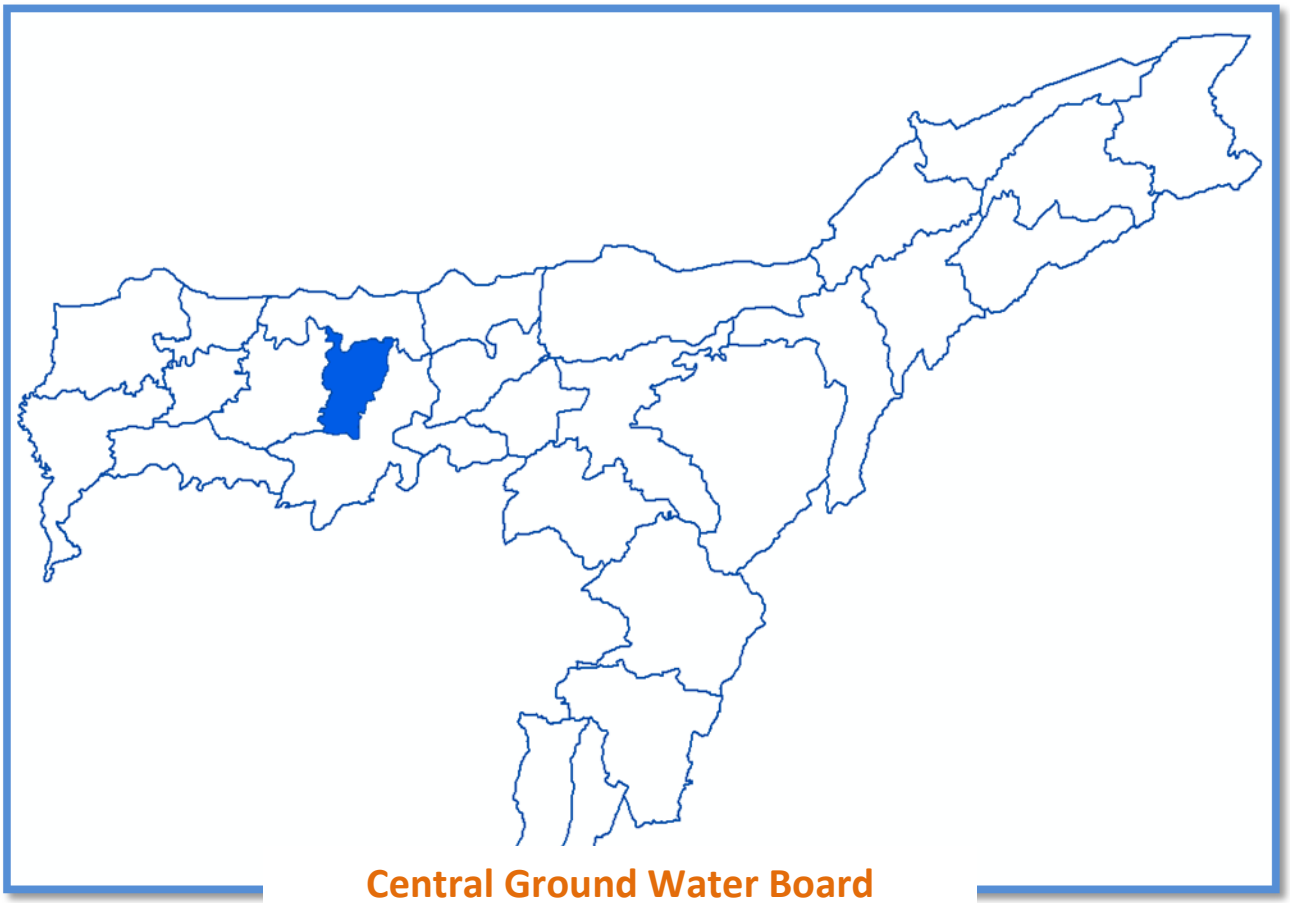
Technical Report Series: D

No:

Ground Water Information Booklet

Nalbari District, Assam



Central Ground Water Board

North Eastern Region

Ministry of Water Resources

GROUND WATER INFORMATION BOOKLET
NALBARI DISTRICT, ASSAM

DISTRICT AT A GLANCE

Sl.No.	Items	Statistics
1.	**GENERAL INFORMATION**	
	i) Geographical AREA (Sq.Km.)	2,257
	ii) Administrative Divisions(as on 2006)	1
	Number of Tehsils/CD Blocks	12
	Number of Panchayats/ Villages	110
	iii) Population (as on 2001 Census)	11,48,824
	iv) Average Annual Rainfall (mm)	1904.4
2.	**GEOMORPHOLOGY**	
	Major Physiographic Units	Tertiary hills, flat alluvial plain(older and younger alluvial) Pagladia river and its tributaries
	Major Drainages	
3.	**LAND USE (Sq.Km.)**	
	a) Forest Area	170.03
	b) Net area sown	1535.45
	c) Culturable waste land	11.07
	d) Current follow	9.50
	e) Total cropped area	2110.64
	f) Cultivable area	1546.52
4.	**MAJOR SOIL TYPES**	Alluvial Soil
5.	**AREA UNDER PRINCIPAL CROPS (as on 2006)**	94,285 ha
6.	**IRRIGATION BY DIFFERENT SOURCES (in ha)**	
	(a) Surface	18,660
	(b) Ground Water	45
7	**NOS. OF CGWB MONITORING WELLS**	3
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Vast river borne sediment, Older and Younger alluvium
9	**HYDROLOGY**	
	Major Water bearing Formation	Sand and pebble aquifer zone down to 300 m depth
	(Pre-monsoon water level	1.24 m
	(Post -monsoon water level	1.61 m
	Long term water level trend	No significant change observed

10	**GROUND WATER EXPLORATION BY CGWB (as on 31.03.2009)**	
	No. of wells drilled	8
	Depth Range in m	30.5-304.62
	Discharge (litres per second)	4.53-57.33
	Transmissivity (m^2/day)	147-3658
	Permeability	4.45-414.3
11	**GROUND WATER QUALITY**	
	Presence of Chemical constituents beyond permissible limit (i.e. EC, F, Fe, As)	EC – Permissible limit F – Within desirable limit Fe – 0.2-1.40 As – not detected
12	**DYNAMIC GROUND WATER RESOURCES 2009**	
	Annual Replenishable Ground Water Resources	943.50 mcm
	Net Annual Ground Water Draft	457.28 mcm
	Projected demand for domestic and industrial uses up to 2025	36.03 mcm
	Stage of Ground Water Development	54%
13	**AWARENESS AND TRAINING ACTIVITY**	
	Mass awareness programmes organised (a) Date (b) Place	Not organised
14	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**	
	Projects completed by CGWB (No. & amount spent)	Nil
	Project under technical guidance of CGWB	Nil
15	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE Blocks	Nil
	No. of Critical Blocks	Nil
	No. of Blocks notified	Nil
16	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Nil

GROUND WATER INFORMATION BOOKLET
NALBARI DISTRICT, ASSAM

1.0 INTRODUCTION

Nalbari district of Assam is located on northern part of the mighty Brahmaputra river and bounded by North Latitudes $26^0$08'30" and $26^0$34'20" E Longitudes $91^0$14'30" and 91^o38'10" covering area of 2,257 sq. Km. The district has been sub-divided into single sub-division, 12 C.D. Blocks and 110 Panchayats.

As per 2001 Census, the total population of the district is 11,48,824. The land use data reveals that the district has total forest land of 17,003 ha. The net area sown is 1,53,545 ha and current fallow is 950 ha. The district has total cropped area of 2,11,064 ha and the total cultivable area of the district is 1,54,652 ha.

The district receives moderate during April to July with an average rainfall of 1904.4 mm. The district experiences highest temperature of 35^0C in summer and mean minimum temperature up to 11^0C. The relative humidity varies from 74 to 85% during monsoon period.

Physiographically the district can be divided into two units (1) Northern alluvial region (between 120-140 amsl) and (2) the southern swamps or flood plain of river Brahmaputra. The general gradient is towards the river Brahmaputra in the south. The area on the bank of the river has very low elevation and is inundated during flood.

The River Brahmaputra along with its tributaries like Pagladiya, Buradiya, Baralia etc. control the main drainage system of the district.

Geologically, the district is occupied by younger alluvium on north and flood plain deposit on southern reach near the Brahmaputra River. The alluvium comprises thick beds of clay. The flood plain deposit is characterised by fine to very fine grained silty sand and loose clay bands.

Ground water occurs under unconfined condition in the district and being a mono aquifer system, the water level is almost directly related to the amount of precipitation received. The pre-monsoon average water level is 1.24 m bgl, which the post monsoon value is 1.61 m bgl. The long term water level trend does not show any significant change.

From quality point of view, the ground water is neutral to slightly alkaline in nature with low to moderate salinity with soft to moderate hardness.

