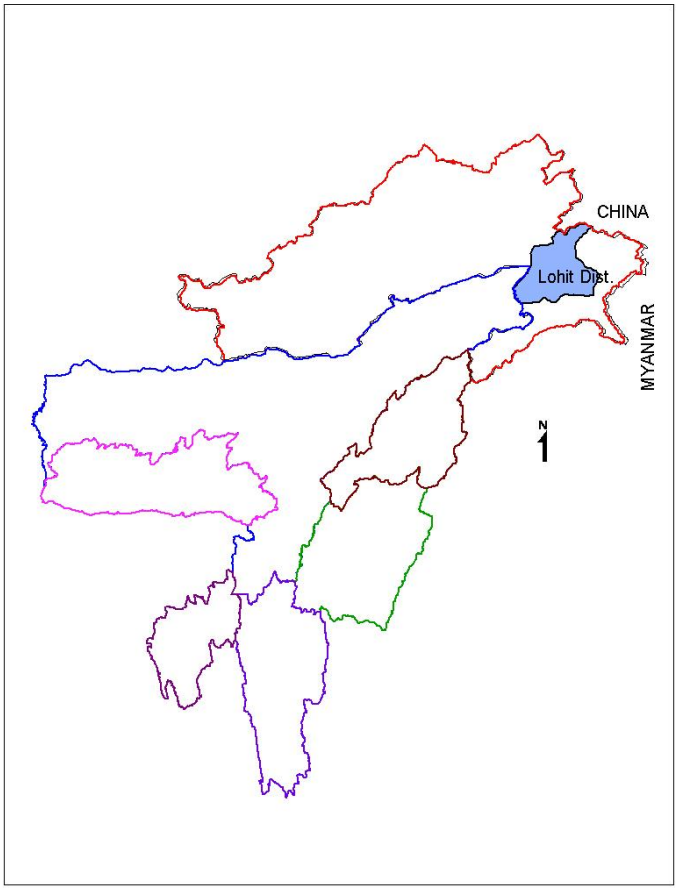
Technical Report Series: D **No: 11/2011-12**

Ground Water Information Booklet
Lohit District, Arunachal Pradesh



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

September 2013

LOHIT DISTRICT
AT A GLANCE

Sl No	ITEMS	Statistics
1.	GENERAL INFORMATION	
	i) Geographical area (sq. km)	5212
	ii) Administrative Divisions (As on 31st March 2013) No. of Sub-divisions No. of Block No.of Villages	 2 4 223
	iii) Population (As per 2011 Census)	143,527-
	iv) Average Annual Rainfall (mm)	5179
2.	GEOMORPHOLOGY	
	Major physiographic units	Alluvial plain
	Major Drainages	Lohit, Tenga Pani, Kamlong
3.	**LAND USE (sq. km) 2010-2011**	
	Net area sown	191.63
	Cultivable area	217.59
4.	MAJOR SOIL TYPES	Older alluvium, Silt and Low level
5.	**AREA UNDER PRINCIPAL CROPS (2010-2011), ha**	Paddy-10412, Maize-8585, Pulses- 1904, Oil seeds - 10411
6.	IRRIGATION BY DIFFERENT SOURCES (Area and Number of Structures)	
	Dug Wells / Tube Wells/ Tanks/ Ponds / Canals / Other Sources	-
	Net irrigated area	1243 ham
	Gross irrigated area	1244 ham
7.	**NUMBER OF GROUND WATER MONITORING WELLS OF CGWB** (As on 31-3-2013) No of Dug Wells No of Piezometers	 1 Nil
8.	**PREDOMINENT GEOLOGICAL FORMATIONS**	
9.	**HYDROGEOLOGY**	
	Major Water bearing formation Pre- monsoon Depth to water level during 2011	Alluvium 3.58

