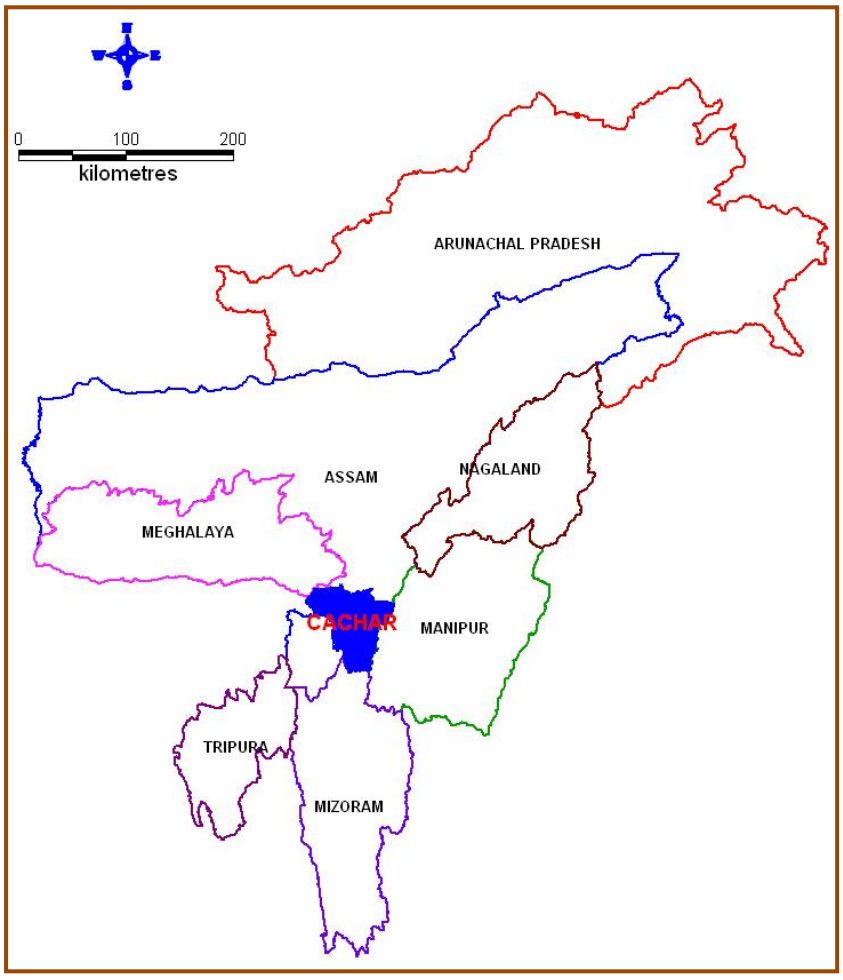
Technical Report Series: D

No:

Ground Water Information Booklet
Cachar District, Assam



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

November 2013

GROUND WATER INFORMATION BOOKLET

CACHAR DISTRICT, ASSAM

DISTRICT AT A GLANCE

Sl. No.	Item	Statistics
1.	GENERAL INFORMATION i) Geographical Area (in sq.km) ii) Population (as per 2011 census) iii) Average Annual Rainfall (mm)	 3,786 17,36,319 3,874.5
2.	GEOMORPHOLOGY i)Major Physiographic units : ii)Major drainage	 Tertiary hill ranges surrounding the district and flat alluvial plain in middle. Barak River with its tributaries.
3.	LAND USE (sq.km) i) Forest area ii) Net area sown iii) Total cropped area iv) Area sown more than once	 1,384.09 1,153.86 1665.76 511.90
4.	MAJOR SOIL TYPES	Silty alluvial soil
5.	AREA UNDER PRINCIPAL CROPS (sq. km)	41,682
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.)	81.98
7.	NUMBERS OF GROUND WATER MONITORING STATIONS OF CGWB (as on March 2013)	24
8.	PREDOMINANT GEOLOGICAL FORMATIONS	Vast alluvial sediments of River Barak and other tributaries.
9.	HYDROGEOLOGY i) Major water bearing formations ii) Pre-monsoon water level iii) Post-monsoon water level iv) iv)Long term water level trend(1988-07)	 Sand of various grades and other river borne aquifer materials 1.05 m bgl 1.62 m bgl Significant decline is not observed.
10.	GROUND WATER EXPLORATION BY CGWB (as on 28.02.2013) i) No. of wells drilled. ii) Depth range in meters.	 23 (17 EW, 6 OW) 277.78 - 301.49

