chloride (> 1000 mg/L)
III. Fluoride (>1.5 mg/L)
IV. Nitrate (>45mg/L)
V. Iron (>1.0mg/L)
VI. Arsenic (>0.01 mg/L)
VII. Uranium (>0.03 mg/L)

7.1 ELECTRICAL CONDUCTIVITY

Electrical conductivity (EC) is the indicator of the total mineral content of water and hence it indicates the total dissolved solids (TDS) present in water. TDS of water determines its usefulness to various uses of water. BIS has recommended a drinking water standard for total dissolved solids a limit of 500 mg/L (corresponding to EC of about 750 μS/cm at 25^0C) that can be extended to a TDS of 2000 mg/L (corresponding to EC of about 3000 μS/cm at 25^0C) in case of no alternate source. Water having TDS more than 2000 mg/L is not suitable for drinking purpose. The Spatial distribution of EC and different ranges of EC in the

shallow groundwater of Tamil Nadu and UT of Puducherry is shown in Fig. 7.1.1 & Fig. 7.1.2 respectively

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Table 7.1.1 shows district-wise percentage of wells having EC >3000 µS/cm and these areas are water quality hot spots from salinity point of view. The elevated level of EC was noticed in the coastal districts of Tiruvarur, sivaganga, Ramanathapuram and Tuticorin due to coastal salinity and isolated pockts in the the districts of Madurai, Dindigul, Tirunelveli, Virudhunagar, Karur, Namakkal, Tiruppur, Erode and Salem districts are due to industrial activities. District-wise percentage of wells having EC >3000 µS/cm is shown as a bar diagram in Fig 7.1.3 List of wells show Electrical conductivity more than 3000 µs/cm at 25º C during May 2022 are given in Table 7.1.2

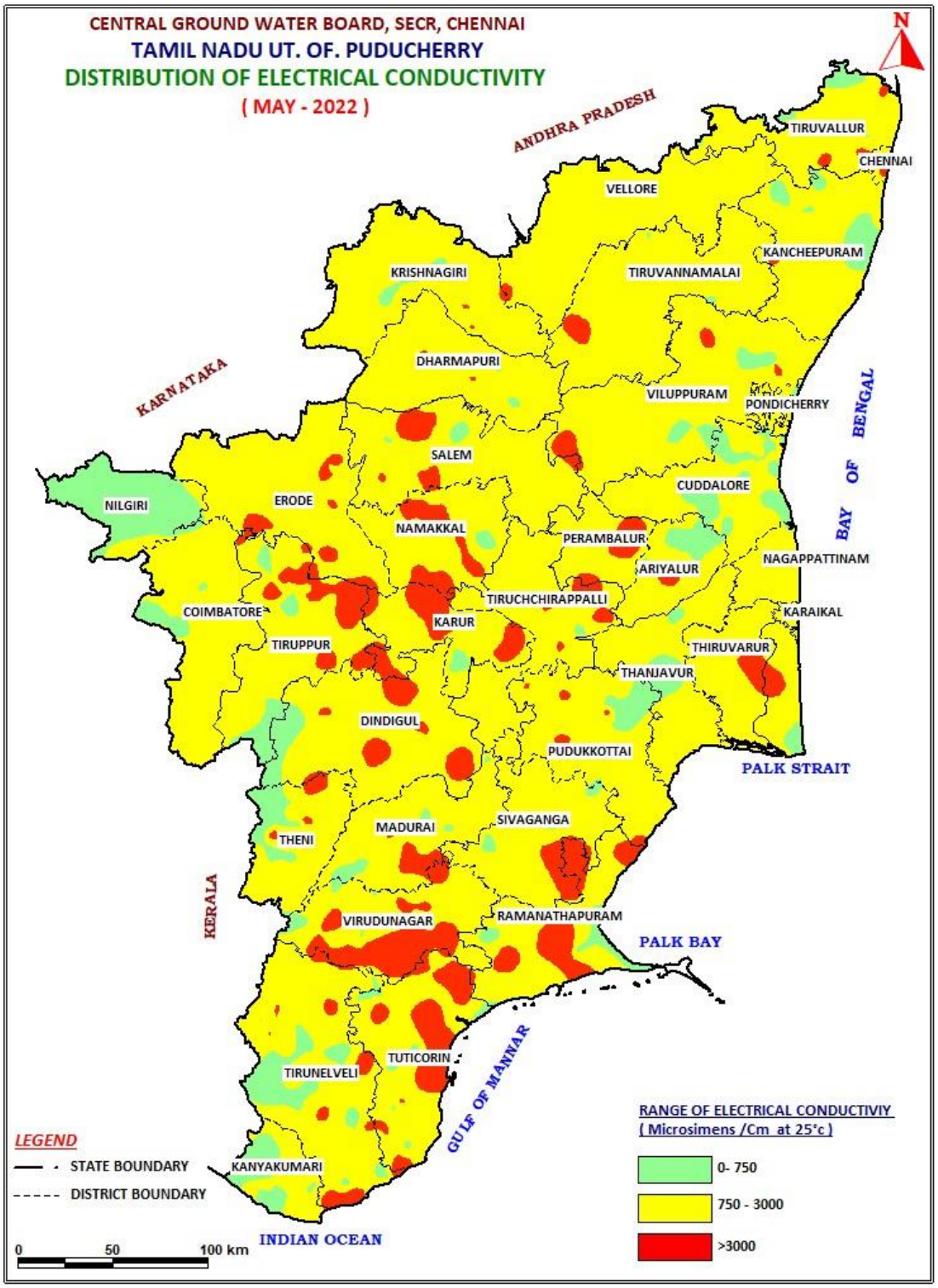


Fig. 7.1.1 Spatial distribution of Electrical Conductivity during May 2022.

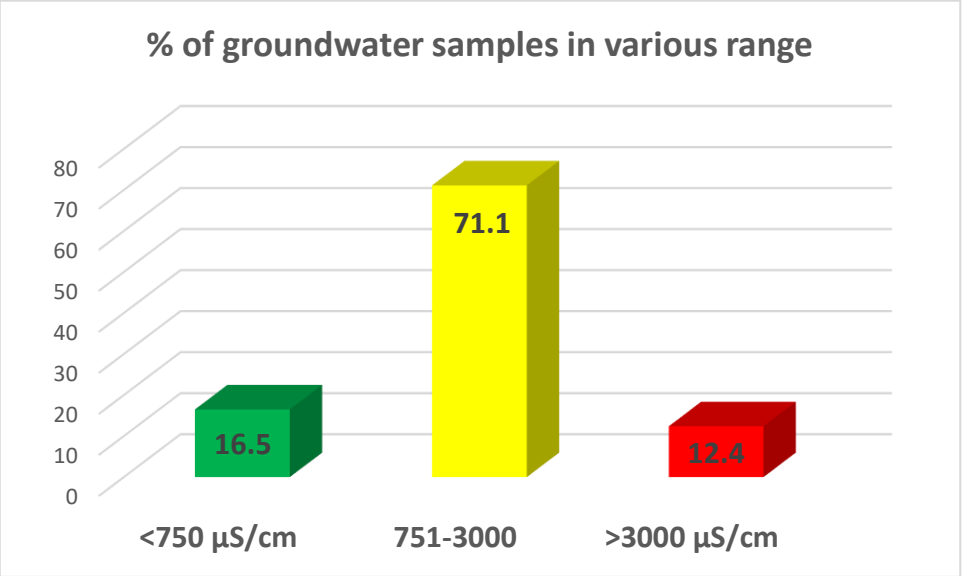


Fig 7.1.2 Percentage of groundwater samples in various EC range

Table 7.1.1 District-wise percentage of wells having EC >3000 µS/cm.

Sr.No	District	No. of Samples collected (NHS 2022-23)	No. of Samples (EC >3000 µS/cm)	(%) Samples (EC >3000 µS/cm)
1	Ariyalur	16	0	0.0
2	Chennai	18	2	11.1
3	Coimbatore	49	4	8.2
4	Cuddalore	66	0	0.0
5	Dharmapuri	58	4	6.9
6	Dindigul	52	8	15.4
7	Erode	84	14	16.7
8	Kancheepuram	79	1	1.3
9	Kanyakumari	21	0	0.0
10	Karaikal (UToP)	4	0	0.0
11	Karur	15	5	33.3
12	Krishnagiri	57	5	8.8
13	Madurai	42	6	14.3
14	Nagapattinam	16	1	6.3
15	Namakkal	45	9	20.0
16	Nilgiris	7	0	0.0
17	Perambalur	20	6	30.0
18	Puducherry (UToP)	15	0	0.0
19	Pudukottai	34	7	20.6
20	Ramanathapuram	19	4	21.1
21	Salem	51	14	27.5
22	Sivaganga	18	4	22.2

Sr.No	District	No. of Samples collected (NHS 2022-23)	No. of Samples (EC >3000 µS/cm)	(%) Samples (EC >3000 µS/cm)
23	Thanjavur	15	0	0.0
24	Theni	39	3	7.7
25	Thiruvannamalai	39	1	2.6
26	Tirunelveli	68	12	17.6
27	Tiruppur	20	4	20.0
28	Tiruvallur	53	6	11.3
29	Tiruvarur	6	0	0.0
30	Trichy	42	5	11.9
31	Tuticorin	40	8	20.0
32	Vellore	7	1	14.3
34	Villupuram	51	4	7.8
35	Virudhunagar	33	10	30.3
		1199	**149**	**12.4**

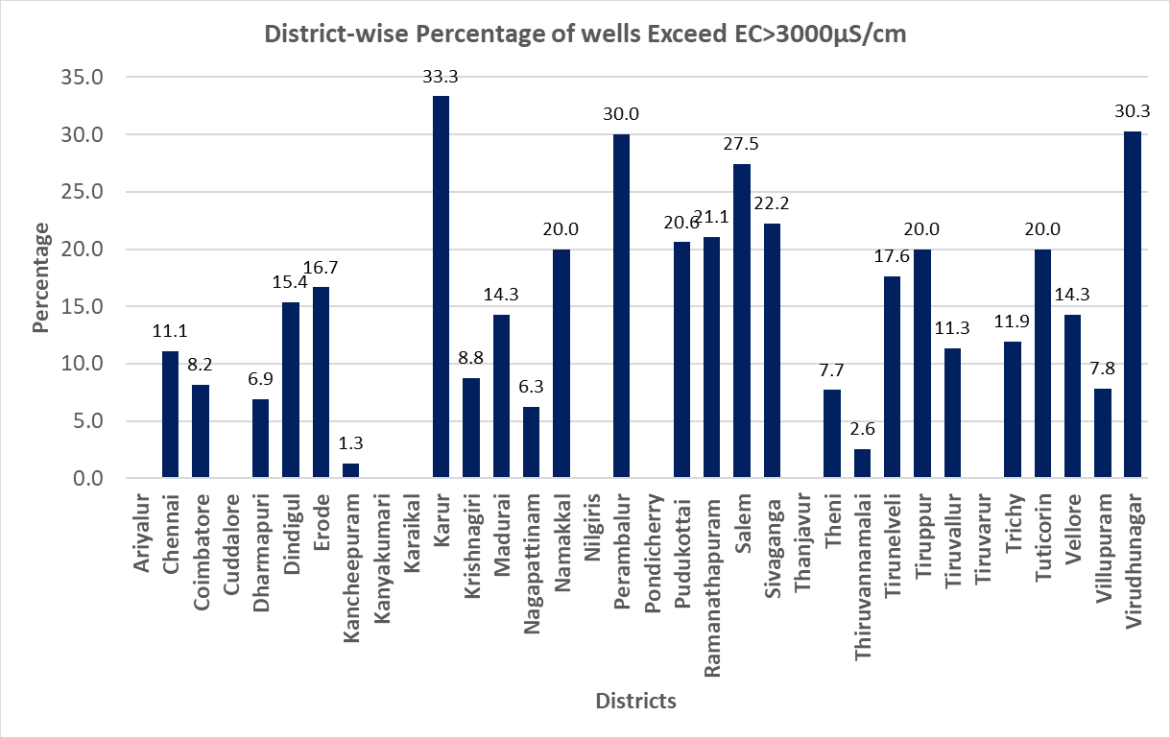


Fig 7.1.3 District-wise percentage of wells having EC >3000 µS/cm.

Table 7.1.2 Details of well shows Electrical conductivity more than 3000 µs/cm at 25º C during May 2022

S_NO	DISTRICT	LOCATION	Latitude	Longitude	EC µs/cm at 25ºC
1	Chennai	Tirumangalam	13.0833	80.1875	5740
2	Chennai	Adyar	13.0089	80.2627	19600
3	Coimbatore	Kallampalayam pz	11.0300	77.2833	3070
4	Coimbatore	Chinnaripalayam	10.7292	77.0917	3100
5	Coimbatore	Ganganaickenpalayam	11.1092	77.4356	4640
6	Coimbatore	Kunnakalpalayam pz	11.0456	77.3272	7430
7	Dharmapuri	Sillarahalli	12.0525	78.2806	3100
8	Dharmapuri	Sillarahalli	12.0525	78.2806	3100
9	Dharmapuri	Indoor	12.1333	78.0583	3300
10	Dharmapuri	Indoor	12.1333	78.0583	3300
11	Dindigul	Nattam	10.2328	78.2333	3010
12	Dindigul	Kanakkanpatti	10.4750	77.5667	3460
13	Dindigul	Vedasandur new	10.5475	77.9711	3490
14	Dindigul	Thamaraipadi	10.4053	78.0453	4020
15	Dindigul	Paraipatti	10.3583	77.9750	4220
16	Dindigul	Natham1	10.2222	78.2472	4660
17	Dindigul	P. Alagapuri	10.5983	77.9756	4990
18	Dindigul	Siddayamkottai	10.2725	77.8356	5830
19	Erode	Nambiyur	11.3606	77.3208	3390
20	Erode	Ooricheri	11.4650	77.6058	3530
21	Erode	Pudupalayam1	11.5944	77.5875	3840
22	Erode	Molengkuttipalayam	11.0672	77.7022	3970
23	Erode	Vijayamangalam pz	11.2444	77.5028	4044
24	Erode	Murlipudur	11.6781	77.6560	4270
25	Erode	Pattaidurai	10.7011	77.7394	4500
26	Erode	Vellakoil	10.9444	77.7153	4600
27	Erode	Puduppai pz	10.9586	77.7225	5790
28	Erode	Ingur New	11.2258	77.5814	5860
29	Erode	Muttur1	11.0417	77.7333	6400
30	Erode	Erakalpudur	11.0308	77.5347	7000
31	Erode	Karaiyur1	10.7639	77.5944	8560
32	Erode	Kavilipalayam	11.3802	77.2308	10700
33	Kancheepuram	Uthiramerur2	12.6083	79.7375	6080
34	Karur	Thogamalai	10.7292	78.4250	3160
35	Karur	Kovilur	10.7603	77.8289	4040
36	Karur	Vellianani	10.8667	78.1333	4080
37	Karur	Ayyampalayam pz	11.0625	78.0361	4660
38	Karur	Enuguru DW	10.8547	78.4878	9070
39	Krishnagiri	Pannandur	12.3013	78.2794	3270
40	Krishnagiri	Panneswara Madam	12.3917	78.2469	3630
41	Krishnagiri	Panneswara Madam	12.3917	78.2469	3630

S_NO	DISTRICT	LOCATION	Latitude	Longitude	EC µs/cm at 25ºC
42	Krishnagiri	Mattur	12.3833	78.4139	3860
43	Krishnagiri	Mattur	12.3833	78.4139	3860
44	Madurai	Kolluveeranpatti pz	9.4225	77.5308	3210
45	Madurai	Valayankulam	9.8042	78.0917	3690
46	Madurai	Thirumangalam new	9.8167	77.9792	3890
47	Madurai	Keelakottai pz	9.7867	78.0019	4200
48	Madurai	Tirumangalam pz	9.9208	77.8833	4430
49	Madurai	Thirupallai	9.9805	78.1453	4470
50	Nagapattinam	Valagarai	10.6289	79.7483	3760
51	Namakkal	Velur	11.1083	78.0033	3200
52	Namakkal	Gurusamipalayam	11.4342	78.1344	3250
53	Namakkal	Senthamangalam	11.3028	78.2333	3340
54	Namakkal	Pottiredddipatti	11.1689	78.2744	3650
55	Namakkal	Paramarthi dw	11.1567	78.0214	3790
56	Namakkal	Pudur Siddhampoondi	11.2361	77.9142	4013
57	Namakkal	Thoppur (N)	11.1011	78.1517	4180
58	Namakkal	Ramapuram	11.4403	78.0092	4730
59	Namakkal	Ezhur-Olapalayam D	11.3658	78.1192	5430
60	Perambalur	Chitali	11.2406	78.9682	3590
61	Perambalur	Kunnam	11.3477	78.9491	3830
62	Perambalur	Therku Mathevi	11.1400	79.2375	3890
63	Perambalur	Veppur (Nallur)	11.3167	79.0636	4130
64	Perambalur	Padalur	11.0960	78.8252	6330
65	Perambalur	Vijayagopalapuram	11.2700	79.0314	6830
66	Pudukkottai	Thirumayam DW	10.2427	78.7455	3020
67	Pudukkottai	Viralimalai DW	10.6083	78.5499	3110
68	Pudukkottai	Lekkampatti Pz	10.5597	78.7264	3540
69	Pudukkottai	Peraiyur Dw	9.3569	78.4467	3580
70	Pudukkottai	Devuipattinam DW	9.4808	78.8976	5690
71	Pudukottai	Mandangudi Dw	10.4853	78.9283	4320
72	Pudukottai	Sundarapatti Pz	10.3588	78.7069	5270
73	Ramanathapuram	Kizhakakarai	9.2394	78.7840	6450
74	Ramanathapuram	Bogalur DW	9.4024	78.7078	15430
75	Ramanathapuram	Mimisal DW	9.9283	79.1476	16210
76	Ramanathapuram	U Kosamangai Dw	9.3152	78.7343	6930
77	Salem	Mamudi	11.5325	78.0517	3110
78	Salem	Tivettipatti	11.8667	78.0875	3270
79	Salem	Salem surviellance	11.6594	78.1664	3350
80	Salem	Puthur dw	11.6264	78.7833	3370
81	Salem	Omalur	11.7458	78.7458	3390
82	Salem	Naikarapatty dw	11.6219	78.1061	3520

S_NO	DISTRICT	LOCATION	Latitude	Longitude	EC µs/cm at 25ºC
83	Salem	Sivadapuram dw	11.6472	78.1092	3960
84	Salem	Palampatti	11.5694	78.0722	4450
85	Salem	Karumbapatti	11.5822	77.8611	4930
86	Salem	Veerapandi dw	11.5736	78.0728	5400
87	Salem	Akkaripalayam	11.3406	78.0500	5760
88	Salem	Attayampatti S.	11.5253	78.0750	6370
89	Salem	Pulaveri	11.6083	78.1083	7830
90	Salem	Sevantampatti	11.5583	78.0917	8870
91	Sivaganga	Rameswaram DW	9.2884	79.3204	4690
92	Sivaganga	Tiruvengamputhur	9.8304	78.7858	5700
93	Sivaganga	Kalayarkoil DW	9.8467	78.6344	3080
94	Sivaganga	Manamadurai Pz	9.7010	78.4597	3520
95	Theni	Koduvilarpatti pz	9.9719	77.4919	3790
96	Theni	Periyakulam	10.1208	77.5500	3890
97	Theni	Sankarapuram pz	9.9069	77.3297	4040
98	Thiruvannamalai	Chengam2	12.2917	78.7917	3900
99	Tirunelveli	Kadayanallur	9.0667	77.3458	3060
100	Tirunelveli	Therkuvalliyur OW	8.3331	77.6240	3090
101	Tirunelveli	Kadayanallur1	9.0833	77.3500	3120
102	Tirunelveli	Tenkasi OW	8.9633	77.3115	3120
103	Tirunelveli	P. Kudieruppu dw	8.5783	77.5603	3260
104	Tirunelveli	P. chatram	9.1183	77.6125	3270
105	Tirunelveli	Udayattur A/B OW	8.2325	77.7206	3510
106	Tirunelveli	Rajapathi OW	8.8517	77.7696	3850
107	Tirunelveli	Seetharappanallur	8.7939	77.6018	4560
108	Tirunelveli	Chettikulam	8.1667	77.6167	4790
109	Tirunelveli	Kuttam	8.3211	77.9366	5790
110	Tirunelveli	N. Vijayanarayanam	8.5333	77.7917	6450
111	Tiruppur	KaravallurPZ	11.2894	77.1692	3620
112	Tiruppur	Kasipalayam (T)	11.1156	77.3858	4350
113	Tiruppur	Tiruppur Agraharam	11.1253	77.4133	4840
114	Tiruppur	Arugampalayam	11.1247	77.4644	10580
115	Tiruvallur	Kanakammachatrm	13.2083	79.7500	3130
116	Tiruvallur	Tirupalavanam	13.4020	80.2485	3250
117	Tiruvallur	Mettukandigai	13.0667	79.9667	3360
118	Tiruvallur	Sangaibedu	13.3298	80.2977	3390
119	Tiruvallur	Chozambedu	13.1203	80.1364	6300
120	Tiruvarur	Pangal	10.7208	79.6417	4140
121	Trichy	Pulivalam	11.0167	78.6375	3350
122	Trichy	Kovilpatty	10.5500	78.3000	3430
123	Trichy	Peramangalam	10.9867	78.6542	3550

S_NO	DISTRICT	LOCATION	Latitude	Longitude	EC µs/cm at 25ºC
124	Trichy	Pullambadi1	10.9417	78.9125	4740
125	Trichy	Mudaliarchatram	10.8003	78.6967	7750
126	Tuticorin	Tiruchendur-e	8.4944	78.1222	3290
127	Tuticorin	Nagalapuram	9.2333	78.1306	3320
128	Tuticorin	Petmanagar	8.6500	77.9500	3410
129	Tuticorin	Paikulam	8.5181	77.8556	3430
130	Tuticorin	Eppodumvendram	9.0292	78.0458	4570
131	Tuticorin	Villiseri	9.0583	77.8500	5040
132	Tuticorin	Kurukkuchalai	8.9306	78.0917	5920
133	Tuticorin	Tuticorin1	8.8083	78.1389	7730
134	Vellore	Kandili	12.4778	78.4556	3670
135	Villipuram	Rajampalayam	11.9459	79.1378	3059
136	Villipuram	Chinnasalem	11.6375	78.8818	3200
137	Villipuram	Gingee	12.2521	79.4259	4410
138	Villipuram	Kiliyanur	12.1008	79.7458	5045
139	Virudhunagar	Virudunagar	9.5833	77.9542	3610
140	Virudhunagar	Aviyur dw	9.7389	78.1008	3680
141	Virudhunagar	Sevalpatti	9.5583	77.9583	3750
142	Virudhunagar	Alangulam	9.3639	77.6861	4180
143	Virudhunagar	Mudukkankulam	9.1508	78.2058	4270
144	Virudhunagar	Srivilliputhur1	9.5000	77.6333	4360
145	Virudhunagar	Choolapuram	9.3833	77.5583	4520
146	Virudhunagar	Vembakkottai-OW	9.3333	77.7667	4670
147	Virudhunagar	Kalloorani	9.4639	78.1650	5090
148	Virudhunagar	Palavanatham	9.5667	78.0750	5430
149	Virudhunagar	Nenmeni1	9.3250	78.0083	19850

7.1.1 TREND ON ELECTRICAL CONDUCTIVITY

Trend analysis determines whether the measured values of the water quality variables increase or decrease during a time period. The Electrical Conductivity (EC) of groundwater is contributed by all the dissolved ionic constituents. Therefore, it is a measure of the total ionic content of the water. It could be used as a source of inorganic pollution indicator as most of the inorganic compounds are present as ions in water. Hence, EC was taken to assess the trend of ground water quality in Tamilnadu. The number of wells monitored in the year 2020 and 2021 is comparatively less due to COVID pandemic situation. The percentage of well exceeds the electrical conductivity more than 3000 µS/cm for the period of 2017 to 2022 were compared and presented in the Table7.1.3 and Fig 7.1.4 and observed that the percentage of samples exceed the permissible limit of 3000 µS/cm were ranging between 12- 16 % during 2017-2022 and slightly decreasing trend was noticed. Trend on Electrical Conductivity in a district, Virudhunagar of Tamil Nadu shows (Fig 7.1.5) an increasing trend due to lowest rain fall recorded district in the state of Tamil Nadu. Trend on Electrical Conductivity in a district, Tiruvallur of Tamil Nadu shows (Fig. 7.1.6) a decreasing trend as a dilution factor due to the effect of implementation of mandatory rain water harvesting structure.

Table 7.1.3 Percentage of wells affected by EC for the period of 2017-2022

Year	No. of districts affected by EC	Total number of locations affected by EC	Total Number of samples analysed	% of locations affected by EC
2017	**30**	**101**	**625**	16.16
2018	**31**	**147**	**930**	15.81
2019	**27**	**168**	**1185**	14.18
2020	**2**	**11**	**113**	9.73
2021	**26**	**78**	**620**	12.58
2022	**27**	**149**	**1199**	12.43

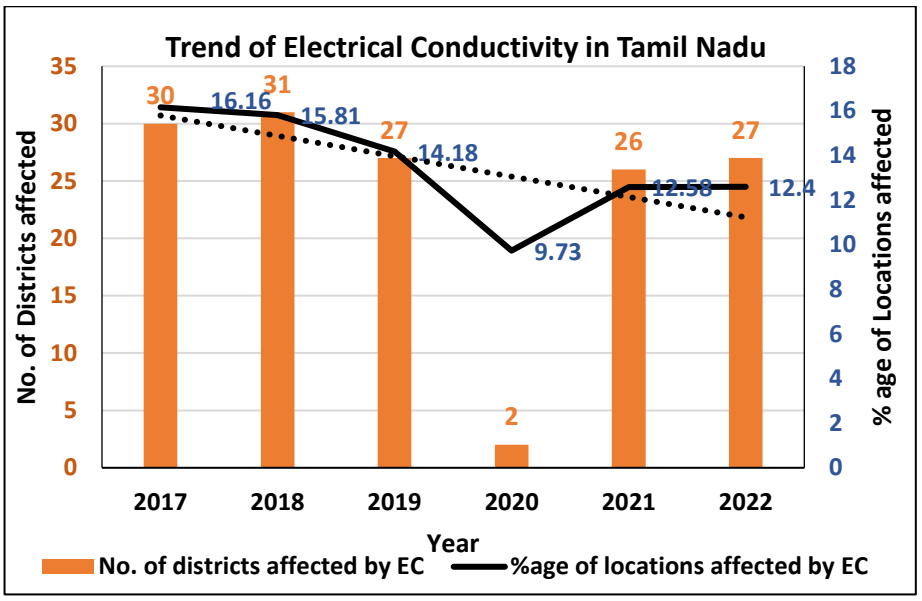


Fig 7.1.4 Trend on Electrical conductivity for the period of 2017-2022

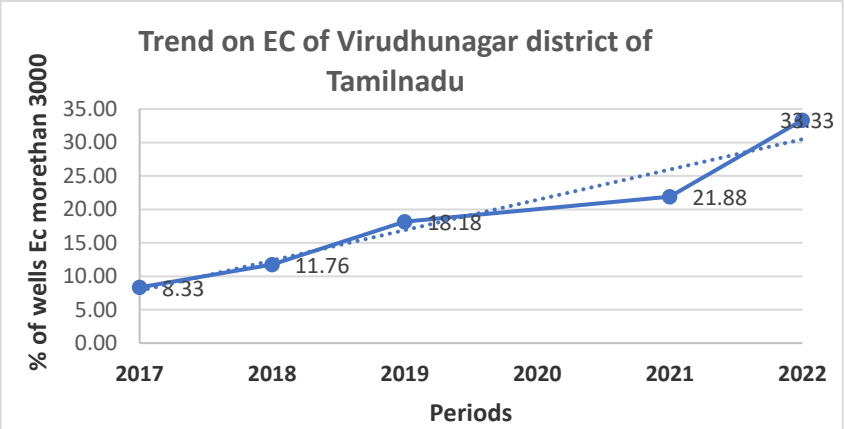


Fig. 7.1.5 Trend on Electrical Conductivity in a district (Virudhunagar) for the period of 2017-2022

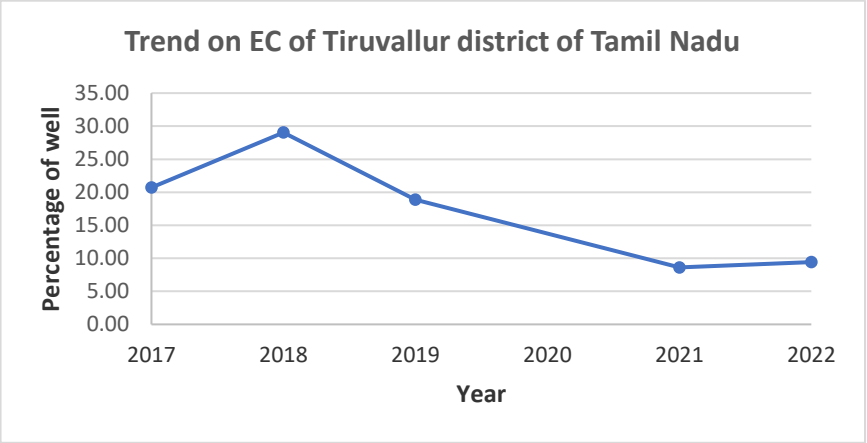


Fig. 7.1.6 Trend on Electrical Conductivity in a district (Tiruvallur) for the period of 2017-2022

7.2 CHLORIDE

Chloride is present in all-natural waters, mostly at low concentrations. It is highly soluble in water and moves freely with water through soil and rock. In ground water the chloride content is mostly below 250 mg/L except in cases where inland salinity is prevalent and in coastal areas.

BIS (Bureau of Indian Standard) have recommended a desirable limit of 250 mg /L of chloride in drinking water; this concentration limit can be extended to 1000 mg/L of chloride in case no alternative source of water with desirable concentration is available. However, ground water having concentration of chloride more than 1000 mg /L are not suitable for drinking purposes. The chloride content is less than 250 mg/l in about 63.3 % of the sample analyzed and 33.2 % of the sample are between 251 – 1000 mg/l and 3.5 % shows more than 1000mg/l.

In Fig 7.2.1, the concentration of chloride (in mg/L) in ground water from observation wells have been used to show distribution patterns of chloride in different ranges of suitability. It is deceptive from the map that the elevated level of chloride was noticed in the coastal districts of Pudukottai, Sivaganga, Ramanathapuram and Tuticorin due to coastal salinity and isolated pockts in the the districts of Dindigul, Tirunelveli, Virudhunagar, Karur, Namakkal, Tiruppur, Erode and Salem districts are due to industrial activities. District-wise percentage of wells having chloride >1000 mg/L is given in Table 7.2.1 and shown as a bar diagram in Fig 7.2.2. respectively. List of wells show chloride concentration more than 1000 mg/L during May 2022 are given in Table 7.2.2

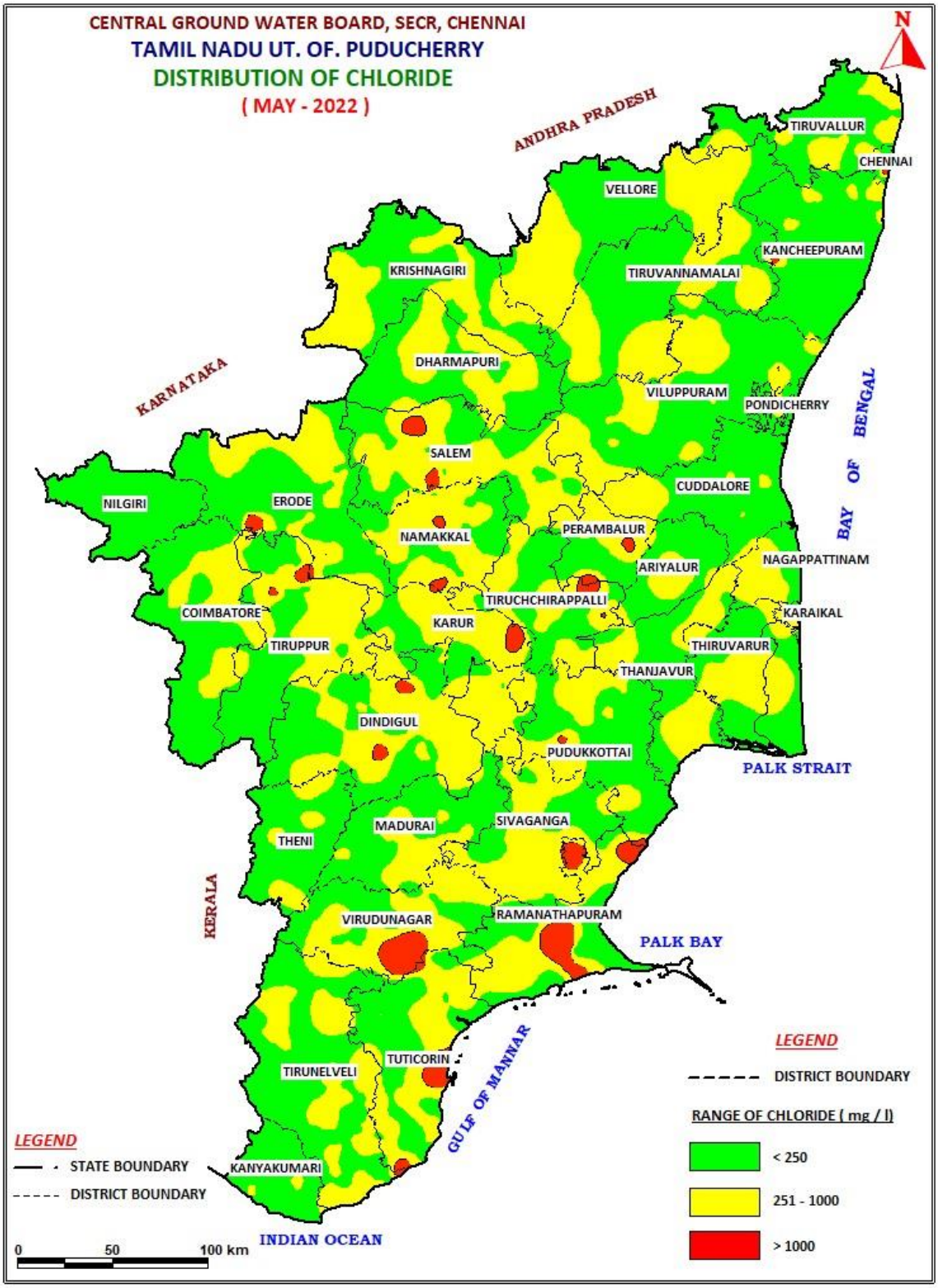


Fig 7.2.1 Spatial Distribution of Chloride during May 2022

Table 7.2.1 District-wise percentage of samples having Chloride >1000mg/L

Sr. No	Districts	No. of Samples collected (NHS 2022-23)	No. of Samples (Cl >1000 mg/l)	(%) Samples (Cl >1000 mg/l)
1	Ariyalur	16	0	0.0
2	Chennai	18	2	11.1
3	Coimbatore	49	1	2.0
4	Cuddalore	66	0	0.0
5	Dharmapuri	58	0	0.0
6	Dindigul	52	2	3.8
7	Erode	84	2	2.4
8	Kancheepuram	79	1	1.3
9	Kanyakumari	21	0	0.0
10	Karaikal	4	0	0.0
11	Karur	15	1	6.7
12	Krishnagiri	57	1	1.8
13	Madurai	42	1	2.4
14	Nagapattinam	16	1	6.3
15	Namakkal	45	3	6.7
16	Nilgiris	7	0	0.0
17	Perambalur	20	2	10.0
18	Pondicherry	15	0	0.0
19	Pudukottai	34	2	5.9
20	Ramanathapuram	19	4	21.1
21	Salem	51	7	13.7
22	Sivaganga	18	2	11.1
23	Thanjavur	15	0	0.0
24	Theni	39	0	0.0
25	Thiruvannamalai	39	0	0.0
26	Tirunelveli	68	3	4.4
27	Tiruppur	20	1	5.0
28	Tiruvallur	53	0	0.0
29	Tiruvarur	6	0	0.0
30	Trichy	42	2	4.8
31	Tuticorin	40	1	2.5
32	Vellore	7	1	14.3
34	Villupuram	51	2	3.9
35	Virudhunagar	33	1	3.0
		1199	**41**	**3.5**

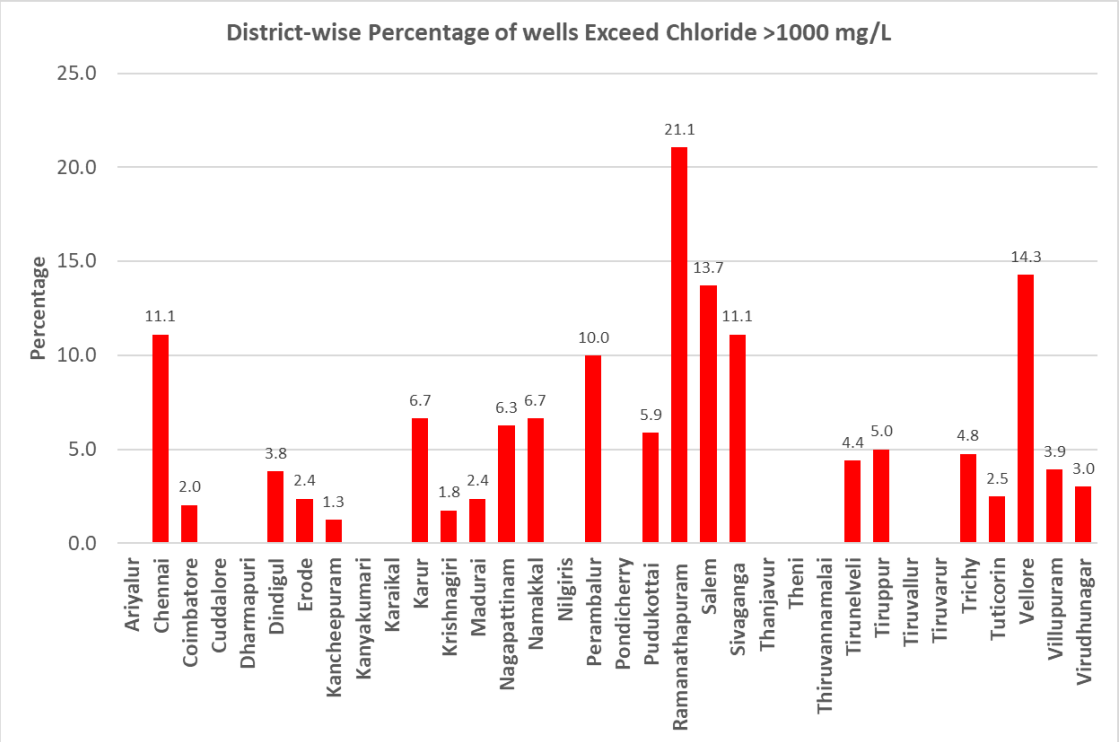


Fig 7.2.2 District-wise percentage of wells having Chloride > 1000 mg/L.

Table 7.2.2 List of well shows chloride more than permissible limit of 1000 mg/L during May 2022

S.NO	DISTRICT	LOCATION	Latitude	Longitude	Chloride mg/L
1	Chennai	Adyar	13.0089	80.2627	6877
2	Chennai	Tirumangalam	13.0833	80.1875	1335
3	Coimbatore	Kunnakalpalayam	11.0456	77.3272	1406
4	Dindigul	Siddayamkottai	10.2725	77.8356	1458
5	Dindigul	P. Alagapuri	10.5983	77.9756	1266
6	Erode	Kavilipalayam	11.3802	77.2308	2871
7	Erode	Ingur New	11.2258	77.5814	1035
8	Kancheepuram	Uthiramerur2	12.6083	79.7375	1839
9	Karur	Enuguru DW	10.8547	78.4878	2386
10	Krishnagiri	Pannandur	12.3013	78.2794	1001
11	Madurai	Thirupallai	9.9805	78.1453	1081
12	Namakkal	Ezhur-Olapalayam	11.3658	78.1192	1241
13	Namakkal	Pudur	11.2361	77.9142	1113
14	Namakkal	Thoppur (N)	11.1011	78.1517	1032
15	Perambalur	Padalur	11.0960	78.8252	1702
16	Perambalur	Vijayagopalapuram	11.2700	79.0314	1418
17	Pudukkottai	Devuipattinam DW	9.4808	78.8976	1124
18	Pudukottai	Sundarapatti Pz	10.3588	78.7069	1316
19	Ramanathapuram	Mimisal DW	9.9283	79.1476	5121
20	Ramanathapuram	Bogalur DW	9.4024	78.7078	4907

21	Ramanathapuram	Kizhakakarai	9.2394	78.7840	1387
22	Ramanathapuram	U Kosamangai Dw	9.3152	78.7343	1742
23	Salem	Sevantampatti	11.5583	78.0917	2471
24	Salem	Pulaveri	11.6083	78.1083	2279
25	Salem	Attayampatti	11.5253	78.0750	1882
26	Salem	Akkaripalayam	11.3406	78.0500	1463
27	Salem	Veerapandi dw	11.5736	78.0728	1314
28	Salem	Palampatti	11.5694	78.0722	1122
29	Salem	Karumbapatti	11.5822	77.8611	1058
30	Sivaganga	Tiruvengamputhur	9.8304	78.7858	1266
31	Sivaganga	Manamadurai Pz	9.7010	78.4597	1010
32	Tirunelveli	Kuttam	8.3211	77.9366	1617
33	Tirunelveli	Vijayanarayanam	8.5333	77.7917	1212
34	Tirunelveli	Seetharappanallur	8.7939	77.6018	1014
35	Tiruppur	Arugampalayam	11.1247	77.4644	2513
36	Trichy	Mudaliarchatram	10.8003	78.6967	1519
37	Trichy	Pullambadi1	10.9417	78.9125	1051
38	Tuticorin	Tuticorin1	8.8083	78.1389	1780
39	Villipuram	Kiliyanur	12.1008	79.7458	1347
40	Villipuram	Gingee	12.2521	79.4259	1134
41	Virudhunagar	Nenmeni1	9.3250	78.0083	4055

7.3 FLUORIDE

Fluorine is a fairly common element but it does not occur in the elemental state in nature because of its high reactivity. Fluorine is the most electronegative and reactive of all elements that occur naturally within many types of rock. It exists in the form of fluorides in a number of minerals of which fluorspar, cryolite, fluorite and fluorapatite are the most common. Fluorite (CaF_2) is a common fluoride mineral.

Most of the fluoride found in groundwater is naturally occurring from the breakdown of rocks and soils or weathering and deposition of atmospheric particles. Most of the fluorides are sparingly soluble and are present in ground water in small amounts. The occurrence of fluoride in natural water is affected by the type of rocks, climatic conditions, nature of hydrogeological strata and time of contact between rock and the circulating ground water. Presence of other ions, particularly bicarbonate and calcium ions also affect the concentration of fluoride in ground water.

