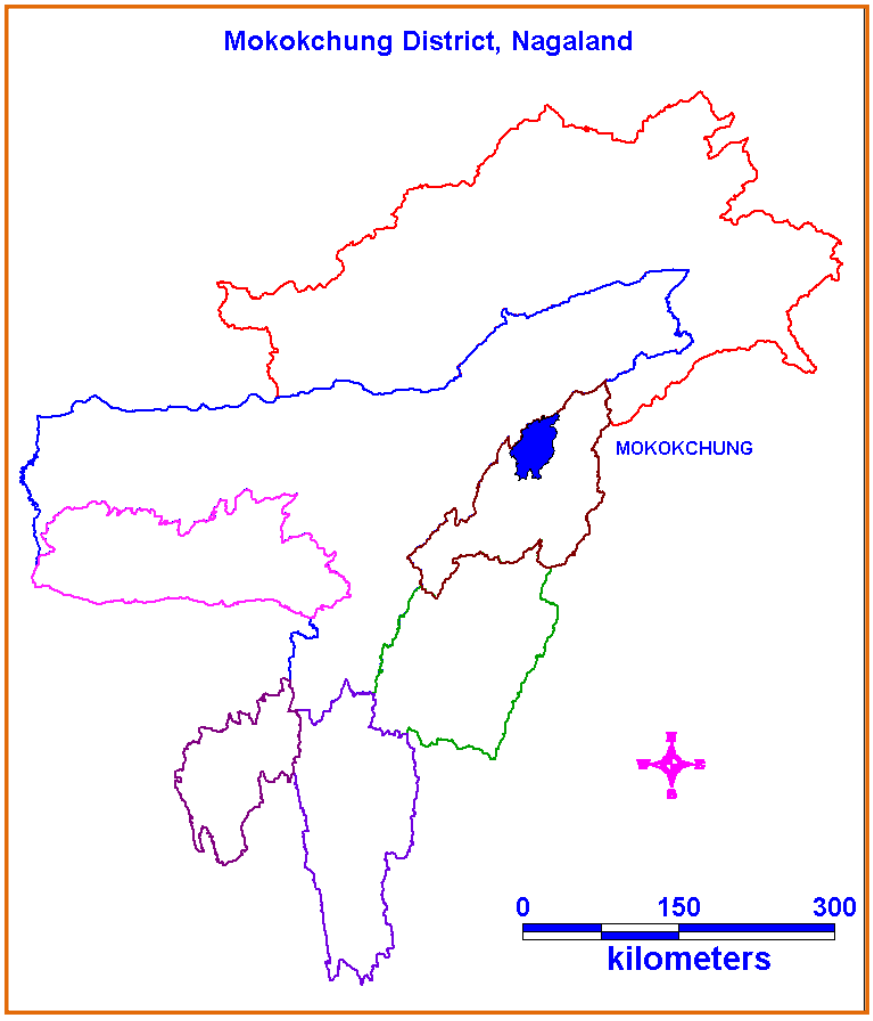
Technical Report Series: D

No:

Ground Water Information Booklet

Mokokchung District, Nagaland



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

Guwahati

September 2013

GROUND WATER INFORMATION BOOKLET
MOKOKCHUNG DISTRICT, NAGALAND

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1	GENERAL INFORMATION	
	i) Geographical Area (sq.km as on 2011) a. Headquarters	1,615 Mokokchung
	ii) Administrative Division (as on 2011) Number of Circle Number of RD Block Number of Villages a. Inhabited b. Uninhabited	 8 6 105 102 3
	iii) Population (as on 2011 Census)	193171
	iv) Literacy (%) a. Male b. Female	84.27 86.14 82.20
	v) Climate a. Average Annual Rainfall (mm) b. Minimum Temp (^{0}C) c. Maximum Temp (^{0}C)	 2,500 2 32
2	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Denudational Hills, Structural Hills, Intermontane valleys, Plateau Melek, Dikhu, Tsurang
3	LAND USE (ha) a. Forest Area b. Net area irrigated	 28977 5602
4	MAJOR SOIL TYPES	Alluvial Soil, Non Laterite Red Soil, Forest Soil
5	IRRIGATION (2011 census) i) Net Irrigated area (Ha)	 5602
6	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB	1
7	PREDOMINANT GEOLOGICAL FORMATIONS	Semi-consolidated rocks of Tertiary age
8	HYDROGEOLOGY i) Major water Bearing Formations	 Semi consolidated formations of Tertiary rocks. Ground water occurs in the form of

