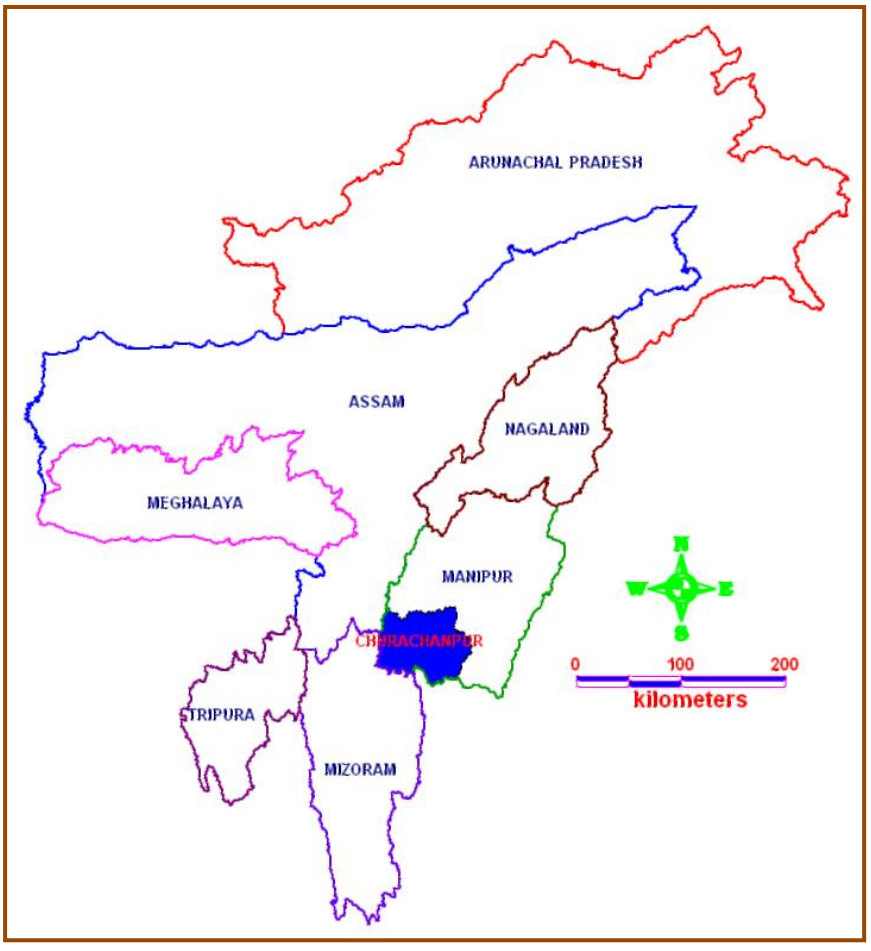
Technical Report Series: D

No: 26/2013-14

Ground Water Information Booklet
Churachandpur District, Manipur



Central Ground Water Board
North Eastern Region
Ministry of Water Resources
Guwahati
September 2013

GROUND WATER INFORMATION BOOKLET
CHURACHANDPUR DISTRICT, MANIPUR

DISTRICT AT AGLANCE

Sl. No.	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical Area (sq. km.)	4,570 (North latitudes 23^0 56' 20.4″ and 24^0 36 ' 46.8″ and East longitudes 92^0 58' 12″ & 93^0 52' 58.8″)
	ii) Administrative Division (as on 31 March 2013) Number of Tehsil/CD Block Number of Panchayat/Village	5 Sub-Divisions, 5 65
	iii) Population (as per 2011 Census)	2,71,274
	iv) Annual Rainfall (mm)	597 mm (Geljang) – 3,080 mm (Tinsong). High intensity of rainfall is observed in the hilly areas.
2	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Mainly hilly district with a very small percentage of the area being plain. Kumotia, Jiyadhoal, Kanibil, Simen, Somkhong and Royang Rivers
3	LAND USE (sq.km) i) Forest Area ii) Net Area Sown iii) Cultivable Area iv)Waste Land	Agricultural land is mainly distributed in the valley plains, piedmonts and pediments; covers the largest land use category in the valley area. 4067 (Secondary forest) 293.23(Jhum) 174.70 984.24
4	MAJOR SOIL TYPES	Residual and Transported type of soils.
5	AREA UNDER PRINCIPAL CROPS (sq.km.)	161.3
6	IRRIGATION BY DIFFERENT SOURCES a)Surface Water b)Ground Water	 Not Available
7	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (as on 31-03-2013) : Dug Wells	01 dug well (alluvium) & 01 Piezometer (sandstone) in the valley area. Prior to 1991, these wells were regularly monitored by CGWB, but **no monitoring has been carried out since 1991 due to deterioration of law and order situation.**