It is well known that small amounts of fluoride (less than 1.0 mg/L) have proven to be beneficial in reducing tooth decay. Community water supplies commonly are treated with NaF or fluorosilicates to maintain fluoride levels ranging from 0.8 to 1.2 mg/L to reduce the incidence of *dental carries*. However, high concentrations such as 1.5 mg/L of F and above have resulted in staining of tooth enamel while at still higher levels of fluoride ranging between 5.0 and 10 mg/L, further pathological changes such as stiffness of the back and difficulty in performing natural movements may take place.

BIS has recommended an upper desirable limit of 1.0 mg/L of F^- as desirable concentration of fluoride in drinking water, which can be extended to 1.5 mg/L of F in case no alternative source of water is available. Water having fluoride concentration of more than 1.5 mg/L are not suitable for drinking purposes.

The fluoride content in groundwater from observation wells in a major part of the state is found to be less than 1.0 mg/L. The occurrences of fluoride in groundwater beyond permissible limit (1.5 mg/L) have also been shown in the map as Fig. 7.3.1. District-wise percentage of wells having fluoride >1.5 mg/L is shown as a bar diagram in Fig 7.3.2. The percentage of wells having fluoride morethan the permissible limit of 1.5 mg/L was more in the districts of Coimbatore, Erdoe, Madurai, Namakkal, Perambalur, Krishnagiri, Salem, Theni, Tiruppur and Virudhunagar district due geogenic activities. The details of locations where fluoride concentration is more than 1.5 mg/L is given in Table 7.3.1.

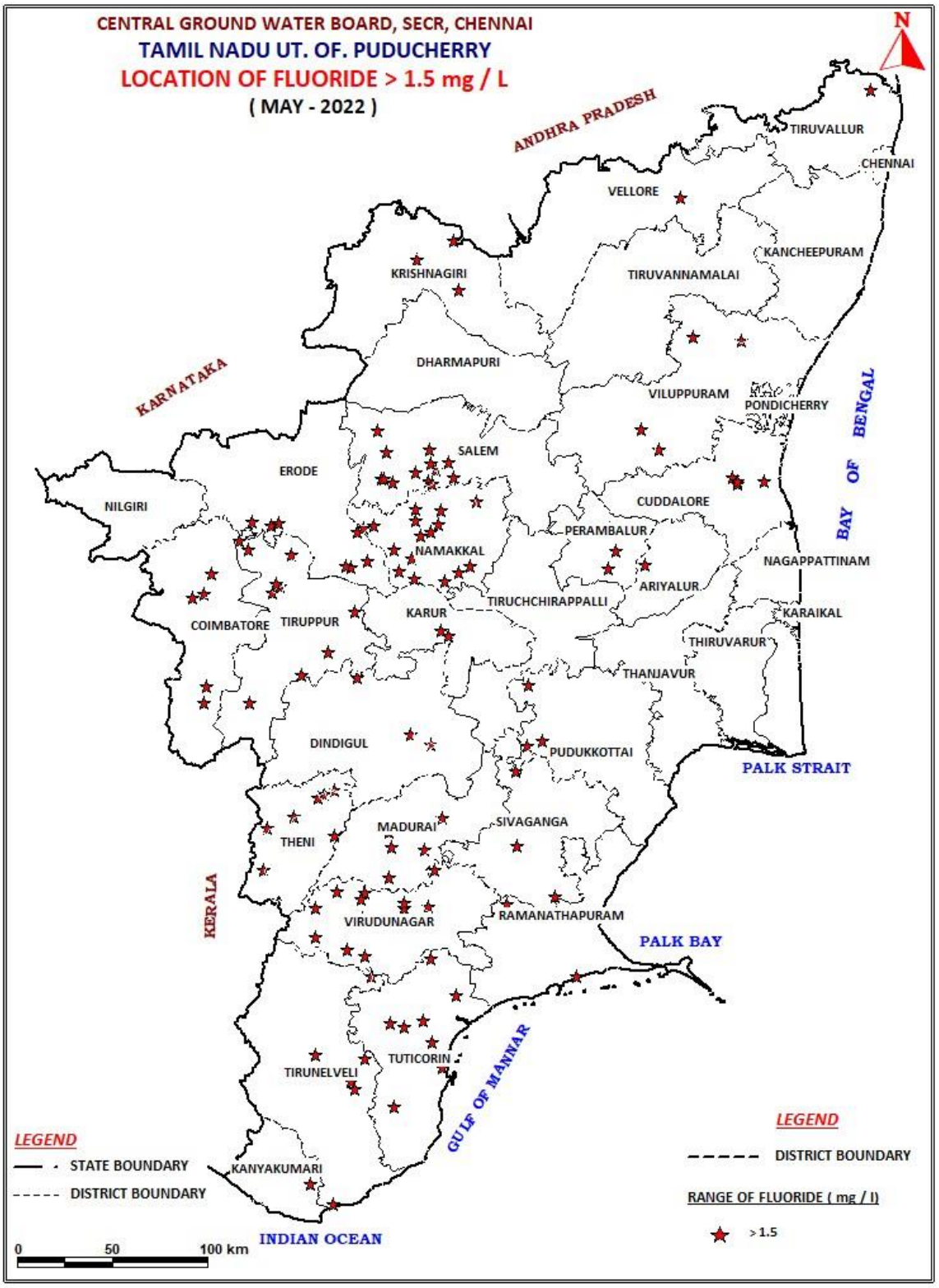


Fig 7.3.1 Locations having Fluoride concentration > 1.5 mg/L during May 2022.

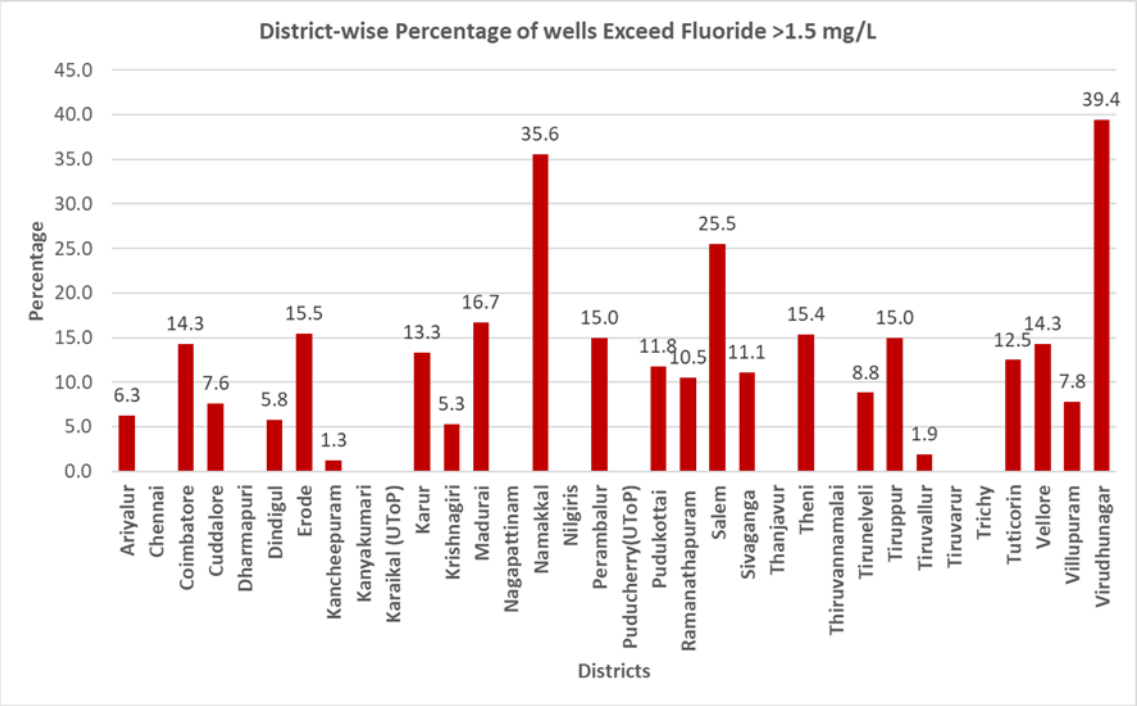


Fig. 7.3.2. District-wise percentage of wells having fluoride >1.5 mg/L

Table 7.3.1 List of well shows fluoride more than permissible limit of 1.5 mg/L during May 2022

S_NO	DISTRICT	LOCATION	Latitude	Longitude	F mg/L
1	Ariyalur	V.Ramanapuram OW	11.1754	79.1096	1.58
2	Coimbatore	Tn Urban Studies pz	11.0219	76.9419	1.70
3	Coimbatore	Angalakurichi	10.5250	76.9994	1.62
4	Coimbatore	Samathur Hss pz	10.6022	77.0089	1.58
5	Coimbatore	Cwc Campus pz	11.0414	77.0006	1.57
6	Coimbatore	Pallapalayam pz	10.5256	77.2181	1.57
7	Coimbatore	Sarkar samakulam pz	11.1333	77.0333	1.55
8	Coimbatore	Kunnakalpalayam pz	11.0456	77.3272	1.54
9	Cuddalore	Tekkumellur	11.5894	79.5278	1.95
10	Cuddalore	Theerthangari EW	11.5604	79.5563	1.86
11	Cuddalore	Vadalur	11.5687	79.5542	1.80
12	Cuddalore	Teerthanagiri	11.5693	79.6790	1.55
13	Cuddalore	Thaiyalkunapattinam	11.5703	79.6832	1.53
14	Dindigul	Nandavanampatti	10.3756	77.9853	2.96
15	Dindigul	Sanarpatti	10.3328	78.0870	2.76
16	Dindigul	Pallapatti	10.0805	77.5457	2.72
17	Erode	Nambiyur	11.3606	77.3208	1.88
18	Erode	Otti Vilangadu	11.2242	77.4186	1.83
19	Erode	Puduppai pz	10.9586	77.7225	1.82
20	Erode	E.Vellampalayam pz	11.1697	77.6806	1.77
21	Erode	Kavilipalayam	11.3802	77.2308	1.73
22	Erode	Archalur	11.1625	77.7000	1.69

S_NO	DISTRICT	LOCATION	Latitude	Longitude	F mg/L
23	Erode	Papayampudur	10.6567	77.4678	1.65
24	Erode	Nagalapuram pz	11.0756	77.3628	1.63
25	Erode	Nilangelvalasu pz	10.6431	77.7342	1.62
26	Erode	Elmattur	11.1944	77.7792	1.60
27	Erode	Karaiyur1	10.7639	77.5944	1.56
28	Erode	Kosanam pz	11.3711	77.3578	1.56
29	Erode	Erode2	11.3333	77.7333	1.54
30	Kanyakumari	Chenpagaramanpudur	8.2599	77.5099	1.82
31	Karur	Vellianani	10.8667	78.1333	1.58
32	Karur	Jagatabi	10.8417	78.1667	1.56
33	Krishnagiri	Enusonai	12.6138	78.0175	1.84
34	Krishnagiri	Vappanapalli	12.6998	78.1925	1.70
35	Krishnagiri	Nattamaikottai	12.4721	78.2154	1.69
36	Madurai	Kolluveeranpatti pz	9.4225	77.5308	3.14
37	Madurai	Chellampatti	9.5638	77.5346	2.60
38	Madurai	Kolluveeranpatti	9.7069	77.8856	2.52
39	Madurai	Surakulam pz	9.8364	78.0567	2.20
40	Madurai	Thirupallai	9.9869	78.1389	1.96
41	Madurai	Tirumangalam pz	9.9208	77.8833	1.59
42	Madurai	P.Ammapatti pz	9.8458	77.8947	1.53
43	Namakkal	Ainthu Panai	11.3633	77.8089	1.94
44	Namakkal	Kumbakkottai	11.4717	78.3044	1.83
45	Namakkal	Thoppur (N)	11.1011	78.1517	1.77
46	Namakkal	Vaiyappamalai	11.3333	78.0833	1.77
47	Namakkal	Elachipalayam new	11.3847	78.0125	1.74
48	Namakkal	Gurusamipalayam	11.4342	78.1344	1.74
49	Namakkal	SPN Nagar	11.1411	78.2200	1.70
50	Namakkal	Ezhur-Olapalayam D	11.3658	78.1192	1.68
51	Namakkal	Pottiredddipatti	11.1689	78.2744	1.68
52	Namakkal	Ramapuram	11.4403	78.0092	1.68
53	Namakkal	Semmadaipalayam	11.1472	77.9344	1.68
54	Namakkal	Kattipalayam	11.3156	78.0336	1.66
55	Namakkal	Solasiramani	11.2500	77.9083	1.65
56	Namakkal	Irumbapalam	11.2042	77.9917	1.62
57	Namakkal	Velur	11.1083	78.0033	1.59
58	Namakkal	Annai sathyanagar	11.3508	77.7639	1.55
59	Perambalur	Chitali	11.2406	78.9682	3.00
60	Perambalur	Ranjankudi (Mangalamedu)	11.3472	78.9412	1.94
61	Perambalur	Perambalur	11.1586	78.9364	1.51
62	Pudukkottai	Viralimalai DW	10.6083	78.5499	2.76
63	Pudukkottai	Vayyapuri DW	10.3469	78.6172	2.44
64	Pudukkottai	Alavoyal Pz	10.3234	78.5464	1.94
65	Pudukottai	Thirukkalambur Pz	10.2055	78.4912	2.04
66	Ramanathapuram	Kizhakakarai	9.2394	78.7840	2.28
67	Ramanathapuram	Parthibanur DW	9.5805	78.4511	1.53
68	Salem	Elampillai dw	11.6089	78.0108	2.15
69	Salem	Salem surviellance	11.6594	78.1664	1.98
70	Salem	Idapadi new	11.5839	77.8500	1.95

S_NO	DISTRICT	LOCATION	Latitude	Longitude	F mg/L
71	Salem	Karuppur	11.7178	78.0769	1.91
72	Salem	Muttur (Karumalikoodal)dw	11.8075	77.8297	1.84
73	Salem	Naikarapatty dw	11.6219	78.1061	1.81
74	Salem	Panamarathupatti2	11.5903	78.1931	1.81
75	Salem	Konganapuram	11.5667	77.9000	1.80
76	Salem	Sevantampatti	11.5583	78.0917	1.78
77	Salem	Karumbapatti	11.5822	77.8611	1.75
78	Salem	Palampatti	11.5694	78.0722	1.68
79	Salem	Vedukathampatty dw	11.6528	78.0819	1.63
80	Salem	Jalakandapuram	11.7056	77.8722	1.59
81	Sivaganga	Nadumanaikadu Dw	9.2780	79.0844	2.62
82	Sivaganga	Sivagangai DW	9.8527	78.4985	1.62
83	Theni	Cumbum	9.7417	77.2847	7.60
84	Theni	Balakombai pz	9.9036	77.6233	2.64
85	Theni	Bodinaickanur dw	10.0989	77.5717	2.36
86	Theni	Kodangipatti pz	9.9917	77.4306	2.08
87	Theni	Ramakrishnapuram pz	9.9392	77.3017	1.60
88	Theni	Silverpatti	10.1123	77.6204	1.53
89	Tirunelveli	Sivalarkulam OW	8.8693	77.5294	1.78
90	Tirunelveli	Naduvapatty	9.2417	77.8014	1.72
91	Tirunelveli	Rajapathi OW	8.8517	77.7696	1.67
92	Tirunelveli	Chettikulam	8.1667	77.6167	1.63
93	Tirunelveli	Tirunelveli1	8.7056	77.7222	1.56
94	Tirunelveli	Tachchnallur	8.7458	77.7000	1.54
95	Tiruppur	Karamadai	11.2458	77.2125	1.60
96	Tiruppur	KaravallurPZ	11.2894	77.1692	1.58
97	Tiruppur	Weekly Market	11.0881	77.3431	1.56
98	Tiruvallur	Agoor	13.1897	12.9197	1.69
99	Tuticorin	Srivaikundam1	8.6250	77.9083	1.73
100	Tuticorin	Pasuvanthanai	9.0013	77.9596	1.66
101	Tuticorin	Tuticorin1	8.8083	78.1389	1.65
102	Tuticorin	Vembur	9.3250	78.0819	1.60
103	Tuticorin	Eppodumvendram	9.0292	78.0458	1.51
104	Vellore	Echipudhur (Vellore dt)	12.9058	79.2819	1.80
105	Villipuram	Allampundi	12.2483	79.3406	1.80
106	Villipuram	Rishivandiyam	11.8131	79.0947	1.76
107	Villipuram	Pidagam	11.7206	79.1792	1.63
108	Villipuram	Gopalapuram-Peramandur	12.2285	79.5702	1.53
109	Virudhunagar	Kundarapatty	9.6300	77.7700	1.88
110	Virudhunagar	Nathampatti OW	9.6042	77.7486	1.84
111	Virudhunagar	Sevalpatti	9.5583	77.9583	1.84
112	Virudhunagar	Vembakkottai-OW	9.3333	77.7667	1.81
113	Virudhunagar	Muntalapuram	9.0172	77.8894	1.79
114	Virudhunagar	Mudukkankulam	9.1508	78.2058	1.73
115	Virudhunagar	Aviyur dw	9.7389	78.1008	1.71
116	Virudhunagar	Palavanatham	9.5667	78.0750	1.70
117	Virudhunagar	Alangulam	9.3639	77.6861	1.69
118	Virudhunagar	Vadapatti	9.5108	77.7550	1.67

S_NO	DISTRICT	LOCATION	Latitude	Longitude	F mg/L
119	Virudhunagar	Virudunagar	9.5833	77.9542	1.67
120	Virudhunagar	Watrap	9.6358	77.6335	1.66
121	Virudhunagar	Pattampudur OW	9.4914	77.9336	1.59

7.3.1 TREND ON FLUORIDE

The occurrence of fluoride in groundwater is mainly due to weathering and leaching of fluoride bearing minerals from rocks and sediments. To assess the trend of ground water pollution due to geogenic activity, the percentage of well exceeds the permissible limit of 1.5mg/L for the period of 2017 to 2022 were compared and presented in the Table 7.3.2 and Fig 7.3.3 and observed that the percentage of samples exceed the permissible limit of fluoride 1.5 mg/L were ranging between 8 -14 % during 2017-2022 except in the year 2020 and no significant trend was noticed. **The number of wells monitored in the year 2020 and 2021 is comparatively less due to COVID pandemic situation**. The number of fluoride affected district has increased in the year 2022 as more number of piezometers (deeper wells) was included in the monitoring wells after 2019. Trend on water quality for fluoride was prepared for the state of Tamil Nadu is shown in Fig 7.3.3. Trend on fluoride in a district, Dindigul of Tamil Nadu shows (Fig 7.3.4) a decreasing trend and Namakkal district of Tamil Nadu shows (Fig 7.3.5) an increasing trend depends on the rain fall pattern and more piezometer/bore wells were included in monitoring as many monitoring dug wells were dried up in the district respectively.

Table 7.3.2 Percentage of well exceeds the permissible limit of 1.5mg/L for the period of 2017 to 2022

Year	No. of districts affected by Fluoride	No. of locations affected by Fluoride	Total Number of samples analysed	% of locations affected by Fluoride
2017	18	61	625	9.76
2018	21	128	930	13.76
2019	23	100	1185	8.44
2020	2	5	113	4.42
2021	13	51	620	8.23
2022	23	121	1199	10.09

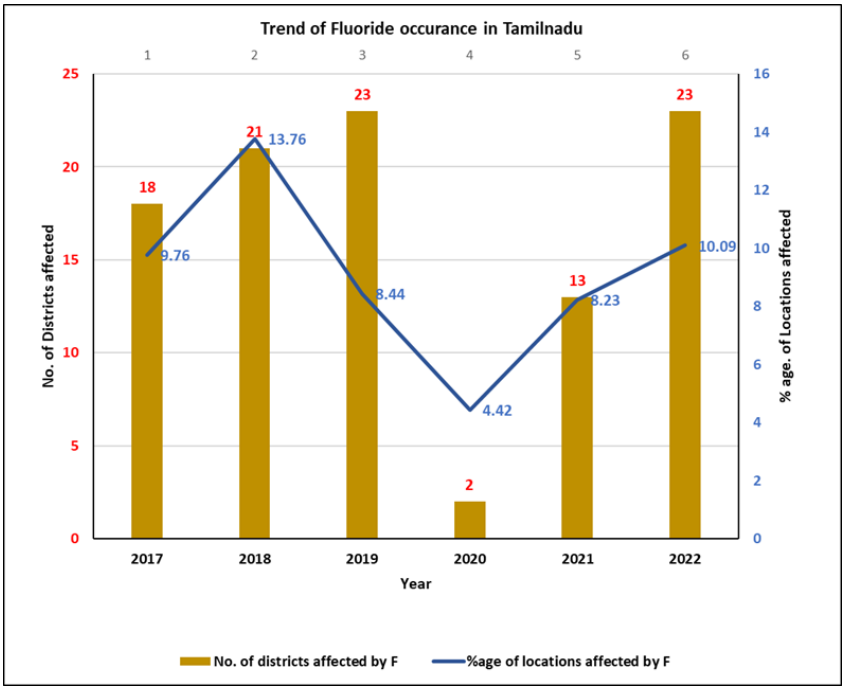


Fig. 7.3.3 Trend of Fluoride occurrence in Tamil Nadu

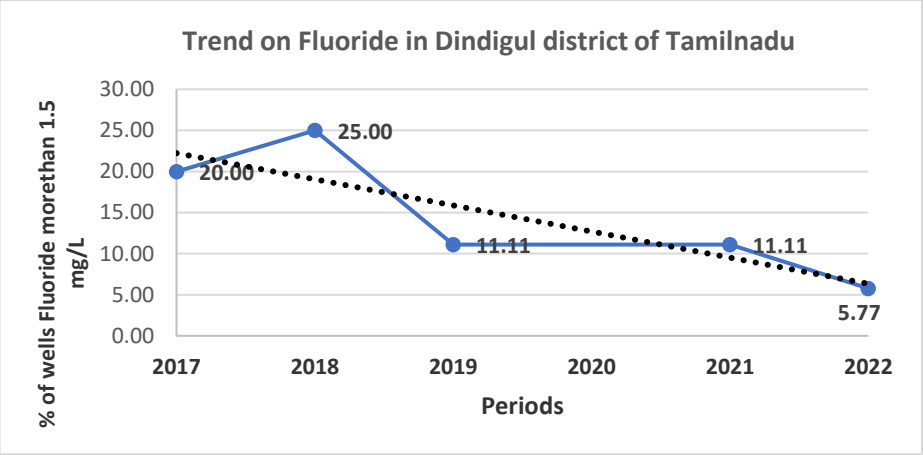


Fig 7.3.4 Trend on Fluoride a district (Dindigul) for the period of 2017-2022

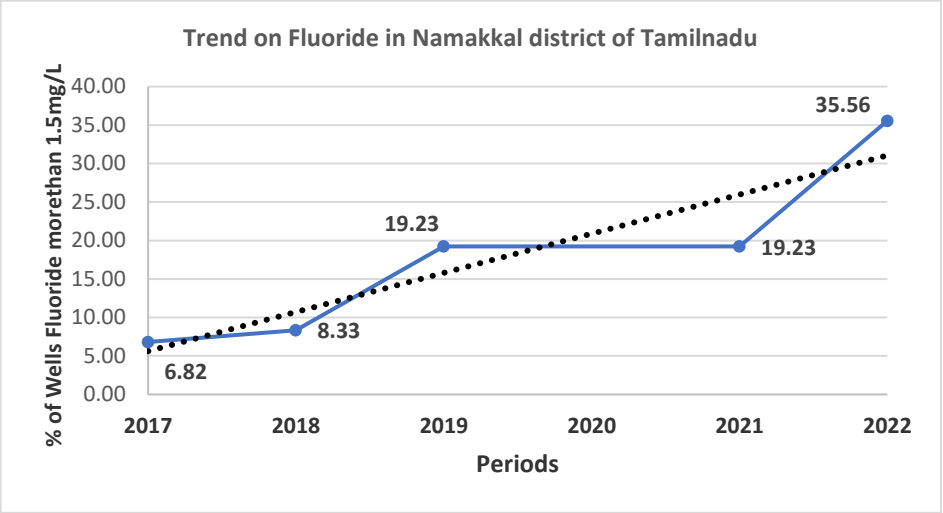


Fig 7.3.5 Trend on Fluoride in a district (Namakkal) for the period of 2017-2022

7.4 NITRATE

Nitrate is one of the major indicators of anthropogenic sources of pollution. The negative charge and high mobility favors its persistence in nature and transport along the groundwater flow path. Nitrate is the ultimate oxidized product of all nitrogen containing matter and its occurrence in groundwater can be fairly attributed to infiltration of water through soils containing domestic, vegetable and animal waste, fertilizer and industrial pollution. A large proportion of this nitrogen gets converted into nitrate which, being soluble in water and not retained by soils, gets leached into water bodies. As the lithogenic sources of nitrogen are very rare, its presence in groundwater is almost due to anthropogenic activity. Some chemical and micro-biological processes such as nitrification and denitrification also influence the nitrate concentration in ground water.

NO_3 is an oxidizing agent and is readily oxidizes haemoglobin (Hb) in to met haemoglobin (MeHb) a blue coloured pigment and gets reduced to NO_2. The oxidized Hb impairs seriously the oxygen carrying capacity of the blood and thus causes hypoxia, which may have fatal consequences in anaemic individuals and infants under8 weeks of age. The MeHb formed in the infant blood gives a characteristic bluish to the skin and mucous membrane, thus giving the name “Blue Baby Syndrome”. This condition is particularly important in the case of infants because the infant and the foetal – Hb, which is $\square_2\square_2$ type has greater affinity for oxygen (O_2) than adult Hb which is $\square_2\square_2$ type. This condition may also result by birth due to the deficiency of an enzyme known as met haemoglobin reducate in the foetal blood. This enzyme catalyse the reversion of MeHb to Hb as follows.

Reductase

Me-Hb ↔ Hb

Thus the Me-Hb formed in the foetal blood severely impairs the oxygen carrying capacity of the blood in infants, causing the blue baby disease.

As per the BIS Standard for drinking water the maximum desirable limit of Nitrate concentration in ground water is 45 mg/L with no relaxation. Though, Nitrate is considered relatively non-toxic, a high nitrate concentration in drinking water is an environmental health concern arising from increased risks of methemoglobinemia particularly to infants. Adults can tolerate little higher concentrations. The specified limits are not to be exceeded in public water supply. If the limit is exceeded, water is considered to be unfit for human consumption.

The occurrences of Nitrate in ground water beyond permissible limit (45 mg /L) have been shown on the map as a point source Fig 7.4.1 and also given in Table 7.4.1, where nitrate has been found in excess of 45 mg/L in groundwater. District-wise percentage of wells having nitrate >45 mg/L is shown as a bar diagram in Fig 7.4.2. The percentage of wells having nitrate morethan the permissible limit of 45 mg/L was more in all the district except Nilgiris district. The details of locations where nitrate concentration is more than 45 mg/L is given in Table 7.4.1.

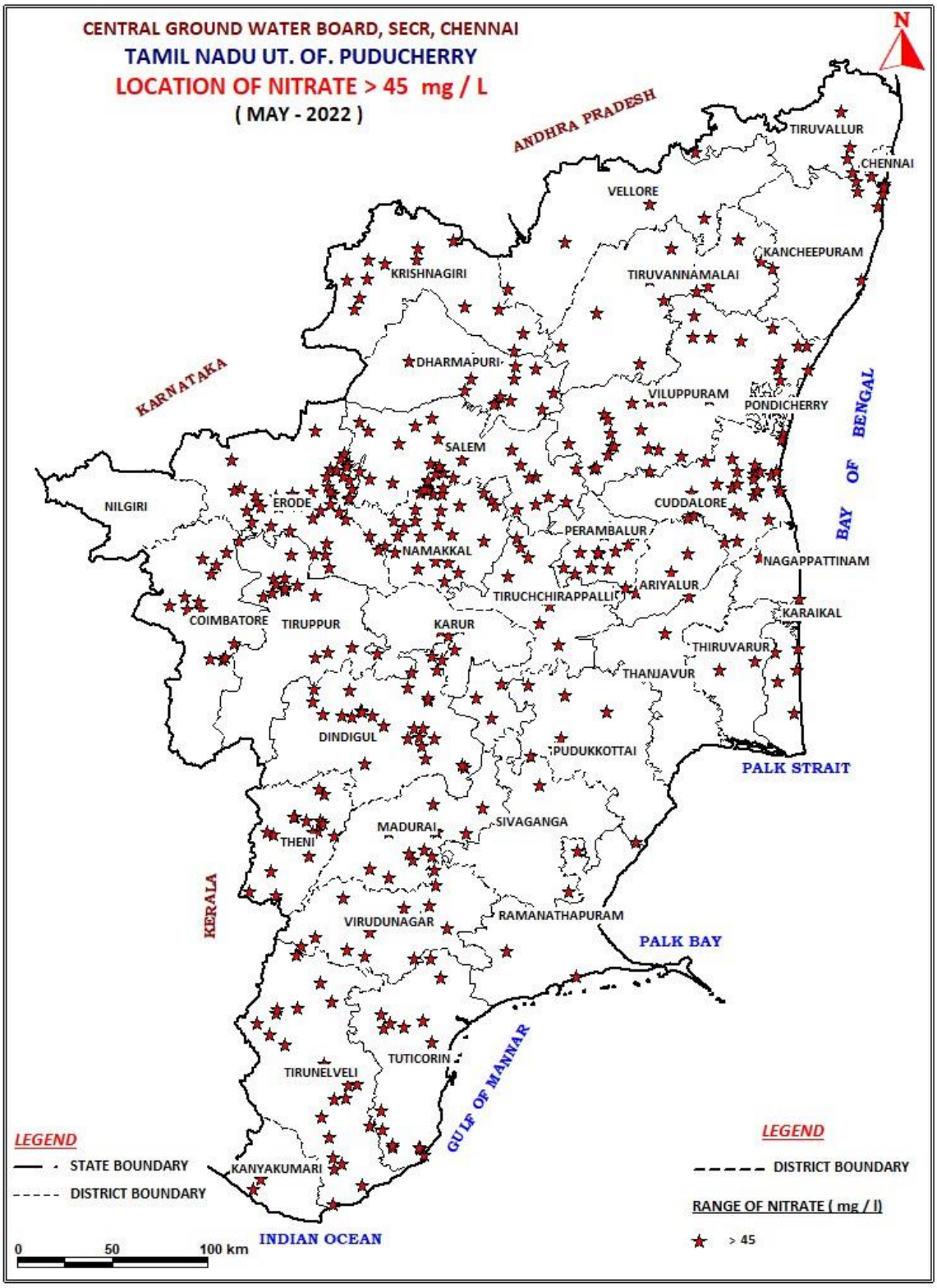


Fig 7.4.1 Locations having Nitrate concentration > 45 mg/L during 2022-23

Table 7.4.1 District-wise percentage of wells having Nitrate >45 mg/L

S. No	Districts	No. of Samples collected (NHS 2022-23)	No. of Samples (NO3 > 45 mg/L)	(%) Samples (NO3 > 45mg/L)
1	Ariyalur	16	5	31.3
2	Chennai	18	1	5.6
3	Coimbatore	49	17	34.7
4	Cuddalore	66	24	36.4
5	Dharmapuri	58	36	62.1
6	Dindigul	52	27	51.9
7	Erode	84	45	53.6
8	Kancheepuram	79	12	15.2
9	Kanyakumari	21	3	14.3
10	Karaikal (UToP)	4	4	100.0
11	Karur	15	5	33.3
12	Krishnagiri	57	17	29.8
13	Madurai	42	18	42.9
14	Nagapattinam	16	8	50.0
15	Namakkal	45	25	55.6
16	Nilgiris	7	0	0.0
17	Perambalur	20	17	85.0
18	Puducherry(UToP)	15	5	33.3
19	Pudukottai	34	7	20.6
20	Ramanathapuram	19	2	10.5
21	Salem	51	31	60.8
22	Sivaganga	18	3	16.7
23	Thanjavur	15	1	6.7
24	Theni	39	17	43.6
25	Thiruvannamalai	39	9	23.1
26	Tirunelveli	68	23	33.8
27	Tiruppur	20	6	30.0
28	Tiruvallur	53	4	7.5
29	Tiruvarur	6	2	33.3
30	Trichy	42	14	33.3
31	Tuticorin	40	14	35.0
32	Vellore	7	2	28.6
34	Villupuram	51	30	58.8
35	Virudhunagar	33	12	36.4
		1199	**450**	**37.5**

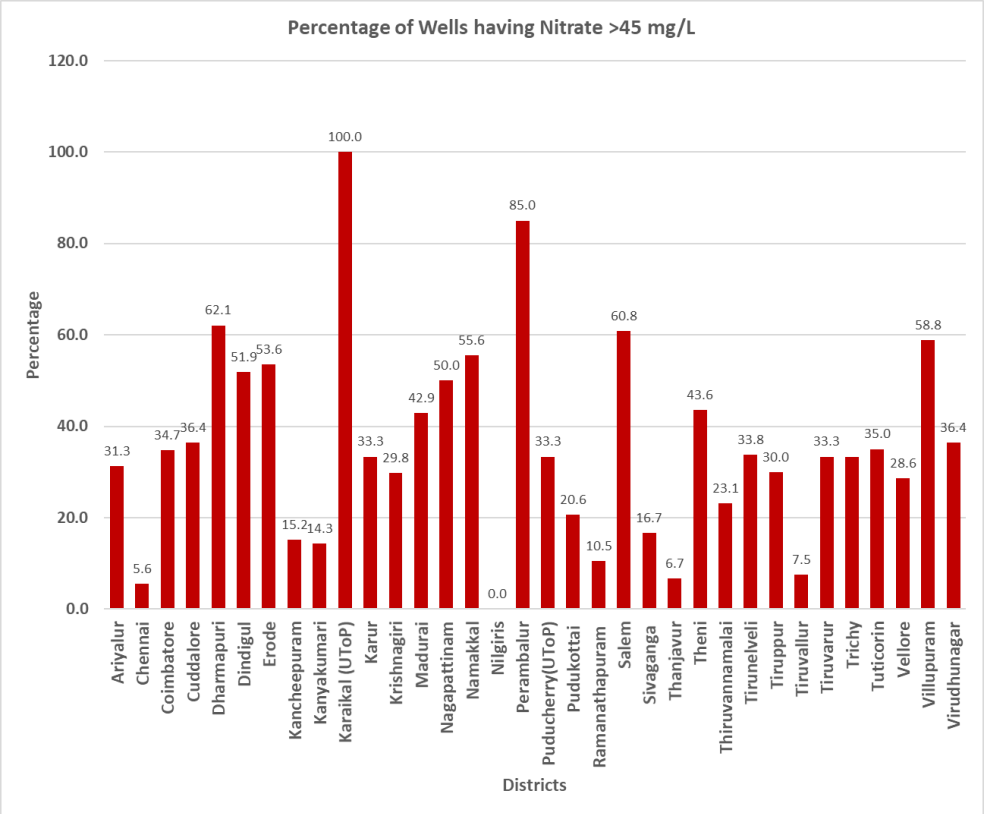


Fig 7.4.2 District-wise percentage of wells having Nitrate >45 mg/L

Table 7.4.2 List of well shows nitrate more than permissible limit of 45 mg /L during May 2022

S_NO	DISTRICT	LOCATIO	Latitude	Longitude	Nitrate mg/L
1	Ariyalur	Kiharasanur	11.0114	78.9319	198
2	Ariyalur	Kilpazhavur	11.0436	79.0653	155
3	Ariyalur	Oliyur EW	11.3979	79.3186	69
4	Ariyalur	Papakudi	11.2855	79.4900	66
5	Ariyalur	Periyathukurichi	11.4104	79.3500	56
6	Chennai	Vepery	13.0833	80.2708	142
7	Coimbatore	Kallampalayam pz	11.0300	77.2833	227
8	Coimbatore	Periya Negamam pz	10.7403	77.1014	213
9	Coimbatore	Kattampatty pz	10.8053	77.1425	199
10	Coimbatore	Annur1	11.2333	77.1083	178
11	Coimbatore	Vadavalli	11.0250	76.9083	178
12	Coimbatore	Chinnaripalayam	10.7292	77.0917	162
13	Coimbatore	P.N. palayam	11.2069	76.9922	137
14	Coimbatore	Kovilvazhi IV	11.0583	77.3889	116
15	Coimbatore	Sarkar samakulam pz	11.1333	77.0333	104
16	Coimbatore	Kuniyamuthur	10.9667	76.9167	104
17	Coimbatore	Kunnakalpalayam pz	11.0456	77.3272	98
18	Coimbatore	Madukkarai-PZ	10.9083	76.9667	93
19	Coimbatore	Podanur1	10.9667	76.9833	86
20	Coimbatore	Thondamuthur	10.9833	76.8333	83

21	Coimbatore	Ganesapuram	11.1758	77.0575	76
22	Coimbatore	Kinathukadavu	10.7333	77.0292	70
23	Coimbatore	Coimbatore Taluk Office	11.0017	76.9711	57
24	Cuddalore	Reddipalayam	11.5371	79.5300	130
25	Cuddalore	Anathanampettai	11.6068	79.6351	124
26	Cuddalore	Sengalpalayam-I	11.4324	79.5422	87
27	Cuddalore	Arasadikuppam	11.6147	79.6614	81
28	Cuddalore	Komaratchi	11.5514	79.8072	74
29	Cuddalore	Kundiamallur	11.5269	79.6517	74
30	Cuddalore	Palayamkottai EW	11.4161	79.5722	74
31	Cuddalore	Theerthangari EW	11.5604	79.5563	74
32	Cuddalore	Vegakollai	11.6758	79.5289	74
33	Cuddalore	Kattumannakudi	11.2872	79.5517	68
34	Cuddalore	Kattusagai(n)	11.5228	79.6534	68
35	Cuddalore	Kattuvegakollai	11.6475	79.6392	68
36	Cuddalore	Kopuvanur	11.6156	79.1378	68
37	Cuddalore	tiruchchopuram	11.6164	79.7416	68
38	Cuddalore	Ammeri	11.5561	79.4578	62
39	Cuddalore	Annmalainagar	11.3919	79.7072	62
40	Cuddalore	Vadalur EW	11.5375	79.8844	62
41	Cuddalore	Iruppu ii	11.5036	79.6325	58
42	Cuddalore	Keelpuvanikuppam	11.6013	79.7191	56
43	Cuddalore	NLC arch gate	11.6177	79.5540	52
44	Cuddalore	Manjakuppam	11.7644	79.7647	51
45	Cuddalore	Nadiyapattu	11.6647	79.4041	50
46	Cuddalore	Srinivasapuram	11.5839	79.6335	50
47	Cuddalore	Vanathirayapuram I	11.5177	79.3347	50
48	Dharmapuri	Sillarahalli	12.0525	78.2806	336
49	Dharmapuri	Sillarahalli	12.0525	78.2806	336
50	Dharmapuri	Echambadi dw	12.1128	78.4942	262
51	Dharmapuri	Echambadi dw	12.1128	78.4942	262
52	Dharmapuri	A.Pallipatti	11.9403	78.4017	199
53	Dharmapuri	A.Pallipatti	11.9403	78.4017	199
54	Dharmapuri	Nagadasampatti	12.1333	77.9833	198
55	Dharmapuri	Nagadasampatti	12.1333	77.9833	198
56	Dharmapuri	Thirthamalai DW	12.1017	78.5892	162
57	Dharmapuri	Thirthamalai DW	12.1017	78.5892	162
58	Dharmapuri	Indoor	12.1333	78.0583	160
59	Dharmapuri	Indoor	12.1333	78.0583	160
60	Dharmapuri	Odasalapatti x road	12.1431	78.2844	157
61	Dharmapuri	Odasalapatti x road	12.1431	78.2844	157
62	Dharmapuri	Bommidimalapurm	12.0000	78.2500	147
63	Dharmapuri	Bommidimalapurm	12.0000	78.2500	147
64	Dharmapuri	Dharmapuri2	12.1375	78.1708	80
65	Dharmapuri	Dharmapuri2	12.1375	78.1708	80
66	Dharmapuri	Morappur dw	12.1247	78.3989	76
67	Dharmapuri	Morappur dw	12.1247	78.3989	76
68	Dharmapuri	Odasalapatti	12.1417	78.2917	67
69	Dharmapuri	Odasalapatti	12.1417	78.2917	67
70	Dharmapuri	Harur2	12.0514	78.4833	62
71	Dharmapuri	Harur2	12.0514	78.4833	62
72	Dharmapuri	Boothanatham	11.9508	78.4688	62
73	Dharmapuri	Boothanatham	11.9508	78.4688	62

74	Dharmapuri	Mukkareddipatti	11.9667	78.4167	61
75	Dharmapuri	Mukkareddipatti	11.9667	78.4167	61
76	Dharmapuri	Kottapatti Pz	11.9850	78.6717	58
77	Dharmapuri	Kottapatti Pz	11.9850	78.6717	58
78	Dharmapuri	Athikarapatti	11.9340	78.3909	55
79	Dharmapuri	Athikarapatti	11.9340	78.3909	55
80	Dharmapuri	Maniyampadi	12.1246	78.2847	52
81	Dharmapuri	Maniyampadi	12.1246	78.2847	52
82	Dharmapuri	Sittilingiri	11.9098	78.6212	49
83	Dharmapuri	Sittilingiri	11.9098	78.6212	49
84	Dindigul	Natham1	10.2222	78.2472	361
85	Dindigul	Chitterivu pz	10.2378	77.7708	289
86	Dindigul	Paraipatti	10.3583	77.9750	282
87	Dindigul	Chattrapatti	10.4667	77.6583	275
88	Dindigul	Thamaraipadi	10.4053	78.0453	241
89	Dindigul	Nattam	10.2328	78.2333	233
90	Dindigul	Thoppampatti	10.5900	77.5269	226
91	Dindigul	Oddanchatram1	10.4908	77.7528	207
92	Dindigul	Vaivesapuram	10.3244	78.0419	207
93	Dindigul	Kanakkanpatti	10.4750	77.5667	204
94	Dindigul	Oodanchatram	10.4875	77.7542	198
95	Dindigul	Thumbalapatti	10.5333	77.5208	178
96	Dindigul	Chellamantadi	10.4072	78.0025	157
97	Dindigul	Guzilamparai	10.6806	78.1156	152
98	Dindigul	Muthampattipalayam	10.7272	78.1392	134
99	Dindigul	Vaivesapuram	10.5396	78.0710	132
100	Dindigul	Pudu Ettama Nayakar Patti	10.4619	77.7061	117
101	Dindigul	Kakkinapatti	10.6714	77.9922	107
102	Dindigul	Vadamadurai pz	10.2630	78.0612	107
103	Dindigul	Kallimandiam	10.5833	77.6944	106
104	Dindigul	P. Alagapuri	10.5983	77.9756	100
105	Dindigul	Vaivesapuram	10.5484	78.0720	100
106	Dindigul	Vadamadurai	10.3583	78.1000	87
107	Dindigul	Palakanthu	10.4658	77.8056	82
108	Dindigul	Reddiarchattram	10.4167	77.8611	79
109	Dindigul	R.Pudukottai	10.3646	78.0303	76
110	Dindigul	Servaikaranpatti	10.7472	78.0917	64
112	Erode	Gettichcheriyar	11.3383	77.4133	94
113	Erode	Punnachipudur dw	11.5919	77.6661	82
114	Erode	Asanur pz	11.6739	77.1289	81
115	Erode	Krishnapuram	11.5367	77.7097	81
116	Erode	Urachikottai	11.4847	77.6917	80
117	Erode	Guvuar dw	11.6414	77.6822	78
118	Erode	Kavilipalayam	11.3802	77.2308	76
119	Erode	Perundurai1	11.2792	77.5847	72
120	Erode	Pudupalayam1	11.5944	77.5875	72
121	Erode	Kavundappadi	11.4333	77.5583	71
122	Erode	Punnam pz	11.5072	77.6139	71
123	Erode	Sathiyamangalam	11.5028	77.2472	70
124	Erode	Ariyappanpalayam pz	11.4756	77.2542	69
125	Erode	Chennampatti pz	11.7019	77.6736	67
126	Erode	Murlipudur	11.6781	77.6560	67
127	Erode	Settunampalayam pz	11.5200	77.6033	67

