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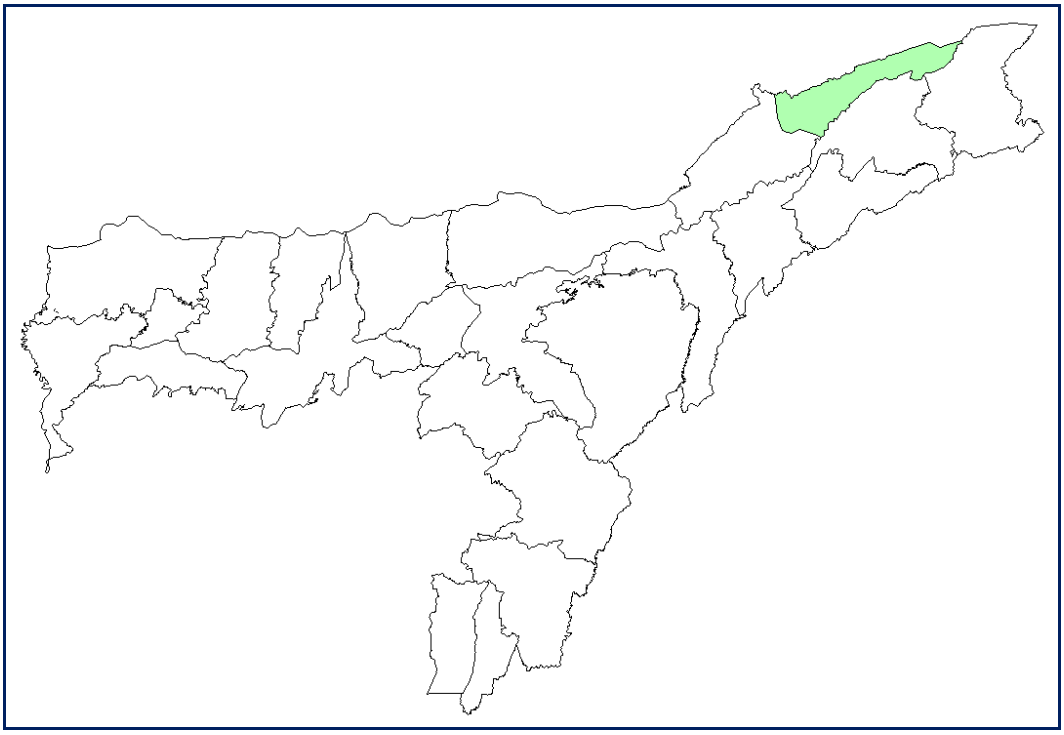
Ground Water Information Booklet
Dhemaji District, Assam



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

Ground Water Information Booklet, Dhemaji District, Assam

DISTRICT AT AGLANCE

Sl. No.	ITEMS	STATISTICS
1	GENERAL INFORMATION i) Geographical Area (in sq.km) ii) Population (as per 2011 census) iii) Average Annual Rainfall (mm)	 3,237 6,88,077 3,435
2	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 High level plain of Brahmaputra River and flat flood plain area Kumotia,Jiyadhol,Kanibil,Simen,Somkhong and Royang Rivers
3	LAND USE (sq.km) i) Forest area ii) Net area sown iii) Total cropped area iv) Area sown more than once	 593.55 675.06 121.70 446.64
4	MAJOR SOIL TYPES	New alluvial, Old alluvial, Red loamy and lateritic soil
5	AREA UNDER PRINCIPAL CROPS in sq.km (as on 2006)	1455.19
6	IRRIGATION BY DIFFERENT SOURCES (sq. km)	3.24
7	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (as on March 2013)	22
8	PREDOMINANT GEOLOGICAL FORMATIONS	Alluvial formations of Pleistocene to recent in age
9	HYDROGEOLOGY i) Major water Bearing Formations ii) Pre-monsoon Depth to Water Level during 2006 iii) Post-monsoon Depth to Water Level during 2006 iv) Long term Water Level Trend in 10 yrs (1997 –2006) in m/yr	 Alluvial sediments of Quaternary age and Piedmont deposits 0.01 to 9.40 mbgl 0.56 to 8.26 mbgl No significant change
10	GROUND WATER EXPLORATION BY CGWB (as on 28.02.2013) i) No of Wells Drilled	 8 (6 EW & 2 OW)

	ii) Depth Range (m) iii) Discharge (lps) iv) Transmissivity (m^2/day)	61.5 13.49 328.30	59.5 12.42 9831.05
11	GROUND WATER QUALITY i) Presence of Chemical Constituents more than Permissible Limit (e.g. EC, F, Fe, As) ii) Type of Water	Except Fe and As, other elements are within the Permissible limit. Fe and As are more than Permissible limit in the shallow aquifers -	
12	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 upto 2025 iv) Stage of Ground Water Development	 1,883.01 140.65 20.83 8%	
13	AWARENESS AND TRAINING ACTIVITY i)MassAwarenessProgrammes Organised ii) Date iv) Place v) No of Participants	 Nil	
14	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING i) Projects Completed by CGWB (No & amount spent) ii) Projects Under technical Guidance of CGWB (Numbers)	Nil	
15	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	Nil	
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	Higher concentration of Fe and As in ground water of the district is observed (greater than permissible limits prescribed by of BIS and WHO).	

Ground Water Information Booklet, Dhemaji District, Assam

1.0 Introduction

Dhemaji district of Assam occurs in the northeastern part of Brahmaputra river basin between north latitude 27°15' to 28° 00' and east longitude 94°05' to 95°30' covering an area of 3,237 sq.km. The district has been sub-divided into two civil sub-division (CSD), which contains four circles and five blocks.

Population of the district is 6,88,077 (as per 2011census) having total rural and urban populations as 639605 and 48472 respectively with density of 213 per sq.km. As per the land used pattern, the net cropped area is 121.70 sq. km.

The district receives heavy rainfall during May to July with an average annual rainfall of 3435 mm under the influence of southwest monsoon. In general temperature varies from 10°C to 37°C and during winter temperature goes down to as low as 2°C to 5°C. Humidity is very high throughout the year being 70 % during winter and goes up to 90% during summer rainy season.

Rice is the main crop in the district. Rain fed crop is practice as agriculture during all the seasons. An area of 4.69 sq. km and 1.13 sq.km land is irrigated with a total of 5.82 sq. km under STW/ILP. As per cropping pattern of the district 759.60 sq. km is mono cropped, 516.40 sq.km is double cropped and 260 sq. km is multiple cropped area with an average cropping intensity of 144%.

Physiographically the district is more or less flat and the area can be divided into high-level plain of Brahmaputra river (area falling between altitudes 107 m to 122 m) and flat flood plain area (area falling in between altitudes 89 m to 96 m)

Number of perennial streams flow through the district from north to south and join the Brahmaputra river. Thus the river Brahmaputra is effluent in nature. The major streams that drain the area are Kumotia, Gai, Kanibil, Sisi, Simen, Dikari and Royang.

Geologically the area is occupied by Older and Newer alluvium formations. Piedmont deposits of older alluvium consist of boulders, cobbles, gravel, sand and silt. Flood plain and Younger alluvial plains of Newer alluvium consist of gravel, pebble, coarse to medium sand, silt and clay.

Ground water occurs under phreatic condition in the shallow aquifer zone and under semi-confined condition in the deeper aquifer. Flow of ground water is from north to south. Pre-monsoon water level varies from 0.01 to 9.40 mbgl and post-monsoon water level varies from 0.56 to 8.26 mgbl. Depth to water level during pre-monsoon is higher than post-monsoon. This may be the effect of pre-monsoon rainfall. Long-term water level shows no significant change in the area.