8	PREDOMINANT GEOLOGICAL FORMATIONS	Splintery shale interbedded with siltstone, sandstone of Disang Group, sandstone, shale of Barail Group, alternations of sandstone, sandy shale, siltstone & mudstone of Surma Group. Alluvium consisting of clay, silt and loam occur in a small area in Churachandpur.
9	HYDROGEOLOGY i) Major Water Bearing Formations	Central valley is underlain by thin veneer of alluvial deposits and underlain by semi-consolidated rocks of Tertiary age. Since, the upper formation is silty and clayey, open wells have poor yield prospects. Tertiary rocks consisting of shale, siltstone, shaly sandstone and shaly siltstone with moderately thick unconfined to semi-confined aquifers of sandstone and shale. The Tertiary rocks are overlain by alluvium formations of about 10 m thick. Drinking water is supplied from springs, streams and limited dug wells in the valley areas.
	ii) Pre-monsoon Depth to Water Level (Existing water level data of CGWB)	3 - 4 mbgl
	iii) Post-monsoon Depth to Water (Existing water level data of CGWB)	1.5 - 2 mbgl
	iv) Long term Water Level Trend in 20 yrs (1987 –2006) in m/yr	Rise: 0.06
10.	Ground Water Exploration by CGWB as on 31.03.2013 i) No. of wells drilled ii) Depth range in m iii) Discharge in lps iv) Transmissivity (m^2/day)	No exploration activities of CGWB in Manipur since 1991 due to disturbed law & order situation. Existing EW data are i. 2 wells (one well abandoned) ii. 68.0 – 78.0 iii. 0.55-3.5, Drawdown, 10.0-18.25 m iv. 7.68
11	GROUND WATER QUALITY i) Presence of Chemical Constituents more than Permissible Limit (e.g. EC, F, Fe, As) ii) Type of Water	Ground water is suitable for all purposes. i) No chemical constituents is found more than permissible limit. Good
12	DYANMIC GROUND WATER RESOURCES (as on March 2009) in **mcm** GEC'97 i) Annual Replenishable GW Resources ii) Net Annual Ground Water Draft iii) Projected Demand for Domestic and Industrial uses up to 2025 iv) Stage of Ground Water Development	Area considered for computation of Dynamic Ground Water Resources is 20000 hectares (where slope is greater than 20%). i) 35.48 ii) 0.85 iii) 4.88 iv) 3.0 %

13	AWARENESS AND TRAINING ACTIVITY i) Mass Awareness Programmes Organized ii) Date iv) Place v) No of Participants	 Nil
14	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i)Projects Completed by CGWB (No & amount spent) ii)Projects Under technical Guidance of CGWB (Numbers)	 Nil Nil
15	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	There is no ground water problem.

GROUND WATER INFORMATION BOOKLET CHURACHANDPUR DISTRICT, MANIPUR

1.0 Introduction

In 1972, Manipur state was divided into five districts namely Central, West, East, North and South districts. The Central district comprised the whole of the Imphal Valley and Jiribam Sub-Division. In the 1980s, it was further divided into the three valley districts of Imphal, Bishenupur and Thoubal. The East, West, North and South districts later became the hill districts of Ukhrul, Tamenglong, Senapati and Churachandpur district respectively. A fifth hill district, Chandel, was carved out from the erstwhile East and South districts. These five are the homes to twenty-nine (29) recognized Scheduled Tribes of Manipur. Among the hill districts, the fastest growing district headquarters and hill-town is that of Churachandpur. All the communities of Manipur live happily in small but noticeable sizes amongst the more populous tribal folk belonging to Chin, Kuki, Mizo, Naga and Zomi ethnic groups - a mosaic of tribes, well laid out and glowing with life.

Churachandpur District, in the southwestern corner of Manipur, has an area of 4,570 sq. km. It is bounded by North latitudes 23^0 56' 20.4″ and 24^0 36 ' 46.8″ and East longitudes 92^0 58' 12″ & 93^0 52' 58.8″. It is a hilly district with a very small percentage of the plain area. It is bounded by Burma in the South, Mizoram in the West & South West, Bishenpur district in the North, Tamenglong district in the West and Thoubal district in the East. The total population of the district as per 2011 census is 2, 71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung (Plate-1).

The district is connected by two major roads, one trending N-S passing through Churachandpur by connecting Imphal and Burma and the other trending E-W connecting Churachandpur with Tipaimukh in the West.