128	Erode	Indiampalayam	11.4500	77.2694	66
129	Erode	Otti Vilangadu	11.2242	77.4186	66
130	Erode	Ingur New	11.2258	77.5814	63
131	Erode	Ammapet2	11.6194	77.7444	62
132	Erode	Kattupalayam pz	11.5453	77.5953	62
133	Erode	Kurichi	11.5733	77.6939	62
134	Erode	Pandiyampalayam pz	11.3983	77.5175	62
135	Erode	Periyapuliyur pz	11.4283	77.6492	62
136	Erode	Puduvadavalli	11.5417	77.1761	62
137	Erode	Varadanallur	11.4933	77.6986	62
138	Erode	Karaiyur1	10.7639	77.5944	61
139	Erode	Rajan Nagar pz	11.5289	77.1422	60
140	Erode	Vellitirupur	11.6208	77.6333	56
141	Erode	Punjaiduraiampalayam	11.5131	77.4233	55
142	Erode	Chittodu	11.3917	77.6778	54
143	Erode	Vinnampalli	11.4328	77.2022	53
144	Erode	Chennimalai2	11.1625	77.5972	52
145	Erode	Nambiyur	11.3606	77.3208	52
146	Erode	Ooricheri	11.4650	77.6058	52
147	Erode	Attani	11.5242	77.5167	50
148	Erode	Alukuli pz	11.4481	77.3578	49
149	Erode	Alampalayam pz	11.6272	77.6061	48
150	Erode	Gobichettipalayam1	11.4583	77.4458	48
151	Erode	Kambaliyampatti pz	11.2314	77.5253	48
152	Erode	Mulanur2	10.7917	77.7083	48
153	Erode	Erakalpudur(Sivanmal	11.0308	77.5347	47
154	Erode	Arakkan kottai	11.4969	77.3431	46
155	Erode	Bhavani1	11.8083	77.5333	46
156	Erode	Thaneerpanthalpalaya	11.6589	77.6847	46
157	Kancheepuram	Kottivakkam	12.9681	80.2600	120
158	Kancheepuram	Anakkaputhur	12.9833	80.1250	109
159	Kancheepuram	Chemmamcheri	12.8633	80.2261	74
160	Kancheepuram	Sadras	12.5203	80.1517	59
161	Kancheepuram	Blue beach road.	12.9539	80.2547	59
162	Kancheepuram	St.Thomas Mount dw	13.0072	80.1978	55
163	Kancheepuram	Mangadu	13.0247	80.1089	55
164	Kancheepuram	Chinna Nilangarai	12.9575	80.2608	51
165	Kancheepuram	Tirukalukundram	12.6083	79.6667	51
166	Kancheepuram	Arasanimangalam	12.5689	79.7233	49
167	Kancheepuram	Tambaram1	12.9333	80.1333	47
168	Kancheepuram	Lions Club	12.9272	80.2639	46
169	Kanyakumari	Karungal pz	8.2347	77.2347	54
170	Kanyakumari	Thiruvattar	8.3333	77.2678	51
171	Kanyakumari	Kattudurai DW	8.2839	77.2719	46
172	Karaikal	Karaikal dw	10.9322	79.8314	115
173	Karaikal	Kottucherry	10.9583	79.8167	58
174	Karaikal	Thirunallur	10.9261	79.7922	47
175	Karaikal	Kilakasakudi	10.9333	79.8417	46
176	Karur	Vellianani	10.8667	78.1333	205
177	Karur	Jagatabi	10.8417	78.1667	116
178	Karur	Melnagavaram dw	10.8767	78.2219	81
179	Karur	Veerapalayam dw	10.7789	78.1975	52
180	Karur	Kovilur	10.7603	77.8289	50
181	Krishnagiri	Mattur	12.3833	78.4139	211

182	Krishnagiri	Mattur	12.3833	78.4139	211
183	Krishnagiri	Sulagiri	12.6667	78.0250	206
184	Krishnagiri	Panneswara Madam	12.3917	78.2469	170
185	Krishnagiri	Panneswara Madam	12.3917	78.2469	170
186	Krishnagiri	Krishnagiri	12.3130	78.1259	122
187	Krishnagiri	Krishnagiri	12.3130	78.1259	122
188	Krishnagiri	Pudur Punganai	12.1864	78.4842	121
189	Krishnagiri	Enusonai	12.6138	78.0175	114
190	Krishnagiri	Bargur	12.3242	78.2054	100
191	Krishnagiri	Machinayampalli	12.6156	77.7844	86
192	Krishnagiri	Machinayampalli	12.6156	77.7844	86
193	Krishnagiri	Uttangarai	12.2667	78.5292	85
194	Krishnagiri	Virupakshinagar	12.5933	77.8681	84
195	Krishnagiri	Denkanikottai1	12.5250	77.7833	64
196	Krishnagiri	Denkanikottai1	12.5250	77.7833	64
197	Krishnagiri	Vappanapalli	12.6998	78.1925	51
198	Madurai	Valayankulam pz	9.8042	78.0917	359
199	Madurai	Kolluveeranpatti pz	9.4225	77.5308	313
200	Madurai	Keelakottai pz	9.7867	78.0019	276
201	Madurai	Tirumangalam pz	9.9208	77.8833	238
202	Madurai	Surakulam pz	9.8364	78.0567	234
203	Madurai	Valayankulam	9.8042	78.0917	213
204	Madurai	Thirumangalam new	9.8167	77.9792	186
205	Madurai	Narayanapuram	9.5726	78.0759	134
206	Madurai	Chekkanoorani pz	9.9414	77.9681	114
207	Madurai	Alanganallur	10.0500	78.0967	112
208	Madurai	Madurai Rly Colony	9.9272	78.1036	109
209	Madurai	Madurai New College	9.9189	78.1119	83
210	Madurai	M.K. University	9.9408	78.0006	74
211	Madurai	Melur1	10.0306	78.3333	58
212	Madurai	Peraiyur pz	9.7428	77.7922	55
213	Madurai	Kolluveeranpatti	9.7069	77.8856	51
214	Madurai	Varichiyur pz	9.9125	78.2569	48
215	Madurai	Nilayur pz	9.5119	78.0332	47
216	Nagapattinam	Keelvalur	10.7667	79.7333	70
217	Nagapattinam	Tranquebar	11.0169	79.8514	63
218	Nagapattinam	Odacherry	10.6833	79.8375	61
219	Nagapattinam	Velanganni	10.6833	79.8375	60
220	Nagapattinam	Valagarai	10.6289	79.7483	58
221	Nagapattinam	Thamaraipulam	10.4781	79.8292	58
222	Nagapattinam	Nagapattinam	10.7825	79.8431	54
223	Nagapattinam	Thalaignayiru	11.2097	79.6639	52
224	Namakkal	Elachipalayam new	11.3847	78.0125	86
225	Namakkal	Pudur Siddhampoondi	11.2361	77.9142	86
226	Namakkal	Unjanai	11.3531	77.9561	72
227	Namakkal	Gurusamipalayam	11.4342	78.1344	68
228	Namakkal	Thoppur (N)	11.1011	78.1517	68
229	Namakkal	Thiruchengodu	11.3833	77.9083	67
230	Namakkal	Ezhur-Olapalayam D	11.3658	78.1192	66
231	Namakkal	Paramarthi dw	11.1567	78.0214	64
232	Namakkal	Mullakurchi dw	11.4594	78.3969	62
233	Namakkal	Pulavar Palayam	11.1956	78.1086	62
234	Namakkal	Thondichettipatti	11.1867	78.1681	61
235	Namakkal	Kattipalayam	11.3156	78.0336	60

236	Namakkal	Kokkarayanpettai	11.3147	77.7947	60
237	Namakkal	selur valavanthinadu	11.2889	78.3392	59
238	Namakkal	Vennandur	11.5125	78.0958	55
239	Namakkal	Mohanur1	11.5125	78.1417	54
240	Namakkal	SPN Nagar	11.1411	78.2200	53
241	Namakkal	Nallur1	11.2667	77.8667	52
242	Namakkal	Metala	11.5167	78.3417	51
243	Namakkal	Kalipatti	11.5167	78.0361	49
244	Namakkal	Kamarajar Nagar	11.4831	78.3750	48
245	Namakkal	Minnampalli	11.3165	78.1865	48
246	Namakkal	Ramapuram	11.4403	78.0092	48
247	Namakkal	Uthandipalayam	11.2464	77.8361	48
248	Namakkal	Rasipuram1	11.4583	78.2250	46
249	Perambalur	Chettikulam	11.1347	78.7750	372
250	Perambalur	Chitali	11.2406	78.9682	322
251	Perambalur	Kallampudur	11.2350	78.8025	223
252	Perambalur	Kunnam	11.3477	78.9491	223
253	Perambalur	Valikandapuram	11.2325	79.3142	192
254	Perambalur	Vijayagopalapuram	11.2700	79.0314	186
255	Perambalur	Kurumbalur	11.1626	78.7203	161
256	Perambalur	Nakkaselam	11.3186	78.9171	155
257	Perambalur	Mangalamedu	11.2306	78.8922	124
258	Perambalur	Ranjankudi	11.3472	78.9412	112
259	Perambalur	Essanai	11.0690	79.0222	93
260	Perambalur	Palaiyur	11.1636	78.8575	81
261	Perambalur	Therku Mathevi	11.1400	79.2375	81
262	Perambalur	Perambalur	11.1586	78.9364	74
263	Perambalur	Perambalur	11.2333	78.8830	74
264	Perambalur	Annukur	11.3293	78.8615	65
265	Perambalur	Veppur (Nallur)	11.3167	79.0636	61
266	Pondicherry	Manapattu EW	11.7992	79.7747	68
267	Pondicherry	Mangalam-I	11.9028	79.7391	68
268	Pondicherry	Pondicherry	11.9333	79.8349	62
269	Pondicherry	Reddichavadi	11.9368	79.8270	50
270	Pondicherry	VILLIANUR	11.7665	79.7678	50
271	Pudukkottai	Devuipattinam DW	9.4808	78.8976	291
272	Pudukkottai	Viralimalai DW	10.6083	78.5499	161
273	Pudukkottai	Lekkampatti Pz	10.5597	78.7264	154
274	Pudukkottai	Vegupatti Pz	10.2755	78.5619	62
275	Pudukkottai	Peraiyur Dw	9.3569	78.4467	49
276	Pudukottai	Sundarapatti Pz	10.3588	78.7069	190
277	Pudukottai	Mandangudi Dw	10.4853	78.9283	64
278	Ramanathapuram	Kizhakakarai	9.2394	78.7840	164
279	Ramanathapuram	Paramakudi DW	9.5417	78.5375	62
280	Salem	Omalur	11.7458	78.7458	270
281	Salem	Palampatti	11.5694	78.0722	234
282	Salem	Papparapatty	11.3131	78.0337	215
283	Salem	Pulaveri	11.6083	78.1083	174
284	Salem	Tivettipatti	11.8667	78.0875	172
285	Salem	Mecheri	12.8111	79.3972	164
286	Salem	Mamudi	11.5325	78.0517	143
287	Salem	Puthur dw	11.6264	78.7833	143
288	Salem	Panamarathupatti2	11.5903	78.1931	127
289	Salem	Ayodhyapattinam	11.6697	78.2389	125

290	Salem	Attayampatti Ghss	11.5253	78.0750	125
291	Salem	Mallur1	11.5375	78.1458	117
292	Salem	Veraganur dw	11.4753	78.7361	116
293	Salem	Thandavarayapuram dw	11.5903	78.5558	108
294	Salem	Vedukathampatty dw	11.6528	78.0819	101
295	Salem	Dhasanaickanpatty dw	11.6094	78.1453	99
296	Salem	Akkaripalayam	11.3406	78.0500	86
297	Salem	Veerapandi dw	11.5736	78.0728	84
298	Salem	Gangavalli	11.4958	78.6500	81
299	Salem	Gudamali dw	11.4603	78.5875	79
300	Salem	Kulathur	11.8472	77.7472	76
301	Salem	Konganapuram	11.5667	77.9000	73
302	Salem	Athur	11.5917	78.5861	67
303	Salem	Samudram pz	11.7472	77.9306	65
304	Salem	Panaimadal	11.7185	78.4755	65
305	Salem	P.N.Palayam1	11.6472	78.5125	63
306	Salem	Kullampatti	11.5833	77.7917	60
307	Salem	Attayampatti S.Puram	11.5253	78.0750	59
308	Salem	Masilapalayam dw	11.8089	77.7889	56
309	Salem	S.K.Garden Nathimedi	11.6392	78.1250	55
310	Salem	Sendarpatti	11.4375	78.5000	54
311	Sivaganga	Tiruvengamputhur	9.8304	78.7858	192
312	Sivaganga	Paniyapatti PZ	10.3126	78.6778	114
313	Sivaganga	Rameswaram DW	9.2884	79.3204	49
314	Thanjavur	Pulavamatham	10.8542	79.2103	51
315	Theni	Koduvilarpatti pz	9.9719	77.4919	266
316	Theni	Gandamanur	9.9183	77.5217	213
317	Theni	M.Subbalapuram pz	9.9717	77.5564	212
318	Theni	Okkaraipatti pz	9.9625	77.5694	195
319	Theni	Gandamanur pz	9.5509	77.3057	174
320	Theni	Kamayagoundanpatti	9.7367	77.3169	166
321	Theni	Sankarapuram pz	9.9069	77.3297	144
322	Theni	Seelampatti PZ	9.8742	77.3928	122
323	Theni	Bodinaickanur dw	10.0989	77.5717	119
324	Theni	Thevaram pz	9.5348	77.1637	112
325	Theni	Periyakulam	10.1208	77.5500	105
326	Theni	Kodangipatti	9.9917	77.4361	94
327	Theni	ThamminaickPatti pz	9.9164	77.2997	77
328	Theni	Kadamalaikundu pz	9.8072	77.5031	68
329	Theni	Balakombai pz	9.9036	77.6233	62
330	Theni	Kodangipatti pz	9.9917	77.4306	61
331	Theni	Erasakkanaayakanur	9.9250	77.5417	52
332	Thiruvannamalai	Kappalur (T)	10.1417	78.6083	137
333	Thiruvannamalai	Pudupalayam	12.3611	78.8792	109
334	Thiruvannamalai	Kalavai(Vellore dist)	12.4886	79.4125	92
335	Thiruvannamalai	Arani	12.3500	79.3500	91
336	Thiruvannamalai	Melravandavadi	12.2083	78.7083	82
337	Thiruvannamalai	Sathanur	12.2097	79.8878	77
338	Thiruvannamalai	Kattampundi OW	12.1267	79.0853	73
339	Thiruvannamalai	Nedumpirai OW	12.7078	79.5611	64
340	Thiruvannamalai	Padagam	12.4194	79.2039	56
341	Thiruvannamalai	Chetpet1	12.4611	79.3583	54
342	Thiruvannamalai	Bagmarpet	12.5167	79.1333	48

343	Tirunelveli	Nelliappar temple	8.7281	77.6883	77
344	Tirunelveli	Therkuvalliyur OW	8.3331	77.6240	76
345	Tirunelveli	P.chatram	9.1183	77.6125	74
346	Tirunelveli	Palayamkottai	8.7333	77.7333	71
347	Tirunelveli	Seetharappanallur	8.7939	77.6018	70
348	Tirunelveli	Taruvai	8.6667	77.6806	68
349	Tirunelveli	Valliyoor	8.3556	77.6583	65
350	Tirunelveli	Poothatan Kudieruppu	8.5783	77.5603	64
351	Tirunelveli	Kalakadu	8.4806	77.5986	63
352	Tirunelveli	Sankarankoil1	9.2083	77.5583	62
353	Tirunelveli	Tenkasi OW	8.9633	77.3115	61
354	Tirunelveli	Valliyur	8.3861	77.6167	61
355	Tirunelveli	Sivagiri OW	9.3400	77.4383	58
356	Tirunelveli	Tiruvembalapuram	8.2542	77.7583	58
357	Tirunelveli	Mullikulam	9.4986	77.7000	57
358	Tirunelveli	N. Vijayanarayanam	8.5333	77.7917	56
359	Tirunelveli	Vannikonendal	8.6611	77.6250	56
360	Tirunelveli	Virasikhamani OW	9.0919	77.4447	56
361	Tirunelveli	Charanmadevi	8.8278	77.5750	55
362	Tirunelveli	Kadayanallur	9.0667	77.3458	55
363	Tirunelveli	Chettikulam	8.1667	77.6167	54
364	Tirunelveli	Kadayanallur1	9.0833	77.3500	54
365	Tirunelveli	Kilpaur	8.9167	77.3833	54
366	Tirunelveli	Panpoli	9.0167	77.2528	46
367	Tiruppur	Nachipalayam	11.0833	77.4458	197
368	Tiruppur	Odakadu	11.1117	77.3342	165
369	Tiruppur	Rengagoundanpalaya	11.0697	77.3844	165
370	Tiruppur	Weekly Market	11.0881	77.3431	79
371	Tiruppur	Kasipalayam (T)	11.1156	77.3858	78
372	Tiruppur	KaravallurPZ	11.2894	77.1692	69
373	Tiruvallur	Tiruvallur	13.1417	79.1417	156
374	Tiruvallur	Kovilpathagai	13.1428	80.0969	90
375	Tiruvallur	Palavakkam (T)	11.4158	80.1300	56
376	Tiruvallur	Periyapalyam	13.3125	80.0500	48
377	Tiruvarur	Mannargudi	10.6833	79.4667	102
378	Tiruvarur	Pangal	10.7208	79.6417	66
379	Trichy	Mudaliarchatram	10.8003	78.6967	397
380	Trichy	Pulivalam	11.0167	78.6375	332
381	Trichy	Ookaeri	11.2108	78.5500	313
382	Trichy	Pullambadi	11.0458	78.9583	256
383	Trichy	Peramangalam	10.9867	78.6542	236
384	Trichy	Sirukambur	10.9014	78.6039	200
385	Trichy	Thathayangarpet	11.1208	78.4542	163
386	Trichy	Chinnagowdanpatti	10.4575	78.3783	136
387	Trichy	Uppiliyapuram	11.2622	78.5167	115
388	Trichy	Koppampatti	11.3008	78.4972	99
389	Trichy	Manaparai	10.6144	78.4253	78
390	Trichy	Vaiyampatty	10.5500	78.3000	69
391	Trichy	Manaparai II	10.6147	78.4256	54
392	Trichy	Tumbalam	11.0306	78.4328	52
393	Tuticorin	Nagalapuram	9.2333	78.1306	81
394	Tuticorin	Thailapuram	8.6083	77.8500	79
395	Tuticorin	Eppodumvendram	9.0292	78.0458	78
396	Tuticorin	Kurukkuchalai	8.9306	78.0917	72

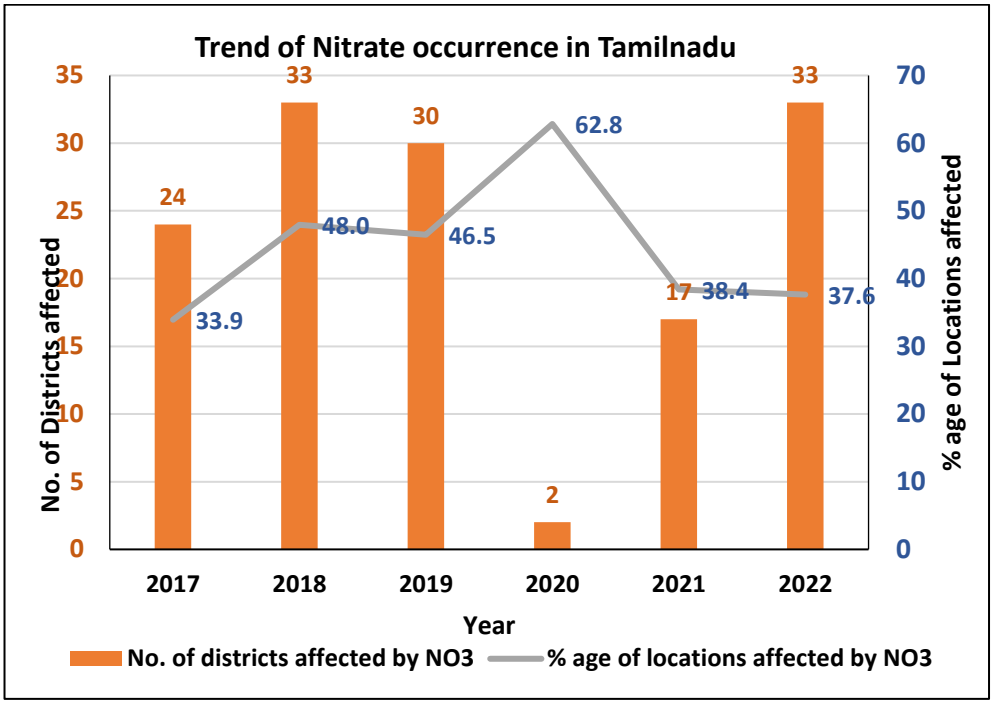
397	Tuticorin	Paikulam	8.5181	77.8556	70
398	Tuticorin	Sathankulam-n	8.4444	77.9000	62
399	Tuticorin	Satankulam	8.4333	77.9028	58
400	Tuticorin	Vembur	9.3250	78.0819	58
401	Tuticorin	Villiseri	9.0583	77.8500	56
402	Tuticorin	Kulasekharaptnm	8.4000	78.0542	55
403	Tuticorin	Kadambur pz (T)	8.9972	77.8617	52
404	Tuticorin	Udangudi	8.4298	78.0335	50
405	Tuticorin	Udangudi dw	8.4342	78.0292	49
406	Tuticorin	Pasuvanthanai	9.0013	77.9596	46
407	Vellore	Kandili	12.4778	78.4556	351
408	Vellore	Avarakarai Pz	12.5636	79.1713	75
409	Vellore	Virupachipuram	12.8778	79.1333	56
410	Villipuram	Ulagankaththan	11.6953	78.9347	192
411	Villipuram	Andiarpalayam	12.0474	79.7627	136
412	Villipuram	Chinnasalem	11.6375	78.8818	130
413	Villipuram	Allampundi	12.2483	79.3406	112
414	Villipuram	Rishivandiyam	11.8131	79.0947	112
415	Villipuram	Nallavur Pudur	12.1344	79.7603	99
416	Villipuram	Vadasemapalaym	11.8592	78.9314	99
417	Villipuram	Rajampalayam	11.9459	79.1378	93
418	Villipuram	Sadaikattu attipattu	11.9988	79.1659	93
419	Villipuram	Eliyathur (New)	11.9552	79.4185	87
420	Villipuram	Sankarapuram	11.8866	78.9147	74
421	Villipuram	Ulundurpet	11.6908	79.2893	74
422	Villipuram	Vazhavanthankuppam	11.7219	79.1289	74
423	Villipuram	Arakandanallur	11.9742	79.2258	68
424	Villipuram	Kallakurichi	11.7386	78.9538	68
425	Villipuram	Kiliyanur	12.1008	79.7458	68
426	Villipuram	Gopalapuram	12.2285	79.5702	62
427	Villipuram	Kallakurichi	11.7391	78.9623	62
428	Villipuram	Sankarapuram	11.8857	78.9178	62
429	Villipuram	Tirukkoilur	11.9535	79.1927	62
430	Villipuram	Gingee	12.2521	79.4259	56
431	Villipuram	Pidagam	11.7206	79.1792	56
432	Villipuram	Siruvadi	12.2048	79.8441	56
433	Villipuram	Alathur	11.7990	78.9471	50
434	Villipuram	Chinnasalem	11.6314	78.8684	50
435	Villipuram	Kadambur	11.9410	79.0500	50
436	Villipuram	Kunimedu	12.0945	79.8929	50
437	Villipuram	Mogaiyur	11.0250	79.3211	50
438	Villipuram	Ollakkur	12.2922	79.7245	50
439	Villupuram	Avalurpet(Villupuram	12.6658	79.2406	107
440	Virudhunagar	Alangulam	9.3639	77.6861	101
441	Virudhunagar	Kariyapatti1	9.6694	78.1083	90
442	Virudhunagar	Devadanam1	9.3833	77.4656	83
443	Virudhunagar	Sevalpatti	9.5583	77.9583	82
444	Virudhunagar	Aviyur dw	9.7389	78.1008	80
445	Virudhunagar	Sivakasi2	9.4500	77.7917	80
446	Virudhunagar	Nenmeni1	9.3250	78.0083	74
447	Virudhunagar	Vembakkottai-OW	9.3333	77.7667	67
448	Virudhunagar	Muntalapuram	9.0172	77.8894	66
449	Virudhunagar	Sundarapandiyan	9.6083	77.6667	58
450	Virudhunagar	Mullikulam-V	9.4986	77.7000	48

7.4.1 TREND ON NITRATE

Trend analysis determines whether the measured values of the water quality variables increase or decrease during a time period. Nitrate is one of the major indicators of anthropogenic sources of pollution. Nitrate is the ultimate oxidized product of all nitrogen containing matter and its occurrence in groundwater can be fairly attributed to infiltration of water through soil containing domestic waste, animal waste, fertilizer and industrial pollution. As the lithogenic sources of nitrogen are very rare, its presence in ground water is almost due to anthropogenic activity. Hence, nitrate was taken to assess the trend of ground water quality in India due to anthropogenic activity. The percentage of well exceeds the permissible limit of 45mg/L for the period of 2017 to 2022 were compared and presented in the Table 7.4.3 and Fig 7.4.3 and observed that the percentage of samples exceed the permissible limit of nitrate (> 45 mg/L) were ranging between 34 – 48 % during 2017-2022 except 2020 and no significant trend was noticed. The number of wells monitored in the year 2020 and 2022 was comparatively less due to COVID pandemic situation. The number of nitrate affected district has decreased in the year 2022 in cmparison with 2018 as a greater number of piezometer/deeper wells were included in the monitoring wells after 2018 and shows deeper aquifers are not affected by nitrate. The percentage of wells affected by nitrate was comparatively more (62.8%) in the year 2020 and the sampling was more in residential area of the city and town limits during 2020. It is also observed that the type of waste generated is important in causing the nitrate pollution and also indicates that domestic waste leads to more nitrate problem. This could be due to the leaching of nitrate from the open sewerage lines. Trend on water quality for Nitrate prepared for the state of Tamil Nadu is shown in Fig 7.4.3.

Table 7.4.5: Percentage of wells Exceed Nitrate >1.5 mg/L during the period of 2017-2022

Year	No. of districts affected by NO3	No. of locations affected by NO3	Total Number of samples analysed	% of locations affected by NO3
2017	**24**	**212**	**625**	33.9
2018	**33**	**446**	**930**	48.0
2019	**30**	**551**	**1185**	46.5
2020	**2**	**71**	**113**	62.8
2021	**17**	**238**	**620**	38.4
2022	**33**	**450**	**1199**	37.6



. **Fig. 7.4.3** Trend of Nitrate occurrence in Tamil Nadu

Trend on Nitrate in a district, Tirunelveli and Cuddalure of Tamil Nadu is shown (Fig 7.4.4 and 7.4.5) and observed that the water level is deeper in Tirunelveli district and nitrate is mainly from anthropogenic activity, its influence is minimum in the deeper and shows decreasing trend. The water level is shallow in cuddalure district as the influence of nitrate is more in shallow aquifer and shows increasing trend.

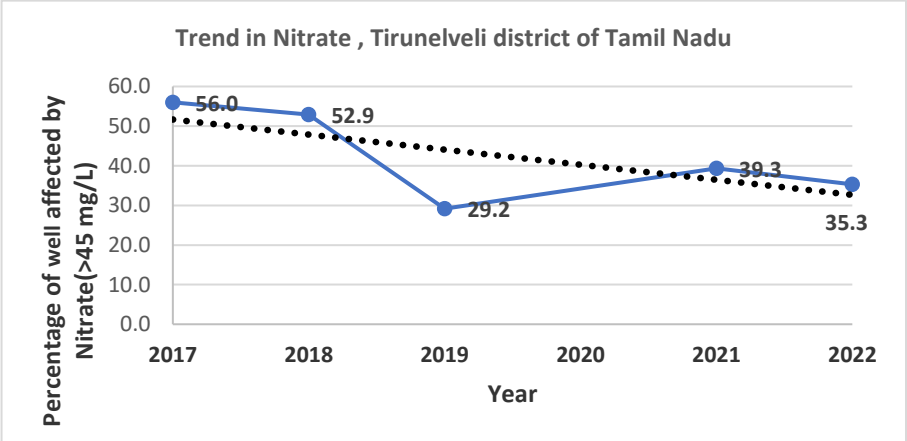


Fig 7.4.4 Trend on Nitrate in a district (Namakkal) for the period of 2017-2022

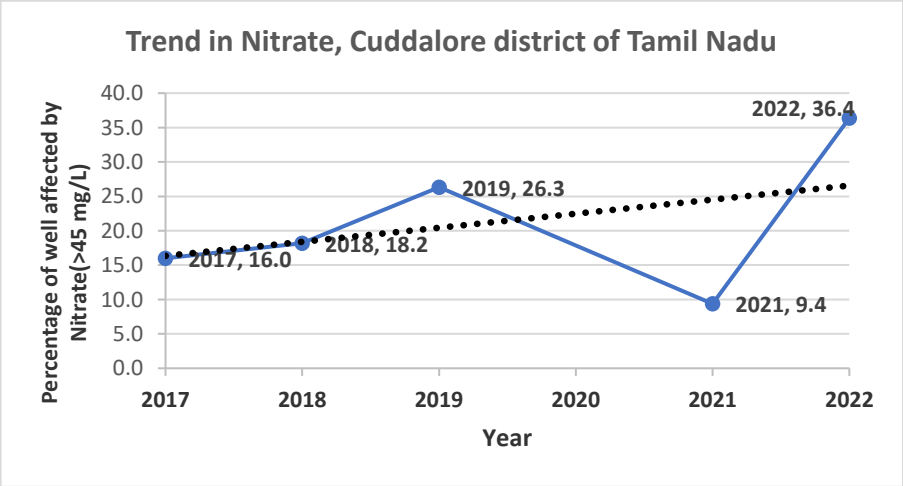


Fig 7.4.5 Trend on Nitrate in a district (Cuddalore) for the period of 2017-2022

7.5 IRON

Iron is a common constituent in soil and ground water. It is present in water either as soluble ferrous iron or the insoluble ferric iron. Water containing ferrous iron is clear and colorless because the iron is completely dissolved. When exposed to air, the water turns cloudy due to oxidation of ferrous iron into reddish brown ferric oxide.

The concentration of iron in natural water is controlled by both physico-chemical and microbiological factors. It is contributed to groundwater mainly from weathering of ferruginous minerals of igneous rocks such as hematite, magnetite and sulphide ores of sedimentary and metamorphic rocks. The permissible Iron concentration in ground water is 0.3 mg/L as per the BIS Standard for drinking water (IS 10500:2012). A baseline study was carried out in the year 2019 for Uranium with other heavy metals like iron, arsenic etc in shallow groundwater in the state of Tamil Nadu and UT of Puducherry to assess the heay metal contamination. A total of 1208 samples were collected and analysed for Iron and found that iron concentration was morethan the permissible limit of 0.3 mg/L was noticed in 57 wells (4.7%). Sampling for heavy metal contamination is once in five years, accordingly sampling will be done in May 2024 for Iron and other heavy metals. Hence May 2019 data has been taken for the assessment iron in groundwater. The occurrences of iron in ground water beyond permissible limit (> 0.3 mg /L) have been shown on the maps as point sources (Fig 7.5.1). It is based on the chemical analysis of water samples mostly collected from the groundwater observation wells during May 2019.

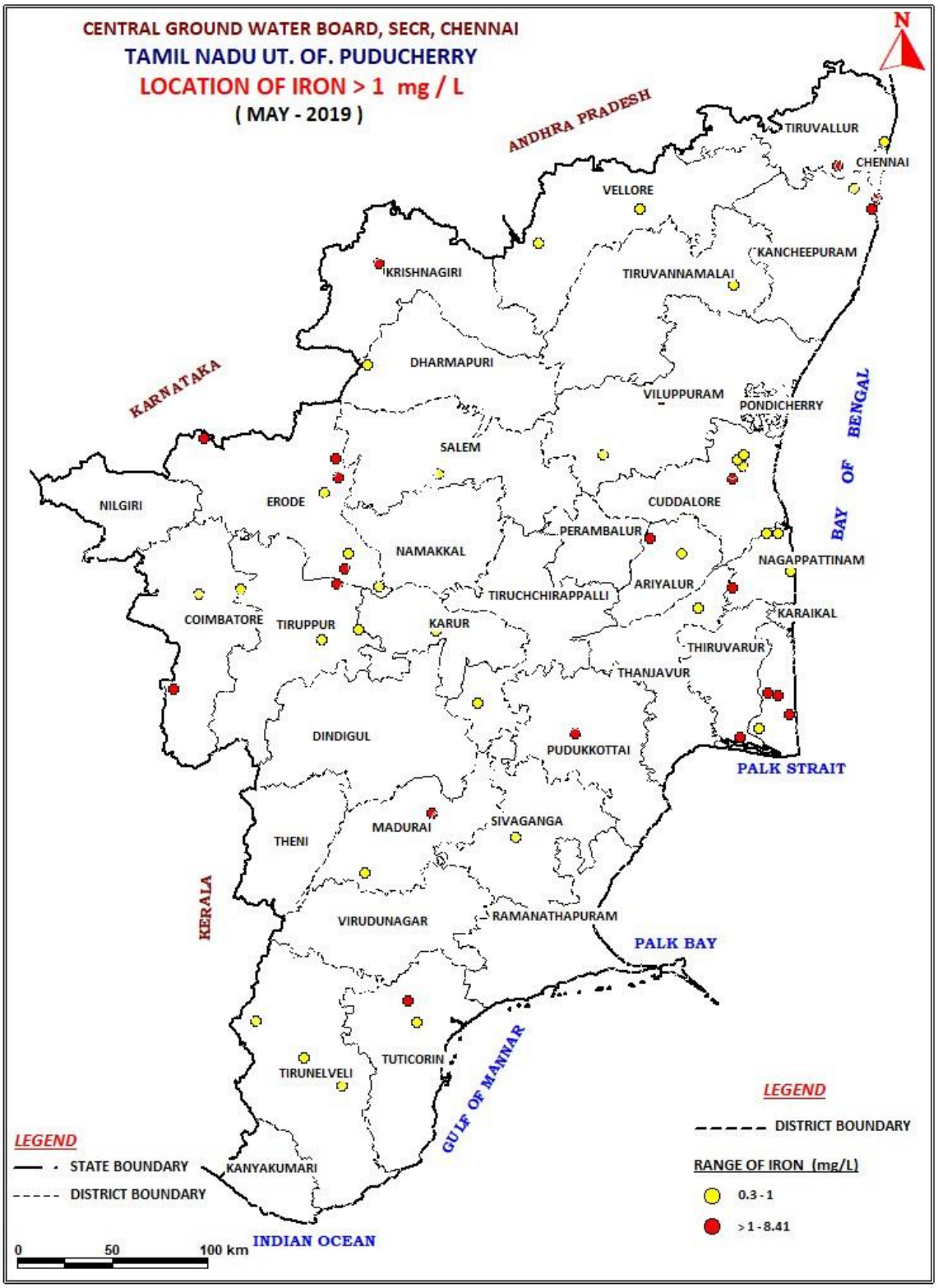


Fig 7.5.1 Map showing locations of Iron contaminated (> 0.3mg/L) groundwater in Tamil Nadu and UT of Puducherry (NHS 2019-20)

7.6 ARSENIC

Arsenic is a shiny, gray, brittle element possessing both metallic and non-metallic properties. Even when it is present, water is colourless, tasteless and odourless making it almost impossible for people to know that water is contaminated. In the natural environment, it occurs in the soil at an average concentration of about 5 to 6 mg/kg. Geochemical characteristics of the aquifer material and their interactions with the aqueous media play an important role in controlling retention and/or mobility of

arsenic within the subsurface environment. Similarly uncontrolled anthropogenic activities such as smelting of metal ores, use of arsenical pesticides and wood preservation agents may also release arsenic directly to the environment. (Bhattacharya, Chatterjee and Jacks ,1995). The occurrence and origin of arsenic in groundwater depends on several factors such as adsorption-desorption, oxidation-reduction, precipitation-dissolution, ion-exchange, grain size, organic content, biological activity and aquifer characteristics. However, it is widely believed that arsenate is the major water-soluble species in groundwater because arsenite is usually prevalent in anaerobic condition.

Based on the environmental factors, socio-economic factors and food habit; the Bureau of Indian standards (BIS) has set a maximum permissible limit of 10 µg/l (0.01 mg/L) of Arsenic in drinking water. The toxicology of arsenic is a complex phenomenonas arsenic is considered to be an essential element also. The speciation of Arsenic determines its toxicity and its pathways in human physiology. The toxicity decreases from Arsenic (III) to Arsenic (V) to Organo Arsenic. As (III) is more mobile than As (V). In fact, As (III) is 60 times more toxic than As (V). The inorganic Arsenic compounds are about 100 times more toxic than its methylated forms. Excessive intake of Arsenic in the human body causes health hazards and is manifested in the form of arsenic poisoning. The fatal disease caused by over intake of Arsenic is calledArsenecosis. Arsenic contamination of groundwater has emerged as a major health hazard in many parts of the world in recent years. In India, Arsenic in groundwater was first noticed in parts of West Bengal, where it has assumed serious proportions, affecting a large number of people depending on groundwater for drinking water supply.

A baseline study was carried out in the year 2019 for Uranium with other heavy metals like iron, arsenic etc in shallow groundwater in the state of Tamil Nadu and UT of Puducherry to to have basic data of arsenic occurrence in groundwater. A total of 1208 samples were collected and analysed

for Arsenic and found that arsenic concentration was morethan the permissible limit of 0.01 mg/L was noticed in 16 wells (1.3%) which are mostly from the Coastal district of Chennai, Tiruvallur, Cuddalore, Nagapattinam, Sivaganga and Ramanathapuram. Sampling for heavy metal contamination is planned for once in five years for background monitoring station, accordingly sampling will be done in May 2024 for Arsenic and other heavy metals. Hence May 2019 data has been taken for the assessment arsenic in groundwater. The occurrences of arsenic in ground water beyond permissible limit (> 0.01 mg /L) have been shown on the maps as point sources (Fig 7.6.1). It is based on the chemical analysis of water samples mostly collected from the groundwater observation wells during May 2019. The list of wells show Arsenic more than the permissible limit of 0.01 mg/L is shown in Table 7.6.1.

Table 7.6.1 List of wells exceed Arsenic more than permissible limit of 0.01 mg/L (May 2019)

Sl No	District	Location	latitude	longitude	As in ppb
1	Chennai	Tiruvottiyur	13.1600	80.3100	12.20
2	Cuddalore	Keelpuvanikuppam	11.6011	79.7189	22.01
3	Dharmapuri	Mullaivanam	12.1115	78.5846	15.64
4	Nagapattinam	Thetakudi	10.4178	79.8364	22.63
5	Nagapattinam	Thamaraipulam	10.4781	79.8292	11.68
6	Nagapattinam	Akkaraipettai	10.7442	79.8503	22.54
7	Pondicherry	Pondicherry	11.9119	79.8233	12.68
8	Ramanathapuram	Devipattanam	9.4708	78.9000	30.54
9	Ramanathapuram	Nadumanaikadu	9.2833	79.0583	59.63
10	Ramanathapuram	Mandapam	9.2833	79.1667	17.93
11	Ramanathapuram	Thangachimadam	9.2842	79.0139	11.97
12	Ramanathapuram	Rameswaram	9.2833	79.2750	54.60
13	Ramanathapuram	Tirupulani	9.2611	78.7653	14.92
14	Sivaganga	Puduvoyal	10.1042	78.8444	14.54
15	Tiruvallur	Gummidipoondi	13.4000	80.1300	11.57
16	Tuticorin	Kulashekarapatnm	8.4000	78.0542	21.21

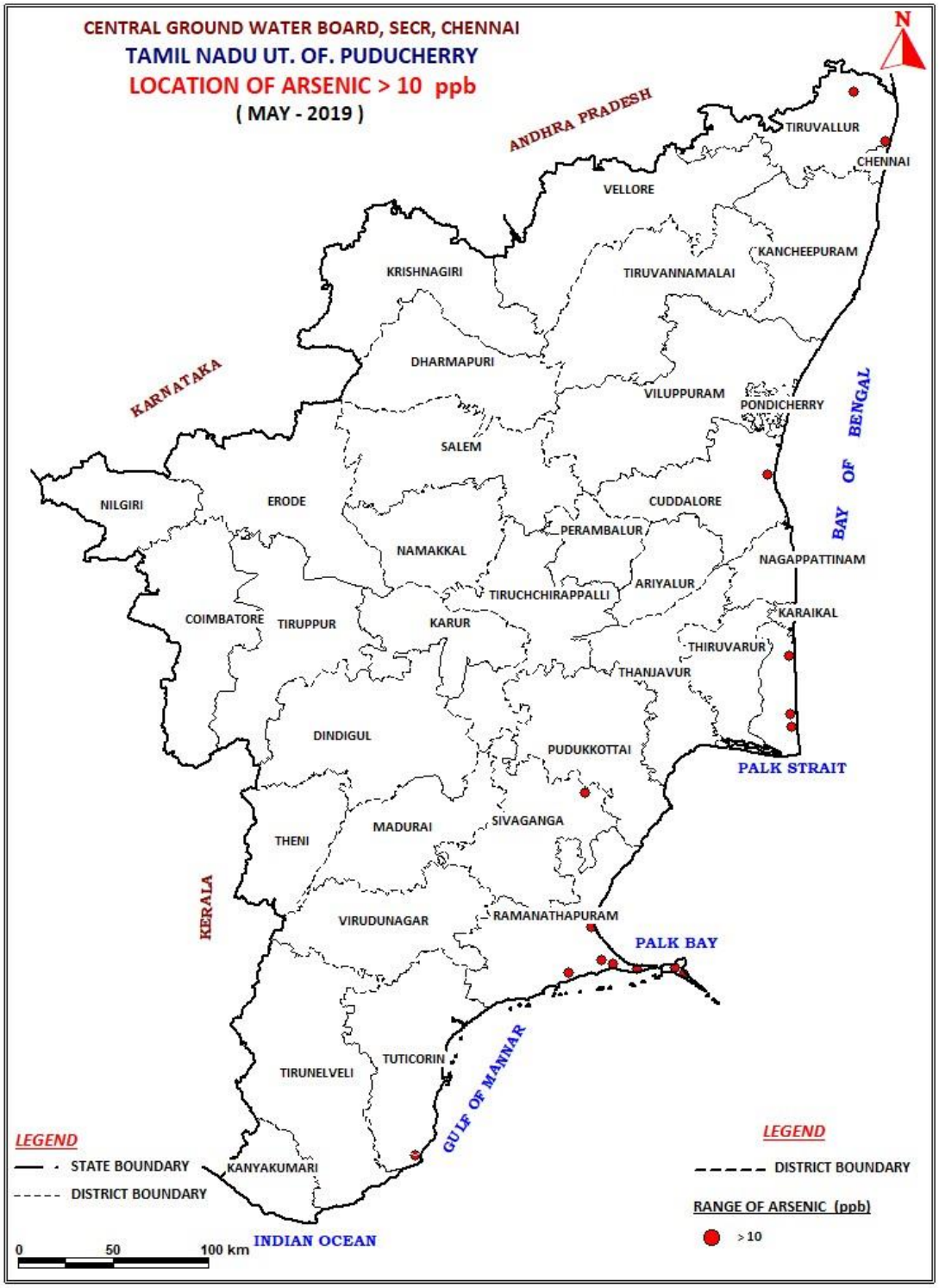


Fig 7.6.1 Map showing locations of Arsenic contaminated (> 10 ppb) groundwater in Tamil Nadu and UT of Puducherry (NHS 2019-20)

7.7 URANIUM

Uranium occurs naturally in groundwater and surface water. Being a radioactive mineral, high uranium concentration can cause impact on water, soil and health. Uranium has both natural and anthropogenic source that could lead to the aquifer. These sources include leaching from natural deposits, release in mill tailings, and emissions from the nuclear industry, combustion of coal and other fuels and the use of phosphate fertilizers that contains uranium and contribute to ground water pollution. Uranium enters in human tissues mainly through drinking water, food, air and other occupational and accidental exposures. Intake of uranium through air and water is normally low, but in circumstances in which uranium is present in a drinking water source, the majority of intake can be through drinking water.