		Spring emanates through cracks/ fissures/ Joints etc. available in the country rock.
9	GROUND WATER QUALITY	In general water is suitable for both drinking and irrigation purposes.
10	DYANMIC GROUND WATER RESOURCES (2009) in mcm i) Annual Replenishable Ground Water Resources ii) Annual Ground Water Draft iii) Projected demand for Domestic and Industrial Use up to 2025 iv) Stage of Ground Water Development	 44.24 0.73 1.11 1.84%
11	AWARENESS AND TRAINING ACTIVITY	Nil
12	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under technical Guidance of CGWB (Numbers)	Nil
13	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil

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1.0 Introduction

Mokokchung district, the territory of Ao Naga, is located in the north-western part of Nagaland State. It is bounded by 26.12º and 26.45º North Latitudes and 94.18º and 94.50º East Longitudes respectively, covering an area of 1,615 sq. km. The altitude of the district varies between 155 and 2,000 m above mean sea level (AMSL). Mokokchung town is the district headquarters situated at a height of about 1,325 m AMSL. The district has been sub-divided into 8 Circles and 6 R. D. Blocks. The R.D. Blocks are-

1. Ongpangkong North
2. Ongpangkong South
3. Kobulong
4. Changtongya
5. Tuli
6. Mangkolemba

The district receives southwest monsoon with annual average rainfall of 2,500 mm. The rainfall spreads over about 9 months of the year with heavy downpour during the period from July to August. Winter, in this district, is cold and summer is mild. Night temperature drops down to 2^0C during January and February. The average summer temperature is 27^0C and usually it does not rise beyond 32^0C.

Physiographically, the district is mostly occupied by NE-SW trending hill ranges, with limited intermontane valleys. The major hill ranges are Ongpangkong, Langpangkong, Changkikong, Japukong and Tsurangkong Ranges.

Numbers of perennial streams flow through the district. All the rivers in the district come within Brahmaputra Basin. Some of the important rivers in the district are Melak, Dikhu and Tsurang.

Geologically, the district is predominantly occupied by Tertiary rocks, comprising sandstone, shale, grit etc.

Ground water occurs under phreatic condition in the shallow aquifer zone and under semi-confined to confined condition in the deeper aquifer.

The estimated net ground water resource is 56.62 mcm. Future provision for domestic and industrial use is 2.87 mcm. The net resource available for future irrigation is 50.89 mcm.

The present ground water utilization in the district is mainly for drinking water purposes. Practically, there is no ground water draft for irrigation purposes. Stage of ground water development in the district is 5.05%.

2.0 Rainfall and Climate

The district enjoys a humid sub-tropical climate. The annual average rainfall of the district is 2,500 mm. The maximum rainfall occurs during the months of June and July. Rainfall generally begins from April and continues till the end of September.

The area enjoys a cold winter and mild summer. January and February are the coldest months when the night temperature comes down to 2ºC. In summer, also it is not at all hot; rather it is cold in comparison to the adjoining plains of Assam. During summer also, the temperature does not rise beyond 32ºC and the average summer temperature is 27ºC.

3.0 Physiography and Drainage

The district is mostly occupied by hill ranges. Physiographically, the district can be divided into two distinct geomorphic units.

1. High Hill Ranges
2. Valley Fills

Entire district is occupied by NW- SE trending hill ranges and in between, there are intermontane valleys. The major hill ranges in the district are Ongpangkong, Langpangkong, Changkikong, Asetkong, Japukong, and Tsurangkong Range. The altitude of the district varies from 155 to 2,000 m AMSL.

Numbers of perennial streams flow through the district before joining the Brahmaputra River. Some of the important streams are Melak, Dikhu, Tsurang.

4.0 Ground water scenario

4.1 Hydrogeology

Hydrogeologically, the area is underlain by unconsolidated and semi-consolidated formations ranging in age from Upper Cretaceous to Recent.

Disang Formation comprising shale and sandstone and Barail Formation comprising bedded fine to medium grained compact sandstone. In these Formations, ground water is restricted to only weathered mantles and fractures. Basically, most of the area being hilly, it acts as run-off zone. At places, ground water emanates as springs.

Area under Tipam Formation comprises moderate structural hills consisting coarse gritty ferruginous sandstone, shale and conglomerate. Tipam Formation forms good aquifer zones. This is a good recharge area. However, depending on slope, the recharge to ground water varies. Ground water yield prospect is low to moderate.

