Water is one of the most indispensable renewable resources and is the elixir of life. In this present world population is increasing tremendously. Rate of technological development in industry and agriculture is also high. All the above factors have increased the demand for water in India which is going to be a major problem in near future. Groundwater is an important natural source that has to be explored and sustained for the future.

The present study covers the Salem district which is in the state of Tamil Nadu, India. Water scarcity is a recurring problem in this district. So, to augment the development of this district groundwater potential areas, the suitability of groundwater for drinking and irrigation have to be identified for the effective management of groundwater in Salem district. Groundwater potential can be identified using geoelectrical survey and by using GIS and remote sensing techniques. The physio chemical analysis of groundwater is also important to identify the suitability of groundwater for drinking and irrigation. Hence these methods were used to delineate groundwater potential zones in Salem district. Salem district is located between 11°15' - 12°00' north latitudes and 77°35' - 78°50' east longitudes. Salem district comprises of twenty administrative blocks. The total geographical area is about 5207 sq. kms. The district has a maximum and minimum temperature of 40 °C and 13 °C. The rivers Cauvery, Vashita Nadhi, Swedha Nadhi, Sarabhanga Nadhi and Thirumanimuthar flow in the district. The study area's base map was created using the Survey of India (SOI) topographical maps.

Quality of groundwater was assessed by collecting and testing groundwater samples, by the procedure prescribed in IS 3025 - 1983 from sixty-six sampling locations during the month of January 2007 (Postmonsoon)

and May 2007 (Premonsoon) in cleaned polythene bottles. Suitability of the groundwater samples for drinking was interpreted by the limitations prescribed by IS 10500 – 1991 (drinking water standard) and based on Water Quality Index (WQI). Irrigation water quality interpretation was based on Sodium Adsorption Ratio (SAR), USSL classification, Doneen's classification and Wilcox's classification. The influence of anions and cations was done by Piper's trilinear diagram, statistical analysis and factor analysis.

Electrical resistivity survey was carried out by taking Vertical Electrical Soundings (VES) at sixty various locations in the study area. Based on the apparent resistivity and processed VES results, groundwater was explored by four methods. In the first method weathered layer map was overlaid on depth to basement map, in the second method variation in electrical resistivity at AB/2 = 45 m electrode spacing map was overlaid on depth to basement map, in the third method variation in electrical resistivity at AB/2 = 45 m electrode spacing map was overlaid on lineament density map. In the fourth method a new approach was adopted. Based on the resistivity contour maps at AB/2 = 30m, 45m and 60 m electrode spacing resistivity basins were identified in the study area and they were integrated to identify the groundwater potential zones.

The rainfall and groundwater level data from 1995 to 2008 (14 years) were used to develop the well hydrographs which ascertains the relationship between rainfall and groundwater level. Groundwater table contour map was prepared based on the groundwater level with respect to mean sea level of sixty-six dug well locations and the flow direction and its

flow accumulation was prepared based on the groundwater level observed during December 2007 which was useful to know the groundwater flow.

The thematic maps geomorphology, geology, soil, land use / land cover, drainage density, lineament density and slope of the study area was overlaid using weighted overlay analysis and a groundwater potential map was prepared. The groundwater potential maps were compared with the borewell yield data. New software GROWPOTENZ was developed using Visual Basic for identifying groundwater potential in the study area.

Based on the research work it was concluded that the land use / land cover between 1992 and 2005 reveals that the area covered by built up land, fallow land, open forest, gully land, stony waste has been increased. Area covered by crop land, scrub forest, dense forest, land with scrub, land without scrub, mining area and water bodies were decreased. Suitability of groundwater for drinking reveals that except Magudanchavadi block groundwater in all other blocks has exceeded the limit for drinking in any one of the parameters. According to Water Quality Index in premonsoon 56.06 % and in postmonsoon 65.15 % of the water samples had WQI rating less than 50 which reveal that they were fit for drinking.

Suitability of groundwater for irrigation reveals that all the groundwater samples were suitable for irrigation in both premonsoon and postmonsoon based on Sodium Adsorption Ratio. According to USSL classification during premonsoon 98.49 % of water samples were fit for irrigation and in postmonsoon 89.39 % of the water samples were fit for irrigation. According to Doneen’s classification all the groundwater samples

were suitable for irrigation in both premonsoon and postmonsoon. According to Wilcox diagram 87.91 % and 86.37 % of the samples were suitable for irrigation during premonsoon and postmonsoon respectively. According to Piper's trilinear diagram in the anion dominance, influence of bicarbonates and chloride was more and in cation dominance sodium and potassium was more. The statistical analysis reveals that the concentration of chloride ions was more. According to factor analysis in premonsoon the tested parameters were grouped into three factors and in postmonsoon it was grouped into four factors.

The geoelectrical survey reveals that the groundwater was found excellent at the foot hills of Shevaroys and north of Kadayampatti block, good in Mecheri, Mettur, Sankari, Valapadi, Pedhanaickenpalayam, Attur and Thalaivasal blocks and moderate in the centre part of the study area. The groundwater potential map according to weighted overlay analysis indicates that groundwater potential was excellent in the blocks Edappadi, Konganapuram, Nangavalli, Mecheri, Taramangalam, Thalaivasal, Attur, Pedhanaickenpalayam and Valapadi. Except Tharamangalam and Yercaud good groundwater potential area was spread in all the other blocks. Groundwater potential was moderate to good in Yercaud block and in some isolated patches in Salem block. The newly developed software GROWPOTENZ holds good for identifying the eight characteristics of a particular location in the study area.