Other than arsenic (As) and iron (Fe) concentration in the ground water, most of the chemical constituents are within the permissible limiting both for the drinking and irrigational uses. In some parts of the district fluoride (F) show within permissible limit during post-monsoon, but concentration rises (>1.5 ppm) in the pre-monsoon period and that may become undesirable for drinking purpose (as per the Special studies report of CGWB, AAP 2003-2004)

The estimated gross annual dynamic groundwater resource is 1376.96 mcm while net ground water resource is 1308.11 mcm. The stages of development are 10%. Future provision for domestic and industrial use is 20.83 mcm and for irrigation use is 1172.13 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. Out of 48 numbers of PWSS under Dhemaji PHE Division only 23 numbers of schemes are functioning. As per report, Department of irrigation creates irrigation potential of 4895 hams by 21 numbers of schemes but most of the schemes are presently in operative due to lack of fund and constant flood damage in the area. At present 47 numbers of STW under the Department of Agriculture is creating 3891 hams ground water draft per year.

2.0 Rainfall and Climate

The district is located near the foothills of Arunachal Pradesh; it exhibits difference in temperature, rainfall, fog, wind etc. The climate of the district is per-humid characterized by high rainfall. Mild summer and winter and falls under cool to warm per-humid thermic-agro ecological sub-zone.

The annual rainfall of the district ranges from 2600 to 3200 mm with a monthly maximum rainfall of 11102.47 m and minimum rainfall of 1.oomm. The maximum rainfall occurred during the month of July (91.9mm) and December is the dry month. Monthly rainfall data of the district is given in Table 1. Rainfall generally begins from April and continues till the end of September. The rainfall generally increases from southeast to northeast. July is the rainiest month in the area. On an average there are about 200 days with 3.5 mm or more rain in a year. The relative humidity varies from 90 to 70 percent. The temperature varies between 39.9^{o}C in summer and 5.9^{o}C in winter.

Table 1: Monthly Rainfall Data (in mm) from the year 1994 to 2006(June) of Dhemaji district, Assam

Year / Month	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Jan	14.9	51.4	29.7	26.7	24.5	09.2	63.4	21.9	28.5	09.4	46.2	0.0	2.5
Feb	72.8	77.8	33.4	67.8	108.4	06.4	37.5	72.5	34.0	57.3	46.5	140	116.9
Mar	188.7	39.6	126.0	200.6	184.70	30.8	52.7	35.3	55.3	81.9	218.1	194	36.4
Apr	177.3	90.2	179.6	63.2	105.6	285.6	241.2	149.7	339.3	164.8	194.2	260.4	242.3
May	390.5	478.2	704.4	214.1	501.2	461.2	245.2	197.6	220.4	275.3	836.8	311.3	393.0
Jun	886.7	673.0	309.8	856.0	1101.7	567.8	583.8	516.8	302.8	598.7	421.4	604.2	738.2
Jul	510.0	674.3	548.1	590.8	625.3	680.1	600.4	480.0	746.6	991.9	501.2	462.1	
Aug	517.6	517.2	612.6	554.8	789.4	871.9	433.4	601.6	584.3	466.2	527.8	733.7	
Sep	389.3	356.2	203.7	526.4	277.0	476.1	805.3	561.1	299.7	468.2	351.3	191.8	
Oct	178.6	191.3	279.1	42.5	150.4	317.1	22.5	228.0	81.4	395.5	336.7	87.3	
Nov	17.2	19.8	Nil	44.4	07.8	18.7	33.8	26.6	63.3	13.0	0.70	40.8	
Dec	08.2	62.4	0.30	29.3	Nil	0.40	Nil	10.60	Nil	Nil	54.9	TR	

Source: Amanda Tea Estate, Pathalipam and Embankment & drainage Department of Dhemaji town

3.0 Geomorphology and Soil Types

3.1 Geomorphic Features and Landforms

Physiographically the district is more or less flat and the area can be divided into two distinct geomorphic units

i) The high-level plain of Brahmaputra river

The high-level plain of Brahmaputra river covers the northern part, which is gentle towards southwest of the eastern part and towards south of the high-grade erosion western part. High level terraces or piedmont plains of above 122 m contour and low level terraces of between 107 and 122 metres above mean sea level are the main characteristic features of the area. The area bordering to the north of the district is hilly terrain.

ii) The flat flood plain area

The flat flood plain area with one or two sand mounds in between central and southern part is present up to the Brahmaputra riverbank and altitude of this area varies from 89 to 96 metres above mean sea level

3.2 Drainage and Morphometric Features

Number of perennial streams originates in the northern hill ranges of Arunachal Pradesh and flow through the district before joining the Brahmaputra River. Because of very high amount of rainfall in the adjoining hill ranges, these rivers bring lot of sediments and flash floods during monsoon period playing havoc for the most part of the district.

3.3 Soil

The soil of the district is broadly classified into four groups, namely new alluvial, old alluvial, red loams and Laterite. The new alluvial soil is found in the flood plain areas subjected to occasional flood and consequently receives annual silt deposit when the flood recedes. The old alluvial soils are developed at higher level and are not subjected to flooding. Red loamy soils are formed on hill slopes under high rainfall conditions. Soil texture of the area is given below

a) Sandy loam = 46% of total cultivable land

b) Loamy = 44% of the total cultivable land

c) Clayey = 10% of the total cultivable land

4.0 Ground Water Scenario

4.1 Hydrogeology

Hydrogeologically the entire area of Dhemaji district is covered by alluvial sediments of Quaternary age. Piedmont deposits comprising of coarse clastic sediments like boulders, pebbles, cobbles, gravel associated with minor fraction of sand and silt are the main formations of the foothill zone. The piedmont zone extends over 4 – 6 km from the foothills. The floodplain area comprising sans, silt clay and gravels and pebbles received from the rivers coming from the upper reaches are the main deposits next to the piedmont deposits. All these formations act as good reservoirs of ground water in the area.

Ground water in the floodplain area occurs under phreatic condition in the shallow aquifer zone and under semi-confined condition in the deeper aquifer. The flow of ground water occurs from north to the south direction. The occurrence and movement of ground water is controlled by topogragraphy, geomorphology, climate, geology etc. Rainfall is the main source of ground water recharge, although seepage from canal, return flow from applied irrigation, seepage from surface water body etc take place.

On the basis of well data received fro the State Government departments and discussion with people engaged in construction of filter points, the following shallow aquifer geometry has been inferred. There is a great lateral and vertical variation of aquifer indicating various degrees of depositional agencies both in space and time. Aquifer horizon in the shallow zone comprises sand of various grades, pebbles and boulders. Sticky clay and clay mixed with sand is encountered within 0 to 6 meter depths and pebble, boulders were encountered from 16 to 20 metre onward.