Dihing Formations comprised of pebble bed, soft sandy clay, grit, sandstone and conglomerate etc forms low lying hills and mounds with valleys. These valleys are underlain by assorted and discontinuous aquifers. Ground water yield prospect is low to moderate (10-20 m^3/hr).

One exploratory well was constructed by CGWB in Longnok valley. The well was drilled down to 117.90 m bgl. In view of meager thickness and very fine grained nature of the aquifer material, the well was abandoned. The salient feature of the well is given as follows:

Table 1: Summarized Hydrogeological Data of EW of CGWB

Well Location	Depth drilled (m bgl)	Aquifer Zone encountered (m)	Remarks
Citrus Farm, Longnok Valley	117.90	35.5 - 41.60 111.80 – 114.80	Well abandoned

4.2 Ground Water Resources

Ground water resource of the district has been estimated by Central Ground Water Board, North Eastern Region based on GEC'97. Due to lack of ground water structures, resource estimation was carried out based on Rainfall Infiltration Factor Method.

The area suitable for ground water recharge has been worked out by excluding the areas with more than 20% slope. Out of a total district area of 1,615 sq. km, only 153 sq. km area was taken as area suitable for ground water recharge. Though, there is ground water recharge, the possibility of ground water extraction is very limited, owing to its hilly terrain; difficult accessibility and fine nature of the most of the aquifer material. The detail of estimated ground water recharge through rainfall is given as follows.

Table 2 Stage of Ground Water Development
(in mcm)

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 (%)
39.81	0	0.73	0.73	1.11	38.70	1.84

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

4.3 Ground Water Quality

Due to lack of ground water structures, there is no detailed water sample analysis for the district. However, a few water samples were analyzed, which were collected from river in the Longnok valley. The pH value of river water sample ranges from 7.55 to 7.94, indicating slightly alkaline in nature. E.C. value ranges from 98 to 103, HCO_3 ranges from 29 to 37 ppm. Hardness of the water was measured as 26 to 52 ppm. As a whole, the river water may be used for drinking (after treatment) and irrigation purposes.

4.4 Status of Ground Water Development

As on date practically there is no ground water development in the district. Ground water extraction is also difficult. Most of the district area being hilly with high slope, the rainfall infiltration is very limited. Though, there is a good amount of rainfall in the area, most of it goes out as surface run-off. In this type of hilly terrain, the scope for ground water storage is limited to mostly secondary porosity developed due to structural features like fractures and faults etc. In this hilly terrain, ground water emanates in the form of springs which are the only sources of water for drinking.

As there is little use for irrigation in this district, ground water is mainly used for drinking purposes. People of the area mostly practise Jhum cultivation due to hilly terrain, spatial variation of rainfall, nature of soil, non-availability of irrigation.

5.0 Ground Water Management Strategy

Ground water survey carried out in the district reveals that there is little scope for ground water development. However, detailed investigation has to be carried out in the area,