Water with uranium concentration above the recommended maximum permissible concentration of 30 ppb (BIS,10500:2012) is not safe for drinking purposes as it can cause damage to internal organs, on continuous intake. Elevated uranium concentrations in drinking water have been associated with many epidemiological studies such as urinary track cancer as well as kidney toxicity. A recent study, found a strong correlation between uranium concentration in drinking water and uranium in bone, suggesting that bones are good indicators of uranium exposed via ingestion of drinking water. Therefore, such studies trigger further assessment of uranium's adverse health effects on humans and/or the environment for countries where elevated uranium concentration in drinking water has been observed. Hence, it becomes important to study the level of uranium in drinking water for health risk assessment.

Uranium concentration in the shallow ground water varies primarily due to recharge and discharge, which would have dissolved or leached the uranium from the weathered soil to groundwater zone. High uranium concentrations observed in groundwater may be due to local geology, anthropogenic activities, urbanization and use of phosphate fertilizers in huge quantity for agriculture purpose. Studies have shown that phosphate fertilizer possess uranium concentration ranging from 1 mg/kg to 68.5 mg/kg (Brindha K et al., 2011). Hence, the phosphate fertilizers manufactured from phosphate rocks may also contribute uranium to ground water in agriculture region. In ores, uranium is found as uranite (UO_2^{2+}) and pitchblende ($U_3O_8^{2+}$) or in the form of secondary minerals (complex oxides, silicates, phosphates, vanadates).

Table 7.7.1 Summary of uranium concentrations in different types of rocks

Rocks	Range(mg/kg)
Granite	3.4
Limestone/dolomite	2.2
Argillaceous shale	3.7
Sediments	1.4-53
Phosphates	30-100

Table 7.7.2 Standards and guidelines for uranium in drinking water in various countries**.**

Sl. No	Country / agency	guideline value (µg/L)	Reference
1	Australia	GV 17	NHMRC, Australia (2011)
2	Bulgaria	ML 60	European Food Safety Authority (2009)
3	Canada	MAC 20	Health Canada (2019)
4	Finland	RV 100	European Food Safety Authority (2009)

5	India	RBL 60	AERB, India (2004)
6	India	PL 30	BIS,2012
7	Malaysia	MAV 2	Ministry of Health Malaysia (2004)
8	USA	MCL 30	USEPA (2011)
9	WHO	PGV 30	WHO 2011

GV, Guideline value; ML, Maximum limit; MAC, Most acceptable concentration; RV, Recommended value; RBL, Radiological based limit; PL, Permissible Limit; MAV, Maximum acceptable value; MCL, Maximum contaminant level; PGV, Provisional guideline value

To assess the Uranium concentration and distribution in the ground water, Central Ground Water Board (CGWB) had decided to carry out Uranium sampling of its National Hydrograph Network Stations (NHNS) in the entire country during Pre-monsoon monitoring (May,2019). The sample collection and storage were done according to the standard protocols prescribed by APHA (2017). The groundwater samples were collected in plastic bottles after having been filtered through 0.45-µm filter paper. For the cations and uranium analyses, groundwater samples were immediately acidified below pH 2 by adding nitric acid to prevent precipitation and adsorption to the container walls. Uranium (U) was detected using Inductively Coupled Plasma Mass-spectrometry. To ensure quality control, duplicate and standard checks were performed on every ten samples. In addition, a trace element standard reference material was examined. A total of 1208 samples were collected and analysed for Uranium and found that Uranium concentration was morethan the permissible limit of 0.03 mg/L was noticed in 33 wells (2.7%) which are mainly from Chennai, Cuddalore, Erode, Krishnagiri, Perambalur, Pudukottai, Salem Sivaganga, Tiruvallur, Trichy, Tuticorin and Virudhunagar. The occurrences of uranium in ground water beyond permissible limit (> 0.03 mg /L) have been shown on the maps as point sources (Fig 7.7.1). It is based on the chemical analysis of water samples mostly collected from the groundwater observation wells during May 2019. The details of location where uranium concentration (>30 ppb) is given in Table 7.7.1.

Table 7.7.1 Details of location having uranium concentration more than permissible limit of 0.03 mg/L (May 2019).

S.No	District	Location	Latitude	Longitude	Uranium in ppb
1	Chennai	Tirumangalam	13.0833	80.1875	36.51
2	Cuddalore	Vadalur(o.w)	11.5687	79.5542	37.20
3	Cuddalore	C.Keeranur EW	11.7625	79.5524	35.27
4	Cuddalore	Iruppu ii	11.5036	79.6325	34.46
5	Cuddalore	Sengalpalayam-I	11.4324	79.5422	33.61
6	Dindigul	Natham1	10.2222	78.2472	49.64
7	Erode	Nambiyur	11.3606	77.3208	45.70
8	Erode	Pandiyampalayam pz	11.3983	77.5175	40.30
9	Erode	Kavilipalayam	11.3802	77.2308	37.80
10	Erode	Settunampalayam pz	11.5200	77.6033	31.00
11	Krishnagiri	Athimugam1	12.7583	77.9792	76.28
12	Krishnagiri	Megalachinnapalli	12.6250	78.2542	68.13
13	Krishnagiri	Vappanapalli	12.6998	78.1925	48.88
14	Krishnagiri	Guruvinayanpalli	12.6500	78.3292	40.86
15	Krishnagiri	Billanakuppam	12.0626	78.1853	32.37

S.No	District	Location	Latitude	Longitude	Uranium in ppb
16	Madurai	Vellalapatti pz	10.0597	78.2708	131.98
17	Perambalur	Padalur	11.0960	78.8252	194.00
18	Perambalur	Vijayagopalapuram	11.2700	79.0314	168.01
19	Perambalur	Perambalur	11.1586	78.9364	47.51
20	Perambalur	Chettikulam	11.1347	78.7750	44.66
21	Perambalur	Kallampudur	11.2350	78.8025	44.37
22	Perambalur	Essanai	11.0690	79.0222	38.49
23	Pudukkottai	Vegupatti Pz	10.2755	78.5619	110.20
24	Pudukottai	Mandangudi Dw	10.4853	78.9283	44.79
25	Salem	Karumbapatti	11.5822	77.8611	39.12
26	Sivaganga	Paniyapatti PZ	10.3126	78.6778	84.04
27	Sivaganga	Tiruvengamputhur DW	9.8304	78.7858	63.86
28	Tiruppur	Odakadu	11.1117	77.3342	87.61
29	Tiruvallur	Padiyanallur	13.2042	80.1792	77.42
30	Tiruvallur	Krishnasamudram OW	13.3344	79.4397	52.49
31	Trichy	Manaparai	10.6144	78.4253	40.53
32	Tuticorin	Kurukkuchalai	8.9306	78.0917	40.70
33	Virudhunagar	Nenmeni1	9.3250	78.0083	54.00

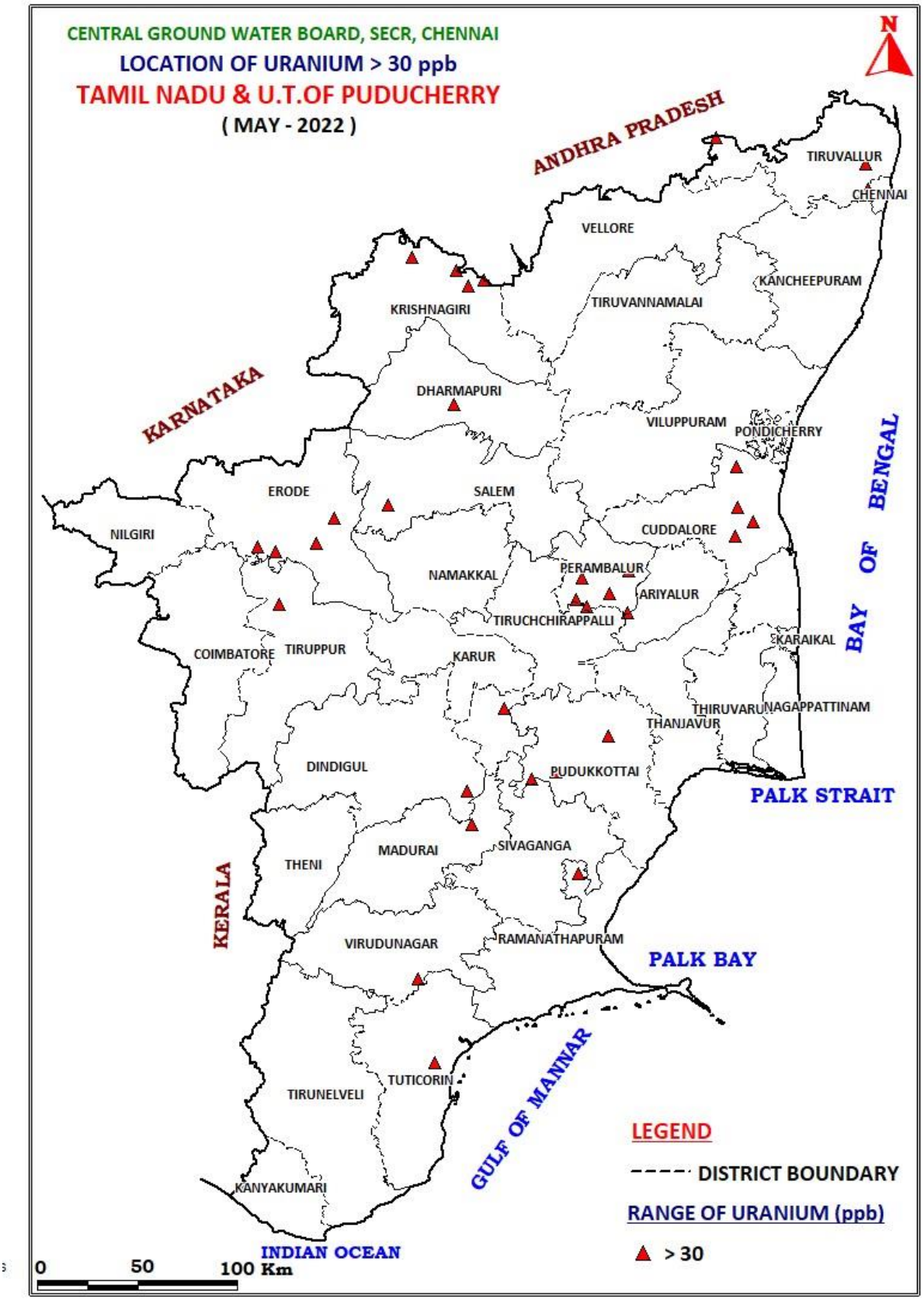


Fig 7.7.1 Map showing areas of Uranium contaminated (> 30 ppb) groundwater in tamilNadu and UT of Puducherry (NHS 2019-20).

8.0 SUITABILITY OF GROUNDWATER FOR IRRIGATION PURPOSE

The chemical quality of water is an important factor to be considered in evaluating its usefulness for irrigation purposes. Plants grown by irrigation absorb and transpire water but leave nearly all the salts behind in the soil, where they accumulate and eventually prevent plant growth. Excessive concentrations of solute interfere with the osmotic process by which plant root membranes are able to assimilate water and nutrients. In areas where natural drainage is inadequate, the irrigation water infiltrating the root zone will cause water table to rise excessively. In addition to problems caused by excessive concentration of dissolved solids, certain constituents in irrigation water are especially undesirable and some may be damaging even when present in small concentrations. Irrigation indices viz. Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) have been evaluated to assess the suitability of ground water for irrigation purposes.

Alkali Hazard

In the irrigation water, it is characterized by absolute and relative concentrations of cations. If the sodium concentrations are high, the alkali hazard is high and if the calcium & magnesium levels are high, this hazard is low. The alkali soils are formed by the accumulation of exchangeable sodium and are characterized by poor tilt and low permeability. The U.S. Salinity laboratory has recommended the use of sodium adsorption ratio (SAR) as it is closely related to adsorption of sodium by the soil.

SAR is derived by the following equation:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{Ca^{2+}Mg^{2+}}{2}}}$$

The water with regard to SAR is classified into four categories

- **S_1 – Low Sodium Water** (SAR <10)

Such waters can be used on practically all kinds of soils without any risk or increase in exchangeable sodium.

- **S_2 – Medium Sodium Water** (SAR 10-18)

Such waters may produce an appreciable sodium hazard in fine textured soil having high cation exchange capacity under low leaching.

- **S_3 – High Sodium Water** (SAR >18-26)

Such waters indicate harmful concentrations of exchangeable sodium in most of the soil and would require special management, good drainage, high leaching and addition of organic matter to the soil. If such waters are used on gypsiferrous soils the exchangeable sodium could not produce harmful effects.

- **S_4 – Very High Sodium Waters** (SAR >26)

Generally, such waters are unsatisfactory for irrigation purposes except at low or perhaps at medium salinity where the solution of calcium from the soil or addition of gypsum or other amendments makes the use of such waters feasible.

The computed SAR values ranges from 0.01 to 36.97. The maximum SAR value has been found at Ramanathapuram district. It is observed that about 97.3% samples belong to excellent category (S_1) and only 0.2% water samples are associated with very high sodium category (S_4) and is unsuitable for irrigation.

Residual Sodium Carbonate (RSC)

If the enriched carbonate (residual) concentration becomes relatively high, carbonates get together with calcium and magnesium to form precipitates. The relative abundance of sodium in comparison to alkaline earths and the quantity of bicarbonate and carbonate in excess of alkaline earths also influences the suitability of water for irrigation. This excess is represented in terms of "Residual Sodium Carbonate" (RSC). The highly soluble sodium carbonate known as residual sodium carbonate (RSC) is defined as;

$$RSC = (HCO_3^- + CO_3^-) + (Ca^{2+} + Mg^{2+})$$

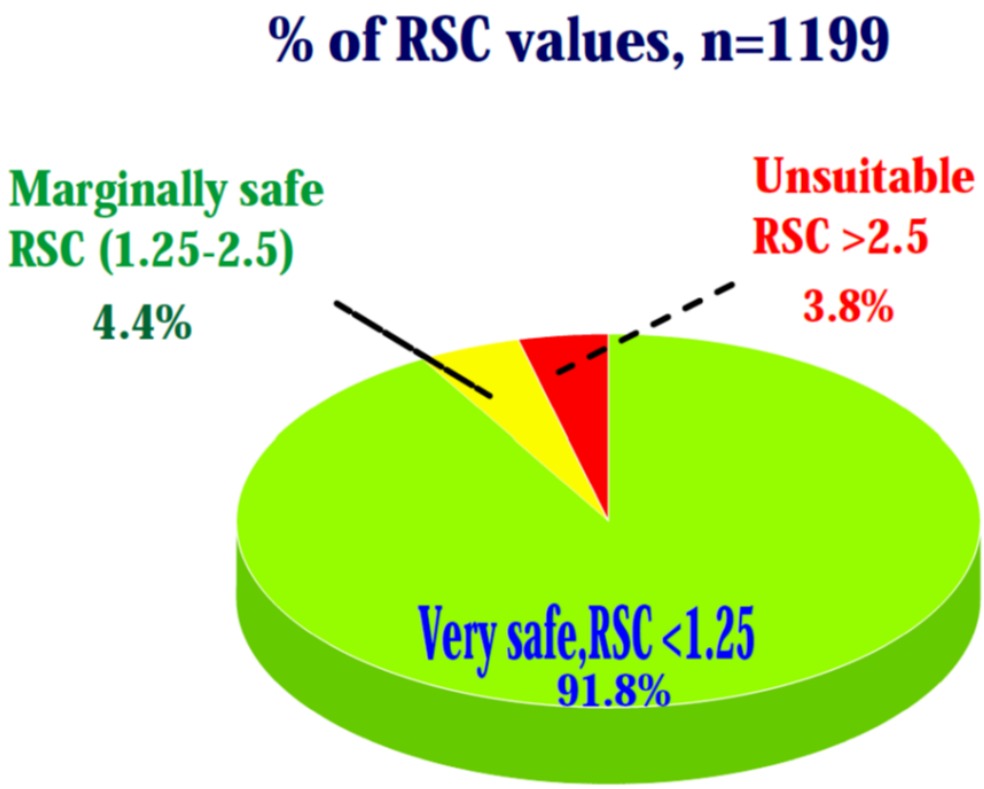


Figure 8.1: Percentage of groundwater samples in various categories according to RSC classifications (n=1199)

Waters with high RSC produces harmful effects on plant development and is not suitable for irrigation. Waters associated with RSC < 1.25 are of excellent irrigation quality and can be safely applied for irrigation for almost all crops without the risks associated with residual sodium carbonate (Wilcox et al.,1954). If the RSC values lie between 1.25 and 2.5, the water is of an acceptable quality for irrigation. Waters associated with RSC values higher than 2.5 are not acceptable for irrigation. In fig 8.1, it can be seen that in Tamil Nadu and UT of Puducherry 91.8% collected water samples are associated with RSC values less than 1.25 and are safe for use in irrigation practices. Only 3.8% water samples are associated with RSC values more than 2.5 and are unsuitable for irrigation which are from Coimbatore, Dharmapuri, Kancheepuram, Madurai, Pudukottai, Sivagangai, Tiruvannamalai, Tiruvallur, Tuticorin and Virudhunagar districts.

9.0 GROUNDWATER TREATMENT OPTIONS

Groundwater is the sustainable source of drinking water in many rural areas and hence, simple community/domestic level treatment options are preferred. The groundwater may contain excess of fluoride, nitrate, dissolved salts etc. Water treatment involves physical, chemical and biological changes that transform rawwater into potable water. The treatment process used in any specific instance must depend on the quality and nature of raw water. Treatment process may be simple like sedimentation or may involve complex physico-chemical processes, as coagulation, demineralization, ion-exchange, reverse osmosis etc. In the present chapter, the specific treatment options for fluoride, nitrate, iron and heavy metals are presented.

Defluoridation of groundwater

The removal of excessive fluorides from public water supplies is justified due to public health implications. In the areas where the groundwater is the main potable source and there is no other alternative source available the treatment of problematic groundwater is the only option before its public use. The treatment option available should have simplicity of operation, economical and applicable to domestic water supplies. The method involves the use of fluoride exchangers like tri-calcium phosphate or bone meal, anion exchangers like activated carbon, magnesium salts or aluminium salts. The following are the simple technique for defluoridation of groundwater before its use.

Nalgonda Technique

Nalgonda technique is a simple method of defluoridation. It involves the use of aluminium salts for the removal of fluoride. This technique employs either the sequence of precipitation, settling and filtration or precipitation, floatation and filtration. The technique can be used equally well for domestic as well as community water supply schemes. The groundwater treatment can be carried out in a bucket of 60L capacity with a tap of 3-5 cm above the bottom of the bucket for withdrawal of treated water after precipitation and settling.

The raw water is taken into the container for treatment and it is mixed with adequate amount of aluminium sulphate (alum). Lime or sodium carbonate solution is then added and the water stirred slowly for 20 minutes and then allowed to settle for nearlyan hour and is withdrawn. The supernatant, which contains permissible amount of fluoride is taken out through the tap for consumption. The settled sludge is discarded.

The amount of alum solution (ml) to be added in 40 L of water at various alkalinity and fluoride levels is presented in Table - 5.1 to obtain acceptable limit of fluoride (1 mg/L) in water.

Table – 9 . 1 Alum dose for treatment of groundwater with different fluorides and alkalinity levels

Available Fluoride (mg/L)	Water Alkalinity as $CaCO_3$ in mg/L based Alum dose (ml)							
	125	200	300	400	500	600	800	1000
2	60	90	110	120	140	160	190	210
3	90	120	140	160	205	210	235	310
4	-	160	165	190	225	240	275	375
5	-	-	205	240	275	290	355	405
6	-	-	245	285	315	375	425	485
8	-	-	-	-	395	450	520	570
10	-	-	-	-	-	-	605	675

Fill and Draw de-fluoridation technology

The defluoridation plant technology is based on Nalgonda technique and is most suitable for rural water supply. The system used for treatment have a reaction –cum- sedimentation tank with power agitator, sump wells, elevated service reservoir, sludgedrying area and chemical store. The raw water with high fluoride is treated in reactor with chemical and agitated by agitator. The defluoridated water from sump well is pumped to reservoir and supplied for domestic consumption.

Ion exchange methods

A simple version of this technique is marketed under the name “Prasanthi Technique” using aluminium oxide as ion exchanger. Aluminium oxide is amphoteric with its iso electric point at approximately pH 9.5. In most natural waters, it will remove anions below this pH and cations above. There are models available both for domestic and community use. These plants operate in five steps; acidification, loading, back washing, rinsing and regeneration. This technique has been proved successful but it has the risk of releasing aluminium compounds into the treated water. Another solution would be to avoid the aluminium and use some calcium compounds such as gypsum. Unfortunately, these have proved to react too slow with the fluoride to serve as medium in fast filters. However, if the water is given enough time to mix with the gypsum until saturation is reached, the solution will probably be able to precipitate large quantity of dissolved fluoride.

Removal of Nitrate from groundwater

The followings are the techniques for the removal of nitrate from groundwater.

- Biological De-nitrification
- Ion exchange
- Reverse Osmosis

Biological De-nitrification

In case of biological de-nitrification, an appropriate carbonaceous material has to be chosen as electron acceptor. The microorganism needs to be grown with appropriate input. Methonal, which assures the highest denitrification efficiency, can constitute a certain risk if the treated water is to be used for drinking purposes. It should be added stochiometrically to avoid the presence of any residual quantity. Moreover, biological growth of denitrifying organisms results in the need for efficient removal of the produced biomass, and thus requiring very skillful management.

In case of ion exchange, which removes not only nitrates but also sulphates from the water under treatment, give rise to the production of waste water from the resin regeneration process, rich in anions and cations, which have to be eliminated from thedrinking water before its discharge.

Reverse osmosis for nitrate removal

Reverse osmosis offers an alternative to above treatment techniques. Its advantages liein the ability to separate and concentrate the compounds contained within the water without modifying their molecular structures. A solvent is forced through a semi- permeable membrane, using an external pressure which has to be higher than the osmotic pressure characteristic of the two different solute concentrations in the solvent separated by the membrane. The groundwater treated with reverse osmosis process is thoroughly purified water with sufficiently low dissolved solid contents.

REMOVAL OF IRON FROM GROUNDWATER

Appreciable amounts of iron and manganese in water impart a characteristic metallic taste to the water. The oxidized precipitates can cause colouration of water, which may be yellowish brown to black and render the water objectionable or unsuitable for domestic and many industrial purposes. The distribution system of potable water to communities is affected due to the deposition of iron oxide and bacterial slimes. The growth of microorganisms (iron bacteria) in iron bearing water are frequent. The

concentration of iron in excess of 0.3mg/L may cause nuisance in groundwater utilization, though its presence does not affect hygienic quality of water. Considerable free carbon dioxide and toxic substances are usually present in iron rich water (ferruginous waters). Hence, the removal of iron alone may cause corrosion of the abstraction system, mains and pipes due to presence of free carbon dioxide. The treatment of iron from water in community systems consists primarily oxidation and removal of free carbon dioxide and then, followed by precipitation and separation of iron by sedimentation and /or filtration.

Iron from groundwater can be treated/removed by following techniques.

- BPMEL design
- NEERI design
- UNICEF / Bangladesh design
- Domestic iron removal plant

BPMEL design

The BPMEL unit for treatment of iron is designed to have sequential processes of aeration reaction cum setting and filtration. The treatment option basic unit is basically down flow type, which can handle raw water iron contents up to 15.0 mg/L, ensuring a treated water ion content of less than 0.5 mg/L. The treatment unit requires back washing of system every 24 to 48 hrs approximately.

NEERI design

The National Environmental Engineering Research Institute (NEERI), Nagpur has developed a treatment option and designed the iron treatment plant of 1.0 m^3/hr capacity. The unit consists of a flocculation chamber, sedimentation chamber and filtration chamber. The hand pump water is sprinkled over aeration / oxidation chamber having limestone. The aerated water flow to the flocculation chamber, treated then sent into sedimentation chamber. The filtered iron free water is drawn andsupplied for domestic use.

UNICEF / Bangladesh design

The treatment unit is of simple design consisting of three separate chambers for sedimentation, filtration and collection. It is built with brick work over the concrete bed.

Raw water passes from the hand pump into ferro-cement channel. Water drops through the perforated base of the channel into the sedimentation tank and in the process gets aerated. The water passes over a dividing wall and down through a filter bed so that the ferric hydroxide precipitate is removed. The filter layer is about 8.0 inches deep consisting of brick clips sieved to a size of 1/8" to 5/8". The brick clups can be removed and replaced without worrying about grading. The filter media rests on perforated ferro cement plates.

Domestic Iron Removal Plant

It is the simplest iron removal method suitable for rural purposes developed byNEERI and referred as "Domestic Iron Removal Unit (DIRU)". It can be fabricated locally. The treatment process includes the aeration of the raw water over a series of coke, marble/calcite beds, followed by slow sand filtration. The catalytic oxidationbed is formed after certain period, which hastens the removal process. No chemicals are needed in treatment of water by this process. The unit can work directly by an elevated hand pump. Raw water containing up to 1- 6 mg/L iron as Fe (III) and 0.1- 0.3mg/L manganese (Mn (IV)) are treated by this treatment plant, at the rate of 200 L/hr.

REMOVAL OF TRACE METALS

The removal of trace metals from water is complicated and expensive option therefore alternative source of safe water are desirable. In the event of non-availability of safe sources of potable water, in extreme cause treatment may be undertaken through any of the following technique:

- Chemical precipitation
- Coagulation with alum or iron salts or big membrane filtration
- Ion exchange and adsorption

Activated carbon is the most common commercial adsorption medium, however, due to prohibitive cost, the use of activated carbon could not be used frequently. Fly ash, an amorphous ferro-alumino silicate can be used for removal of heavy metals. Silica, alumina, Fe_2O_3, CaO, MgO are the constituents of fly ash, which may facilitate treatment of metallic species in water through adsorption.

10.0 CONCLUSIONS AND RECOMMENDATIONS

In general, the groundwater quality in the state is fresh in about 16.5 % of the Groundwater Monitoring wells as indicated by the EC value less than 750 µS/cm at 25ºC. In about 59.4 % of the Groundwater Monitoring wells, the EC varies between 751 - 2250 µS /cm at 25º C and 11.7 % of Groundwater Monitoring wells are between 2251 and3000 µS /cm at 25º C indicating that the groundwater is slightly mineralized and about 12.4 % of Groundwater Monitoring wells the EC is more than 3000 µS /cm at 25ºC indicating that the groundwater is highly mineralized. The highest value 19,850 µS /cm at 25º C was observed in Nenmeni1, Virudhunagar districts.

The chloride content is less than 250 mg/L in about 57 % of the sample analyzed and39 % of the sample are between 251 – 1000 mg/L and 4% shows more than 1000mg/L which are from Kancheepuram, Thiruvallur, Karur, Namakkal, Perambalur, Salem, Tirupur, Thiruvarur Ramanathapuram, Pudukotai, Tuticorin and Virudhunagar the districts.

The Fluoride content is less than 1.5 mg/L in about 90 % of the sample analyzed and about 10 % of the sample shows more than 1.5 mg/L, which are from Coimbatore, Dharmapuri, Dindigul, Erode, madurai, Namakkal, Perambalur, Pudukottai, Ramanathapuram, Salem, Tirunelveli, Sivaganga, Theni, Tuticorin and Virudhunagar the districts.

The Nitrate content is less than 45mg/L in about 62 % of the sample analyzed and 38 % of sample shows more than 45 mg/L which are from all the districts except Nilgiris district.

A baseline study was carried out in the year 2019 for Uranium with other heavy metals like iron, arsenic etc in shallow groundwater in the state of Tamil Nadu and UT of Puducherry to assess the heay metal contamination. A total of 1208 samples were collected and analysed for Iron and found that iron concentration was morethan the permissible limit of 0.3 mg/L was noticed in 57 wells (4.7%). Arsenic concentration was morethan the permissible limit of 0.01 mg/L was noticed in 16 wells (1.3%) which are mostly from the Coastal district of Chennai, Tiruvallur, Cuddalore, Nagapattinam, and Ramanathapuram. Uranium concentration was morethan the permissible limit of 0.03 mg/L was noticed in 33 wells (2.7%) which are mainly from Chennai, Cuddalore, Erode, Krishnagiri, Perambalur, Pudukottai, Salem Sivaganga, Tiruvallur, Trichy, Tuticorin and Virudhunagar.

The groundwater suitability for irrigation has been evaluated based on salinity, sodium adsorption ratio (SAR), and residual sodium carbonate (RSC). It is observed thatit can be seen

that in Tamil Nadu and UT of Puducherry 91.8% collected water samples are associated with RSC values less than 1.25 and are safe for use in irrigation practices. Only 3.8% water samples are associated with RSC values more than 2.5 and are unsuitable for irrigation which are from Coimbatore, Dharmapuri, Kancheepuram, Madurai, Pudukottai, Sivagangai, Tiruvannamalai, Tiruvallur, Tuticorin and Virudhunagar districts. The overall probable causes of groundwater quality deterioration in Tamil Nadu are due to natural hydrogeological conditions, over exploitation of groundwater, improper disposal of domestic and industrial waste and lack of public awareness.

The following recommendations are made as a safeguard against further deterioration of groundwater pollution

- All the natural water bodies, ponds, impoundments should be revitalized for groundwater recharge.
- Possibilities of construction of artificial recharge structures such as check dams, recharge shaft, etc, have to be explored to augment the groundwater recharge.
- All groundwater extraction structures should be tested for fitness for human consumption and the information should be disseminated to the user groups.
- All drinking water sources should be tested for bacteriological parameters periodically and suitable disinfection techniques such as chlorination have to be adopted.
- The open wells, especially the public wells, should be covered with wire mesh to avoid any direct contamination of groundwater due to falling of debris and other waste materials.
- The hand pumps and wells, which have been identified as having suspected water quality should be painted in „**red'** to indicate and warn the public thatthe water drawn from the source is not fit for human consumption.
- The defluoridation techniques either Nalgonda (or) Ion exchange technique should be undertaken in the case of fluoride affected areas if alternate water supply is not provided.
- The existing landfill sites are not scientifically designed, their lechate and overflow water is contaminating the groundwater. It is suggested that landfill sites should be selected after detailed hydrogeological studies considering sub- surface geology and

groundwater flow direction and these must be scientifically designed with provision of collection and treatment of lechate water.

- All the groundwater extraction structures should be registered and structure fitted with mechanism should be regulated to avoid over exploitation and deterioration of quality of groundwater. Public co-operation is required in this context.
- The mass awareness should be generated about quality of water, its effect on human health and responsibilities of public to safeguard water resources and public health.

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Annexure – I

Analytical Results of samples collected from National Groundwater Monitoring Wells (May 2022)

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1	Ariyalur	Andimadam	11.3385	79.3775	7.66	560	100	32	5	74	12	0	195	21	62.4	43	0.81	1.09
2	Ariyalur	Elaiyur	11.2333	79.3151	7.27	184	60	14	6	16	1	0	49	21	24	1	0.12	1.71
3	Ariyalur	G.K.cholapuram	11.2066	79.4492	7.44	711	160	22	26	81	13	0	189	85	41.28	40	0.68	3.74
4	Ariyalur	Gangaikondachozhapuram EW	11.2080	79.4475	7.12	1521	560	108	70	83	12	0	378	177	177.6	11	0.92	14.21
5	Ariyalur	Jayamkondan	11.2129	79.3647	7.43	668	155	36	16	78	12	0	256	67	24	14	0.51	5.01
6	Ariyalur	Kattathur	11.3070	79.3496	7.54	674	155	42	12	76	13	0	293	25	48	16	0.67	1.96
7	Ariyalur	Keelkavarapalayam OW I	11.3476	79.3843	7.60	336	125	22	17	21	4	0	92	35	28.8	25	0.31	1.91
8	Ariyalur	Kiharasanur	11.0114	78.9319	7.40	1296	210	68	10	193	10	0	122	223	67.2	198	0.91	22.46
9	Ariyalur	Kilpazhavur	11.0436	79.0653	7.26	1331	215	54	19	202	13	0	275	142	115.2	155	0.85	19.66
10	Ariyalur	Kuvagam OW	11.2846	79.2818	7.40	298	85	16	11	18	14	0	98	21	14.4	25	0.21	1.23
11	Ariyalur	Mahimapuram EW	11.2346	79.3701	7.30	436	130	34	11	30	14	0	122	35	52.8	7	0.52	12.33
12	Ariyalur	Oliyur EW	11.3979	79.3186	6.79	965	315	24	62	69	16	0	226	89	96	69	0.63	3.05
13	Ariyalur	Papakudi	11.2855	79.4900	7.38	741	165	38	17	83	16	0	165	89	48	66	0.47	4.42
14	Ariyalur	Periyathukurichi	11.4104	79.3500	7.40	1013	250	42	35	101	36	0	244	124	96	56	0.21	12.51
15	Ariyalur	Thandalai (kallathur)	11.2576	79.3754	7.59	216	80	22	6	9	2	0	73	7	7.2	31	0.11	5.77
16	Ariyalur	V.Ramanapuram OW	11.1754	79.1096	7.30	542	200	28	32	28	9	0	153	71	14.4	43	1.58	9.93
17	Chennai	ADAYAR	13.0089	80.2627	7.51	19600	2400	240	440	3800	130	0	352	6877	960	1	0.84	0.54
18	Chennai	Adayar dw	13.0192	80.2678	6.78	1262	280	40	44	140	31	0	336	170	100	2	0.47	0.74
19	Chennai	Alwarpet	13.0250	80.2583	7.33	1580	350	56	51	175	17	0	293	238	180	1	0.11	0.74
20	Chennai	Aminjikarai	13.0667	80.2278	7.50	1062	145	40	11	155	30	0	287	138	66	7	0.40	0.34
21	Chennai	BEASANT NAGAR	12.9985	80.2645	7.35	1062	280	84	17	68	16	0	310	121	35	6	0.69	0.30

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
22	Chennai	Besant Nagar	13.0014	80.2700	7.28	685	225	46	27	36	24	0	256	75	37	2	0.35	0.51
23	Chennai	Chepauk (A)	13.0556	80.2814	7.10	1480	440	118	35	154	32	0	329	256	112	43	0.45	4.54
24	Chennai	Egmore	13.0747	80.2625	7.46	585	145	36	13	55	17	0	195	67	27	2	0.29	1.40
25	Chennai	Guindy (CLRI) pz	13.0222	80.2250	7.38	700	200	56	15	59	15	0	171	121	18	5	0.75	1.63
26	Chennai	K.K.Nagar	13.0417	80.2083	7.13	735	265	72	21	51	18	0	281	82	64	2	0.66	2.17
27	Chennai	Kottivakkam	12.9669	80.2603	7.58	1300	345	60	47	136	27	0	390	188	130	0	0.23	1.73
28	Chennai	Pallavaram pz	12.9728	80.1544	7.24	690	240	56	24	26	15	0	159	121	12	3	0.96	4.81
29	Chennai	Taramani (NITTR PZ)	12.9867	80.2497	7.18	655	140	16	24	96	16	0	268	114	10	3	0.42	1.73
30	Chennai	Tirumangalam	13.0833	80.1875	7.10	5740	1025	172	145	687	17	0	378	1335	386	3	0.17	36.51
31	Chennai	Tondiarpet	13.1167	80.2750	7.30	1422	375	92	35	144	33	0	329	206	150	24	0.35	2.69
32	Chennai	Vallalar Nagar	13.1056	80.2814	7.36	555	140	30	16	59	18	0	189	85	27	0	0.27	2.39
33	Chennai	Vepery	13.0833	80.2708	7.41	2600	430	34	84	401	46	0	519	199	434	142	0.36	2.45
34	Chennai	WASAHERMENPET	13.1170	80.2852	7.91	267	70	12	10	22	8	0	121	14	2	1	0.33	0.56
35	Coimbatore	Alandurai pz	10.9625	76.8008	7.39	632	230	36	34	38	16	0	165	71	87	18	0.59	0.77
36	Coimbatore	Ambarampalayam	10.6353	76.9411	7.10	768	360	80	39	19	13	0	250	78	65	6	0.60	0.49
37	Coimbatore	AnaimalaiPZ	10.5097	77.0594	6.94	975	420	80	54	41	5	0	262	142	62	36	1.23	0.45
38	Coimbatore	Andipalayam	11.0050	77.4039	7.69	452	190	16	36	15	3	0	128	85	12	5	0.18	0.44
39	Coimbatore	Angalakurichi	10.5250	76.9994	7.40	1660	410	100	39	190	25	0	586	199	92	28	1.62	2.01
40	Coimbatore	Annur1	11.2333	77.1083	7.36	2580	760	128	107	198	21	0	488	305	298	178	0.43	5.58
41	Coimbatore	Chinnaripalayam	10.7292	77.0917	7.24	3100	800	208	68	241	72	0	470	575	182	162	0.57	0.51
42	Coimbatore	Coimbatore Taluk Office	11.0017	76.9711	7.27	1461	450	92	54	132	29	0	458	192	90	57	0.77	3.64
43	Coimbatore	Corporation North Zone pz	11.0161	76.9772	6.90	275	130	24	17	4	14	0	67	53	21	1	0.34	0.00
44	Coimbatore	Cwc Campus pz	11.0414	77.0006	7.41	2490	430	64	66	389	19	0	470	121	675	8	1.57	17.34
45	Coimbatore	Devanur Pudur pz	10.5542	77.0856	7.36	1486	300	80	24	125	97	0	384	220	65	0	1.17	0.91
46	Coimbatore	Ganesapuram	11.1758	77.0575	7.48	1786	530	124	54	133	16	0	470	284	47	76	0.16	13.62
47	Coimbatore	Ganganaickenpalayam pz	11.1092	77.4356	7.18	4640	1380	240	190	178	17	0	366	937	180	41	0.35	4.53
48	Coimbatore	Ghs Ganapathi pz	11.0419	76.9419	6.80	287	140	24	19	8	14	0	116	36	18	2	0.37	0.00
49	Coimbatore	Gopalapuaram	10.6958	76.9375	7.28	1324	520	120	54	79	19	0	378	213	91	23	0.88	2.15

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
50	Coimbatore	Kallampalayam pz	11.0300	77.2833	7.51	3070	640	88	102	352	17	0	451	462	263	227	1.48	2.53
51	Coimbatore	Kaltanpet (Karanampettai)	11.0167	77.1847	7.46	1088	470	116	44	46	7	0	311	156	92	2	0.52	2.00
52	Coimbatore	Kaniyampoondi pz	11.1289	77.2833	7.38	1632	530	112	61	109	8	0	464	277	52	15	0.78	2.43
53	Coimbatore	Kattampatty pz	10.8053	77.1425	7.26	1689	600	160	49	101	23	0	323	206	153	199	0.96	3.32
54	Coimbatore	Kinathukadavu	10.7333	77.0292	7.31	1671	570	140	54	114	42	0	378	227	174	70	0.68	2.69
55	Coimbatore	Kovilvazhi IV	11.0583	77.3889	7.20	1743	530	68	88	140	16	0	427	234	126	116	0.70	6.92
56	Coimbatore	Kuniyamuthur	10.9667	76.9167	7.22	1270	460	112	44	83	21	0	305	199	76	104	0.48	2.06
57	Coimbatore	Kunnakalpalayam pz	11.0456	77.3272	7.44	7430	1280	272	146	1059	14	0	549	1406	1188	98	1.54	5.46
58	Coimbatore	Madukkarai-PZ	10.9083	76.9667	7.54	1363	430	120	32	117	20	0	323	178	165	93	1.00	2.40
59	Coimbatore	Mettupalayam pz	11.3000	76.9472	7.40	1169	470	84	63	82	5	0	390	128	101	21	0.57	0.68
60	Coimbatore	Oothukadu	11.1119	77.3344	7.40	2930	860	164	109	201	25	0	348	589	263	38	0.28	3.57
61	Coimbatore	P.N.palayam	11.2069	76.9922	7.46	2270	610	112	80	222	38	0	586	284	161	137	1.25	8.71
62	Coimbatore	Pallapalayam pz	10.5256	77.2181	7.20	1746	650	212	29	96	6	0	293	170	298	23	1.57	12.57
63	Coimbatore	Periya Negamam pz	10.7403	77.1014	7.28	2330	780	188	75	145	23	0	311	383	147	213	0.90	4.78
64	Coimbatore	Pichanur	10.8750	76.9000	7.18	314	140	24	19	7	14	0	49	36	87	2	0.14	0.00
65	Coimbatore	Pillaimpalayam pz	11.1914	77.0900	7.45	2720	660	112	92	270	20	0	549	454	230	41	0.52	4.59
66	Coimbatore	Podanur1	10.9667	76.9833	7.35	2400	730	164	78	212	32	0	531	433	79	86	0.60	5.72
67	Coimbatore	Pollachi1	10.6611	77.0000	7.40	1237	420	92	46	87	37	0	409	192	84	4	1.04	0.74
68	Coimbatore	Ponnaiyur	10.6750	76.9375	7.36	960	360	68	46	55	17	0	281	149	63	41	0.87	0.20
69	Coimbatore	Samathur Hss pz	10.6022	77.0089	7.28	2750	810	200	75	217	32	0	549	554	93	5	1.58	5.88
70	Coimbatore	Saravanampatti	11.0694	77.0014	6.88	332	150	40	12	5	14	0	92	71	11	1	0.15	0.00
71	Coimbatore	Sarkar samakulam pz	11.1333	77.0333	7.29	2350	850	132	126	161	35	0	580	355	152	104	1.55	9.40
72	Coimbatore	Seeliyur	11.1792	76.7583	7.70	1352	460	100	51	93	23	0	256	170	242	10	1.22	5.14
73	Coimbatore	Singanallur	10.9964	77.0208	7.28	2510	560	80	88	307	14	0	897	327	93	15	0.77	1.74
74	Coimbatore	Sokkanur	10.8083	76.9583	7.44	1323	340	76	36	85	116	0	323	170	173	36	0.89	0.65
75	Coimbatore	Sulur	11.0250	77.1250	7.30	2870	800	192	78	259	17	0	567	483	173	3	0.57	8.98
76	Coimbatore	Telungupalayam pz	10.9833	76.9228	7.35	1450	510	108	58	102	21	0	500	213	71	11	0.64	7.47
77	Coimbatore	Thathanur Aanaikalpalayam pz	11.3067	77.2789	7.40	783	290	64	32	36	17	0	275	85	41	11	0.46	9.87