As per the study of 1994-95 satellite imagery, the total built up area is 6,726 ha (Urban - 585 ha and Rural - 6,141 ha) and the cropland area is 9,928 ha. A large portion of the area is either under current ‘jhum’ or abandoned ‘jhum’ i.e. 29,323 ha and 190,447 ha respectively. There is no primary forest in the district and the secondary forest including

mixed bamboo forest, covers an area of 1, 18,092 ha. The area under wasteland is 98,424 ha and the total area of the water bodies is 2,144 ha (2,072 ha of river/streams and 72 ha of lakes/tanks/ponds). The road network covers an area of 3,581 ha located in and around the district headquarters.

2.0 Physiography and Drainage

Major parts of the district are occupied by rugged hills constituting parts of the southern extension of Naga Hill ranges, with their elevation ranging from 350 to 1,950 m above mean sea level (AMSL). Of the total geographical area of 4,570 sq. km. of the district, about 5.57%, i.e. 255 sq. km. is the valley portion. A small and narrow valley adjoining Churachandpur having an areal extent of 200 sq. km. is present through which the Khuga River, a tributary of Manipur River is flowing towards northern direction. This valley actually forms the southern extension of Manipur valley and is locally known as Khuga valley. In addition, small valley areas are seen around Beheng, Leizangphei and Tuilaphai.

The area is mainly drained by the tributaries viz. Khuga, Tuila, Tuili, Leimatak, Tuivai and Barak of Manipur River. Leimatak River and Tuipuilui River, tributaries of Irang River flow towards northerly direction, while the rest of the rivers flow in general southerly direction. Most of these river-courses are structurally controlled and are parallel to sub-parallel with one another, generally flowing in the direction of NNE-SSW. Dendritic to parallel drainage pattern is also noticed in the district.

3.0Rainfall and Climate

The highest rainfall is 3,080 mm recorded at Tinsong and the lowest is 597 mm recorded at Geljang. The maximum humidity is 100% and the minimum is 61%. The beauty of the landscape is supplemented by the climate which is temperate and salubrious. The maximum temperature is 37^0 C while the minimum is 1^0 C. The winter extending from November to February is cold, particularly in the hills but days are bright and sunny. The monsoon months stretch from May-June to September with heavy showers almost throughout the period. The spring and summer months are mildly pleasant despite high humidity. However, the low temperature (ranging from 30 - 35^0 C) prevents sultriness that

is so common in Eastern India. The climate imparts the people with considerable stamina and hardiness through the lack of rains during non- monsoon months and the consequent decline in water flow in the major rivers during that period make the state a mono-crop economy.

4.0 Geomorphology and Soil Types

Information on landforms is an important input for land management and identification of potential zones of groundwater occurrence. Valley portion exists in central area. It is virtually a flat alluvium filled valley. The Valley is surrounded in all sides by hill ranges of denudo-structural hills trending NNE-SSW direction. A number of isolated hillocks of denudational remnants are found within the valley. Imphal River and its major tributaries are main drainage of the valley. These rivers have a nearly NNE-SSW trend concurring with the regional structural trend. This central valley portion is a part of Manipur Valley which is made up of alluvium of fluvio-lacustrine origin. These are usually dark grey to black in colour. The principal constituents are clay, silt and sand whereas sand, gravel, pebbles and boulders are found in the foothill regions. The hillocks inside the valley are basically composed of Disang shales but some have sandstone capping on the eastern side of the valley. These cappings are mainly Barails and occur in the form of outliers. Very steep slope class occupies the major portion of the study area in the upper catchments area. It definitely accelerates the speed of the various streams and rivers and hence, streams and rivers become more voluminous during rainy season and erosion capacity becomes more and as a result, more sediment loads pass through the drainage system. The area falls within a high seismic zone along the regional Churachandpur-Mao Thrust (CMT) situated west of the Indo-Myanmar subduction zone.

Residual and transported types of soils have been observed in this area. The residual types of soils are occurring mainly in the hilly regions. The soils are deficient in nitrogen, in general, it contains fair amount of phosphorous, potassium and other nutrients for plant. The soils of both valley and hill regions are acidic in nature. Sandy and clay loams are found to occur in some parts of the area. Sandy loams are characterized with less water holding capacity and possess excessive internal drainage while the clay loam soils possess excessive water holding capacity and impede internal drainage.

5.0 Hydrogeomorphological Units

Hydrogeomorphological units (Plate-3) observed in the district area are as follows.

1) Denudo-structural hills
2) Piedmont zone
3) Alluvial plain

Denudo-structural Hills

A group of hill ranges surrounding the valley are formed due to different erosion and weathering processes and most prominently due to the plate kinematics of the Indian and Burmese plates. This zone is characterized by very close space linear strike parallel ridges and intervening narrow valleys, in association with lineaments, fracture, fold patterns, cuestas etc. They trend in NNE-SSW direction. They occupy the major portion of the valley area. Some of the hillocks inside the valley area are also have structural elements; moreover they are oriented in NNE-SSW direction.

