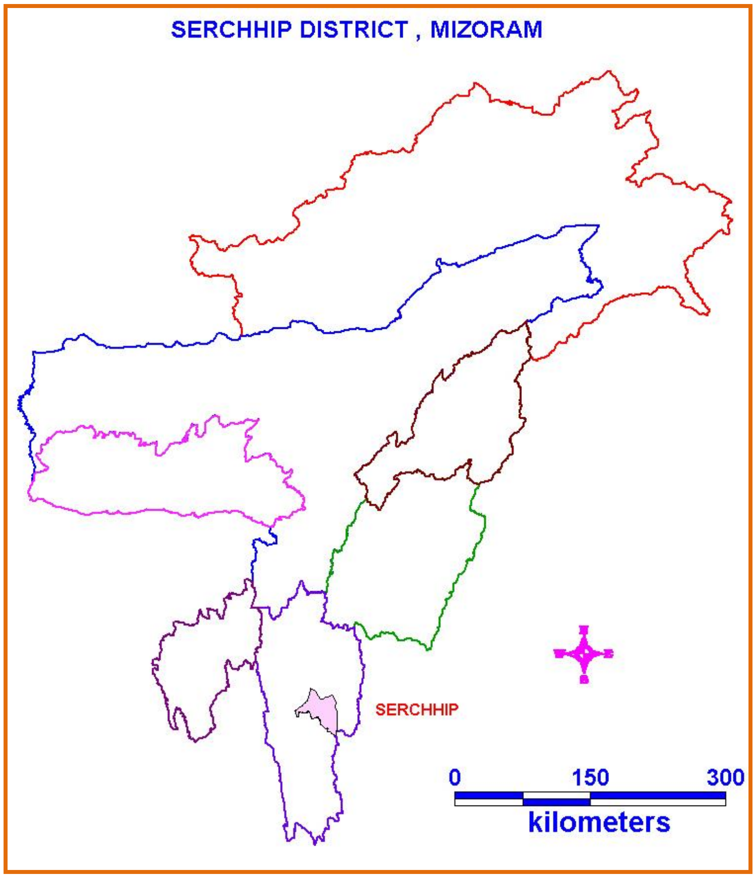
Technical Report Series: D

Ground Water Information Booklet
Serchhip District, Mizoram



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

GROUND WATER INFORMATION BOOKLET
SERCHHIP DISTRICT, MIZORAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical Area (sq.km.)	1,421.60
	ii) Administrative Division (as on 2013) Number of Tehsil /CD Block Number of Panchayat/Village	 Two Blocks
	iii) Population (as on 2011 Census)	64875
	iv) Average Annual Rainfall (mm)	1486.5 (As on 2009)
2	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	Denudo Structural Hills with moderate linear ridges, Moderate hills and limited valley fills. Tlawng or Dhaleswari River and Tuichang River with its tributaries.
3	LAND USE	Mostly Jhum / Shifting cultivation.
4	MAJOR SOIL TYPES	Colluvial soil forms along the steep side slopes and alluvial soil in the limited valley-fill areas.
5	AREA UNDER PRINCIPAL CROPS	Mainly practised Shifting or Jhum cultivation
6	PREDOMINANT GEOLOGICAL FORMATIONS	Lower Tertiary Formations of Oligocene to Miocene Age.
7	HYDROGEOLOGY i) Major Water Bearing Formations	 Semi-consolidated formations of Tertiary Age. Ground water occurs in the form of spring emanating through cracks/ fissures/ joints etc. available in the country rock.
8	GROUND WATER QUALITY Presence of Chemical Constituents more than Permissible Limit (e.g. EC, F, Fe, As) ii) Type of Water	Chemical constituents are within the permissible limit. Ground water is fresh and potable and is suitable for domestic and industrial purposes. Good and potable

9	DYANMIC GROUND WATER RESOURCES (2009) in mcm i) Annual Replenishable Ground Water Resources ii) Net Annual Ground Water Draft iii) Projected Demand for Domestic and Industrial Use up to 2025 iv) Stage of Ground Water Development	 3.39 3.05 0.04 0.95%
10	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under Technical Guidance of CGWB (Numbers)	4 Rain Water Harvesting Structures have been completed under Central Sector Scheme. Nil
11	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil
12	MAJOR GROUND WATER PROBLEMS AND ISSUES	In spite of good rainfall, there is acute shortage of drinking water especially during the summer.