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							<…….mg/L…….>											ppb
78	Coimbatore	Thivansapudur	10.6283	76.8753	7.46	1128	440	88	54	59	18	0	336	192	74	14	1.10	0.48
79	Coimbatore	Thondamuthur	10.9833	76.8333	7.42	1886	540	120	58	160	19	0	439	284	141	83	1.11	6.11
80	Coimbatore	Tn Urban Studies pz	11.0219	76.9419	7.48	1575	290	56	36	240	7	0	549	121	160	6	1.70	13.12
81	Coimbatore	Vadavalli	11.0250	76.9083	7.53	2330	690	128	90	234	29	0	494	362	133	178	0.68	7.13
82	Coimbatore	Varadharajapuram Murungapatti pz	10.6797	77.2719	7.26	1155	460	120	39	53	5	0	299	156	102	3	0.97	1.85
83	Coimbatore	Velampalayam	11.1447	77.3094	7.40	564	180	40	19	41	3	0	140	78	51	4	0.11	1.22
84	Cuddalore	Abathanapuram	11.5821	79.5534	7.44	848	300	56	39	55	2	0	366	74	38.4	22	0.34	12.32
85	Cuddalore	Ammeri - Thoppulikuppam (Kilmungiladi)	11.5561	79.4578	7.45	766	210	40	27	74	9	0	146	110	52.8	62	0.90	0.08
86	Cuddalore	Anathanampettai	11.6068	79.6351	7.38	883	310	48	46	53	8	0	244	67	57.6	124	0.40	23.54
87	Cuddalore	Arasadikuppam	11.6147	79.6614	7.40	1420	290	52	39	184	25	0	305	213	96	81	0.57	5.18
88	Cuddalore	C.Keeranur EW	11.7625	79.5524	7.50	1165	380	124	17	94	14	0	275	177	91.2	37	0.60	35.27
89	Cuddalore	Chidambaram New	11.3996	79.6944	7.46	1219	390	48	66	99	1	0	183	71	336	22	0.32	2.15
90	Cuddalore	Chidhambaram Annamalainagar (Seshambadi)	11.3919	79.7072	7.23.	1000	320	52	46	81	5	0	214	89	144	62	1.20	0.07
91	Cuddalore	Gandhinagar-NLC arch gate	11.6177	79.5540	7.44	947	320	76	32	74	8	0	281	82	96	52	0.07	0.84
92	Cuddalore	Indiira Nagar (Thirumandangudi)	11.4342	79.5533	7.20	800	300	96	15	41	8	0	195	106	52.8	37	0.53	0.02
93	Cuddalore	Iruppu ii	11.5036	79.6325	7.50	1160	420	116	32	71	10	0	250	142	144	58	0.62	34.46
94	Cuddalore	Karunguli	11.5223	79.5256	7.11	611	200	64	10	34	25	0	73	106	72	31	0.04	3.24
95	Cuddalore	Kattiyankuppam-I	11.6661	79.6524	7.60	725	235	76	11	64	5	0	275	67	50.88	31	1.04	3.38
96	Cuddalore	Kattumannakudi	11.2872	79.5517	7.38	1471	400	44	70	145	10	0	366	177	120	68	0.44	4.60
97	Cuddalore	Kattusagai(n)	11.5228	79.6534	7.50	1015	340	50	52	69	10	0	214	152	57.6	68	0.90	1.38
98	Cuddalore	Kattuvegakollai	11.6475	79.6392	7.01	946	320	72	34	60	10	0	305	92	24	68	0.19	0.71
99	Cuddalore	Keelpuvanikuppam	11.6013	79.7191	7.30	836	265	36	43	69	5	0	244	53	100.8	56	0.58	5.25
100	Cuddalore	Killai	11.6161	79.8028	7.39	1215	365	36	67	113	5	0	378	177	57.6	6	0.06	0.80
101	Cuddalore	Kodandaramapuram	11.0667	79.7573	7.60	1815	410	36	78	230	10	0	214	312	268.8	20	0.61	3.95
102	Cuddalore	Komaratchi	11.5514	79.8072	7.55	886	300	48	44	64	9	0	183	71	144	74	0.39	10.38
103	Cuddalore	Kopuvanur	11.6156	79.1378	7.45	1396	405	40	74	122	14	0	360	199	48	68	0.37	10.53
104	Cuddalore	Kudikkadu I	11.7436	79.6403	7.60	960	255	32	43	92	14	0	73	160	168	16	0.22	0.19
105	Cuddalore	Kundiamallur	11.5269	79.6517	7.36	1398	410	60	63	120	15	0	92	160	288	74	0.04	12.42

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							<…….mg/L…….>											ppb
106	Cuddalore	Kurinjipadi	11.5638	79.5865	7.71	165	55	16	4	12	0	0	37	18	10.08	19	0.78	4.85
107	Cuddalore	Maa Podaiyur	12.2581	80.2275	7.90	1104	310	88	22	99	24	0	415	57	105.6	31	1.33	20.91
108	Cuddalore	Mangalur	11.6194	79.5586	7.70	900	245	48	30	92	10	0	403	7	100.8	19	0.86	0.76
109	Cuddalore	Manjakuppam	11.7644	79.7647	7.30	660	215	60	16	46	4	0	153	74	57.6	51	1.47	0.32
110	Cuddalore	Marungur-I	11.4931	79.6015	7.60	860	245	36	38	74	10	0	73	78	220.8	14	0.33	5.25
111	Cuddalore	Maruthur-II	11.7759	79.6733	7.80	775	215	36	30	69	14	0	262	71	62.4	11	0.84	4.05
112	Cuddalore	Nadiyapattu	11.6647	79.4041	7.38	978	260	62	26	104	4	0	153	142	115.2	50	0.15	0.30
113	Cuddalore	Nadutitu	11.6392	79.7474	7.37	128	50	14	4	7	0	0	24	11	14.4	16	0.25	0.57
114	Cuddalore	Nellikuppam	11.5923	79.5921	7.20	493	150	50	6	48	8	0	183	60	19.2	12	1.15	1.16
115	Cuddalore	Pacharapalayam-I	11.3621	79.4670	7.10	906	295	46	44	69	8	0	159	174	48	37	0.37	0.61
116	Cuddalore	Palayamkottai EW	11.4161	79.5722	7.50	1790	455	82	61	184	24	0	342	262	168	74	0.93	1.10
117	Cuddalore	Parudur-I	11.5416	79.5777	7.70	1075	335	64	43	83	20	0	336	113	86.4	25	0.52	1.19
118	Cuddalore	Pathirikuppam OW	12.2581	80.2275	7.50	317	105	40	1	21	5	0	67	43	24	25	0.44	0.36
119	Cuddalore	Periyakumuthi	11.4894	79.7156	7.13	100	40	12	2	7	2	0	31	14	9.6	7	0.72	3.00
120	Cuddalore	Poovalai	11.5138	79.6453	7.10	1000	225	60	18	120	12	0	445	35	52.8	37	0.30	2.60
121	Cuddalore	Porto-nova	11.4891	79.7533	7.04	99	30	6	4	7	2	0	24	11	5.28	13	0.72	1.56
122	Cuddalore	Rajankuppam	11.6873	79.6941	7.45	747	240	42	33	69	10	0	183	106	48	31	0.12	1.19
123	Cuddalore	Ramapuram-I	11.5323	79.5967	7.40	840	225	40	30	76	10	0	171	89	105.6	31	1.15	8.48
124	Cuddalore	Reddipalayam	11.5371	79.5300	7.38	2520	800	164	95	191	23	0	195	411	384	130	0.64	2.02
125	Cuddalore	Reddipalayam	11.5395	79.5914	7.08	139	45	12	4	9	0	0	31	11	12	20	0.82	6.63
126	Cuddalore	Sakthi Nagar OW	11.6194	79.5586	7.00	790	100	36	2	129	10	0	305	78	24	12	0.38	0.03
127	Cuddalore	Sathamangalam	11.5213	79.3779	6.50	155	45	12	4	14	2	0	43	18	12.96	7	0.25	1.66
128	Cuddalore	Seerakuppam	11.5295	79.5312	6.50	207	60	16	5	18	2	0	49	32	10.08	7	0.22	1.45
129	Cuddalore	Sengalpalayam-I	11.4324	79.5422	7.53	990	225	42	29	120	4	0	122	121	139.2	87	1.02	33.61
130	Cuddalore	Sethiathope-I	11.6928	79.6100	7.52	710	270	40	41	37	8	0	183	71	86.4	31	0.78	2.71
131	Cuddalore	Silambinathanpettai- I &II	11.4052	79.3983	7.60	540	150	40	12	51	8	0	122	64	48	37	0.52	0.15
132	Cuddalore	Solatharam	11.3617	79.5083	6.60	210	80	18	9	12	2	0	49	28	19.2	7	1.31	5.51
133	Cuddalore	Srimushanam	11.6177	79.7194	7.63	513	200	42	23	25	4	0	183	57	19.2	6	0.97	0.14

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							<…….mg/L…….>											ppb
134	Cuddalore	Srinivasapuram	11.5839	79.6335	7.54	801	300	80	24	46	4	0	244	96	28.8	50	1.18	8.21
135	Cuddalore	Teerthanagiri	11.5693	79.6790	7.00	1325	400	132	17	115	8	0	201	234	144	17	1.55	6.58
136	Cuddalore	Tekkumellur (Therkumelur)	11.5894	79.5278	7.50	1340	410	100	39	113	17	0	134	319	96	17	1.95	5.52
137	Cuddalore	Thaiyalkunapattinam	11.5703	79.6832	7.45	2530	550	120	61	315	20	0	281	638	96	37	1.53	2.24
138	Cuddalore	Theerthangari EW	11.5604	79.5563	7.70	1050	275	64	28	104	16	0	207	135	86.4	74	1.86	1.01
139	Cuddalore	Tholudur	11.6647	79.4041	7.60	1220	390	16	85	92	18	0	519	60	72	31	1.32	2.44
140	Cuddalore	tiruchchopuram	11.6164	79.7416	7.70	325	120	36	7	18	2	0	67	28	10.56	68	1.18	0.12
141	Cuddalore	Tiruvamur OW	11.7631	79.4756	7.30	225	90	20	10	9	2	0	43	28	28.8	9	0.32	0.25
142	Cuddalore	Vadalur EW	11.5375	79.8844	7.66	1015	325	60	43	81	8	0	128	117	192	62	0.64	3.07
143	Cuddalore	Vadalur(o.w)	11.5687	79.5542	7.50	360	155	48	9	7	14	0	98	57	12	19	1.80	37.20
144	Cuddalore	Vanathirayapuram I	11.5177	79.3347	7.63	700	250	50	30	39	12	0	146	82	72	50	0.36	0.55
145	Cuddalore	Vazhisothanaipalayam	11.6916	79.7216	7.40	1420	360	44	61	152	14	0	561	82	96	37	0.99	2.92
146	Cuddalore	Vegakollai	11.6758	79.5289	7.30	650	210	72	7	41	18	0	134	71	44.16	74	1.23	0.50
147	Cuddalore	Vilathur (Budangudi) OW	11.3436	79.2205	7.50	760	140	36	12	106	9	0	293	82	19.2	7	1.12	0.05
148	Cuddalore	Vridhachalam	11.5177	79.3347	7.30	510	195	60	11	18	25	0	122	60	67.2	27	0.57	1.00
149	Cuddalore	Vridhachalam I	11.7681	79.2628	7.52	635	200	32	29	51	5	0	98	110	48	37	0.11	0.32
150	Dharmapuri	A.Pallipatti	11.9403	78.4017	7.05	2970	790	204	68	296	64	0	525	497	207	199	0.30	0.58
151	Dharmapuri	A.Pallipatti	11.9403	78.4017	7.05	2970	790	204	68	296	64	0	525	497	207	199	0.30	0.58
152	Dharmapuri	Athikarapatti	11.9340	78.3909	7.73	2960	620	88	97	389	8	0	500	632	156	55	0.70	0.25
153	Dharmapuri	Athikarapatti	11.9340	78.3909	7.73	2960	620	88	97	389	8	0	500	632	156	55	0.70	0.25
154	Dharmapuri	Bharathipuram	12.1172	78.1531	7.31	753	340	56	49	45	1	0	226	99	82	31	0.33	0.23
155	Dharmapuri	Bharathipuram	12.1172	78.1531	7.31	753	340	56	49	45	1	0	226	99	82	31	0.33	0.23
156	Dharmapuri	Bommidimalapurm	12.0000	78.2500	7.38	1336	500	116	51	119	4	0	317	170	132	147	0.35	0.00
157	Dharmapuri	Bommidimalapurm	12.0000	78.2500	7.38	1336	500	116	51	119	4	0	317	170	132	147	0.35	0.00
158	Dharmapuri	Boothanatham	11.9508	78.4688	7.57	577	220	40	29	30	6	0	140	57	63	62	0.97	1.69
159	Dharmapuri	Boothanatham	11.9508	78.4688	7.57	577	220	40	29	30	6	0	140	57	63	62	0.97	1.69
160	Dharmapuri	Dharmapuri2	12.1375	78.1708	7.68	2100	690	164	68	131	6	0	543	298	129	80	0.31	0.00
161	Dharmapuri	Dharmapuri2	12.1375	78.1708	7.68	2100	690	164	68	131	6	0	543	298	129	80	0.31	0.00

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							<…….mg/L…….>											ppb
162	Dharmapuri	Echambadi dw	12.1128	78.4942	7.16	1963	750	160	85	183	1	0	323	312	162	262	0.74	0.40
163	Dharmapuri	Echambadi dw	12.1128	78.4942	7.16	1963	750	160	85	183	1	0	323	312	162	262	0.74	0.40
164	Dharmapuri	Harur2	12.0514	78.4833	7.50	2640	790	100	131	233	5	0	506	561	159	62	1.08	0.00
165	Dharmapuri	Harur2	12.0514	78.4833	7.50	2640	790	100	131	233	5	0	506	561	159	62	1.08	0.00
166	Dharmapuri	Hogenakkal	12.1236	77.8083	8.15	1545	150	16	27	307	2	0	519	156	164	13	0.64	0.76
167	Dharmapuri	Hogenakkal	12.1236	77.8083	8.15	1545	150	16	27	307	2	0	519	156	164	13	0.64	0.76
168	Dharmapuri	Indoor	12.1333	78.0583	7.60	3300	1150	228	141	181	47	0	323	433	733	160	0.66	2.03
169	Dharmapuri	Indoor	12.1333	78.0583	7.60	3300	1150	228	141	181	47	0	323	433	733	160	0.66	2.03
170	Dharmapuri	Irumattur new	12.2611	78.3019	7.74	2570	530	100	68	278	55	0	555	454	153	21	0.54	0.42
171	Dharmapuri	Irumattur new	12.2611	78.3019	7.74	2570	530	100	68	278	55	0	555	454	153	21	0.54	0.42
172	Dharmapuri	Karthankulam DW	12.1331	78.3197	7.43	1356	520	84	75	86	1	0	372	149	143	40	1.04	0.06
173	Dharmapuri	Karthankulam DW	12.1331	78.3197	7.43	1356	520	84	75	86	1	0	372	149	143	40	1.04	0.06
174	Dharmapuri	Kaveripattinathankottai	12.1461	78.1733	7.09	902	270	32	46	85	41	0	354	107	63	6	0.49	1.69
175	Dharmapuri	Kaveripattinathankottai	12.1461	78.1733	7.09	902	270	32	46	85	41	0	354	107	63	6	0.49	1.69
176	Dharmapuri	Kottapatti Pz	11.9850	78.6717	7.81	1706	680	92	109	115	3	0	586	213	133	58	0.49	1.48
177	Dharmapuri	Kottapatti Pz	11.9850	78.6717	7.81	1706	680	92	109	115	3	0	586	213	133	58	0.49	1.48
178	Dharmapuri	Maniyampadi	12.1246	78.2847	7.51	589	230	44	29	35	6	0	153	64	54	52	0.52	1.80
179	Dharmapuri	Maniyampadi	12.1246	78.2847	7.51	589	230	44	29	35	6	0	153	64	54	52	0.52	1.80
180	Dharmapuri	Morappur dw	12.1247	78.3989	7.43	1976	680	84	114	182	4	0	433	369	153	76	1.21	0.00
181	Dharmapuri	Morappur dw	12.1247	78.3989	7.43	1976	680	84	114	182	4	0	433	369	153	76	1.21	0.00
182	Dharmapuri	Mukkareddipatti	11.9667	78.4167	7.40	1730	660	80	112	129	1	0	439	284	109	61	1.14	0.57
183	Dharmapuri	Mukkareddipatti	11.9667	78.4167	7.40	1730	660	80	112	129	1	0	439	284	109	61	1.14	0.57
184	Dharmapuri	Mullaivanam	12.0975	78.6289	7.69	823	370	44	63	51	2	0	329	92	51	5	0.38	1.30
185	Dharmapuri	Mullaivanam	12.0975	78.6289	7.69	823	370	44	63	51	2	0	329	92	51	5	0.38	1.30
186	Dharmapuri	Nagadasampatti	12.1333	77.9833	7.57	2650	1010	148	156	137	1	0	458	419	222	198	1.04	1.65
187	Dharmapuri	Nagadasampatti	12.1333	77.9833	7.57	2650	1010	148	156	137	1	0	458	419	222	198	1.04	1.65
188	Dharmapuri	Odasalapatti	12.1417	78.2917	7.40	1343	540	88	78	107	1	0	403	149	143	67	0.78	0.00
189	Dharmapuri	Odasalapatti	12.1417	78.2917	7.40	1343	540	88	78	107	1	0	403	149	143	67	0.78	0.00

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
190	Dharmapuri	Odasalapatti x road	12.1431	78.2844	7.34	1654	550	104	71	168	1	0	336	220	153	157	0.90	0.01
191	Dharmapuri	Odasalapatti x road	12.1431	78.2844	7.34	1654	550	104	71	168	1	0	336	220	153	157	0.90	0.01
192	Dharmapuri	Papireddipatti1	11.9167	78.3361	7.47	1603	530	48	100	152	7	0	494	270	109	15	1.32	0.49
193	Dharmapuri	Papireddipatti1	11.9167	78.3361	7.47	1603	530	48	100	152	7	0	494	270	109	15	1.32	0.49
194	Dharmapuri	Pattarakaran Kottai	12.0274	77.8104	7.66	1647	570	156	44	132	2	0	409	149	300	33	0.99	0.19
195	Dharmapuri	Pattarakaran Kottai	12.0274	77.8104	7.66	1647	570	156	44	132	2	0	409	149	300	33	0.99	0.19
196	Dharmapuri	Pennagaram1	12.1250	77.9000	7.68	754	320	40	54	36	2	0	195	92	124	8	0.58	1.57
197	Dharmapuri	Pennagaram1	12.1250	77.9000	7.68	754	320	40	54	36	2	0	195	92	124	8	0.58	1.57
198	Dharmapuri	Sillarahalli	12.0525	78.2806	7.61	3100	1210	132	214	196	6	0	567	497	186	336	0.71	0.50
199	Dharmapuri	Sillarahalli	12.0525	78.2806	7.61	3100	1210	132	214	196	6	0	567	497	186	336	0.71	0.50
200	Dharmapuri	Sittilingiri	11.9098	78.6212	7.76	1282	380	40	68	145	4	0	506	114	49	49	1.04	2.32
201	Dharmapuri	Sittilingiri	11.9098	78.6212	7.76	1282	380	40	68	145	4	0	506	114	49	49	1.04	2.32
202	Dharmapuri	Thambichettipatti dw	12.1081	78.4128	7.35	583	210	44	24	36	1	0	171	57	63	24	0.62	2.32
203	Dharmapuri	Thambichettipatti dw	12.1081	78.4128	7.35	583	210	44	24	36	1	0	171	57	63	24	0.62	2.32
204	Dharmapuri	Thirthamalai DW	12.1017	78.5892	7.37	1926	710	120	100	184	2	0	445	277	147	162	1.08	0.59
205	Dharmapuri	Thirthamalai DW	12.1017	78.5892	7.37	1926	710	120	100	184	2	0	445	277	147	162	1.08	0.59
206	Dharmapuri	Thoppur (D)	11.9433	78.0481	7.76	2100	620	72	107	227	0	0	683	206	200	30	1.23	0.90
207	Dharmapuri	Thoppur (D)	11.9433	78.0481	7.76	2100	620	72	107	227	0	0	683	206	200	30	1.23	0.90
208	Dindigul	Ayyalur	10.2858	78.1002	7.21	1183	510	144	36	54	7	0	427	156	30	19	0.90	8.42
209	Dindigul	Chattrapatti	10.4667	77.6583	6.88	2390	860	152	117	97	3	0	415	356	115	275	0.49	0.27
210	Dindigul	Chellamantadi	10.4072	78.0025	7.30	2900	460	96	54	232	282	0	647	398	125	157	0.50	1.52
211	Dindigul	Chitterivu pz	10.2378	77.7708	7.21	2910	1100	144	180	152	2	0	500	441	135	289	1.00	1.66
212	Dindigul	Dindigul1	10.4083	77.9667	7.34	1385	360	52	56	129	118	0	573	142	62	6	0.22	0.60
213	Dindigul	Dindigul2	10.3667	77.9708	7.36	1516	400	48	68	121	141	0	622	142	100	5	1.20	0.71
214	Dindigul	Gandhigram	10.2583	77.9250	7.18	1070	310	52	44	117	9	0	317	149	60	10	0.21	1.17
215	Dindigul	Guzilamparai	10.6806	78.1156	7.14	1538	490	80	70	143	34	0	415	185	80	152	1.11	3.51
216	Dindigul	Hanumanthanagar	10.3514	77.9944	7.46	2890	660	160	63	285	52	0	793	356	170	9	0.58	1.66
217	Dindigul	Idayapatti	10.7583	78.0333	7.21	1328	380	52	61	120	17	0	354	199	92	24	1.16	3.10

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
218	Dindigul	Kakkinapatti	10.6714	77.9922	7.24	1409	550	60	97	57	24	0	451	149	64	107	0.64	3.86
219	Dindigul	Kallimandiam	10.5833	77.6944	7.36	1484	460	64	73	142	16	0	464	185	67	106	0.68	1.07
220	Dindigul	Kanakkanpatti	10.4750	77.5667	7.17	3460	760	168	83	403	183	0	634	455	335	204	0.60	0.50
221	Dindigul	Kodaikanal	10.1343	77.2758	5.41	40	14	4	1	2	0	0	12	4	3	1	0.00	0.45
222	Dindigul	Kovilur (Ramanathapuram)	10.5917	78.0861	7.01	759	195	38	24	99	5	0	250	100	52	1	0.93	1.36
223	Dindigul	Kullanampatti	10.3417	77.9917	7.08	309	124	30	12	13	1	0	151	16	5	0	0.00	0.21
224	Dindigul	Muthampattipalayam	10.7272	78.1392	7.13	2270	500	120	49	216	75	0	476	313	155	134	0.84	6.24
225	Dindigul	Nandavanampatti	10.3756	77.9853	7.29	2470	620	120	78	284	17	0	647	384	112	13	2.96	2.88
226	Dindigul	Natham1	10.2222	78.2472	7.77	4660	1180	32	268	584	6	0	1074	754	340	361	1.26	49.64
227	Dindigul	Nattam	10.2328	78.2333	7.53	3010	860	48	180	275	4	0	683	469	180	233	0.74	21.77
228	Dindigul	Oddanchatram1	10.4908	77.7528	7.11	2590	840	144	117	207	2	0	549	370	165	207	0.78	0.53
229	Dindigul	Oodanchatram	10.4875	77.7542	7.06	2360	800	104	131	192	7	0	647	213	160	198	1.22	1.44
230	Dindigul	P.Alagapuri	10.5983	77.9756	7.14	4990	1340	176	219	424	55	0	354	1266	92	100	0.92	2.09
231	Dindigul	Palakanthu	10.4658	77.8056	7.26	1528	540	48	102	125	2	0	525	178	85	82	0.93	1.02
232	Dindigul	Palani2	10.4333	77.5125	7.16	805	345	24	69	46	2	0	439	46	17	1	1.32	0.79
233	Dindigul	Pallapatti	10.0805	77.5457	7.89	1276	380	36	70	139	3	0	415	170	100	28	2.72	2.79
234	Dindigul	Paraipatti	10.3583	77.9750	7.15	4220	980	256	83	384	79	0	378	711	370	282	0.08	1.12
235	Dindigul	Pittalaipatti	10.3278	77.9333	7.46	1998	620	48	122	215	12	0	573	327	75	34	1.20	9.75
236	Dindigul	Pudu Ettama Nayakar Patti	10.4619	77.7061	7.24	1226	510	64	85	92	4	0	415	100	80	117	1.18	0.82
237	Dindigul	R.Pudukottai	10.3646	78.0303	7.26	1380	470	64	75	123	12	0	439	178	110	76	1.22	6.06
238	Dindigul	R.Vellodu	10.4502	78.0116	7.23	2310	600	64	107	237	23	0	427	441	182	16	1.07	22.43
239	Dindigul	Reddiarchattram	10.4167	77.8611	7.27	1206	490	56	85	67	2	0	378	142	48	79	0.83	2.11
240	Dindigul	Sanarpatti	10.2583	78.1000	7.37	1964	590	52	112	209	9	0	793	235	75	12	1.22	3.31
241	Dindigul	Sanarpatti	10.2745	78.0697	7.47	1833	490	72	75	235	3	0	720	192	75	6	1.48	1.93
242	Dindigul	Sanarpatti	10.2779	78.0738	7.52	1903	520	36	105	205	12	0	598	263	85	25	1.25	3.37
243	Dindigul	Sanarpatti	10.2974	78.0863	7.38	1477	360	40	63	158	6	0	622	100	47	2	1.14	8.45
244	Dindigul	Sanarpatti	10.3328	78.0870	7.33	1840	350	28	68	333	3	0	878	149	70	7	2.76	2.76
245	Dindigul	Servaikaranpatti	10.7472	78.0917	7.40	1249	500	88	68	57	8	0	342	114	188	64	0.81	3.12

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
246	Dindigul	Siddayamkottai	10.2725	77.8356	7.05	5830	1980	328	282	366	15	0	390	1458	500	31	0.55	3.07
247	Dindigul	Siluvathur	10.2037	78.0508	7.32	1219	400	44	70	117	7	0	488	142	62	10	1.02	5.61
248	Dindigul	Sundarapuri	10.4597	78.0272	7.59	969	375	60	55	66	14	0	451	82	28	13	0.75	4.23
249	Dindigul	Thamaraipadi	10.4053	78.0453	7.40	4020	720	200	54	529	92	0	769	640	370	241	0.54	3.35
250	Dindigul	Thoppampatti	10.5900	77.5269	7.16	1863	570	92	83	202	21	0	415	270	92	226	1.20	2.51
251	Dindigul	Thumbalapatti	10.5333	77.5208	7.13	1110	460	64	73	64	6	0	403	85	31	178	1.06	0.75
252	Dindigul	Vadamadurai	10.3583	78.1000	7.02	2290	780	192	73	198	11	0	476	384	138	87	1.00	2.63
253	Dindigul	Vadamadurai pz	10.2630	78.0612	7.07	2420	660	168	58	273	11	0	512	384	142	107	1.32	7.61
254	Dindigul	Vaivesapuram	10.3244	78.0419	7.15	2300	680	168	63	183	21	0	439	313	182	207	0.82	0.04
255	Dindigul	Vaivesapuram	10.5396	78.0710	7.11	1846	800	172	90	50	12	0	342	384	53	132	0.35	0.00
256	Dindigul	Vaivesapuram	10.5484	78.0720	7.27	2160	760	144	97	130	17	0	451	356	200	100	1.18	5.75
257	Dindigul	Vaivesapuram	10.5551	78.0742	7.28	1628	430	128	27	167	7	0	183	164	410	17	1.35	11.64
258	Dindigul	Vaivesapuram	10.5555	78.0717	7.09	878	205	40	26	93	6	0	262	110	55	1	0.80	0.15
259	Dindigul	Vedasandur new	10.5475	77.9711	7.11	3490	900	80	170	353	13	0	439	768	92	2	1.30	8.29
260	Erode	Alampalayam pz	11.6272	77.6061	7.40	2800	760	36	163	152	25	0	525	305	126	48	0.58	3.64
261	Erode	Alukuli pz	11.4481	77.3578	7.50	1110	140	40	10	190	48	0	159	280	86	49	0.50	10.23
262	Erode	Ammapet2	11.6194	77.7444	7.90	1800	500	40	97	167	2	0	604	227	66	62	0.97	1.60
263	Erode	Arakkan kottai(Modur Diversion pirivu)	11.4969	77.3431	7.50	2120	610	74.8	103	166	17	0	549	241	118	46	0.24	4.93
264	Erode	Archalur	11.1625	77.7000	7.98	762	250	80	12	17	33	0	146	71	88	12	1.69	0.00
265	Erode	Ariyappanpalayam pz	11.4756	77.2542	7.70	1912	500	60	85	71	6	0	354	156	153	69	1.15	6.66
266	Erode	Asanur pz	11.6739	77.1289	7.20	2450	740	56	146	126	18	0	476	284	209	81	0.67	0.12
267	Erode	Attani	11.5242	77.5167	7.50	1219	430	60	68	80	11	0	378	121	115	50	0.29	0.89
268	Erode	Avalpundurai	11.2333	77.7208	8.10	1520	380	90	38	64	25	0	299	142	74	16	1.02	1.07
269	Erode	Bangalapudhur	11.5042	77.4083	7.25	1240	410	64	61	77	8	0	427	135	45	33	0.41	0.53
270	Erode	Bhavani1	11.8083	77.5333	7.30	2610	590	60	107	140	148	0	476	298	128	46	0.74	3.75
271	Erode	Chengapalli	11.2250	77.4436	7.50	1604	600	88	92	62	12	0	329	241	60	42	1.32	1.82
272	Erode	Chennampatti pz	11.7019	77.6736	7.00	1552	750	120	109	26	0	0	165	199	298	67	0.29	2.32
273	Erode	Chennimalai2	11.1625	77.5972	8.00	1613	330	92	24	160	125	0	427	163	168	52	1.43	0.00

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							<…….mg/L…….>											ppb
274	Erode	Chittodu	11.3917	77.6778	7.50	1542	320	48	49	88	67	0	268	170	121	54	0.44	1.60
275	Erode	Dharapuram2	10.7389	77.5292	7.80	2760	410	108	34	189	87	0	415	298	221	45	0.11	0.00
276	Erode	E.Vellampalayam pz	11.1697	77.6806	7.60	958	240	40	34	107	20	0	354	64	72	33	1.77	0.97
277	Erode	Elmattur	11.1944	77.7792	7.50	1136	290	48	41	111	56	0	390	85	79	35	1.60	0.67
278	Erode	Erakalpudur(Sivanmalai)	11.0308	77.5347	7.30	7000	960	40	209	883	4	0	1031	681	739	47	0.93	0.00
279	Erode	Erode2	11.3333	77.7333	7.50	1381	390	80	46	147	17	0	415	206	93	43	1.54	2.86
280	Erode	Ganapathipalayam	10.7681	77.6547	7.30	1089	420	68	61	41	5	0	256	128	121	37	1.21	0.32
281	Erode	Gandhinagar Thaneerpanthalpalayam	11.6589	77.6847	7.10	1365	490	124	44	25	18	0	153	177	136	46	0.20	1.34
282	Erode	Gettichcheriyar	11.3383	77.4133	7.70	2560	580	48	112	212	186	0	708	284	114	94	0.84	2.83
283	Erode	Gobichettipalayam1	11.4583	77.4458	7.50	979	350	76	39	60	7	0	342	71	115	48	0.53	0.33
284	Erode	Gugalur	11.4889	77.4897	7.40	1172	450	88	56	49	7	0	238	113	169	19	0.59	1.11
285	Erode	Guvuar dw	11.6414	77.6822	7.60	1240	610	56	114	42	0	0	366	177	66	78	0.34	0.53
286	Erode	Indiampalayam	11.4500	77.2694	7.00	880	340	48	53	78	16	0	366	99	58	66	0.13	0.82
287	Erode	Ingur New	11.2258	77.5814	7.30	5860	970	128	158	316	42	0	183	1035	213	63	0.62	4.80
288	Erode	Kambaliyampatti pz	11.2314	77.5253	7.50	1636	550	124	58	148	10	0	293	404	69	48	1.35	2.60
289	Erode	Kambanaickenpalayam pz	11.5297	77.2953	7.60	1561	360	40	63	155	48	0	598	149	13	7	0.75	1.30
290	Erode	Kangayam2	11.0028	77.5625	7.30	2060	640	152	63	134	21	0	415	312	211	37	1.08	0.00
291	Erode	Karaiyur1	10.7639	77.5944	7.80	8560	1510	304	182	446	33	0	683	943	810	61	1.56	3.35
292	Erode	Kasipalayam (E)	11.4556	77.3394	7.30	647	310	40	51	18	5	0	342	35	5	12	0.60	0.16
293	Erode	Kathampalayam pz	11.4256	77.2411	7.70	1201	300	28	56	165	12	0	500	57	103	23	1.05	1.39
294	Erode	Kattupalayam pz	11.5453	77.5953	7.40	1090	480	52	85	42	5	0	177	106	189	62	0.42	1.37
295	Erode	Kavilipalayam	11.3802	77.2308	7.30	10700	2350	244	423	980	16	0	488	2871	184	76	1.73	37.80
296	Erode	Kavundappadi	11.4333	77.5583	7.50	1086	440	48	78	75	52	0	378	121	136	71	0.68	7.54
297	Erode	Kodumudi pz	11.0819	77.8853	7.00	1345	570	60	102	61	3	0	305	170	162	13	0.58	3.74
298	Erode	Kolappalur	12.5583	79.3500	7.50	1475	600	64	107	112	33	0	366	277	238	45	1.17	2.97
299	Erode	Kolathupalayam	10.7639	77.5842	7.40	2620	480	108	51	244	17	0	415	213	261	36	0.14	2.00
300	Erode	Kosanam pz	11.3711	77.3578	7.80	851	200	36	27	97	23	0	220	177	12	40	1.56	2.40
301	Erode	Krishnapuram	11.5367	77.7097	7.40	1295	460	72	68	45	3	0	238	113	174	81	0.58	2.35

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
302	Erode	Kullakalpalayam	10.8044	77.5569	7.70	1690	760	32	165	126	8	0	220	510	54	38	1.30	0.00
303	Erode	Kunnathur	11.2692	77.4106	7.50	1471	415	60	64	59	80	0	342	142	94	38	0.42	3.36
304	Erode	Kurichi	11.5733	77.6939	8.00	545	250	32	41	13	8	0	140	64	10	62	0.73	0.53
305	Erode	Molengkuttipalayam	11.0672	77.7022	7.70	3970	410	60	63	332	13	0	153	592	224	42	0.81	0.99
306	Erode	Mulanur2	10.7917	77.7083	7.50	2400	630	168	51	185	14	0	317	298	242	48	1.20	1.63
307	Erode	Murlipudur	11.6781	77.6560	7.60	4270	1300	152	224	150	2	0	390	496	682	67	0.79	7.85
308	Erode	Murukkandurai (Bhavanisagar)	11.4833	77.1500	7.40	705	210	32	32	60	5	0	275	35	74	17	0.60	0.48
309	Erode	Muttur1	11.0417	77.7333	7.80	6400	1340	168	224	412	74	0	647	851	720	28	0.36	1.12
310	Erode	Nagalapuram pz	11.0756	77.3628	7.50	2210	690	68	126	145	25	0	293	347	188	22	1.63	3.00
311	Erode	Nallampatti pz	11.3333	77.5417	7.40	826	330	72	36	24	5	0	311	43	65	40	0.74	9.16
312	Erode	Nambiyur	11.3606	77.3208	7.60	3390	720	68	134	333	21	0	464	404	333	52	1.88	45.70
313	Erode	Nilangelvalasu pz	10.6431	77.7342	7.70	1300	550	60	97	35	4	0	415	99	114	17	1.62	1.20
314	Erode	Ooricheri	11.4650	77.6058	7.40	3530	1000	56	209	171	4	0	622	496	249	52	0.93	8.81
315	Erode	Otti Vilangadu	11.2242	77.4186	7.40	1960	700	64	131	78	7	0	427	113	254	66	1.83	4.55
316	Erode	Padiyur pz	11.0639	77.4922	7.20	950	280	96	10	15	19	0	128	110	77	38	1.37	0.16
317	Erode	Pandiyampalayam pz	11.3983	77.5175	7.10	2230	610	124	73	150	21	0	451	298	201	62	0.28	40.30
318	Erode	Papayampudur	10.6567	77.4678	7.60	2900	980	64	199	120	7	0	378	397	282	31	1.65	0.75
319	Erode	Pattaidurai	10.7011	77.7394	7.40	4500	1170	176	177	233	16	0	232	915	288	19	0.74	4.29
320	Erode	Periyakolanalli pz	11.1744	77.8567	7.60	960	340	52	51	83	41	0	390	128	68	13	0.75	0.31
321	Erode	Periyapuliyur pz	11.4283	77.6492	7.90	2860	150	16	27	457	170	0	1122	199	177	62	1.27	23.16
322	Erode	Perundurai1	11.2792	77.5847	7.50	2470	550	92	78	223	23	0	476	241	200	72	0.27	3.15
323	Erode	Ponmudi	11.2608	77.5303	7.70	1988	540	48	102	238	50	0	317	411	182	25	1.00	13.00
324	Erode	Ponnapuram pz	10.6981	77.3906	7.70	1067	370	132	10	77	5	0	342	64	177	14	1.31	0.00
325	Erode	Pudupalayam1	11.5944	77.5875	7.10	3840	1340	44	299	171	1	0	549	468	560	72	0.68	9.59
326	Erode	Puduppai pz	10.9586	77.7225	7.70	5790	1140	88	224	146	132	0	671	383	586	12	1.82	0.44
327	Erode	Puduvadavalli	11.5417	77.1761	7.30	1603	570	74	94	87	5	0	427	149	167	62	1.33	0.92
328	Erode	Punjai Puliyampatti	11.3528	77.1694	7.48	1261	310	76	29	128	23	0	366	106	105	41	0.11	0.30
329	Erode	Punjaiduraiampalayam	11.5131	77.4233	7.10	2300	500	112	53	191	10	0	458	248	223	55	0.34	3.71

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							<…….mg/L…….>											ppb
330	Erode	Punnachipudur dw	11.5919	77.6661	7.20	2830	940	92	173	167	2	0	317	468	375	82	0.63	13.00
331	Erode	Punnam pz	11.5072	77.6139	7.30	1465	650	52	126	47	4	0	354	184	213	71	0.47	1.50
332	Erode	Rajan Nagar pz	11.5289	77.1422	7.40	2240	530	48	100	182	4	0	512	227	184	60	0.28	1.63
333	Erode	Sathiyamangalam	11.5028	77.2472	7.60	1619	430	56	70	170	10	0	476	170	177	70	1.08	3.59
334	Erode	Settunampalayam pz	11.5200	77.6033	7.30	2800	1010	44	219	107	22	0	268	588	253	67	0.81	31.00
335	Erode	Unjalur	11.1250	77.8750	7.60	931	300	52	41	131	54	0	415	106	122	2	0.95	0.34
336	Erode	Urachikottai	11.4847	77.6917	7.40	1867	690	108	102	122	23	0	427	255	205	80	0.12	4.50
337	Erode	Uthukuli pz	11.1744	77.4472	7.50	1484	460	52	80	126	26	0	586	170	62	32	1.36	0.68
338	Erode	Varadanallur	11.4933	77.6986	7.00	884	370	44	63	30	2	0	268	57	68	62	0.87	0.77
339	Erode	Vellakoil	10.9444	77.7153	7.60	4600	1120	68	231	103	16	0	433	418	491	44	0.56	1.42
340	Erode	Vellitirupur	11.6208	77.6333	7.70	2200	640	60	119	82	24	0	598	142	159	56	0.78	2.85
341	Erode	Velliyampalayamputhur pz	11.4886	77.1564	7.60	1467	280	44	41	112	12	0	317	92	136	14	0.79	0.38
342	Erode	Vijayamangalam pz	11.2444	77.5028	7.70	4044	600	56	112	163	252	0	244	652	12	34	1.44	2.13
343	Erode	Vinnampalli	11.4328	77.2022	7.30	1443	300	32	53	146	17	0	244	149	139	53	0.15	0.79
344	Kancheepuram	Acharapakkam1	12.4000	79.8167	7.09	846	380	88	39	4	13	0	346	99	14	1	0.42	0.32
345	Kancheepuram	Agaram2	12.8875	80.1486	7.30	940	340	96	24	24	12	0	220	149	10	39	0.69	0.37
346	Kancheepuram	Anakkaputhur	12.9833	80.1250	7.28	1210	210	76	5	188	1	0	311	178	42	109	0.65	0.92
347	Kancheepuram	Arasanimangalam	12.5689	79.7233	7.20	1110	310	32	56	135	10	0	323	192	18	49	0.89	1.07
348	Kancheepuram	Athur1	12.3478	79.8892	7.37	1237	590	44	117	50	4	0	244	234	124	16	1.32	2.21
349	Kancheepuram	Baluchettychatram	10.4633	77.7900	6.83	1473	550	100	73	119	16	0	214	270	198	6	0.60	9.42
350	Kancheepuram	Blue beach road.	12.9539	80.2547	7.41	1426	400	112	29	90	45	0	201	192	160	59	0.23	2.94
351	Kancheepuram	Chemmamcheri Periurban	12.8633	80.2261	7.29	810	440	40	83	12	10	0	159	178	56	74	0.48	0.32
352	Kancheepuram	Chenglepet1	12.7000	79.9750	7.22	847	280	80	19	85	20	0	305	142	28	3	0.96	0.38
353	Kancheepuram	Chinna Nilangarai	12.9575	80.2608	7.05	1694	480	116	46	129	47	0	262	213	210	51	0.44	5.19
354	Kancheepuram	Chitlapakkam	12.9406	80.1375	7.38	585	230	36	34	11	14	0	171	57	60	3	0.45	0.59
355	Kancheepuram	Chrompet	12.9514	80.1392	7.50	1728	490	32	100	173	16	0	671	231	57	5	0.22	1.11
356	Kancheepuram	Chunambedu	12.2669	79.9844	7.19	1223	405	32	79	81	12	0	207	284	16	5	0.80	0.91
357	Kancheepuram	Elegant Flat	12.9875	80.2639	7.30	1094	170	48	12	209	22	0	79	355	95	7	0.32	0.84