Table 2: Summarised Hydrogeological data of EW of CGWB

Well Location	Depth Of construction (m)	Aquifer Zone Tapped (m)	SWL (mbgl)	Discharge (LPM)	Draw Down (m)	Transmissivity (m^2/day)	Permeabilty (m/day)	Hydraulic Cunductivity (m/hr)
Borola Mirigaon	61.5	(36-48) (54-60) Total=18	1.62	809.99	0.855	3283.20	14.62	126.896
Mohori Camp	59.5	(26-29) (32-38) (42-46) (49-54) (58-59) Total=19	1.25	745.641	2.45	9831.05	258.71	55.858

4.2 Ground Water regime and depth to Water Analysis

Sri G.Vijay Reddy, Junior Hydrogeologist and Sri B.Roy, Junior Hydrogeologist during the AAP 1997-1998 and 2003-2004 carried out Reappraisal Hydrogeological and

special Studies respectively in Dhemaji district. The NHNS monitored data for the year 1997 period is compared with the year 2003 data and change in ground water regime is compiled as per record in Table.3

Table 3: Ground Water Regime Analysis of Dhemaji district, Assam

Sl. No	Location	Block	10 yrs Mean Water Level (1993-2002)		Pre-monsoon Water Level (mbgl)		Change in Ground Water regime	Post-monsoon Water Level (mbgl)		Change in Ground Water regime	Fluctuation in Nov'2003 With respect to	
			WL	Yrs	April 1997	April 2003		Nov 1997	Nov 2003		April 2003	Mean
1	Bordoloni	Bordoloni	0.594	8	-	0.60	-	-	0.65	N.A	-0.05	-0.056
2	Dhemaji	Dhemaji	1.94	10	-	2.90	-	2.05	1.73	0.32	1.17	0.211
3	Sirpani	Sisibagaon	-	8	-	0.85	-	3.60	0.22	0.38	0.20	-
4	Sisibagaon	Sisibagaon	-	8	-	1.48	-	1.95	0.33	1.62	0.20	-
5	Akajan	Sisibagaon	1.996	8	-	3.20	-	2.37	1.55	0.82	1.65	0.446
6	Silapathar	Sisibagaon	1.86	8	-	5.35	-	0.93	1.25	0.98	4.10	0.61
7	BhagbanC	Jonai	0.705	8	-	0.95	-	-	0.37	-	0.58	0.335
8	Telem	Jonai	2.384	8	-	-	-	2.99	2.15	0.52	-	0.234

9	Bijaypur	Jonai	1.795	8	-	3.25	-	1.81	2.60	0.39	1.65	0.195
10	Jonai M S	Jonai	1.657	7	-	1.90	-	-	1.99	0.18	0.50	0.257

4.3 Water Level trend analysis:

Depth to water level during pre-monsoon (2006) ranges from 0.01 to 9.40 mbgl and it varies from 0.56 to 8.26 mbgl during post-monsoon (2006) period in the area. It is observed that water level fluctuation during pre and post-monsoon period varies from 0.11 to 4.54 m. Long term fluctuation analysis have been attempted with the water level data of the permanent hydrograph stations for the period of 1997 to 2006 which shows that no major change is observed in the water level over the period.

4.4 Ground Water Resources

Methodology adopted for ground water resource estimation of Dhemaji District of Assam is as per GEC 1997 Report, i.e. Ground Water Level Fluctuation and Rainfall infiltration factor Method.

The net ground water availability estimated in the year 2009 is 1,694.71 mcm. The existing gross ground water draft 140.65mcm and the stages of development are 8% only. Future provision for domestic and Industrial use is 20.83mcm and for Irrigation use is 1547.21mcm.

Assessment unit can be categorized into 4 categories as SAFE, SEMI-CRITICAL, CRITICAL, and OVER-EXPLOITED. In Dhemaji district stage of ground water development is 8%, which shows under the SAFE category. As long-term water level trend does not show any major change so the whole district may be considered as SAFE.

CHART OF GROUND WATER RESOURCE ESTIMATION

Net Ground Water Availability	= 1694.71mcm
Gross Ground Water Draft	= 140.65mcm
Stage of Ground Water Development	= 8%
Future provision for Domestic & Industrial Use	= 20.83mcm
Future Provision for Irrigation Use	= 1547.21mcm

4.5 Ground Water Quality

The quality of water is measure of its chemical, physical, microbiological and radiological properties with respect to its purposed use. In recent year, arsenic (As) in ground water has been reported from various parts of Assam and adjoining areas, which are mostly, fall in the vast riverine tracts of Brahmaputra River. However, reports have

also came from Barak river valley areas. Chakraborty et al. (2004) reported that Dhemaji district is worst affected. North Eastern Regional Institute of Water and Land Management (NERIWALM) based on their own study claimed that most of the districts are affected. Public Health Engineering Department has conducted its own study partly in collaboration with UNICEF, however detailed findings are yet to be published. Thus, Assam has been identified as the 5th State of India with As contamination. However clinical manifestation of *arsenicosis* is quite uncommon till date among the people living in the area.

The chemical quality of ground water in Dhemaji district showed high concentration of some harmful elements. Iron (Fe) and arsenic (As) content in the ground water of the district is observed high which is greater than permissible limit of BIS and WHO. Keeping in view this updated picture of chemical quality scenario of ground water in the district, it is advisable to test the potability of ground water before using it for drinking and cooking purpose. A long term environmental planning is also essential to blunt the danger from such pollution problems. The status of chemical quality of ground water regime and its utilized formulation for future ground water development programme and drinking water management strategy must assumed a greater significance.

Preliminary study in Dhemaji district by CGWB during 2005-06 indicated that, concentration of arsenic ranges from 0.025 to 0.55 ppm for samples collected from hand pumps taping depth range of 6 to 30 m (analysed by NERIWALM). However, the analytical results are showing wide range of variations for samples from same wells collected at different time. Hence, in this context, during 2006-07 the area has been resampled and analysed at referral laboratory of CGWB, SR as well as at NERIWALM.

Analysis results from CGWB, SR shows that concentration of iron (Fe) during pre-monsoon ranges from 0.31 to 69 ppm and that of arsenic (As) ranges from Below Detection Limit to 0.249 ppm during pre-monsoon. The highest Fe content is detected from the shallow aquifer of 16 feet depth hand pump at Teliajan, whereas the lowest Fe is from a 300 feet depth deeper aquifer at Likhabali. Arsenic concentration is higher in Dhemaji, Bordoloni and Sisiborgaon blocks and less in Merkong Selek block. The highest concentration of As is recorded from the shallow aquifer zone with a depth of 18 feet at Bhekeli.

The concentration levels of post-monsoon analytical data of iron (Fe) and arsenic (As) in Dhemaji district followed the same trend of higher concentration in the shallow aquifers. The concentration of iron (Fe) ranges from 0.2 to 49.2 ppm and that of arsenic (As) ranges from < 0.001 to 0.109 ppm respectively during post-monsoon period. The highest concentration of Fe is detected from a hand pump of 26 feet depth at Jaidhol Tingharia and highest As content is also detected from a shallow hand pump of 45 feet depth at Moridhol.

General chemical quality analysis of ground water samples were carried out by Standard Quantitative Methods and Advanced Instrumental analysis Techniques.

Physical parameters, such as pH, EC, TDS and temperature were determined at the time of sample collection in the field itself. The general hydrochemical behavior of contaminats and water quality standards were properly followed in the determination of chemical quality data of ground water sample in the area. It is not possible to consider all of them at a time. Some of the more important contaminants of ground water, which have direct bearing on human health and environment, are highlighted for the purpose of study

In order to study the quality of ground water suitable for domestic, irrigation and industrial purpose, ground water samples were collected from dug wells, deep tube wells and hand pumps during the Special Study period of 2003-04. The water samples are analysed in the Chemical laboratory of CGWB, NER, Guwahati. Detailed analyses report is discussed separately for shallow and deeper aquifers for the water samples collected during the said period in order compared the changes in the chemical quality.

4.5.1 Water Quality of Shallow Aquifer

EC ranges from 92 to 408 µmhos/cm at 25^{o}C,pH ranges from 7.0 to 7.8, TDS ranges from 115 to 300 ppm, Ca from 26 to 40 ppm, Mg from 3.6 to 13 ppm, HCO_3 from 146 to 214 ppm, Cl ranges from 18-64 ppm, SO_4 ranges from trace to 9.6. F ranges from 0.15 to 1.1 ppm. Different constituents are within permissible limit. Fluoride ranges from 0.30 to 2.50 ppm during pre-monsoon and it varies from 0.05 to 0.58 ppm during post-monsoon which indicates though fluoride content remains within the permissible limit during post-monsoon but becomes undesirable for drinking purpose during pre-monsoon.