GROUND WATER INFORMATION BOOKLET SERCHHIP DISTRICT, MIZORAM

1.0 Introduction

The district is located in the central part of the state. A small part is occupied by Myanmar in the southeast. It is bounded by Aizawl and Lunglei districts in the south west and north respectively. It lies in between North Latitude $22^0 57^/ 07^{//}$ to $23^0 32^/ 48^{//}$ and East Longitude $92^0 43^/ 12^{//}$ to $93^0 41^/ 55^{//}$ covering an area of 1,421.6 sq. km. The district has been sub-divided into two numbers of blocks.

As per 2011 census, the population of the district is 64875 and the density of population is 39 people per sq. km. Slope cultivation locally called shifting or jhuming is the main agricultural system in the district.

The district receives heavy rainfall during May to late September with an average annual rainfall of 1486.5 mm (As on 2009) under the influence of southwest monsoon.

Physiographically, the district is mostly represented by North-South trending hill ranges with moderately steep slopes. In the southeastern part of the district, the relief is comparatively higher than the western part and the average elevation is of the order of 1,500 m AMSL. The slopes are moderate to steep. Tlawng or Dhaleswari River and Tuichang River drain the district.

Geologically, the district is occupied by shale, siltstone, and sandstone of Surma and Barail formations of Oligocene to Miocene age.

Ground water stored in the hill slopes emanates in the form of springs, which are being used as a source of water supply. From quality point of view, most of the chemical constituents in ground water are within the permissible limit.

The net annual groundwater availability is 1.89 mcm while net ground water availability for future irrigation development is 1.85 mcm. The stage of ground water development is 5.29%. Future provision for domestic and industrial use is 0.04 mcm.

The present ground water utilization is for domestic and to some extent for agriculture purpose as there is no major industry in the district.

2.0 Rainfalls and Climate

The average annual rainfall of the district is 2,200 mm and the normal rainfall is 2,216 mm. The rainfall is mainly due to the monsoons from early May to late September. The climate is tropical humid with cool summer and cold winter. Winter temperatures vary between 11^0 and 13^0 C in general. Climatic disturbances in the Bay of Bengal have marked influence in the intensity of rainfall.

3.0 Geomorphology and Soil Types

A. Geomorphology

a. Denudo structural Hills

The district is mostly occupied by denudo structural hills, which is predominantly argillaceous. These are north-south trending parallel to sub-parallel hill ranges with synclinal narrow valleys. The hills are steep and separated by rivers, which flow either to north or to the south, creating deep gorges. Basically, these are structural hills. One of the dominant processes responsible for the formation of such landform is running water. Based upon relief, drainage, lithology and structural pattern; it has been classified as follows.

i. Moderate linear ridges
ii. Moderate hills
iii. Valley fills

i. <u>Moderate linear ridges</u>

The entire district is mostly occupied by these hill ranges except very limited areas in the southeast and valley fill areas in the south. The hills are highly dissected and separated by 'v' shaped narrow valleys. The rocks are of hard and compact nature with soft rock alternations. The relief is highly variable. Slopes are moderately steep. The major drainage shows parallel and trellis pattern.

ii. <u>Moderate hills</u>

This unit occurs in the southeast part of the district. The moderate hills are different from moderate linear ridges by being not linear in some definite direction. The relief is comparatively higher than western part and the average elevation is of the order of 1,500 m AMSL. The drainage pattern is mostly dendritic and the dissection is very high.

iii. <u>Valley fills</u>

The valley fills are unconsolidated alluvial and colluvial patches of limited areal extent deposited by rivers/ streams and occur in the southern part of the district.