	iii) Discharge in lps iv) Transmissibility (m^2/day) v) Permeability (m/day)	3.01 - 21.78 10.55 - 265.29 0.21 - 3.12
11.	GROUND WATER QUALITY i) Presence of chemical constituents beyond permissible limit (i.e.Ec,F,Fe,As)	EC within permissible limit F within permissible limit Fe ranges from 0.24 to 4.19 As is not determined.
12.	DYANMIC GROUND WATER RESOURCES (2009) in mcm i) Annual replenishable G.W. resources ii) Net annual G.W. draft iii) Projected demand for domestic and industrial use upto 2025 iv) Ground water availability for future irrigation v) Stage of G.W. development	 1133.35 39.21 52.46 966.99 4%
13.	AWARENESS AND TRAINING ACTIVITY i) Mass awareness programmes organized (Date & Place)	Not Organized
14.	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Project completed by C.G.W.B. Nos. and amount spent) ii) Project under technical guidance of CGWB (Nos.)	Nil
15.	GROUND WATER CONTROL AND REGULATION i) No. of OE blocks ii) No. of critical blocks. iii) No. of blocks notified.	Nil
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Higher concentration of Fe in ground water in some parts of the district is observed. Water logging in certain parts of the district is also observed.

GROUND WATER INFORMATION BOOKLET
CACHAR DISTRICT, ASSAM

1.0 Introduction

Cachar district of Assam is located in the central parts of the Barak valley on southern parts of Assam. It is bounded by North Latitudes $24^0 27^/$ and $25^0 08^/$ and East Longitudes $92^0 00^/$ and $95^0 15^/$. It covers an area of 3,786 sq. km. and it is divided into five circles. As per 2011 census, the population of the district is 17,36,319 and the density of population is 459 persons per sq. km. The percentage of literacy is 67.82. As per land record, the district has total net sown area 1,153.86 sq. km and current fallow is 68.51 sq. km. The district is much occupied by marshy land.

Physiographically, the area consists of hilly terrain surrounded by the border on all sides with bowl shaped synclinal valley elongated towards south. The main river system is Barak River with its tributaries in the North and South. Other tributaries are Madhera, Chiri, Jatinga, Kalain and Seema.

Geologically, the district can be divided into two major groups, i.e. unconsolidated deposits comprising alluvial deposits of Sub-Recent to Recent age and semi-consolidated Tertiary deposits of Bhaban, Bokabil, Girujan/ Tipam, Dupitila and Dihing formations of Miocene to Pliocene age. The alluvial deposits containing in the central parts mainly comprises of sand, silt and clay with gravel and occasional coal bands. The semi-consolidated rocks are exposed in the form of hillocks comprising shale, sandstone, ferruginous sandstone, mottle clay, pebble bed and boulder beds etc.

Ground water occurs in phreatic condition in shallow aquifer and in semi-confined condition in deeper aquifer. Flow of ground water is from the North to South in northern parts and from South to North in southern parts of the district. The area mostly represents a water logged area. The pre-monsoon water level is 1.05 m bgl while the post-monsoon water level is 1.62 m bgl. There is no significant decline observed in long term trends. The water level fluctuation in general is less than 1.00 m. However, in fringe areas of Mohanpur, Srikona, Rangpur, Kashipur and Rajabazar, it ranges from 4.41 to 6.96 m.

From quality point of view, the ground water in Cachar district is suitable for domestic, irrigation and industrial uses except for some isolated areas where high concentration of iron is observed.

The estimated Annual replenishable ground water resources are 2239.21 mcm against net annual ground water draft of 32.65 mcm. The projected demand for domestic and industrial use of ground water upto 2025 is only 52.46 mcm. The stage of ground water development in the district is only 2%.

