CHAPTER- I

INTRODUCTION

1.1 Location

The area under present study comprises three districts of Assam namely, Cachar, Karimganj and Hailakandi districts. Combined together they are also known as Barak valley, Barak being the major river system of the area. The Barak valley lies between north latitudes 24°08’ and 25°08’ and east longitudes 92°12’ and 93°16’ covering an area of about 6921 sq.km. and forms the southern most part of Assam. The area is bounded on the North by Karbi-Anglong and North Cachar Hills districts, on the North-West by Meghalaya, on the South by Mizoram, on the East by Manipur state and has an international boundary on the West with Bangladesh. The area is covered by Survey of India Degree Sheets No. 83D and 83H. The location map of the area is shown in Fig.1.1.

1.2 Communication and accessibility

The area is well connected to the adjoining states of Meghalaya, Tripura and Manipur by National Highways No.44 and No.57. There is a network of all weather motorable roads connecting major villages with nearby towns. Railway connection exists between Badarpur, Silchar, Agartala and Guwahati. Air services are also available between Silchar and Guwahati.

1.3 Population

As per 2001 census (Govt. of India, 2001) total population of Barak valley is 29,92,989 out of which Cachar district has 14,42,141, Karimganj district has 10,07,976 and Hailakandi district has 5,42,872. Density of population is 321 per sq.km in Cachar district, 555 per sq.km in Karimganj district and 451 per sq.km in Hailakandi district. Bengali is the official language of the three districts, however, Assamese and Hindi are also spoken and understood by the populace. Apart from the tea garden workers and a minor fraction particularly from the urban area that
Fig. 1.1 Location map of the study area
resorts to miscellaneous occupation for their livelihood, cultivation is the main occupation for the majority of the population.

1.4 Landuse

Barak valley has 38.58 per cent of total geographical area under forest, 33.08 per cent as net shown area and 8.48 per cent as area sown more than once. About 5.47 per cent of land is used for plantation crops, miscellaneous trees and other (Govt. of Assam, 2009).

1.5 Status of studies

The pioneering work in the field of geology was done by H.B. Medlicott (1865) and Mallet (1876) whose valuable reports on geological mapping of Upper Assam coal belts were published in G.S.I. Memoirs. Subsequent significant geological contribution was made by the premier Assam Oil Company established in 1912 at Digboi in Upper Assam. Extensive prospecting for oil was carried out by this company during that period. Evans (1932) of Assam Oil Company recorded a detailed account of stratigraphy and structure of the Tertiary sediments of Assam.


Central Ground Water Board (CGWB) of Ministry of Water Resources, Government of India, has carried out hydrogeological investigations of the entire area in a phased manner. They have also established a number of open wells within the area as permanent observation wells for monitoring the behavior of ground water regime. Public Health Engineering Department and Directorate of Geology and Mining, Govt. of Assam have also carried out hydrogeological studies and borehole drilling for the supply of drinking water in the area. However, of all the
hydrogeological studies carried out so far in the area, only a few are at present available in published form.

Sri D.K. Vaid from C.G.W.B was the first to carry out systematic hydrogeological survey in parts of Barak valley during 1974-75. Sri D. Shivane of the same organization conducted systematic ground water studies in the area during 1975-76 and 1976-77. Shivane and Prasad (1981) published a report on hydrogeological conditions in Cachar district (including Hailakandi and Karimganj district) highlighting the findings of other workers and North Eastern Council project studies. During the North Eastern Council project studies in 1977-80, 17 exploratory wells, five observation wells and two slimholes were drilled to a maximum depth of about 300m below ground level. During Tipaimukh project studies in 1990-93, eight exploratory wells, 16 observation wells and eight piezometers were drilled to a maximum depth of 50m below ground level.