B. Soil Types

The soils of the district are the products of the weathered ferruginous sandstone, shale followed by limited alluvial and colluvial materials transported by rivers/streams etc. In general, the soil formations have been categorized in to following groups.

i. Colluvial soil: formed along the steep side slopes because of accumulation of material on slope surface.
ii. Alluvial soil: restricted to the valley fill areas along the river/ stream courses.
iii. Terraces: these are thick and deep soils susceptible to erosion because of their topography

4.0 Ground Water Scenario

4.1 Hydrogeology

Almost entire area of Serchhip district is occupied by semi-consolidated formations of denudostructural hills belonging to Bhuban group of rocks of Miocene age. The Barail group of Oligocene age comprising hard and compact bedded and massive sandstone occurs in the southeast corner of the district. The valley fill areas with limited areal extent also occur in and around N.Vanlaiphai village in the southern part of the district. The main constituents are mixture of arenoargillaceous assemblages such as shale, siltstone. mudstone and fine-grained hard, compact sandstones. The unit is characterized by very low permeability and infiltration rate. It acts as run off zone. Ground water potential is low, localized potential in limited way can be attributed through development of secondary porosity through cracks. The valley-fill areas with limited areal extent located around N. Vanlaiphai village are underlain by shale, sandstone and siltstone alternations. The valley is about 6.5 km long and 0.3 km wide; covering a least area of about 2.0 sq. km. The valley is drained by Tuiphal River. No ground water abstraction structures have been noticed in the valley. The shallow ground water abstraction structures may be attempted in the suitable locations in the valley. The valley formation shows low permeability and infiltration rate. Ground water potential is low.

The occurrence of ground water in such a terrain is mainly restricted to weak zones such as fractures, lineaments and weathered residuum. These tectonic elements create seepage conduits, which are sources of springs. These springs are utilized as the main source of water supply to the rural population. The existing water supply for drinking purposes is mainly from these springs tapped through gravity drainage. A good number of springs were inventoried during earlier field investigations i.e. spring studied in and around Bungtllang, old Sercchip, Keitum, Chhialang villages in the Sercchip block shows discharges varying between 1,080 Lpd to 21,600 Lpd. Similarly, in the E. Lungdar block, spring studied in and around N. Mualcheng, Biate, Chakawn and N. Vanlaiphai villages shows discharges varying between 1024 to 3,330 Lpd. All the springs are fractures and joints oriented. A large number of springs are perennial. In general, the discharge of the springs is very meager in high altitudes and it progressively increases towards lower altitudes.

4.2 Ground Water Resources

Ground water resources of the district have been calculated based on rainfall infiltration factor method. The method is considered because of lack of data especially on population, number of ground water structures, draft of ground water and other important parameters on watershed basis. Water level trend is also not available due to lack of ground water abstraction structures, hence, the annual ground water recharges of all the assessment unit have been computed by the Rainfall Infiltration Factor method.

The smallest administrative unit, i.e. the R.D.Block has been taken as the unit of computation. The area is mostly occupied by hills with very steep slopes that is more than 20%. As per GEC-97, these hilly areas are not taken into account for resource computation. Ground water resource of the district is calculated as follows.

Table 1 Ground Water Resource Potential of Serchhip district (as on March 2009)

(in mcm)

Sl. No.	Block	Rainfall Recharge During monsoon season	Recharge from other sources during monsoon season	Recharge from Rainfall during non-monsoon season	Recharge from other sources during non-monsoon season	Total Annual Ground water Recharge	Natural Discharge during non-monsoon season	Net Annual ground Water availability
1.	2	3	4	5	6	7	8	9
2.	E.Lungdar	0.87	Negligible	0.59	Negligible	1.46	0.15	1.31
3.	Sercchip	1.15	Negligible	0.78	Negligible	1.94	0.19	1.74
District Total		2.02	0	1.37	0	3.30	0.34	3.05

Table 11 Stage of Ground Water Development of Serchhip district

(in mcm)

Sl. No.	Blocks	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross ground Water Draft for Domestic & Industrial	Existing Gross Ground Water Draft for all uses	Allocation domestic & Industrial requirement supply up to 2025	Net annual Ground Water availability for future irrigation development	Stage of Ground Water development (%)
1.	2	3	4	5	6	7	8	9
2.	E.Lungdar	1.31	0	0.02	0.02	0.03	1.28	1.73
3.	Sercchip	1.74	0	0.01	0.01	0.01	1.73	0.37
District Total		3.05	0	0.03	0.03	0.04	3.01	2.10%

The net annual groundwater availability is 3.05 mcm while net annual ground water draft is 0.03mcm. The stage of ground water development is 2.10%. Natural discharge during non-monsoon season is 0.34 mcm. Future provision for domestic and industrial use is 0.04 mcm and for irrigation use, it is 3.01mcm.

Sercchip district is under the **SAFE** category.