Piedmont Zone

Piedmont zone is a gently sloping area situated in between hills and plains which are found on the western sides of the valley, they are however rare in the eastern side. This zone consists of sand, gravel, pebbles and boulders.

Alluvial Plain

Alluvial plain covers small areal extent in the valley, consisting of carbonaceous Clay, silt and sand. Clay forms the main sedimentary constituent.

6.0 Geological Set Up

Table 1 Geological Succession of Rocks Occurring in Churachandpur District

	Tipam Group }	Predominantly coarse grained feruginous sandstone with shale
Miocene		
	Surma Group }	predominantly shale, with alternations of sandstone, siltstone & mudstone
---------- Unconformity ----------		
Oligocene to Lower Eocene	Barail Group }	Sandstone –massive and bedded with abundant carbonaceous material, shale
Lower & Middle Eocene		Sandstone, minor buff coloured shale, grit, conglomerate &Limestone
		Sandstone buff coloured shale & limestone, siliceous
to Upper Cretaceous	Disang Group }	Grey shale with minor mudstone, siltstone, siltstone & sandstone

The regional strike of rock formation is N-S and is found to vary from N 20^{o} E to S 20^{o} W. The rocks have been subjected to a high degree of structural deformations, which have resulted in a number of open & tight folds and also faulting. The rocks exhibit well-developed system of prominent set of joints trending in E-W. They generally show vertical or steep dips.

Disang Group

The Disangs are dark grey to black splintery shales. The term Disang was first introduced by Mallet (1876). They are usually thinly laminated, intercalation of siltstone and fine grained sandstone in the form of lensoids and bands. Based on the nature and litho character, the Disangs are found to be flysch sediments displaying turbidity character at places. Usually, almost all the hillocks within the valley are made up of Disang shale. They are often brown to reddish brown in colour due to weathering. Denudo-structural hills of Disang Group surrounded the valley area in all sides. The rocks belonging to the Disang Group occupy in the eastern part of the district. At places the shale is light brown to grayish brown in colour as seen near Saikot and Tuining. The shale is soft, weathered,

micaceous and friable. On weathering, these give rise to black to dark grey & light reddish brown clay and silt.

Barail Group

The Barails are grey to brownish colour sandstone of fine to medium grain size. The Term, Barail was first coined by Evans (1932). They are greywacke in composition. They are usually alternations of shale and sandstone. The Barail Group of rocks which are predominantly arenaceous in nature occurs in the central part of the district forming mostly hilly terrain. These are found to occur towards west of the old Churachandpur and occur as alternating beds of sandstone, shale and are best exposed along the rock cuttings from Churachandpur to Parbung and from Thinghat to Kangkap. The sandstones are massive light to dark grey, fine grained and occur with alternating beds of shale which are light yellowish brown to brown in colour. Towards west of Pansang village, well developed ripple marks are seen in the shale beds. On weathering, these give rise to light brown to reddish brown and dark grey loamy soil.

Surma Group

Rocks belonging to Surma Group consist of alternations of sandstone, sandy shale, siltstone & mudstone and occur in the western part of the district. The sandstone are massive, fine grained, light grey in colour and are associated with beds of dark grey shale as seen near Jaiso village.

Tipam Group

Tipam Group of rocks consisting of light pink to light brown, fine to medium grained sandstone and occur in parts of western corner of the district covering a small area.

Alluvium

Alluvium covers small areal extent in the valley. These are mainly dark grey to black carbonaceous clay, silt and sand of which clay forms the main sediments while silt and sand are subordinate. Average thickness of the alluvium is very limited and is about 10 m. Along the foothills, sand, gravel and boulder deposits as well as fan deposits are common. Alluvium consisting of clay, silt and loam occur in a small area in Khuga valley towards east of Churachandpur.

7.0 Ground Water Scenario

7.1 Hydrogeology

Major part of the area is underlain by the rocks of the Disang Group consisting of dark grey splintery shale inter-bedded with siltstone and mudstone (Plate-2 & 2A). Rocks of the Barail Group, which are essentially arenaceous, consisting of alternating beds of sandstone and shale, are seen in the western and southern part of the area. As major parts of the district are occupied by hilly terrain with steep slopes covered with thick vegetation, the occurrence of ground water is limited to the weathered portions and the joints & fractures in the underlying rocks which are mainly shale in nature. Ground water occurs under moderately thick but discontinuous confined to semi-confined aquifers. Depth to water level is in the order of 25.2 m bgl. Moderate to poor yield of bore well varies from 15-35 m^3/hr with drawdown of 25-35 m.

