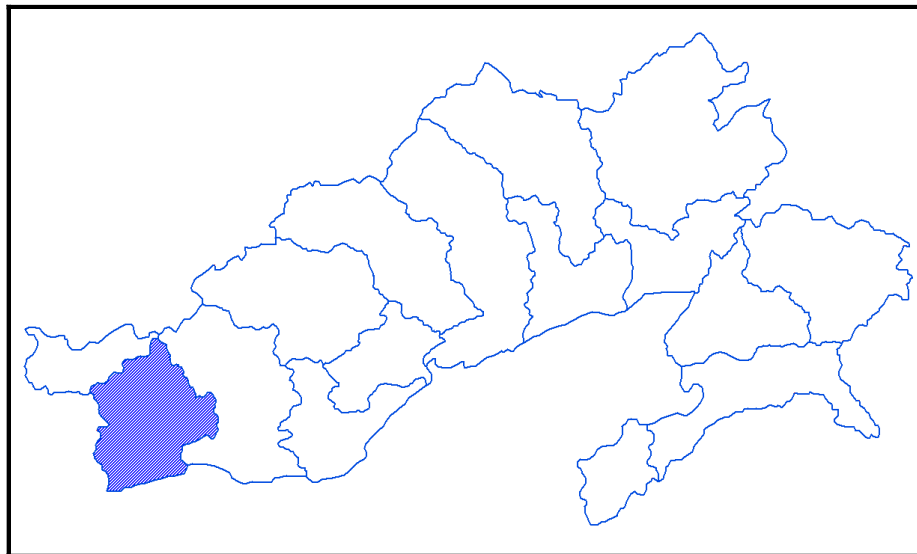


Technical Report Series: D

No:



# Ground Water Information Booklet West Kameng District, Arunachal Pradesh



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

## WEST KAMENG DISTRICT AT A GLANCE

Sl.No.	ITEMS	STATISTICS
1	<b>GENERAL INFORMATION</b>	
	i) Geographical area (sq.km.)	7422
	ii) Administrative Divisions (As on 31 <sup>st</sup> March, 2011) Number of Tehsils/Block Number of Panchayat/villages/Circles	01 sub-divisions  04  212 villages, 10circles
	iii) Population (As per 2011 census)	87013
	iv) Average Annual Rainfall (mm)	1607
2	<b>GEOMORPHOLOGY</b>	Denudo structural hills, Structural hills, valley fills
	Major physiographic units	High Mountainous peaks Irregular land forms
	Major Drainages	Kameng river and its tributaries viz. Tenga, Bichom and Dirang
3	<b>LAND USE</b>	
	a) Forest area (reserved forest)	708.35hac
	b) Net area sown	5303 hac
	c) Gross cropped area	5386 hac
4	<b>MAJOR SOIL TYPES</b>	Alluvial and residual soils
5	<b>AREA UNDER PRINCIPAL CROPS (As on 2010-11), in sq.km.)</b>	Rice, Wheat and Maize
6	<b>IRRIGATION BY DIFFERENT SOURCES (Areas and numbers of Structures)</b>	
	Dug wells	Nil
	Tube wells	Nil
	Tanks/ponds	Nil
	Canals	26 Nos. 53 Hectares
	Other sources (Hand pumps)	Nil
	Net irrigated area	191.66 Hectares
	Gross irrigated area	191.66 hectares
7	<b>NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2013)</b>	
	No. of Dug wells No. of Piezometers	Nil
8	<b>PREDOMINANT GEOLOGICAL FORMATIONS</b>	Bomdilla Group, Tenga Formation
9	<b>HYDROGEOLOGY</b>	Older alluvium and River Terraces, Siwalik Group, Gondwana Formations

10	<b>GROUND WATER EXPLORATION BY CGWB (as on 31.3.2013)</b>	1
	No. of wells drilled (EW, OW, PZ, SH, Total)	EW – 1, Total – 1
	Depth Range (m)	99.5
	Discharge (litres per second)	48 lpm
	Storativity (m <sup>2</sup> /day)	-
	Transmissivity (m <sup>2</sup> /day)	4.96 m <sup>2</sup> /day
11	<b>GROUND WATER QUALITY</b>	
	Presence of Chemical constituents more than permissible limits	Nil
	Type of water	Fresh
12	<b>DYNAMIC GROUND WATER RESOURCES (2009)</b>	
	Annual Replenish able Ground Water Resources	2391.48ham
	Net annual Ground Water Draft	N.A
	Projected Demand for Domestic and Industrial Uses upto 2025	63ham
	Net annual ground water availability & Stage of Ground Water Development	2152.33 ham and safe
13	<b>AWARENESS AND TRAINING ACTIVITY</b>	
	Mass awareness programme organized Date Place No. of participants	Nil
14	<b>EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING</b>	Nil
	Projects completed by CGWB (No. and Amount spent)	Nil
	Projects under technical guidance of CGWB	Nil
15	<b>GROUND WATER CONTROL AND REGULATION</b>	
	Number of OE Blocks	Nil
	No. of Critical Blocks	Nil
	No. of blocks notified	Nil
16	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	

