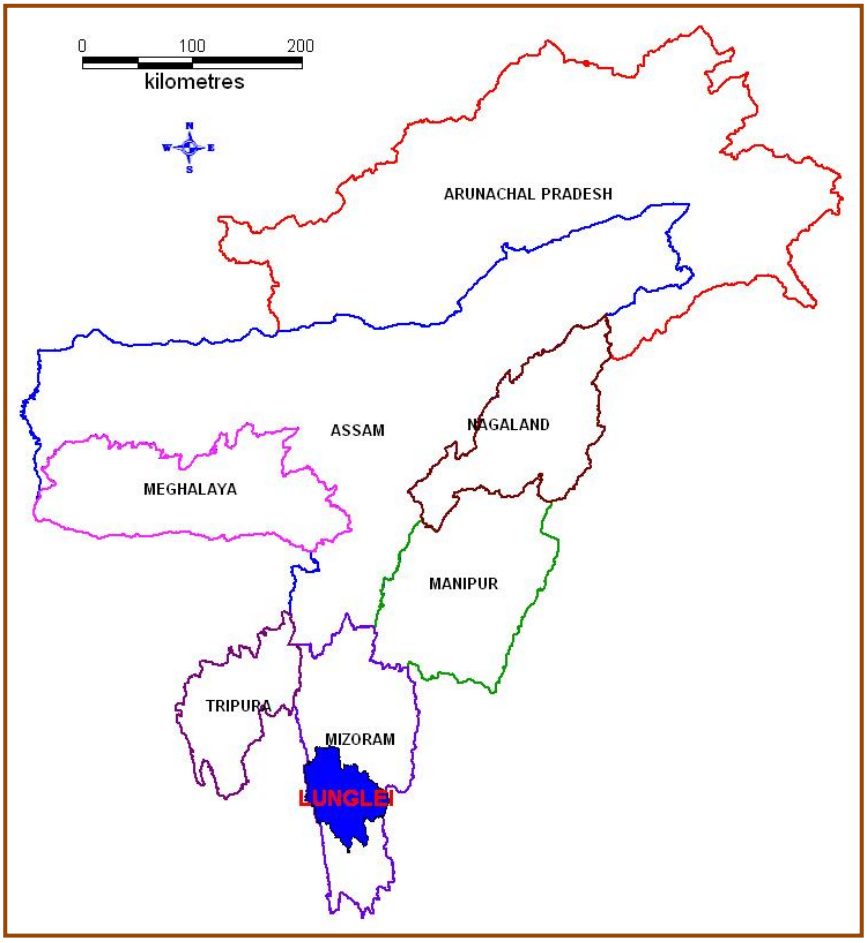
Technical Report Series: D

Ground Water Information Booklet
Lunglei District, Mizoram



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

GROUND WATER INFORMATION BOOKLET
LUNGLEI DISTRICT, MIZORAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION	
	i) Geographical Area (sq.km.)	4,538.0
	ii) Administrative Division (as on 12011 Number of Tehsil/CD Block Number of Panchayat/Village	Four Blocks,
	iii) Population (as on 2011 Census)	154094
	iv) Average Annual Rainfall (mm)	2313.8 (As on 2009)
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	Denudation structural hills with low and moderate ridges. Mat & Tuichang Rivers with its tributaries.
3.	LAND USE (sq.km.) i) Forest Area ii) Net Area Sown iii) Cultivable Area	Mostly jhum / Shifting cultivation. 452.44, 9.97% of total area, NA NA
4.	MAJOR SOIL TYPES	Colluvial soil forming along the steep side slopes.
5.	AREA UNDER PRINCIPAL CROPS	Mainly practised shifting or 'jhum' cultivation
6.	PREDOMINANT GEOLOGICAL FORMATIONS	Lower Tertiary Formations of Miocene Age.
7.	HYDROGEOLOGY i) Major Water Bearing Formations	Semi consolidated formations of Tertiary rocks. Ground water occurs in the form of spring which emanates through cracks/ fissures/ joints etc. available in the country rocks.
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	 5.53 0.07 0.10 1.37 %
10.	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i)Projects Completed by CGWB (No & amount spent) ii)Projects under Technical Guidance of CGWB (Numbers)	 5 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 water especially during the summer.

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LUNGLEI DISTRICT, MIZORAM

1.0 Introduction

Lunglei district of Mizoram is located in the south central part of the state. It is bounded by Bangladesh in the west and Burma in the east. The Mamit and Serchip districts in the northern part and the southern most part are occupied by Saiha and Lawngtlai districts. It lies in between North Latitude $22^0 10' 0''$ to $23^0 25' 0''$ and East Longitude $92^0 15'$ to $93^0 10'$ covering an area of 4,538 sq.km. The district has been sub-divided into four numbers of blocks.