	Post- monsoon Depth to water level during 2011	3.52
10.	**GROUND WATER EXPLORATION BY CGWB** (As on 31-03-2013)	
	No of wells drilled (EW, OW, PZ, SH, Total)	EW : 5
	Depth Range (m)	54 to74
	Discharge (litres per second)	10 to 15
	Drawdown (m)	1 to 21
	Transmissivity (m^2/day)	33 to 1732
11.	GROUND WATER QUALITY	
	Presence of chemical constituents more than permissible limit	Nothing
	Type of water	Low mineralized, fresh and soft to moderately hand
12.	**DYNAMIC GROUND WATER RESOURCES (2009) in Ham**	
	Annual Replenish able Ground Water Resources	194480
	Net Ground Water Availability	175032
	Net annual Ground Water Draft	5.30
	Projected Demand for Domestic and Industrial Uses up to 2025	197.20
	Stage of Ground Water Development	0.003%
13.	**AWARNESS AND TRAINNING ACTIVITY**	Nil
	Mass Awareness Programme organized Date Place No. of Participants	
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	Nil
	Projects completed by CGWB (No & Amount spent)	
	Projects under technical guidance of CGWB	
15.	GROUND WATER CONTROL AND REGULATION	Nil
	Number of OE Blocks	
	No of Critical Blocks	
	No of blocks notified	

1. INTRODUCTION

The Lohit district is the north eastern district of Arunachal Pradesh. It is bounded on the north by Dibang valley and Anjaw district, on south by Tirap district, on west by Dibang valley and Assam, and on east by Anjaw district. Geographically the district covers on area of 5212 sq. km. and has population of 145,538 as per 2011 census. The decadal growth rate (2001 – 2011) is 16.44 and density of population is 28 per sq.km. The administrative divisions of the district are shown in table 1.

Table 1: Administrative divisions of Lohit district.

District	Sub - division	Block
Lohit	Tezu	Tezu
	Namsai	Namsai
		Wakro
		Lekang
	Hayuliang	Hayuliang
		Walong
		Changlang

DRAINAGE

Lohit is the principal river of the district. It rises from the eastern Tibet where it is known as Zayul chu. Flowing southward it enters the district and passes through the heart of the district in east – west direction and finally merges with the Brahmaputra River in Assam. The Lohit is joined by many tributaries, most important of which are Kamlong, Lam, Tezu, Tabang, Metzu and Tenga Pani. Lohit and all its major tributaries are perennial in nature. Drainage pattern of the district is sub-dendritic to sub- angular.

AGRICULTURE AND IRRIGATION

Agriculture is the mainstay of the people of the district. Major food crops produced in this district are Paddy, Maize, Millet, Wheat and pulses, and a total of 17905 ha area cultivated under different crops. There is no major irrigation scheme in the district, but a good number of minor irrigation schemes have been constructed. During 2005-06, through 17 canals 159 ha irrigation potential has been created. Net area irrigated is 62 ha while gross area irrigated is 70 ha. Because of limited surface water source, the agricultural practice is basically monocropped. With the assured irrigation from ground water sources, more areas can be brought under permanent cultivation with multi cropping pattern.

PREVIOUS STUSDIES

Systematic hydrogeological survey was carried out in this district by Sh. J. K. Verma, AHG during 1976-77 followed by Shri A.D. Patgiri during 1978–79. Latest survey carried out by Sh. R. K. Nayek, Scientist – B during 2004-05. Central Ground Water Board established ground water monitoring stations in this district and every year four times (January, March, August and November) water level monitoring are carried out. During January, water samples are collected from these monitoring stations for chemical analysis.

2. RAINFALL AND CLIMATE

The climate of the district is largely influenced by the nature of its terrain. Climate is sub-tropical (rather cool), wet and highly humid in the lower elevations and in the valleys. The area falls in heavy rainfall belt and average annual rainfall is 5179 mm.

3. GEOMORPHOLOGY AND SOIL TYPES

Geomorphologically, Lohit district can be broadly divided into two categories Structural hills and Piedmont plains. Structural hills consist of valleys and ridges of definite trend lines. Piedmont plains are the plains in the foot hill belt of structural hills. All the major settlements like Tezu, Namsai etc comes under piedmont plains.