## WEST KAMENG DISTRICT

### **Introduction**

The West Kameng district is located in the western part of Arunachal Pradesh, lies between 91°30' to 92°40' East longitudes 26°54' to 28°01' North latitude falling in Survey of India topographical sheets 78 M/83A/83B and 83E. The district is bordered by East Kameng district in the east. The northern boundary passes through the high peaks of the Himalayas that form the boundary between India and China (Tibet). The western boundary demarcates Bhutan from India. The Tawang district lies in the north western side of the district while the Sonitpur district is situated in the southern boundary of Assam.

The name of the district is derived from the Kameng river, a tributary of Brahmaputra, that flows through the district. Tenga, Bichom and Dirang chu are the main streams of the district. All these rivers are the tributaries to the Kameng river. Administratively, the district is divided into One sub-divisions. Number of villages' are 212. Population of the district is 87013 as per 2011 census.

The topography of the district is mostly mountainous. The altitude of the Sela range varies from 14000 to 15000 feet and Sela pass is situated at 13714 feet height. Central Ground Water Board, North Eastern Region, Guwahati has carried out systematic hydrogeological surveys. Ground water management studies were carried out by Shri Biplab Ray, Scientist 'C', besides these surveys and investigations, the apex organization has so far drilled one Exploratory well at Balukpang location, down to a depth of 99.5 metres.

### **2. Rainfall and Climate**

The rainy season starts from April and continues up to November. The average rainfall is 1607.4 mm. The climate is hot and humid upto 1200 amsl and beyond that in the northern belt, the climate is cold. Relative humidity is high throughout the year while in the winter months when it is less. The coldest months are December and January. Temperature in the district ranges from 0.1° to 31° Celsius.

### **3. Geomorphology and Soil Type**

Geomorphologically, the district has been sub-divided into 3 major geomorphological units –

- i) Denudo structural hills
- ii) Structural hills
- iii) Valley fills

**i) The Denudo-structural hills**

These mainly comprise metamorphic and some igneous intrusions occurrences high hills with steep slopes. Their heights vary from 2100 to 5800 amsl. The unit acts as run-off zone.

- (a) High denude-structural hills – The entire Tawang and northern part of West Kameng district comprise this unit. The southern limit of this unit goes upto the north of Dirang, Sangti and Nafra. Their altitude varies from 300 to 6,000 above MSL. These hill ranges are very steep. The northern part is devoid of vegetation for being now bound area.
- (b) Moderate denude-structural hills – In the South of Dirang, the hills are of moderate height varying between 2,100 to 3,000 m amsl. This unit occupies the central part of the West Kameng District.

**ii) Structural Hills**

These are moderate to low hills comprising sedimentary formations. This unit occupies the area south of Tenga up to Assam border. According to height this unit can further sub-divided in to two units.

- a) Moderate structural hills – This unit occupy the area south of Tenga valley upto north of Tipi and Doimara valley. These are moderate in height ranging from 1200 to 2100 m amsl. This unit is structurally disturbed and as a result number of fractures and faults are developed. This unit mainly acts as a run-off zone.
- b) Low structural hills – This unit forms the southernmost part of West Kameng district merging with Assam border. The unit comprises the formations of Tertiary to Recent age. The height of this unit varies from 500 to 1200 m amsl. The unit acts as a both recharge and run-off zone.

**iii) Valley Fills**

The valley fills within the hill ranges occur with limited areal extent. These are covered by recent alluvium. These act as a good recharge zone. In the moderate denude-structural hills the valley fills identified and located at Dirang, Sangti, Tenga and Shergaon areas and in the structural hills the valley fills are located at Anatulla, Doimora and Tipi areas. A sum total of 43 sq.km. Of area have been occupied by this unit in the district.