Alluvium consisting of dark grey clay, silt and loams occur as a thin patch in the eastern part of the district, i.e. Khuga valley. Here, ground water development has been done to a limited extent by means of constructing dug wells or trenches to collect the water oozing or emanating as the springs. Ground water occurs under moderately thick unconfined to semi-confined multilayered aquifers. The yield prospect is moderate ranging from 10-30 m^3/hr with drawdown of 10-15 m. Most of the springs have very less discharges. Usually, water is found to be oozing or occurring as spring from the escarpment face on the hill slopes and is allowed to be collected in small pits or trenches cut near them. The water thus collected is used for domestic requirements.

Development of ground water is limited in this area. Most of the villagers depend on water from the rivers, streams and springs for their domestic requirements. A few wells of very shallow depth tapping the water table aquifer are present in the area. These are generally located in topographically low areas and at places, on the beds of stream itself. The dug wells are very shallow and mostly act as surface reservoirs are located on beds of streams. These are found to contain a little quantity of water (probably taping base flow) though the stream is dry.

National Hydrograph Stations of CGWB in Churachandpur district that were regularly monitored prior to 1991. **No monitoring work has been carried out since 1991 due to disturbed law and order situation in the state.**

7.2 Ground Water Resources

Computation of Dynamic Ground Water Resources of Churachandpur district has been carried out in the district as per GEC '97 as on March 2009. **The Administrative district has been considered as the Assessment Unit due to paucity of block –wise data.** Area considered for computation of Dynamic Ground Water Resources in the district is 20000 hectares (i.e. the valley part of the district where slope is within 20%).

Annual Replenishable Ground Water Resources is 35.48 mcm. Net Annual Ground Water Draft is 0.85 mcm. Projected Demand for Domestic and Industrial Use up to 2025 is 4.88 mcm. Stage of Ground Water Development estimated is 3.0% which is under the 'Safe' category.

7.3 Ground Water Quality

The result of the chemical analysis of water sample collected from the nearby existing shallow dug well shows that ground water is generally suitable for all purposes with pH value 6.8. The EC value is found to be 424.3 µS/cm at 25^{o}C and the TDS value recorded is 272 ppm which indicates that ground water is safe for drinking purpose. The concentration of iron (Fe) and arsenic (As) are 0.66 ppm and 0.0089 ppm respectively and so, it is within the permissible limit.

7.4 Ground Water Management Strategy

The utilization of ground water resources by means of ground water abstraction structures like dug wells, shallow tube wells etc. is very rare in the area. The areas have possibility of development of ground water through large diameter dug wells. The valley portion is underlain by silty alluvium of about 8 to 10 m thick with low permeability value. A dug well with about 6 m diameter and 15 to 20 m depth tapping about 4 to 5 m saturated granular zone may yield about 3 lps (10.8 m^3/hr). Large diameter dug well can be constructed in the central valley portion on trial basis. Ground water availability is quite substantial to sustain wells.

8.0 Ground Water Related Issues and Problems

As such, there is no ground water related issues in the area. Flood is a primary natural hazard in the area during monsoon season damaging the crops and properties of the people. Flash flood occurred almost every year during rainy season due to poor drainage

condition. The primary causes of flood particularly in the valley are heavy runoff and less infiltration in degraded watersheds in the upper reaches of the rivers during rainy seasons.

9.0 Recommendations

The area constituting a small portion in southeastern part of the main valley and is geologically occupied by rocks of Tertiary age, consisting of shale, siltstone, shaly sandstone and shaly siltstone with moderately thick unconfined to semi-confined aquifers of sandstone and shale. The Tertiary rock is overlain by alluvium formations of about 10 m thick.

Based on the local topographical setting, drainage pattern, geological and hydrogeological settings and the performance of the nearby existing ground water abstraction structures, construction of Dug Well, Dug cum Bore Wells are recommended for construction as abstraction structures in the area with the following specifications.

Dug Well down to a depth of 15 to 20 m bgl with diameter of 4 to 6 m is recommended. This may be followed by construction of a Bore well down to a depth of 75 m. Drilling should be carried out by deploying DTH Rig using 8"/6" size bit. Extreme care may be taken due to occurrence of splintery shale in the geological formations likely to be encountered at/after 25 m depth.

The water of the well needs to be treated for iron (Fe) and other suspended particles before being used for domestic purposes.

Construction of check dams in the junction of valley and plain areas at suitable places is recommended. This will regulate inflow of water in the rivers; this will also check siltation/sedimentation in the river courses. Careful action viz. contour bandhs, subsurface dykes, gully plugging, terracing may be taken up whenever suitable.