The nature and properties of soil vary according to regional variations. In the hilly regions, the soil generally contains high humus and nitrogen due to extensive cover of the forests. The soil along the foothill areas is alluvial, loamy or sandy loam mixed with gravel and pebble brought down by rain from higher attitudes. The soil in the valley is rich in organic content. The soil is mainly acidic in nature.

The soils in the district can be divided into a) plain alluvial soils up to 305 m attitude and b) hilly soils above 305m. The plains soils consist of the following types.

1) Older Alluvium Type

It represents the formation of higher level terraces in the foothill areas, consisting mainly of coarse sand and organic matter. It covers parts of Man Bum and Namsai forests on the east, Lohitpur and Timai in the middle and Roing to Sonitpur area on the west. The soil is generally loamy and brownish in colour.

2) Silt Type

It comprises the area next below the terraced type. The high silt content of this area is confined to the present flood plains on the banks of the big rivers and their tributaries. This type consists or comparatively recent alluvial deposits characterized by shallow surface layer of silt with a sub-soil of coarse sand sometimes mixed with pebbles and boulders. The soil is sandy and comparatively poorer.

3) Low Level Type

It includes depressions and swamps which remain submerged under water for sometimes during the rainy season. The surface soil is generally clay.

4. HYDROGEOLOGY

The ground water regime in alluvial areas can be demarcated into two zones.

a) Water table or semi-confined aquifer down to a depth of 30 to 50 m.
b) Deep aquifers beyond the depth of 50 m.

a) Water Table Aquifer

The shallow zone in the Bhabar belt consists of boulders, cobbles, pebbles intermixed with silt and sand whereas in alluvial plains it consist of silt and medium to coarse sand and gravel. The top horizon consists of yellow to yellowish brown clay. The sediments become gradually fines from Bhabar zone to flood plain. The Bhabar is mostly composed of boulders while flood plain is composed of fine sand and silt. Vertical gradation in grain sizes is also noticed. The grains become coarser with depth. Due to variation in grain sizes and their sorting etc., the hydraulic properties also vary. The Bhabar zone, being composed of loose boulders, is highly permeable.

Depth of ground water level in shallow zones varies from 6 to 10m bgl in the Terai area. In flood plain areas, depth to water level varies between 1.5 to 6m bgl. In Bhabar belt the depth to water level is generally deep and sometimes goes below 10m.

The hydraulic gradient of water table aquifer from north to south is 1:300 in northern part of the district. The slope decreases towards west where it is 1:625. The seasonal fluctuation is high in Bhabar belt being about 7 m while in the Terai zone the water level fluctuation is 2.5 m.

The hydrogeological characteristics of the shallow zone are based on 2 exploratory tube well constructed by CGWB and pumping test in two dug wells. In the shallow zone granular zones in general encountered are between 8 to 24 m, 29 to 35 m, 37 to 39 m and 45 to 49 m of depth with little variation. Static water level varies from 6 to 10 m for a drawdown up to 21m. Transmissivity at Old Mohong is found to be 33 m^2 / day. Pumping tests of one dug well at Tezu (flood plain) area shows specific capacity / m of drawdown is 80 and at Namsai (Terai belt) specific capacity / m of drawdown are 30.

b) Deeper Aquifer

The characteristics of the deeper aquifer in the district have been inferred from the 3 tube wells constructed by Central Ground Water Board, NE Region. Ground water occurs under confined condition. The wells were constructed by tapping granular zones between 29 to 68 m of depth. The piezometric head in the wells varies from 3 to 3.3 m bgl. Discharge of these wells is up to 10 lit per second for a drawdown of 1 to 4 m. Transmissivity at Mahadevpur is found to be 1732 m^2/ day.