#### **4. Ground Water Scenario**

The district can be divided into 3 distinct hydro geological units :-

##### **i) Consolidated formations**

This unit occupies the north and the central part of West Kameng district and consists of Sela, Bomdila and Gondwana Group of rocks. Moderate to high-grade metamorphic rocks like gneisses, schist, Phyllite, Quartzite, etc. constitute Sela and Bomdila Groups. The Gondwana Group of rocks consist of hard and compact sandstone, carbonaceous shale, phyllites, slates etc.

The consolidated formations mainly act as a run-off zone. Here the rainwater is infiltrated through the weathered mantle and colluvial formations in the hill slopes to join the sub-surface. Groundwater comes out where the water table cuts the mountain slopes to give rise to springs.

##### **2. Semiconsolidated formations:**

The unit occupies the southern part of the west Kameng district. Semi-consolidated formation comprise of ENE-WSW trending Siwalik Groups of rocks. This group consists of sandstone, shale, sill-stone, conglomerate, gravel beds. The rocks are porous in nature and act as good media for rainwater percolation, and good recharge zone. Though the units have ground water reserve, the area is not suitable for ground water exploration due to occurrence of hilly topography.

##### **3. Unconsolidated Formation:**

In the area unconsolidated formations occur as valley fills. The valley fill deposits are identified in Darrang, Sangti, Rupa, Tenga and Shergoan valleys. These valleys have better ground water development prospect than those located in consolidated and semi-consolidated formations.

#### **Depth to water level:**

Since ground water structures are not available in West Kameng district barring the foothill areas at Bhalukpong, the water level situation for the entire district cannot be portrayed. However, at Bhalukpong the depth to water level in dug wells found to vary between 2.62 to 5.50 mbgl in the lean period. In the shallow aquifer tapped by the dugwell represents unconfined condition while in tube wells semi-confined to confined conditions could be observed. In the exploratory tube well drilled by CCWB, static water level was found at 3.74 mbmp. The depth of well is 99.5 meters and transmissivity is  $4.96 \text{ m}^2 / \text{day}$ . The discharge of the well is 48 IPm.

## **4.2. Ground water resources:**

The dynamic ground water resources of the district have been estimated based on methodology recommended by GEC-97. The net annual ground water availability the district is 2152.33hectare meter (Ham). Projected demand for domestic and industrial purposes upto 2025 is 63ham. The net annual ground water availability for future irrigation development is 2089.33ham The stage of ground water development is thus negligible and the district can be categorized as safe.

## **4.3. Ground water Quality:-**

The chemical quality of ground water in this area is ascertained through the samples collected from the springs. The analysis data indicates that the spring water is alkaline in nature ranging in pH values from 6.52-8.02. The bicarbonate content is nil. EC vary from 18-200 cm except in Dirang, Sangti area where the values go up to 486  $\mu\text{s}/\text{cm}$ . Remaining all the parameters like Ca, Na, Mg, etc. are well within the permissible limit. The water is fresh and potable and can be safely used for domestic and industrial purposes.

## **4.4 Status of Ground Water Development**

There are 212 villages in West Kameng district where the State PHED provides all villages with drinking water. The present source of drinking water supply is streams /springs which are perennial in nature. The quantity of water is insufficient in most of the cases to meet the demand of the village people. The stream water can be diverted to a de-siltation plant through a diversion dam and then to a chlorination plant. After proper treatment this water may be supplied to the villages through pipes. Central Ground Water Board drilled one well at Balukpung. Bhalukpong area is feasible for construction of dug wells.

## **5. Groundwater Management Strategy**

The ground water development in the district is practically negligible.. There are 212villages in West Kameng district where the state department established and provides all villages with drinking water. However, in view of extreme necessity of sustainable water management for drinking and irrigation, the scope of development of ground water in the district should be examined forthwith with the deployment of percussion-DTH combined rig as also through application of needful artificial recharge, development of the springs and rainwater harvesting measures.

### **5. 1 Groundwater Development**

The problem of groundwater development in the district varies depending upon topographic and geologic conditions. Most of the area is occupied by Denudo structural hills

.The rocks are very hard and compact with steep slopes. They act mostly as a run-off zone. The major scope for the groundwater development in this area through the improvement of the springs. These springs can be developed for drinking and also locally for irrigational purposes. The method of development of springs is by construction of concrete sump near the mouth of the spring and widening the fracture or joint, through which is emerging. The collect well should be well protected from surface pollution.

The valley areas of Anathula, Doimora and Balukpung, which forms a part of alluvial plain of Assam. These valley fills are suitable for development through dug wells as also tube wells.