Plate -1

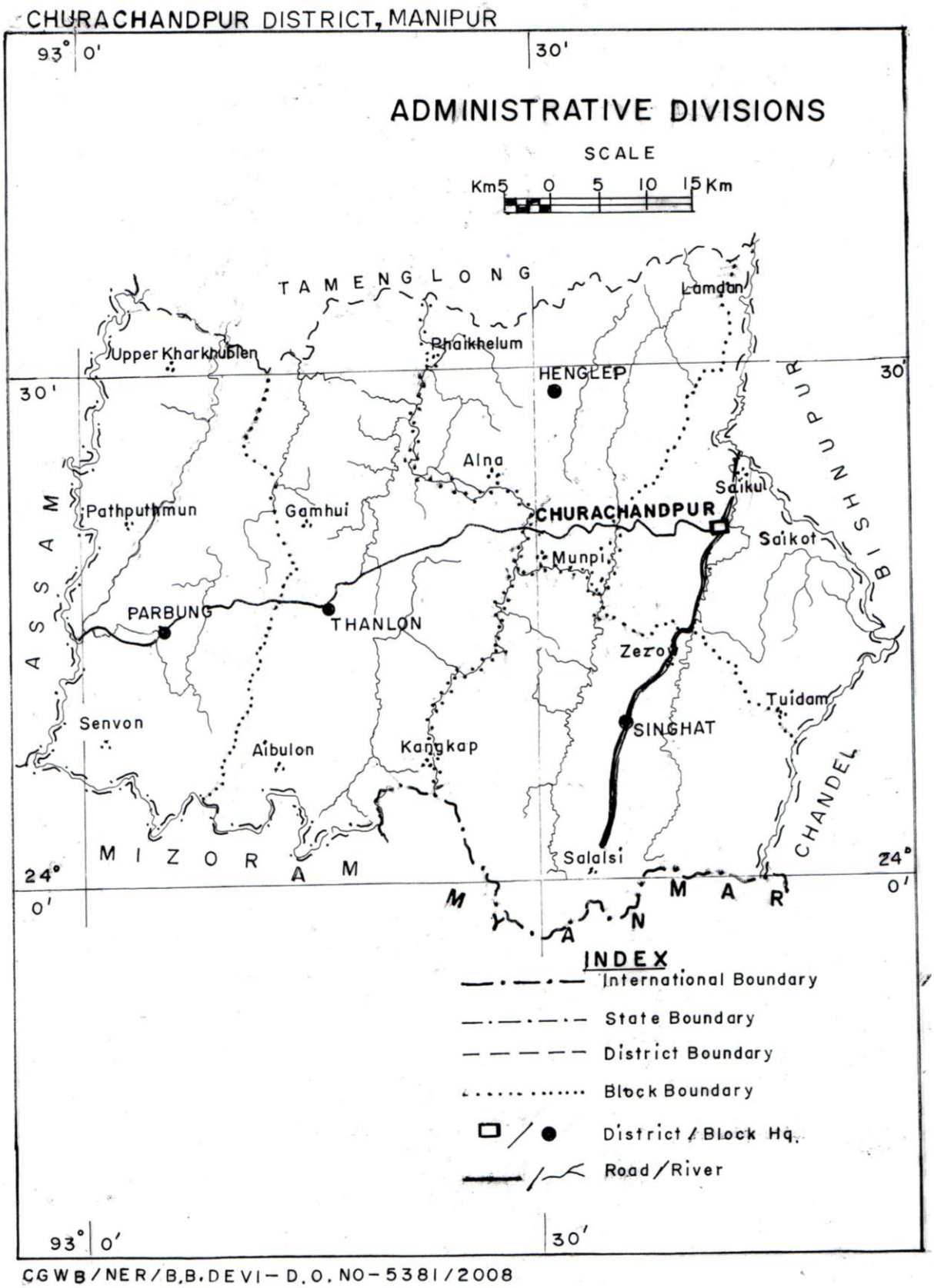


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Plate -2

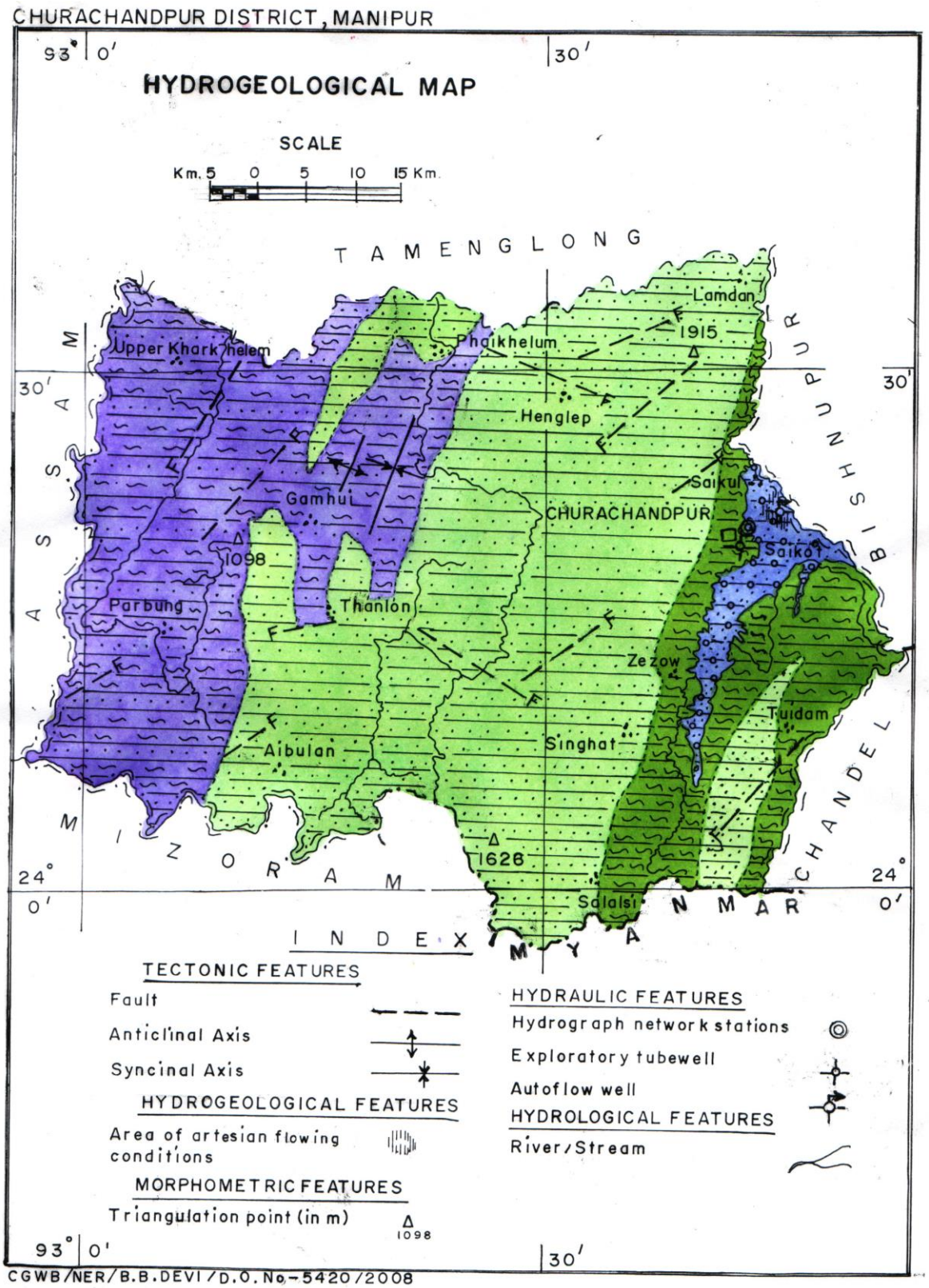

CHURACHANDPUR DISTRICT, MANIPUR
HYDROGEOLOGICAL MAP
SCALE
Km. 5 0 5 10 15 Km.
93° 0'
30'
24° 0'
TAMENGLONG
Lamdan
1915
Phaikhelum
Upper Kharkhalem
Henglep
Saikul
CHURACHANDPUR
Saiko
Gamhui
1098
Parbung
Thanlon
Zezow
Tuidam
Singhat
Aibulan
1626
Salalsi
BISHNUPUR
CHANDEL
ASSAM
MIZORAM
MYANMAR
INDEX
TECTONIC FEATURES
Fault
Anticlinal Axis
Syncinal Axis
HYDROGEOLOGICAL FEATURES
Area of artesian flowing conditions
MORPHOMETRIC FEATURES
Triangulation point (in m)
HYDRAULIC FEATURES
Hydrograph network stations
Exploratory tubewell
Autoflow well
HYDROLOGICAL FEATURES
River/Stream
CGWB/NER/B.B.DEVI/D.O.No-5420/2008