4.5.2 Water Quality for Deeper Aquifers

Ground water samples collected from the exploratory wells of CGWB at Borola Mirigaon and Tarajan, Mohori camp show EC of 165 to 346 µmhos/cm at 25^{o}C, pH 7.0,TDS ranges from 68 to 170 ppm, Ca from 16 to 56 ppm, Mg 6.7 to7.3 ppm, HCO_3 from 98 to 220 ppm, Cl ranges from 3.5 to 7.0 ppm, SO_4 ranges from zero to traceable to 9.6 ppm, F ranges from 0.45 to 0.60 and NO_3 is 4.90 ppm. The analytical result indicate that all the constituents with in deeper aquifer are within permissible limit for all purposes

4.5.3 Comparison of Ground Water Quality W.r.t. previous Study

Comparison of ground water quality with respect to previous study reveals that there is no major change in the chemical quality of water for the last ten years. But recently arsenic has been reported from various parts of the district. Presence of arsenic content in some of the hand pumps is far beyond the permissible limit of Indian water Standard for drinking purposes (0.05ppm).

RCV, a voluntary organization working at Dhemaji has collected water samples from different parts of the district and as per analytical results, it is found that faecal colliform ranges from 0 to > 50/100 ml. It indicates no risk to gross pollution, high risk for drinking purpose and need improvement of water supply and sanitation system.

4.6 Status of Ground Water Development

4.6.1 Present Ground Water Development

Ground water is used fro drinking and irrigation purpose only in the district. As there is no major industry in this district, ground water utilization for the same may be considered as negligible. Development of ground water in Dhemaji district is discussed below

i) **Urban and Rural Water Supply Schemes:** In Dhemaji district out of 3237 sq.km of total geographical area, 3233.50 sq.km area if rural and only 3.50 sq.km area is under urban. As per the report of PHE, Dhemaji Division water supply status of the district is shown below:

Sl. No	Name of L.A.C	Total No. Of PWSS	Under ARP	Under TSP	Under MNP	Functioning			Remark
						ARP	TSP	MNP	
1	Dhemaji	16	05	10	01	05	09	-	-
2	Jonai	31	03	24	04	03	03	03	-

N.B. 47 Nos and 01 Nos of Dhemaji PWSS (Deposit Schemes)

ii) **Number of PWSS/spot Sources and Habitation covered under the Dhemaji, PHE-Division:**

Name of Division	Nos. of PWSS completed/ Commissioned	Nos.of spot source installed since inception	Total habitation Covered	If any habitation Left out as per 1991 census
Dhemaji (PHE)	48 Nos	8092 Nos	1204 Nos	1283-1204 = 79 Nos

4.6.2 Ground Water for Irrigation

Depending upon agro climatic conditions and rainfall distribution in the district, rice is the main crop, which is cultivated during three seasons i.e. autumn paddy (march to June), winter paddy (June to November) and summer paddy (November to April). In this district autumn paddy is grown over 21,404 ha, winter paddy over 1,13,093 ha and summer paddy over 1005 ha. It is apparent that winter paddy is the main crop, which covers 82% of the total rice production. Summer and autumn paddy production is 0.74% and 15.8% of the total rice production.

Table 4: Statement Showing Irrigation Potential Created in Dhemaji district

IRRIGATION POTENTIAL CREATED UPTO 2003 (in HA)

Sl. No.	Type of Irrigation Scheme	Dhemaji CSD		Jonai CSD		District total		Remarks
		No. of Schemes	Gross Area (ha)	No. of Schemes	Gross Area (ha)	No. of Schemes	Gross Area (ha)	
1	Surface LIS	07	2040	06	1387	13	3427	At present the Schemes are inoperative due to lack of fund
2	Shallow Tube Well	05	144	05	138	10	282	
3	Deep Tube Well	09	1146	01	40	10	1186	

Source: Office of the EE, Dept. of Irrigation, Dhemaji, Assam

Every year the district is severely affected by flood during summer and shortage of water due to insufficient irrigation facility during autumn is the reason for less production of paddy during this time. Department of Irrigation, Dhemaji district cerates irrigation potential of 4895 ha by 21 Nos of irrigation schemes (LIS, STWS and DTWS). But most of the schemes are inoperative due to lack of fund and constant flood damage. At only 47 Nos of STW are running in the district. As per ground water resources estimation of Dhemaji district it is observed that 3891 ham/year draft is created for irrigation purpose against 1,62205 ham net ground water availability for the district. Thus it is observed that production assured irrigation from ground water source is required to be developed for which there is ample scope from the resource point of view.

5.0 Ground Water Management Strategy

5.1 Ground Water Development

Thick and extensive alluvial deposits of excellent hydraulic properties having rich ground water resources underlie Dhemaji district. As per ground water resource estimation, total ground water resource of the district is 1,88301 ham of which 1,54721 ham is available for irrigation after allocation of 2083 ham for domestic and industrial purpose. There is good number of shallow and deep tube wells constructed by various State agencies. There is much scope for the development of ground water by way of constructing ground water abstraction structures in a planned way for profitable ground water development.

5.2 Water Conservation and Artificial recharge

Method of making ground water abstraction structure, type, design, depth of wells, number and spacing between two wells depends on size of aquifer material, depth range & hydraulic parameters of aquifer zones, which differ from place to place. As per earlier reports and present study, following design criteria is recommended.

5.2.1 Shallow Domestic Wells

Open wells and filter point wells are feasible in all area of the district. In unconsolidated sediments ring well may be constructed by excavating down to the saturated horizon. Cement or earthen rings from 0.80 to 1.20 placed one above another with weep holes in the bottom rings are likely to hold sufficient quantity of water. Depth may be range from 05 to 15 m depending upon the topographic elevation. Expected discharge will be 3-to5 cubic meters per day.

Filter Point Wells with a total depth of 10 to 20 mbgl by providing galvanized iron or mild steel pipe and at bottom slotted pipe against aquifer zone either made from bamboo or MS pipe or P.V.C pipe are suitable. Bamboo as pipe and screen are very much within the reach of small and marginal farmers, as bamboo is locally available in the district. This type of well will be low cost and long lasting. Expected discharge will be 10 to 15 cubic meters per day.

5.2.2 Deep Tube Well for Irrigation Purpose

Deep tube wells are feasible in the entire district. These tube wells are expected to tap the granular zones occurring beyond 50 mbgl. Diameter of casing pipe, when used as housing pipe, need to be decided based on the anticipated discharge. Housing pipe should be large enough to accommodate the pump. Based on the static water level, maximum draw down and seasonal fluctuation length of housing pipe should be range from 30 to 40 mbgl. Along foothill region and 20 to 30 mbgl towards central and southeastern part. For avoiding corrosion and clogging of well screen, the entrance velocity should be less than 2 cm/sec.

6.0 Ground Water Related issues and problems

Frequent floods ravage the district every year during the monsoon months from May to September. About 70% area of the district is affected by floods in one way or other. Flood affected area during 1996 was 1656sq.km and during 2003 it was only 365.18sq.km. Flood accompanied with soil erosion and sand deposition cause maximum damage to standing crops and to the agricultural lands.

Physiographically the district is more or less flat and the area can be divided into high-level plain of Brahmaputra river (area falling in between 107m to 122m contour) and flat flood plain area (area falling in between 89m to 96m contour)

Number of perennial streams flow through the district from north to south and ultimately join the Brahmaputra River. Thus the river Brahmaputra is effluent in nature. The major streams that drain the area are Kumotia, Gai, Kanibil, Sisi, Simen, Dikari and Royang.