The present ground water utilization is mainly for domestic uses. As per record, only 1 scheme with ground water is operated which irrigates 12 ha of land in Rabi and 10 ha land in Kharif season. Public Health Engineering Department, Govt. of Assam has constructed so many shallow and medium tubewells in the district for rural water supply.

2.0 Rainfall and Climate

The district receives heavy annual rainfall of the tune of 3,874.5 mm. The maximum rainfall occurs during monsoon period between May to August. The district experiences a sub-tropical and humid climate. The temperature varies from 12^0C in winter to 35^0C in summer. The humidity varies from 32% to maximum of 98% during July and October.

3.0 Geomorphology and Soil Type

The area consists of resistant structural hills in the borders with an elongated valley in the central part. The general trend of the hills is NE-SW. Structural features like hog's back and steep escarpments are commonly present. The valley area comprises of low land with swamps and alluvial flat land. The southern part has number of field depressions and these are permanent water bodies commonly known as 'beel'.

The soil of the district varies from alluvial to lateritic in nature. Texture is generally clayey loam to clay. The pH ranges from 4.5 to 6.0. The river line tracts are found to be loamy to sandy loamy in nature. The hilly tracts are covered by lateritic soil.

4.0 Ground Water Scenario

4.1 Hydrogeology

The entire area of Cachar district is represented by i) unconsolidated, ii) semi-consolidated and iii) consolidated (Compact formation of Tertiary) formations and these units are as follows.

1) Very compact formations comprising the Surma and Dihing series of rocks,
2) Semi-consolidated rocks comprising Tipam and Dupitila formations, and
3) Unconsolidated formation of alluvial deposits.

The semi-consolidated Tipam sandstones form good repository in the area. The depth to water level varies from a few metre to 4 m bgl in alluvial sediments particularly in north and south of Silchar and in western parts while it varies from a few metre to 2 m bgl in the central parts. The hydraulic gradient of ground water is from North to South in northern parts and ground water flows from South to North-West in southern parts. The static water level in shallow aquifers (within 5 m) is within 1.3 to 4.0 m bgl in the North of the Barak River and it varies from 1.8 to 2.22 m bgl in southern parts. Discharge of tube well varies from 5.5 to 8 m^3/hr with drawdown of 6.0 m. The storativity value varies from 8.8×10^{-4} to 4.14×10^{-3}. The hydraulic conductivity is low in Badribasti area and ranges between 6.1 to 45.23 m/day in the district.

In the deeper aquifer, the granular zone occurs below a confining layer of clay, thus it is a confined aquifer. The static water level ranges from 1.92 to 6.88 m bgl in northern parts and from 0.50 to 8.50 m bgl in the southern parts of the River Barak. The yield of the tube well varies from 33 to 88 m^3/hr with drawdown varying between 9.9 to 32.65 m.

The water level fluctuation, in general, is less than 1 m, however, in places like Mohanpur, Srikona, Kashipur, Rajabazar etc. it is from 4.52 to 7.0 m. In the central parts of the district around Dholai, Palanghat etc. it is only 0.20 m indicating low fluctuation in fine grained deposits.

4.2 Ground Water Resources

Methodology adopted for ground water resource estimation of Cachar District of Assam is as per GEC 1997 Report, i.e. Ground Water Level Fluctuation and Rainfall infiltration factor Method.

The net ground water availability estimated in the year 2009 is 1020.02 mcm. The existing gross ground water draft 39.21 mcm and the stages of development are 4% only. Future provision for domestic and Industrial use is 52.46 mcm and for Irrigation use is 966.99 mcm.

Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Cachar district stage of ground water development is 4%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE.

Ground Water Quality

From the quality point of view, ground water attains its suitability for drinking as well as irrigation purposes. Ground water is slightly alkaline in nature (pH: 7.2-8.6) with Electrical conductivity value of 160-630 Micromhos/cm at 25^0C indicating that it is suitable for all purposes. The other constituents like Chloride (14-67 ppm), Nitrate (0.4-10.2 ppm), Sulphate (20-280 ppm), Calcium (25-160 ppm), Magnesium (10-70 ppm), total hardness (TH: 40-185), Potassium (0.4-7 ppm), Silica (3.6-28 ppm) are present within permissible limit for use in different purposes. The Fluoride (F) content in ground water is detected in trace condition in the water samples.