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
358	Kancheepuram	Gerugambakkam	13.0153	80.1367	7.39	1412	350	30	67	159	30	0	458	153	143	17	0.46	4.94
359	Kancheepuram	Guduvancheri	12.8417	80.0667	7.23	1159	440	88	54	12	28	0	305	163	21	44	0.80	0.17
360	Kancheepuram	Hasthinapuram	12.9431	80.1478	7.46	1616	355	40	62	102	16	0	415	131	74	7	0.23	0.08
361	Kancheepuram	Injambakkam	12.9339	80.2547	7.48	930	330	84	29	38	15	0	189	157	45	14	0.57	1.18
362	Kancheepuram	Kalakshetra	10.4633	80.2636	7.35	1127	300	88	19	110	16	0	165	192	156	2	0.18	1.94
363	Kancheepuram	Kancheepuram	12.8333	79.7083	7.44	1257	160	48	10	158	74	0	488	135	38	4	0.86	0.40
364	Kancheepuram	Kattangulathur	12.8139	80.0333	7.26	775	170	44	15	106	13	0	293	85	8	27	0.69	0.28
365	Kancheepuram	Kattur	12 34 14	80 0 59	7.57	450	210	20	39	4	4	0	140	43	41	2	0.89	0.31
366	Kancheepuram	KCG Garden, Vettuvankani	12.9433	80.2569	7.66	1312	320	72	34	162	22	0	267	198	146	3	0.56	1.11
367	Kancheepuram	Kilkattalai	12.9622	80.1842	7.13	1624	375	22	77	163	13	0	329	249	96	31	0.31	1.78
368	Kancheepuram	Kolapakkam	12.8686	80.1103	7.07	1504	360	80	39	178	13	0	500	206	47	36	0.97	1.95
369	Kancheepuram	Kolathanallur	12.3472	79.9083	7.27	1380	380	56	58	144	13	0	427	227	17	6	0.53	3.28
370	Kancheepuram	KOTTIVAKKAM	12.9681	80.2600	7.36	1587	400	60	61	166	32	0	244	259	122	120	0.27	5.79
371	Kancheepuram	Kundathur periurban	13.0019	80.0694	7.60	1200	320	34	57	133	20	0	366	163	87	2	0.11	6.45
372	Kancheepuram	Kunnattur	13.0027	80.0992	7.51	1210	510	44	97	6	0	0	238	213	19	5	0.81	5.00
373	Kancheepuram	Lions Club	12.9272	80.2639	7.45	545	250	52	34	28	30	0	128	142	18	46	0.27	4.96
374	Kancheepuram	Maduranthakam	12.5083	79.8917	7.25	1225	380	96	34	127	12	0	500	156	12	27	0.91	4.29
375	Kancheepuram	Mahabalipuram	12.6250	80.1917	7.39	265	130	32	12	2	2	0	132	24	4	6	0.81	0.34
376	Kancheepuram	Mangadu	13.0247	80.1089	7.28	1320	390	88	41	145	20	0	311	181	103	55	0.25	1.76
377	Kancheepuram	Mannivakkam	12.8916	80.0694	7.35	690	225	28	38	52	12	0	177	71	68	13	0.76	0.66
378	Kancheepuram	Meenambakkam1	12.9722	80.1736	7.26	1148	405	58	63	65	14	0	311	110	150	4	0.35	1.06
379	Kancheepuram	Mudichur	12.8919	80.0689	7.22	820	260	64	24	72	23	0	232	110	74	17	0.45	0.66
380	Kancheepuram	Muttukadu	12.8219	80.2406	6.40	1755	380	80	44	216	20	0	268	426	48	3	0.89	2.34
381	Kancheepuram	Nagalkeni	12.9575	80.1261	7.45	1580	275	18	56	182	22	0	482	199	23	3	0.60	1.29
382	Kancheepuram	Nandambakkam	13.0042	80.1875	7.24	710	310	64	36	32	9	0	171	142	12	12	0.76	0.27
383	Kancheepuram	Nedunkundram	12.8847	80.1136	7.54	1030	440	24	92	58	10	0	207	178	110	24	0.81	0.78
384	Kancheepuram	Neelangarai	12.9542	80.2556	7.29	1639	400	84	46	117	25	0	195	192	232	17	0.73	2.54
385	Kancheepuram	Paddapai	12.9125	80.0125	7.44	1596	243	10	106	88	8	0	201	220	210	21	0.92	2.61

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							<…….mg/L…….>											ppb
386	Kancheepuram	PALKALAI NAGAR	12.9633	80.2617	7.55	1602	385	50	63	148	37	0	476	213	15	39	0.40	6.12
387	Kancheepuram	Pallavaram	12.9728	80.1544	7.04	2270	570	90	84	205	14	0	384	380	248	7	0.52	5.78
388	Kancheepuram	Pallikaranai	12.9264	80.1978	7.80	1417	100	32	5	273	12	0	79	469	22	1	0.76	0.79
389	Kancheepuram	Panruti Kandigai	12.8506	79.9119	7.41	558	140	44	7	73	6	0	165	107	10	7	0.70	0.83
390	Kancheepuram	Perungulathur	12.9167	80.1083	7.61	2370	500	48	92	264	17	0	427	433	92	20	0.60	1.70
391	Kancheepuram	Podavur (Melpodavur)	12.9237	79.7455	7.78	575	180	28	27	59	11	0	226	36	55	14	0.70	0.14
392	Kancheepuram	Ponmar	12.8556	80.1694	7.32	1030	430	44	78	56	5	0	207	178	98	25	0.73	0.33
393	Kancheepuram	Poonamallee	13.0567	80.0819	7.27	1510	375	42	66	188	21	0	384	209	146	10	0.45	4.25
394	Kancheepuram	Porur dw	13.0225	80.1533	7.31	980	350	28	68	56	14	0	195	199	36	22	0.73	0.60
395	Kancheepuram	Putheri EW	12.8395	79.6787	7.63	1102	80	24	5	210	3	0	214	178	76	6	0.84	2.56
396	Kancheepuram	Rettamangalam	12.6333	79.8333	7.31	790	330	28	63	28	14	0	177	121	46	16	1.11	2.21
397	Kancheepuram	Sadras	12.5203	80.1517	7.45	1107	255	26	46	123	17	0	250	178	18	59	0.73	4.05
398	Kancheepuram	Seashore Appartment, 39	12.9828	80.2656	7.38	1389	190	36	24	227	24	0	67	398	42	20	0.34	0.49
399	Kancheepuram	Seashore Appartment, 40	12.9786	80.2656	7.22	1543	190	76	0	247	21	0	73	419	92	20	0.22	1.01
400	Kancheepuram	Sholinganallur Periurban	12.9000	80.2333	7.05	2970	360	80	39	425	72	0	195	639	210	11	0.53	0.22
401	Kancheepuram	Sriperumbudur	12.9667	79.9500	7.21	276	150	20	24	11	4	0	61	71	8	8	0.76	0.14
402	Kancheepuram	St.Thomas Mount dw	13.0072	80.1978	7.20	1895	460	48	83	167	14	0	433	231	150	55	0.12	1.88
403	Kancheepuram	Tambaram1	12.9333	80.1333	7.39	830	360	48	58	48	1	0	195	156	23	47	0.72	0.14
404	Kancheepuram	Thirumukkudal	12.7375	79.8417	7.34	785	250	48	32	75	19	0	185	142	55	3	0.89	1.60
405	Kancheepuram	Thiruporur	12.8083	80.1875	7.37	590	250	32	41	20	14	0	195	78	25	3	0.78	0.65
406	Kancheepuram	Thiruverkadu	13.0669	80.1367	7.40	1270	340	112	15	126	13	0	281	149	210	7	0.64	1.03
407	Kancheepuram	Tirukalukundram	12.6083	79.6667	7.29	810	340	44	56	44	20	0	201	135	32	51	0.73	0.17
408	Kancheepuram	Tirumani	12.6658	79.9930	7.53	890	430	28	88	25	4	0	256	114	77	3	1.12	0.84
409	Kancheepuram	Uthandi	12.8694	80.2472	7.46	370	100	34	4	30	16	0	127	32	44	5	0.03	0.57
410	Kancheepuram	Uthiramerur2	12.6083	79.7375	6.85	6080	1920	432	204	480	13	0	464	1839	128	29	0.80	6.95
411	Kancheepuram	Uthukkadu pz	12.8292	79.8300	7.46	780	320	64	39	41	10	0	329	85	12	2	0.84	8.44
412	Kancheepuram	Uttiramerur	12.6333	79.7607	7.49	685	310	8	71	20	10	0	183	95	42	17	1.00	0.17
413	Kancheepuram	Vadakkupattu pz	12.8181	79.9367	7.69	1210	90	24	7	224	2	0	275	199	48	2	0.87	0.24

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414	Kancheepuram	Vadekkal Ow (Palnallur)	12.9035	79.9139	7.52	1410	230	44	29	205	21	0	281	341	18	11	0.87	19.19
415	Kancheepuram	Vengaivasal	12.9003	80.1711	7.06	1604	520	96	68	123	13	0	500	270	38	5	0.86	1.88
416	Kancheepuram	Vishranthi Old Age Home	12.9786	80.2606	7.12	1558	420	104	39	186	25	0	165	305	240	23	0.72	2.73
417	Kancheepuram	Walajabad	12.7750	79.8250	7.22	1490	520	64	88	87	12	0	281	362	27	14	1.34	2.48
418	Kancheepuram	VAYAULUR	12.5014	80.0816	6.99	840	280	44	41	78	14	0	220	199	18.45	0	0.70	0.47
419	Kancheepuram	INJAMBAKKAM	12.9263	80.2506	7.40	1434	330	96	22	158	21	0	342	242	16.25	6	0.61	4.58
420	Kancheepuram	NEMMILI	12.7206	80.2279	7.44	598	210	40	27	44	8	0	122	125	16.15	13	0.63	0.36
421	Kancheepuram	PANAIYUR	12.9879	80.2678	7.36	1520	230	20	44	200	16	0	122	426	34.05	1	0.34	0.56
422	Kancheepuram	UTHANDI	12.8955	80.2440	7.30	760	290	60	34	40	12	0	183	125	43	8	0.56	0.54
423	Kanyakumari	Aralvaimozhi	8.2500	77.5167	7.40	532	175	44	16	29	13	0	104	71	43	12	0.59	0.33
424	Kanyakumari	Attur	8.3250	77.2583	6.90	170	90	16	12	2	3	0	18	50	7	3	0.67	2.12
425	Kanyakumari	Boothapandy	8.2583	77.4528	7.30	1843	600	68	105	190	0	0	525	277	118	2	1.17	3.34
426	Kanyakumari	Chenpagaramanpudur	8.2599	77.5099	7.00	665	235	36	35	39	0	0	305	28	23	2	1.82	0.16
427	Kanyakumari	Chettiarmadam DW	8.1917	77.2953	6.90	180	110	12	19	15	4	0	61	50	10	11	0.86	0.16
428	Kanyakumari	Kanyakumari PZ	8.0889	77.5500	7.40	1354	320	60	41	117	15	0	342	206	50	39	0.16	1.15
429	Kanyakumari	Kanyakumari1	8.0833	77.5500	7.50	1089	340	64	44	104	34	0	464	121	70	18	0.60	1.18
430	Kanyakumari	Karungal pz	8.2347	77.2347	6.90	1241	250	32	41	166	28	0	61	305	65	54	0.14	0.16
431	Kanyakumari	Kattudurai DW	8.2839	77.2719	6.90	755	130	24	17	104	17	0	49	177	32	46	0.32	0.00
432	Kanyakumari	Kolachal	8.1778	77.2625	6.85	475	200	24	34	35	0	0	37	99	65	26	1.08	0.14
433	Kanyakumari	Kulasekharan DW	8.3522	77.2858	7.00	555	210	24	36	31	13	0	85	99	65	8	0.15	0.15
434	Kanyakumari	Kundal(West) PZ	8.1028	77.5439	7.40	1205	230	44	29	177	0	0	281	206	54	6	0.69	0.00
435	Kanyakumari	Marthandam	8.3097	77.2142	6.90	250	120	20	17	12	0	0	37	43	29	26	0.92	0.00
436	Kanyakumari	Marthandam pz	8.3097	77.2142	6.90	381	100	16	15	26	12	0	12	99	6	13	0.34	0.00
437	Kanyakumari	Nagarkoil1	8.1667	77.4500	7.10	1050	300	68	32	119	11	0	268	156	76	43	0.16	0.48
438	Kanyakumari	Puthukadai	8.2793	77.1824	6.85	640	200	20	36	41	21	0	73	128	57	39	0.24	0.00
439	Kanyakumari	Thakkalai1	8.2486	77.3083	6.90	921	300	36	51	44	6	0	85	206	18	32	0.43	0.00
440	Kanyakumari	Thiruvattar	8.3333	77.2678	7.00	231	120	16	19	11	3	0	24	43	29	51	0.60	0.17
441	Kanyakumari	Variyur	8.1167	77.5425	7.50	1228	280	32	49	180	4	0	549	113	98	5	0.57	2.80

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
442	Kanyakumari	Vellaivilai	8.2222	77.2583	6.96	660	180	12	36	69	0	0	24	149	57	41	0.58	0.11
443	Kanyakumari	Villukuri	8.2250	77.3583	7.10	456	155	20	26	33	5	0	122	71	19	13	0.10	0.00
444	Karaikal	Karaikal dw	10.9322	79.8314	7.72	1518	270	68	24	213	57	0	384	249	56	115	0.86	0.64
445	Karaikal	Kilakasakudi	10.9333	79.8417	7.68	1825	340	76	36	221	52	0	336	376	83	46	0.55	1.21
446	Karaikal	Kottucherry	10.9583	79.8167	7.63	504	200	40	24	36	9	0	92	50	88	58	0.71	0.13
447	Karaikal	Thirunallur	10.9261	79.7922	7.81	1925	230	24	41	370	7	0	403	369	66	47	0.66	1.78
448	Karur	Allur-Agragaram dw	10.8661	78.5472	7.10	1322	270	48	36	120	96	0	360	185	79	28	0.11	0.59
449	Karur	Aravakurichi2	10.7750	77.9250	7.26	1205	370	68	49	115	5	0	390	192	28	19	0.16	1.85
450	Karur	Ayyampalayam pz	11.0625	78.0361	7.26	4660	900	184	107	583	28	0	580	966	389	13	0.48	10.47
451	Karur	Chinna Dharapuram	10.8667	77.9000	7.24	1644	500	84	71	138	34	0	464	256	78	21	0.79	3.39
452	Karur	Choladasanpatti pz	10.8500	78.0000	7.45	1166	430	76	58	97	8	0	342	121	198	17	0.17	6.15
453	Karur	Echampatti pz	10.8589	78.4228	7.43	1896	340	40	58	269	5	0	439	369	55	4	1.39	4.40
454	Karur	Enuguru DW	10.8547	78.4878	7.14	9070	1740	108	358	1252	12	0	1001	2386	229	20	0.87	10.70
455	Karur	Jagatabi	10.8417	78.1667	7.22	2740	620	124	75	312	6	0	525	462	165	116	1.56	8.71
456	Karur	Kovilur	10.7603	77.8289	7.26	4040	1000	136	161	457	18	0	598	781	363	50	0.65	10.51
457	Karur	Mayanur	10.9417	78.2417	7.00	1977	520	104	63	178	16	0	348	462	16	5	0.12	3.77
458	Karur	Melnagavaram dw	10.8767	78.2219	7.05	2840	660	112	92	332	5	0	580	540	154	81	0.61	8.40
459	Karur	Paramatti1	10.9667	77.9125	7.36	1742	300	56	39	267	7	0	476	185	202	3	1.12	1.17
460	Karur	Thogamalai	10.7292	78.4250	7.17	3160	530	136	46	414	69	0	543	589	232	1	0.27	13.50
461	Karur	Veerapalayam dw	10.7789	78.1975	8.50	740	210	40	27	70	11	0	165	135	11	52	0.66	0.59
462	Karur	Vellianani	10.8667	78.1333	7.32	4080	790	96	134	427	130	0	647	682	284	205	1.58	6.58
463	Krishnagiri	Anusonai	12.5667	77.9000	7.78	1157	410	64	61	69	64	0	342	149	130	12	0.51	5.33
464	Krishnagiri	Anusonai	12.5667	77.9000	7.78	1157	410	64	61	69	64	0	342	149	130	12	0.51	5.33
465	Krishnagiri	Athimugam1	12.7583	77.9792	7.52	1336	410	100	39	122	5	0	207	149	314	38	1.15	76.28
466	Krishnagiri	Athimugam1	12.7583	77.9792	7.52	1336	410	100	39	122	5	0	207	149	314	38	1.15	76.28
467	Krishnagiri	Bargur	12.3242	78.2054	7.81	2260	690	60	131	202	9	0	567	305	238	100	1.28	5.53
468	Krishnagiri	Billakottai Pz	12.4072	78.1658	7.60	1834	600	52	114	150	1	0	415	270	218	39	0.71	1.18
469	Krishnagiri	Billakottai Pz	12.4072	78.1658	7.60	1834	600	52	114	150	1	0	415	270	218	39	0.71	1.18

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
470	Krishnagiri	Billanakuppam	12.0626	78.1853	7.43	1090	400	52	66	81	11	0	390	121	120	16	1.28	32.37
471	Krishnagiri	Denkanikottai1	12.5250	77.7833	7.36	2830	760	140	100	243	9	0	336	462	417	64	0.78	6.71
472	Krishnagiri	Denkanikottai1	12.5250	77.7833	7.36	2830	760	140	100	243	9	0	336	462	417	64	0.78	6.71
473	Krishnagiri	Enusonai	12.6138	78.0175	7.25	1290	440	80	58	77	11	0	275	149	128	114	1.84	3.21
474	Krishnagiri	Guruparapalli	12.5974	78.1331	7.70	598	290	60	34	5	4	0	159	85	43	2	0.30	2.43
475	Krishnagiri	Guruvinayanpalli	12.6500	78.3292	7.54	1012	410	68	58	73	7	0	287	114	191	20	0.69	40.86
476	Krishnagiri	Guruvinayanpalli	12.6500	78.3292	7.54	1012	410	68	58	73	7	0	287	114	191	20	0.69	40.86
477	Krishnagiri	Hosur HP	12.7167	77.8333	7.68	1240	500	120	49	77	5	0	329	185	138	44	0.74	13.64
478	Krishnagiri	Hosur HP	12.7167	77.8333	7.68	1240	500	120	49	77	5	0	329	185	138	44	0.74	13.64
479	Krishnagiri	Karukkanchavadi	12.4083	78.2083	7.45	1320	490	80	71	110	2	0	342	256	88	18	0.72	1.89
480	Krishnagiri	Karukkanchavadi	12.4083	78.2083	7.45	1320	490	80	71	110	2	0	342	256	88	18	0.72	1.89
481	Krishnagiri	Kaveripatnam	12.4125	78.2292	7.49	1682	650	40	134	100	3	0	329	362	91	8	0.64	1.48
482	Krishnagiri	Kaveripatnam	12.4125	78.2292	7.49	1682	650	40	134	100	3	0	329	362	91	8	0.64	1.48
483	Krishnagiri	Kawthalam	12.5347	78.0489	7.22	569	270	48	36	28	3	0	220	85	45	3	0.52	1.09
484	Krishnagiri	Kawthalam	12.5347	78.0489	7.22	569	270	48	36	28	3	0	220	85	45	3	0.52	1.09
485	Krishnagiri	Keezhkuppam Pz	12.2228	78.5283	7.84	1785	650	80	109	138	7	0	592	241	100	3	1.36	0.49
486	Krishnagiri	Keezhkuppam Pz	12.2228	78.5283	7.84	1785	650	80	109	138	7	0	592	241	100	3	1.36	0.49
487	Krishnagiri	Konnanur	12.3328	78.3503	7.09	1042	390	92	39	75	1	0	293	156	90	20	0.55	0.00
488	Krishnagiri	Konnanur	12.3328	78.3503	7.09	1042	390	92	39	75	1	0	293	156	90	20	0.55	0.00
490	Krishnagiri	Krishnagiri	12.3130	78.1259	7.41	2700	690	140	83	258	6	0	397	490	263	122	0.64	3.32
491	Krishnagiri	Machinayampalli	12.6156	77.7844	7.65	1424	470	148	24	82	21	0	275	128	252	86	1.38	16.11
492	Krishnagiri	Machinayampalli	12.6156	77.7844	7.65	1424	470	148	24	82	21	0	275	128	252	86	1.38	16.11
493	Krishnagiri	Machinkanakottai	12.4131	78.1708	7.10	1230	510	112	56	80	6	0	415	178	80	7	1.29	6.87
494	Krishnagiri	Machinkanakottai	12.4131	78.1708	7.10	1230	510	112	56	80	6	0	415	178	80	7	1.29	6.87
495	Krishnagiri	Mahadeva Gollahalli	12.4025	78.3436	7.52	1208	480	100	56	90	17	0	329	220	69	18	0.89	1.31
496	Krishnagiri	Mahadeva Gollahalli	12.4025	78.3436	7.52	1208	480	100	56	90	17	0	329	220	69	18	0.89	1.31
497	Krishnagiri	Mallapadi	12.5344	78.3752	7.44	1304	490	88	66	72	8	0	354	206	110	19	0.98	7.77
498	Krishnagiri	Mattur	12.3833	78.4139	7.84	3860	1260	236	163	274	22	0	689	646	347	211	0.34	2.10

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
499	Krishnagiri	Mattur	12.3833	78.4139	7.84	3860	1260	236	163	274	22	0	689	646	347	211	0.34	2.10
500	Krishnagiri	Mattur2	12.3833	78.4167	7.26	1479	520	48	97	140	1	0	458	249	78	12	1.17	2.24
501	Krishnagiri	Mattur2	12.3833	78.4167	7.26	1479	520	48	97	140	1	0	458	249	78	12	1.17	2.24
502	Krishnagiri	Megalachinnapalli	12.6250	78.2542	7.44	1820	700	100	109	145	3	0	397	291	279	11	0.92	68.13
503	Krishnagiri	Megalachinnapalli	12.6250	78.2542	7.44	1820	700	100	109	145	3	0	397	291	279	11	0.92	68.13
504	Krishnagiri	Nagathunai	12.5639	77.9128	7.80	792	310	64	36	59	1	0	244	114	68	18	1.21	0.00
505	Krishnagiri	Nagathunai	12.5639	77.9128	7.80	792	310	64	36	59	1	0	244	114	68	18	1.21	0.00
506	Krishnagiri	Nattamaikottai	12.4721	78.2154	7.45	1337	410	48	71	153	2	0	342	284	66	17	1.69	6.15
507	Krishnagiri	Pannandur	12.3013	78.2794	7.23	3270	900	236	75	282	5	0	177	1001	82	28	0.50	8.52
508	Krishnagiri	Panneswara Madam	12.3917	78.2469	7.14	3630	1000	140	158	259	57	0	531	675	215	170	1.29	0.42
509	Krishnagiri	Panneswara Madam	12.3917	78.2469	7.14	3630	1000	140	158	259	57	0	531	675	215	170	1.29	0.42
510	Krishnagiri	Pudur Punganai	12.1864	78.4842	7.13	2120	680	128	88	139	23	0	488	320	116	121	1.48	1.21
511	Krishnagiri	Rayakottai	12.5111	78.5111	7.70	1620	580	120	68	98	52	0	525	256	77	24	0.73	0.00
512	Krishnagiri	Sulagiri	12.6667	78.0250	7.50	2600	790	160	95	197	3	0	500	348	213	206	1.02	0.28
513	Krishnagiri	Tattarhalli	12.3408	78.2458	7.25	696	280	60	32	27	4	0	195	85	55	11	0.61	2.00
514	Krishnagiri	Udhanapalli	12.6103	77.9395	7.74	1305	350	52	54	117	2	0	342	170	80	33	0.61	3.38
515	Krishnagiri	Unichetty	12.4370	77.8505	7.90	683	340	48	54	2	3	0	311	71	2	4	0.63	1.34
516	Krishnagiri	Uttangarai	12.2667	78.5292	7.47	1123	560	80	88	48	5	0	323	149	78	85	1.15	0.09
517	Krishnagiri	Vanambli	12.3475	78.5550	7.82	1744	510	68	83	135	3	0	311	348	109	8	1.42	1.35
518	Krishnagiri	Vappanapalli	12.6998	78.1925	7.69	1854	450	68	68	247	8	0	451	263	227	51	1.70	48.88
519	Krishnagiri	Virupakshinagar	12.5933	77.8681	6.76	918	350	60	49	59	2	0	98	185	105	84	0.62	0.00
520	Madurai	Alanganallur	10.0500	78.0967	7.41	1287	460	36	90	99	13	0	366	178	52	112	0.94	3.20
521	Madurai	Andarkottaram pz	9.9086	78.1858	7.51	1497	420	92	46	141	5	0	317	299	78	27	0.42	0.79
522	Madurai	Avalsuranpatti pz	9.6414	77.9744	7.74	1097	310	84	24	109	11	0	451	121	43	11	1.01	1.59
523	Madurai	Chekkanoorani pz	9.9414	77.9681	7.64	2340	460	72	68	312	4	0	403	455	88	114	0.60	1.15
524	Madurai	Chellampatti	9.5638	77.5346	7.67	1090	360	32	68	95	4	0	549	71	60	22	2.60	2.94
525	Madurai	Keelakottai pz	9.7867	78.0019	7.68	4200	1040	120	180	384	80	0	573	811	260	276	1.45	4.52
526	Madurai	Kolluveeranpatti	9.7069	77.8856	7.70	2420	820	176	92	177	15	0	488	370	299	51	2.52	1.48

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							<…….mg/L…….>											ppb
527	Madurai	Kolluveeranpatti pz	9.4225	77.5308	7.65	3210	740	104	117	295	162	0	476	427	277	313	3.14	3.18
528	Madurai	Kottampatti pz	10.2219	78.3772	7.73	1488	420	32	83	152	8	0	476	213	121	0	0.52	13.59
529	Madurai	Kulamangalam	10.0050	78.0652	8.04	529	200	34	28	34	4	0	311	32	6	0	0.72	1.20
530	Madurai	M.K.University	9.9408	78.0006	7.48	1250	560	76	90	53	4	0	390	128	118	74	0.86	1.61
531	Madurai	M.Puliyankulam	9.8844	78.1825	7.77	2500	340	40	58	390	2	0	659	412	122	16	0.61	10.85
532	Madurai	Madurai New College House	9.9189	78.1119	7.74	1589	430	36	83	179	6	0	561	156	108	83	1.06	3.22
533	Madurai	Madurai Rly Colony	9.9272	78.1036	7.50	2059	590	92	88	225	6	0	671	263	95	109	0.79	2.94
534	Madurai	Melamadai	9.9347	78.1689	6.99	142	44	11	3.9	6	7	0	54	13	3	3	0.00	0.17
535	Madurai	Melur1	10.0306	78.3333	7.66	1221	390	64	56	92	8	0	329	164	62	58	0.25	0.85
536	Madurai	Meluru new	10.0333	78.3444	7.38	389	146	38	12	18	3	0	178	32	2	3	0.39	0.00
537	Madurai	Nallathevanpatti	9.5611	77.4701	7.61	2350	860	56	175	169	5	0	476	398	181	27	0.68	7.16
538	Madurai	Narayanapuram	9.5726	78.0759	7.40	1917	490	80	70	253	9	0	476	277	136	134	1.32	4.05
539	Madurai	Nilayur pz	9.5119	78.0332	7.31	1765	660	116	90	91	6	0	451	327	66	47	1.06	1.24
540	Madurai	P.Ammapatti pz	9.8458	77.8947	7.64	1022	250	28	44	124	2	0	415	85	77	9	1.53	2.45
541	Madurai	Peraiyur pz	9.7428	77.7922	7.47	900	320	76	32	47	2	0	238	89	62	55	0.26	1.18
542	Madurai	Saptur pz	9.7628	77.7392	7.24	282	96	21	11	18	2	0	110	23	13	0	0.18	0.10
543	Madurai	Sedapatti	9.7500	77.6750	7.33	285	92	19	11	18	2	0	107	24	13	0	0.00	0.12
544	Madurai	Surakulam pz	9.8364	78.0567	7.58	2250	800	124	119	142	7	0	525	327	117	234	2.20	0.57
545	Madurai	T.Kallupatti	9.4320	77.5053	7.72	1926	380	52	61	261	1	0	586	284	155	3	0.56	2.13
546	Madurai	T.Krishnapuram pz	9.8044	77.6692	7.67	2580	580	56	107	247	76	0	598	327	186	24	0.90	6.65
547	Madurai	Thirumangalam new	9.8167	77.9792	7.56	3890	1060	144	170	369	28	0	659	668	379	186	1.36	3.16
548	Madurai	Thirupallai	9.9777	78.1432	7.61	1168	400	48	68	113	8	0	427	156	35	17	0.78	0.75
549	Madurai	Thirupallai	9.9805	78.1453	7.58	4470	1200	32	272	481	11	0	708	1081	54	1	0.78	0.00
550	Madurai	Thirupallai	9.9856	78.1397	7.64	60	8	1.6	1	8	2	0	15	7	1	6	0.39	0.00
551	Madurai	Thirupallai	9.9869	78.1389	7.65	2380	640	76	109	294	14	0	964	284	71	10	1.96	0.30
552	Madurai	Thirupallai	9.9872	78.1445	7.84	1383	440	52	75	146	5	0	549	100	70	33	1.36	1.76
553	Madurai	Thonthilingapuram pz	10.2597	78.3586	7.67	542	190	34	26	40	1	0	226	39	15	37	0.64	0.04
554	Madurai	Thummakaundu pz	9.8739	77.8681	7.45	1516	600	56	112	72	6	0	512	228	10	27	0.19	1.89

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							<…….mg/L…….>											ppb
555	Madurai	Tirumangalam pz	9.9208	77.8833	7.58	4430	1100	64	229	543	15	0	720	754	401	238	1.59	7.89
556	Madurai	Usilampatti new	9.9861	77.8042	7.55	1352	410	68	58	123	21	0	634	135	9	5	0.32	0.91
557	Madurai	Valayankulam	9.8042	78.0917	7.00	3690	1220	408	49	222	5	0	244	910	63	213	0.73	0.27
558	Madurai	Valayankulam pz	9.8042	78.0917	7.12	2850	1060	224	122	100	4	0	305	569	43	359	1.20	0.78
559	Madurai	Varichiyur pz	9.9125	78.2569	7.34	1712	480	84	66	162	6	0	415	299	84	48	0.82	3.06
560	Madurai	Vellalapatti pz	10.0597	78.2708	7.65	1034	230	28	39	103	12	0	427	53	76	9	1.33	131.98
561	Madurai	Vilangudi	9.9606	78.0731	7.34	458	150	30	18	49	3	0	244	27	6	2	0.54	1.44
562	Nagapattinam	Akkarapettai	10.7442	79.8500	7.58	1330	360	40	63	157	31	0	268	234	94	43	1.05	0.25
563	Nagapattinam	Keelvalur	10.7667	79.7333	7.65	1421	240	56	24	170	95	0	372	220	72	70	0.58	0.00
564	Nagapattinam	Mayavaram	11.0944	79.6556	7.69	2380	500	68	80	342	21	0	567	497	103	2	0.52	5.23
565	Nagapattinam	Nagapattinam	10.7825	79.8431	7.74	1564	450	100	49	144	60	0	610	156	114	54	0.92	3.41
566	Nagapattinam	Nagore	10.8011	79.8419	7.70	1292	360	56	54	149	7	0	519	156	53	38	1.13	0.30
567	Nagapattinam	Nallur	11.3300	79.7753	7.54	762	140	36	12	102	10	0	171	114	62	43	0.46	0.20
568	Nagapattinam	Odacherry	10.6833	79.8375	7.62	1332	440	60	71	123	9	0	354	199	71	61	0.44	1.13
569	Nagapattinam	Poompuhar Melaiyur	11.1469	79.8350	7.40	805	190	60	10	86	18	0	195	135	45	37	0.53	0.00
570	Nagapattinam	Thalaignayiru	11.2097	79.6639	7.58	2190	500	40	97	228	11	0	317	454	53	52	0.28	1.29
571	Nagapattinam	Thamaraipulam	10.4781	79.8292	7.70	1235	400	68	56	89	70	0	415	142	47	58	0.62	0.98
572	Nagapattinam	Thethakudi	10.4178	79.8364	7.52	740	280	68	27	74	2	0	250	114	48	1	0.25	0.08
573	Nagapattinam	Thirukadaiyur	10.4781	79.8289	7.12	354	150	32	17	16	8	0	61	43	58	44	0.70	0.03
574	Nagapattinam	Tranquebar	11.0169	79.8514	7.65	1158	300	80	24	136	23	0	293	163	111	63	1.29	0.62
575	Nagapattinam	Valagarai	10.6289	79.7483	7.53	3760	1020	120	175	394	45	0	635	682	279	58	0.23	7.34
576	Nagapattinam	Vedaranyam	10.3500	79.8625	7.56	674	230	60	19	70	13	0	207	107	51	8	0.20	0.05
577	Nagapattinam	Velanganni	10.6833	79.8375	7.55	972	330	48	51	95	21	0	244	142	87	60	0.16	0.29
578	Namakkal	Ainthu Panai	11.3633	77.8089	7.80	834	240	36	36	56	30	0	336	71	58	3	1.94	0.00
579	Namakkal	Annai sathyanagar	11.3508	77.7639	7.80	933	195	44	21	67	11	0	232	92	66	2	1.55	0.00
580	Namakkal	Chittalandur dw	11.3150	77.9242	7.50	2460	730	160	80	141	106	0	360	340	246	45	0.74	6.17
581	Namakkal	Elachipalayam new	11.3847	78.0125	7.70	2630	620	40	126	337	0	0	476	525	230	86	1.74	0.00
582	Namakkal	Ezhur-Olapalayam D	11.3658	78.1192	7.30	5430	1110	104	207	767	8	0	415	1241	600	66	1.68	30.29

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
583	Namakkal	Gurusamipalayam	11.4342	78.1344	7.50	3250	760	48	156	353	5	0	195	858	145	68	1.74	4.89
584	Namakkal	Irumbapalam	11.2042	77.9917	7.70	1182	510	88	70	107	0	0	268	206	150	28	1.62	4.74
585	Namakkal	K.Naickanpatti	11.3333	78.2458	7.10	1233	510	52	92	45	4	0	238	199	70	32	0.95	0.00
586	Namakkal	Kalinayakkanur	11.2742	78.0825	7.70	1260	490	20	107	77	1	0	451	177	90	5	0.62	0.00
587	Namakkal	Kalipatti	11.5167	78.0361	7.40	1251	410	60	63	40	4	0	110	220	75	49	1.41	3.24
588	Namakkal	Kamarajar Nagar	11.4831	78.3750	7.50	1062	410	84	49	11	3	0	122	184	51	48	0.51	1.43
589	Namakkal	Kattipalayam	11.3156	78.0336	7.60	1392	490	32	100	122	4	0	488	170	105	60	1.66	0.00
590	Namakkal	Kokkarayanpettai D	11.3147	77.7947	7.62	2990	610	80	100	216	30	0	439	440	181	60	0.94	27.40
591	Namakkal	Kumbakkottai	11.4717	78.3044	7.30	1920	480	36	95	162	3	0	476	248	100	23	1.83	1.16
592	Namakkal	Metala	11.5167	78.3417	7.40	1555	700	52	139	12	3	0	360	199	65	51	1.16	2.00
593	Namakkal	Minnampalli	11.3165	78.1865	7.30	2850	1260	48	277	46	4	0	427	574	141	48	1.30	4.08
594	Namakkal	Mohanur1	11.5125	78.1417	7.70	2470	580	20	129	293	12	0	586	383	150	54	0.83	9.58
595	Namakkal	Mullakurchi dw	11.4594	78.3969	7.60	2030	730	88	124	67	1	0	415	234	155	62	0.26	3.50
596	Namakkal	Nallur1	11.2667	77.8667	7.50	2690	880	104	151	163	82	0	305	468	290	52	1.01	1.05
597	Namakkal	Namagiripet	11.4625	78.2750	7.00	907	290	52	39	84	3	0	366	113	45	8	1.47	0.24
598	Namakkal	Paramarthi dw	11.1567	78.0214	7.30	3790	630	52	122	562	31	0	634	822	330	64	1.47	4.46
599	Namakkal	Patlur	11.2753	77.8081	7.80	953	310	36	53	77	17	0	262	113	133	6	0.87	0.00
600	Namakkal	Pottiredddipatti	11.1689	78.2744	7.10	3650	1060	160	160	251	5	0	390	681	301	43	1.68	5.25
601	Namakkal	Pudur Siddhampoondi	11.2361	77.9142	7.80	4013	1030	164	151	651	65	0	256	1113	600	86	1.22	24.40
602	Namakkal	Pulavar Palayam	11.1956	78.1086	7.40	1394	570	56	105	21	5	0	226	206	115	62	0.84	0.00
603	Namakkal	Ramapuram	11.4403	78.0092	7.80	4730	830	60	165	955	0	0	1049	837	550	48	1.68	11.41
604	Namakkal	Rasipuram1	11.4583	78.2250	7.50	1945	630	32	134	134	4	0	427	340	80	46	1.32	0.00
605	Namakkal	Sammankadu Elanthankottai	11.4128	77.7736	7.90	1134	320	32	58	168	21	0	488	85	122	14	0.59	12.90
606	Namakkal	Sanarpalayam	11.4192	77.7006	7.50	959	320	40	53	75	31	0	329	99	140	3	0.46	0.00
607	Namakkal	selur valavanthinadu	11.2889	78.3392	7.00	366	170	20	29	3	3	0	37	71	15	59	0.77	0.98
608	Namakkal	Semmadaipalayam	11.1472	77.9344	7.60	1070	360	32	68	109	4	0	378	177	90	4	1.68	0.00
609	Namakkal	Senthamangalam	11.3028	78.2333	7.60	3340	560	48	107	311	3	0	415	610	132	31	1.32	1.90
610	Namakkal	Singalanadu prm	11.4167	78.3000	7.20	2380	890	32	197	173	1	0	561	425	305	8	1.06	1.13

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
611	Namakkal	Solasiramani	11.2500	77.9083	8.00	853	390	44	68	85	0	0	342	135	80	18	1.65	0.75
612	Namakkal	SPN Nagar	11.1411	78.2200	7.50	1124	540	52	100	19	0	0	268	142	125	53	1.70	0.00
613	Namakkal	Tharagadu Mandavathur	11.3886	77.7647	8.10	759	290	24	56	63	18	0	244	71	108	21	1.29	0.00
614	Namakkal	Thiruchengodu	11.3833	77.9083	7.00	1715	380	104	29	177	9	0	329	291	105	67	1.11	4.96
615	Namakkal	Thondichettipatti	11.1867	78.1681	7.30	1215	460	64	73	43	5	0	262	142	110	61	0.62	0.00
616	Namakkal	Thoppur (N)	11.1011	78.1517	7.40	4180	920	216	92	323	49	0	134	1032	224	68	1.77	1.78
617	Namakkal	Udayarpalayam dw	11.5103	78.3486	7.60	1734	730	84	126	28	2	0	451	248	120	22	0.84	3.00
618	Namakkal	Unjanai	11.3531	77.9561	7.50	2730	620	96	92	241	132	0	451	461	250	72	0.63	0.00
619	Namakkal	Uthandipalayam	11.2464	77.8361	7.20	1874	620	128	73	124	4	0	281	326	214	48	1.01	8.02
620	Namakkal	Vaiyappamalai	11.3333	78.0833	7.60	995	370	24	75	73	1	0	317	128	75	17	1.77	0.00
621	Namakkal	Velur	11.1083	78.0033	7.20	3200	860	72	165	242	23	0	177	773	193	8	1.59	5.69
622	Namakkal	Vennandur	11.5125	78.0958	7.60	1416	510	64	85	127	5	0	464	177	80	55	0.84	0.00
623	Nilgiris	Gudalur	11.4997	76.4861	6.85	418	170	44	15	16	12	0	98	71	48	3	0.15	0.00
624	Nilgiris	Kothagiri	11.4333	76.8639	6.76	393	180	32	24	9	3	0	61	50	55	16	0.06	0.00
625	Nilgiris	Mullur	11.3583	76.9083	6.82	289	130	28	15	5	2	0	49	36	57	1	0.34	0.00
626	Nilgiris	Nadugani	11.4708	76.4114	7.10	382	140	28	17	23	5	0	67	43	66	13	0.23	0.00
627	Nilgiris	Pandalur	11.4778	76.3472	6.40	552	230	48	27	12	17	0	128	99	23	29	0.24	0.06
628	Nilgiris	Udhagamandalam	11.3972	76.7000	6.92	529	220	32	34	11	19	0	134	85	8	38	0.20	0.00
629	Nilgiris	Wellington	11.3833	76.8083	6.67	387	200	48	19	3	3	0	98	85	5	18	0.12	0.00
630	Perambalur	Ammapalayam	11.2135	78.7444	7.61	1289	415	42	75	99	10	0	470	92	96	31	0.30	15.74
631	Perambalur	Annukur	11.3293	78.8615	7.72	2100	350	22	72	313	10	0	244	355	278.4	65	1.05	5.99
632	Perambalur	Chettikulam	11.1347	78.7750	7.43	2320	400	66	57	338	13	0	85	248	403.68	372	0.55	44.66
633	Perambalur	Chitali	11.2406	78.9682	7.80	3590	585	26	126	538	24	0	427	305	672	322	3.00	2.50
634	Perambalur	Elaiyur	11.2714	78.8461	8.20	512	195	38	24	18	14	0	122	43	67.2	30	0.50	4.44
635	Perambalur	Essanai	11.0690	79.0222	7.66	1230	325	36	57	127	9	0	183	142	168	93	0.79	38.49
636	Perambalur	Kallampudur	11.2350	78.8025	7.59	2420	590	20	131	276	10	0	427	149	432	223	1.13	44.37
637	Perambalur	Kunnam	11.3477	78.9491	7.87	3830	375	20	79	690	20	0	580	518	504	223	1.21	11.73
638	Perambalur	Kurumbalur	11.1626	78.7203	7.86	1550	460	40	88	145	8	0	317	177	144	161	0.62	19.27