5. GROUND WATER RESOURCES

The dynamic ground water resources of the district have been estimated based on GEC' 97 methodology. The dynamic resources has been calculated by considering entire district as a single unit, because block-wise hydrological data was not available. An annual replenish able ground water resource of the district is 194480Ham. Net ground water availability of the district is 17532Ham while net ground water draft for all uses is only 5.30Ham. Projected demand for domestic and industrial uses up to 2025 is 197.2Ham. Ground Water Availability for future irrigation is 174829.5Ham. Stage of ground water development is 0.003 % and thus the district can be categorized as safe.

6. GROUND WATER QUALITY

Water samples collected from dug wells, tube wells and springs from various parts of the district and analyzed in the regional chemical laboratory of CGWB at Guwahati. Range of chemical constituents is shown in table 2.

Table 2: Range of chemical constituents in Lohit district

Constituents	Dug wells	Tube wells	Springs
P^H	6.3 - 7.85	5.6 - 7.30	7.0 - 7.85
E.C. (in micromhos / cm at 25˚c)	62 – 470	55 - 680.9	72.83 – 330.97
HCO_3 (mg/lit)	25 – 293	12 – 387	32 – 200
Cl^- (mg/lit)	5 – 35	2.1 – 31	7 – 14
Hardness (Ca , Mg) as $CaCo_3$ (mg/lit)	22 –218	23 – 390	32 – 178
Ca^{++} (mg/lit)	5 – 59	4.8 – 40	8 – 52
Mg^{++} (mg/lit)	1.5 – 33	1.9 – 71	2.4 – 26
Fe (mg/lit)	0.15 – 0.30	NA	NA

It is revealed from table 2 that chlorides, calcium, magnesium and iron are within permissible limit for all purpose. P^H ranges show that waters from dug wells are slightly acidic to slightly alkaline, tube wells water are all acidic and springs water are all alkaline.

Majority of all the samples have EC values less than 250 micromhos / cm at 25˚c indicating very low mineralization. Majority samples fall under 50 – 250ppm range of bicarbonate, 20 – 30% samples have less than 50ppm bicarbonate.

About 30% samples are soft and few samples (5 – 8%) are very hard. It is evident that ground water is less mineralized, fresh and soft to moderately hard.

7. STATUS OF GROUND WATER DEVELOPMENT

Central Ground water Board, NER constructed three tube wells in the district. State department, WRD, constructed two tube wells. A few wells constructed by PHED, AP for drinking water supply but data is not available. Other than this, a good number of hand pumps also have been constructed in individual households. But, with respect to resource availability, ground water development is negligible.

8. GROUND WATER MANAGEMENT STRATEGY

The net sown area of the district is 19163 ha whereas irrigated area is only 1244 ha. Source of irrigation schemes are mainly surface water. The agricultural practice is basically mono cropped due to limited surface water sources. With the assured irrigation from ground water source, more areas can be brought under permanent cultivation with multi cropping pattern. At present ground water is utilized for domestic uses only. Terraced deposits and flood plains are having good ground water potential and can be developed for irrigation purposes. These areas are suitable for construction of dug wells, shallow tube wells and deep tube wells. Shallow tube wells constructed down to the depth of 50m by tapping about 15 m saturated granular zones can yield 5 to 10 lps for moderate drawdown. The depths to water levels are deeper in terraced deposits as compared to flood plains.

9. WATER CONSERVATION AND ARTIFICIAL RECHARGE

At present state govt. authorities are supplying water by tapping surface or spring water sources and are almost sufficient for the district. Net ground water availability of the district is 909.21 MCM while net ground water draft for all uses is only 0.15 MCM.

Therefore, now artificial recharge is not required for this district. However, since area is receiving very high rainfall roof top rain water harvesting may be taken up.

10. RECOMMENDATIONS

1. In the flood plain area 300 dugwells having 4 to 6 m dia within a depth range of 10 to 15 m and 300 shallow tubewells tapping about 15 m saturated thickness within 30 to 50 m depth can be constructed. Based on the data available from these minor irrigation structures further program of development can be chalked. The spacing between dugwells and shallow tubewells should be kept as 150 and 175 m respectively.