Geologically the area is occupied by Older and Newer alluvium consists of boulder, cobbles, gravel, sand and silt. Flood plain and Younger alluvial plains of newer alluvium consist of gravel, pebble, coarse to medium send, silt and clay.

Ground water occurs under phreatic condition in the shallow aquifer zone & under semi-confined condition in the deeper aquifer. Flow of Ground water is from north to south. Depth to water during Pre-monsoon is higher than Post-monsoon. This may be the affect of Pre-monsoon rainfall. Long term water level show no major change in the area.

Other than Iron (Fe) and arsenic (As) content, most of the constituents are within permissible limit, both for drinking and irrigational use. In some part of the district Fluoride (F) show within permissible limit during Post-monsoon, but in the Pre-monsoon period concentration rises (1.5 ppm) and become undesirable for drinking purpose. Recent detection of presence of As in the shallow aquifer in some parts of the district needs a detailed study.

7.0 Awareness and Training activity

7.1 Mass Awareness Programme and Water Management Programme by CGWB.

No such programme and activity is carried out in the district till date.

7.2 Participation In Exhibition, Mela, Fair etc.

Till date no such Exhibition, Mela, Fair etc were organized and participation by CGWB does not arise.

7.3 Presentation and Lecture delivered in Public forum/radio/T.V/Institution of repute/Grassroots associations/NGO/Academic institutions etc.

Till date CGWB is not involved in such programme in the district

8.0 Areas Notified by CGWA/SGWA

Nil.

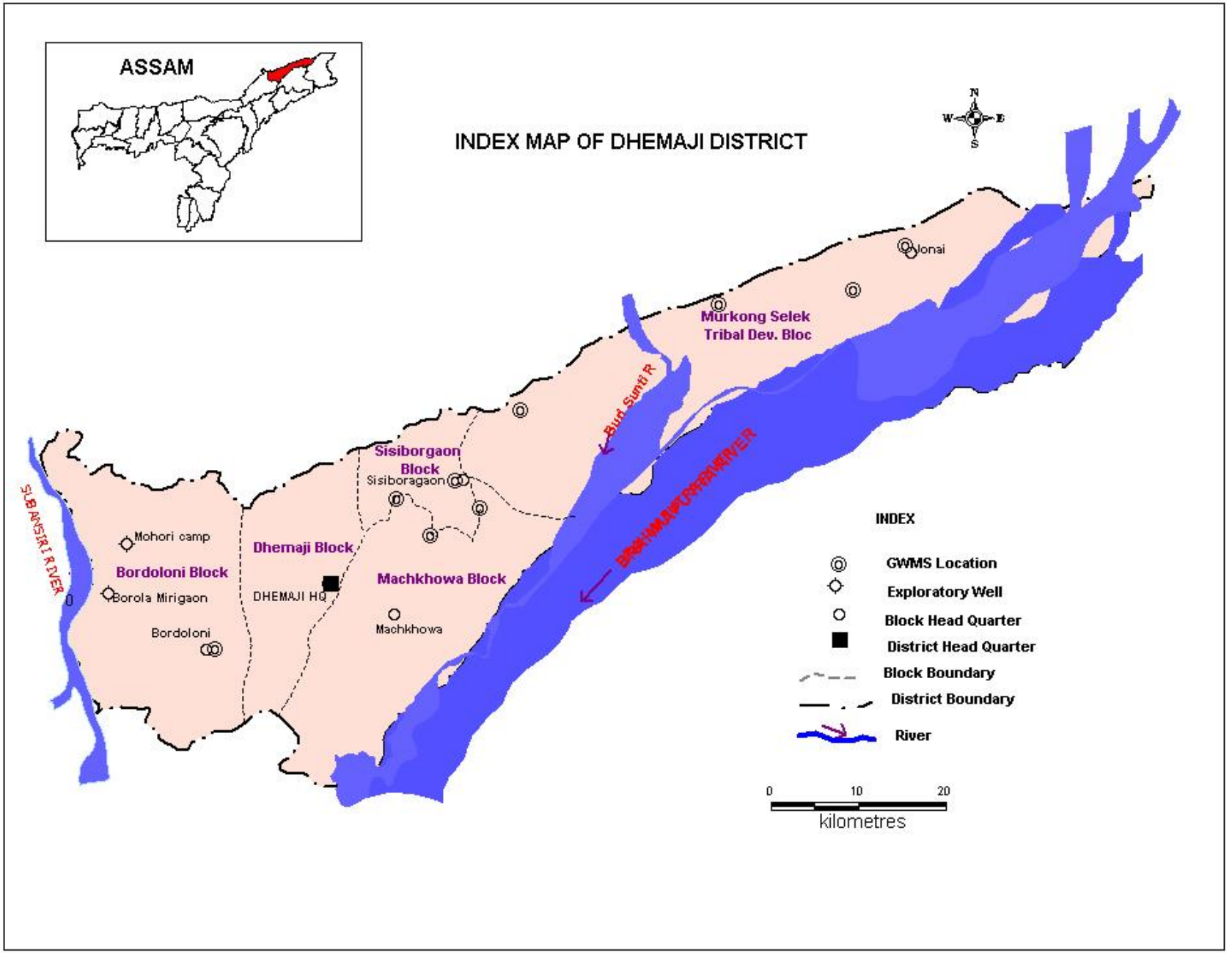
9.0 Recommendations

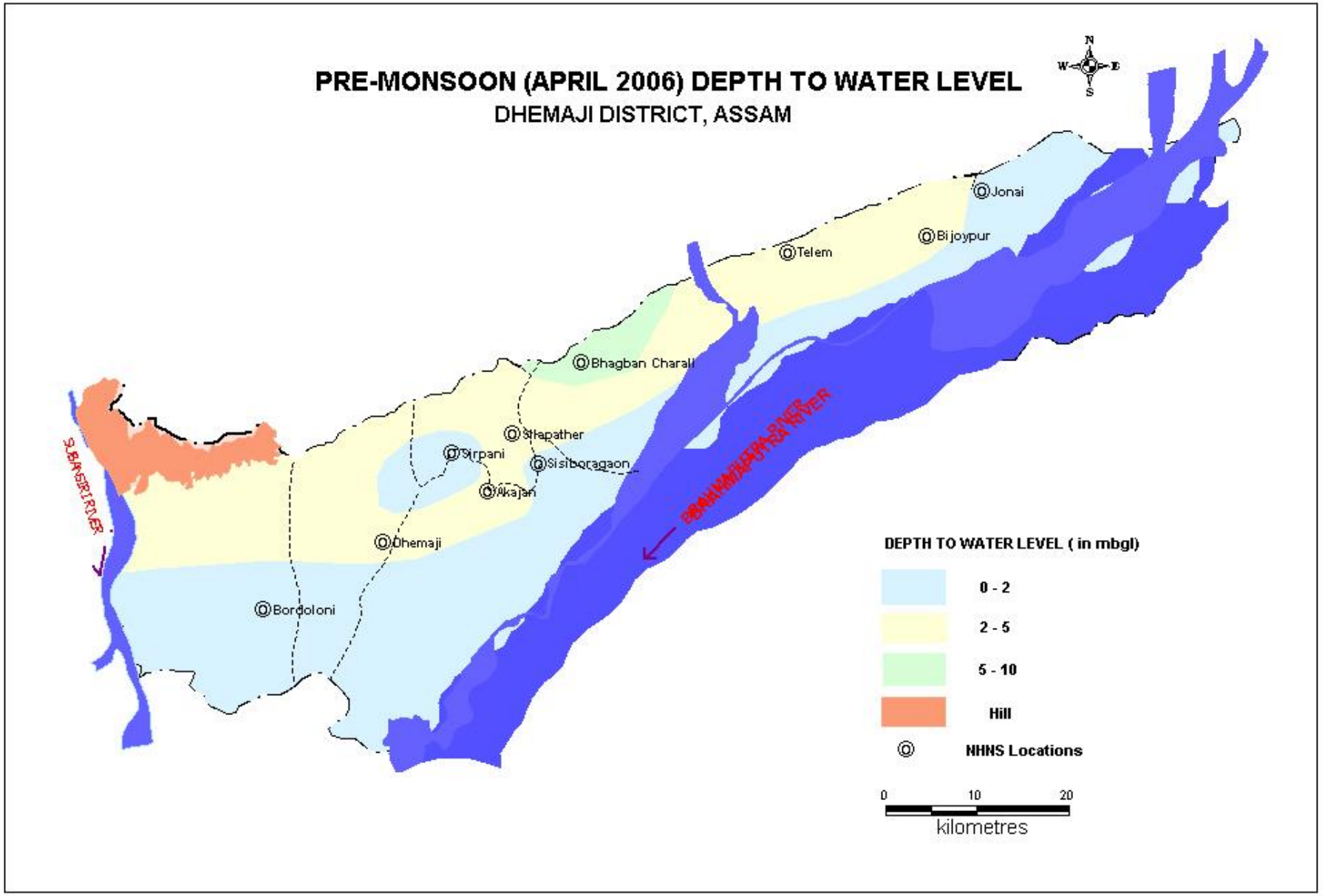
Existing hydrogeological set up and availability of huge ground water resource indicate that there is much scope for the development of ground water by way of constructing ground water abstraction structures in a planned way for profitable ground water development. In future ground water in the area can also be developed by means of tube wells or filter point wells.