As per 2011 census, the population of the district is 154094 and the density of population is 30 persons per sq.km. Slope cultivation locally called 'shifting' or 'jhuming' is the main agriculture system in the district.

The district receives heavy rainfall during May to late September with an average annual rainfall of 2313.8 mm (As per 2009) under the influence of southwest monsoon.

Physiographically, the district is represented by parallel to sub parallel hill ranges trending North – South direction. The hills are steep and separated by rivers which flow either to north or to the south creating deep gorges. Numbers of perennial streams flow through the district from North to South and join the Kaladan River.

Geologically, the district is occupied by shale, siltstone, and sandstone of Surma formation of Miocene age.

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

The estimated gross annual dynamic groundwater resource is 5.53 mcm while net ground water availability for future irrigation development is 4.97 mcm. The stage of development is 1.22%. Future provision for domestic and industrial use is 0.1 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 Rainfall and Climate

The climate of the district is characterized by tropical humid climate with cool summer and cold winter. Winter temperature varies from 11^0 to 13^0 C in general. The winter season is however, without snow. The average annual rain fall is 2313.8 mm.

3.0 Geomorphology and Soil Types

A) Geomorphology

Physiographically, the district is a mountainous terrain with prominent relief. The hills have ranges running from North to South. Mostly anticlinal longitudinal parallel to sub parallel hill ranges and synclinal narrow valleys create deep gorges in between North- South hill ranges. Basically, these are structural hills. The denudation and weathering is still under going in response to various physicochemical processes. One of the dominant processes of the formation of such land form is running water. Based upon relief, drainage, lithology and structural pattern, the district has been divided into two major units i.e. **a)** Denudation Structural Hills and **b)** Valleys.

a) Denudation Structural Hills

The district is mostly occupied by denudation structural hills which is predominantly argillaceous comprising shale, siltstone and mudstone, fine grained and compact sandstone with occasional limestone. The processes of denudation have not yet obliterated the structural features such as dip facets and strike trend, anticline and syncline. This major form has been further divided as follows.

i) Low linear ridges

These are low elevated hills and occupy outer flank of structural folds. They have gentle to moderate slopes and possess gully erosion. The main drainage is controlled by strike of the formations and shows slight meandering pattern. The main rock types are mixture of arenoargillaceous assemblages, comprising shale and fine to medium grained, friable sandstone. The units occur in the western part of the district.

ii) Moderate linear ridges

Mostly moderate linear ridges occupy about 90% of the district. The main constituents are hard and compact sandstone, shale and siltstone, alterations of Bhutan formation. The ridges show serrated top and hogback pattern, which are highly dissected and separated by intervening 'V', shaped narrow valleys.

b) Valleys

The valleys have limited areal extent and occur mostly in the western part of the district adjacent to Bangladesh border.

i) Linear rolling valley

These valleys are found in the structural depressions in between low linear ridges of fine to medium grained, friable sandstone with subordinate shale of Bhuban group of rocks and siltstone, shale, mudstone with subordinate sandstone of Bokabil group of rocks.

B. Soil Types

The soils of the district, in general, have been derived from parent rock such as ferruginous sandstone, shale, alluvial and colluvial materials. In general, the soil formations have been categorized into following groups.

i) Hill Soil: It includes colluvial soil, formed along the steep side slopes because of accumulation of material on slope surface.

ii) Valley Soil: Occurs as a mixture of colluvial and alluvial materials. It is restricted to the rolling valleys along the river courses.

iii) Terrace Soil: These are the remnants of deposits of cobbles and pebbles which make it excessively drained.

4.0 Ground Water Scenario

4.1 Hydrogeology

Hydrogeologically, the entire area of Lunglei district is occupied by semi-consolidated formations of denudation structural hills belonging to Surma formations of Miocene age with limited areal extent of linear rolling valleys adjacent to Bangladesh border. The low linear ridges comprise mainly mixture of arenoargillaceous assemblages such as shale, siltstone. mudstone and hard, compact sandstones of Bokabil shale. The unit is characterized by low permeability and infiltration. It acts as run off zone. The moderate linear ridges which occupy almost the entire district comprise of hard and compact sandstone, shale, and siltstone, alternations of Bhuban group of rocks. This unit is also characterized by very low permeability and infiltration and 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 linear rolling valleys with limited areal extent are underlain by shale, sandstone and siltstone alternations. No ground water abstraction structures have been noticed in the valley. However, earlier field investigation by the CGWB in the area revealed the occurrences of small ponds like structures with very shallow water level i.e. within 2.0 m below ground level. Based on the fact, it is inferred that shallow ground water structures may be attempted in the suitable locations in the valley. Ground water potential is low.