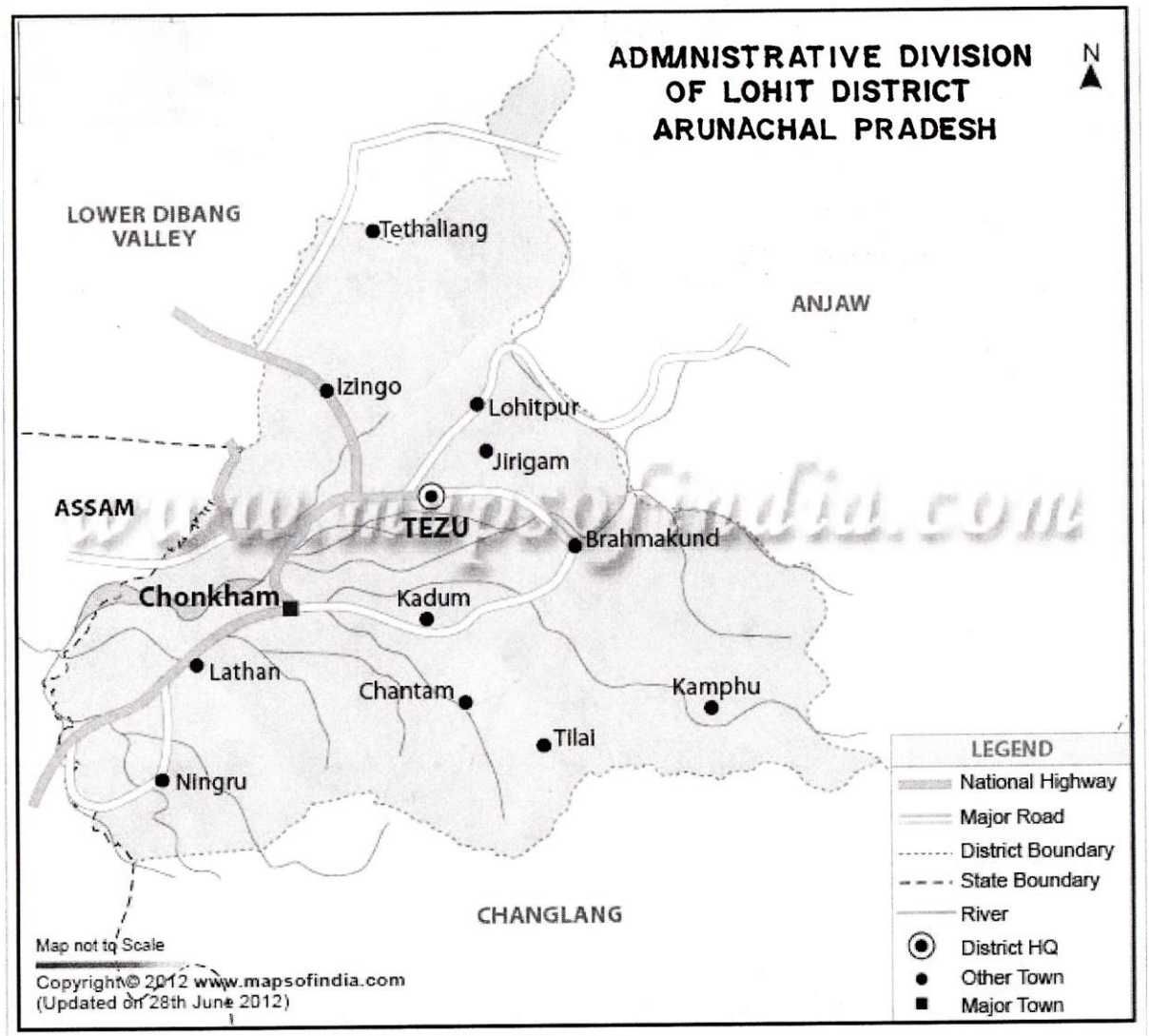
2. The deeper aquifers in flood plain, terai and bhabar zones seem to be quite promising based upon the data available in the similar terrain of Assam. However, the paucity of any reliable data in the district prohibits the description and recommendation to develop the deeper aquifers.

