ABSTRACT

Water is the precious and the most essential resource that is required for the very existence of life. The largest available source of fresh water lies underground. Groundwater occurs very commonly and its distribution beneath the earth's surface is wide. The developments in any nation require water for their growth in industry, agriculture and in water supply schemes. The water supply schemes to meet these demands from surface water resources are not adequate. The reasons are such as exploitation, deforestation, monsoon failure, etc. Hence the techniques for investigating the occurrence and movement of groundwater have been improved.

The present study attempts to assess the groundwater quality of an area which is mostly dependent on groundwater for all its needs. Namakkal district has been chosen as study area. Namakkal district is located in west part of TamilNadu state between 11°00'00" to 11°30'00" North latitudes and 77°40'00" to 78°30'00" East longitudes. The district covers an area of 3404 sq.kms falling within the semi arid region and frequently facing water scarcity as well as water quality problems.

Namakkal is known all over the country for its role in poultry and cattle farms. The district has a population of 15 million. The average rainfall of the district is 670 mm. The total livestock strength of the district is 9.07 lakhs and the strength of the poultry is 12.9 million.10.3 million numbers of eggs are being produced every day in this district and supplied all over the country. The whole district depends on groundwater for drinking, irrigation

and industrial purposes. The major sources of employment are agriculture and animal husbandry.

The water samples were collected at random locations covering all the plain area of the district. The base map of the study area was developed from the Survey of India (SOI) Toposheets. The sample locations were marked on the base map. The geology, geomorphology, soil types, physiography, drainage, landuse/land cover, rainfall, water level and rainfall maps of the study area have been digitized using GIS.

Water samples were collected from 73 locations during premonsoon(July) and postmonsoon(March) seasons for the year 2007 and were subjected to analysis for physical and chemical characteristics. The water quality has been evaluated based on IS:10500-1991 for drinking purposes and suitability of water for irrigation is evaluated based on irrigation quality guide lines and irrigation water quality classifications such as Wilcox, Doneen and USSL .

On the comparison of groundwater quality premonsoon groundwater quality is found better than the postmonsoon groundwater quality. The mechanism controlling groundwater chemistry is discussed with the help of Gibbs diagram and Piper's diagram. The rock water interaction was found to be major controlling mechanism and surface influences were also found during postmonsoon season.

Various statistical analyses were also carried out to evaluate the most influencing factor of the groundwater chemistry and groundwater quality variations between the seasons. Regression models have also been developed to exhibit the relation between chemical parameters of the groundwater chemistry.

Prediction of groundwater quality for a well before drilling at a location based on the parameters governing the groundwater chemistry are highly drastic and non linear. An artificial neural network (ANN) model was developed to predict the groundwater quality. The concentrations of major cations and anions in the groundwater of the proposed well can also be estimated using Linear regressions equations (LRE) developed from the value of TDS determined using ANN.

The dissolution due to higher meteorologic precipitation during premonsoon season was found to be primary cause for the quality variations. Hence, the dissolution has been taken as the right mechanism to improve the groundwater quality or to maintain consistent groundwater quality all over the year.

It is recognized that the most appropriate method which is readily available now for the improvement of groundwater quality through dissolution is artificial recharge. The various aspects of artificial recharge were studied and a design methodology for artificial recharge system has been formulated based on the local hydrological conditions. A Design program "ARD PRO.1.0" in C language has been developed to carry out the designs for artificial recharge.