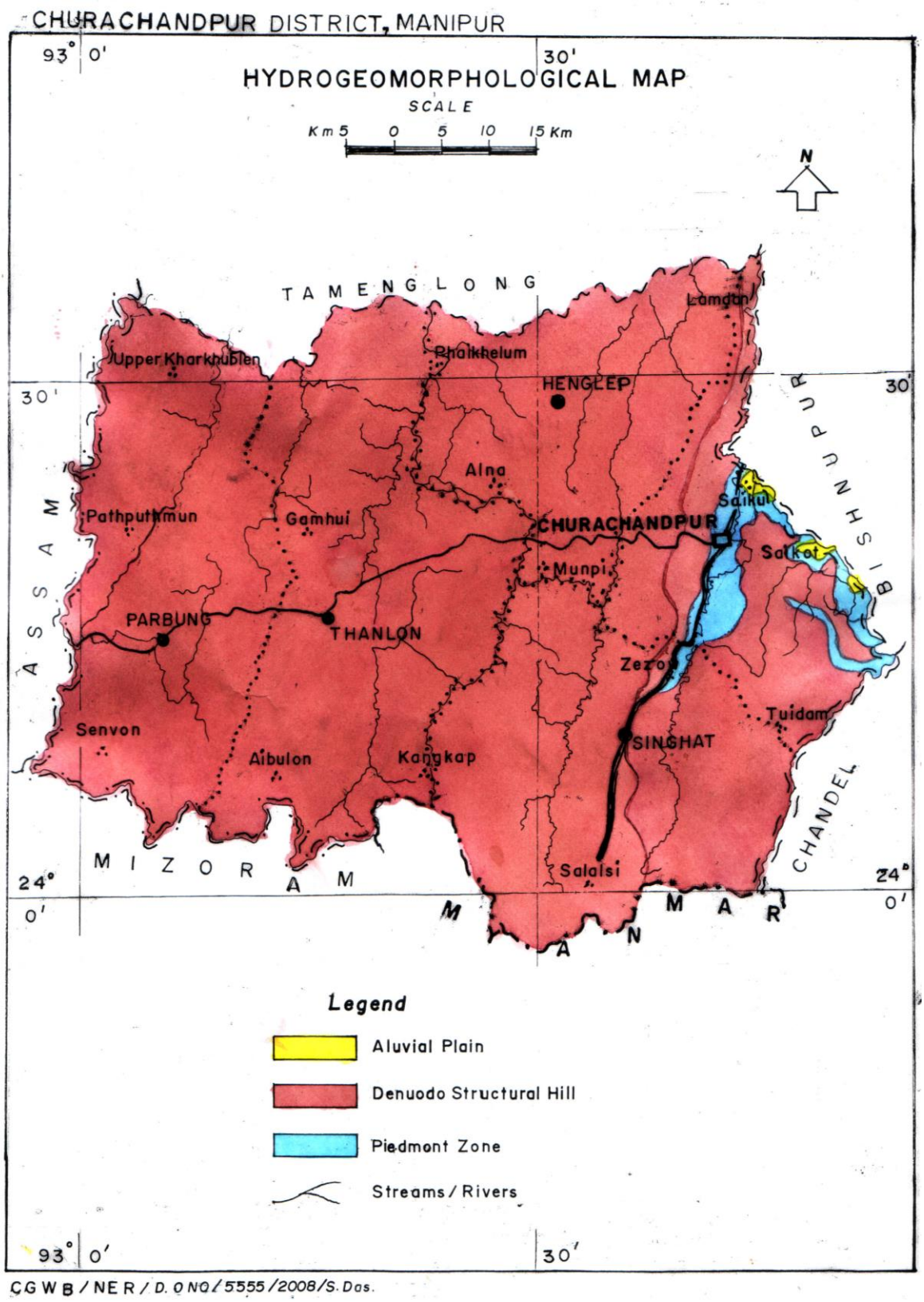
Plate -2A

CHURACHANDPUR DISTRICT, MANIPUR

LEGEND

	AGE	FORMATION	LITHOLOGY		HYDROGEOLOGICAL CONDITION	GROUND WATER PROSPECTS	
UN-CONSOLIDATED	QUATERNARY	Recent Alluvium	Sand, gravel, pebles, silt and clay.		Moderately thick unconfined to semi-confined multilayered aquifer system within the drilled depth of 100 m.	Moderate yield prospects of 10-30 m^3/hr. at 10-15 m drawdown	
SEMI-CONSOLIDATED	LOWER MIOCENE	Surma	Shale, siltstone, sandstone, and conglomerate		Moderately thick but discontinuous confined to semi-confined aquifers within the drilled depth of 250 m	Moderate to poor yield prospects of 15-35 m^3/hr at 25-35 m drawdown.	
	OLIGOCENE	Barail	Bedded sandstone intercalated with hard shale and massive sandstone		Ground water restricted to secondary porosity in weathered residuam, joints, fractures and fissures.	Mostly run-off zone Low yield prospects restricted to intermontane valleys.	
	EOCENE	Disang	Hard and compact sandstone, shale and limestone.				

Plate -3



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