In general, the terrain is tectonically young and immature. 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 population. The existing water supply for drinking purposes is mainly from those springs formed by gravity drainage. A good number of springs were inventoried during earlier field investigation. The springs are connected with fractures and joints. A large number of springs are perennial. In general, the discharge of the springs are very meager in high altitudes and it progressively increase towards lower altitudes. The discharge of the spring varies from 3,000 to 20,000 liters per day during the period of January to March, which is generally dry period.

4.2 Ground Water Resources

The entire district is occupied by hill ranges with very steep slopes that are more than 20%. Moreover, no details about the recharge potential in these hills are available. As per GEC, 97 these hilly areas are not taken into account for resource computation. Due to lack of data especially on population, number of ground water structures, draft and other important parameters of watershed, the smallest administrative unit, i.e. the R.D.Block has been taken as the unit of computation. 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 estimated gross annual dynamic groundwater resource is 5.53 mcm while net annual ground water draft is 0.07 mcm. The stage of ground water development is 1.37%. Natural discharge during non-monsoon season is 0.55 mcm. Future provision for domestic and industrial use is 0.10 mcm and for irrigation use, it is 4.87 mcm.

Lunglei district is under the 'SAFE' category.

4.3 Ground Water Quality

As per earlier field investigation reports, it is found that water samples collected from springs indicate pH value ranges from 6.9 to 8.3. Electrical conductivity of spring water is found to vary from 31 to 249 micromhos/cm at 25^{O} C except at few places. The concentration of bicarbonate ranges from 12 to 158 ppm. The concentration of Calcium varies from 4 to 22 ppm and that of Magnesium varies from 1 to 10 ppm respectively. Concentration of Iron ranges from 0.02 to 0.3 ppm and is within the permissible limit of 0.3 ppm.

In general, the chemical 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. The rock types are comprised of mostly siltstone, claystone and compact sandstone. Inspite of good rainfall of more than 2,000 mm in the district, there is acute shortage of water during summer. Most of the rain water flows out as surface run-off. 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.

In the district, Ground water is used for drinking purpose only. There is no industry in the 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 Central Ground Water Board revealed the occurrence of good number of perennial springs in the different altitudes. In general, the discharge of the springs progressively increases in the lower altitudes. These springs can be developed scientifically for providing safe drinking water to the rural people. Rain water harvesting which is well known to the people of the district in remote areas may also be encouraged for solving the scarcity of potable water in lean period.