The presence of Arsenic is not reported from the district and further detail survey and analysis of water samples for Arsenic as well as Fluoride will reveal the fact.

Out of the water samples collected for analysis in Cachar district, 43% of samples show higher concentration of Iron beyond its permissible limit of 1 ppm. The iron content in the district varies from 0.05 to as much as 5 ppm and the higher concentration is noticed in Kabaganj, Ujjan, Tarapur, Paila pool, Sadin bazaar, Dayapur, Dwarbond, Panibhora, Rangpur, Phatimora, Chandighat T.G. and Durgakona areas. The high iron content impairs the colour and taste of ground water and adversely affects its use for domestic purposes.

Iron concentration in deeper aquifers is comparatively much lower than the shallow aquifers and it ranges from 0.3 ppm to 1.3 ppm.

4.3 Status of Ground Water Development

It has been observed that the ground water development in the district is only 2% against the availability of ground water resources in the tune of 2,239 mcm. There is almost no deep tube well scheme for irrigation purposes. The only utilization of ground water is through shallow tube well (50 m depth) and deep tube wells for water supply in the district.

The alluvial deposit comprising sand, clay, silt with occasional gravel has a good thickness in the central part of the district. The deep tube wells constructed by C.G.W.B. reveal medium thick aquifer zones intercalated with clay bands down to depth of 300 m. These tube wells have medium yields up to 88 m^3/hr. Because of fine nature of the aquifer materials, sand rushing to the well screen reduces the ultimate yield of the tube well.

Shallow tube wells down to 50 m depth are feasible in the fringe areas where the alluvial patch thins out and area is dominated by semi-consolidated Dupitila and Tipam rocks. The maximum discharge of such tube wells is up to 8 m^3/hr. Such tube wells tapping clean aquifer zones are feasible in the low lying mounds and hills dominated by young Tertiary rocks.

Dug wells are less feasible in the alluvial plains of the district. The silty and clayey nature of the shallow aquifer zones tapped by dug wells can not yield much and as a result, heavy drawdown resulting complete dryness of the zone. The dug wells are however, feasible in low mounds and hills of Tertiary rocks surrounding the plain and in fractures of the hard rocks. At the base of Tipam hills, such dug wells maintain constant water level throughout the year as observed in field.

The district is represented by depressions in its western and central parts resulting water logged conditions. Some of such structures are permanent water bodies known as ‘beel’. Because of clayey nature of the superficial layers and seepages from the surrounding hills, the surface sustains the water and prevents percolation to underground aquifers.

The frequent flood in the district spoils the quality of soil resulting water logging. Presently, this problem of water logging in the district creates hazards for irrigation of land during cultivation.

5.0 Ground Water Management Strategy

Ground water resource is mainly utilized for drinking purposes. It has little industrial use as there is no major industry in the district. Dug well of 10 to 15 m depth and shallow tube well (STW) can be constructed along the fringe area of the district.

Deep tube well of 300 m depth or more can be constructed in the alluvial plains of the district. The aquifer zones should be selected properly with the help of electrical logging device. Proper gravel packing should be done with 2 to 4 mm dia gravel and thickness of gravel pack should be minimum 4″ to avoid sand rushing. Optimum use of the tube well should be ascertained to avoid probable hazards.