## **5.2 Water conservation and artificial Recharge**

The entire district is occupied by rugged terrain and it is having hilly and valley portion. there is a limited scope of ground water development in hilly terrain and the scope of recharge in hilly terrain requires a rigorous study. Rainwater can be harvested for drinking water supply.

## **6. Groundwater Related Issues and Problems**

There is no such problem related to groundwater. Sometimes at some locations iron content in groundwater is more than the permissible limit, otherwise groundwater is fresh and portable and may be used for domestic, irrigation and industrial needs.

## **7. Awareness & Training Activity**

### **7.1 Mass awareness program (MAP), Water Management Training Program (WMTP) by CGWB.**

No mass awareness program and WMTP so far has been conducted in this district.

### **7.2 Participation in exhibition, mela, fair, etc groundwater related exhibition.**

### **7.3 Presentation and Lectures delivered in public form/ radio/TV - Nil**

## **8. Recommendation**

The area is mostly comprised by consolidated and semi consolidated formation.

Major part of the formation in the north is Sela and Bombidilla group of rocks occupy central part of the district. Ground water prospect is very much limited in these units, confining mainly to secondary porosity developed due to thrust. No scope for drilling in these areas is possible due to unapproachable hilly terrain.

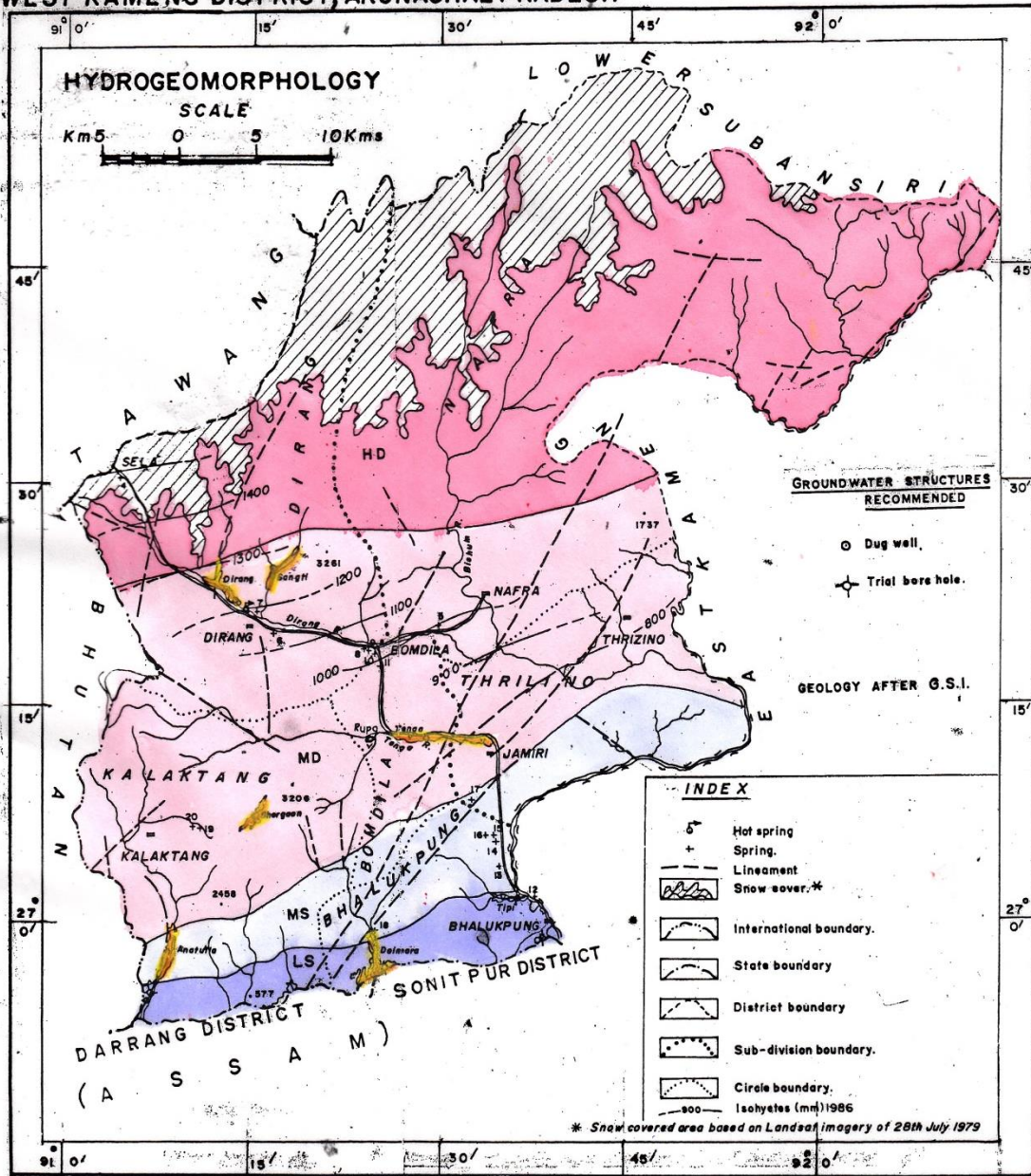
1. The main recommendation for ground water development of these areas is to develop and maintenance of the springs scientifically..