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							<…….mg/L…….>											ppb
639	Perambalur	Mangalamedu	11.2306	78.8922	8.16	1640	90	10	16	329	1	0	439	142	153.6	124	1.26	16.27
640	Perambalur	Nakkaselam	11.3186	78.9171	7.40	2350	460	84	61	322	9	0	110	447	293.76	155	0.54	6.21
641	Perambalur	Padalur	11.0960	78.8252	7.60	6330	1660	28	386	685	10	0	305	1702	480	35	1.29	194.00
642	Perambalur	Palaiyur	11.1636	78.8575	7.52	1165	430	30	86	74	5	0	195	85	254.4	81	0.84	8.54
643	Perambalur	Perambalur	11.1586	78.9364	7.67	888	235	22	44	81	28	0	244	71	96	74	1.51	47.51
644	Perambalur	Perambalur	11.2333	78.8830	7.76	920	100	16	15	150	14	0	244	67	91.2	74	1.49	13.52
645	Perambalur	Ranjankudi(Mangalamedu)	11.3472	78.9412	7.50	1689	100	24	10	345	2	0	622	142	72	112	1.94	20.22
646	Perambalur	Therku Mathevi (Aathukeni)	11.1400	79.2375	7.55	3890	510	74	79	644	24	0	305	851	408	81	0.77	7.51
647	Perambalur	Valikandapuram	11.2325	79.3142	7.74	1315	255	32	43	184	9	0	189	89	240	192	1.07	6.42
648	Perambalur	Veppur(Nallur)	11.3167	79.0636	7.89	4130	450	8	105	736	2	0	995	709	192	61	1.40	13.20
649	Perambalur	Vijayagopalapuram	11.2700	79.0314	7.51	6830	1720	48	389	764	20	0	671	1418	672	186	1.26	168.01
650	Pondicherry	AUROVILLE	11.9971	79.8355	7.54	491	160	40	15	32	13	0	195	35	19.2	19	1.05	0.19
651	Pondicherry	CAPPER QUARRY	11.7220	79.7234	7.24	565	200	56	15	30	12	0	226	39	28.8	12	0.18	0.16
652	Pondicherry	KARUVADUKUPPAM	11.9723	79.8132	7.45	726	260	52	32	41	9	0	275	71	24	12	0.65	0.08
653	Pondicherry	Kattukuppam	11.8075	79.7803	7.66	900	250	80	12	92	5	0	336	71	48	37	0.45	0.38
654	Pondicherry	KUDIKADU	11.6822	79.7519	7.83	1200	260	44	36	152	8	0	232	213	96	12	0.96	0.23
655	Pondicherry	M.N. Kuppam	11.9012	79.8331	7.47	1441	550	96	75	76	5	0	342	156	192	25	0.38	1.46
656	Pondicherry	MANAMEDU	11.8088	79.6871	7.50	648	200	40	24	55	4	0	244	53	28.8	25	0.38	0.08
657	Pondicherry	Manapattu EW	11.7992	79.7747	7.78	1340	400	76	51	120	8	0	354	142	110.4	68	0.90	0.20
658	Pondicherry	Mangalam-I	11.9028	79.7391	7.63	2640	450	64	70	391	13	0	427	532	144	68	0.18	0.95
659	Pondicherry	MANJAKUPPAM	11.7665	79.7678	7.81	303	100	20	12	18	9	0	61	35	19.2	37	0.52	0.04
660	Pondicherry	PILLAICHAVADI	12.0146	79.8502	7.49	620	160	40	15	60	13	0	183	71	48	12	0.38	0.08
661	Pondicherry	Pondicherry	11.9333	79.8349	7.59	1220	180	40	19	194	6	0	409	89	96	62	0.65	1.18
662	Pondicherry	Reddichavadi	11.9368	79.8270	7.61	1195	300	80	24	131	10	0	183	110	240	50	0.59	0.25
663	Pondicherry	Villanur	11.9158	79.7557	7.74	1667	400	84	46	193	10	0	598	85	192	37	0.46	0.23
664	Pondicherry	VILLIANUR	11.7665	79.7678	7.49	788	280	48	39	41	20	0	171	106	96	50	0.51	0.41
665	Pudukkottai	Adanakottai Dw	10.5210	78.9570	3.78	396	100	30	6.3	34	2	0	0	91	4	38	0.20	0.00
666	Pudukkottai	Alavoyal Pz	10.3234	78.5464	7.58	1741	480	60	80	196	5	0	561	263	77	25	1.94	13.32

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							<…….mg/L…….>											ppb
667	Pudukkottai	Aranthangi DW	10.1750	78.9981	7.45	1264	200	52	17	156	60	0	354	199	58	1	0.42	0.73
668	Pudukkottai	Devuipattinam DW	9.4808	78.8976	7.66	5690	880	168	112	788	168	0	769	1124	347	291	0.40	6.77
669	Pudukkottai	Kallal DW	9.9860	78.6669	7.35	1172	290	60	34	90	88	0	390	164	51	31	0.51	2.08
670	Pudukkottai	Kandanur Dw	10.1050	78.8250	7.62	754	215	60	16	61	13	0	250	103	31	20	0.29	0.48
671	Pudukkottai	Kodumbalur BW	10.5425	78.5122	7.35	2470	500	112	54	300	75	0	512	398	180	33	0.64	4.14
672	Pudukkottai	Lekkampatti Pz	10.5597	78.7264	7.27	3540	880	112	146	339	7	0	329	910	54	154	0.72	3.63
673	Pudukkottai	Melur Pz	10.2408	78.7339	7.73	604	230	34	35	33	1	0	299	43	6	2	0.52	0.80
674	Pudukkottai	Oliyamangalam (Vengampatti) Pz	10.4183	78.5290	7.31	1270	460	88	58	101	5	0	390	192	42	34	0.58	8.26
675	Pudukkottai	Padamathur pz	9.8538	78.3710	7.77	593	205	32	30	51	2	0	329	28	8	1	0.96	0.87
676	Pudukkottai	Peraiyur Dw	9.3569	78.4467	7.70	3580	780	72	146	456	3	0	415	740	294	49	0.85	4.87
677	Pudukkottai	Perambur BW	10.6166	78.6450	7.81	858	120	20	17	148	4	0	451	60	24	0	0.40	2.14
678	Pudukkottai	Pokkisarpatti Dw	10.4749	78.8915	7.49	1170	220	40	29	123	46	0	256	149	61	42	0.40	0.30
679	Pudukkottai	Puttampur Pz	10.4646	78.8495	7.47	1735	550	72	90	114	5	0	378	370	32	28	0.79	1.12
680	Pudukkottai	RS Mangalam DW	9.6388	78.8603	6.47	1208	290	88	17	146	8	0	61	306	74	4	0.41	0.48
681	Pudukkottai	Sadayampatti PZ	10.3894	78.5508	7.42	1254	480	68	75	87	7	0	378	213	50	8	0.95	3.37
682	Pudukkottai	Sakkotai Pz	10.0995	78.8625	6.91	407	118	31	9.7	32	1	0	30	87	0	39	0.00	0.00
683	Pudukkottai	Sayalkudi Dw	9.1699	78.4500	7.75	1070	280	40	44	143	12	0	439	114	41	1	0.56	0.62
684	Pudukkottai	Sikkal DW	9.2483	78.6400	7.70	1343	270	72	22	199	10	0	476	185	67	1	0.59	0.69
685	Pudukkottai	Thirumayam DW	10.2427	78.7455	7.32	3020	500	96	63	419	5	0	488	612	192	13	1.02	2.77
686	Pudukkottai	Thirunallur N BW	10.2848	79.0224	7.49	769	230	36	34	55	12	0	244	100	50	0	0.34	0.00
687	Pudukkottai	Tiruvadanai DW	9.7857	78.9149	7.40	1630	50	16	2.4	366	4	0	390	320	25	0	1.23	0.00
688	Pudukkottai	Uchipulli Dw	9.3054	79.0242	7.53	677	140	54	1.2	71	5	0	189	89	31	0	0.07	0.02
689	Pudukkottai	Udaikulam DW	9.4398	78.5570	7.62	850	230	30	38	73	8	0	336	100	21	0	0.56	0.34
690	Pudukkottai	Vathiripatti Pz	10.4839	78.6803	7.64	817	200	26	33	112	1	0	464	36	16	3	1.26	6.23
691	Pudukkottai	Vayyapuri DW	10.3469	78.6172	7.70	1590	430	36	83	193	1	0	561	249	35	8	2.44	1.47
692	Pudukkottai	Vegupatti Pz	10.2755	78.5619	7.27	2510	740	112	112	241	8	0	439	484	114	62	1.00	110.20
693	Pudukkottai	Viralimalai DW	10.6083	78.5499	7.76	3110	460	48	83	529	41	0	854	398	139	161	2.76	3.57
694	Pudukottai	Avudayarkoil	10.0749	79.0424	7.51	2340	340	48	54	410	27	0	525	427	60	40	0.40	28.33

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
695	Pudukottai	Mandangudi Dw	10.4853	78.9283	7.85	4320	480	40	92	684	245	0	720	782	318	64	0.87	44.79
696	Pudukottai	Sundarapatti Pz	10.3588	78.7069	7.31	5270	1180	112	219	688	3	0	586	1316	141	190	1.22	20.43
697	Pudukottai	Thirukkalambur Pz	10.2055	78.4912	7.53	1808	590	24	129	149	8	0	622	313	37	6	2.04	11.01
698	Pudukottai	Vayalogam Pz	10.3972	78.6919	7.71	749	320	36	56	26	1	0	396	39	7	1	0.51	1.16
699	Ramanathapuram	Athikadu Vadakkur Dw	10.1904	78.5293	7.47	757	250	16	51	43	12	0	342	64	20	4	0.40	3.81
700	Ramanathapuram	Bogalur DW	9.4024	78.7078	7.03	15430	3220	392	545	2335	7	0	647	4907	710	3	1.02	25.13
701	Ramanathapuram	Chettinadu DW	10.1516	78.7641	7.30	1820	320	56	44	278	7	0	427	334	49	2	0.44	0.38
702	Ramanathapuram	Erachi Dw	10.2327	78.9685	7.37	857	220	54	21	79	22	0	207	132	51	25	0.78	0.42
703	Ramanathapuram	Ervadi Dw	9.2230	78.7024	7.67	785	230	38	33	56	17	0	262	103	18	0	0.17	0.00
704	Ramanathapuram	Kamudhi Pz	9.4154	78.3777	7.30	488	130	30	13	46	4	0	152	50	15	32	0.61	0.00
705	RAMANATHAPURAM	Kizhakakarai	9.2394	78.7840	7.83	6450	800	200	73	1017	32	0	817	1387	312	164	2.28	3.36
706	Ramanathapuram	Mimisal DW	9.9283	79.1476	6.82	16210	1380	88	282	3402	53	0	183	5121	682	8	0.55	17.49
707	Ramanathapuram	Mukundarayar Chathram Dw	9.2003	79.3804	7.58	1136	290	64	32	132	28	0	329	142	150	0	0.74	0.02
708	Ramanathapuram	Muthupatti Pz	9.8437	78.4985	7.36	2500	720	160	78	165	3	0	305	555	8	34	1.02	0.99
709	Ramanathapuram	Paramakudi DW	9.5417	78.5375	7.66	1133	280	52	36	128	28	0	354	114	82	62	0.90	0.71
710	Ramanathapuram	Parthibanur DW	9.5805	78.4511	7.73	1721	120	24	15	351	3	0	512	242	147	40	1.53	3.70
711	Ramanathapuram	Pudukottai DW	10.3719	78.8155	7.52	1729	380	40	68	216	4	0	427	327	25	3	0.73	2.90
712	Ramanathapuram	Pudukottai Pz	10.3853	78.8077	7.30	718	180	38	21	79	6	0	232	89	46	1	0.49	0.57
713	Ramanathapuram	Pudupatti DW	10.5592	79.0597	6.96	215	70	22	3.9	11	5	0	59	31	6	2	0.16	0.00
714	Ramanathapuram	Solandur DW	9.5631	78.8608	7.14	741	90	18	11	103	48	0	183	121	43	0	0.41	1.34
715	Ramanathapuram	Thirupullani Dw	9.3667	78.7833	7.72	670	100	30	6.1	93	6	0	287	46	37	1	0.59	1.43
716	Ramanathapuram	Vaniyavallam DW	9.5458	78.6918	7.39	670	230	44	29	54	5	0	329	43	19	0	1.09	1.37
717	Ramanathapuram	U Kosamangai Dw	9.3152	78.7343	7.84	6930	640	72	112	1142	194	0	671	1742	336	1	0.90	1.84
718	Salem	Akkaripalayam	11.3406	78.0500	7.24	5760	1060	172	153	672	8	0	323	1463	255	86	0.93	7.62
719	Salem	Athur	11.5917	78.5861	7.62	1334	550	52	102	84	6	0	378	206	135	67	0.80	2.71
720	Salem	Attayampatti Ghss	11.5253	78.0750	7.72	2500	650	96	100	239	19	0	458	398	246	125	1.38	1.72
721	Salem	Attayampatti S.Puram	11.5253	78.0750	7.32	6370	2130	400	275	514	5	0	189	1882	454	59	1.05	15.15
722	Salem	Ayodhyapattinam	11.6697	78.2389	7.87	2950	880	88	161	224	4	0	549	462	276	125	1.24	4.40

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
723	Salem	Dhasanaickanpatty dw	11.6094	78.1453	7.80	1594	340	76	36	166	5	0	354	178	144	99	0.98	2.25
724	Salem	Elampillai dw	11.6089	78.0108	7.83	2830	550	80	85	317	27	0	573	426	249	29	2.15	11.92
725	Salem	Gangavalli	11.4958	78.6500	7.56	2320	670	140	78	138	139	0	525	419	129	81	0.73	1.01
726	Salem	Gudamali dw	11.4603	78.5875	7.60	1970	650	76	112	108	15	0	512	277	80	79	1.32	2.18
727	Salem	Idapadi new	11.5839	77.8500	7.63	2100	810	104	134	131	10	0	708	355	74	44	1.95	3.76
728	Salem	Jalakandapuram	11.7056	77.8722	7.40	1755	550	96	75	110	47	0	525	256	94	31	1.59	18.04
729	Salem	Karumbapatti	11.5822	77.8611	7.54	4930	880	76	168	768	29	0	750	1058	465	12	1.75	39.12
730	Salem	Karuppur	11.7178	78.0769	7.67	1849	780	76	144	88	7	0	567	234	202	31	1.91	1.02
731	Salem	Keeripati	11.5417	78.4917	7.56	1028	490	88	66	32	4	0	305	170	78	29	0.49	1.38
732	Salem	Konganapuram	11.5667	77.9000	7.79	1257	600	80	97	48	22	0	439	149	101	73	1.80	4.49
733	Salem	Kulathur	11.8472	77.7472	7.82	1160	510	100	63	37	6	0	287	135	144	76	0.71	0.00
734	Salem	Kullampatti	11.5833	77.7917	7.70	1260	390	88	41	62	53	0	305	227	8	60	0.53	0.55
735	Salem	Mallur1	11.5375	78.1458	7.18	2190	710	124	97	138	27	0	586	320	72	117	0.99	6.33
736	Salem	Mamudi	11.5325	78.0517	7.74	3110	750	116	112	323	159	0	458	625	143	143	0.37	4.37
737	Salem	Masilapalayam dw	11.8089	77.7889	7.80	916	400	80	49	22	3	0	256	114	58	56	1.32	0.16
738	Salem	Mecheri	12.8111	79.3972	7.47	2380	850	88	153	188	2	0	567	447	51	164	1.04	0.07
739	Salem	Muttur (Karumalikoodal)dw	11.8075	77.8297	7.53	906	400	72	54	48	2	0	305	135	77	15	1.84	3.56
740	Salem	Naikarapatty dw	11.6219	78.1061	7.74	3520	730	96	119	416	23	0	842	667	126	43	1.81	2.60
741	Salem	Nangavalli	11.7583	77.8958	7.91	504	230	44	29	9	5	0	159	71	29	6	0.65	1.11
742	Salem	Omalur	11.7458	78.7458	7.40	3390	670	240	17	393	16	0	653	504	185	270	0.65	0.60
743	Salem	P.Goundanpalyam	11.4667	78.4825	7.72	975	230	44	29	65	78	0	293	142	36	29	0.49	0.26
744	Salem	P.N.Palayam1	11.6472	78.5125	7.46	1762	680	108	100	71	2	0	299	320	100	63	0.50	1.33
745	Salem	Palampatti	11.5694	78.0722	7.35	4450	1130	220	141	452	21	0	482	1122	127	234	1.68	4.80
746	Salem	Panaimadal	11.7185	78.4755	7.62	1760	600	76	100	140	15	0	433	227	236	65	0.84	2.67
747	Salem	Panamarathupatti2	11.5903	78.1931	7.45	2940	800	108	129	277	4	0	482	540	197	127	1.81	0.72
748	Salem	Papparapatty	11.3131	78.0337	7.52	2480	770	208	61	204	3	0	549	376	115	215	0.40	0.59
749	Salem	Ponnammapet dw	11.6642	78.1772	7.30	1006	410	68	58	62	3	0	323	163	20	26	0.96	0.37
750	Salem	Pulaveri	11.6083	78.1083	7.02	7830	1420	240	199	1132	165	0	549	2279	225	174	0.91	1.73

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							<…….mg/L…….>											ppb
751	Salem	Puthur dw	11.6264	78.7833	7.27	3370	1130	264	114	143	4	0	275	611	323	143	1.02	0.00
752	Salem	S.K.Garden Nathimedi	11.6392	78.1250	7.52	1640	620	92	95	68	2	0	409	220	126	55	0.66	0.00
753	Salem	Salem Bankhouse	11.6667	78.1583	7.46	1492	630	120	80	93	3	0	512	185	134	29	0.89	0.00
754	Salem	Salem surviellance	11.6594	78.1664	7.83	3350	750	72	139	467	6	0	769	717	172	9	1.98	0.63
755	Salem	Samudram pz	11.7472	77.9306	7.82	2290	490	52	88	316	26	0	543	270	385	65	1.40	3.37
756	Salem	Sankagiri (V.N.Palayam)	11.4775	77.8753	7.94	1532	330	60	44	98	143	0	488	206	60	3	1.05	0.68
757	Salem	Sendarpatti	11.4375	78.5000	7.42	1268	350	88	32	77	72	0	403	156	72	54	0.66	0.27
758	Salem	Sevantampatti	11.5583	78.0917	7.38	8870	1330	64	285	1524	15	0	122	2471	655	34	1.78	6.46
759	Salem	Shasan chavadi	11.3919	78.2018	7.46	2570	870	152	119	134	1	0	305	582	162	36	0.71	4.30
760	Salem	Sivadapuram dw	11.6472	78.1092	7.75	3960	1070	56	226	371	15	0	1025	689	207	3	1.16	0.51
761	Salem	Thalaivasal1	11.5833	78.7583	7.87	1432	410	52	68	105	3	0	336	249	68	12	0.54	12.07
762	Salem	Thandavarayapuram dw	11.5903	78.5558	7.24	2840	870	172	107	172	1	0	262	639	154	108	0.45	7.10
763	Salem	Tivettipatti	11.8667	78.0875	8.05	3270	620	56	117	504	4	0	696	476	180	172	1.44	1.08
764	Salem	Vedukathampatty dw	11.6528	78.0819	7.58	2370	750	40	158	243	5	0	549	433	151	101	1.63	2.71
765	Salem	Veerapandi dw	11.5736	78.0728	7.85	5400	1030	76	204	849	15	0	714	1314	218	84	1.41	3.70
766	Salem	Veppampoondi	11.5344	78.7558	7.89	846	360	40	63	13	1	0	201	135	43	13	0.18	0.39
767	Salem	Veraganur dw	11.4753	78.7361	7.96	2590	460	36	90	238	168	0	427	440	182	116	0.75	0.00
768	Salem	Yercaud	11.7833	78.2111	7.82	346	150	28	19	17	4	0	61	64	27	23	0.17	0.00
769	Sivaganag	Devakottai Dw	9.9609	78.6669	6.88	402	94	28	5.8	40	4	0	67	60	17	35	0.22	0.00
770	Sivaganga	Alangudi Dw	10.3639	78.9817	8.13	886	155	46	9.7	108	20	0	128	178	48	23	0.31	0.36
771	Sivaganga	Gandharvakottai Dw	10.5724	79.0152	7.36	1287	340	88	29	122	8	0	244	270	50	43	0.34	0.53
772	Sivaganga	Kattumavadi DW	10.1373	79.2226	7.40	1833	340	64	44	262	15	0	342	434	61	0	0.36	0.62
773	Sivaganga	Keeranur DW	10.5715	78.7844	7.87	2490	320	48	49	322	128	0	573	398	140	13	1.34	2.68
774	Sivaganga	Manamalkudi DW	10.0393	79.2309	7.58	1870	420	84	51	192	36	0	500	270	140	4	0.38	2.63
775	Sivaganga	Nadumanaikadu Dw	9.2780	79.0844	7.87	1616	510	24	109	160	4	0	610	228	56	0	2.62	3.34
776	Sivaganga	Paniyapatti PZ	10.3126	78.6778	7.24	1724	520	72	83	119	4	0	317	306	62	114	1.17	84.04
777	Sivaganga	Rameswaram DW	9.2884	79.3204	7.96	4690	720	72	131	543	249	0	878	853	398	49	0.52	19.96
778	Sivaganga	Sampathi Vidhiti Dw	10.4332	78.9778	7.43	622	210	40	27	42	6	0	183	96	18	1	0.34	0.22

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							<…….mg/L…….>											ppb
779	Sivaganga	Sivagangai DW	9.8527	78.4985	7.46	1171	260	56	29	172	7	0	403	171	101	0	1.62	1.64
780	Sivaganga	Thirupattur Bw	10.1090	78.5919	7.81	2440	220	24	39	426	2	0	732	398	54	12	0.82	14.93
781	Sivaganga	Thondi DW	9.7365	79.0174	6.75	790	95	26	7.3	130	24	0	207	100	49	9	0.76	2.32
782	Sivaganga	Tiruvengamputhur DW	9.8304	78.7858	7.45	5700	1020	128	170	791	121	0	622	1266	356	192	0.45	63.86
783	Sivaganga	Annanagar DW	9.1179	78.6418	7.24	1541	500	92	66	125	7	0	244	299	186	6	0.59	2.66
784	Sivaganga	Kalayarkoil DW	9.8467	78.6344	7.01	3080	780	192	73	323	7	0	220	796	86	5	0.48	3.86
785	Sivaganga	Manamadurai DW	9.6946	78.4514	7.76	1165	300	32	54	144	6	0	415	164	38	1	0.92	2.00
786	Sivaganga	Manamadurai Pz	9.7010	78.4597	7.00	3520	1320	368	97	113	5	0	244	1010	29	36	0.44	3.04
787	Thanjavur	Icchankottai1	10.6500	79.1778	7.32	229	90	32	2	18	1	0	49	36	50	2	0.10	0.00
788	Thanjavur	Kumbakonam1	10.9750	79.3917	7.62	1653	370	52	58	155	79	0	439	320	54	2	0.29	1.79
789	Thanjavur	Lower Anaicut	11.1250	79.4542	7.40	1712	540	68	90	153	3	0	531	312	63	2	0.41	3.87
790	Thanjavur	Madigai	10.7150	78.2055	7.54	455	230	36	34	22	2	0	122	85	73	1	0.44	0.22
791	Thanjavur	Narsinganpettai	11.0167	79.5056	7.68	1247	500	72	78	70	1	0	366	227	60	2	0.49	0.00
792	Thanjavur	Papanasam	10.9250	79.2750	7.48	561	270	28	49	31	2	0	159	121	42	8	0.39	0.00
793	Thanjavur	Pattukottai1	10.4250	79.3000	7.44	1587	500	88	68	100	36	0	390	298	62	6	0.53	2.15
794	Thanjavur	Puduchataram	10.8542	78.9517	7.68	856	350	48	56	56	2	0	238	170	54	14	0.31	1.15
795	Thanjavur	Pulavamatham	10.8542	79.2103	7.54	1026	490	80	71	34	2	0	305	185	52	51	0.35	1.42
796	Thanjavur	T Budalur	10.7667	78.9972	7.34	1986	850	152	114	62	3	0	268	547	57	18	0.33	9.45
797	Thanjavur	Thanjavur	10.7750	79.1083	7.65	1352	390	76	49	88	71	0	384	227	54	3	0.52	1.97
798	Thanjavur	Thirukarukuvur	10.8667	79.2833	7.69	1980	480	80	68	264	1	0	586	355	71	30	0.87	4.81
799	Thanjavur	Thiruvilapatti	10.7339	78.8711	7.56	1595	460	72	68	199	2	0	299	412	69	5	0.71	2.21
800	Thanjavur	Vaduvakudi	10.8781	79.0356	7.60	1527	600	72	102	82	34	0	549	256	65	8	0.72	1.41
801	Thanjavur	Vallam	10.7183	79.0625	7.23	992	340	68	41	86	19	0	232	220	81	9	0.26	0.00
802	Theni	A.Vadipatti pz	10.0958	77.6881	7.89	1006	280	36	46	119	2	0	390	121	78	2	0.47	0.26
803	Theni	Appipatti alagapuri	9.8100	77.4100	7.06	582	215	44	26	28	5	0	207	57	20	28	0.83	0.28
804	Theni	Balakombai pz	9.9036	77.6233	7.70	950	405	46	70	55	0	0	433	32	54	62	2.64	1.96
805	Theni	Bodinaickanur dw	10.0989	77.5717	7.67	1886	430	48	75	301	11	0	671	178	100	119	2.36	2.41
806	Theni	Cumbum	9.7417	77.2847	7.70	1700	130	12	24	346	43	0	854	78	50	1	7.60	8.90

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							<…….mg/L…….>											ppb
807	Theni	Devadanapatti	10.1528	77.6583	7.26	1790	550	76	88	135	104	0	878	149	32	11	0.83	3.74
808	Theni	Dumbacheri pz	9.9586	77.3911	7.35	476	168	39	17	33	4	0	220	33	16	6	1.40	0.53
809	Theni	Erasakkanaayakanur	9.9250	77.5417	6.61	400	132	30	14	22	4	0	51	68	15	52	0.00	0.28
810	Theni	Gandamanur	9.9183	77.5217	7.49	2440	740	136	97	247	31	0	561	341	125	213	1.34	0.93
811	Theni	Gandamanur pz	9.5509	77.3057	7.60	1650	610	132	68	92	6	0	317	284	43	174	0.96	2.49
812	Theni	Ganguvarpatti pz	10.1669	77.6944	7.29	700	300	32	54	24	0	0	366	28	18	1	0.58	0.79
813	Theni	Kadamalaikundu pz	9.8072	77.5031	7.62	1237	480	72	73	103	16	0	488	107	65	68	0.74	7.00
814	Theni	Kamayagoundanpatti pz	9.7367	77.3169	7.57	1694	510	20	112	158	10	0	549	185	66	166	0.81	3.75
815	Theni	Kodangipatti	9.9917	77.4361	7.60	1400	260	56	29	131	172	0	512	107	60	94	0.60	0.33
816	Theni	Kodangipatti pz	9.9917	77.4306	7.69	2053	460	40	88	327	6	0	622	213	225	61	2.08	10.26
817	Theni	Koduvilarpatti pz	9.9719	77.4919	7.49	3790	1180	272	122	208	122	0	549	697	148	266	0.83	0.47
818	Theni	Kottur Pz	9.9061	77.4058	7.39	1545	520	32	107	97	19	0	464	228	50	21	0.70	1.82
819	Theni	M.Subbalapuram pz	9.9717	77.5564	7.46	1869	530	56	95	219	13	0	427	277	98	212	1.34	0.90
820	Theni	Myladumparai dw	10.0989	77.5717	7.57	1548	470	64	75	156	0	0	561	121	100	31	0.54	2.65
821	Theni	Okkaraipatti pz	9.9625	77.5694	7.36	1769	820	100	139	62	8	0	427	277	54	195	0.57	0.96
822	Theni	Periyakulam	10.1208	77.5500	7.41	3890	1080	200	141	457	2	0	939	740	192	105	1.23	10.19
823	Theni	Ramakrishnapuram pz	9.9392	77.3017	7.61	590	270	38	43	24	0	0	360	11	5	7	1.60	0.00
824	Theni	Rathinanagar(Theni2)	10.0278	77.4750	7.43	974	275	54	34	103	7	0	336	121	39	5	0.68	2.58
825	Theni	Sankarapuram pz	9.9069	77.3297	7.43	4040	1300	120	243	347	10	0	378	896	315	144	0.90	0.34
826	Theni	Seelampatti PZ	9.8742	77.3928	7.39	1713	560	36	114	116	22	0	488	220	110	122	0.47	1.69
827	Theni	Silverpatti	10.0713	77.3732	7.38	584	280	30	50	20	2	0	336	21	9	0	0.98	1.02
828	Theni	Silverpatti	10.0985	77.6125	7.40	1728	470	44	88	196	5	0	671	171	65	6	1.42	0.49
829	Theni	Silverpatti	10.1123	77.6204	7.44	677	230	30	38	66	0	0	378	28	18	0	1.53	0.76
830	Theni	Silverpatti	10.1333	77.6309	7.31	915	325	36	57	67	8	0	384	64	53	24	1.07	0.55
831	Theni	Silverpatti	10.1384	77.6377	7.21	639	320	32	58	15	0	0	366	21	18	1	1.08	0.61
832	Theni	T.Subbalapuram pz	10.0064	77.6547	7.39	796	365	76	43	26	2	0	274	96	70	15	0.55	0.07
833	Theni	ThamminaickPatti pz	9.9164	77.2997	7.53	978	345	28	67	60	2	0	390	68	20	77	0.48	0.03
834	Theni	Theni1	10.0042	77.2847	7.14	302	100	22	11	21	1	0	105	27	10	0	0.50	1.01

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
835	Theni	Thevaram	9.8847	77.2847	7.35	714	220	26	38	57	4	0	366	28	21	24	0.75	0.00
836	Theni	Thevaram pz	9.5348	77.1637	7.39	1002	360	36	66	61	3	0	317	100	12	112	0.43	0.00
837	Theni	Uttamapalayam	9.8083	77.3333	6.57	160	46	15	1.9	10	3	0	68	10	4	0	0.13	0.36
838	Theni	Vadugapatti dw	10.0989	77.5717	7.40	941	260	26	47	114	2	0	470	53	22	2	1.30	3.89
839	Theni	Varusandu pz	9.7358	77.5203	7.84	1263	460	44	85	99	4	0	464	121	125	0	0.93	2.10
840	Theni	Veerapandi pz	9.9606	77.4467	7.14	427	146	31	16	22	5	0	195	24	10	2	0.82	0.31
841	Thiruvannamalai	AKKUR	12.6844	79.6292	7.06	1276	150	44	10	221	4	0	427	156	51.3	8	0.62	0.72
842	Thiruvannamalai	Anandavadi	12.2583	78.6625	7.60	1260	400	92	41	135	2	0	561	121	18	2	1.38	1.30
843	Thiruvannamalai	Andampallam (Isukalikatteri) OW	12.0989	79.1694	7.58	1998	670	16	153	128	7	0	427	398	37	20	0.54	10.54
844	Thiruvannamalai	Arani	12.3500	79.3500	7.57	1660	450	112	41	143	18	0	476	220	56	91	0.36	3.89
845	Thiruvannamalai	Bagmarpet	12.5167	79.1333	7.63	870	290	96	12	56	1	0	390	50	12	48	0.96	1.57
846	Thiruvannamalai	Chengam2	12.2917	78.7917	7.82	3900	1050	144	168	283	59	0	634	831	165	16	0.12	4.82
847	Thiruvannamalai	Chetpet1	12.4611	79.3583	7.23	2990	710	120	100	310	6	0	549	582	208	54	0.84	3.14
848	Thiruvannamalai	Cheyyar2	12.6583	79.5333	6.62	1485	320	88	24	129	66	0	390	213	48	44	1.31	1.22
849	Thiruvannamalai	Eendal	12.4361	79.4181	7.86	700	250	52	29	79	4	0	403	57	28	3	0.54	0.10
850	Thiruvannamalai	Kalavai(Vellore dist)	12.4886	79.4125	7.41	2510	370	136	7	295	2	0	342	412	126	92	0.72	2.90
851	Thiruvannamalai	Kappalur (T)	10.1417	78.6083	7.34	1940	640	88	102	92	4	0	464	263	47	137	0.30	2.60
852	Thiruvannamalai	Kattampundi OW	12.1267	79.0853	7.65	2810	670	172	58	272	5	0	305	497	206	73	1.20	4.56
853	Thiruvannamalai	Kilpalur	12.5808	78.9436	7.22	822	300	76	27	58	9	0	295	107	48	1	0.10	0.51
854	Thiruvannamalai	Kuppam	12.7236	79.1256	7.55	723	210	48	22	106	4	0	256	99	67	0	0.36	0.94
855	Thiruvannamalai	Ladavaram	12.4250	79.1467	7.42	1224	320	112	10	123	4	0	354	170	28	41	0.18	0.32
856	Thiruvannamalai	Mamandur	12.8572	79.6756	7.26	1172	300	96	15	121	5	0	342	156	38.85	31	0.67	0.80
857	Thiruvannamalai	Mecheri (Vellore)	12.8111	79.3972	7.55	1804	470	88	61	187	10	0	488	298	92	24	0.30	4.36
858	Thiruvannamalai	Melmakotturoad	12.2097	79.6275	7.48	1440	180	64	5	220	12	0	427	121	144	9	0.48	1.57
859	Thiruvannamalai	Melravandavadi	12.2083	78.7083	7.46	1398	490	100	58	108	5	0	549	149	36	82	0.66	0.87
860	Thiruvannamalai	Modaiyur	12.5022	79.2256	7.53	990	350	56	51	93	4	0	403	121	75	5	0.90	0.38
861	Thiruvannamalai	Mullandram	12.7667	79.2667	7.63	1263	330	116	10	100	3	0	451	121	23	13	0.24	1.05
862	Thiruvannamalai	Nedumpirai OW	12.7078	79.5611	7.31	2300	680	168	63	185	3	0	342	412	198	64	1.02	0.05

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
863	Thiruvannamalai	Netchatramalai	12.4439	79.0567	7.74	1400	440	56	73	78	4	0	439	135	78	19	0.84	0.07
864	Thiruvannamalai	Pachal	12.2667	78.9417	7.50	1150	310	76	29	130	10	0	378	114	152	20	0.06	2.43
865	Thiruvannamalai	Padagam	12.4194	79.2039	7.60	1672	390	100	34	208	4	0	537	199	62	56	1.44	0.05
866	Thiruvannamalai	Padaveedu	12.6586	79.1150	7.59	946	260	64	24	87	3	0	403	78	23	29	0.48	0.27
867	Thiruvannamalai	Pennagar (Vellore Dist)	12.8250	79.3917	7.65	1710	480	108	51	145	2	0	537	241	56	9	1.26	2.08
868	Thiruvannamalai	Polur	12.5167	79.5167	7.53	1235	320	88	24	96	4	0	451	107	27	14	0.48	2.14
869	Thiruvannamalai	Pudupalayam	12.3611	78.8792	7.67	2140	690	108	102	117	2	0	671	206	96	109	0.24	1.09
870	Thiruvannamalai	PURISAI	12.2922	79.5800	7.44	859	250	40	36	90	8	0	324	149	22	0	0.31	0.14
871	Thiruvannamalai	Sathanur	12.2097	79.8878	7.38	1875	500	112	54	170	4	0	415	312	96	77	0.18	1.82
872	Thiruvannamalai	Siruvallur	12.4858	78.9881	7.66	846	350	112	17	42	4	0	366	71	24	8	1.44	0.94
873	Thiruvannamalai	Thandarampattu	12.1542	78.9458	7.41	1350	360	76	41	143	3	0	305	185	78	35	0.12	3.56
874	Thiruvannamalai	Thanipadi	12.1083	78.8375	7.40	2300	390	148	5	310	4	0	598	327	92	43	0.06	1.54
875	Thiruvannamalai	Timiri (Vellore dt)	12.4439	78.1419	7.33	2520	480	112	49	182	3	0	342	396	55	36	0.08	3.70
876	Thiruvannamalai	Tiruvannamalai	12.6583	79.0725	7.55	1560	230	80	7	180	113	0	476	185	158	6	0.24	1.19
877	Thiruvannamalai	Vandavasi1	12.5022	79.6056	7.28	2320	600	152	54	219	5	0	305	490	147	27	0.28	5.86
878	Thiruvannamalai	Venmani	12.5094	79.1469	7.66	2120	550	16	124	215	41	0	512	362	120	11	1.20	0.91
879	Thiruvannamalai	Vilaripattu	12.6708	79.5318	7.29	1788	470	60	78	183	7	0	512	320	35	1	0.56	1.14
880	Tirunelveli	Abishekapatti	8.7625	77.6403	7.30	2020	690	104	105	119	57	0	299	425	53	31	0.78	1.42
881	Tirunelveli	Alangulam1	8.8625	77.5056	7.40	1296	510	108	58	78	27	0	415	213	46	3	0.48	1.30
882	Tirunelveli	Alankulam	8.9000	77.4750	7.30	348	155	44	11	9	13	0	73	50	43	2	0.29	0.00
883	Tirunelveli	Alwarkurichi	8.7917	77.4333	7.50	2070	415	56	67	179	154	0	671	248	140	3	0.30	0.39
884	Tirunelveli	Ambalam	8.5224	77.7254	7.20	710	200	52	17	47	6	0	226	64	51	3	0.53	0.48
885	Tirunelveli	Ambasamudram	8.7194	77.4361	7.20	625	110	40	22	13	15	0	110	50	82	3	0.40	0.00
886	Tirunelveli	Ambasamudram1	8.7000	77.4389	7.20	914	150	52	5	53	42	0	232	64	59	11	0.10	0.44
887	Tirunelveli	Charanmadevi	8.8278	77.5750	7.70	1224	600	92	90	37	13	0	366	128	110	55	0.99	8.70
888	Tirunelveli	Chettikulam	8.1667	77.6167	7.00	4790	930	164	126	547	1	0	415	808	740	54	1.63	6.00
889	Tirunelveli	Chintamani	9.1667	77.4000	7.20	2690	800	48	165	180	21	0	708	340	46	4	0.67	3.66
890	Tirunelveli	Govt.Eng College	8.6856	77.7269	7.10	804	330	72	36	32	0	0	244	113	61	18	0.25	1.58

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
891	Tirunelveli	Idaikkal	8.5333	77.4653	7.10	1016	240	48	29	67	19	0	214	142	62	12	0.12	0.31
892	Tirunelveli	Iyan Singampatty OW	8.6709	77.4458	7.10	411	80	24	5	18	5	0	73	28	18	1	0.28	0.00
893	Tirunelveli	Kadayam	8.8333	77.4083	7.30	661	240	52	27	12	18	0	128	57	99	31	0.20	0.00
894	Tirunelveli	Kadayanallur	9.0667	77.3458	7.20	3060	530	144	41	255	47	0	268	624	102	55	0.45	3.82
895	Tirunelveli	Kadayanallur1	9.0833	77.3500	7.30	3120	550	204	10	288	47	0	390	631	103	54	1.44	3.59
896	Tirunelveli	Kalakadu	8.4806	77.5986	7.60	1006	430	88	51	47	25	0	207	149	105	63	0.75	4.24
897	Tirunelveli	Kalakkadu	8.5125	77.5417	7.40	874	490	92	63	38	16	0	305	128	101	16	0.45	5.53
898	Tirunelveli	Kilpaur	8.9167	77.3833	7.10	1680	820	136	117	57	14	0	360	333	72	54	0.65	1.77
899	Tirunelveli	KUTTAM	8.3211	77.9366	7.39	5790	1420	88	292	621	37	0	293	1617	221	25	0.25	6.68
900	Tirunelveli	Manur1	8.8625	77.6528	7.30	265	210	24	36	6	4	0	195	35	25	4	0.16	0.10
901	Tirunelveli	Marudakulam	8.5833	77.7153	7.20	362	130	36	10	12	1	0	104	21	33	9	0.29	0.00
902	Tirunelveli	Mayaneri OW	8.5713	77.7350	7.30	630	260	52	32	22	0	0	256	28	28	3	0.74	1.33
903	Tirunelveli	Merjara Pallivasal	8.7403	77.6656	7.40	690	340	48	53	20	32	0	85	184	52	5	0.52	1.89
904	Tirunelveli	Molaikkaraipatti	8.3167	77.5792	7.30	1137	280	64	29	72	2	0	171	163	78	11	0.31	1.50
905	Tirunelveli	Mukkudal	8.7347	77.5208	7.20	461	140	36	12	17	16	0	104	71	25	3	0.50	0.18
906	Tirunelveli	Mullikulam	9.4986	77.7000	7.16	2280	470	72	70	200	53	0	525	291	34	57	0.99	2.07
907	Tirunelveli	Munanchipatti	8.5258	77.7909	7.20	1167	300	100	12	78	0	0	171	142	157	4	0.90	5.09
908	Tirunelveli	Muthumottamozhi OW	8.3086	77.8603	7.50	348	130	32	12	12	1	0	110	35	8	12	0.42	0.10
909	Tirunelveli	N. Vijayanarayanam	8.5333	77.7917	7.10	6450	1180	336	83	490	620	0	561	1212	515	56	0.21	18.22
910	Tirunelveli	Naduvapatty	9.2417	77.8014	7.20	694	310	56	41	20	5	0	195	64	64	30	1.72	0.48
911	Tirunelveli	Nanguneri1	8.4917	77.7042	7.50	1239	70	18	6	194	0	0	128	248	11	23	0.47	0.18
912	Tirunelveli	Nanguneri2	8.3167	77.5792	7.20	1076	270	56	32	107	0	0	378	106	78	6	0.86	1.34
913	Tirunelveli	NAVALADI	8.2583	77.8246	7.30	1988	620	80	102	225	16	0	366	454	83	26	0.76	3.38
914	Tirunelveli	Nelliappar temple	8.7281	77.6883	7.40	1399	230	44	29	114	91	0	177	184	77	77	0.66	0.72
915	Tirunelveli	Ngo A Colony dw	8.6911	77.7383	7.20	1440	400	76	51	113	0	0	354	206	102	22	0.52	1.56
916	Tirunelveli	P.chatram	9.1183	77.6125	7.00	3270	1080	248	112	124	0	0	464	553	161	74	0.41	11.65
917	Tirunelveli	Palayamkottai	8.7333	77.7333	7.10	2760	720	104	112	313	39	0	561	525	128	71	0.65	2.63
918	Tirunelveli	Panpoli	9.0167	77.2528	7.60	1430	340	52	51	114	56	0	403	128	68	46	0.48	1.40