Ground water at present time is used for domestic and irrigation purposes. As per reports issued by Irrigation Department, an area of 43.20.5 ha has been covered by irrigation scheme out of which about 45 ha is covered by ground water resources.

2.0 RAINFALL AND CLIMATE

The district experiences a tropical humid climate with heavy rainfall and hot summer. The average temperature ranges from minimum 8^0C to maximum 34^0C through out the year. The average humidity remains almost same with variation from 62% in winter to 87% in post monsoon period.

The average annual rainfall of the district is 1904.4 mm with minimum rainfall as zero mm in November to maximum 395 mm during August. The maximum rainfall occurs during the period from April to August. Heavy rainfall starts from April with the onset of monsoon and continues till August. Then it recedes afterward.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Physiographically, the district is divided into two units (i) Northern alluvial region and (ii) Southern swamps or flood plains of the river Brahmaputra.

The northern alluvial part forms a flat land with heights of 120-140 m above MSL with a gentle slope towards south the river Brahmaputra. The regional gradient is from east to west which indicates the general flow direction of the Brahmaputra river.

The Brahmaputra river flows from east to west and from the main regional drainage. Its tributaries like Pagladia, Baralia etc. originating from Northern Himalayan foothill have a steep slope and shallow braided channels for considerable distances. They have coarse gravel and sandy beds and carry loads of silts and sand during flash flood. The elevation of land near the Brahmaputra is 5-10 m amsl and the flood water in the flood plain area is detained in low depression forming bil and marshy land along the main river coarse.

The soil of the district can broadly be classified into two groups.

(1) Deep reddish clayey soil in forest and hilly area and (2) Alluvial soil of Recent age occurring along the alluvial plains of the Brahmaputra river. The red clayey alluvial highlands of the district are ideally suited for the tea and sugarcane cultivation. The swampy and very low lands are characterised by deep grey silty soil suitable for jute cultivation.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

Hydrogeologically the entire area of Nalbari district is occupied by alluvial sediments of Quaternary age. The alluvium comprises unconsolidated sediments of clay, silt, sand. Gravel and boulders of quartz, feldspars etc. The younger alluvial cover deposited during the period comprises thick beds of clay, sand and gravel. The upper layer of the alluvial formation comprises clayey/sandy soil followed by coarse sand gravel beds at depth. This formation is a very good potential zone for ground water extraction**.**

Ground water in the district occurs under water table and semi-confined condition. The district is underlain by thick alluvium having uniform porosity and permeability of 10-15%. Water level records of the hydrographic network stations show very less variation in rise and fall. The average pre-monsoon water level of the district is 1.24 m bgl while that of post monsoon is 1.61 m bgl. Exploratory drilling by CGWB reveals the following characteristics of the deeper aquifers of the district.

Location	SWL (m bgl)	Discharge m^3/day	Draw-down (m)	Sp. Capacity Lpm/m	Trans-missivity m^2/day	Storativity
Bangaon	3.0	3440	4.40	544.8	1398.94	-
Bijalighat	-	2701.44	8.03	233.01	24734.5	$4.5x10^{-5}$
Nankarvaira	3.90	560	-	-	-	-

4.2 Ground Water Resources

The annual replenishable ground water resources of Nalbari district are 943.50 mcm and the net annual ground water draft is 457.28 mcm. The projected demand for ground water for domestic as well as industrial use up to 2025 will be 36.03 mcm. The stage of ground water development is the under **SAFE** category.

4.3 Ground Water Quality

The chemical analysis shows that the ground water is neutral to alkaline in nature with pH ranging between 6.9 and 7.9. The Electrical Conductivity value is within permissible limit. Calcium content is form 24 to 62 mg/l and well within permissible limit. The alkalinity value governed by anion content of carbonates and bicarbonates is within range of 43 to

275 mg/l. The hardness of ground water ranging from 65 to 235 ppm indicates that ground water is of soft to moderately hard in nature.

The analysis of ground water samples from deep aquifer indicates its suitability for its domestic & irrigation use. The ground water in general is alkaline as pH of ground water ranges from 7.9 to 8.4. The water is of medium salinity and contains low sodium.

4.4 Status of Ground Water Development

Ground Water Development in the district is not up to the mark. Except a few deep and shallow tube wells, no much more construction has been made. Rural water supply by Public Health Department covers almost most of the parts of the district. Irrigation wells by ASMIDC, Irrigation Department and Agriculture Department have covered a few schemes with construction of shallow tube wells.