2. The sumps of the collector structure should be well protected from surface contamination
3. Geophysical surveys should be carried out in the valleys underlain by the semi consolidated formation. It can be helpful for construction of dug wells and shallow tube wells in these areas.
4. Roof top rainwater harvesting should be practiced in the hilly area and surplus rain water can be conserved to mitigate the drinking water problem during lean period, when springs discharge drops considerably.

<b>Symbol</b>	<b>Annotation</b>	<b>Geomorphic Unit</b>	<b>Age</b>	<b>Lithostratigraphic Unit</b>	<b>Material/Land Use/ Hydrogeological Character</b>	<b>Ground water potential</b>
	HD	High Denude structural hills	Archaean to Precambrian	Sela Group	Quartzites etc./ Run off zone, schist, gneiss	Poor. Spring development. (Yield 14-43 m <sup>2</sup> /dav)
	MD	Moderate Denude structural hills	Lower Palaeozoic	Bomdila Tenga Groups	Granite, phyllite, quartzites, micaschist, gneiss, etc. Jhum, forest, settlement/Run-off and recharge zone	Poor. Spring development. (Yield 14-64 m <sup>3</sup> /day)
	MS	Moderate structural hills	Penno-Carboniferous to Jurassic	Gondwana	Consolidated Formation: Compact siltstone, sandstone, phyllite, quartzites, etc. Forest, Jhum settlement/Run-off and recharge zone	Moderate to poor, spring development (Yield 10-54 m <sup>3</sup> /day)
	LS	Low structural hills	Tertiary	Siwaliks	Semiconsolidated formations : Siltstone, sandstone, shale, etc., Forest, Jhum settlement/Run-off and recharge zone	Moderate, dug well at selected location

# WEST KAMENG DISTRICT, ARUNACHAL PRADESH



CGWB/NER/DoNo/5628/2009/S.Das.

WEST KAMENG DISTRICT, ARUNACHAL PRADESH.

Legend

<u>Annotation</u>	<u>Geomorphic unit</u>	<u>Age</u>	<u>Lithostratigraphic unit</u>	<u>Material/Land use/Hydrogeological characters</u>	<u>Groundwater potential</u>
V	Valley fill	Recent	Recent & older alluvium	(p) <u>Unconsolidated &amp; Sediments</u> :- Clay, silt, sand, gravel, boulder/cultivation, settlement/ recharge zone.	Good. Dugwell, trial boreholes
LS	Low structural hills	Tertiary	Siwaliks	(b) <u>Semiconsolidated Formation</u> :- Siltstone, sandstone, shale, etc/Forest, Jhum settlement/Run-off and recharge zone	Moderate. Dugwell at selected location
MS	Moderate structural hills	Permo-Carboniferous to Jurassic.	Gondwans	(c) <u>Consolidated Formation</u> :- Compact Siltstone, Sandstone, Phyllite, quartzite etc/Jhum, Forest, Settlement /Run- off zone	Moderate to poor. Spring development. (Yield 10-54 m <sup>3</sup> /day)
MD	Moderate denudo-structural hills.	Lower Paleozoic	Bomdila, Tenga Groups	Granite, phyllite, quartzite, mica-schist, gneisses etc/Jhum, forest, settlement /Run off zone.	Poor. Spring development. (Yield 14-64 m <sup>3</sup> /day)
HD	High denudo-structural hills.	Archaean to Pre-Cambrian	Sela, Bomdila Groups	Quartzites, Schists, Gneisses etc/Jhum, snow cover, Forest, settlement. /Run off zone.	Poor. Spring development. (Yield 14-43 m <sup>3</sup> /day)