Cachar-Tripura-Mizoram Frontal Fold Belt within the greater Assam-Arakan Tectono-Sedimentary basin is part of a foredeep accretionary basin between the Indian craton and Indo-Burma plate collision zone. The general depositional events of the area consist of a repetitive succession of Neogene arenaceous and argillaceous sediments, known as rhythmites, with thinning upward sequence (Nandy, 2001). The rhythmites of marine origin are followed later by fluvial deposits. The entire sedimentary column of the area is made up of sandstone, siltstone, shale, mudstone, conglomerate, unconsolidated sediments ranging in size from clay to boulders. All these formations are not exposed throughout the area, but are present at various depths due to folded nature of the rocks. The oldest rock of this area belongs to Disang Group (Eocene) followed by Barails (Oligocene), Surma (Miocene), Tipams (Mio-Pliocene), Dupi Tila (Plio-Pleistocene) and Dihing Group (Pleistocene). These are followed by Alluvium of Pleistocene to Recent age.

Structurally the area is characterised by a series of meridional to sub-meridional, arcuate, elongated, doubly plunging, asymmetric folds arranged in an enechelon pattern, trending N-S to NNE-SSW with slight convexity towards west (Ganguly, 1983, 1984). The regional geology and the tectonics have been recorded in
vii) To suggest measures for rational development and utilization of ground water in the study area

1.7 Methodology

The study area comprises Cachar, Karimganj and Hailakandi districts of Assam, forming the southern part of the state. The plains are of alluvial origin and is a part of the larger Barak-Surma-Meghna Plain, major part of which now falls in Bangladesh. Survey of India Degree Sheets No.83D and No.83H provided the basis for studying the geology and hydrogeology of the area.

Central Ground Water Board, North Eastern Region, has set up 19 numbers of Ground Water Monitoring Stations in Barak Valley in order to know ground water conditions and its variation, in both time and space. For the present study all these wells were selected for monitoring ground water levels in the area to maintain continuity with the historical data available with CGWB. By doing so long term trend analysis of water level from the historical data available with CGWB are generated. These wells were set up based on the following consideration –

a) Lithology of the formation
b) Geomorphic setting
c) Nearness to rain-gauge station
d) Relatively easy approachability of the wells and fair control to give representation to the entire study area

Both the shallow and deep tube wells have been measured with GPS from which reduced level (RL) of water levels have been computed. Water level data collected from the monitoring stations were utilized to estimate the net rise between pre-monsoon and post-monsoon levels. Hydrographs were prepared utilizing water level data of the monitoring wells to study the long term trend of the water levels and also to see the effect of rainfall on water level. For the study of rainfall and its distribution in the study area, rainfall data from 22 tea estates were collected and analysed.
During the North Eastern Council Project (1977-80), 17 exploratory wells, five observation wells and two slim holes were drilled by CGWB to a depth of about 300m below ground level. Later in the year 1990 to 1993 eight(8) exploratory wells, 16 observation wells and eight(8) piezometers were constructed to a depth of 50m below ground level under the Tipaimukh Project (1990-93). These explorations have provided valuable data about the thickness, extent and nature of aquifer existing in the study area down to a depth of about 300m. Lithological logs obtained from these exploratory wells were used to prepare several lithological cross sections so that the geometry of the aquifers can be deciphered. While preparing the cross-sections various subsurface litho-units were correlated based on the assumption that the formations were more or less horizontally disposed. Tertiary formations are also showing very low dip and hence can be considered as more or less horizontal.

The degree of sorting and size of grains of sediments are of considerable importance in ground water movement and storage. These were determined by mechanical analysis of the borehole samples collected during drilling. Conventional Sieve-Pipette method (Krumbein and Pettijohn, 1938) were used for analysis. Cumulative curves were prepared from mechanical analysis data utilizing semi-log papers.

Size parameters of the mechanically analysed samples such as Effective Size ($d_{10}$) and Uniformity Coefficient ($C_u$) were computed from the cumulative curves based on the formulae suggested by Hazen (1892). Data collected from pumping tests conducted by CGWB on the Test wells were analysed by the software (AquaTest, Waterloo Hydrologic, Inc. Canada) and hydraulic characteristics of the aquifers were computed following standard procedures and methods discussed elaborately later in Chapter IV.

Finally an attempt was made to estimate the ground water resources available in the study area and to suggest ground water development perspective.