Department	Structures	Working	Non-working
ASMIDC	STW	1134	336
	LLP	229	-
Irrigation	STW	57	92
	DTW	46	56
Agriculture	Bamboo structure	1000	-

5.0 GROUND WATER MANAGEMENT STRATEGY

As stated above, the Nalbari district as a whole is represented by a mono-aquifer system with thickness varying from 50 to 250 m. Ground water development in the district is almost in nascent stage. Shallow tube wells down to the depth of 50 m and deep tube well down to the depth of 200 m or more can be constructed in almost all parts of the district with proper hydrogeological investigation, with expected discharge of 3,500 m^3/day and draw down of 5-6 m in the alluvial area.

The area adjacent to the Brahmaputra river is feasible for shallow tube wells with depth range of 30 to 50 m depending on availability of granular zones. Such tube well is expected to yield from 35 to 45 m^3/hr tapping 15 m of aquifer zones with drawdown of 2.5 to 5 m.

Deep tube wells can be constructed in all parts of the district especially on northern parts where water requirement is more. Low cost ground water structures can be constructed to a depth of 50 m and tapping 10-15 m granular zone using standard strainer.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

The district as whole is affected by flood during monsoon along the courses of the tributaries of the Brahmaputra river. The effect of flood and soil erosion is much more on southern part than the northern portion near the Brahmaputra river.

The frequent flood affects the ground water regime of the district with water logging problem along with rising of water table which recedes in post-monsoon period due to porous and monotonous nature of the aquifer.

No quality problem is recorded so seriously except high iron content in certain pockets. The problems of arsenic and fluoride have not been reported

7.0 RECOMMENDATION

Existing hydrogeological setup and availability of huge potential aquifer zones down to the depth of 300 m indicate much scope for ground water development by shallow and deep abstraction structures.

Both shallow tube wells down to the depth of 50 m and deep tube wells down to 250 m are feasible in the district, particularly deep tube wells in northern part and shallow tube wells in southern part near the Brahmaputra river. The shallow tube wells in such cases can yield average 30 m^3/hr while the deep tube wells can yield 100 to 120 m^3/hr. The selection of sites in both the cases may be done after proper investigation.

Low cost ground water development structures in the alluvial part of the district can be constructed to a depth of 50 m tapping 10-15 m saturated granular zones through standard strainers.

From the point of chemical quality, ground water is suitable for domestic, industrial and irrigation purposes except in a few locales where iron content is high.