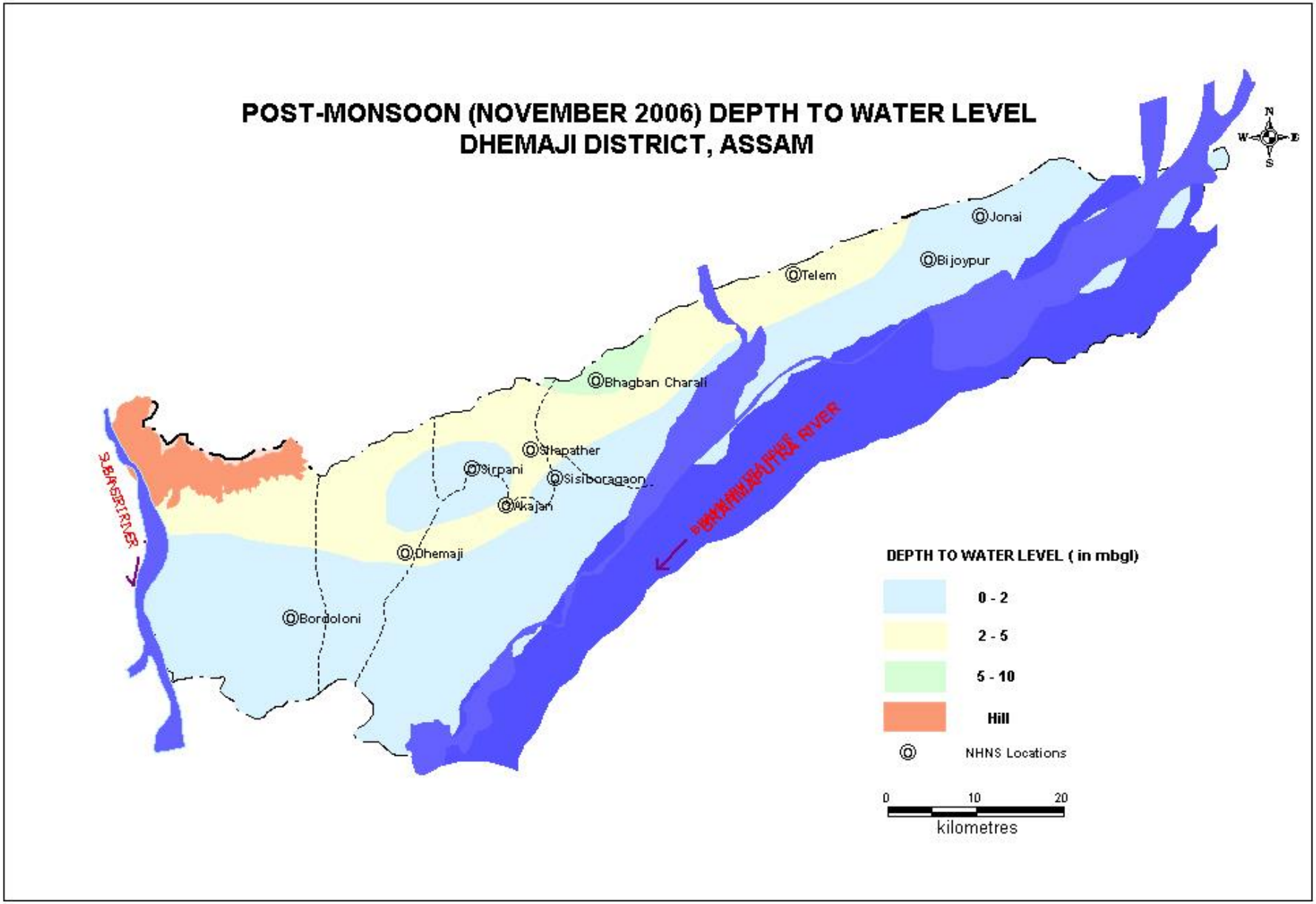
Iron treatment plants need to be installed with PHED water supply station very urgently for drinking purpose. Recent report on presence of Arsenic in shallow ground water need an urgent study and on the basis of the report of the study, water from very deep aquifers should be provided (if Arsenic is within permissible limit) for drinking