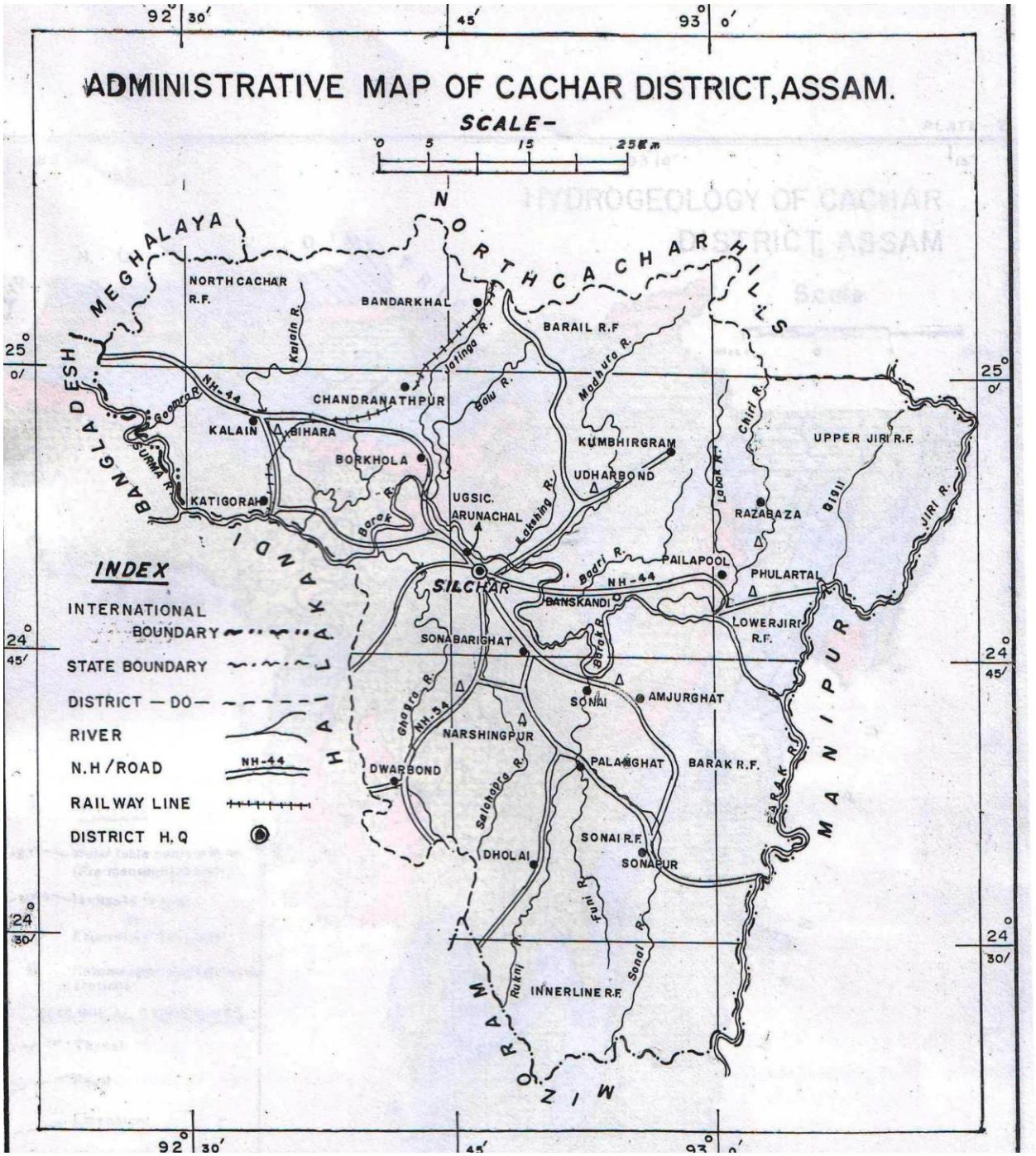
It is known that the area receives a high amount of rainfall throughout the year. Rain water harvesting should be adopted to augment ground water resources. Proper planning of available ground water resource, available surface water and rain water harvesting may lead to overall development of the district with respect to water management.

6.0 Ground Water Related Issues and Problems

Frequent flood with heavy rainfall affects the soil condition of the district resulting water logging. As the River Barak flows at higher altitude, generally, water in the plains is not drained out. The soil being clayey in nature does not allow the surface water to infiltrate below. The problem for high iron content in water can be reduced by aeration as adopted by some agencies.

7.0 Recommendations

The use of ground water is in nascent stage against vast occurrence of resources in the district. This resource can be utilized by constructing dug wells and shallow tube wells in the suitable locales depending upon hydrogeological situations. Deep tube wells may be constructed in the alluvium of the district and optimum discharge of the tube well may be maintained. Conjunctive use of both surface and ground water may be adopted. Rain water harvesting is encouraged to augment ground water resources.