3. It is recommended that exploratory drilling to a depth of 300 m may be undertaken in these zones assess and evaluate the potentialities of deeper aquifers, and their hydrological properties. Based upon this the optimal design of deep tubewells can be suggested. In Bhabar zone, which is predominantly bouldery, combination rigs having rotary and percussion functions would be required for tubewell construction.

4. Because of limited surface water source, the agricultural practice is basically monocropped. With the assured irrigation from ground water sources, more areas can be brought under permanent cultivation with multi cropping pattern.

5. It has been noticed that some of the perennial rivers like Papojan, Tengapani and Dirak etc, have many suitable locations for low lift irrigation schemes. These schemes can provide irrigation during the lean (Rabi) period also.

6. The district receives very high annual rainfall. Therefore, roof top rain water harvesting may be taken up.


ADMINISTRATIVE DIVISION
OF LOHIT DISTRICT
ARUNACHAL PRADESH
N
LOWER DIBANG
VALLEY
Tethaliang
ANJAW
Izingo
Lohitpur
Jirigam
ASSAM
TEZU
Brahmakund
Chonkham
Kadum
Lathan
Chantam
Kamphu
Tilai
Ningru
CHANGLANG
LEGEND
National Highway
Major Road
District Boundary
State Boundary
River
District HQ
Other Town
Major Town
Map not to Scale
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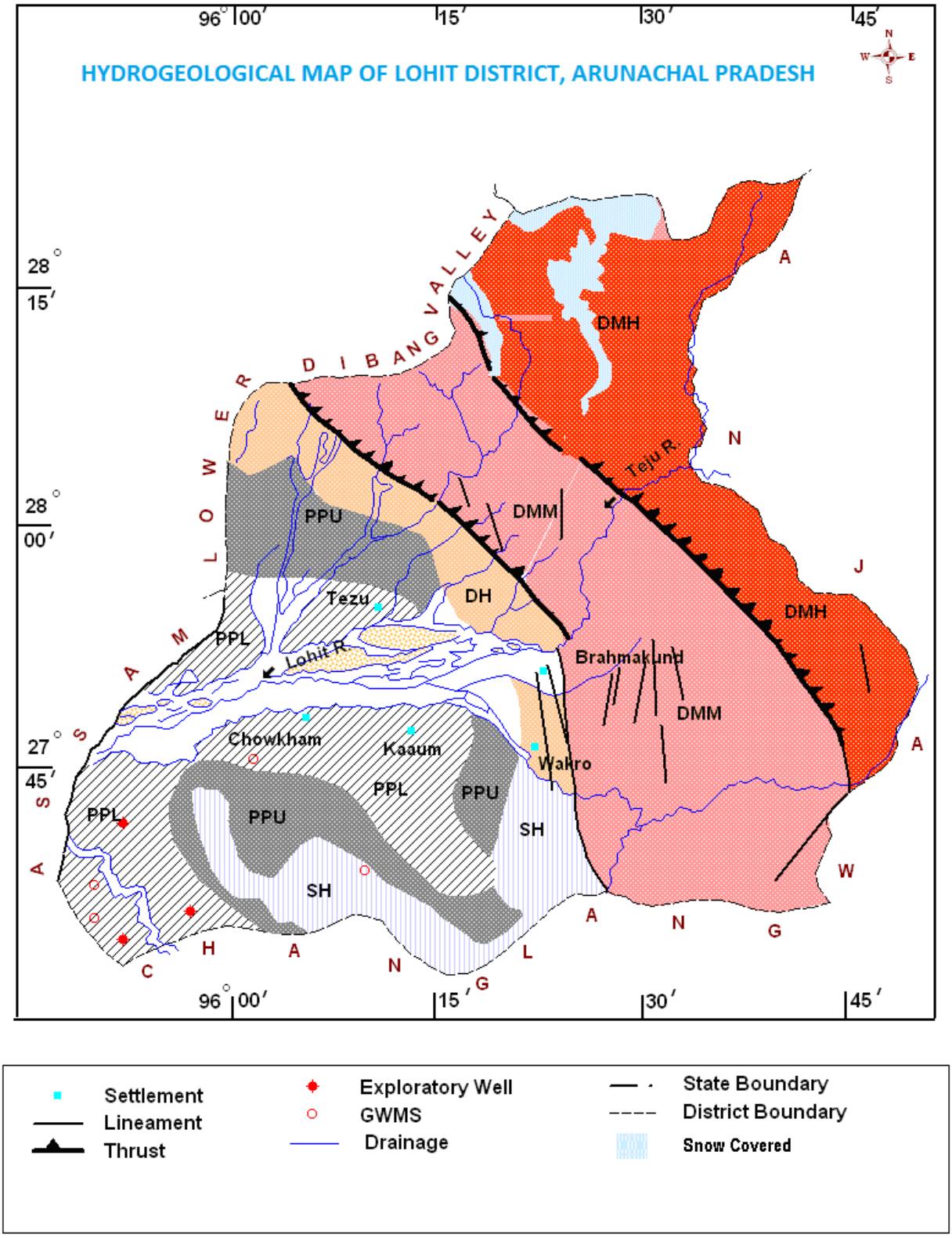
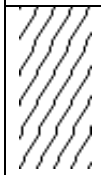
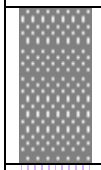
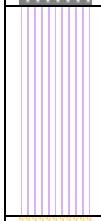
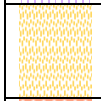
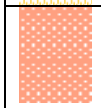
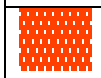
(Updated on 28th June 2012)