5.1 Rain Water Harvesting Structures constructed under Central Sponsored Scheme

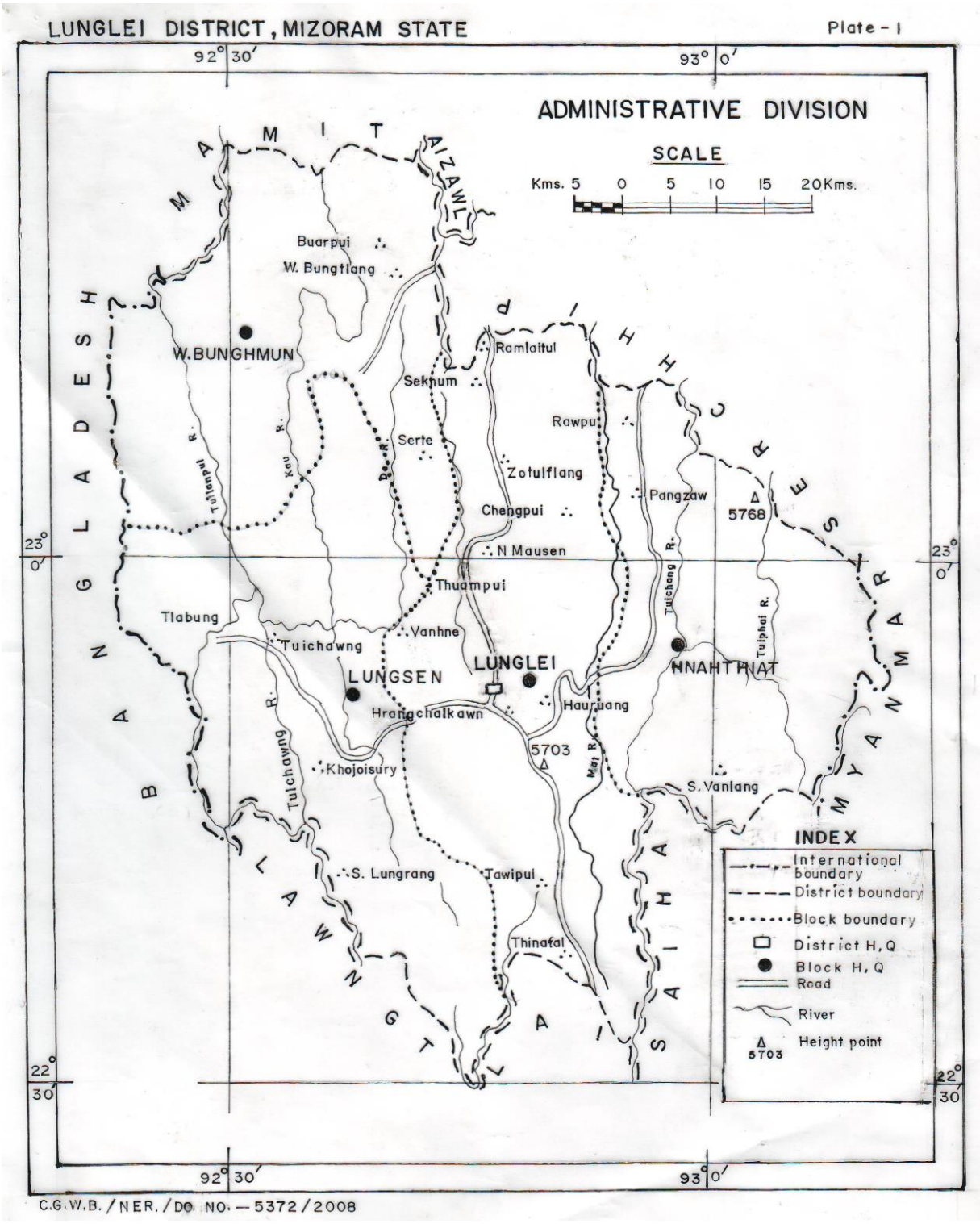
Village wise volume of water used and number of persons benefited are given below.

Sl. No.	Name of District/ Block	Name of Village	Volume of Water Used (liters)	No. of Persons Benefited
1.	Lunglei/ Hnahthial R.D. Block	Thingsai	15,800	3,316
2.	Lunglei R.D.Block	Sekhum	15,800	250
3.	--do--	Chengpui	15,800	300
4.	--do--	Farm Veng	15,800	2,300
5.	--do--	Salem Veng	15,800	2,302
6.	Lungsen R.D.Block	Thangte	15,800	291
7.	Bunghmun R.D. Block	Sertlangpui	15,800	946