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							<…….mg/L…….>											ppb
919	Tirunelveli	Papanasam1	8.7111	77.3681	7.10	696	110	32	7	28	28	0	110	57	54	2	0.13	0.00
920	Tirunelveli	Poothatan Kudieruppu dw	8.5783	77.5603	7.50	3260	990	112	173	247	64	0	476	596	243	64	0.98	8.70
921	Tirunelveli	R.Pattinam	8.9256	77.3542	7.00	1562	640	92	100	64	27	0	329	284	46	40	1.33	2.04
922	Tirunelveli	Radhapuram1	8.2667	77.6847	7.10	430	225	44	28	17	5	0	159	71	19	5	0.23	0.43
923	Tirunelveli	Rajapathi OW	8.8517	77.7696	7.40	3850	830	128	124	220	2	0	177	695	236	30	1.67	2.61
924	Tirunelveli	Ramakrishnapuram OW	8.4849	77.7964	7.40	1890	460	120	39	166	0	0	220	397	74	5	0.84	3.87
925	Tirunelveli	Sankarankoil1	9.2083	77.5583	7.00	2300	780	36	168	63	3	0	366	333	9	62	0.67	3.62
926	Tirunelveli	Sankarankoil2	9.2083	77.5583	7.10	1152	360	84	36	35	3	0	293	128	15	29	0.59	0.26
927	Tirunelveli	Seetharappanallur	8.7939	77.6018	7.20	4560	1080	168	160	483	28	0	488	1014	96	70	0.73	13.63
928	Tirunelveli	Sencottai	8.9722	77.2528	7.40	993	240	44	32	62	17	0	232	128	8	2	0.21	0.81
929	Tirunelveli	Sivagiri	9.3403	77.4278	7.10	2120	410	44	73	108	154	0	586	177	45	19	1.26	0.65
930	Tirunelveli	Sivagiri OW	9.3400	77.4383	7.30	1521	590	104	80	76	1	0	573	156	75	58	0.64	1.71
931	Tirunelveli	Sivalarkulam OW	8.8693	77.5294	7.40	915	310	40	51	88	13	0	439	78	24	1	1.78	0.25
932	Tirunelveli	Syed Beedi Company	8.7322	77.7131	7.40	623	330	64	41	17	17	0	329	43	48	7	0.61	0.30
933	Tirunelveli	Tachchnallur	8.7458	77.7000	7.00	1676	610	112	80	68	0	0	378	291	61	32	1.54	1.87
934	Tirunelveli	Taruvai	8.6667	77.6806	7.30	1818	870	140	126	66	13	0	281	390	157	68	0.91	3.83
935	Tirunelveli	Tenkasi OW	8.9633	77.3115	7.30	3120	760	148	95	148	35	0	476	447	100	61	0.50	3.87
936	Tirunelveli	TenkasiPZ	9.0317	77.2717	7.30	639	335	68	40	18	12	0	244	57	47	39	0.80	0.00
937	Tirunelveli	Therkuvalliyur OW	8.3331	77.6240	7.40	3090	750	116	112	228	218	0	366	603	223	76	1.28	4.48
938	Tirunelveli	Thiraviyarnagar	8.8769	77.3458	7.30	718	230	48	27	23	15	0	171	50	77	32	0.69	0.41
939	Tirunelveli	Tirunelveli1	8.7056	77.7222	7.20	1072	240	48	29	72	30	0	183	170	67	12	1.56	0.76
940	Tirunelveli	Tiruvembalapuram	8.2542	77.7583	7.28	2660	780	168	87	233	11	0	415	539	120	58	0.70	5.35
941	Tirunelveli	Udayattur A/B OW	8.2325	77.7206	7.27	3510	1170	300	102	281	18	0	354	893	122	20	1.35	5.91
942	Tirunelveli	Uvari	8.2867	77.8939	7.50	832	300	72	29	42	45	0	317	92	48	14	0.21	0.54
943	Tirunelveli	Valliyoor	8.3556	77.6583	7.50	1183	480	96	58	83	35	0	317	142	128	65	0.82	2.95
944	Tirunelveli	Valliyur	8.3861	77.6167	7.70	2620	660	164	61	250	27	0	634	404	194	61	0.94	5.80
945	Tirunelveli	Vannikonendal	8.6611	77.6250	7.20	2810	640	148	66	207	1	0	427	383	252	56	0.56	8.02
946	Tirunelveli	Vasudevanallur2	9.2417	77.4083	7.20	945	310	56	41	23	3	0	232	50	46	33	1.43	0.85

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							<…….mg/L…….>											ppb
947	Tirunelveli	Virasikhamani OW	9.0919	77.4447	6.90	786	310	56	41	24	19	0	171	135	21	56	0.40	0.12
948	Tiruppur	Arugampalayam	11.1247	77.4644	7.19	10580	1180	240	141	1896	20	0	519	2513	1115	34	1.09	3.04
949	Tiruppur	Avinashi1	11.1847	77.2750	7.48	458	200	40	24	27	10	0	134	71	66	8	0.12	0.12
950	Tiruppur	Kaniyur	10.6083	77.3833	7.20	1529	490	96	61	121	30	0	317	213	173	16	0.54	1.20
951	Tiruppur	Karamadai	11.2458	77.2125	7.36	1650	500	120	49	141	35	0	567	220	89	9	1.60	2.17
952	Tiruppur	Karattoluvu	10.6236	77.3750	7.29	1946	480	104	54	211	65	0	506	241	192	2	0.77	2.46
953	Tiruppur	KaravallurPZ	11.2894	77.1692	7.42	3620	910	108	156	333	18	0	549	632	290	69	1.58	14.12
954	Tiruppur	Kasipalayam (T)	11.1156	77.3858	7.22	4350	1240	168	199	305	97	0	531	994	56	78	0.90	6.14
955	Tiruppur	Kettanur	10.9153	77.2611	7.47	2450	650	112	90	202	105	0	732	341	160	1	1.14	3.36
956	Tiruppur	Kumaralingam	10.4917	77.3500	6.88	283	120	28	12	6	3	0	79	36	23	1	0.40	0.24
957	Tiruppur	Nachipalayam	11.0833	77.4458	7.50	2880	710	104	109	287	13	0	512	433	242	197	1.06	4.38
958	Tiruppur	Odakadu	11.1117	77.3342	7.44	1634	500	116	51	137	9	0	476	114	147	165	0.09	87.61
959	Tiruppur	Palavanchipalayam pz	11.0689	77.3519	7.05	2290	690	140	83	166	5	0	476	426	143	4	1.44	8.28
960	Tiruppur	Palladam	10.9958	77.2778	7.42	1737	690	128	90	88	16	0	378	277	155	1	0.62	3.44
961	Tiruppur	Periyapatti	10.7583	77.2708	7.21	1513	680	176	58	33	5	0	354	249	86	5	0.43	4.41
962	Tiruppur	Pongalur1	11.2958	77.1319	7.68	1542	460	88	58	128	23	0	323	220	204	3	0.80	16.40
963	Tiruppur	Rengagoundanpalayam pz	11.0697	77.3844	7.26	1880	520	88	73	156	22	0	317	270	148	165	0.30	3.17
964	Tiruppur	Tiruppur Agraharam	11.1253	77.4133	7.34	4840	980	208	112	501	31	0	799	895	49	9	0.13	7.46
965	Tiruppur	Tiruppur1	11.1014	77.3542	7.45	1710	500	84	71	220	7	0	451	256	248	45	1.21	2.61
966	Tiruppur	Udumalpet1	10.5833	77.2472	7.50	828	240	48	29	65	32	0	244	114	75	4	0.45	0.01
967	Tiruppur	Weekly Market	11.0881	77.3431	7.39	1850	420	56	68	244	54	0	537	263	210	79	1.56	2.04
968	Tiruvallur	KODUR	13.3196	80.1709	7.52	1085	340	68	41	84	17	0	305	135	30.35	6	0.52	1.76
969	Tiruvallur	NALLUR	13.2198	80.1605	7.55	862	260	36	41	49	18	0	98	156	35	17	0.24	0.18
970	Tiruvallur	Agoor	13.1897	12.9197	7.53	950	340	80	85	85	16	0	268	355	12	10	1.69	0.91
971	Tiruvallur	Alamadhi	13.2042	80.1169	7.44	1074	200	64	10	88	14	0	403	64	12	2	0.65	6.09
972	Tiruvallur	Ambattur	13.1186	80.1547	7.50	905	330	48	46	46	16	0	125	184	28	22	0.76	0.25
973	Tiruvallur	Andersonpet	13.0625	79.8625	7.62	1265	260	76	17	183	18	0	610	121	9	2	0.72	0.60
974	Tiruvallur	Arani	13.3345	80.0846	7.62	1330	360	72	44	127	3	0	427	128	92	2	0.54	10.81

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
975	Tiruvallur	Attipattu	13.2625	80.2903	7.40	2790	390	84	97	282	31	0	214	540	360	2	1.11	5.78
976	Tiruvallur	Avadi OW	13.1306	80.1081	7.47	670	400	84	12	27	16	0	122	99	90	1	0.81	2.10
977	Tiruvallur	Balapuram (Veeramangalam)	13.1531	79.3825	7.41	620	160	44	44	53	17	0	183	148	42	15	1.38	0.02
978	Tiruvallur	Chozambedu (Tirumullaivayal)	13.1203	80.1364	7.44	6300	1120	152	180	840	32	0	720	860	970	6	0.72	5.26
979	Tiruvallur	Elavur	13.4626	80.1173	7.54	580	180	36	22	41	4	0	73	92	85	13	0.12	0.70
980	Tiruvallur	Enambakkam	13.2867	80.0000	7.43	1180	340	64	36	131	14	0	183	185	198	2	0.92	3.67
981	Tiruvallur	GOONIPALAYAM	13.2789	79.8508	7.50	780	300	60	27	45	14	0	137	158	48	3	0.49	0.46
982	Tiruvallur	Gummidipoondi	13.4000	80.1333	7.47	1550	680	112	58	56	39	0	201	263	95	27	0.81	1.38
983	Tiruvallur	Kaddapakkam	13.2023	80.2459	7.33	2330	330	32	61	352	54	0	281	525	202	33	0.72	0.91
984	Tiruvallur	Kanakammachatrm	13.2083	79.7500	7.79	3130	340	76	36	534	2	0	439	703	129	1	0.60	2.50
985	Tiruvallur	Kathavur	13.1792	80.0644	7.00	1500	620	104	88	86	26	0	415	292	92	11	0.65	6.85
986	Tiruvallur	Kottaiyur	13.0008	79.8661	7.05	1240	305	48	11	210	17	0	183	228	180	15	0.92	8.26
987	Tiruvallur	Kovilpathagai	13.1428	80.0969	7.26	2620	520	128	49	232	44	0	561	305	55	90	0.56	4.14
988	Tiruvallur	Krishnasamudram OW	13.3344	79.4397	7.52	1756	160	20	109	132	32	0	189	320	205	32	1.38	52.49
989	Tiruvallur	Mepperu	13.0292	80.0800	7.16	1270	360	40	63	129	15	0	378	156	165	3	0.24	4.52
990	Tiruvallur	Mettukandigai	13.0667	79.9667	7.56	3360	1030	260	92	263	2	0	403	689	245	10	1.08	21.62
991	Tiruvallur	Minjur dw	13.2703	80.2631	7.07	1654	570	128	61	174	8	0	366	348	123	1	0.78	3.84
992	Tiruvallur	Nandiambakkam	13.2667	80.2792	7.40	875	430	72	61	52	3	0	244	135	113	2	0.24	3.88
993	Tiruvallur	NEDAMBARAM	13.2197	79.7303	7.61	940	630	72	24	68	16	0	232	71	125	14	1.32	0.72
994	Tiruvallur	Padiyanallur	13.2042	80.1792	7.38	878	380	80	44	51	2	0	342	121	48	15	1.08	77.42
995	Tiruvallur	Palavakkam (T)	11.4158	80.1300	7.40	1030	340	88	29	76	33	0	451	92	15	56	0.30	7.59
996	Tiruvallur	Panapakkam	13.2983	80.5597	8.11	996	260	64	63	41	13	0	201	121	180	3	0.25	2.72
997	Tiruvallur	Pappanchatram	13.0314	80.0389	7.48	1520	530	40	105	104	9	0	305	256	128	15	0.97	4.43
998	Tiruvallur	Pattabiram	13.1211	80.0617	7.68	2240	280	10	62	413	16	0	878	252	187	6	0.39	9.19
999	Tiruvallur	Periyapalyam	13.3125	80.0500	7.47	1425	310	60	39	180	30	0	500	192	11.5	48	0.42	8.36
1000	Tiruvallur	PLACEPALAYAM	13.2783	79.7703	7.45	325	380	48	15	3	15	0	104	57	42	1	0.57	2.85
1001	Tiruvallur	Ponneri dw	13.3419	80.1892	7.58	945	290	76	24	94	9	0	293	121	72	10	0.30	29.25
1002	Tiruvallur	Pulal	13.1667	80.2125	7.49	750	280	48	39	73	2	0	159	99	142	1	1.26	1.02

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1003	Tiruvallur	Pulicat	13.4158	80.3139	7.57	2690	300	60	36	367	178	0	634	376	218	3	0.90	12.59
1004	Tiruvallur	Redhills	13.1906	80.1858	7.18	540	240	88	5	38	17	0	244	78	12	11	0.10	1.04
1005	Tiruvallur	Sangaibedu	13.3298	80.2977	7.79	3390	340	84	32	642	156	0	1000	476	282	39	0.84	9.60
1006	Tiruvallur	SHOLAVARAM	13 13 52	80 10 9	7.38	910	375	10	85	28	13	0	424	78	10	3	0.72	4.99
1007	Tiruvallur	Tirumazhisai	13.0625	80.0625	7.24	1125	220	52	22	110	5	0	268	36	201	20	0.60	1.93
1008	Tiruvallur	Tirupalavanam	13.4020	80.2485	7.44	3250	740	144	92	381	7	0	354	562	418	22	0.54	14.22
1009	Tiruvallur	Tiruttani	13.1875	79.6083	7.40	1240	410	84	49	130	3	0	354	234	102	4	1.02	5.26
1010	Tiruvallur	Tiruvalangadu	13.1250	79.7667	7.37	1681	600	92	90	144	4	0	634	199	142	32	0.84	10.81
1011	Tiruvallur	Tiruvallur	13.1417	79.1417	7.44	2430	480	100	56	273	3	0	378	376	170	156	1.02	3.60
1012	Tiruvallur	Tiruvellavoyal	13.3318	80.2791	7.60	1240	250	28	44	99	61	0	183	206	93	26	0.72	0.27
1013	Tiruvallur	Uthukottai1	13.3417	79.9083	7.43	1046	340	92	27	73	8	0	390	135	12	27	0.48	7.05
1014	Tiruvallur	Valasai Vettikadu OW	13.0350	79.9283	7.47	632	340	80	24	1	14	0	142	125	15	13	0.46	0.22
1015	Tiruvallur	Veerapuram	13.1656	80.1178	7.24	960	560	96	78	7	14	0	317	185	36	2	0.78	7.21
1016	Tiruvallur	Veeraraghapuram	13.2158	80.1319	7.20	1220	400	88	44	97	44	0	320	135	160	17	0.80	1.45
1017	Tiruvallur	Vellanur	13.1656	80.1178	7.06	705	360	56	54	15	14	0	210	171	12	17	0.62	0.66
1018	Tiruvallur	Velliagram	13.3275	79.4228	7.31	830	290	76	44	21	13	0	244	78	88	9	0.81	7.95
1019	Tiruvallur	Vengal	13.2505	80.0099	7.46	630	240	48	29	46	3	0	207	92	32	27	0.18	2.07
1020	Tiruvallur	Voyalur	13.3071	80.2751	7.56	1220	270	56	32	103	22	0	220	185	102	3	0.48	0.40
1021	Tiruvarur	Mannargudi	10.6833	79.4667	7.38	1280	450	68	68	106	9	0	226	284	54	102	0.37	0.45
1022	Tiruvarur	Nannilam	10.8875	79.6000	7.60	840	360	68	46	32	3	0	256	121	67	8	0.37	1.26
1023	Tiruvarur	Needamangalam	10.7458	79.4708	7.59	1281	400	52	66	114	7	0	439	185	70	2	0.71	2.92
1024	Tiruvarur	Pangal	10.7208	79.6417	7.40	4140	1130	92	219	380	87	0	476	895	199	66	0.98	13.30
1025	Tiruvarur	Peralam	10.9606	79.5733	8.13	1179	240	20	46	176	2	0	323	199	78	3	1.00	7.87
1026	Tiruvarur	Thillaivilagam	10.3708	79.5917	7.64	1075	300	52	41	111	22	0	366	142	70	40	0.07	1.60
1027	Trichy	Amur	10.9100	78.5511	7.32	807	250	60	24	45	37	0	214	128	39	11	0.45	0.96
1028	Trichy	Angarai	10.8769	78.7978	7.43	668	150	48	7	53	50	0	183	85	72	2	0.04	0.51
1029	Trichy	Chattirapatti	10.7417	78.5833	7.72	801	310	96	17	41	15	0	342	92	35	1	0.55	6.77
1030	Trichy	Chinnagowdanpatti	10.4575	78.3783	7.52	1637	700	160	73	42	20	0	366	320	39	136	0.68	4.22

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1031	Trichy	Kannanurpalayam	11.0722	78.5500	7.69	930	290	72	27	99	16	0	348	121	67	7	1.23	1.53
1032	Trichy	Kattur	10.8047	78.7439	7.45	1660	470	100	54	139	19	0	415	320	44	8	1.20	2.97
1033	Trichy	Kollidam Karai	10.8692	78.6906	7.55	915	380	76	46	44	19	0	329	142	60	6	0.70	3.46
1034	Trichy	Koppampatti	11.3008	78.4972	7.32	2240	820	156	105	111	3	0	476	305	223	99	0.27	4.64
1035	Trichy	Kovilpatty	10.5500	78.3000	7.40	3430	930	208	100	297	31	0	293	817	198	1	0.48	24.57
1036	Trichy	Lic Colony Kk Nagar	10.7597	78.6822	7.35	1655	480	140	32	139	15	0	421	270	129	0	0.62	1.68
1037	Trichy	Manachanallur	10.9850	78.7656	7.47	1827	510	68	83	165	27	0	451	334	122	14	0.20	1.64
1038	Trichy	Manaparai	10.6144	78.4253	7.53	1686	610	144	61	110	21	0	415	256	163	78	0.50	40.53
1039	Trichy	Manaparai II	10.6147	78.4256	7.40	1619	470	136	32	158	18	0	397	241	165	54	0.34	9.43
1040	Trichy	Mudaliarchatram	10.8003	78.6967	7.42	7750	2250	720	109	566	23	0	610	1519	300	397	0.56	3.56
1041	Trichy	Musiri2	10.9583	78.4500	7.49	1520	280	68	27	134	99	0	342	263	78	5	0.15	1.57
1042	Trichy	Muthupandiyanpatti	10.6381	78.4467	7.49	1291	460	100	51	69	16	0	323	256	58	3	0.93	3.83
1043	Trichy	Oodathurai Odakarai	10.8367	78.6992	7.60	1332	390	76	49	151	26	0	506	185	40	18	0.65	1.12
1044	Trichy	Ookaeri	11.2108	78.5500	7.49	1534	630	148	63	55	3	0	317	135	77	313	1.44	2.25
1045	Trichy	Peramangalam	10.9867	78.6542	7.47	3550	580	116	71	380	186	0	580	533	284	236	1.14	7.56
1046	Trichy	Pulivalam	11.0167	78.6375	7.10	3350	1030	256	95	280	7	0	488	511	297	332	0.88	7.61
1047	Trichy	Pullambadi	11.0458	78.9583	7.49	1652	450	68	68	203	6	0	458	199	68	256	0.72	2.54
1048	Trichy	Pullambadi1	10.9417	78.9125	7.12	4740	1010	184	134	574	68	0	671	1051	200	20	0.33	0.00
1049	Trichy	Puttur-Thennur	10.8147	78.6794	7.64	1007	300	56	39	69	28	0	275	149	48	31	0.36	0.63
1050	Trichy	Samayapuram	10.8458	78.7486	7.55	948	320	56	44	75	17	0	317	163	25	5	0.61	1.60
1051	Trichy	Sembattu	10.7450	78.7117	7.63	2500	700	128	92	203	18	0	537	497	36	1	1.21	2.11
1052	Trichy	Siruganur	11.0014	78.7250	7.50	1985	540	92	75	206	6	0	476	327	165	43	0.82	4.74
1053	Trichy	Sirukambur	10.9014	78.6039	7.39	2620	470	112	46	250	142	0	598	355	146	200	0.57	1.79
1054	Trichy	Srirangam	10.8558	78.6867	7.60	779	310	48	46	48	17	0	256	135	42	0	0.36	2.45
1055	Trichy	Thatchankurichi	10.9553	78.8192	7.62	1236	300	92	17	125	86	0	427	149	98	19	0.81	1.64
1056	Trichy	Thathayangarpet	11.1208	78.4542	7.50	1972	840	224	68	82	17	0	397	341	165	163	0.17	3.83
1057	Trichy	Thiruvallarai	10.9569	78.6675	7.53	2490	580	104	78	140	233	0	677	398	104	0	0.02	2.13
1058	Trichy	Thottiyam	10.9917	78.3292	7.40	1184	390	108	29	82	22	0	342	220	44	5	0.38	6.43

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							<…….mg/L…….>											ppb
1059	Trichy	Thuvakkudi	10.7500	78.8250	7.55	1159	430	88	51	80	2	0	268	263	53	20	0.62	1.59
1060	Trichy	Tiruchchirappalli1	10.7917	78.7125	7.50	1936	670	68	122	156	26	0	354	412	90	0	0.33	1.00
1061	Trichy	Tiruvanaikovil	10.8528	78.7064	7.69	321	120	20	17	16	17	0	110	57	15	1	0.10	0.17
1062	Trichy	Tiruvasi	10.8906	78.5317	7.74	2480	380	76	46	244	182	0	641	284	233	37	0.65	3.33
1063	Trichy	Tumbalam	11.0306	78.4328	7.63	1893	640	176	49	150	28	0	561	249	110	52	0.37	5.41
1064	Trichy	Tuvarankuruchi	10.3583	78.3722	7.48	2520	710	136	90	203	26	0	458	582	30	3	0.51	4.53
1065	Trichy	Uppiliyapuram	11.2622	78.5167	7.42	2040	780	124	114	116	4	0	506	263	189	115	0.83	2.68
1066	Trichy	Vaiyampatty	10.5500	78.3000	7.41	1878	690	200	46	105	20	0	281	383	124	69	0.52	7.45
1067	Trichy	Valadi	10.8728	77.7647	7.36	1059	360	76	41	90	3	0	311	149	98	18	0.46	2.12
1068	Trichy	Vengankudi	10.9125	78.7233	7.39	1206	460	132	32	73	11	0	305	192	102	4	0.95	1.32
1069	Tuticorin	ARUMUGANERI	8.5656	78.0978	7.70	1636	540	40	107	185	78	0	708	277	131	9	1.08	3.40
1070	Tuticorin	Devachayalpuram	8.7344	77.9194	7.40	1308	375	116	21	95	12	0	165	213	87	25	0.43	1.57
1071	Tuticorin	Eppodumvendram	9.0292	78.0458	7.50	4570	530	128	51	436	238	0	366	475	692	78	1.51	4.28
1072	Tuticorin	Ettayapuram	9.2178	77.9833	7.60	950	320	52	46	77	4	0	244	78	130	22	1.13	1.31
1073	Tuticorin	Kadambur pz (T)	8.9972	77.8617	7.10	1247	510	84	73	47	30	0	317	135	127	52	0.47	0.72
1074	Tuticorin	Kallurani dw	9.1431	77.7719	7.30	591	320	64	39	10	7	0	293	21	43	7	0.50	0.39
1075	Tuticorin	Kalugumalai	9.1486	77.7167	7.20	565	240	40	34	29	2	0	134	85	47	4	0.32	0.30
1076	Tuticorin	Kalungumalai	9.1444	77.7056	7.00	1062	400	80	49	76	5	0	195	156	122	26	0.60	1.17
1077	Tuticorin	Karisalkulam	9.1500	78.1667	7.70	2280	350	72	41	276	4	0	610	220	113	24	0.89	5.00
1078	Tuticorin	Kayattar	8.9444	77.7750	7.40	1308	560	52	105	57	9	0	378	206	127	11	1.37	1.07
1079	Tuticorin	Kovilpatti	9.1750	77.8750	7.30	949	390	40	70	33	1	0	268	78	87	4	0.52	0.25
1080	Tuticorin	Kulasekharaptnm	8.4000	78.0542	7.60	1077	500	68	80	55	55	0	439	92	110	55	0.80	1.16
1081	Tuticorin	Kurukkuchalai	8.9306	78.0917	7.20	5920	1440	296	170	463	3	0	366	730	904	72	1.50	40.70
1082	Tuticorin	Maniyachi	8.8667	77.9000	7.20	1400	400	80	49	58	42	0	488	92	90	7	0.37	0.57
1083	Tuticorin	Maniyachi1	8.8333	77.8958	6.90	370	155	16	28	23	2	0	110	57	26	4	0.89	0.28
1084	Tuticorin	Mettupanaiyur dw	9.0317	78.2522	7.60	868	300	16	63	76	1	0	378	64	70	3	0.67	1.00
1085	Tuticorin	Mukkani dw	8.6342	78.0736	7.60	888	420	68	61	73	2	0	476	85	28	3	0.91	1.85
1086	Tuticorin	Muppilipatti dw	8.9011	78.0256	7.40	656	190	64	7	29	21	0	146	71	22	22	0.18	0.92

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1087	Tuticorin	Nagalapuram	9.2333	78.1306	7.20	3320	1690	248	260	32	5	0	415	581	387	81	1.30	8.66
1088	Tuticorin	Nakkalamuthanpatty	9.2323	77.7732	7.50	1685	290	64	32	212	41	0	488	85	267	35	0.77	3.07
1089	Tuticorin	Nallattinputhur	9.1583	77.8417	7.50	542	235	28	40	27	1	0	122	64	53	32	0.48	0.42
1090	Tuticorin	Nazareth	8.4375	77.9736	7.02	604	190	56	12	36	20	0	67	121	42	5	0.17	0.35
1091	Tuticorin	Paikulam	8.5181	77.8556	7.10	3430	1180	412	36	92	3	0	134	603	476	70	0.34	17.03
1092	Tuticorin	Pasuvanthanai	9.0013	77.9596	7.20	1232	535	108	64	36	1	0	220	149	133	46	1.66	0.82
1093	Tuticorin	Perunkulam	8.6439	77.9978	7.65	2210	480	56	83	219	70	0	537	326	22	34	0.90	1.02
1094	Tuticorin	Petmanagar	8.6500	77.9500	7.30	3410	1200	252	139	172	53	0	329	822	97	24	0.56	5.74
1095	Tuticorin	Pudur	9.3136	78.1361	7.90	2850	200	12	41	471	7	0	1074	78	186	43	0.47	29.50
1096	Tuticorin	Saidunganallur	8.4958	77.8333	7.00	482	150	52	5	18	22	0	110	43	48	1	0.36	0.85
1097	Tuticorin	Satankulam	8.4333	77.9028	7.30	2360	700	196	51	112	6	0	354	355	87	58	0.45	21.56
1098	Tuticorin	Sathankulam-n	8.4444	77.9000	7.30	2140	590	156	49	169	2	0	476	298	151	62	0.42	10.01
1099	Tuticorin	Srivaikundam1	8.6250	77.9083	7.10	576	110	28	10	48	15	0	122	64	57	2	1.73	0.11
1100	Tuticorin	Thailapuram	8.6083	77.8500	7.00	2250	790	164	92	102	43	0	244	440	126	79	0.45	6.82
1101	Tuticorin	Tiruchendur-e	8.4944	78.1222	7.50	3290	590	88	90	316	129	0	525	503	350	28	0.55	12.20
1102	Tuticorin	Tiruchendur-w	8.4958	78.1208	7.50	497	275	52	35	22	3	0	281	50	14	4	0.52	0.62
1103	Tuticorin	Tuticorin1	8.8083	78.1389	7.60	7730	840	48	175	1477	8	0	708	1780	740	7	1.65	16.20
1104	Tuticorin	Udangudi	8.4298	78.0335	7.60	1782	490	56	85	185	58	0	390	312	97	50	1.36	2.50
1105	Tuticorin	Udangudi dw	8.4342	78.0292	7.60	1194	360	136	5	132	46	0	366	184	60	49	0.38	3.02
1106	Tuticorin	Vembar	9.0770	78.3568	7.50	408	230	40	32	3	2	0	171	14	47	11	0.82	0.23
1107	Tuticorin	Vembur	9.3250	78.0819	7.20	2110	790	196	73	35	12	0	244	241	266	58	1.60	3.14
1108	Tuticorin	Villiseri	9.0583	77.8500	7.50	5040	1590	312	197	450	7	0	354	255	1660	56	0.48	16.85
1109	Vellore	Echipudhur (Vellore dt)	12.9058	79.2819	7.62	2140	600	100	75	189	15	0	275	348	255	1	1.80	15.36
1110	Vellore	Avarakarai Pz	12.5636	79.1713	7.50	1758	350	44	58	228	1	0	378	291	93	75	0.87	3.45
1111	Vellore	Chinnapallikuppam pz	12.7633	78.8386	7.68	1246	430	36	83	81	10	0	329	227	63	3	1.00	10.37
1112	Vellore	Kandili	12.4778	78.4556	7.65	3670	900	56	185	345	8	0	598	625	168	351	1.32	17.89
1113	Vellore	Ponnai	13.1111	79.4264	7.79	2570	620	88	97	246	3	0	482	511	114	36	1.20	5.22
1114	Vellore	Ranipet2	12.9333	79.3500	7.74	1615	340	52	51	206	5	0	323	341	104	7	0.82	6.86

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1115	Vellore	Virupachipuram(bagayam)	12.8778	79.1333	7.75	1246	400	28	80	88	3	0	281	149	153	56	0.92	5.35
1116	Villipuram	Alathur	11.7990	78.9471	7.60	1710	280	72	24	253	16	0	409	163	235.2	50	0.72	2.85
1117	Villipuram	Allampundi	12.2483	79.3406	7.60	2340	480	64	78	313	9	0	354	454	144	112	1.80	0.76
1118	Villipuram	Andiarpalayam	12.0474	79.7627	7.57	2680	480	100	56	391	10	0	525	355	288	136	0.45	0.72
1119	Villipuram	Arakandanallur	11.9742	79.2258	7.60	1607	420	120	29	168	16	0	293	248	153.6	68	1.06	0.15
1120	Villipuram	Asanur	11.6257	79.1920	7.60	800	220	64	15	76	13	0	250	46	96	37	0.65	0.29
1121	Villipuram	Brahmadessam	12.2000	79.7785	7.76	1011	300	60	36	92	8	0	244	106	144	12	0.12	0.32
1122	Villipuram	Chinnasalem	11.6314	78.8684	7.14	1586	460	124	36	143	18	0	305	284	96	50	0.32	0.46
1123	Villipuram	Chinnasalem	11.6375	78.8818	7.60	3200	660	104	97	426	9	0	354	638	288	130	0.38	0.30
1124	Villipuram	Eliyathur (New)	11.9552	79.4185	7.40	2051	670	120	90	154	13	0	500	255	168	87	1.12	1.02
1125	Villipuram	Gingee	12.2521	79.4259	7.50	4410	840	124	129	621	9	0	311	1134	288	56	0.45	0.03
1126	Villipuram	Gingee	12.2543	79.4076	7.17	2780	560	80	88	375	9	0	458	567	168	43	0.72	0.03
1127	Villipuram	Gopalapuram-Peramandur	12.2285	79.5702	7.50	1070	300	72	29	104	5	0	330	46	134.4	62	1.53	0.02
1128	Villipuram	Kacharapalayam	11.7646	78.8679	7.60	1570	285	84	18	230	6	0	305	220	192	37	0.45	0.91
1129	Villipuram	Kadambur	11.9410	79.0500	7.33	1680	450	88	56	175	8	0	275	284	168	50	1.46	0.87
1130	Villipuram	Kallakurichi	11.7386	78.9538	7.29	2670	1100	168	165	104	9	0	549	376	288	68	0.79	3.12
1131	Villipuram	Kallakurichi	11.7391	78.9623	7.50	1880	300	80	24	290	5	0	458	248	153.6	62	0.92	0.44
1132	Villipuram	Kanai	11.9552	79.4185	7.75	1820	450	72	66	200	20	0	397	284	144	43	0.72	6.05
1133	Villipuram	Kiliyanur	12.1008	79.7458	7.60	5045	1550	320	182	437	22	0	92	1347	480	68	1.39	0.15
1134	Villipuram	Kodima	12.1717	79.5974	7.70	460	150	40	12	32	6	0	183	28	24	12	0.12	0.11
1135	Villipuram	Kunimedu	12.0945	79.8929	7.65	1245	350	68	44	120	8	0	317	85	192	50	1.06	17.04
1136	Villipuram	Mambazhapattu	11.9580	79.3709	7.90	1060	370	44	63	69	6	0	488	50	52.8	1	1.19	8.68
1137	Villipuram	Marakanam	12.1294	79.7181	7.00	299	100	24	10	9	24	0	61	35	38.4	12	0.45	0.03
1138	Villipuram	Melporadikuppam	12.2501	79.5701	7.50	1137	330	96	22	106	4	0	397	78	96	37	1.15	0.57
1139	Villipuram	Mogaiyur	11.0250	79.3211	7.70	1130	250	80	12	131	26	0	275	142	96	50	0.86	14.99
1140	Villipuram	Mogaiyur	11.9759	79.3120	7.40	1100	430	60	68	48	9	0	378	67	100.8	43	0.95	1.59
1141	Villipuram	Nallavur Pudur	12.1344	79.7603	6.80	1122	370	80	41	74	24	0	195	106	168	99	0.72	0.58
1142	Villipuram	Ollakkur	12.2922	79.7245	7.50	1042	320	68	36	81	13	0	427	43	57.6	50	0.59	0.34

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1143	Villipuram	Pidagam (Elavarasanarkottai) (A)	11.7206	79.1792	7.40	940	250	92	5	92	17	0	336	35	100.8	56	1.63	0.47
1144	Villipuram	Rajampalayam	11.9459	79.1378	7.40	3059	500	148	32	460	22	0	366	603	288	93	1.14	1.72
1145	Villipuram	Rishivandiyam	11.8131	79.0947	7.30	2037	400	68	56	269	26	0	397	284	192	112	1.76	2.63
1146	Villipuram	Sadaikattu attipattu	11.9988	79.1659	7.40	1241	380	92	36	106	8	0	293	74	192	93	1.44	0.94
1147	Villipuram	Salavathi	12.8346	79.6723	7.30	958	400	96	39	30	9	0	287	53	144	19	0.45	0.02
1148	Villipuram	Sankarapuram	11.8857	78.9178	7.60	1493	520	100	66	99	9	0	458	142	124.8	62	1.12	0.38
1149	Villipuram	Sankarapuram	11.8866	78.9147	7.40	1589	310	64	36	216	8	0	458	74	240	74	1.33	0.66
1150	Villipuram	Siruvadi	12.2048	79.8441	6.80	1455	440	96	49	120	20	0	85	149	384	56	0.45	0.10
1151	Villipuram	Tehzbasar (Tenpasiyar)	12.1921	79.6260	7.66	1140	480	68	75	32	18	0	488	64	57.6	25	0.37	0.01
1152	Villipuram	Thiyagadurgam	11.7361	79.0842	7.40	1196	180	44	17	182	14	0	391	64	144	37	1.10	0.41
1153	Villipuram	Timmalai	11.7294	79.1196	7.44	1115	400	52	66	69	11	0	372	57	144	31	1.12	0.02
1154	Villipuram	Tiruchidrambalam	11.9964	79.7793	7.00	1312	550	76	88	35	20	0	207	213	144	37	0.28	2.11
1155	Villipuram	Tirukkoilur	11.9535	79.1927	7.50	1748	400	112	29	205	16	0	427	142	254.4	62	0.59	0.90
1156	Villipuram	Tyagadurgam	11.7359	79.0804	7.40	895	170	32	22	122	12	0	293	71	96	12	0.65	1.24
1157	Villipuram	Ulagankaththan-Thimmaiya nagar	11.6953	78.9347	7.40	1057	380	120	19	62	10	0	293	46	62.4	192	1.12	0.24
1158	Villipuram	Ulundurpet	11.6866	79.2894	7.69	1735	400	52	66	200	27	0	397	248	163.2	25	0.45	1.24
1159	Villipuram	Ulundurpet	11.6908	79.2893	7.60	1876	330	48	51	276	11	0	403	284	144	74	1.06	1.54
1160	Villipuram	Vadasemapalaym	11.8592	78.9314	7.40	1855	500	128	44	184	25	0	317	291	168	99	0.52	1.74
1161	Villipuram	Vallam	12.2558	79.5072	7.55	1118	420	80	53	60	9	0	256	89	192	31	0.65	0.00
1162	Villipuram	Vazhavanthankuppam	11.7219	79.1289	7.40	1246	400	112	29	101	13	0	323	106	153.6	74	0.79	1.16
1163	Villipuram	Vellaiyur	11.7043	79.3317	7.40	2016	460	120	39	248	9	0	305	429	120	39	1.06	1.77
1164	Villipuram	Veppur	11.5322	79.1239	7.20	2029	800	280	24	87	17	0	439	425	38.4	12	0.65	15.56
1165	Villipuram	Vikravandi	12.0403	79.5448	7.59	955	420	60	66	23	8	0	330	35	144	12	0.18	0.02
1166	Villupuram	Avalurpet(Villupuram	12.6658	79.2406	7.59	1643	500	156	27	158	9	0	586	220	23	107	0.54	1.38
1167	Virudhunagar	Alangulam	9.3639	77.6861	7.40	4180	760	40	160	528	7	0	586	482	498	101	1.69	7.80
1168	Virudhunagar	Ammayappapuram	9.4400	77.5369	7.20	2900	740	80	131	164	1	0	464	546	27	19	0.86	2.76
1169	Virudhunagar	Anaiyur	9.4464	77.7667	7.10	552	180	52	12	6	3	0	122	57	5	3	0.27	0.10
1170	Virudhunagar	Aruppukottai-w	9.5132	78.0851	7.10	1766	420	64	63	197	61	0	476	262	144	7	1.09	1.13

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1171	Virudhunagar	Aviyur dw	9.7389	78.1008	6.90	3680	980	196	119	216	2	0	390	666	15	80	1.71	7.40
1172	Virudhunagar	Ayyanarkoil dw	9.5117	77.4542	7.00	192	100	22	11	5	0	0	73	14	18	8	0.47	0.00
1173	Virudhunagar	Choolapuram	9.3833	77.5583	7.30	4520	660	28	143	509	0	0	525	837	220	37	1.34	4.86
1174	Virudhunagar	Devadanam1	9.3833	77.4656	7.20	2370	550	52	102	166	56	0	695	220	46	83	1.06	2.58
1175	Virudhunagar	Erichanatham	9.6333	77.8167	7.20	692	260	56	29	25	6	0	268	50	22	32	1.01	0.66
1176	Virudhunagar	Kalloorani	9.4639	78.1650	7.00	5090	1170	328	85	451	1	0	476	858	426	47	1.28	22.20
1177	Virudhunagar	Kanjannaickenpatti	9.6097	78.1019	7.00	1110	450	88	56	59	2	0	354	135	36	21	1.38	1.29
1178	Virudhunagar	Kariyapatti1	9.6694	78.1083	7.20	2970	810	172	92	198	2	0	512	518	24	90	1.21	13.00
1179	Virudhunagar	Kilarajakumaran	9.4000	77.6320	7.20	873	290	72	27	28	3	0	165	128	24	3	0.68	0.81
1180	Virudhunagar	Kundarapatty	9.6300	77.7700	7.30	2180	460	68	70	164	7	0	659	170	24	9	1.88	4.65
1181	Virudhunagar	Mudukkankulam	9.1508	78.2058	7.60	4270	290	36	49	616	2	0	744	698	166	41	1.73	12.20
1182	Virudhunagar	Mullikulam-V	9.4986	77.7000	7.10	1895	460	48	83	167	3	0	342	340	106	48	0.96	1.58
1183	Virudhunagar	Muntalapuram	9.0172	77.8894	7.20	1347	440	64	68	78	2	0	476	113	16	66	1.79	2.78
1184	Virudhunagar	Nathampatti OW	9.6042	77.7486	7.30	1056	260	40	39	80	1	0	415	21	55	14	1.84	2.34
1185	Virudhunagar	Nenmeni1	9.3250	78.0083	7.30	19850	3190	556	437	2212	14	0	476	4055	1476	74	1.00	54.00
1186	Virudhunagar	Palavanatham	9.5667	78.0750	7.00	5430	1730	300	238	281	2	0	622	815	478	33	1.70	13.30
1187	Virudhunagar	Pattampudur OW	9.4914	77.9336	7.50	1376	80	16	10	245	3	0	683	50	14	27	1.59	4.61
1188	Virudhunagar	Rajapalayam1	9.4625	77.5417	7.00	2640	680	92	109	208	0	0	512	369	82	38	1.30	3.50
1189	Virudhunagar	Sevalpatti	9.5583	77.9583	7.00	3750	1280	316	119	105	0	0	476	581	36	82	1.84	9.54
1190	Virudhunagar	Sivakasi2	9.4500	77.7917	7.00	2060	530	100	68	150	2	0	378	376	17	80	0.53	1.74
1191	Virudhunagar	Srivilliputhur	9.1519	77.6267	7.20	1479	390	68	53	77	21	0	451	121	18	8	0.85	0.72
1192	Virudhunagar	Srivilliputhur1	9.5000	77.6333	6.90	4360	1330	168	221	190	2	0	232	893	217	23	0.98	6.90
1193	Virudhunagar	Sundarapandiyan	9.6083	77.6667	7.20	1749	450	64	70	184	0	0	512	156	88	58	1.06	2.00
1194	Virudhunagar	Tamilpadi	9.5111	78.1972	7.30	1644	360	84	36	190	2	0	451	170	79	14	1.25	1.58
1195	Virudhunagar	Vadapatti	9.5108	77.7550	7.30	2150	570	64	100	215	3	0	476	206	244	40	1.67	4.10
1196	Virudhunagar	Vembakkottai-OW	9.3333	77.7667	7.20	4670	1100	96	209	485	7	0	830	695	297	67	1.81	27.80
1197	Virudhunagar	Vilampatti	9.4169	77.7506	7.00	777	260	72	19	12	2	0	153	64	55	20	0.70	0.38
1198	Virudhunagar	Virudunagar	9.5833	77.9542	7.30	3610	640	108	90	430	0	0	598	510	178	42	1.67	5.00

S.No	District	Location	Latitude	Longitude	PH	EC *	TH**	Ca	Mg	Na	K	CO3	HCO3	Cl	SO4	NO3	F	U
							<…….mg/L…….>											ppb
1199	Virudhunagar	Watrap	9.6358	77.6335	7.10	725	250	40	36	48	0	0	366	21	33	2	1.66	0.33

*Micro Siemens / Cm at 25^0 C

**(mg/L as $Ca\ CO_3$)