ADMINISTRATIVE MAP OF CACHAR DISTRICT, ASSAM.
SCALE-
0 5 15 25 Km
92° 30'
45'
93° 0'
25° 0'
24° 45'
24° 30'
N
MEGHALAYA
NORTH CACHAR R.F.
BANDARKHAL
NORTH CACHAR HILLS
BARAIL R.F
Kusiyara R.
Jatinga R.
Madhura R.
Chiri R.
Lobak R.
BANGLADESH
NH-44
Goamra R.
CHANDRANATHPUR
Balu R.
KALAIN
BIHARA
KUMBHIRGRAM
UPPER JIRI R.F.
BORKHOLA
UDHARBOND
Surma R.
KATIGORAH
Barak R.
UGSIC.
ARUNACHAL
Lakshing R.
RAZABAZA
Bigli
JIRI R.
INDIA
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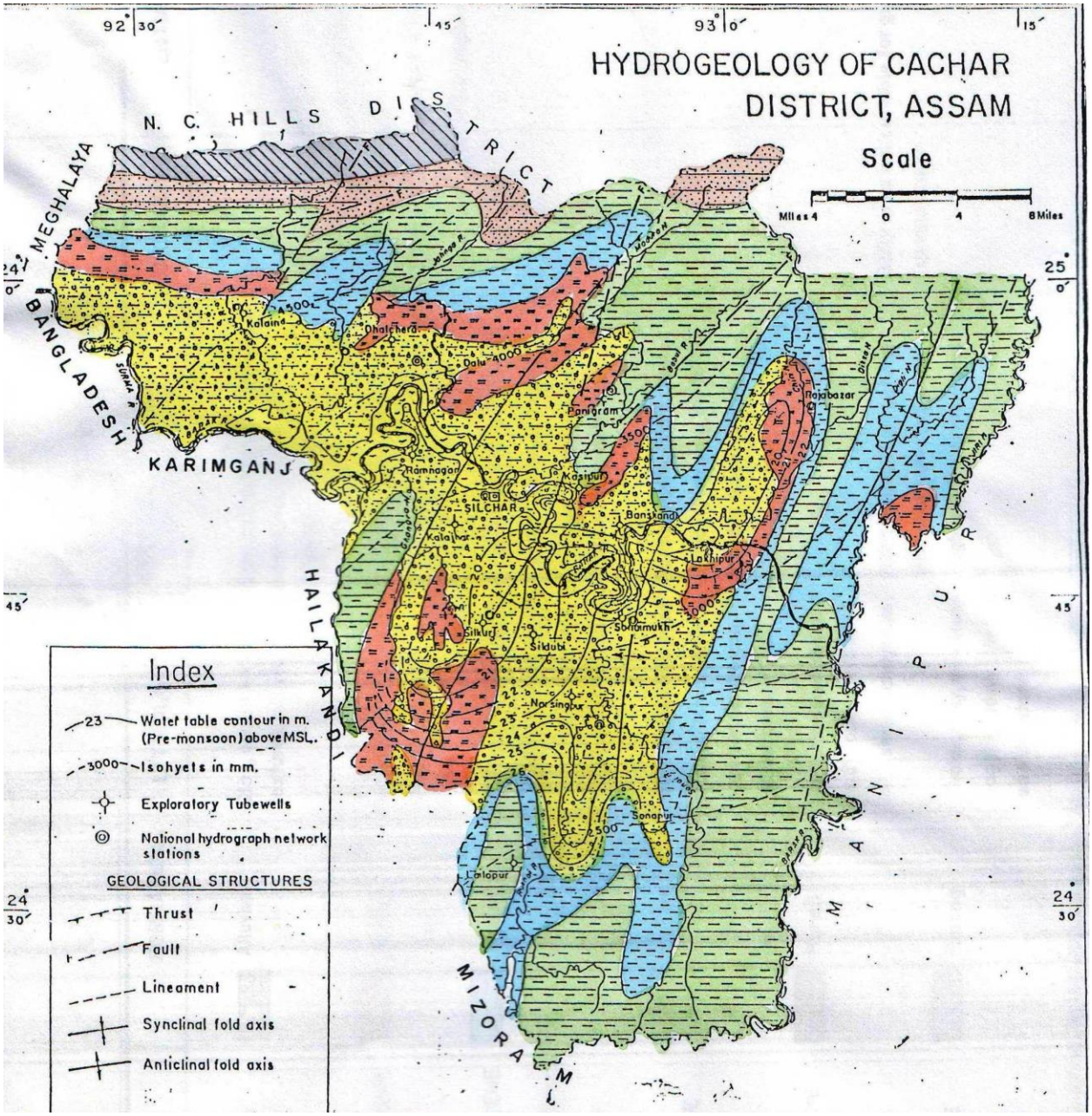
INTERNATIONAL BOUNDARY
STATE BOUNDARY
DISTRICT — DO —
RIVER
N.H/ROAD
NH-44
RAILWAY LINE
DISTRICT H.Q
SILCHAR
Bagri R.
PAILAPOOL
PHULARTAL
NH-44
BANSKANDI
LOWERJIRI R.F.
SONABARIGHAT
Barak R.
Ghagra R.
NH-54
SONAI
AMJURGHAT
NARSHINGPUR
PALAGHAT
BARAK R.F.
DWARBOND
Sailchapra R.
BARAK R.
MANIPUR
SONAI R.F.
SONAPUR
DHOLAI
Tuni R.
Rukni R.
Sonai R.
INNERLINE R.F.
MIZORAM