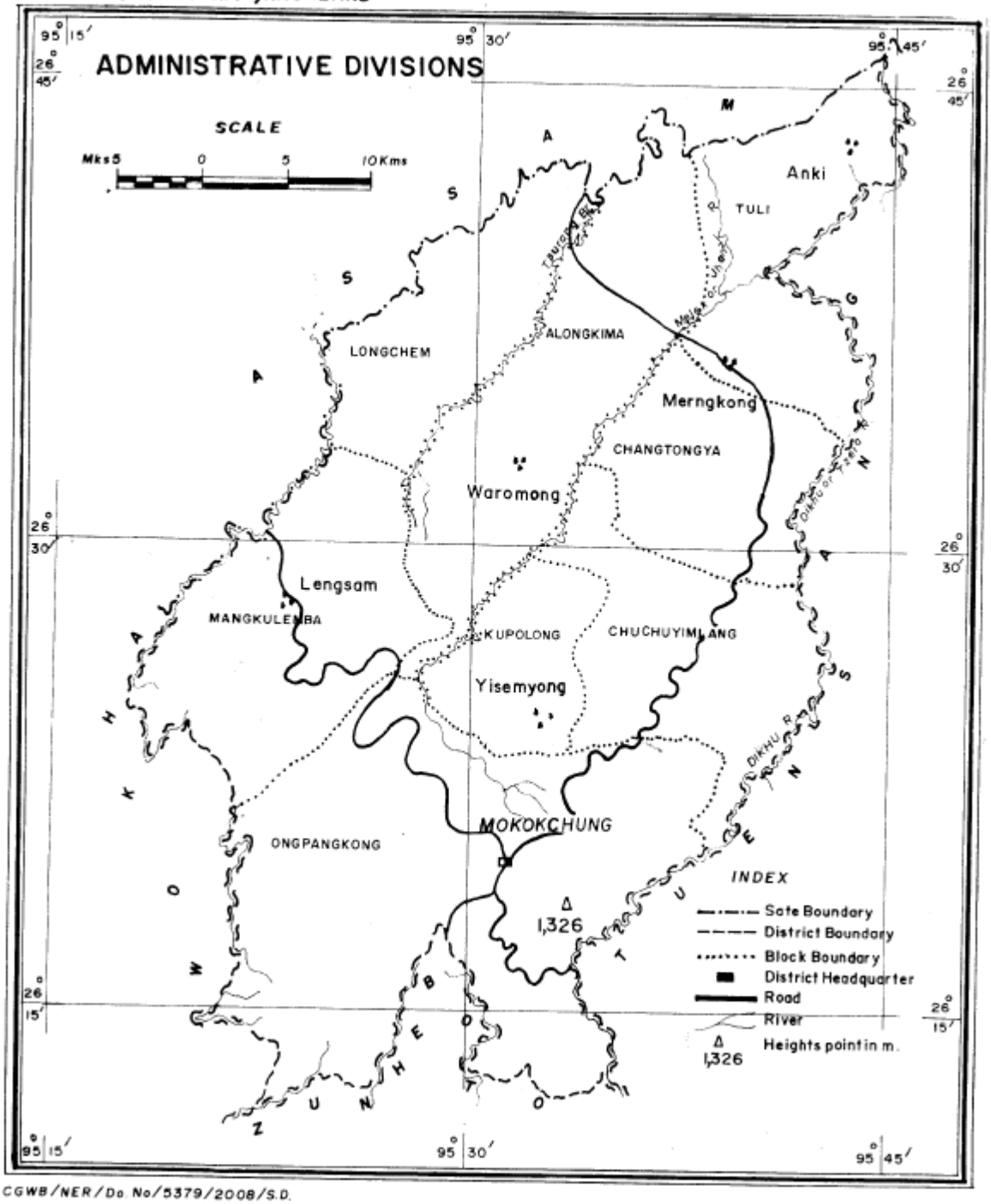
to assess the ground water resources, especially in the intermontane valleys. Accessibility is the main hindrance for the ground water exploration in the area. Only suitable source is the springs. There are many perennial springs in the hills of this district. These springs can be scientifically developed for both drinking and local irrigation purposes. Suitable artificial recharge structures viz. Nala bund, Gabion structures, Contour bunding may be constructed for both irrigation and recharge to ground water.

6.0 Recommendations

Existing hydrogeological set up indicates the limited ground water development prospects in the linear intermontane valleys and foot-hill areas. 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.