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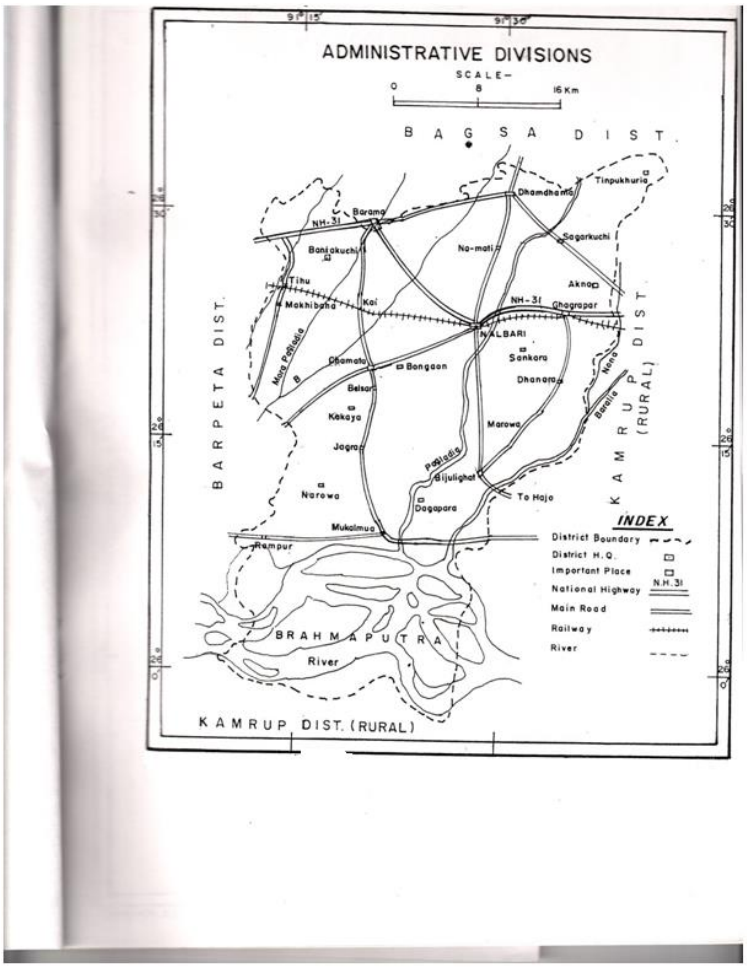
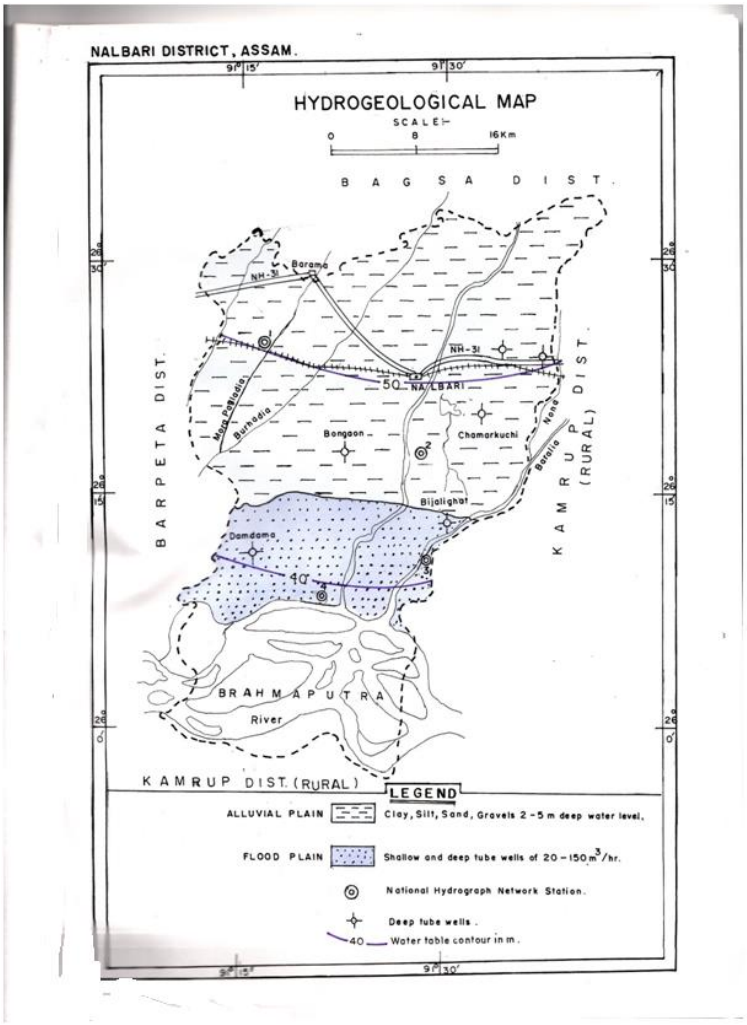

ADMINISTRATIVE DIVISIONS
SCALE–
0 8 16 Km
BAGSA DIST.
Tinpukhuria
Dhamdhama
Baroma
NH-31
Sagarkuchi
Banjakuchi
Na-mati
Akna
Tihu
Makhibaha
Koi
NH-31
Ghograpar
NALBARI
Mora Pathar
Chamata
Bongaon
Senkara
Nala
Dhanara
Belsar
Kekaya
Marowa
Jagara
Pathar
Bijulighat
To Hajo
Narowa
Dagapara
Mukalmua
Rampur
INDEX
District Boundary
District H.Q.
Important Place
National Highway N.H.31
Main Road
Railway
River
BRAHMAPUTRA
River
BARPETA DIST.
KAMRUP DIST. (RURAL)
KAMRUP DIST. (RURAL)


NALBARI DISTRICT, ASSAM.
HYDROGEOLOGICAL MAP
SCALE
0 8 16Km
B A G S A D I S T.
BARPETA DIST.
K A M R U P DIST. (RURAL)
Barama
NH-31
NALBARI
Bongaon
Chamarkuchi
Bijaligha
Damdama
Mora Pathadia
Burnadia
Bandia
BRAHMAPUTRA River
KAMRUP DIST. (RURAL)
LEGEND
ALLUVIAL PLAIN
Clay, Silt, Sand, Gravels 2 - 5 m deep water level.
FLOOD PLAIN
Shallow and deep tube wells of 20 - 150 m3/hr.
National Hydrograph Network Station.
Deep tube wells.
Water table contour in m.