HYDROGEOLOGY OF CACHAR DISTRICT, ASSAM
Scale
Miles 4 0 4 8 Miles
92° 30'
45'
93° 0'
15'
25° 0'
24° 30'
N. C. HILLS DISTRICT
MEGHALAYA
BANGLADESH
KARIMGANJ
HAILAKANDI
MANIPUR
MIZORAM
SILCHAR
Kalaincherra
Dholcherra
Dalu
Panigram
Ramnagar
Kasipur
Kalaihar
Bansland
Lakhipur
Sibrimukh
Silkuri
Sildubi
Narsingpur
Sonapur
Lalapur
Rajabazar
Jatinga R.
Jadukata R.
Barak R.
Sonai R.
Dhaleswari R.
Index
23 Water table contour in m. (Pre-monsoon) above MSL.
3000 Isohyets in mm.
Exploratory Tubewells
National hydrograph network stations
GEOLOGICAL STRUCTURES
Thrust
Fault
Lineament
Synclinal fold axis
Anticlinal fold axis

Legend

AGE	FORMATIONS	LITHOLOGY	GEOMORPH OLOGICAL CHARACTERS	GROUND WATER POTENTIALS
HOLOCENE	Alluvium	Clay, sand of various fextures and silts.	Synclinal valleys, structurally controlled, occasionally flooded.	Moderate to thick and discontinuous semi-confined to confined aquifer. Development limited to synclinal tectonic and intermontane valleys. Tubewells 270m deep yield upto 100 m^3/hr. higher drawdown upto 25 m.
MIO-PLIOCENE	Dupitila	Mottled clay, ferruginous sandstone, conglomerates	Undulating plain with lowlying flat topped mounds, narrow to wide valleys	
MID-MIOCENE	Tipam	Medium to fine grained feldspathic, ferruginious friable sandstone, Well sorted, mottled clay.	Closely paralled round topped serrated residual ridges, lowlying, highly dissected hills with steep valleys.	
LOWER MIOCENE	Surma	Alternating shale, mudstone, siltstone, ferruginous sandstone, conglomerates.	Resistant hills, sharp crested including lowlying, moderate to highly dissected	
OLIGOCENE	Barail	Hard, massive beded sandstone interbeded with shale, sandyshale	Hard resistant, structural hills, sharp crested and hogbacks, highly dissected	Hilly area not suitable for groundwater development.
EOCENE	Disang	Shales, grey, sandstone flaggy grading in to bedded sandstone.		