4.3 Ground Water Quality

Water sample collected for chemical analysis from spring during field season programme (1986-87) shows that iron content of water ranges between 0.4 to 0.6 ppm, which is within the permissible range of drinking water. The other constituents like pH, EC etc have been considered based on hydrogeological studies in the State during 1985-86. In the adjacent district, pH values range between 6.9 and 8.3. Electrical conductivity of the water is found to vary from 31-249 micromhos/cm at 25^0 C except at few places. The concentration of bicarbonate ranges from 12 to 158 ppm. In general, the quality of ground water in the district is fresh and potable and is suitable for domestic and industrial purposes.

4.4 Status of Ground Water Development

The entire district is covered by hills of semi-consolidated rocks of Tertiary age constituting mostly siltstone, claystone and compact sandstone. Because of steep slopes of the hills, rainwater flows out as surface run-off. Hence, there is acute shortage of potable water during summer. In this type of hilly terrain, the scope for ground water storage is limited to mostly secondary porosity. These aquifers are the main source of springs. Ground water stored in the hill slopes emanates in the form of springs, which are being used as a source for water supply.

Ground water is used for drinking purpose only in the district. As there is no industry in this district, Ground water utilization for the same may be considered as negligible. Due to hilly terrain, spatial variation of rainfall, nature of soil, non-availability of irrigation (e.g. from ground water and surface water), the people practise jhum cultivation.

5.0 Ground Water Management Strategy

Hydrogeological investigation carried out by the Central Ground Water Board during 1984-85 & 1985-86 in the entire state and Pilot Project studies under Technology Mission on drinking water and related water management in parts of Mizoram State revealed the occurrence of perennial springs in the different altitudes. A good number of perennial springs also exist in the district. The discharges of the springs progressively increase in the lower altitudes. These springs can be developed scientifically for providing safe drinking water to the rural people. Shallow ground water structures may also be attempted in the limited valley fill areas in the district. Rainwater harvesting technique, which is well known to the people of the district in remote areas, can also be utilized for solving the scarcity of potable water.

5.1 Rainwater harvesting structures constructed under centrally sponscered scheme.

Village wise volume of water used and number of persons benefitted are detailed below.

Sl No.	Name of district/ block	Name of village	Volume of water used (liters)	No. of persons benefitted
1	Serchhip/ Serchhip R.D. Block	Bungtlang	15,800	2,197
2	E.Lungdar R.D.Block	North Mualchng	15,800	1,833
3	-Do-	Sialhawk	15,800	2,593
4	-Do-	Leng	15,800	1,014