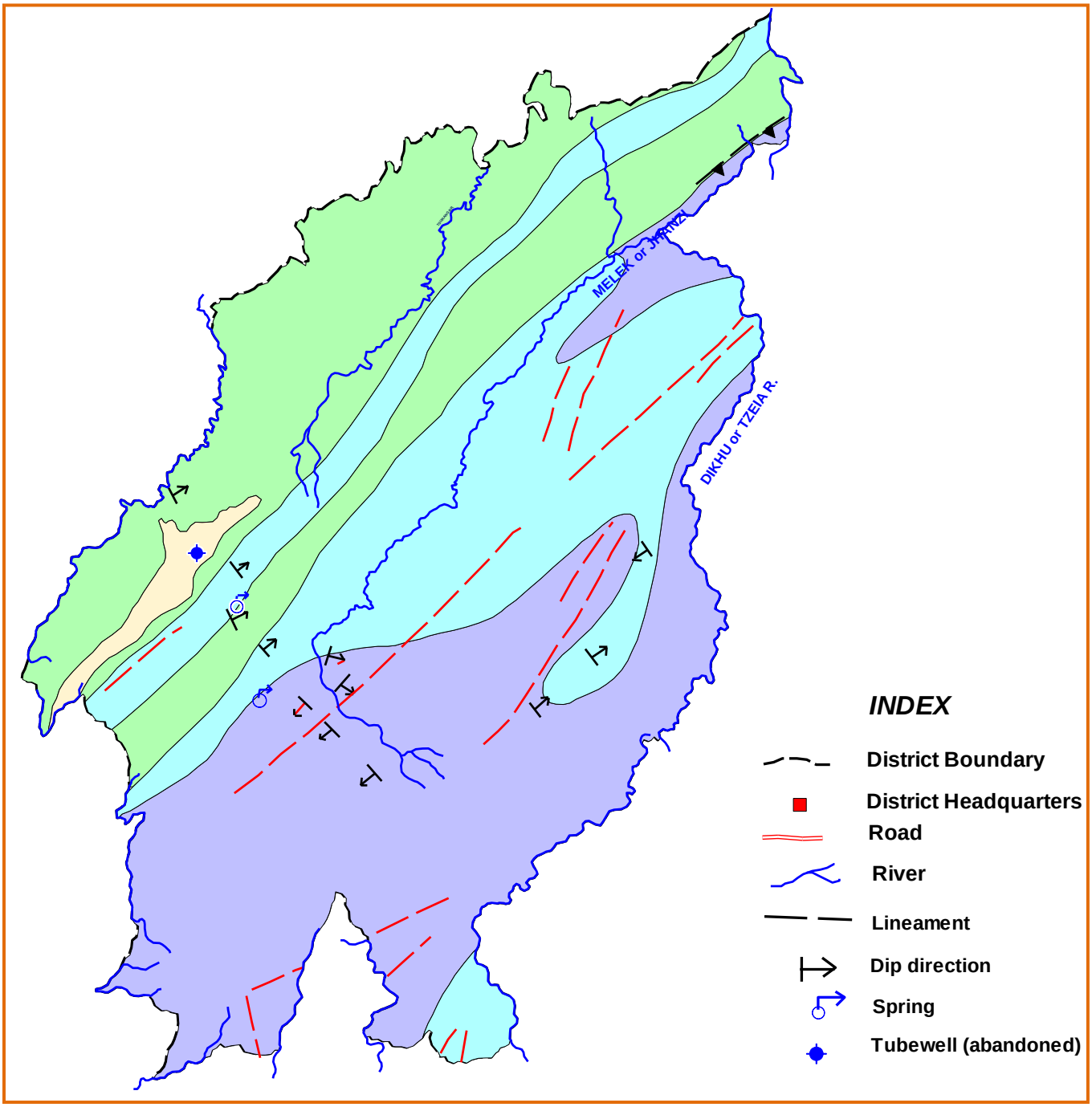
In the major part of the district, tapping perennial springs and rain water harvesting would remain the main sources for water supply to the local population. The spring should be properly developed and protected wherever they are used for domestic purposes. Some of the spring waters in lower altitudes can be impounded in some structures and pumped again to supply water.

MOKOKCHUNG DISTRICT, NAGALAND



CGWB/NER/Do. No/5379/2008/S.D.

HYDROGEOLOGICAL MAP OF MOKOKCHUNG DISTRICT, NAGALAND



LEGEND

	AGE	FORMATION	LITHOLOGY	AQUIFER DISPOSITION	GROUND WATER POTENTIAL
~~ Unconformity ~~~					
	PLIOCENE PLEISTOCENE	DIHING	Denudational and low lying hills and mounds, consisting of pebble bed, soft sandy clay, grit, sandstone and conglomerate	Valleys underlain by Dihing Formation are comprised of assorted and discontinuous aquifers with high argillaceous matrix.	Low to moderate yield prospect of 10 -20 m^3 /hr for drawdown of more than 6 m.
~~ Unconformity ~~~					
	UPPER AND MIDDLE MIOCENE	TIPAM	Moderate structural hills, consisting of clay, shale, coarse to gritty ferruginous sandstone and conglomerate	The valleys underlain by Tipam sandstone form good aquifers	Good recharge zone for high and moderate yield aquifer system of deeper depth.
~~ Unconformity ~~~					
	UPPER EOCENE TO OLIGOCENE	BARAIL	Denudo-structural hills, long linear ridges and highly dissected round to flat topped hills consisting of bedded compact, fine to medium grained sandstone mostly less susceptible to erosion	Ground water restricted to weathered mantle and fractures	Run-off zone, ground water occurs as springs. Infiltration to ground water is controlled by development of secondary porosity in rocks caused due to action of tectonic elements.
	UPPER CRETACEOUS – MIDDLE EOCENE	DISANG	High structural hills, linear, curvi-linear and at places irregular hill ranges and narrow inter-montane valleys consisting of shale and sandstone.		