HYDROGEOLOGICAL MAP OF LOHIT DISTRICT, ARUNACHAL PRADESH
96° 00′
15′
30′
45′
28° 15′
28° 00′
27° 45′
LOWER DIBANG VALLEY
ARUNACHAL PRADESH
DMH
DMM
DH
PPU
PPL
SH
Tezu
Tezu R.
Lohit R.
Brahmakund
Chowkham
Kaaum
Wakro
Settlement
Lineament
Thrust
Exploratory Well
GWMS
Drainage
State Boundary
District Boundary
Snow Covered

MAP UNIT	Geomorphic Unit	GEOMORPHOLOGICAL UNIT	LITHOSTRATIGRAPHIC UNIT	STRUCTURE /DESCRIPTION
	FP	Flood Plain	Alluvium	Narrow stretch of alluvial plain consisting of river borne alluvium(Sand, Silt & Clay) occurring along the major river occurring along the major river occasionally flooded
	PPL	Piedmont Plain Lower	Alluvium	A stretch of alluvial plain formed at the lower part of the foot-hill zone consisting of intercalations of course fan material and river alluvium of silt, coarse sand & pebbles.
	PPU	Piedmont Plain Upper	Alluvium	A narrow stretch of alluvial plain formed at the upper part of the foot-hill zone consisting of unconsolidated sediments comprising of assorted silt, sand, pebble & boulder
	SH	Structural Hills	Dihing Fm (Mio-Pliocene)	Steeply dipping hills with pebble, boulder, sandstone, mudstone, clay beds are mostly ferruginous, semi-consolidated nature associated with folding, faulting and showing definite trend lines.
	DH	Denudation Hills	Tenga Fm. (Upp. Proterozoic)	Moderate hills of bedded sandstone, fractured quartzite & phyllites
	DMM	Denudational Mountain (Moderate)	Tidding Fm.	High top mountains consisting of quartzite, phyllite, mica-schists and gneiss occurring in the thrust zone
	DMH	Denudational Mountain (High)	Lohit Granodiorites (Unclassified)	High top mountains consisting of biotite, granite, granodiorite, mica-schist