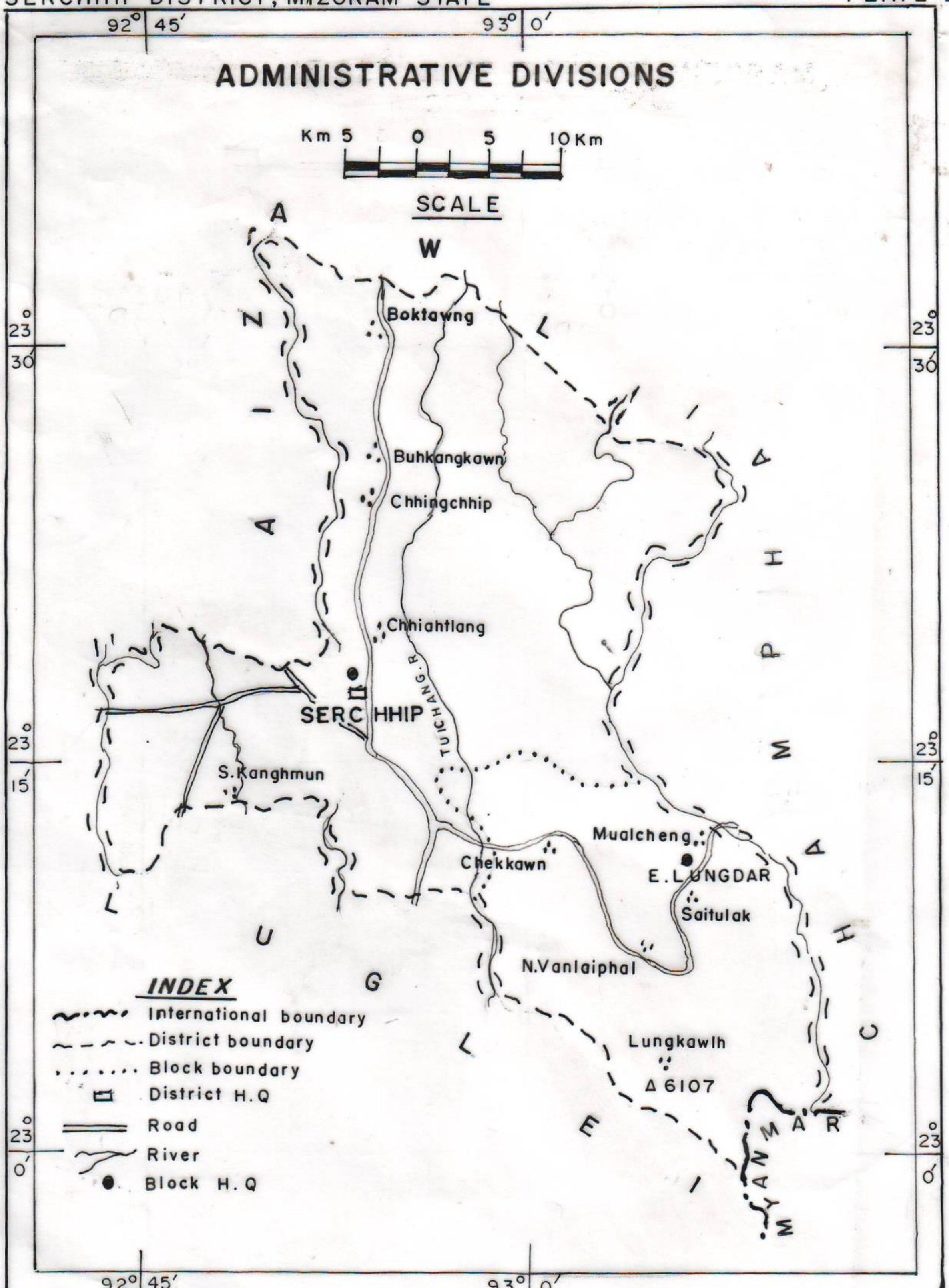
6.0 Recommendations

There are ground water development prospects in the very limited areas of valley-fills areas in the southern part of the district. In the valley-fill areas of N.Vanlaiphi village, the thickness of alluvium is very limited (within 10-15 m). Though the valleys are underlain by shale, siltstone and sandstone, part of which may be saturated and it can support construction of dug wells. Ground water structures do not exist at present. In the N.Vanlaiphai valley, the following sites have been recommended for construction of ring well. Thus, ring well with 2-3 m diameter and 10-12 m depth below ground level may be constructed in i) the west of the village in the flat ground. ii) east of Khurung lui near road on the way to Chengtui village iii) 3 km west of village in the flat ground adjacent to Nala. Besides, ring well with similar design may also be attempted in the topographic depression in and around Duntlang, Bungzang, Leisen and Vanzan villages. These wells may be constructed with half baked bricks keeping weep holes.

Ground water manifests in the form of springs. A large number of springs are perennial. Springs in Serchhip town, Mualcheng, khawlailung, Bawktlang, Keitum, Lunglrang villages etc can be developed scientifically for providing safe drinking water to the rural people.

Rainwater harvesting is another suitable age old and time tested technology for augmenting water for the drinking water supply and this can be one of the appropriate and economical measures for solving the scarcity of potable water in such areas. It involves relatively low cost, less time for implementation and provides almost safe water at doorsteps.