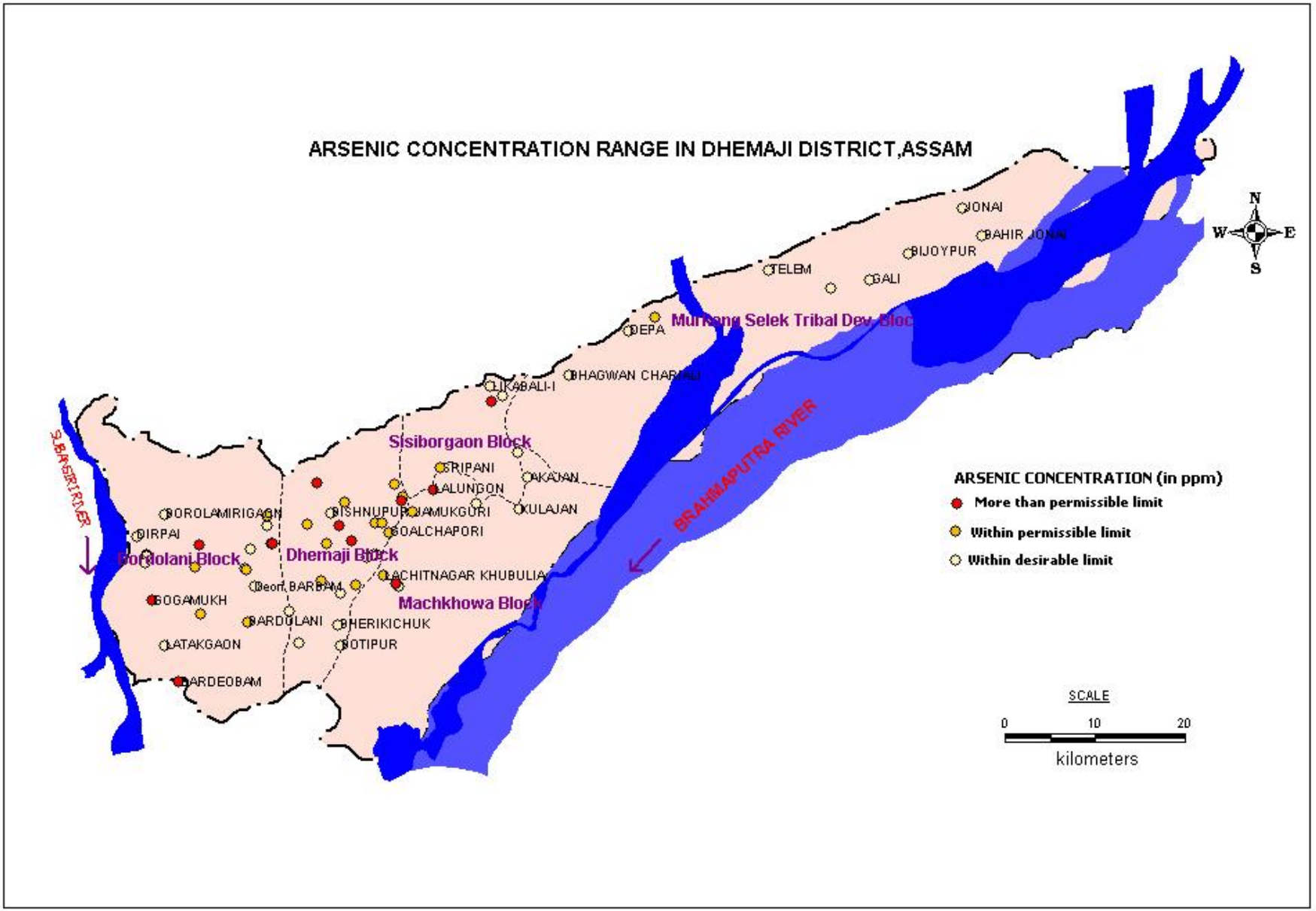
purpose. A good number of tube wells under PHED are presently not in functioning stage or discharge is very low. Proper rehabilitation of these sick wells in the entire area is to be carried out so as to mitigate water scarcity as reported from different village.

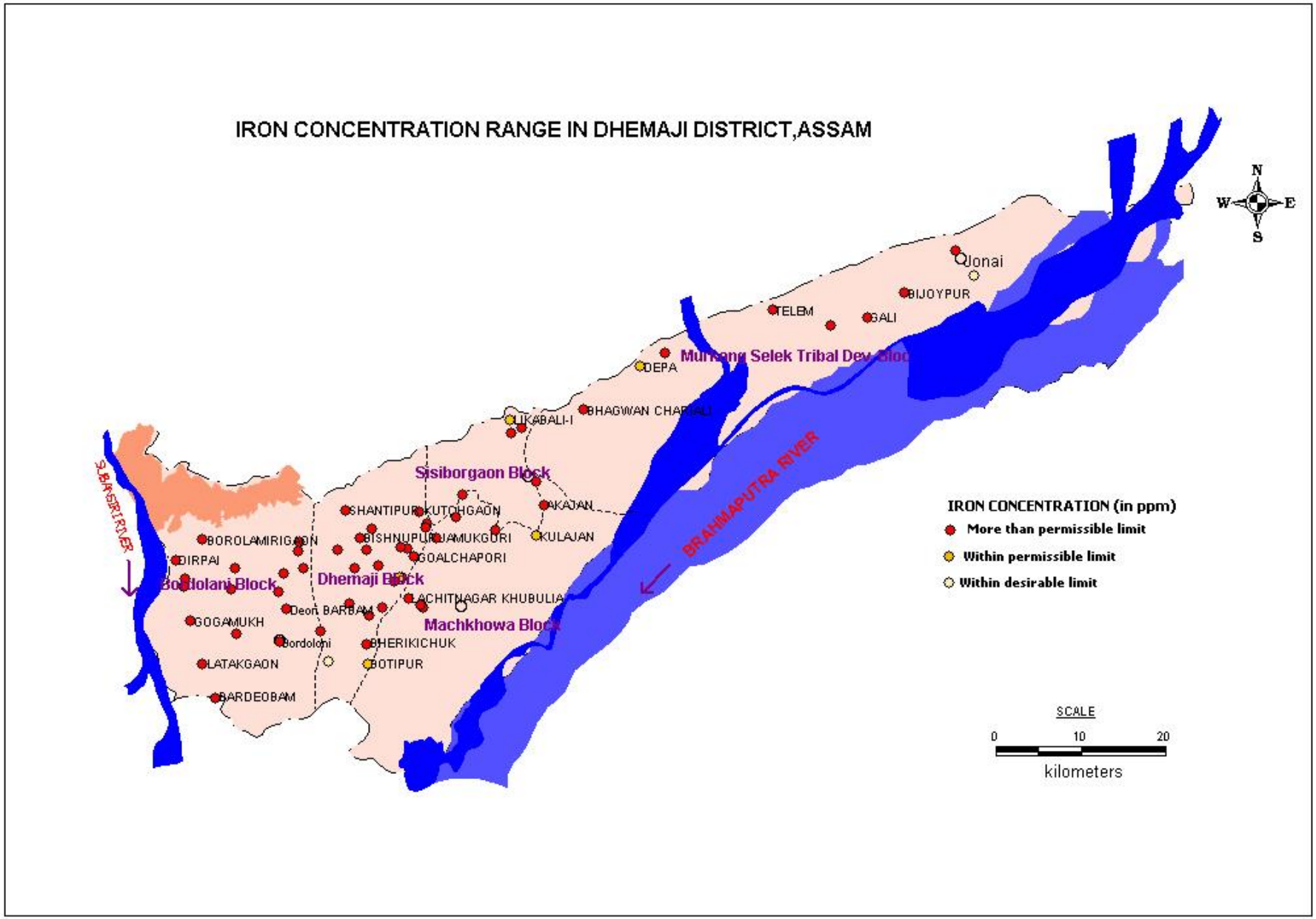
To delineate the arsenic (As) free aquifer at deeper depth has taken up to exploration in the district in this current AAP, 2006-07.


ASSAM
INDEX MAP OF DHEMAJI DISTRICT
N
W
E
S
Jonai
Murkong Selek
Tribal Dev. Bloc
Burh Suntil R
Sisiborgaon
Block
Sisiboragaon
SUBANSIRI RIVER
Mohori camp
Bordoloni Block
Borola Mirigaon
Bordoloni
Dhemaji Block
DHEMAJI HQ
Machkhowa Block
Machkhowa
INDEX
GWMS Location
Exploratory Well
Block Head Quarter
District Head Quarter
Block Boundary
District Boundary
River
0
10
20
kilometres