6.0 Recommendations

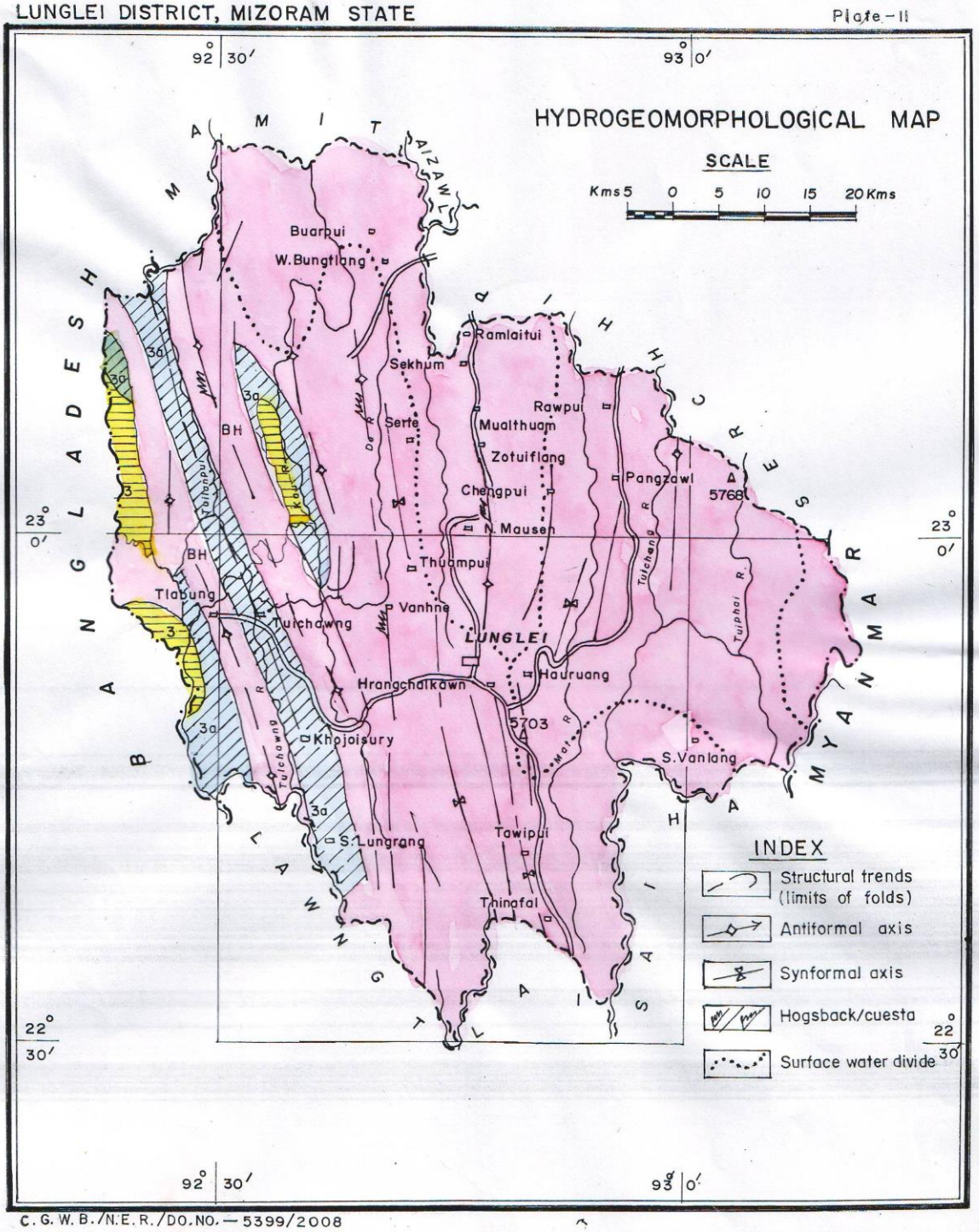
Existing hydrogeological set up indicates that the limited ground water development prospects in the linear rolling valleys occur in the western part of the district adjacent to Bangladesh border. Though, the valleys are underlain by shale, siltstone and sandstone, the intercalated sandstone layers may be productive for construction of shallow ground water structures. Thus, ring well with 2-3 m diameter and 10-15 m depth below ground level may be constructed in the suitable locations. These wells may be constructed with half baked bricks keeping weep holes in the sandstone layers.

In the major parts of the district, proper development of perennial springs would serve as the main sources for water supply to the local population. The spring should be properly protected to avoid any sort of contamination wherever these are used for domestic purposes. Some of the springs in lower altitudes can be impounded in some structures and pumped again to supply water.


LUNGLEI DISTRICT, MIZORAM STATE
Plate - I
92° 30′
93° 0′
ADMINISTRATIVE DIVISION
SCALE
Kms. 5 0 5 10 15 20Kms.
MAMIT
AIZAWL
Buarpui
W. Bungtlang
W.BUNGHMUN
Ramlaitul
Sekhum
Rawpui
Serte
Zotulflang
Pangzaw
5768
Chengpui
N Mausen
Thuampui
Tlabung
Vanhne
Tuichawng
LUNGSEN
LUNGLEI
HNAHTHIAL
Hrangchalkawn
Haulawng
5703
Khojoisury
S. Vanlang
S. Lungrang
Tawipui
Thinafal
BANGLADESH
LAWNGTLAI
SAIHA
MYANMAR
Tuichawng R.
Tuipui R.
Kau R.
Tuichang R.
Tuiphai R.
Mat R.
INDEX
International boundary
District boundary
Block boundary
District H.Q
Block H.Q
Road
River
Height point
5703
23° 0′
22° 30′
C.G.W.B. / NER. / DO. NO. — 5372 / 2008

LUNGLEI DISTRICT, MIZORAM STATE

Plate-II



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LUNGLEI DISTRICT, MIZORAM

LEGEND

AGE	FORMATIONS		GEOMORPHIC		HYDROGEOLOGICAL CHARACTERS
	SERIES	GROUP	UNIT	FORMS	
			(A) DENUDO STRUCTURAL HILLS		
MIOCENE	SURMA	BOKABIL	3o Low linear ridges	Cuesta	Consists of shales with silfstone alternations. Permeability and infiltration low. Act as run off zones.
		BHUBAN	BH Moderate linear ridges	Hogs back	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 can be attributed through development of secondary porosity through cracks.
				Cuesta	
			UNCONFORMITY		
OLIGOCENE			(B) VALLEYS		
			3 Linear rolling valley		Consist of mainly shale, sandstone, siltstone alternations. Permeability and infiltration low. Act as run off zones, ground water potential is low.

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