SERCHHIP DISTRICT, MIZORAM STATE PLATE-I



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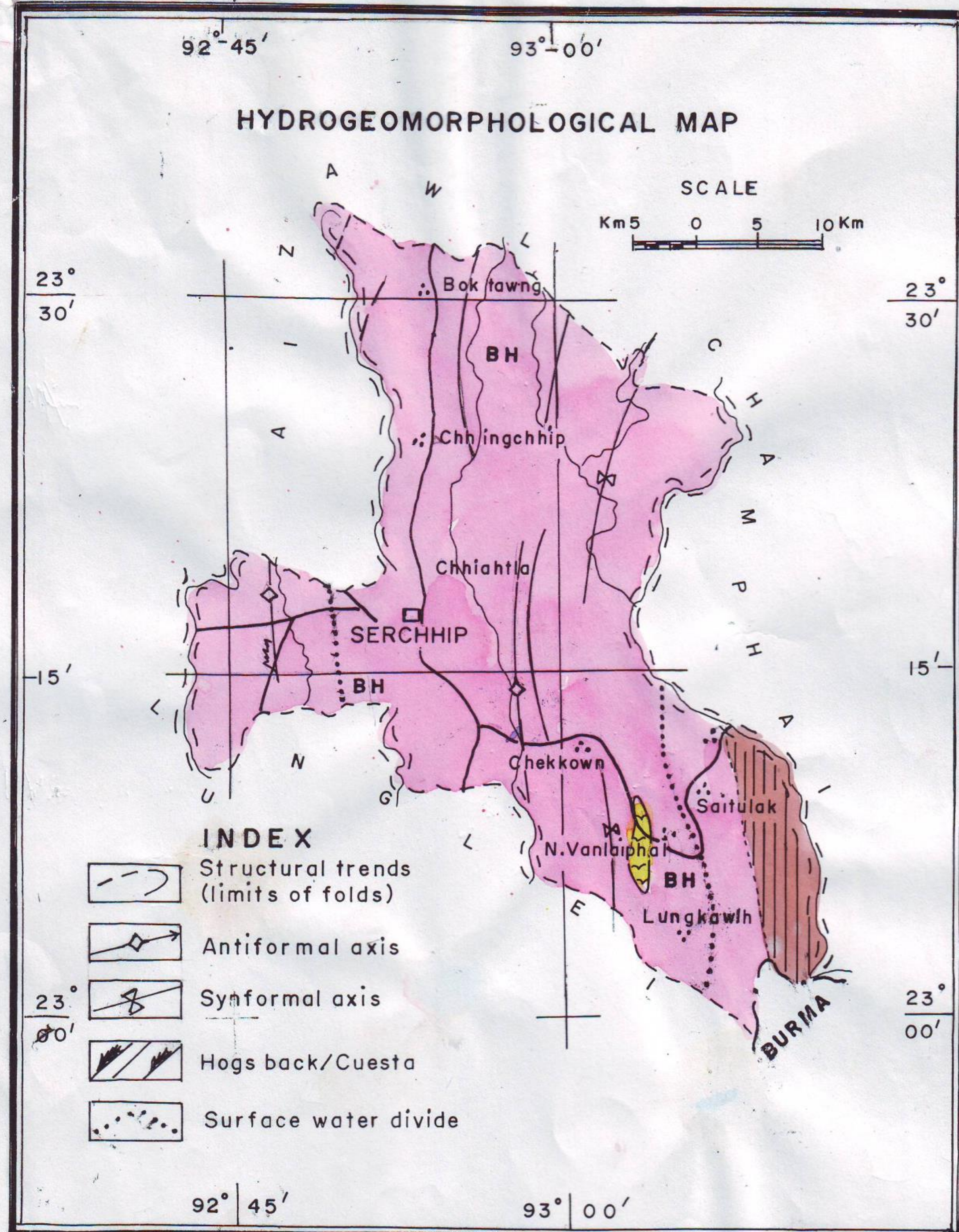

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SERCHHIP DISTRICT, MIZORAM

LEGEND

AGE	FORMATION		GEOMORPHIC		HYDROGEOLOGICAL CHARACTERS
	SERIES	GROUP	UNIT	FORMS	
			(A) DENUDO STRUCTURAL HILLS		
MIOCENE	SURMA	BHUBAN	BH Moderate linear ridges.	Hogs back Cuesta	Consists of hard and compact sandstone, shale, siltstone alternation. Permeability is very low and infiltration is negligible, (Act as run-off zone. Ground water potential low, localised potential in limited way canbe attributed through development of secondary porosity through cracks)
			UNCONFORMITY		
OLIGOCENE	BARAIL	BARAIL	Moderate hills	Hogs back Cuesta	Consists of fine grained, hard and compact badded and massive sand-stone with orgillaceous admixture, (poor permeability and infiltration ground water potential is low localised potential may be expected due to tectonic feature)
			(B) VALLEY		
			Valley fills		Undelain by clay, silt and sandstone moderate ground water potential zone can be expected through shallow aquifers.

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