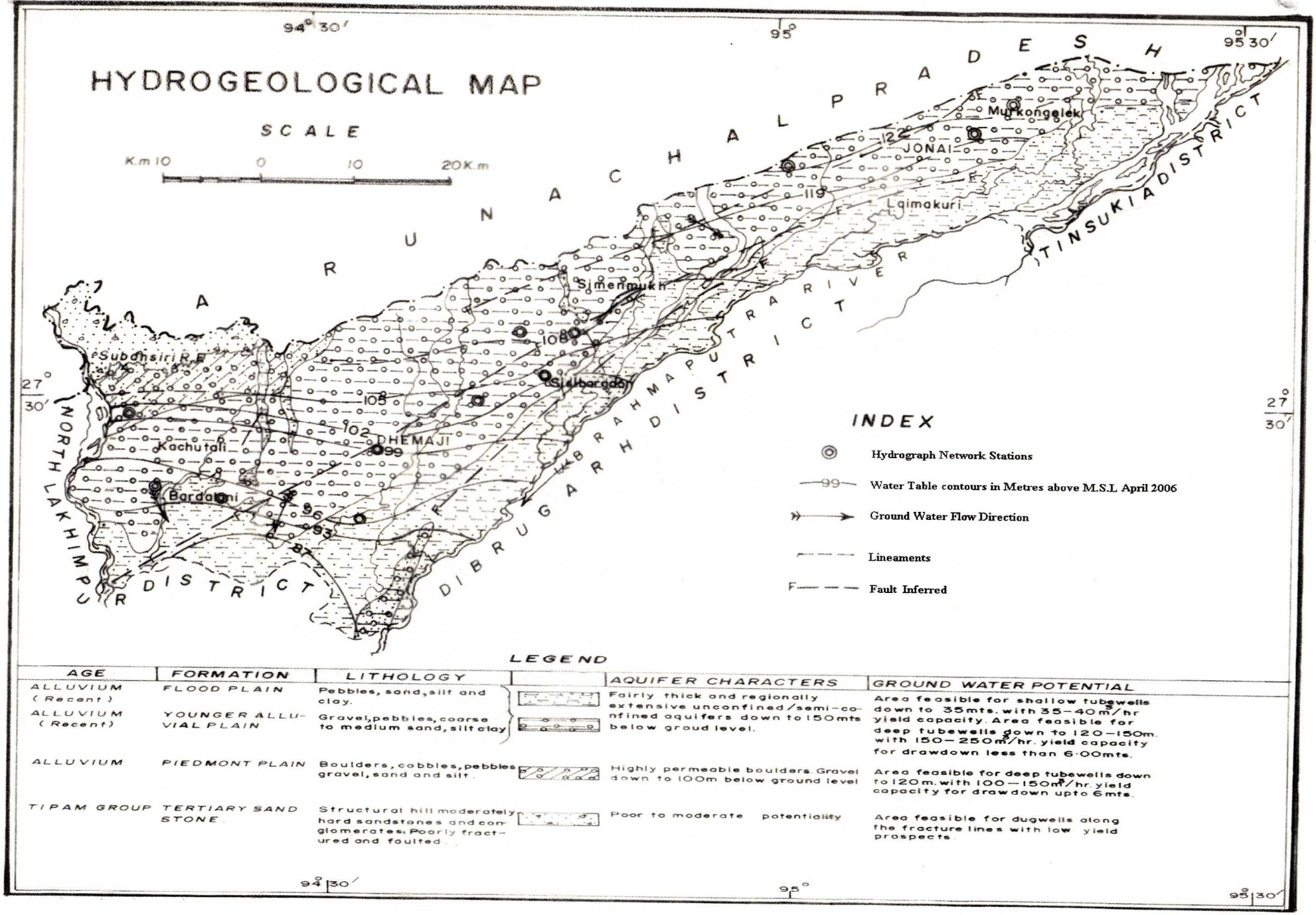

PRE-MONSOON (APRIL 2006) DEPTH TO WATER LEVEL
DHEMAJI DISTRICT, ASSAM
N
W
E
S
Jonai
Bijoypur
Telem
Bhagban Charali
Silapather
Sirpani
Sisiboragaon
Akajan
Dhemaji
Bordoloni
SUBANSIRI RIVER
BRAHMAPUTRA RIVER
DEPTH TO WATER LEVEL (in mbgl)
0 - 2
2 - 5
5 - 10
Hill
NHNS Locations
0
10
20
kilometres


POST-MONSOON (NOVEMBER 2006) DEPTH TO WATER LEVEL
DHEMAJI DISTRICT, ASSAM
N
W
E
S
Jonai
Bijoypur
Telem
Bhagban Charali
Dhapather
Sirpani
Sisiboragaon
Nikajan
Dhemaji
Bordoloni
SUBANSIRI RIVER
BRAHMAPUTRA RIVER
DEPTH TO WATER LEVEL (in mbgl)
0 - 2
2 - 5
5 - 10
Hill
NHNS Locations
0
10
20
kilometres


ARSENIC CONCENTRATION RANGE IN DHEMAJI DISTRICT,ASSAM
JONAI
BAHIR JONAI
BIJOYPUR
TELEM
GALI
DEPA
Murkong Selek Tribal Dev. Bloc
BHAGWAN CHARIALI
LIKABALI-I
Sisiborgaon Block
RIPANI
AKAJAN
ALUNGON
KULAJAN
BOROLAMIRIGAON
BISHNUPUR
JAMUKGURI
GOALCHAPORI
DIRPAI
Bordolani Block
Dhemaji Block
LACHITNAGAR KHUBULIA
Beon BARBAM
Machkhowa Block
BOGAMUKH
BARDULANI
BHERIKICHUK
LATAKGAON
BOTIPUR
BARDEOBAM
SUBANSIRI RIVER
BRAHMAPUTRA RIVER
N
W
E
S
ARSENIC CONCENTRATION (in ppm)
More than permissible limit
Within permissible limit
Within desirable limit
SCALE
0
10
20
kilometers


IRON CONCENTRATION RANGE IN DHEMAJI DISTRICT,ASSAM
N
W
E
S
Jonai
BIJOYPUR
TELEM
GALI
DEPA
Murkong Selek Tribal Dev. Block
BHAGWAN CHARIALI
LIKABALI-I
Sisiborgaon Block
AKAJAN
SHANTIPUR
KUTOHGAON
BISHNUPUR
JAMUKGURI
KULAJAN
GOALCHAPORI
BOROLAMIRIGAON
DIRPAI
Bordoloni Block
Dhemaji Block
LACHITNAGAR KHUBULIA
Deori BARBAM
Machkhowa Block
GOGAMUKH
Bordoloni
BHERIKICHUK
LATAKGAON
BOTIPUR
BARDEOBAM
BRAHMAPUTRA RIVER
SUBANSIRI RIVER
IRON CONCENTRATION (in ppm)
More than permissible limit
Within permissible limit
Within desirable limit
SCALE
0
10
20
kilometers

DHEMAJI DISTRICT, ASSAM



LEGEND

AGE	FORMATION	LITHOLOGY	AQUIFER CHARACTERS	GROUND WATER POTENTIAL
ALLUVIUM (Recent)	FLOOD PLAIN	Pebbles, sand, silt and clay.	Fairly thick and regionally extensive unconfined/semi-confined aquifers down to 150mts below groud level.	Area feasible for shallow tubewells down to 35mts. with 35–40 m^3/hr yield capacity. Area feasible for deep tubewells down to 120–150m. with 150–250 m^3/hr. yield capacity for drawdown less than 6·00mts.
ALLUVIUM (Recent)	YOUNGER ALLUVIAL PLAIN	Gravel, pebbles, coarse to medium sand, silt clay		
ALLUVIUM	PIEDMONT PLAIN	Boulders, cobbles, pebbles gravel, sand and silt.	Highly permeable boulders Gravel down to 100m below ground level	Area feasible for deep tubewells down to 120m. with 100–150 m^3/hr. yield capacity for drawdown upto 6mts.
TIPAM GROUP	TERTIARY SAND STONE	Structural hill moderately hard sandstones and conglomerates; Poorly fractured and faulted.	Poor to moderate potentiality	Area feasible for dugwells along the fracture lines with low yield prospects.